Beet, Brassica and Forage

CROPPING GUIDE

2018.
FOREWORD

Forage crops are a valuable tool for meeting the changing feed and energy requirements of a livestock operation throughout the year. Feed supply and stock performance can be manipulated through the use of different forage species. Agricom recognised the integral role of brassicas, forage cereals and herbs, investing in breeding and research, and is now proud to supply products specifically bred for New Zealand’s farming systems. Agricom also maintains a strong partnership with leading overseas fodder beet plant breeders, Florimond Desprez, to ensure Agricom’s fodder beet are equal to the best in the world.

Understanding the breeding process is useful when considering the purchase of a new product. Agricom’s core business is investing in plant breeding to produce innovations that will increase farmers’ profitability. NZ farmers can buy Agricom products with confidence knowing they come from a highly developed breeding programme and are backed by strong technical support and a proven track record.

WHAT’S NEW AT AGRICOM?

In 2018, Agricom will release a number of new products. We encourage people to keep their eyes open for the availability of limited seed volumes of Mainstar early maturity forage rape and SovGold kale. An exciting development for 2018 is the commercialisation of Ecotain®, the country’s first environmentally functional plantain. This is a revolutionary product and we are excited to be bringing ground-breaking technology like this to the market this year.

These products all bring with them advancements in each of their categories and continue to highlight the breeding investment in research, development and innovations providing not just increased yield, but also farmer-friendly products.
**Fodder Beet and Brassica User Guide**

### Cropping Guide

<table>
<thead>
<tr>
<th>Page No.</th>
<th>Cultivar</th>
<th>Sowing Time</th>
<th>Sowing Rate (kg/ha)</th>
<th>Time to First Grazing</th>
<th>Period of Grazing</th>
<th>Number of Grazings</th>
<th>Potential Yield (kg DM/ha)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>JAMON</td>
<td>Early October - early November</td>
<td>90,000 seeds/ha (Precision sown)</td>
<td>Typically 24-28 weeks to reach yield potential*</td>
<td>March to September*</td>
<td>1</td>
<td>Average = 18,000-22,000Top = 30,000+</td>
<td>Medium to high dry matter type (16-18%**): cultivar, true mono-germ seed, high yield potential. Most suited for grazing</td>
</tr>
<tr>
<td>13</td>
<td>MOSAIC</td>
<td>Early October - early November</td>
<td>90,000 seeds/ha (Precision sown)</td>
<td>Typically 24-28 weeks to reach yield potential*</td>
<td>March to September*</td>
<td>1</td>
<td>Average = 16,000-22,000Top = 30,000+</td>
<td>Low dry matter type (13-15%**: cultivar, true mono-germ seed), high yield potential, Most suited for grazing</td>
</tr>
<tr>
<td>14</td>
<td>CERISE</td>
<td>Early October - early November</td>
<td>90,000 seeds/ha, grazing 100,000 seeds/ha lifting (Precision sown)</td>
<td>Typically 24-28 weeks to reach yield potential*</td>
<td>March to September*</td>
<td>1</td>
<td>Average = 18,000-22,000Top = 30,000+</td>
<td>High dry matter type (18-27%**): cultivar, true mono-germ seed, high yield potential ideal for grazing, may be lifted</td>
</tr>
<tr>
<td>14</td>
<td>BRUNET</td>
<td>October to early November</td>
<td>80,000 seeds/ha, grazing 100,000 seeds/ha lifting (Precision sown)</td>
<td>Typically 24-28 weeks to reach yield potential*</td>
<td>March to September*</td>
<td>1</td>
<td>Average = 18,000-22,000Top = 30,000+</td>
<td>Medium to high dry matter (16-20%**: cultivar, true mono-germ seed ideal for grazing and may be lifted. Rhizoctonia tolerant</td>
</tr>
<tr>
<td>20</td>
<td>SPITFIRE</td>
<td>Mid-October to early November</td>
<td>3-4 alone 3 with herbs and clover 1-2 with short term ryegrass</td>
<td>13-14 weeks</td>
<td>January to August 1 (Cattle) 1-2 (Sheep)</td>
<td>1st grazing 8,000-10,000 depending on number of grazings</td>
<td>Higher yield potential with increased uptake tolerance. Number of grazings is most affected by management and climatic conditions</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>MAINSTAR</td>
<td>Mid-October to early November</td>
<td>3-4 alone 2.5-3.5 with herbs and clovers</td>
<td>10-12 weeks*</td>
<td>January to March 3-4</td>
<td>10,000-12,000 depending on number of grazings</td>
<td>Number of grazings is most affected by management and climatic conditions. The addition of herbs, clovers or ryegrass will increase the potential for other grazings once the Mainstar has died out or slowed in regrowth</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>HUNTER</td>
<td>Mid-October to early November</td>
<td>4 1-2 with short term ryegrass</td>
<td>10-12 weeks</td>
<td>February to March 1-2</td>
<td>6,000-9,000</td>
<td>Sowing at this time greatly elevates crop quality and potential yield potential. Ideal for grazing</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>SOVEREIGN</td>
<td>Late October</td>
<td>4</td>
<td>16-18 weeks</td>
<td>September to October 1</td>
<td>6,000-9,000</td>
<td>Preferred cultivar due to high yield potential than Mainstar</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>DOMAIN</td>
<td>Late October to early December</td>
<td>0.5-1.5 cm ridges 1-2 cm narrow 1.5 cm broadcast 90,000 seeds/ha planted</td>
<td>24-30 weeks</td>
<td>June to September 1</td>
<td>8,000-12,000</td>
<td>Scooping at this time greatly elevates crop quality and potential utilisation rates throughout winter</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>TREVAIL</td>
<td>Late October to early December</td>
<td>0.5 in 60 cm ridges 1-2 cm narrow 1.5 cm broadcast 90,000 seeds/ha planted</td>
<td>24-30 weeks</td>
<td>June to September 1</td>
<td>8,000-12,000</td>
<td>Scooping at this time greatly elevates crop quality and potential utilisation rates throughout winter</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>NEW YORK</td>
<td>Late October to early December</td>
<td>13-13 depending on quality of seedbed preparation</td>
<td>12-14 weeks*</td>
<td>January to March 1</td>
<td>Average = 8,000-12,000Top = 14,000+</td>
<td>New York is a good choice to be sown for the last paddocks of summer toms to be grazed. Care should be taken to make sure that New York makes no more than 5 kg DM/hd/day if 1/3 of a milking cow’s diet</td>
<td></td>
</tr>
</tbody>
</table>

* Or after all herbicide, fungicide and insecticide grazing withholding periods are met.

** Variation in DM% can occur under different sowing rate and/or environmental conditions. Northern North Island dairymen have consistently been lower than stated.
VARIETIES
Agricom has been supplying fodder beet to farmers for a number of years, and in that time has conducted research into cultivar performance, crop husbandry and animal feeding techniques. Agricom has partnered with world leading French fodder beet breeding company, Florimond Desprez, to access new genetics for improved yield and quality. Table 1 shows the varieties Agricom markets in New Zealand.

PROS AND CONS RELATIVE TO TRADITIONAL WINTER FORAGES (KALE, SWEDES)
Many farmers have been interested in growing fodder beet, with the main attraction being a higher yield potential than swedes or kale, and reduced insect and disease problems (Table 2, page 7). Where land area is restricted, fodder beet should be considered due to the high yield potential. Other farmers may also find that swedes or kale work well for them, and therefore value the lower establishment and supplementary feeding costs, and familiarity with management.

Fodder Beet in Livestock Systems
Fodder beet forage systems provide a flexible, high quality feed option which have the potential to deliver high yields in autumn, winter and early spring with inherently high rates of utilisation by livestock. Many different livestock systems can benefit from the inclusion of fodder beet (see Table 3).

Appropriate grazing management includes a well planned and executed transition phase and appropriate choices around supplement use (see Transition section – Table 4, page 10).

TABLE 1: FODDER BEET VARIETY BULB DM %

<table>
<thead>
<tr>
<th>Variety</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Sugar Beet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monro</td>
<td>13-15%</td>
<td>15-18%</td>
<td>18-16%</td>
<td>16-18%</td>
</tr>
<tr>
<td>Jamon</td>
<td>16-18%</td>
<td>18-20%</td>
<td>20-22%</td>
<td>22-24%</td>
</tr>
<tr>
<td>Brunium</td>
<td>18-20%</td>
<td>20-22%</td>
<td>22-24%</td>
<td>24-26%</td>
</tr>
<tr>
<td>Cerise</td>
<td>18-21%</td>
<td>21-23%</td>
<td>23-25%</td>
<td>25-27%</td>
</tr>
<tr>
<td>Tardorne</td>
<td>20-22%</td>
<td>22-24%</td>
<td>24-26%</td>
<td>26-28%</td>
</tr>
</tbody>
</table>

Variation in 1.0% can occur under different sowing rate and/or environmental conditions. Northern North Island drymatters have consistently been lower than stated.

TABLE 2: KEY FEATURES OF FODDER BEET AND WINTER BRASSICAS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Fodder Beet</th>
<th>Swedes</th>
<th>Kale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average yield (kg DM/ha)</td>
<td>18-22,000</td>
<td>10-14,000</td>
<td>10-14,000</td>
</tr>
<tr>
<td>Potential yield range (kg DM/ha)</td>
<td>30,000+</td>
<td>18,000+</td>
<td>18,000+</td>
</tr>
<tr>
<td>Disease tolerance</td>
<td>Very good</td>
<td>Moderate</td>
<td>Very good</td>
</tr>
<tr>
<td>Insect tolerance</td>
<td>Very good</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Cost to establish ($/ha)*</td>
<td>2,000-3,000</td>
<td>800-1,000</td>
<td>1,000-1,400</td>
</tr>
<tr>
<td>Potential animal issues**</td>
<td>Moderate</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Supplements required**</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
</tr>
</tbody>
</table>

* Best practice estimates. Actual cost may vary due to different situations and weed pressure in different regions of the country. ** Particularly relevant for dairy grazing.

TABLE 3: BENEFITS OF FODDER BEET ACROSS DIFFERENT LIVESTOCK AND SEASONS

<table>
<thead>
<tr>
<th>System</th>
<th>Autumn</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy</td>
<td>Extended lactation</td>
<td>Winter feed high utilisation crop</td>
<td>Balance high protein pasture, help build spring cover</td>
</tr>
<tr>
<td>Beef</td>
<td>Supplement autumm pasture or dry</td>
<td>Winter maintenance High stocking rate Winter livestock gains</td>
<td>Balance high protein pasture</td>
</tr>
<tr>
<td>Sheep</td>
<td>Flashing feed in a dry autumn</td>
<td>Winter maintenance Winter lambs-LURG</td>
<td>Balance high protein pasture</td>
</tr>
<tr>
<td>Deer</td>
<td>Pre-weaning feed in a dry autumn</td>
<td>Winter feed</td>
<td>Hold breed prior to Emptying</td>
</tr>
</tbody>
</table>

Successful farm system outcomes from grazing fodder beet rely on appropriate grazing management which minimises the risk of animal health and production issues.
Getting the Best Out of Fodder Beet

PRE-SOWING

It is important to get a soil test at least six months before sowing fodder beet, as it is very sensitive to low pH levels in the soil, with a pH of at least 6 being required and ideally 6.2. Any soil nutrient correction should be made prior to sowing.

Paddocks should be sprayed with glyphosate and a contact insecticide (i.e. chlorpyrifos) prior to working. Soils should ideally be free-draining and relatively free of weeds. The soils should be worked into a fine and firm tilth before sowing to allow for even sowing depth.

A general fertiliser recommendation is: pre-sowing Crepaprol 16N at 150-200 kg/ha plus NafSi (sail) at 350 kg/ha. Sulphur, boron and magnesium may be beneficial on some soil types.

It is important when choosing the paddock to ensure that there has been no recent history of chemical use as fodder beet is very sensitive to certain chemicals.

A “stale seedbed” technique to remove weed competition is has been no recent history of chemical use as fodder beet is very sensitive to certain chemicals.

SOWING

Depending on location, sowing between late September and early November is generally recommended. Earlier sowings risk vernalisation causing bolting, later sowing reduces yield potential, and germination may be hindered in areas prone to dry summers.

A precision drill is recommended for sowing fodder beet. This will place the seed at the correct depth (2 cm) and space plants accurately ensuring the correct sowing rate.

POST-SOWING

Due to slow establishment and the time taken to form a leaf canopy, early and timely weed and insect control is essential; please contact your local seed retailer or chemical representative for more details.

PRACTICAL CONSIDERATIONS OF CULTIVATING FODDER BEET

Some thought is required to the practicalities of feeding fodder beet. Starting a transition programme requires some planning as it is critical to restrict access to fodder beet. This may be done by “lifting” fodder beet and feeding this out in increasing amounts to stock grazing pasture. Transition programmes utilising fodder beet in situ may require a headland to be left without crop at sowing or a headland to be “lifted” prior to feeding to allow animals access to a small amount of the crop. The ability to “drop” a fence adjacent to the crop is also a strategy worthy of consideration.

Large crops may be problematic to feed off due to the high stocking rate required to meet allocation targets. This has practical implications for stock traffic through gateways and tractor movements for supplementary feed. For sheep and deer, particularly on restricted allocations, break dimensions meeting allocation targets may be too small to feed all animals at once and a system where two different mobs/herds graze the same break at different times (morning and afternoon) may be useful.

For some fodder beet chemicals there are considerable grazing withholding periods. All chemicals, especially fungicides need to have their withholding periods recorded so they can be reviewed if grazing plans are brought forward. Accurate crop allocation relies on accurate measurements of the crop yield. Fodder beet is inherently difficult to accurately measure without many samples. Yield estimates using five measurement points on the paddock could have an error of +/- 4.5 t DM/ha (Judson, unpublished data). See page 15 for details on the Beet Guru®, an app to assist with calculating and interpreting fodder beet yield.

Fodder Beet Grazing Management

DIET PLANNING

Prior to feeding a fodder beet crop to livestock, a diet plan needs to be developed detailing both the targeted volume of daily intake and the percentage of this total that fodder beet will make up. This will depend on stock class and the desired level of performance.

In some cases the total amount of crop available on farm may also have some impact on these decisions.

HIGH/AD LIB INTAKE

Where the expectation of gains in liveweight (i.e. steers) or body condition (in dairy cows) is high and the supply of crop is non limiting, high/1 ad lib intakes are often targeted where animals have access to some crop and supplement at all times. With fodder beet, high performance can be achieved while maintaining very high rates of utilisation as quality does not vary significantly through the bulk. Utilisation rates in excess of 90% are observed by the majority of graziers. A careful transition phase is required to minimise the risks (particularly of acidosis) in reaching these high intakes. Performance of animals grazing large volumes of fodder beet is generally high, but there is no good evidence that it is higher than similar animals grazing similar volumes of kale for example and therefore expectations need to be in line with other crops.

RESTRICTED INTAKE

In some situations, such as maintenance winter feeding or in lactating dairy cows where beet make up only a proportion of the diet, restricted fodder beet diets may be more appropriate. Restrictions in some cases may result in periods of hunger and controlling intake is paramount. Key considerations for restricted feeding are accurate feed allocation, keeping stock full with alternative fibre supplements, the use of double fences or "on-off" grazing to reduce the risk of breakouts. Transition is still critical when restricted feeding is desirable.

CHOICE OF SUPPLEMENT

During the transition phase and once target allocations have been met, supplement plays an important role in the diet. During transition it keeps animals full allowing a gradual increase in the proportion of fodder beet in the diet. Fibre also encourages chewing and the production of saliva which is important in maintaining healthy rumen conditions. The supplement needs to be palatable, close to the crop face and easily accessed. Choice of supplement comes down to the supply of protein. Where the fodder beet component of the diet does not meet protein requirement, the supplement needs to supply the shortfall. Such situations may occur in large fodder beet crops, or damaged crops, when the leaf makes up a small proportion (i.e. 10%) and the total allocation and/ or livestock demand for protein is greater, such as the case for young growing animals. In practice, this may mean hay and straw are sufficient for mature animals on a winter diet but good grass balage, conserved lucerne or red clover may be better where LWG is important in maintaining young stock.

ACIDOSIS

Acidosis is a reduction in the rumen pH caused by a rapid change of diet to a high quality (starch or sugar), low protein feed source. Fodder beet bulbs have high sugar levels and low fibre levels which can cause acidosis in ruminants if the transition phase isn’t managed correctly. The most extreme cases can cause death.

Non-fatal, visual symptoms in cattle are:

- Diarrhoea
- Limited cud chewing (< 50% of cows lying down not chewing their cud)
- Sore hooves – laminitis
- Faeces foamy, contains gas bubbles
- Faeces in the same feeding group varies from firm to diarrhoea
- Faeces in the same feeding group varies from firm to diarrhoea

Oxalates

Oxalate levels in the leaves of fodder beet may pose a potential, but low risk to cows in a vulnerable metabolic state, as the oxalates bind calcium during digestion making it unavailable to the stock. Symptoms are similar to milk fever, including lethargy and in extreme cases loss of consciousness. Reducing the risk of stock breakdowns, which lead to gorging, is vital in reducing the animal health risks.

QUICK FACTS:

- Bolter weed beets are derived from wild beet populations and while it’s typical to get a few bolters coming through within fodder beet crops, growers need to be aware of the commitment and requirement to completely remove these plants ensuring that fodder beet can be grown sustainably in the future.

Managing for Sustainability

A close relative to sugar beet and silver beet, fodder beet is now widely used in New Zealand as a winter feed source, where it is mainly grazed in situ.

Many people are aware that a small number of bolters are typical in a fodder beet crop, and cultivars that are clean one year may have some bolters the next such is the nature of pollen transfer and weed beet presence in seed production environments. Leaving or ignoring paddock with bolting plants, no matter how few, is the single biggest risk to the sustainability of fodder beet in New Zealand.

For the last few years the true effect of bolters has been overlooked by many in the sector and their relevance underestimated. Therefore, its prevalence has risen on many support blocks to significant levels. In some severe cases it will reduce future fodder beet plantings.

Often there are no specific clinical signs of rumen acidosis. Poor performance of stock grazing fodder beet in the initial 14-21 days could be a symptom of acidosis.

Fodder beet bulbs have high sugar levels and low fibre levels which can cause acidosis in ruminants if the transition phase isn’t managed correctly. The most extreme cases can cause death.

TABLE 4. EXAMPLE OF A TRANSITION PROGRAMME AND FINAL DIETS OF FODDER BEET FOR COWS, SHEEP AND DEER SYSTEMS

<table>
<thead>
<tr>
<th>M A Cows</th>
<th>RZ Heifers/Steers</th>
<th>RT Heifers/Steers</th>
<th>Ewes/Hoggets/Hinds</th>
<th>Lambs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beet</td>
<td>1-2 kg DM/hd</td>
<td>1-2 kg DM/hd</td>
<td>0-1 kg DM/hd</td>
<td>0.5-1 kg DM/hd</td>
</tr>
<tr>
<td>Silage</td>
<td>2-3 kg DM/hd</td>
<td>2-3 kg DM/hd</td>
<td>1-2 kg DM/hd</td>
<td>0.5-1 kg DM/hd</td>
</tr>
<tr>
<td>Supplement</td>
<td>1 kg DM/hd</td>
<td>1 kg DM/hd</td>
<td>0.5 kg DM/hd</td>
<td>0.5 kg DM/hd</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Access to pasture</td>
<td>Access to pasture</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt; 2000 kg DM/ha</td>
<td>&gt; 2000 kg DM/ha</td>
</tr>
</tbody>
</table>

Transition

<table>
<thead>
<tr>
<th>Diet</th>
<th>Increase the allocation of crop by 1 kg DM and decrease the supplement allocation by 0.5 kg DM per animal every second day until the final diet is reached for each component. If residuals are accumulating, pause until the allocation is totally consumed.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increase the allocation of crop by 1 kg DM and decrease the supplement allocation by 0.5 kg DM per animal every second day until the final diet is reached for each component. If residuals are accumulating, pause until the allocation is totally consumed.</td>
</tr>
<tr>
<td></td>
<td>Increase the allocation of crop by 0.5 kg DM and decrease the supplement allocation by 0.5 kg DM per animal every second day until the final diet is reached for each component. If residuals are accumulating, pause until the allocation is totally consumed.</td>
</tr>
<tr>
<td></td>
<td>Increase time spent cropping crop by 1-2 hours every second day until the final diet is reached for each component. If residuals are accumulating, pause until the allocation is totally consumed.</td>
</tr>
<tr>
<td></td>
<td>Increase time spent cropping crop by 1-2 hours every second day until the final diet is reached for each component. If residuals are accumulating, pause until the allocation is totally consumed.</td>
</tr>
</tbody>
</table>

Final diet [an example]

<table>
<thead>
<tr>
<th>Beet at 2 kg DM/hd</th>
<th>Beet at 5 kg DM/hd</th>
<th>Beet at 1 kg DM/hd</th>
<th>Beet at 1 kg DM/hd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slage at 3 kg DM/hd</td>
<td>Slage at 2 kg DM/hd</td>
<td>Slage at 2 kg DM/hd</td>
<td>Slage at 0.5 kg DM/hd</td>
</tr>
</tbody>
</table>

This is a guide only. Allocation is important. The timing of feeding each day needs to be consistent. Regular checks are suggested to identify issues early. Always seek further technical advice.

Managing for Sustainability

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 Often there are no specific clinical signs of rumen acidosis. Poor performance of stock grazing fodder beet in the initial 14-21 days could be a symptom of acidosis.

Oxalates

Oxalate levels in the leaves of fodder beet may pose a potential, but low risk to cows in a vulnerable metabolic state, as the oxalates bind calcium during digestion making it unavailable to the stock. Symptoms are similar to milk fever, including lethargy and in extreme cases loss of consciousness. Reducing the risk of stock breakdowns, which lead to gorging, is vital in reducing the animal health risks.

QUICK FACTS:

- Bolter weed beets are derived from wild beet populations and have a dormancy mechanism for survival.
- Each individual bolt can produce up to 6,000 seeds which can stay in the soil for up to 10 years.
- Having a crop rotation with beet following beet is very risky and increases the chances of seed beet build up as well as the introduction of crop limiting diseases and pests.
- Bolter weed beets can stay in the soil for up to 10 years.

When considering next year’s spring crops, time must be taken to plan rotations which will support long term fodder beet production. In many cases a 4+ year rotation is advised and if the rotation length is shorter between crops, extra resources must be accounted for in the rogueing of bolters. It is also important to be aware of the potential of bolters to emerge in a paddock going into fodder beet that has previously grown beet at any stage in the past – especially in the past 10 years. Above all else it’s critical to the future of the crop that all bolting plants are completely removed from paddocks irrespective of anything else.
Jamon is a very uniform, mono-germ cultivar that has been evaluated in New Zealand for a number of years. It is an orange skinned cultivar with a bulb drymatter percentage of between 16-18%*, similar to many current industry products. Jamon is French fodder beet breeders Florimond Desprez’s most popular product.

“VERY GOOD RESISTANCE TO BOLTING.”

- True mono-germ cultivar
- Medium to high drymatter type (16-18%*)
- 50% of bulb above ground
- Proven to perform across all stock classes and environments in New Zealand
- Above ground colour: orange

* Variation in DM % can occur under different sowing rate and/or environmental conditions. Northern North Island drymatters have consistently been lower than stated.

Monro is a red coloured beet with a large more rounded bulb shape. It is suitable for in-paddock grazing where it is readily accessible to the grazing animal.

“SUITABLE FOR IN-PADDOCK GRAZING.”

- True mono-germ cultivar
- Larger bulb type
- Low drymatter type (13.15%*)
- 60% of bulb above ground
- Good resistance to bolting
- Above ground colour: red

* Variation in DM % can occur under different sowing rate and/or environmental conditions. Northern North Island drymatters have consistently been lower than stated.

Please refer to pages 09-10 for animal welfare information.
**CERISE**

Cerise is a recent breeding release from Florimond Desprez, with a uniform yellow/green tankard shaped bulb.

- True mono-germ cultivar
- High drymatter type (18-21%)*
- Approximately 40-50% of bulb above ground
- Very good resistance to bolting
- Above ground colour: yellow/green

**BRUNIUM**

Brunium is an ideal cultivar where a history of Rhizoctonia has been experienced on farm. It is highly suitable for both grazing and lifting.

- True mono-germ cultivar
- Medium-high drymatter type (16-20%)*
- Oval bulb shape, approximately 40-60% of bulb above ground
- Recommended not to be sown in September particularly in the South Island
- Very good resistance to Rhizoctonia
- Above ground colour: red

*Variation in DM % can occur under different sowing rate and/or environmental conditions. Northern North Island drymatters have consistently been lower than stated.

**The Beet Guru® App**

The Beet Guru is an exciting app that makes undertaking yield assessments of fodder beet much simpler.

We all know that the accurate measurement of fodder beet yield is challenging. That’s why we have developed a tool that makes interpretation of assessments simple for farmers and retailers. Aptly called the ‘Beet Guru’, the tool is an app that is extremely easy to use on your handheld device.

All you need to do is enter the fresh weights of the bulb and leaves from each sample into the app and it calculates a mean, upper and lower range of drymatter yield that’s statistically valid. The Beet Guru also has a reporting function which is especially useful for retail users. All the grower and paddock details are stored within each assessment so a report can be produced at the end of the process. Simple and efficient, and it’s free!

**WHY USE BEET GURU?**

- Simple to use
- No need for pen and paper in the field
- Preview yield with every measurement entered
- Assessment reports sent via email as PDF
- Assessments stored within the app and used in a spreadsheet
- Available on Apple, Windows and Android
- Free to download

**HOW TO DOWNLOAD:**

1. **GO TO YOUR APP STORE**
2. **SEARCH**
3. **DOWNLOAD**

For more information visit beetguru.co.nz
Phone 0800 183 358 or Email info@beetguru.co.nz

Beet Guru® terms and conditions apply. Please see www.beetguru.co.nz for more details
TABLE 5. KEY PESTS AND DISEASES AFFECTING FODDER BEET

<table>
<thead>
<tr>
<th>Condition</th>
<th>Impact on Plant</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedling Insect Pests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Springtails (Blueteniella spp.)</td>
<td>Attack cotyledons and emerging plants</td>
<td>Seed treatment, chemical, crop rotation and hygiene</td>
</tr>
<tr>
<td>Greasy Cutworm (Agrotis ipsilon aneituma)</td>
<td>Plants, especially seedlings ripped off at or just below ground level, young plants wilt</td>
<td>Chemical, crop rotation and hygiene</td>
</tr>
<tr>
<td>Grass Grub (Costelytra zealandica)</td>
<td>Adults attack young growing points, larvae attack seedling roots</td>
<td>Seed treatment, chemical</td>
</tr>
<tr>
<td>Wheat Bug (Phyl做到 Autillo)</td>
<td>Ringanking of seedlings at ground level leaves plants susceptible to other attack, damage is similar to that caused by weevils</td>
<td>Seed treatment, chemical</td>
</tr>
<tr>
<td>Weevils (Curculio spp.)</td>
<td>Chew cotylesons or stem at ground level, scoping of leaf edge</td>
<td>Chemical</td>
</tr>
<tr>
<td>Slugs (many species)</td>
<td>Creates severe damage to plants by destroying seedlings</td>
<td>Minimise crop residual or trash before direct drilling, use slug bait, cultivate paddocks</td>
</tr>
<tr>
<td>Seedling Fungal Diseases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wirestem (Rhizoctonia)</td>
<td>Often results in complete plant death</td>
<td>Seed treatment, chemical</td>
</tr>
<tr>
<td>Plant Pests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaf Miners (many species)</td>
<td>Larvae create tunnels and live within leaf tissue. Damage may reduce photosynthetic activity and cause leaf yellowing, premature leaf death, and limit growth at this time. Damage is similar to that caused by Diamondback moth</td>
<td>Chemical</td>
</tr>
<tr>
<td>Crop Virus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beet Necrotic Yellow Vein Virus</td>
<td>Pale yellow green leaf colour. Causes root malformation which reduces nutrient uptake. Can cause leaf wilting</td>
<td>Crop rotation and hygiene</td>
</tr>
<tr>
<td>Beet Western Yellows Virus (BWYV) / Yellow Virus</td>
<td>General stunted growth, purpling of leaves</td>
<td>Crop rotation and hygiene</td>
</tr>
<tr>
<td>Crop Fungal Disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rust</td>
<td>Orange spots cover leaf surfaces. Effect on yield is yet to be confirmed</td>
<td>Research ongoing</td>
</tr>
<tr>
<td>Powdery Mildew</td>
<td>White powdery substance on leaf surface. Evidence suggests a yield reduction may occur</td>
<td>Research ongoing</td>
</tr>
<tr>
<td>Rhizoctonia root Rot (Ph join Storia)</td>
<td>Caused by soil borne fungi. Leaves wilt and collapse and brown rot develops on the root</td>
<td>Crop rotation, good drainage, maintained soil structure</td>
</tr>
<tr>
<td>Wet Rot (Pythium spp.)</td>
<td>Fungal roots and shrivels and a rot of the root develops from the tip upwinds</td>
<td>Good drainage, maintained soil structure and avoiding excessive irrigation</td>
</tr>
<tr>
<td>Crop Nutrient Deficiencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown Heart / Heart Rot</td>
<td>Brown deficiency creates the symptoms of the central leaves dying and rotting and can extend to the crown of the root which becomes hollow</td>
<td>Soil testing, boron fertiliser application</td>
</tr>
<tr>
<td>Magnesium Deficiencies</td>
<td>Pale yellowing of leaf. Symptoms of slight magnesium deficiency are similar to that of Beet Western Yellow Virus, although the BWYV is very bright and often tinted orange</td>
<td>Soil testing and fertiliser application</td>
</tr>
</tbody>
</table>

Fodder Beet Pests

Fodder beet establishment can be compromised by occasional, localised, and seasonal, pest and disease attack. Their impact can usually be minimised by management. Once established, fodder beet is typically disease-free relative to other crops.


Introduction

Forage crops can often provide a superior feed supply, both in terms of quantity and quality. They provide an excellent source of energy and protein for grazing stock. Use of a forage crop should be considered in any situation where pasture quantity or quality is limiting the potential production of your livestock.

THE MOST COMMON SITUATIONS ARE AS FOLLOWS:

- Finishing young stock in early summer - feed for post weaning period, where feed demands increase at a time when vegetative pasture growth rates are falling.
- Mid-late summer feed for all stock classes - at a time when pastures are of a low quality and low moisture levels are impacting on pasture growth.
- Summer “fall” feed - a parasite/pathogen-free grazing environment, to avoid stock health issues related to endophyte effects, worms, facial eczema etc.
- Autumn feed - to support an increased stocking rate, required when paddocks are removed for pasture renewal.
- Winter feed - maintenance feed for stock when pasture growth is limited, allows stock to be held on small areas, thereby building the amount of valuable, high quality early spring feed. Crops also aid in reducing widespread pasture damage in wet conditions.
- Winter stock-finishing - large quantities of quality feed suitable for finishing. For example, cattle and winter lamb contracts.
- Break crop for renovation programme of sub-standard pastures - if managed well, forage crops will provide a significant drymatter contribution, minimal time out of production, a useful system for assisting in weed and disease clean up for pre-pasture establishment, and a good opportunity for improving fertility status. Brassicas are particularly useful in avoiding ryegrass seeding over the summer prior to establishment of a grass variety with AR1 or AR37 endophyte.
Brassica Cultivar Information

WHICH MULTIPLE-GRAZING FORAGE BRASSICA SHOULD I USE?

Hunter (Brassica rapa spp. campestris) is a hybrid cross between a turnip and a rape, producing one of the fastest maturing brassicas, with a look most like a leafy, non-bulb producing turnip.

Spitfire (Brassica napus) is a cross between a kale and a rape.

Mainstar (Brassica napus) is a cross between a kale and turnip. Both Mainstar and Spitfire are commonly termed forage rapes. These different genetic make-ups have resulted in very different characteristics. The following diagram (Figure 3) summarises these characteristics and how they relate to their suitability for different farming systems.

**Figure 3. Choosing the Right Spring Sown Multiple-Grazing Forage Brassica for Your Farming System**

- **SOIL FERTILITY**
  - Sporadic
  - Reliable
- **SUMMER MOISTURE**
  - Low/med
  - Med/high
- **FEED REQUIREMENT**
  - 10-12 weeks
  - 13-14 weeks
- **SUGGESTED BRASSICA AND HERB PASTURE MIXES**
  - In a typical pasture renovation when herbs and clovers are established with grass, they may be disadvantaged in terms of establishment rate and the subsequent grazing management of the sward. Adding Relish red clover and/or Ecotain environmental plantain and Choice chicory with a multiple-grazing brassica is a valuable establishment tool, when used in conjunction with subsequent direct-drilling of grass species.

**Herb and Clover Systems with Multiple-Grazing Forage Brassicas**

The popularity of the pasture herbs Ecotain® environmental plantain and Choice chicory is a result of the real benefits they provide to farm production and animal well-being. Establishing herbs and clovers with a multiple-grazing brassica, e.g. Mainstar, Spitfire, Hunter, can improve the regrowth potential of the crop in repeat grazing situations, or can be a useful method of establishing these companion species for future pasture sow-downs (see Figure 7, page 23).

**BENEFITS FOR DRYMATTER PRODUCTION:**
- The red clover and herbs will provide a small but high quality contribution to the diet in the first grazing and increase in quantity in subsequent grazings
- Improves production and persistence in dry periods, with rapid recovery when soil moisture improves
- Provides continued growth under cold conditions
- Increases total crop production over time
- Provides an established herb base for the direct-drilling of grass and clover species into the run-out brassica crop

**BENEFITS FOR THE ANIMALS:**
- Provides variety in the diet, with a greater mineral availability than a brassica crop alone
- May reduce the animal health issues that can arise on a sole brassica diet

Herbs should not be mixed with brassica when that crop is being used to remove weeds from a paddock, because the herbs are sensitive to the brassica herbicides that would be used.

**SUGGESTED BRASSICA AND HERB PASTURE MIXES**

In a typical pasture renovation when herbs and clovers are established with grass, they may be disadvantaged in terms of establishment rate and the subsequent grazing management of the sward. Adding Relish red clover and/or Ecotain environmental plantain and Choice chicory with a multiple-grazing brassica is a valuable establishment tool, when used in conjunction with subsequent direct-drilling of grass species.
EXCELLENT YIELD AND INSECT TOLERANCE.

PRODUCT USAGE
Spitfire is a multi-purpose rape that can be sown in spring for lamb or cattle finishing or summer dairy grazing, or sown in mid summer to early autumn for autumn and winter grazing. Spitfire has excellent yield, insect tolerance, and a low dry matter percentage (DM%) stem. If using cattle to graze spring sown Spitfire, plan for a single graze as the treading of cattle can reduce regrowth ability. With sheep, plan for at least two grazings, as a third summer grazing may not always occur. If more than two summer grazings are required then Mainstar is the better option, especially with cattle.

SPITFIRE FORAGE SYSTEMS
Due to the regrowth ability of Spitfire and the lower DM% stem, there are numerous options for the addition of companion species, either at the time of sowing Spitfire or after grazing, to provide at least 12–18 months grazing. Ecotain environmental plantain and/or ryegrass (Asset without endophyte, Progrow or Ohau) can be added to increase the quality, yield and longevity of the crop.

GRAZING MANAGEMENT
Grazing Spitfire down to a 30 cm stalk, removing all leaf. This residual will optimise utilisation while ensuring plant survival for future dry matter production and crop quality. Crop utilisation is an important factor when grazing brassicas. Spitfire, which has a lower DM% stem, has been observed to have higher potential utilisation, and this has been demonstrated in recent trials.

TRIAL RESULTS
Spitfire has a high total crop yield potential and excellent leaf yield, which is important for overall crop feed quality. Spitfire has a good ability to regrow (Figure 5). Aphids have the ability to reduce the potential yield of a brassica crop, and can be expensive to control on highly susceptible crops. Spitfire is one of the leading rape varieties for aphid tolerance (Figure 6). Spitfire can still be affected by aphids, but the risks are reduced, thus increasing plant health and future productivity in aphid prone areas.

Please refer to pages 37-42 for grazing management and animal welfare information.
EXCELLENT REGROWTH POTENTIAL.

PRODUCT USAGE

Mainstar is a modern early maturity rape. Traditionally rape has been used as a summer lamb-finishing crop and ewe-flushing feed. Mainstar has excellent regrowth potential and good frost tolerance extending grazing times from early summer to late winter. Mainstar has extremely good aphid tolerance. While its use won’t completely remove the need to spray for aphids, it will greatly reduce the need in many situations. Mainstar is a very versatile brassica, being suitable for a wide range of soil fertility and environmental conditions, stock classes and sowing times.

Due to Mainstar’s potential to have an earlier first graze than most other rapes, it has the ability to be grazed up to three times through summer and early autumn, at which time it is regularly shut up and carried into winter as a winter feed. The direct drilling of annual ryegrass into this regrowth Mainstar in early-mid autumn is an option. This differs from many existing rapes, which often have longer ripening requirements and are grazed later, providing less opportunity for multiple regrowths.

Due to its early grazing and multiple opportunities to graze regrowth, Mainstar can be sown with Agritonic plantain, Ecotain® environmental plantain, Choice chicory and Relish® red clover, providing a spring-sown crop that may last at least 12, if not 18 months.

- Early-maturing, 10-12 weeks
- Regrowth potential for 3-4 grazings
- Fast recovery from grazing with excellent subsequent yields
- Ideal for mixing with herbs and clover

MAINSTAR FORAGE BRASSICA & CHOICE CHICORY MIX SUITED TO LONGER ROTATIONS AND BETTER CHICORY GROWING CONDITIONS

| Mainstar forage brassica | 3 kg/ha |
| Grasslands Choice chicory | 3 kg/ha |
| Grasslands Relish® or Grasslands Sensation red clover | 4 kg/ha |
| Grasslands Tribute® white clover | 2 kg/ha |
| **Total Mix** | **12 kg/ha** |

For grazing management and animal welfare information, please refer to pages 37-42.
Maximising Returns From Hunter

Leafy turnips like Hunter have become a widely used feed source for finishing lambs. It is common to set-stock lambs on the crop and draft them off as they reach target weights. A trial by Agricom suggests it is unlikely this grazing management makes the most efficient use of the Hunter crop.

The trial investigated the effect of daily allowance on the production of liveweight per-hectare in a rotationally grazed Hunter finishing system, with the view of determining optimum grazing parameters.

At allowances of 1 kg DM/lamb/day or less, where grazing residual was low, the crop produced little regrowth, lamb growth rates were poor (25-75 g/day) and production per-hectare was not maximised (2-5 kg LWG/ha/day).

At generous allowances (3.5 kg DM/lamb/day) where grazing residual was high (3000 kg DM/ha) and where lamb growth rates were high (300 g/day), per-hectare production was still not maximised (7 kg LWG/ha/day) because of low stocking rates.

The key message from this work was that per-hectare productivity was maximised (12 kg LWG/ha/day) at an allowance of 2.0-2.5 kg DM/lamb/day where lambs ate 65% of the crop and grew at nearly 300 g/day. Grazing residual, also has a dramatic effect on the survival of Hunter plants.

Residual too low - eating too much of crop
- High stocking rates, but animals growing slowly
- Low LWG/ha - 1.7 kg LWG/ha/day
- Eating 80% of forage on offer

Residual too high - not eating enough of crop
- Low stocking rates and animals growing quickly
- Moderate LWG/ha - 7.2 kg LWG/ha/day
- Eating 35% of forage on offer

Quick Guide to Hunter Grazing Management

**Product Usage**
Hunter is a quick growing, leafy turnip, with minimal bulb development and is best suited to multiple grazings. Hunter was selected for vigorous regrowth, resulting in a variety with fast recovery from grazing and excellent ability to yield in the second, third and sometimes fourth regrowth cycles.

Plants are susceptible to drought and aphids, and are best suited to heavier soil conditions with periodic summer moisture and/or irrigation.

Hunter is an ideal crop for lamb finishing and suitable for most stock classes.

**Performance**

Figure 8. Hybrid Brassica Drymatter Production Trial Lincoln, Canterbury
Sown 25/10/07, Average Rainfall 660 mm Supplementary Irrigation of Approximately 80 mm

Suggested Sowing Time
Mid-October to early November
February possible

Suggested Sowing Rate (kg/ha)
4
4

Time to First Grazing
6-8 weeks
8-10 weeks

Number of Potential Grazings
3-4
2-3

Potential Yield (1 DM/ha)
10-12
10-12

* Depending on number of grazings

- Early-maturing from spring sowing, 6-8 weeks with minimal ripening requirement
- Excellent quality forage for finishing animals through the summer months
- Fast recovery from grazing with excellent subsequent yields
- Strong plant survival from multiple-grazings

Figure 9. Effect of Allowance on Production Per Hectare
Liveweight gain per hectare, per day (kg LWG/ha/day)

MAXIMISING RETURNS FROM HUNTER

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Figure 9. Effect of Allowance on Production Per Hectare
Liveweight gain per hectare, per day (kg LWG/ha/day)

**Please refer to pages 37-42 for grazing management and animal welfare information.**
CROPPING GUIDE

GOOD LEAF-TO-STEM RATIO.

PRODUCT USAGE

Sovereign is a very popular kale that combines excellent quality with a good yield potential. Sovereign has a very high top end yield potential, although average yields are around 10-14 t DM/ha, depending on management and environment. The majority of Sovereign sowings occur from late November through to mid December. These sowing dates maximise winter feed yield potential for dairy cows, heifers, sheep and beef. Earlier sowings can be used, and these are often lightly grazed by lambs through February, before being used for winter feed by other stock classes.

Sovereign can be successfully sown from late January to mid February for mid-to-late winter feed. These later sowing dates provide a lower yield potential, more similar to rape, but a very high quality feed with excellent utilisation potential for heifers, hoggets, deer and even lambs. Where grazing management results in the whole kale plant being consumed, crude protein intake may be marginal particularly if straw or other low-protein supplements are used. For dry cows a crude protein level of 12-14% is required (DairyNZ Farm Fact 1-13). Other low-protein supplements are used. For dry cows a crude protein level of 12-14% is required (DairyNZ Farm Fact 1-13).

When aiming to improve body condition of cows grazing kale it is important to understand the influence of utilisation on total diet quality. When 84% is utilised the overall diet quality for Sovereign (12 MJ ME/kg DM) is higher than giant types (11 MJ ME/kg DM). To achieve the same diet quality relative to Sovereign at 86% utilisation giant types could only be utilised to 70% and much more of the stem would have to be left ungrazed. At an 84% utilisation a Sovereign diet would supply 12.2% crude protein but at 85% utilisation giant types would only supply 10.2% crude protein. In this situation a supplement with a higher amount of protein is likely to be needed.

UNDERSTANDING YOUR KALE PLANT – GRAZING IMPLICATIONS

CROP YIELD

Crop yield is heavily influenced by a number of factors including soil fertility and environmental conditions through the growing season.

KALE PLANT COMPOSITION

There is considerable variation between kale cultivars in the relative proportion of leaf and stem, and the various qualities of these plant components. In general, Sovereign has a higher percentage of leaf than giant types. This difference in composition is consistent, but the actual proportions are influenced by environmental conditions. The leaves of kale plants are high quality regardless of the type of kale. The quality of the stem of kale decreases from the top to the bottom (Table 7).

Sovereign generally has a higher quality throughout the stem than giant types. From the middle of the kale stem to ground level, quality reduces quickly to low levels at the bottom of the plant.

IMPLICATIONS OF UTILISATION FOR DIET QUALITY

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* Depending on number of grazings.

• Medium-tall kale with excellent yield potential
• Late flowering variety that maintains leafy crops into early September
• Good leaf-to-stem ratio for its yield potential
• Thinner stemmed variety, particularly when compared to giant kales

Please refer to pages 37-42 for grazing management and animal welfare information.

CROPPING GUIDE

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**CROPPING GUIDE**

**EXCELLENT DRY ROT TOLERANCE.**

**PRODUCT USAGE**

**Domain**

- Excellent dry rot tolerance
- Early maturity, yellow-fleshed first crop swede
- Palatable swede, ideal for all classes of stock
- Very good table swede
- Seed available pelleted for precision sowing

*Potential Yield (t DM/ha)*

- Average = 10-14
- Top = 18+

*Number of Potential Grazings*

- 24-30 weeks

*Time to First Grazing*

- 0.5 in 60 cm ridges
- 1.0 in 20 cm rows
- 1.5 broadcast
- 90,000 seeds/ha pelleted

*Sowing Rate*

<table>
<thead>
<tr>
<th>Sowing Type</th>
<th>Late November to early December</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested</td>
<td></td>
</tr>
<tr>
<td>Sowing Rate (kg/ha)</td>
<td>0.5 in 60 cm ridges</td>
</tr>
<tr>
<td></td>
<td>1.0 in 20 cm rows</td>
</tr>
<tr>
<td></td>
<td>1.5 broadcast</td>
</tr>
<tr>
<td></td>
<td>90,000 seeds/ha pelleted</td>
</tr>
</tbody>
</table>

*Date to Graze*

- Early December
- 24-30 weeks

*Suggested Sowing Time*  

- Late November to early December

**Triumph**

- Very high yielding, yellow-fleshed, main-crop swede
- Leafy swede with good leaf retention in winter
- High dry rot tolerance
- Suitable for all stock classes
- Seed available pelleted for precision sowing

*Potential Yield (t DM/ha)*

- Average = 10-14
- Top = 18+

*Number of Potential Grazings*

- 24-30 weeks

*Time to First Grazing*

- 0.5 in 60 cm ridges
- 1.0 in 20 cm rows
- 1.5 broadcast
- 90,000 seeds/ha pelleted

*Sowing Rate*

<table>
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<td></td>
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</tr>
</tbody>
</table>

*Date to Graze*

- Early December
- 24-30 weeks

*Suggested Sowing Time*  

- Late November to early December

**Domain**

*Average Dry Rot Infection (%)*

- Domain: 6.0
- Invitation: 8.0
- Triumph: 10.0
- Dominion: 11.0
- Highlander: 14.0

*Domain* is a dry rot tolerant, yellow-fleshed swede. *Domain* is an early maturing soft swede which is often preferentially grazed in May and June. It is very similar in growth habit to *Doon Major* and *Dominion*. Traditional types of swedes such as *Domain* are not particularly leafy in nature and often produce and maintain lower leaf yields than the more modern higher yielding swedes available today. They also are characterised by lower bulb dry matter percentages – this is often related to softer bulb types. *Domain* is suitable for sheep, dairy, beef and deer and this type of swede is ideal for younger stock classes. *Domain* has shown very high tolerance to dry rot, however it has an improved clubroot tolerance and is not recommended as a second crop swede and should not be sown after any other brassica. As *Domain* is a palatable swede, the practice of grazing the leaf with lambs and hoggets in autumn requires careful monitoring as the chipping of bulbs can occur very early in the grazing. Bulb chipping can lead to diseases infecting the damaged bulb prior to the main grazing period.

**Figure 1.** Percent Infection of Dry Rot in Swede Cultivars

Combined averages from three trials in Gore Plant and Food Research (2009, 2010 & 2011) where all swedes presented were present in all three trials and dry rot occurred.

*Statistical Significance: Those cultivars whose error bars do not overlap are significantly different from each other at the 95% confidence level. Those cultivars whose error bars do overlap are not significantly different from each other.*

**R&D Program Belarus**

- *Triumph* is a very high yielding yellow-fleshed swede with high dry rot and mildew tolerance. This new generation swede has a uniform bronze/purple skinned bulb and very good leaf holding characteristics. *Triumph* is defined by its very high yield potential for a swede and is one of the highest yielding swedes to come through our breeding programme. *Triumph* has an intermediate bulb dry matter percentage, higher than *Domain*. *Triumph* has shown high tolerance to dry rot, however it has no significant improvement in clubroot tolerance and is not recommended as a second crop swede and should not be sown after any other brassica. *Triumph* is highly suitable to a full range of systems that require high yielding swede crops. It is suitable for ewes, deer and is particularly suitable for dairy support. Like all brassicas, *Triumph* requires good establishment management, climatic conditions and fertiliser use to fully express its yield potential.

**Figure 2.** Drymatter Production of Swede Cultivars


*Statistical Significance: Those cultivars whose error bars do not overlap are significantly different from each other at the 95% confidence level. Those cultivars whose error bars do overlap are not significantly different from each other.*

**PRODUCT USAGE**

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**Figure 2.** Drymatter Production of Swede Cultivars


*Statistical Significance: Those cultivars whose error bars do not overlap are significantly different from each other at the 95% confidence level. Those cultivars whose error bars do overlap are not significantly different from each other.*
RIVAL

Rival is ideally used as part of a pasture renovation programme on dairy farms that have a period of dry weather, or a loss of pasture quality, through January and February. Growing a Rival crop provides a standing volume of high energy and protein feed, which helps maintain milk production under periods of environmental stress. Rival is a high-performing cultivar, with a higher leaf proportion than some other turnip varieties, ensuring high quality at grazing.

NEW YORK

New York is a modern version of a traditional late autumn and early winter feed turnip. It has also performed very well as a spring sown medium to late-maturity summer turnip, and fits very well in conjunction with Rival, where the early grazed Rival makes up two thirds of the area and New York provides the last third of the area to be grazed.

New York has performed strongly as a later-holding crop, where the early grazed New York has performed strongly as a later-holding crop, providing the last third of the area to be grazed.

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PLANTING:

Conventional cultivation

Conventional cultivation is generally the most reliable way of eliminating weeds and establishing brassicas. Best practice is the broadcasting of fertiliser prior to planting. For a minimal pass operation, pull hoses out of coulters and drop fertiliser in a surface band, with incorporation by light harrowing and rolling.

Direct-drilling

Direct-drilling is suitable if spray control of weeds is successful and fertiliser applications are considered carefully. For detailed information on no-tillage and direct-drilling refer to "Successful No – Tillage in Crop and Pasture Establishment", Ritchie et al. (2000).

Broadcasting

Broadcasting, (the scattering of seed onto a worked seedbed), can be successful, but a higher sowing rate and subsequent light harrowing and rolling is recommended.

Fertiliser guidelines for brassicas

Typically, less productive pastures are sown out into brassicas, often meaning they are established into less than optimum conditions. Brassicas tend to differ from other crops in certain aspects of their fertiliser requirements. Brassicas yield is sensitive to nitrogen and phosphorus status. In addition, boron deficiency may impact on plant health, especially in the bulb brassicas. The seed is particularly prone to germination injury if soluble fertiliser or boron is placed too near the seed. Inappropriate levels of certain nutrients can induce animal disorders e.g. the sulphur compound S-Methyl Cysteine Sulphoxide (SMCO).

Nitrogen (N) applications are a key component of successful establishment from direct-drilling.

Under no-tillage regimes, crop residues are broken down by microbial activity (not burning, oxidation or mineralisation as in tillage systems) that temporarily locks up nitrogen. Therefore N will not be available at the time of the brassica establishment, and hence this delay in N availability needs to be compensated for at sowing time.

Ridging

Ridging effectively provides a raised seedbed for establishment away from excess moisture. It is best suited to use in wetter climates.

Phosphorus (P)

Early purpling, stunted and erect leaves are an indicator of P deficiency (this can also be induced by cool weather, so heritage testing is the best form of identification). In many cases farmers do not see brassica crops reach their full potential because P levels are limiting growth. Ideally P status should be 20+. Low inputs (20-30 kg P/ha) are only suitable for high fertility soils or where crop yield is not important. Most crops will benefit from rates of 40-50 kg P/ha, and swedes at a higher rate of 60-70 kg P/ha. DAP is a good way to provide P to brassicas. The opportunity for lifting of P status should also be considered at this time.

Sulphur (S)

Sulphur deficiency is characterised by stunted, pale or yellowed growth (particularly the young growth) and leaf curling and distortion. It is not necessary to use sulphur on brassicas unless S levels are low (2-3 mg/kg).

TABLE 8. OPTIMUM SOIL FERTILITY STATUS (MAF QUICK TEST)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Short Term Crop</th>
<th>Long Term Crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olsen P</td>
<td>20-30</td>
<td></td>
</tr>
<tr>
<td>Sulphate</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Soil test K</td>
<td>5+</td>
<td></td>
</tr>
<tr>
<td>Soil test Mg</td>
<td>8+</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>5.7-6.2</td>
<td></td>
</tr>
</tbody>
</table>

TABLE 9. GENERAL FERTILISER APPLICATION

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Short Term Crop</th>
<th>Long Term Crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>50-100</td>
<td>100-200</td>
</tr>
<tr>
<td>Phosphate</td>
<td>40-60</td>
<td>50-80</td>
</tr>
</tbody>
</table>

* When optimum soil fertility is present, the following fertiliser needs to be applied to support good crop growth. ** Site dressing of 20-30 kg P/ha at sowing and 25-50 kg P/ha 4-6 weeks after sowing.
TABLE 10A. KEY PESTS AND DISEASES AFFECTING BRASSICA SEEDLINGS

<table>
<thead>
<tr>
<th>Condition</th>
<th>Impact on Plant</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Seedling Insect Pests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Springtails (Thuridilla spp.)</td>
<td>Attack cotyledons and emerging plants, smooth edge damage, damaging until the 4th leaf stage</td>
<td>Ultrastrike® or Superstrike® seed treatment, chemical, crop rotation and hygiene</td>
</tr>
<tr>
<td>Greasy Cutworm (Agrotis ipsilon aneituma)</td>
<td>Plants, especially seedlings ripped off at or just below ground level, young plants wilt</td>
<td>Chemical, crop rotation and hygiene</td>
</tr>
<tr>
<td>Grass Grub (Costelytra zealandica)</td>
<td>Adults attack young growing points, larvae attack seedling roots</td>
<td>Chemical</td>
</tr>
<tr>
<td>Wheat Bug (Nysius huttoni)</td>
<td>Ring-barking of seedlings at ground level leaves plants susceptible to other attacks, damage is similar to that caused by wirestem</td>
<td>Ultrastrike + chemical</td>
</tr>
<tr>
<td>Weevils (Catopes spp.)</td>
<td>Chew cotyledons or stem at ground level, scalloping of leaf edge</td>
<td>Chemical</td>
</tr>
<tr>
<td>Slugs (many species)</td>
<td>Creates severe damage to brassica plants by destroying seedlings</td>
<td>Minimise crop residual or trash before direct-drilling, use slug baits, cultivate paddocks</td>
</tr>
</tbody>
</table>

**Seedling Fungal Diseases**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Impact on Plant</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wirestem/Strangles (Rhizoctonia solani)</td>
<td>Brown lesions at ground level, narrowing of root and stem base, often caused by shank flies, damage similar to that caused by wirestem</td>
<td>Ultrastrike or Superstrike seed treatment, chemical, crop rotation and hygiene</td>
</tr>
<tr>
<td>Damping-off (Fusarium and Pythium)</td>
<td>Affects seedlings in the first few weeks after sowing. Infected seedlings either fail to emerge or recently emerged plants can collapse, with plants revealing shrinking and discoloration at the shoot base</td>
<td>Ultrastrike or Superstrike seed treatment</td>
</tr>
</tbody>
</table>

Brassica establishment can be compromised by occasional, localised, and seasonal, pest and disease attack. Their impact can usually be minimised by management. Once established, brassicas are normally relatively disease-free compared with other crops. Please refer to pages 37-42 for grazing management and animal welfare information.
<table>
<thead>
<tr>
<th>Condition</th>
<th>Impact on Plant</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plant Pests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aphids (many species)</td>
<td>Sap suckers that weaken plants, reduce yields, carry viral diseases, mainly attack summer crops</td>
<td>Tolerant cultivars to certain aphid species, Ultrastrike® seed treatment, chemical</td>
</tr>
<tr>
<td>Diamondback Moth (Plutella xylostella)</td>
<td>Young larvae burrow in and feed on internal leaf tissue, older larvae feed on lower leaf surfaces, larvae damage is often holes, some quite large, similar to white butterfly caterpillar</td>
<td>Chemical</td>
</tr>
<tr>
<td>White Butterfly (Pieris rapae)</td>
<td>Leaf feeding/leaves skeletonised with leaf ribs remaining</td>
<td>Chemical</td>
</tr>
<tr>
<td>Leaf Miners (many species)</td>
<td>Larvae create tunnels and live within leaf tissue, tissue damage may reduce photosynthetic activity and cause leaf yellowing, premature leaf death, and limit growth at this time. Damage is similar to that caused by Diamondback moth</td>
<td>Chemical</td>
</tr>
<tr>
<td><strong>Crop Viruses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turnip Mosaic</td>
<td>Stunted growth, mottling and striated leaves, yellowing, leaf death, poor bulb development</td>
<td>Control of vector aphids</td>
</tr>
<tr>
<td>Beet Western Yellows</td>
<td>General stunted growth, purpling of leaves</td>
<td>Control of vector aphids</td>
</tr>
<tr>
<td>Cauliflower Mosaic</td>
<td>Poor vigour, can attack all brassica species</td>
<td>Control of vector aphids</td>
</tr>
<tr>
<td><strong>Crop Fungal Diseases</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clubroot (Plasmodiophora spp.)</td>
<td>Causes irregular swelling of root, leaf wilting, stunted growth and plant death</td>
<td>Crop rotation; 5 years in high risk areas, hygienic, reduce double cropping</td>
</tr>
<tr>
<td>Dry Rot (Lepiosphaeria maculans)</td>
<td>Affects crows, mainly small suckers, brown-grey circular spots on leaf or bulb neck, plant death</td>
<td>Crop rotation and hygiene, more tolerant cultivars, reduce double cropping</td>
</tr>
<tr>
<td>Nez Spot (Mycosphaerella brassicae)</td>
<td>Small dark spots on older leaves in cool wet conditions</td>
<td>Crop rotation</td>
</tr>
<tr>
<td>Leaf Spot (Alternaria spp.)</td>
<td>Small dark lesions and dark sooty mould on leaves, may lower yields</td>
<td>Chemical</td>
</tr>
<tr>
<td>Black Rot (Verticillium dahliae)</td>
<td>Attack on vascular system in warm humid conditions, yellowing of leaf margins, wilting, leaf loss</td>
<td>Crop rotation</td>
</tr>
<tr>
<td>Ral</td>
<td>Orange spongy cover leaf surfaces. Effect on yield is yet to be confirmed</td>
<td>Research on-going</td>
</tr>
<tr>
<td>Powdery Mildew</td>
<td>White powdery substance on leaf surface. Evidence suggests a yield reduction may occur</td>
<td>Research on-going</td>
</tr>
<tr>
<td><strong>Crop Nutrient Deficiencies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown Heart</td>
<td>Boron deficiency, affects bulb crops</td>
<td>Soil testing; Boron fertiliser application</td>
</tr>
</tbody>
</table>


Brassica Grazing Management and Animal Welfare

**BEST PRACTICE GRAZING**

To successfully achieve the desired outcome (e.g. body condition score gain, liveweight gain or maintenance feeding) from grazing brassica crops, farmers should be aware of a number of factors which may impact on the productivity and health of animals.

**ALLOCATION**

In many cases, where animal performance does not meet the expectation of farmers, reduced feed intake through poor allocation of feed is a common cause. Fast growing animals require high intakes and where feed is restricted high intakes are not possible. Restricted intake may occur as a result of the daily break in a strip grazing situation being too small for the number of animals or animal spending too long in a paddock in a rotationally grazed situation. Stocking rate being too high in a set stocked system can also restrict intake. Correct allocation is critical for highly productive systems. See page 25 ‘Quick Guide to Hunter Grazing Management’.

**FEED QUALITY**

Quality parameters of feeds influence stock performance. For young growing animals adequate intakes of energy, protein, macro and trace elements are the daily important for healthy and productive livestock. Specific requirements will depend on liveweight, pregnancy status and desired performance level (e.g. growth rate). Table 11, page 38 gives typical values for energy, protein and DM% of a range of feeds to help determine specific requirements.

**CROP UTILISATION**

Break feeding (strip grazing) is the best practice for manipulating utilisation rates, diet quality, crop life, and crop regrowth potential. Generally, as crop utilisation increases, animal intake per head decreases.

Ensure stock have ready access to a good supply of drinking water.
TRANSITIONING ONTO A CROP

Transitioning is allowing time for the rumen microbial populations to reach a new equilibrium capable of dealing with a new feed. Theoretically this process takes 21 days to be fully complete but practically the transition is well enough advanced to minimise issues by 10-14 days. The process usually entails a gradual increase in the proportion of the crop in an animal's diet. This can be achieved by a) the time they are left on the crop each day, or b) the daily crop allocation.

The following guidelines help to limit the effect of diet change through the transition period:

- Introduce animals slowly to a crop, from an initial 2-3 hours to full allocation by 10-14 days. This allows rumen microbes to adjust and may reduce the “grazing check” effect.
- Do not introduce hungry animals to the crop. Gorging may occasionally lead to bloat or nitrate poisoning problems.
- Offer an alternative source of feed, pasture, hay or silage, during introductory stage and throughout the grazing of the crop.

WHY IS FIBRE IMPORTANT?

Brassica crops typically are highly digestible, have high ME and protein content but are often low in fibre. Fibre is required for efficient rumen function.

- Helps maintain rumen pH by encouraging saliva production through chewing.
- May dilute any possible anti-nutritional plant chemicals and therefore reduce their effect on livestock.
- Extends the number of grazing days on the crop, as it supplements animal intake.
- Must be palatable so stock can consume it.
- May be detrimental to animal performance if there is excessive use of low quality fibre.

TABLE 11. TYPICAL NUTRITIVE VALUES FOR A RANGE OF FEEDS

<table>
<thead>
<tr>
<th>Feed Type</th>
<th>Drymatter Content</th>
<th>Metabolisable Energy (MJ ME/kg DM)</th>
<th>Crude Protein (% DM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swedes Top</td>
<td>7-8</td>
<td>11.3-13.2</td>
<td>15</td>
</tr>
<tr>
<td>Swedes Bulb</td>
<td>10</td>
<td>12.3-13.0</td>
<td>12</td>
</tr>
<tr>
<td>Kale Top</td>
<td>15</td>
<td>11.5-12.5</td>
<td>15-20</td>
</tr>
<tr>
<td>Kale Bulb</td>
<td>15</td>
<td>12.5-13.5</td>
<td>13</td>
</tr>
<tr>
<td>Rape Top</td>
<td>9</td>
<td>12.3-13.0</td>
<td>13</td>
</tr>
<tr>
<td>Rape Bulb</td>
<td>17</td>
<td>12.5-13.0</td>
<td>16</td>
</tr>
<tr>
<td>Ryegrass/White Clover Winter leaf</td>
<td>14</td>
<td>11.2</td>
<td>25</td>
</tr>
<tr>
<td>Ryegrass/White Clover Winter Autumn</td>
<td>17</td>
<td>11.2</td>
<td>23</td>
</tr>
<tr>
<td>Ryegrass/White Clover Summer dry</td>
<td>28</td>
<td>11.2</td>
<td>13</td>
</tr>
<tr>
<td>Oats Winter grazing</td>
<td>15</td>
<td>11.2</td>
<td>18</td>
</tr>
<tr>
<td>Oats All time harvested for green chop cereal silage</td>
<td>15</td>
<td>11.2</td>
<td>13</td>
</tr>
<tr>
<td>Triticale Winter grazing</td>
<td>15</td>
<td>11.2</td>
<td>20</td>
</tr>
<tr>
<td>Triticale All time harvested for whole crop cereal silage</td>
<td>28</td>
<td>11.2</td>
<td>20</td>
</tr>
<tr>
<td>Triticale Top</td>
<td>15</td>
<td>10.5-12.5</td>
<td>15</td>
</tr>
<tr>
<td>Triticale Bulb**</td>
<td>52-60</td>
<td>11.9</td>
<td>10-10.5</td>
</tr>
</tbody>
</table>

Adapted from: Drew and Fennessy, (1980) and the Lincoln University Farm Technical Manual, and Plant & Food Research Ltd data. * Figure adjusted to better reflect ideal harvest timing. ** Drymatter content will vary depending on crop maturity, weather, and cultivar. ***mAb Association, The Agronomist Handbook 2000/1.

RAPE SCALD

Rape scald is a reaction by livestock to photodynamic plant chemicals in brassicas. Symptoms include reddening and swelling of the skin, commonly on the ears and face and possibly udders of sheep and cattle. Affected livestock generally attempt to seek shade, rub affected areas, and may appear generally distressed. This condition is most commonly seen in lambs grazing immature or second growth rape or other forage brassicas.

- The risk of rape scald can be minimised by delaying first grazing until crops have ripened (purplish/blue tinge on leaf margin).
- Avoiding excessive nitrogen and sulphur fertilisers, and being vigilant to early signs.
- Animals with scald should be removed from crop and offered shade as soon as possible.

PHOTOSENSITIVITY FROM TURNIPS

Photosensitivity is also possible with dairy cows grazing summer turnips and with other stock classes on summer turnips and leafy turnips. The cause of this condition is not well understood for dairy cows the risk factors include: consuming large volumes of turnips (greater than one third of diet) and feeding on crops under environmental stress.

- Crops should be accurately measured and allocation for dairy cows should be no more than one third of diet.
- Animals with photosensitivity should be removed from crop and offered shade as soon as possible.

In lambs grazing summer turnips (including Hunter) this condition is rare and unpredictable but may be associated with adverse and overcast weather conditions. This may be of particular concern to stud stock owners, where photosensitivity may cause cosmetic issues to sale animals.

Animal Health and Welfare Considerations

Ensure stock have ready access to a good supply of drinking water.
NITRATES

When protein manufacture cannot keep up with nitrogen uptake in plants, the excess accumulates as nitrates, which when consumed are converted to nitrates in the rumen and can cause toxicity problems to grazing animals. This may occur in most pasture species when nitrate levels (as KNO3) reach 5% of the dry matter. When animals ingest high levels of nitrates, nitrites build up in the bloodstream. Here they bind with the oxygen-carrying compound, haemoglobin, to form a compound that no longer is able to carry oxygen. Simply, the animal suffers oxygen deprivation.

The most common symptom of nitrate toxicity is sudden death, but prior to death, excessive salivation, rapid gasping breath, rapid pulse (>150 beats/min), pale blue or brown colouration of membranes, tremors, and muscle weakness may occur. Pregnant animals surviving may abort.

Nitrates can build up in any situation where environmental conditions promote plant growth but limit photosynthetic activity. These include sudden temperature changes, dry periods followed by rain, frost, shading, overcast days, insect damage, some herbicides, some nutrient deficient soils, excessive nitrogen fertiliser use, soils with deficiencies in sulphur, phosphorus, molybdenum, or high acidity levels. Nitrate toxicity can occur on a range of grasses, brassicas, forage cereals and weeds. Young plants and plant material close to the ground are more likely to have high nitrate levels.

TREATMENT OF NITRATE TOXICITY

1. Remove stock to low risk pasture
2. Seek emergency veterinary assistance
3. Ensure that soil nutrient levels are in the optimum range for your farming system, as some nutrient deficiencies lead to nitrate build up
4. Healthy animals are less likely to be affected than animals in poor health
5. Remember that nitrate levels in animals are a combination of the nitrate consumed in their feed and their drinking water

SMCOS, KALE ANAEMIA, RED WATER

As the name suggests this disorder is most commonly found when animals graze kale, however it can occur in all brassicas. It is most likely to occur in brassicas that have bolted or are flowering in spring. It may also become a problem if crops are grown in soils high in sulphur, or after sulphur fertilisers have been used.

Brassicas contain a non-protein amino acid called S-methyl cysteine sulphoxide (SMCO). During rumination SMCO is converted into a compound that can potentially damage the red blood cell membrane, allowing leakage of haemoglobin from the cell and ending up in the urine (hence the term red water). Moderate levels of SMCO may cause loss of appetite, ill thrift, mild anaemia and digestive upsets. High levels can cause severe anaemia and red coloured urine (red water). After an attack of poisoning, death can occur suddenly.

Follow best practice guidelines for feeding brassica crops, e.g. slow introduction, access to an alternative feed source etc. Be vigilant if you are grazing a crop that has started flowering and suspect there may be a problem. Soil testing prior to sowing will indicate the levels of key nutrients, including sulphur, and assist in applying the right fertiliser for good crop growth. Ideally, limit the applications of sulphur and nitrogen. If kale anaemia is suspected, remove animals from the crop and keep under close watch until health is regained.

- When changing stock class in early spring to clean up remaining brassica crops, follow best practice for feeding crops
- Slow introduction (ensure transition feeding)
- Access to alternative feed source

GOITRE

In some situations iodine deficiency can occur when livestock are fed on brassica crops. This is because brassicas are naturally low in iodine and contain plant chemicals which are goitrogenic and inhibit iodine uptake. Iodine is important for growth and cell differentiation of tissues through its inclusion in thyroid hormones. Consequently, iodine deficiency has its greatest effect on the developing foetus and therefore may play an important role where pregnant livestock graze brassicas for extended periods in the final stages of pregnancy. The most marked sign of iodine deficiency is enlarged thyroid glands (goitre), but weak newborn lambs, low birth weights and a high rate of perinatal mortality, may be subclinical signs along with poor wool growth and lower fertility in older stock. Be aware of the iodine status of pregnant livestock grazing a brassica crop and consider an iodine supplement.

KEY TIPS

- Recognise environmental conditions that cause nitrate build up
- Get suspect crops analysed before grazing
- Introduce stock gradually to allow rumen adjustment
- Do not put hungry animals onto suspect crops
- Avoid overstocking of suspect crops as high grazing pressure will increase the amount of high-nitrate plant parts eaten
- When strip grazing, watch utilisation levels or graze for short periods
- Dilute high nitrate feed with a low nitrate feed source, e.g hay, pasture, silage
- Make high nitrate forages into silage. Fermentation generally reduces nitrate levels
- Manage nitrogen applications carefully to match plant requirements, and therefore avoid excess uptake and nitrate build up
- Do not allow animals access to nitrogen fertilisers, fertiliser storage areas, fertiliser spills, or grazing on recently fertilised paddocks
- Take care when using nitrogen fertiliser around waterways, to avoid nitrate build up in drinking water
- Ensure that soil nutrient levels are in the optimum range for your farming system, as some nutrient deficiencies lead to nitrate build up
- Healthy animals are less likely to be affected than animals in poor health
- Remember that nitrate levels in animals are a combination of the nitrate consumed in their feed and their drinking water

Mixing herbs and clovers with brassica crops is a strategy that may assist with increasing trace element availability to stock (refer pages 43-50).
TRACE ELEMENTS

There is some evidence that animals grazing solely brassica crops do not receive sufficient trace elements and begin to deplete their liver stores. A trace element supplementation programme should be considered if animals are offered a sole diet of brassica for an extended period, or animals have a low trace element status prior to crop introduction. This may require soil, herbage and blood analysis and consultation with your veterinarian to establish current trace element status and the appropriate supplementation programme.

ENVIRONMENTAL CONSIDERATIONS FOR FEEDING WINTER FEED CROPS

Winter grazing of crops is a key source of sediment, nutrient and pathogen loss into waterways from farms. Reducing losses from winter crops can go a long way to reducing total farm losses. With a few simple steps, you can make a real difference now. Soil is our greatest asset, so holding on to more of it makes good economic sense. Damage to soil from poor grazing management of winter crops will impact on the future productivity of that paddock. Too much soil and nutrients in waterways impacts on their ecology and can kill freshwater species.

What can you do?
1. Exclude stock from waterways. Create an ungrazed buffer zone of crop between the livestock and the waterway. 3-5 metres is a good starting point but this should increase with slope and instability of soil.
2. Leave an ungrazed buffer zone around either side of Critical Source Areas (CSAs). These are parts of the paddock that can channel overland flow directly to waterways, like gullies, swales, very wet areas, spring heads, waterway crossings, stock camps and vehicle access routes.
3. Graze paddocks strategically. On a sloping paddock, fence across the slope and start grazing at the top of the paddock, so the standing crop acts as a filter. Or, if there is a waterway present, start grazing at the opposite end of the paddock.
4. Make breaks "long and narrow" - research shows that the crop will be utilised more efficiently by cattle.
5. Back fence. Regularly backfence stock off grazed breaks to help minimise pugging damage and to reduce runoff risk.
6. Place troughs and supplementary feed in a dry central part of the paddock well away from any waterways or CSAs.
7. Look after your stock. Provide adequate feed, shelter and clean fresh drinking water. Doing this will also limit stock movement and help reduce damage to crop and soil.
8. Plant a catch crop. Where soil conditions and farm management allow, consider planting a fast growing crop in spring such as greenfed oats or Ecotain® environmental plantain. It can make a dramatic difference to reducing nitrogen losses - see page 44 for more.

For more information visit beeflambnz.com/wintergrazing

Herbs and legume crops are often used as a source of quality summer feed where they offer both consistently high energy and protein in grazing stock. Recently the role of plantain and red clover as spring lactation feeds has highlighted how widely these products can be incorporated into different farming systems. Herbs offer particularly high levels of critical micro-nutrients which are complementary to an existing animal health supplementary programme.

The most common situations are:
- Sheep lactation stands of AgriTonic plantain or Relish red clover established to lamb-specific stock classes
- Last lambing twin bearing ewes
- Twin bearing hoggets
- Scanned triplet mobs
- AgriTonic and clover pastures and Relish red clover stands for spring lactation feeding and summer, autumn finishing
- Choice chicyrory for specific summer lamb finishing over two to three years
- Choice chicyrory or Ecotain® environmental plantain for summer cropping on dairy platforms
- Summer “safe” feed – a parasite/pathogen-free grazing environment, to avoid stock health issues related to endophyte effects, worms, facial eczema etc.
- Break crop for renovation programme of sub-standard pastures.

If managed well, forage crops will provide a significant drymatter contribution, minimal time out of production, a useful system for assisting in weed and disease clean-up for pre-pasture establishment, and a good opportunity for improving fertility status. Herb and legume stands are particularly useful in avoiding ryegrass seeding over the summer prior to establishment of a grass variety with novel endophytes such as AR1 or AR37.
• Huge reduction in N leaching from the urine patch - up to 89% depending on sward blend (Woods, 2017 used with permission. Figure 15, page 45)

• A natural, environmentally friendly forage solution to mitigate N leaching

• Increases feed quality and/or supply during summer and autumn

• Improves speed of sward recovery after summer dry

• Improves cool season activity of pasture base

• An ideal source of minerals for animal health and performance

• Suitable as a 2-3 year crop option

• Positive impact on milk production when grass quality drops in summer

• Also ideal for undersowing or broadcasting on to damaged or open pasture

• Can be grazed to deliver 100% of the diet

• An ideal source of minerals for animal health and performance

DRYMATTER PERFORMANCE

• Very similar drymattern quantity and quality to ryegrass pasture

• Can add value in terms of both drymatten and quality to any farming system

• Contributes invaluable DM production, typically at times of the year when ryegrass and other species, e.g. white clover, are not performing

1. DILUTE
Ecotain® environmental plantain increases the volume of urine animals produce, which means the N being excreted is in a more dilute form, resulting in a reduced N load in the urine patch.

2. REDUCE
Ecotain reduces the amount of dietary N which is excreted in urine, compared with ryegrass. This reduces the amount of N released into the soil via the urine patch.

3. DELAY
In urine patches from animals grazing Ecotain, the conversion from ammonium to nitrate is delayed. Slower conversion allows plants a greater opportunity to uptake N, significantly reducing the potential for leaching.

4. RESTRICT
The presence of Ecotain plants in the soil reduces nitrification, likely through the effect of a biological nitrification inhibitor.

THE POWER OF 4

Lysimeters are columns of soil which are placed into large tubes undisturbed. These can be used to evaluate the effect of different management on nitrate leaching.

The diagram below represents the outcome of a lysimeter study which demonstrated a 45% reduction in leaching when urine from animals grazing normal pasture (ryegrass/ clover) was applied to an Ecotain mix. This is the RESTRICT function at work. When urine from animals grazing the Ecotain mix was applied to the same sward, a reduction in leaching of 89% was recorded*. This second lysimeter demonstrates all four mechanisms working together. Research continues to demonstrate that not all plantains (current cultivars or breeding lines) are capable of reducing nitrate leaching from the urine patch through the four mechanisms to the same extent Ecotain can.

Figure 15.

* From the urine patch (Woods, 2017 used with permission). Compared to control ryegrass / white clover pastures.
AgriTonic is a forage plantain from the breeding programme that created Tonic; it maintains many of the seasonal growth features while having an increased leaf number. AgriTonic has been bred from plants surviving our intense breeding process and we believe this has conferred some additional tolerance to grazing and other farm management stresses.

AgriTonic provides the ideal option for including in a general pasture mix at 1-3 kg/ha where grazing pressure is often unnoticed and intense. In high density legume mixes AgriTonic also provides well tillered plants that should complement this style of grazing system.

**Perenniality**
- Perennial

**Cool Season Growth**
- Very high. Similar to perennial ryegrass

**Growth Habit**
- Erect

**1000 Seed Weight (grams)**
- 2.0

**Suggested Sowing Rate (kg/ha)**
- 1-3 mixed sward
- 6-8 pure stand

- Strong all year round growth pattern
- Upright growth habit
- High tiller density
- Suitable addition to grass pasture mixes and high legume density pastures

---

**Perenniality**
- Perennial

**Cool Season Growth**
- High (for chicory)

**Growth Habit**
- Erect

**1000 Seed Weight (grams)**
- 1.2

**Suggested Sowing Rate (kg/ha)**
- 1-3 mixed stand
- 6-8 pure stand

---

**CHOICE FOR SHEEP AND BEEF SYSTEMS**

Standout Points from Current Choice Research and Experience in Sheep and Cattle
- **Choice** is a uniform, high quality summer forage with ME’s ranging between 11.5-13.0 MJ/kg DM
- Average lamb liveweight gains of around 250 grams/head/day are achievable with ranges from 220 to 450 grams/head/day
- High dressing out percentages in lambs and cattle
- Faecal egg counts are reduced in lambs grazing chicory compared with perennial ryegrass
- Chicory carries lower spore counts for facial eczema, and potentially supports lower concentrations of overwintering.
- Carrying capacities have ranged from 40-70 lamb/ha with an average of 40 on dryland and 50 with irrigation or summer rainfall
- Chicory is a good source of minerals particularly (Zn, Cu, Mg, P, Ca, K)

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**CHOICE FOR DAIRY SYSTEMS**

Standout Points from Current Choice Research and Experience in Dairy Systems
- Spring sown summer crops of **Choice** with or without clover average around 11-12 kg DM/ha ranging from 8 to 12 kg DM/ha in 6-7 months
- As a summer crop, **Choice** is a very high quality feed source with ME’s of 11.5 to 13.0 MJ/kg DM and crude proteins of 22% to 27% at a time when unirrigated ryegrass can contain both low ME and low crude protein
- When pasture quality is poor (below 10 ME) feeding **Choice** at 20-40% of the diet can increase milk solids production by 17%*
- **Choice** is a responsive species to high fertility and is well suited to effluent paddocks where the deep taproot and high summer growth rates make it ideal for utilising surplus nutrients
- **Choice** is an ideal break crop, reducing insect pest build up and providing an opportunity to control difficult weed grasses such as yellow bristle grass

---

Red clover is successfully used as a component of a pasture mix to improve pasture production and quality during the summer. However, recent interest in red clover sown as a pure stand has shown the potential as an alternative to a summer brassica crop for finishing lambs. In a series of Agricom experiments, groups of lambs (n=10-55) were rotationally grazed on red clover, perennial ryegrass/white clover pasture, or spring-sown leafy turnip, over two years. Table 12 shows the general effect of each forage system on key productive parameters. This evaluation suggested that, in the appropriate environment, there is no disadvantage in using red clover compared with a forage brassica in either the number of lambs potentially finished per-hectare, or the speed of growth. Additional benefits include:

• Persists for two or more summers
• Improves nitrogen cycling for future crop rotations
• Has the option to conserve surplus as silage or hay

Brassica crops are still important in a renovation programme where longer crop rotations are less appropriate, or where quick feed is required from a spring sowing. In these situations red clover is less appropriate. However, red clover is an option where a longer term finishing crop is desirable.

**PROVEN IN PERSISTENCE TRIALS**

In a replicated rotationally grazed pilot trial Relish showed significantly greater growth and persistence over all other varieties. This is a significant breakthrough in red clover genetics for New Zealand based grazing systems and highlights why Relish is a major change in red clover reliability. For persistence, nothing else evaluated from within New Zealand or from around the world came close to Relish for persistence under grazing.

![Figure 16. Plant Survival (%). Percentage of Red Clover Plants Surviving after Three and a Half Years Under Cattle Grazing in the Manawatu](image)

**STEP CHANGE IN CLOVER GENETICS.**

Relish red clover is ideally suited to pasture mixes where its growth habit should help to maintain red clover content over time. It must be remembered that sowing rate often has the biggest impact on red clover persistence as it is a much larger seed than white clover. Low sowing rates will lead to low plant populations from the very start of the pasture. Relish is a primary option for a red clover forage crop with proven persistence and production. Relish has shown to be highly productive with enough early spring growth for it to be used as a lambing forage (as early as September).

**TABLE 12. COMPARISON OF THREE FORAGE OPTIONS FOR GROWING LAMBS**

<table>
<thead>
<tr>
<th>Forage Treatments</th>
<th>Forage Brassica</th>
<th>Red Clover</th>
<th>Rye grass/White Clover</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM production (t/ha) (November to March)</td>
<td>6.5-8.0</td>
<td>6.5-8.0</td>
<td>4.5-5.5</td>
</tr>
<tr>
<td>Stocking rate (lamb/ha)</td>
<td>45-55</td>
<td>45-55</td>
<td>30-35</td>
</tr>
<tr>
<td>Liveweight gain (kg/ha/day)</td>
<td>200-300</td>
<td>200-300</td>
<td>50-150</td>
</tr>
<tr>
<td>Liveweight gain/ha/day (kg/lamb/day)</td>
<td>5-17</td>
<td>5-17</td>
<td>15-53</td>
</tr>
</tbody>
</table>

**Figures:**

- **Figure 17. Effect of Daily Allowance of Red Clover on Liveweight Gain of Lambs**

- **Figure 16. Plant Survival (%).** Percentage of Red Clover Plants Surviving after Three and a Half Years Under Cattle Grazing in the Manawatu

- **Figure 15. Forage Grazing Options for Growing Lambs**

**Maximising Animal Productivity**

Maximising animal productivity from red clover stands is a balance between high stocking rates and fast growing animals (Figure 17). Key points:

- Low allowance creates high utilisation and poor per head liveweight gains along with reduced liveweight gain per-hectare despite high stocking rates
- High allowance, liveweight gain can be reduced due to an increase in poorer quality forage and liveweight gain per-hectare rates can be lower
- Liveweight gain maximised at a lamb allowance of 2 kg D.M./ha/day, as lambs grew fast and stocking rate was optimised
Sensation red clover was selected as an upright growing cultivar with good persistence under close grazing. It is an early flowering variety, giving better production in late winter and spring without losing the summer production advantage that red clovers offer over white clovers. Sensation has low levels of formononetin (a plant oestrogen), allowing it to be used in all pasture mixes to enhance animal performance. Red clover can also be set-stocked in spring, so is suitable for lambing ewes.

**Perenniality**
- Perennial

**Cool Season Growth**
- Medium-high for red clovers

**Oestrogen**
- Low

**Leaf Size**
- Medium

**1000 Seed Weight (grams)**
- 2.5

**Ploidy**
- Diploid

**Suggested Sowing Rate (kg/ha)**
- 4-6 grass or brassica mix
- 12 pure stand

- High yielding cultivar
- Upright growth habit
- Strong early season growth
- Reduced levels of formononetin (oestrogen)
Cereal Silage
Spring sown forage cereals are an excellent way of producing high yields in a short space of time. This large yield is a cost effective way of producing feed that has either a good balance of protein and energy or more carbohydrate and starch depending on the cultivar used and the time of harvest.

GREEN CHOP CEREAL SILAGE (GCCS)
GCCS produces a feed that has a good balance of protein and energy, similar to high quality pasture silage. GCCS is used as a pasture replacement supplement when pasture levels are low. GCCS is harvested late spring/early summer before seed heads are present to get maximum quality and yield.

CORONET AND MILTON
Oats are used for quick production of GCCS, usually after a winter crop. Both Coronet and Milton oats can be planted from late winter onwards for high quality GCCS before planting another crop or pasture early summer. Coronet is leafier and has the ability to provide very high quality feed later in the season due to a later maturity date. Milton oats are faster to mature, providing higher levels of feed during the early mid winter.

Management of GCCS is simple with a nitrogen based fertiliser (150-250 kg/ha DAP) being used at sowing, with the potential of another application of nitrogen (40-50 kg N/ha) being applied six weeks after sowing depending on background soil nitrogen.

WHOLE CROP CEREAL SILAGE (WCCS)
WCCS produces a feed that has high carbohydrate and starch levels, with adequate fibre for a balanced feed. WCCS can be used as a feed supplement to balance animal intake when feeding brassicas or high quality pasture. WCCS can be planted in either mid winter or early spring.

BARLEY PLANTED IN SPRING FOR SILAGE

**BASIC MANAGEMENT RECIPE FOR CRTR27 TRITICALE PLANTED IN SPRING FOR SILAGE**

**TABLE 13A. TRITICALE – BASIC MANAGEMENT RECIPE FOR CRTR27 TRITICALE PLANTED IN SPRING FOR SILAGE**

<table>
<thead>
<tr>
<th>Typical Timing</th>
<th>Action</th>
<th>Details (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>July-September</td>
<td>Spray out old pasture or winter crop residue</td>
<td>Glyphosate at 3-6 l/ha + surfactant</td>
</tr>
<tr>
<td>1st post-sowing</td>
<td>Drill CRTR27</td>
<td>175-200 kg seed + 250 kg DAP</td>
</tr>
<tr>
<td>5-8 weeks post-sowing</td>
<td>Assess weed pressure</td>
<td>3 l/ha MCPA</td>
</tr>
<tr>
<td>5-8 weeks post-sowing</td>
<td>Apply first fungicide</td>
<td>Tank mix fungicide with herbicide</td>
</tr>
<tr>
<td>5-8 weeks post-sowing</td>
<td>Main nitrogen application</td>
<td>75-100 kg N/ha (depending on soil fertility)</td>
</tr>
<tr>
<td>Flag leaf/booting stage</td>
<td>Control plant growth regulator</td>
<td>125-150 kg/ha Cycocel + 200 ml/ha Minodilus</td>
</tr>
<tr>
<td>Flag leaf/ booting stage</td>
<td>Fungicide application</td>
<td>Protectant + curative fungicide</td>
</tr>
<tr>
<td>Finale</td>
<td>Final nitrogen</td>
<td>50-70 kg N/ha</td>
</tr>
</tbody>
</table>

**TABLE 13B. MONTY BARLEY – BASIC MANAGEMENT RECIPE FOR MONTY PLANTED IN SPRING FOR SILAGE**

<table>
<thead>
<tr>
<th>Typical Timing</th>
<th>Action</th>
<th>Details (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>September</td>
<td>Spray out old pasture</td>
<td>Glyphosate at 3-6 l/ha + surfactant</td>
</tr>
<tr>
<td>September</td>
<td>Sow Monty barley and fertiliser</td>
<td>140 kg N/ha seed + 70 kg N/ha providing 75-100 kg N/ha</td>
</tr>
<tr>
<td>4-6 weeks post-sowing</td>
<td>Assess weeds and spray if required</td>
<td>e.g. MCPA at 3 l/ha</td>
</tr>
<tr>
<td>4-6 weeks post-sowing</td>
<td>Tank mix fungicide with herbicide</td>
<td>Product mix to provide curative plus protectant properties</td>
</tr>
<tr>
<td>4-6 weeks post-sowing</td>
<td>Final nitrogen application</td>
<td>50-75 kg N/ha</td>
</tr>
</tbody>
</table>

**WCCS CROP MANAGEMENT**
Time of sowing is crucial for yield. Crops planted too late rush through their growth stages and have less time to accumulate yield. Plant crops as early as possible, CRTR27 triticale can be planted as early as mid winter, and Monty barley in early September.

Paddock preparation can affect yield. Cultivated ground should be moderately fine and even to achieve a consistent drilling depth of 3-4 cm. Broadcasting cereal seed is not recommended.

Fertiliser has a critical influence on yield potential. All spring cereals should be planted with a nitrogen-based fertiliser (e.g. 150-250 kg/ha DAP). Triticale crops normally have 66% of their total nitrogen requirements applied at the end of tillering (Growth Stage 31), with further nitrogen applied at flag leaf emergence (Growth Stage 39) for high yielding crops. Barley develops faster, so 60% is applied at sowing and 40% at the end of tillering (Growth Stage 31).

**BASIC MANAGEMENT RECIPE FOR MONTY BARLEY PLANTED IN SPRING FOR SILAGE**

Monty barley can be sown later in the spring (Sept-Oct) and harvested earlier in the summer. Monty barley will produce very high quality WCCS. Monty is a slag barley with high yield and quality that will perform in a wide range of environments. Trials show yields equal to or better than other cultivars in the Manawatu, Southland and Canterbury.
When to Harvest Cereal Silage

When making silage from oat crops (GCCS), harvesting should only be done at the booting stage, as this species is not ideal for whole crop cereal silage. Barley is recommended to be harvested at the whole crop stage, with either oats or triticale providing better leaf yield if crops are cut at the green chop stage. Triticale can be harvested at either the green chop or whole crop stage. The whole crop stage maximises yield and carbohydrate content of the silage (Figure 18), while the green chop stage maximises protein content at the expense of yield and carbohydrate. Harvesting between these stages is not advised as it fails to produce optimum yield or quality.

WHICH FORAGE CEREAL TYPE TO USE?

| TABLE 14. FORAGE CEREAL TYPE BASED ON PLANTING TIME AND INTENDED USE |
|------------------------|-----------------|-----------------|-----------------|
| Intended Use           | Autumn Planting | Late Winter, Early Spring | Mid Spring |
| Coronet oats           | Single Late Winter Grass For High LWG | Single Winter Grass For High DM Production | Summer Green Crop Cereal Silage |
| Milton oats            |                  |                  | 1 S Winter Graze, and/or Whole Crop Cereal Silage |
| Prophet triticale      |                  |                  | Single Cut Whole Crop Cereal Silage |
| CRTR27 triticale       |                  |                  | Single Cut Whole Crop Cereal Silage |
| Monty barley           |                  |                  |                  |

Chemicals are commonly mixed to achieve both 'knock-down' and residual control. Discuss with a retailer or chemical company representative.

Harvesting of WCCS requires planning and monitoring to ensure correct timing. The grain needs to develop until it is larger than the seed you planted, and will have changed colour from light-green to yellow/brown (Figure 18). When you squeeze the grain between your finger and fingernail, it should crease easily but no liquid or white 'slop' should ooze out of the grain. This is called the 'cheesy dough' stage, because the contents of the grain resemble colby cheddar cheese. The drymatter of the crop should then be 36-40%.

When making silage from oat crops (GCCS), harvesting should only be done at the booting stage, as this species is not ideal for whole crop cereal silage. Barley is recommended to be harvested at the whole crop stage, with either oats or triticale providing better leaf yield if crops are cut at the green chop stage. Triticale can be harvested at either the green chop or whole crop stage. The whole crop stage maximises yield and carbohydrate content of the silage (Figure 18), while the green chop stage maximises protein content at the expense of yield and carbohydrate. Harvesting between these stages is not advised as it fails to produce optimum yield or quality.

Figure 18. Optimum Time of Harvest for Cereal Silage and Impact on Yield and Quality

Whole crop silage is high in carbohydrate (in the form of starch) and fibre, with moderate protein, making it ideal to supplement animal diets when they are grazing brassica crops, or pastures with high water and protein content. Green chop cereal silage has a good balance of protein and energy (similar to good pasture silage), so can be used as a substitute for a lack of available pasture.
PRODUCT USAGE

CRTR27 delivers flexibility to farmers as it can be sown mid winter through to spring. Winter sown CRTR27 can be grazed once when 2.5-3.0 t DM/ha has been reached, then left for WCCS. Careful management should be applied to avoid overgrazing and affecting regrowth. Spring sown CRTR27 results in high quality green chop or WCCS and is the preferred option for spring WCCS production. Spring sown triticale is not a difficult crop to grow and has a wide harvest window (compared with barley). When harvested at the recommended stage (approximately 130 days from August sowings in Canterbury), silage has a good energy level and is sought after by dairy farmers. The variety Prophet is also used for silage production, but is generally planted in autumn for winter grazing and spring silage.

SOWING

WCCS, CRTR27 can be sown from mid winter to spring (July-September) in the North Island and Canterbury, or late winter to early spring (August-October) in Southland. The recommended sowing rate is 170-180 kg/ha to achieve 250-300 plants/m², but this will vary with seed size and sowing date (increase populations from 250 to 300 plants/m² for later sowings). Weed and aphid management is similar to cereals grown for grain.

TRIAL DATA

Although yields will be influenced by a number of factors such as fertility levels, timing of sowing and ongoing inputs, crop yields of 8-14 tonnes DM/ha could be expected.
Coronet has a fine stem and high leaf content, combined with very good disease and cold/frost tolerance, to make it the preferred crop where very high quality feed is wanted. Coronet can germinate in relatively cold soils (5°C) compared with ryegrass, so is an ideal crop to plant in late winter to early spring after winter crops have been grazed, enabling high quality green chop cereal silage to be harvested before planting another crop or pasture in late spring. Trials indicate that yields of 6-8 tonnes DM/ha can be achieved in this short timeframe. The ideal time to cut Coronet for maximum quality and yield is at the boot stage (see Figure 18, page 55).

Coronet is also an ideal option for winter feed when sowing in dry autumn conditions, as it can be sown deeper and later than ryegrass. Trials have shown Coronet to yield 6-8 tonnes DM/ha over this period. When sowing in autumn, the earlier Coronet is sown the larger the grazing yield will be. If twitch/couch is a problem weed in pastures, autumn is the ideal time to spray this weed with glyphosate, with Coronet being drilled for winter feed, then the paddock re-sown to grass, or another break crop in early spring.

Milton is a very high yielding oat with improved disease resistance and has the ability to hold quality until grazing/cutting. It can be planted in autumn to provide a single grazing in early to mid winter. Milton is also ideal for green chop cereal silage, either planted in autumn after maize, or in early spring following winter brassica crops.
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