Spring Cropping Plan
Crops provide a large amount of high quality feed at times of year when either pasture quality or growth is limited. The use of crops to transfer feed from one season to another is highly valued, enabling a large number of stock to be fed on a relatively small area. Hence the value of crop feed is high. Given this, everything should be done to ensure a successful brassica crop to get maximum benefit from the crop. Below is ‘best practice’ in terms of a spring sown crop programme.
Our award winning technology helps you make more informed decisions based on accurate data.

- Soil test results
- Nutrient summaries
- Feed wedge information
- Application plans
- Online ordering
## Paddock Selection

The total area will be determined by feed requirements and can be part of a long term crop sequence or re-grassing plan. Often the ‘worst’ paddocks are chosen, given this, they are likely to need extra attention.

Mono-cropping encourages an increase in weeds, pests and diseases so paddock and/or crop rotation must be advised. However there are many paddocks that are cropped year after year and have no issues, nevertheless the more mono-cropping done, the higher the risk for weeds, pests and disease affecting yields and feed quality.

## Soil Testing

Soil testing should occur early; 6-12 months prior to the crop being sown so deficiencies can be rectified.

### Optimum nutrient status for brassica:

<table>
<thead>
<tr>
<th>Soil pH</th>
<th>Olsen P</th>
<th>QT Potassium</th>
<th>Sulphate-S</th>
<th>QT Magnesium</th>
</tr>
</thead>
</table>
| 5.8 - 6.2 | 25 - 30 (sedimentary & ash)  
           40 - 50 (pumice & peat) | 5 - 8        | 3 - 8      | 8 - 10       |

*refer to your Ravensdown Agri Manager for advice on lifting soil fertility*

## Fertiliser Requirements

The current soil fertility, prior history and desired crop species and yield will determine the fertiliser programme for individual crops. Ask your Ravensdown Agri Manager for a fertiliser recommendation programme which may include a combination of capital applications (of lime or phosphate fertiliser), base fertiliser dressing (prior to sowing), starter fertiliser (at sowing) and one or more side dressings.

### Nitrogen

The amount of Nitrogen (N) required will depend on the paddock history and soil type. A soil N test (mineralisable N) will provide a guide to the soil N supply. Alternatively, the following information can be used as a general guide:

- **Ex-good pasture**: require starter N only (20-30kg N)
- **Ex-run out pasture/development phase**: starter N plus several urea side-dressings. This will ensure there is no shortage of N due to temporary immobilisation of N by the decomposing organic matter. Confine side-dressings to 90-100kg/ha. In total, up to 200-250kg N may be required for Kale, Swedes and Turnip crops sown into paddocks with a very low soil N status
- **Second year crops**: Starter N, plus the option of 1 side dressing
- **Longer term cropping**: Starter N plus the option of 2 side dressings

The first side dressing is typically applied 4-6 weeks after sowing. Excessive N will do two things, it may change the ratio to leaf from bulb, and run the risk of increasing nitrate levels. Avoid late N application unless growth is likely to continue for some time and wean stock onto the crop. The more N that is required the earlier side-dressing should commence. If in doubt complete an herbage test.

**Deficiency symptoms**

N deficiency symptoms are pale yellow leaves with purpling edges of older leaves.
**Phosphorus**

Brassicas respond well to Phosphorous (P) and in many instances P is often a limiting growth nutrient for crops. Ideally Olsen P status should be 25+ for sedimentary and ash soils, and 40+ for pumice and peat soils. P inputs as low as 20-30kg should only be used in good fertility situations and for short term crops.

If paddocks have Olsen P levels of 10-15, capital P inputs are required to ensure the crop performs. Aim to raise the Olsen P status to 20+. Research by Crop & Food confirms brassicas to be highly responsive to P fertiliser. Where soil fertility is around Olsen P 15, recommended rates of P for various brassica types are:

- Rape: 20-35kg P
- Bulb Turnips and Leafy Turnips: 40-60kg P
- Kale: 80-90kg P
- Swedes: 50-80kg P

Remember that, on average, 10kg P will lift soil Olsen P by 1 unit to 15cm depth for sedimentary soils. At a 15cm soil depth, use 22kg P to lift the Olsen P by 1 on volcanic soils, and 14kg P for every Olsen P unit on pumice soils.

If soil fertility is low, use **Triple Super** to raise P levels. DAP is a good way to provide P to brassicas. Where the P status is very low (Olsen P <12) put some P (as serpentine super) down the spout with the seed.

The benefit of banding will diminish as the soil P levels increase. If using DAP down the spout, keep rates less than 100kg DAP and broadcast the balance to avoid the risk of the fertiliser burning the seed.

At low P levels you may also wish to lift the P status, although some farmers will prefer to do this when they go back into permanent pasture. **Triple Super** is a good way to lift P status during the brassica phase. Early purpling usually means a P deficiency, but can also be due to poor P uptake in cool weather.

Where paddocks have high Olsen P levels (e.g. 30), it is very unlikely that crops such as Kale will respond to P fertiliser.

**Deficiency symptoms**

Purpling, stunted and erect growing leaves. However this can be similar to symptoms for plant stress so a plant test is highly advised.

**Boron**

Brassicas respond well to Boron (B), mainly for crop quality, however the rates may vary from zero with small leafy type brassicas to > 25kg **Borate 46** with high rainfall Swede crops. Some soils have adequate B levels, thus will not require B fertiliser.

- As a general rule use 10-15kg/ha **Borate 46** on most crops
- 20-25kg/ha of **Borate 46** in wetter areas (split applications due to risk of boron leaching)
- Swedes are the crop most prone to brown heart, followed by Kales and Turnips. Leafy Turnips (e.g. Hunter, Pasja) will unlikely require additional B
- If you are unsure as to whether a brassica crop such as Kale or leafy brassica requires B, a B soil test may be of help. If the result is below 0.5 ppm, then B fertiliser is recommended (as the lighter rate of 5-10kg/ha **Borate 46**)
- Don’t put B fertiliser down the spout with seed
- B sprays complement rather than replace solid B, so verify whether spraying is warranted by herbage sampling

**Deficiency symptoms**

Boron deficiency symptoms are ‘brown heart’ of bulb brassicas and browning of stems in Kale and Rape. Symptoms are usually seen too late for any treatment so ensuring adequate Boron supply in the early to mid-stages of growth is recommended.
Potassium

Potassium (K) is usually not required unless soils have a low K status, e.g. West Coast soils, some soils in Taranaki/Manawatu. When a soil test indicates a deficiency (QT K<5), apply 50-100kg K/ha if following a potash-deficient pasture. **Cropmaster 13** or **Cropmaster 15** is a good way to provide this unless potash supers are used as a development phase for the paddock.

*Deficiency symptoms*

K deficiency symptoms are plants with yellow or purple leaf-tints with browning at the edge of the leaf. Wilting of older leaves may occur with a scorched look. Initially older leaves show signs of deficiency as dying leaf tips, then spreads.

Sulphur

It is not necessary to use Sulphur (S) on brassicas unless S levels are low (2-3), as S-methyl-cysteine sulphone (SMCO) compounds may be formed which reduce intake and weight gain. If S levels are >8 you are probably going to be susceptible to SMCO issues.

Research on Kale has shown that the synthesis of SMCO is stimulated by the addition of N when soil sulphate-S is high (>10 ppm). Interestingly, addition of S-containing fertilisers (e.g. superphosphate) under high soil sulphate-S levels did not increase SMCO levels.

However, under low soil sulphate-S levels (4 ppm), application of S-containing fertilisers do increase the SMCO level. And when N is also applied, the Kale leaf SMCO levels increase further (but the stem levels remain unchanged). Where no S fertiliser is applied, addition of N decreases the SMCO level in the stems, but leaf levels remain unchanged.

Don’t get hung up on this issue, simply avoid high rates of sulphur (sulphur supers). Kale is more prone to the SMCO problem. Crop & Food research has shown no response to S fertiliser, even at sulphate levels around 3ppm.

Magnesium

If soil Magnesium (Mg) levels are 7 or less, then consider applying 20-30kg Mg/ha. If in the optimum soil Mg range, then no Mg should be required.

*Deficiency symptoms*

Deficiency symptoms are interveinal yellowing, sometimes with reddish brown tints and early leaf fall.

Soil pH

Although brassicas can tolerate a range of pH, preferably lift pH to >5.5, liming will increase soil molybdenum availability. Preferably work lime into the soil.

On soils that are known to be low in molybdenum (with no previous Molybdenum topdressing history), apply 100g/ha of **Sodium Molybdate**.

Trace elements

Apply if site known for particular trace element deficiencies, otherwise rely on herbage sampling.
Sowing Method

1. Direct drilling (or No-till) requires good weed control using ideally two applications of appropriate herbicide(s). If soils are of low fertility, it is important to put some fertiliser down the spout with seed for direct drilled crops.

   • First spray is based on Glyphosate G360 (4-6L/ha) or Glyphosate 540 (2.7-4L/ha) + Accelerate® @ 100mL per 100 litres water + suitable companion herbicide (refer to companion herbicide table, page 9)
   • Second spray Glyphosate G360 or Glyphosate 540 just prior to sowing at 1.5 - 3L/ha or 1-2L/ha respectively, with Accelerate® @ 100mL per 100 litres water. Add Toppel® 500 Insecticide @ 1.25L/ha
   • Place a damp sack in the sprayed out paddock to check the slug population. If slug numbers are above 4 per sack, then it is recommended to apply Endure® slug bait @ 4-8 kg/ha as close to sowing as possible. Continual monitoring is recommended as slug populations may vary depending on environmental conditions

2. Conventional cultivation is the most traditional method, where corrective soil status fertiliser is broadcast and worked into the soil prior to sowing. At sowing, additional fertiliser (e.g. DAP) may be applied with the seed.

   • Spray at least one day for annual weeds or three days for perennial weeds prior to cultivation using Glyphosate G360 (4-6L/ha) or Glyphosate 540 (2.7-4L/ha) + Accelerate® @ 100mL per 100 litres water + suitable companion herbicide (refer to companion herbicide table, page 9)
   • Incorporate Triflow® 480 @ 1.7L/ha for soil with 0-4 % organic matter, or 2.5L/ha for soil 5-8 % organic matter into soil as a pre-emergent herbicide just prior to sowing. If organic matter of soil is over 8% results may be inconsistent.
     o Refer to below section on Triflow® 480

3. Broadcasting fertiliser with seed is popular in some areas, however it is important to minimise the contact time of the fertiliser and seed. Higher sowing rates (e.g. 20-25 % more) are recommended due to the increased risk of poor germination due to both fertiliser injury and poor soil contact.

   • Spray at least one day for annual weeds or three days for perennial weeds prior to cultivation using Glyphosate G360 (4-6 L/ha) or Glyphosate 540 (2.7-4L/ha) + Accelerate® @ 100mL per 100 litres water + suitable companion herbicide (refer to companion herbicide table, page 9)
   • Incorporate Triflow® 480 @ 1.7L/ha for soil with 0-4 % organic matter, or 2.5L/ha for soil 5-8 % organic matter into soil as a pre-emergent herbicide just prior to sowing. If OM of soil is over 8 % results may be inconsistent.
     o Refer to below section on Triflow® 480

   For both conventional and broadcast sowing methods, the ground preparation will significantly affect the establishment success. Ensure the seedbed is fine, firm and even to allow consistent sowing depth allowing a quicker, more even establishment.

Triflow® 480

**Rate:** 1.7L/ha (0-4% organic matter soils); 2.5L/ha (5-8% organic matter soils)

**Weeds controlled:** Amaranthus (redroot), annual poa, barnyard grass, bladder campion, bristle grass, calandrinia, catchfly, chickweed, cornbind, fathen, red dead-nettle, spurrey (yarr), scarlet pimpernel, summer grass, wild portulaca, wireweed, witch grass, yellow gromwell

**General comments:** Should be immediately shallow worked (5-10cm) into the seedbed to avoid UV light breaking down the active ingredient. Please refer to the label for specific information about incorporation.

Care must be taken when used on summer brassicas with chemical soil residuals for the following crop.
“Our Cropmaster DAP Boron Plus blend is of the highest quality.”
Lloyd Glenny BSc
Product Manager Fertiliser

Choose Cropmaster DAP Boron Plus for the best brassica fertiliser based on science and local knowledge.

- Dust free boron coated DAP
- Well granulated fertiliser
- Delivers better nutrient distribution than a blend
- Each granule contains the same ratio of every nutrient
- Provides readily available nitrogen, phosphate and boron for high yielding healthy crops
- Boron coating is equivalent to 50 kg Borate 46 per tonne, ideal for field crops and greenfeed brassicas
## Companion Herbicides

<table>
<thead>
<tr>
<th>Companion Herbicide</th>
<th>Granit (tribenuron-methyl)</th>
<th>Backup (thifensulfuron-methyl)</th>
<th>Dicam 480 (dicamba)</th>
<th>Multiple (clopyralid)</th>
<th>Pasture Guard 2,4-D 680 (2,4-d ester)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(40g/ha)</td>
<td>(20g/ha)</td>
<td>(625mL/ha)</td>
<td>(0.5 - 1.0L/ha)</td>
<td>(1.5 - 3.0L/ha)</td>
<td></td>
</tr>
<tr>
<td>Extra Weeds Controlled</td>
<td>Clovers, sheep sorrel, thistles, ragwort, wireweed, yarrow</td>
<td>Buttercup, dock</td>
<td>Clovers, dandelion, dock, mallow, pennyroyal, ragwort, sheep sorrel, thistles, mayweed, wireweed, yarrow</td>
<td>Clovers, dandelions, plantains, thistles, yarrow</td>
<td>Nettles, ragwort, storksbill, thistles</td>
</tr>
<tr>
<td>Plant-back Period</td>
<td>14 days; grasses, clovers, cereals, brassica</td>
<td>14 days; grasses, clovers, cereals, brassica</td>
<td>0 days; brassicas, grasses, cereals</td>
<td>28 days; clovers</td>
<td>3-6 months; clovers, legumes</td>
</tr>
</tbody>
</table>

## Companion Insecticide

<table>
<thead>
<tr>
<th>Companion Insecticide</th>
<th>Toppel 500 (chlorpyrifos)</th>
<th>Halex&lt;sup&gt;CS&lt;/sup&gt; (lambda-cyhalothrin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insects Controlled</td>
<td>Springtails</td>
<td>Army caterpillar</td>
</tr>
<tr>
<td>200ml/ha</td>
<td>500ml/ha</td>
<td>600ml/ha</td>
</tr>
</tbody>
</table>
**Sowing**

### Seed Treatment

The use of seed treatment is highly recommended for all brassica seed to reduce the impact damaging insects may have on brassica establishment.

Crop monitoring is still required as brassica seedlings may not be covered when there are a high number of insects. Insects are controlled by ingesting the chemical from biting the plant, therefore with high numbers of insects there may be enough one-off bites to cause plant damage.

### Sowing Date

The sowing date depends on the maturity of the crop and the time of grazing. Once the grazing requirements and reason for the crop is understood, the type of brassica and sowing date can be easily worked out.

### Sowing Depth

Sowing depth for all brassicas should be around 10-15mm.

### Cultivar Description

#### Leaf Turnip

Leaf Turnips are multi-graze summer brassicas for use in areas with good summer rainfall/irrigation for high yield and quality forage. Leaf Turnips can be mixed with other high energy forages such as red clover, chicory and plantain to increase both yield and quality of the summer crop; however potential weed issues must be addressed prior to doing this as herbicide options may become limited with the addition of some other species. They are often referred to as Hunter/Pasja rather than Leaf Turnips.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Sowing Rate (kg/ha)</th>
<th>Regrowth Ability</th>
<th>Days to 1st Grazing</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alone</td>
<td>Mix</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pasja</td>
<td>3-5</td>
<td>1-2</td>
<td>V. High</td>
<td>45-65</td>
</tr>
<tr>
<td>HT Leafy Turnip</td>
<td>3-5</td>
<td>1-2</td>
<td>V. High</td>
<td>45-65</td>
</tr>
<tr>
<td>Hunter</td>
<td>3-5</td>
<td>1-2</td>
<td>V. High</td>
<td>45-65</td>
</tr>
<tr>
<td>SF Pacer</td>
<td>3-5</td>
<td>1-2</td>
<td>V. High</td>
<td>45-65</td>
</tr>
</tbody>
</table>
Kale

Also known as Chou Moellier, Kales are mainly used as a winter feed with average yields around 12T DM/ha, however can grow up to 20T DM/ha. They are more tolerant of club root, but can get a form of dry rot called ‘black leg’ which reduces stem strength. Higher sowing rates lead to thinner and more palatable stems. Kales should be strip fed to reduce wastage, taking 150 to 220 days to reach maturity. Suitable for cattle, sheep, deer, but the taller varieties are best used only for cattle. Grazing must be light in late summer if regrowth is required. Hay or pasture run off will improve the nutritional balance of stock grazing Kale.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Sowing Rate (kg/ha)</th>
<th>Stock Suitability</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coleor</td>
<td>4-5</td>
<td>Sheep, Beef, Deer and Dairy</td>
<td>Coleor is a high yielding, leafy, diploid Kale of short to medium height, very high leaf-to-stem ratio and very good winter hardiness.</td>
</tr>
<tr>
<td>Caledonian</td>
<td>4-5</td>
<td>Beef, Deer and Dairy</td>
<td>A tall Kale with good winter hardiness. It has high quality and is a high yielding cultivar.</td>
</tr>
<tr>
<td>Sovereign</td>
<td>4-5</td>
<td>Sheep, Beef, Deer and Dairy</td>
<td>A high yielding intermediate height Kale. It has high leaf to stem ratio and very good quality.</td>
</tr>
<tr>
<td>Kestrel</td>
<td>4-5</td>
<td>Sheep, Beef, Deer and Dairy</td>
<td>A leafy hybrid variety with short stems which was bred for low stem fibre content and high digestibility.</td>
</tr>
<tr>
<td>Gruner</td>
<td>4-5</td>
<td>Beef and Dairy</td>
<td>A tall growing, single grazing, longer maturing, frost hardy variety with good resistance to lodging. It was bred as a winter feed for cattle.</td>
</tr>
<tr>
<td>Regal</td>
<td>4-5</td>
<td>Beef, Deer and Dairy</td>
<td>An intermediate height Kale bred for high leaf percentage and winter hardiness. It is high yielding and has good tolerance to brassica diseases.</td>
</tr>
<tr>
<td>SF Inka</td>
<td>4-5</td>
<td>Beef and Dairy</td>
<td>A giant Kale developed for cattle grazing. It is high yielding with chunky stems and good lodging tolerance.</td>
</tr>
<tr>
<td>SF Fuel</td>
<td>4-5</td>
<td>Beef, Deer and Dairy</td>
<td>An intermediate, tall-type Kale with good resistance to brassica diseases. It is a deep green colour.</td>
</tr>
<tr>
<td>Voltage</td>
<td>4-5</td>
<td>Sheep, Beef, Deer and Dairy</td>
<td>A medium stem Kale suitable for all classes of livestock. Voltage has good disease resistance and tolerance to lodging.</td>
</tr>
</tbody>
</table>
Rape may be sown alone or in mixtures as a specialist summer to winter feed option. Rape can be sown from early spring to late summer and is generally ready to graze 12-16 weeks after sowing. Rape can be grown on lower soil fertility than most other brassicas and also soils with good soil fertility and moisture, yields of 8 t DM/ha plus can be achieved. Do not grow in clubroot infected areas. Some care is required when grazing Rape and it is best to allow the crop to fully mature before grazing and also gradually introduce Rape into the diet to reduce the risk of animal health issues (see Grazing Brassicas on page 29).

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Sowing Rate (kg/ha)</th>
<th>Aphid Tolerance</th>
<th>Maturity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alone: 3-4, Mix: 0.5-1kg/ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonar</td>
<td>3-4</td>
<td>0.5-1</td>
<td>Mod 90-110</td>
<td>Bonar is a late maturing Rape, with short stems and large paddle like leaves. Bred for high protein, high digestibility and lower SMCO levels. Bonar has good regrowth potential.</td>
</tr>
<tr>
<td>Goliath</td>
<td>3-4</td>
<td>0.5-1</td>
<td>Good 90-110</td>
<td>A giant type Rape with high yield potential. Very good winter keeping potential and very good palatability.</td>
</tr>
<tr>
<td>Greenland</td>
<td>3-4</td>
<td>0.5-1</td>
<td>Mod 70-90</td>
<td>Very late flowering, medium height Rape. Good palatability with flexible multi-graze potential.</td>
</tr>
<tr>
<td>HT Rape</td>
<td>3-4</td>
<td>0.5-1</td>
<td>Mod 70-90</td>
<td>Seed of HT™ brassica cultivars are bred to be tolerant to the chlorsulfuron herbicide.</td>
</tr>
<tr>
<td>Interval</td>
<td>3-4</td>
<td>0.5-1</td>
<td>Good 90-110</td>
<td>Interval is a tall, high producing Rape with good tolerance to dry conditions and frost. It has good palatability and good regrowth.</td>
</tr>
<tr>
<td>Spitfire</td>
<td>3-4</td>
<td>0.5-1</td>
<td>Good 90-110</td>
<td>Spitfire is a medium to tall Rape with high dry matter yields and good tolerance to aphids. Its low DM stem gives it good palatability.</td>
</tr>
<tr>
<td>Titan</td>
<td>3-4</td>
<td>0.5-1</td>
<td>Good 70-90</td>
<td>High yielding early maturing cultivar of intermediate height. Titan has high aphid and virus tolerance and has good palatability.</td>
</tr>
<tr>
<td>Winfred</td>
<td>3-4</td>
<td>0.5-1</td>
<td>Mod 70-85</td>
<td>Winfred is an early maturing cultivar, with broad leaves, a high leaf to stem ratio, and good cold tolerance. High regrowth potential from multiple grazings.</td>
</tr>
</tbody>
</table>

- Very high yielding with good re-growth potential
- Very fast establishing
- Good disease resistance
- Can be spring or autumn sown
- Suitable for sheep, cattle and deer

**Rate:** Alone: 3-4, Mix: 0.5-1kg/ha

**Type:** High yielding, multi-graze, maturity 90-110 days

**General comments:** An exciting new, fast establishing, high yielding multi-graze giant-type forage Rape with strong re-growth potential, good aphid tolerance and disease resistance.

**Other options:**

- **Cropmark Pillar Forage Rape**
**Bulb Turnip**

Turnip varieties vary in yield potential, ploidy level, maturity, size of bulb, bulb keeping quality, and these factors considerably influence the choice and intended usage. October sowings produce summer feed, whilst later sowings through to early March produce autumn to winter feed. Turnips are generally susceptible to aphids, club root, dry rot, and virus. A highly digestible Turnip bulb provides a good source of sugars which, combined with a high protein concentration in the Turnip tops, stimulates good rumen function.

**Rate:**
- Alone: 3-4, Mix: 0.5-1kg/ha

**Days to maturity:** 55-65

**General comments:** Marco is a newer tetraploid variety with a large seed. Sowing rates should be increased compared to diploid varieties. Very quick maturing, highly palatable, with a large bulb size. Good club root and bolting tolerance. Can be used as a summer feed option if sown early, but is also widely used as an autumn winter feed option.

### Other Options:

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Sowing Rate (kg/ha)</th>
<th>Days to Maturity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alone</td>
<td>Mix</td>
<td></td>
</tr>
<tr>
<td>Appin</td>
<td>1.5-2</td>
<td>0.5</td>
<td>60-100</td>
</tr>
<tr>
<td>Barkant</td>
<td>1.5-2</td>
<td>0.75</td>
<td>60-90</td>
</tr>
<tr>
<td>Dynamo</td>
<td>1.5-2</td>
<td>0.75</td>
<td>60-80</td>
</tr>
<tr>
<td>SF Envy</td>
<td>2-3</td>
<td>1</td>
<td>60-90</td>
</tr>
<tr>
<td>Green Globe</td>
<td>0.75</td>
<td>0.5</td>
<td>80-120</td>
</tr>
<tr>
<td>HT Bulb Turnip</td>
<td>1.5-2</td>
<td>0.5</td>
<td>90-120</td>
</tr>
<tr>
<td>New York</td>
<td>0.75</td>
<td>0.5</td>
<td>60-80</td>
</tr>
<tr>
<td>Rival</td>
<td>1.5-2.5</td>
<td>0.75</td>
<td>60-80</td>
</tr>
<tr>
<td>SF White Star</td>
<td>1-3</td>
<td>0.5</td>
<td>90-110</td>
</tr>
<tr>
<td>York Globe</td>
<td>0.75</td>
<td>0.5</td>
<td>60-80</td>
</tr>
</tbody>
</table>
Swedes are sown November to early December, either ridged in wet cool areas, or drilled to provide specialist winter feed for all livestock classes. They are a high quality, slow growing crop with better keeping ability than Turnips. Swedes should not be sown in successive years in the same paddock as they are particularly susceptible to dry rot and clubroot diseases. Generally yellow fleshed Swede varieties are commonly used for human consumption because of improved flavour compared to white fleshed types.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Sowing Rate (kg/ha)</th>
<th>Flesh</th>
<th>Dry Rot</th>
<th>Club Root</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aparima Gold</td>
<td>0.5</td>
<td>1</td>
<td>Yellow</td>
<td>Improved</td>
<td>Improved Aparima Gold has high leaf percentage and very good keeping ability. It is a high producing main crop Swede variety.</td>
</tr>
<tr>
<td>Dominion</td>
<td>0.5</td>
<td>1</td>
<td>Yellow</td>
<td>Susceptible</td>
<td>Susceptible Dominion is an early maturing Swede with good dry matter yield. It is a traditional main-crop Swede.</td>
</tr>
<tr>
<td>Doon Major</td>
<td>0.5</td>
<td>1</td>
<td>Yellow</td>
<td>Susceptible</td>
<td>Susceptible Doon Major is an older Scottish variety with round bulbs, standing well clear of the ground for grazing. A popular variety. Reddish purple skin.</td>
</tr>
<tr>
<td>Highlander</td>
<td>0.5</td>
<td>1</td>
<td>White</td>
<td>Susceptible</td>
<td>Susceptible Highlander produces higher leaf and bulb yields than the older varieties and is best used as a first crop Swede. Pink skinned.</td>
</tr>
<tr>
<td>HT Swede</td>
<td>0.5</td>
<td>1</td>
<td>Yellow</td>
<td>Improved</td>
<td>Improved Seed of HT™ brassica cultivars are bred to be tolerant to the chlorsulfuron herbicide.</td>
</tr>
<tr>
<td>Invitation</td>
<td>0.5</td>
<td>1</td>
<td>Yellow</td>
<td>Improved</td>
<td>Improved Invitation is a high yielding Swede producing high quality feed for sheep, cattle and deer.</td>
</tr>
<tr>
<td>Keystone</td>
<td>0.5</td>
<td>1</td>
<td>White</td>
<td>Improved</td>
<td>Susceptible A medium maturity Swede with high dry rot tolerance. Keystone is white fleshed and has excellent keeping ability.</td>
</tr>
<tr>
<td>Major Plus</td>
<td>0.5</td>
<td>1</td>
<td>Yellow</td>
<td>Susceptible</td>
<td>Susceptible A re-selection of Doon Major, producing up to 10 percent higher yields.</td>
</tr>
<tr>
<td>Winton</td>
<td>0.5</td>
<td>1</td>
<td>White</td>
<td>Improved</td>
<td>Improved Winton is a main crop Swede with bronze skin bulb colour and a high leaf and bulb yield.</td>
</tr>
</tbody>
</table>
0-6 Weeks Post Germination

Crop monitoring is vital for reducing the potential impacts of insects, weeds and any nutritional deficiencies affecting brassica establishment and growth.

The newly sown paddock should be checked 1-2 times a week looking for insects or signs of insect damage. Seed treatment will give six weeks control of insects in the vast majority of cases, however if insect numbers are very high, damage can still occur.

**Damaging Insects**

**Springtails (Bourletiella spp.)**

- Brown to black in colour
- Up to 1mm long
- Chewing mouthparts

**Damage symptoms:**
- Damaged cotyledons and emerging growing points, causing damage up to the fourth leaf stage
- Half-moon notches seen in emerging leaves
- Very difficult to see insects on the bare soil
- Place card or hanky on ground and tap, looking for insects ‘springing’ onto the hanky
- Multiple generations may be seen in one year

**Cultural control:**
- Reduce trash in seed bed

**Chemical options:**
- Cropcote Plus™ Seed Treatment
- Toppel® 500 @ 200mL/ha + Widespread® 1000 @ 25mL/100L water, ideally in 200 litres of water per hectare

**Nysius or Wheat Bug (Nysius huttoni)**

- Adults are about 4mm long
- Pale green colour maturing to brownish-grey
- Camouflage appearance with silvery triangle at the end of the tail

**Damage symptoms:**
- Damages seedlings at ground level
- Causes ring-barking effect
- Increasing the risk of fungal or environmental (wind, snow) damage
- May kill the plant

**Cultural control:**
- Reduce trash in seed bed

**Chemical options:**
- Cropcote Plus™ Seed Treatment
- Toppel® 500 @ 1.25L/ha + Widespread® 1000 @ 25mL/100L water, ideally in 200 litres of water per hectare
**Slugs (Deroceras reticulatum muller)**

**Damage symptoms:**
- Damage to establishing brassica crops particularly in direct drilled situations
- Chewing of cotyledons and leaves

**Cultural control:**
- Reduce initial populations via
  - Heavy rolling
  - Cultivation
  - Mob stocking
- Reduce trash in seedbed
- Monitor slug numbers through the use of damp sacks

**Chemical options:**
- **Endure®** @ 4-8kg/ha

---

**Greasy Cutworm (Agrotis ispsilon)**

- Brown to greyish brown moths
- Larvae are greasy, going from light grey to dark brown
- 50mm long at maturity
- Nocturnal feeders
- Shelter in the soil profile during day time

**Damage symptoms:**
- Larvae eat young seedling at or just below ground level
- Plant wilting
- Plants ‘cut-down’ found

**Cultural control:**
- Cultivation

**Chemical options:**
- **Halex®** @ 40mL/ha + **Widespread® 1000** @ 25mL / 100L water, ideally in 200-300 litres of water per hectare
- **Toppel® 500** @ 600mL/ha + **Widespread® 1000** @ 25mL/100L water, ideally in 200 litres of water per hectare
Herbicides

Weeds need to be assessed in combination with crop monitoring. The weeds present will determine the specific herbicide to use. Please refer to the label for further application information.

**Purge**

*Rate:* 350mL/ha + 500mL/100L *Collaborate* spray oil  
*Weeds controlled:* Black nightshade, fathen  
*Weeds suppressed:* Amaranthus (redroot)  
*Compatibility:* *Valiant® 520*  
*General comments:* Always apply Purge to fodder brassicas in combination with Collaborate spray oil. Works best under good growth conditions when weeds are small (2-8 leaf leaves). Be aware of soil residues for following crops; clover = 6 months (need to cultivate), lucerne = 12 months, beets = 12 months.

**Multiple®**

*Rate:* 0.5L/ha – 1L/ha + 500ml *Collaborate* spray oil per 100L water  
*Weeds controlled:* Thistles, yarrow  
*Weeds suppressed:* Plantain, dandelion  
*Compatibility:* Multiple® is compatible with most commonly used herbicides as well as Toppel® 500  
*General comments:* Be aware of soil residues for following crops; clover = 3 months for rates up to 500mL/ha, 6 months for 500mL - 1.0L/ha.

**Dicam 480**

- only apply to kale  
*Rate:* 350mL/ha  
*Weeds controlled:* Black nightshade, thistles, clover, cornbind, dandelion, seedling docks, fathen, amaranthus (redroot)  
*Weeds suppressed:* Spurrey, chickweed, cleavers, dandelion, shepherds purse  
*Compatibility:* Compatible with most commonly used herbicides, insecticides and fungicides  
*General comments:* Works best under good growth conditions when weeds are small (2-4 leaf stage). Does not work well when weeds are large and conditions are dry. Do NOT add any surfactant with Dicam 480. Dicam 480 will check Kale plants but they will grow through it.

**Valiant® 520**

A selective hebicide for control of grass weeds in certain broadleaf crops. Refer to your Agri Manager for further information.
**6+ Weeks Post Germination**

### Fertiliser

Side dressing(s) of Urea should be applied depending on soil available Nitrogen (N), crop type and yield expectations. Urea should be applied at a minimum of 100kg/ha onto crops that have adequate soil moisture for growth. Further applications may be warranted for Kale, up to the end of March. Keep in mind nitrate poisoning in high N soils. Do not apply closer than six weeks to planned grazing.

Crop monitoring should be continued but at a less frequent interval; a weekly crop walk will identify any potential insect issues that may be occurring or about to occur. The seed treatment only lasts up to six weeks, therefore chemical application will be required to control any insects present.

### Damaging Insects

#### Diamondback Moth (*Plutella xylostella*)

- Adult moth is a small, slender, grey insect with a wingspan of 7-10mm - they do not cause damage
- Larvae are up to 7mm long and cause the damage
- Pupae are enclosed in loosely woven cocoons often found on the underside of leaves in the crop
- When disturbed larvae drop off leaves attached to a silk thread

**Damage symptoms:**

- Young larvae feed on internal leaf tissue causing white markings on leaves
- Older larvae feed underneath leaf surface
- Leaf has ‘shotgun’ appearance

**Cultural control:**

- None

**Chemical options:**

- Halex® @ 40mL/ha + Widespread® 1000 @ 25mL/100L water, ideally in 200-300 litres of water per hectare

Repeat applications may be required if populations are high.
**Cabbage White Butterfly (Pieris rapae)**

- Caterpillars are dull green with small hairs
- 2mm to 30mm in length

**Damage symptoms:**
- Larvae feed on leaf leaving behind a skeletonised leaf with ribs remaining
- Flights of the adult white butterfly are warning signs for crop damage

**Cultural control:**
- None

**Chemical options:**
- **Halexcs** @ 40mL/ha + **Widespread® 1000** @ 25mL/100L water, ideally in 200-300 litres of water per hectare

Repeat applications may be required if populations get high.

---

**Aphids (many species)**

- Around 2mm long
- Can be yellow to dark green or grey
- Some are winged others are wingless
- Aphids will reduce crop yields and cause secondary virus infection as they are vectors (carriers) of brassica diseases

**Damage symptoms:**
- Infest brassicas in large numbers
- Suck the sap reducing the plants available energy for growth
- Crop wilting
- Seen most during times of plant stress

**Cultural control:**
- Some modern cultivars are more resistant to aphids

**Chemical options:**
- **Rogor®** @ 800-1000mL/ha + **Widespread® 1000** @ 25mL per 100 litres water, ideally in 200-300 litres of water per hectare
- **Toppel® 500** @ 300-400mL/ha + **Widespread® 1000** @ 25mL per 100 litres water, ideally in 200 litres of water per hectare

Repeat applications may be required if populations get high.
Leaf Miner (many species)

- Larvae are small, yellowish-green
- Similar to maggots in look

**Damage symptoms:**
- Larvae cause tunnels within the leaf tissue
- May reduce amount of photosynthesis carried out by the plant, hence yields

**Cultural control:**
- Turnips are the most susceptible, however, only high damage is detrimental to yield
- Often the use of N in the autumn will encourage plant to grow through the damage

**Chemical options:**
- Refer to your Agri Manager for further information

The combination of Halexcs, Rogor® and Widespread® 1000 will cover the majority of insects damaging brassicas at this stage.

**Trial details:**

<table>
<thead>
<tr>
<th>Location</th>
<th>Crop</th>
<th>Sowing Date</th>
<th>Treatment Date</th>
<th>Trial Scored</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Canterbury</td>
<td>40% Turnip, 60% Rape</td>
<td>3-Feb-11</td>
<td>28-Mar-11</td>
<td>42 days after treatment</td>
</tr>
</tbody>
</table>

**Evaluation of Insect Control using Halexcs (40mL/ha), Rogor® (1000mL/ha) and Widespread® (at label rate):**

- Red: Untreated
- Green: Halexcs + Rogor® + Widespread®

Plants Damaged

Leaves Damaged
12+ Weeks Post Germination
12+ Weeks Post Germination

Fertiliser

Depending on the crop type, end yield objectives and available soil Nitrogen (N) - known by soil test, there may be a need / desire to apply another 100 kg/ha of Urea 12 weeks post establishment. This application is optional depending on crop targets.

Whether or not Urea application was completed at 12 weeks, it is highly advisable to apply the last side dressing of 100 kg/ha of Urea 18 weeks post establishment (early to mid-March) for leaf brassica crops (i.e. Kale). Excess N on bulb crops may change growth priority from bulb to leaf. An N application will set leaf crops up for winter and encourage one final accumulation of yield prior to the temperature cooling down.

Do not apply if grazing is commencing within six weeks after Urea application.

Damaging Insects

Crop monitoring for insects is still required as insect numbers can rapidly rise to damaging levels if conditions are right (warm and dry). Refer to the previous chemical options for insect control, pages 20 - 22.

---

**Insecticide Options:**

<table>
<thead>
<tr>
<th>Pest(s) and Treatment</th>
<th>Seedling To Young Plant</th>
<th>Mature Plant or Re-growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aphids - <strong>Toppel® 500</strong> @ 300-400ml/ha or <strong>Rogor®</strong> @ 800ml-1.0L/ha</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaf Miner, or Aphids and Leaf Miner \nTalk to your Ravensdown Agri Manager</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diamondback Moth and White Butterfly \n<strong>Halex®</strong> @ 40ml/ha</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caterpillars and Aphids \n<strong>Halex®</strong> @ 40ml/ha + <strong>Rogor®</strong> @ 800ml - 1.0L/ha</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caterpillars &amp; Leaf Miner or Caterpillars, Aphids &amp; Leaf Miner \n<strong>Rogor®</strong> @ 800ml - 1.0L/ha + <strong>Halex®</strong> @ 40ml/ha \nTalk to your Ravensdown Agri Manager</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The inclusion of **Widespread® 1000** @ 25ml per 100L of water for all insecticide application is recommended to increase effectiveness.
Brassica Diseases

**Club Root (Plasmodiophora spp.)**

- There are several strains of Clubroot which are normally found on heavy soils
- A fungal disease

**Damage symptoms:**
- Irregular swelling of the root systems
- Plants often appear wilted and stunted
- Leaves sometimes purple through plant stress

**Cultural control:**
- Crop rotation and hygiene
- Clubroot is hosted on brassica species
- A non-brassica interval of at least six years is required once damage has been found
- The Clubroot disease can be transferred through machinery, stock and water
- Tolerant brassica cultivars are available, however new strains of the disease develop quicker than plant breeding and may overcome tolerance

**Chemical options:** None

**Dry Rot (Leptosphaeria Maculans)**

- A fungal disease

**Damage symptoms:**
- Brown lesions on bulbs normally around the neck region
- Leads to bulb rotting
- Can be seen in Kale (Black Leg)
- Black lesion/spots on Kale stem

**Cultural control:**
- Crop rotation and hygiene
- If pressure was high in the previous year consider other forage options or more tolerant brassicas such as Kale
- Non-brassica forages are recommended for six years post infection
- If paddocks become infested consider grazing first/early to realise crop yield prior to the bulbs dissolving from the rot

**Chemical options:** None

**Powdery Mildew (Erysiphe cruciferarum)**

**Damage symptoms:**
- Extensive growth of white, powdery fungus on the upper and lower leaf surfaces
- Often more prolific in times of plant stress

**Cultural control:**
- Crop rotation and hygiene
- Reduce crop debris
- Water and N

**Chemical options:** None
Crop Measurement

Brassicas can be a very variable crop, with large differences between and within paddocks. Accurate crop measurement is vital to ensuring the correct allocation is given to stock to ensure animal performance is in line with expectations.

The equipment required is:

- 3.54m length of hose to make a 1m$^2$ circle, or a white electric fence standard (these are 1m long and can be used to measure out a 1m$^2$ square.
- Tool to cut brassicas
- Bag to place cut brassica to allow weighing
- Scales

When measuring bulb crops, measuring along the row is more accurate, with the length of measurement determined by the row spacing. For example if the row width is 60cm, then a row length of 1.67m is required to give a 1m$^2$ area measured.

Choosing the area to be measured is not a random decision; it needs to be made to ensure the areas measured are a good representation of the paddock to increase accuracy. If it was random the area measured may be either a poor or very good area that represents a small area of the paddock that will screw the result one way or another. On average five measurements should be made per paddock, with more or less being required in variable paddocks.

Cut the area and weigh all the brassicas that were inside that area. The Dry Matter percentage (DM %) can alter the results significantly so getting at least three DM% samples per paddock is required (2-3 plants per sample), taking in the whole plant. For bulb crops slice the bulbs into ¼ lengthways and chop up one ¼ up into small cubes/slices to allow faster drying, place in bag with all the leaf.

Send to appropriate agency for drying, or if drying yourself dry the samples down until the weight of the sample doesn’t change (i.e. all the water has been removed).

Yield Calculations

DM% = Dry weight of sample divided by the fresh weight of sample dried.

Yield calculation

1. (Total Fresh weight (kg) / Area sampled (m$^2$)) – to get FWT (kg) per m$^2$
2. Multiply by 10,000 to get total fresh weight per hectare – kg FWT / ha
3. Multiply by DM% - kg DM/ha
Grazing Brassicas

It is always best-practice to transition animals onto a diet if there is a significant change, and depending on the type of crop this could be over several days or up to 2 weeks. Animals should be introduced to brassicas and given adequate access to a fibre source such as mature pasture, hay, or straw. Ensuring animals are not hungry when they are put onto brassica crops will reduce the risk of gorging and the subsequent animal health issues. Ensure stock have adequate levels of trace elements before grazing brassica crops; otherwise supplement them at an appropriate time during grazing.

Transitioning off brassicas is not as critical as transitioning onto brassicas, but doing this gradually would still be best-practice. This is not always easy to manage given grazing blocks are often mostly all crop, but only a few days transitioning would be sufficient. Feeding pregnant stock who are due to calve/lamb on brassica crops can lead to metabolic problems, so ideally transition back to a grass diet 2 weeks before calving/lambing.

As with crop establishment, close monitoring is required to ensure any animal health issues are noticed and treated prior to long-term damage occurring.

Brassica Nutritional Analysis

The table below shows the average feed value of different types of brassicas.

Table 1: All values are expressed as percentage of DM. DM% = dry matter percentage; MJ ME = mega joules of metabolisable energy; DOMD = digestibility; CP = crude protein; ADF = acid detergent fibre; NDF = neutral detergent fibre; WSC = water soluble carbohydrate.

<table>
<thead>
<tr>
<th>Brassica</th>
<th>DM%</th>
<th>MJ ME</th>
<th>DOMD</th>
<th>CP</th>
<th>ADF</th>
<th>NDF</th>
<th>WSC</th>
<th>Lipid</th>
<th>Ash</th>
<th>Leaf %</th>
<th>Stem/Bulb %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swede</td>
<td>10.3</td>
<td>13.8</td>
<td>93.5</td>
<td>13.7</td>
<td>13.9</td>
<td>15.2</td>
<td>49.8</td>
<td>1.8</td>
<td>6.1</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Rape</td>
<td>14.3</td>
<td>12.9</td>
<td>88.1</td>
<td>10.8</td>
<td>20.3</td>
<td>23.2</td>
<td>27.3</td>
<td>2.9</td>
<td>9.1</td>
<td>67.2</td>
<td>32.8</td>
</tr>
<tr>
<td>Bulb Turnip</td>
<td>10.1</td>
<td>11.7</td>
<td>89</td>
<td>14.2</td>
<td>18.9</td>
<td>22.5</td>
<td>27</td>
<td>na</td>
<td>10.4</td>
<td>55.4</td>
<td>44.6</td>
</tr>
<tr>
<td>Leaf Turnip (1st cut)</td>
<td>13.7</td>
<td>13</td>
<td>86.7</td>
<td>22.6</td>
<td>13.5</td>
<td>15.6</td>
<td>19.2</td>
<td>4.8</td>
<td>11.1</td>
<td>72</td>
<td>28</td>
</tr>
<tr>
<td>Kale</td>
<td>17.3</td>
<td>11.2</td>
<td>77</td>
<td>9.7</td>
<td>23.5</td>
<td>28</td>
<td>33.4</td>
<td>2.1</td>
<td>7</td>
<td>28.7</td>
<td>71.3</td>
</tr>
</tbody>
</table>


Potential Animal Health Issues

Nitrate / Nitrite Poisoning

Background:
Excess nitrate levels can accumulate in the plant if growth and photosynthesis is retarded under certain climatic conditions (i.e. overcast/warm conditions often after a drought). In the rumen, nitrate is normally converted through to nitrite, ammonia and ultimately to microbial protein. Nitrate poisoning occurs when excess nitrite causes a sudden and drastic reduction in the oxygen-carrying capacity of the blood (by converting haemoglobin to methaemoglobin).
**Symptoms:**
Animals will start panting and gasping for air and will die very quickly (within hours) if not given emergency veterinary assistance. The likelihood of this disease can be reduced by letting the crop mature (and preferably test it) before feeding out.

**Risk reduction:**
Introduce animals onto the crop gradually at short grazing periods initially, and feed an additional fibre source. Don’t let hungry animals onto suspect feed and again be vigilant.

**Brassica Red-Water (also called SMCO poisoning, nutritional haemoglobinuria or kale anaemia)**

**Background:**
Brassicas contain a sulphur-containing substance called S-Methyl Cysteine Sulphoxide (SMCO), which has the potential to damage animals’ red blood cells. In general, the SMCO concentration increases as the plant matures, with rapid increases during flowering.

**Symptoms:**
Mild cases (SMCO intakes of 0.10-0.15g/kg live-weight per day) show a loss of appetite, poor growth rates, mild anaemia and digestive upsets. Severe cases (SMCO intakes of 0.18-0.35g/kg live-weight per day) have life-threatening anaemia, marked growth suppression, red-coloured urine (‘red-water’) and even death.

**Risk reduction:**
Affected animals should be removed from the crop, placed on pasture and if required, involve your local vet. Limit Nitrogen and Sulphur fertiliser to what the crop requires. Also introduce stock onto the crop gradually, graze for limited periods initially, and feed an additional fibre source (e.g. hay, silage or straw). Do not feed flowering brassicas to animals unless they are accustomed to it and always be vigilant while they are on the crop.

**Goitre (induced/secondary iodine deficiency)**

**Background:**
Brassicas are typically low in iodine and contain substances called goitrogens (glucosinates) that block the uptake of iodine by the animal. Both factors can result in stock becoming iodine deficient, the most common symptom is offspring from these animals being born with enlarged thyroid glands in the neck.

**Symptoms:**
In sheep particularly, severe cases can result in lambing problems, with many stillborn or weak (and occasionally hairless) lambs and a poor lamb survival rate. Iodine deficiency can also cause subclinical reproductive losses.

**Risk reduction:**
Because iodine-amended fertilisers are of very little value due to poor plant uptake, ensure animals have sufficient iodine before grazing and supplement pregnant stock with iodine while on the crop.

**Rape Scald**

**Background:**
Rape Scald is usually seen in lambs being fed on immature or second growth Rape or Leaf Turnip, but is also occasionally seen in dairy cows, and can affect any brassica crops. As a result, animals become severely sun burnt on exposed areas of skin (usually the face) following normal doses of sunlight. Occurrence is sporadic and unpredictable.

The exact cause is still uncertain, but an unknown substance (historically thought to be similar to SMCO) from the plant accumulates in the skin and causes the skin to become overly sensitised to ultra-violet light.

**Symptoms:**
Symptoms include swollen ears/face, shaking and rubbing at face, seeking shade. Occasionally red-water is seen. There is no specific treatment, but ‘nursing’ care and provision of shade is important. Rapid recovery is seen on withdrawal from crop.

**Risk reduction:**

The management of grazing Rape paddocks is similar to that for prevention of SMCO.

1. Ensure Rape has ripened with purpled edges on leaves
2. Limit Nitrogen application to 20-40kg/ha at sowing time; use a follow up fertiliser if needed but do not apply within four weeks of grazing
3. Use low Sulphur fertiliser such as DAP or urea prior to sowing
4. Have a slow introduction of Rape:
   - Run stock on the crop for 1-2 hours a day initially (about 20% of diet)
   - Build up to a maximum of 100% of diet by day 7-10 of introduction
   - Give supplementary feed such as straw while they graze
   - Or as an alternative allow the stock to have a pasture run-off paddock
5. Even once animals are adapted, continue to provide a supplementary high fibre feed source (e.g. hay, straw or silage) to dilute any anti-nutritional factors
**Turnip Growers Guide**

<table>
<thead>
<tr>
<th>Maturity</th>
<th>Sowing Rate (kg/ha)</th>
<th>Ploidy</th>
<th>Sowing Depth</th>
<th>Growth Peak</th>
<th>Bolting Resistance (1 = low, 9 = high)</th>
</tr>
</thead>
<tbody>
<tr>
<td>55-65 days</td>
<td>3</td>
<td>Tetraploid</td>
<td>10mm</td>
<td>Summer</td>
<td>9</td>
</tr>
</tbody>
</table>

### Soil Requirements

<table>
<thead>
<tr>
<th>pH</th>
<th>Olsen P</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Na</th>
<th>S</th>
<th>AMN*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimum</td>
<td>5.8-6.0</td>
<td>20-30</td>
<td>5-10</td>
<td>4-10</td>
<td>8-10</td>
<td>4-8</td>
<td>10-12</td>
</tr>
</tbody>
</table>

*AMN*-available mineralisable nitrogen

### Cost/benefit

In general terms, it will cost $1,200 - $1,400/ha to grow a turnip crop, with average yields around 12 t DM/ha achieved with this investment. This equates to the cost of dry matter grown being between 10 – 11.7 c/kg DM of high quality forage grown for feeding at times where pasture quality and quantity may be limiting animal production.

<table>
<thead>
<tr>
<th>Yield (kg DM/ha)</th>
<th>Cost of Growing Crop ($/ha)</th>
<th>Cost of Dry Matter ($/kg DM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>1,200</td>
<td>0.12</td>
</tr>
<tr>
<td>12,000</td>
<td>1,200</td>
<td>0.10</td>
</tr>
<tr>
<td>14,000</td>
<td>1,200</td>
<td>0.09</td>
</tr>
</tbody>
</table>

### Area required

The area required depends on the end yield of the crop, required grazing days and cow allocation. The below formula will help you calculate the required area of turnips to be sown per cow:

\[
\text{Area required (per cow)} = \frac{(\text{Required Grazing Days} \times \text{Per Cow Allocation})}{\text{Crop Yield (kg DM/ha)}}
\]

e.g. For a 12,000kg DM/ha turnip crop, with a daily allocation of 5kg DM/cow over 60 days, the area required per cow is 0.025ha, or 2.5ha per 100 cows.

If the area doesn’t fit your paddock sizes, it is better to increase the area required rather than reduce it to fit as there will always be options to utilise the feed.
Paddock preparation

Refer to Page 5 for further information.

Grazing Summer Turnips

When grazing turnips as with all brassica crops care should be taken to avoid nutritional disorders. This is because brassicas are low in fibre, high in sugars, and there are some toxic compounds found in brassicas that can potentially limit animal production or cause death. The health issues that may arise with turnips include photosensitivity, nitrate poisoning, red water/SMCO poisoning, rumen acidosis, goitre, bloat, choke and recently reported acute interstitial pneumonia (AIP). Prevention to avoid these issues is ultimately the same. By strictly following the guidelines, grazing summer turnips will ensure animals maximise summer production.

The most commonly seen health issue is photosensitivity due to glucosinolates which are present in higher concentrations in young plants, stressed plants, and during droughts. Glucosinolates are broken down in the rumen and the breakdown products affect the liver – the liver damage causes the visible signs of photosensitivity. Clinical signs are swollen face and ears, reddened skin on the udder, peeling of white patches of skin, irritability, kicking off the milkers, changes in behaviour, strange or erratic behaviour, or a drop in milk production.

Prevention of Stock Health Problems

- Introduce stock gradually to the crop to allow the rumen time to adjust - this can take up to 7-10 days. Offer a maximum of 2kg DM/cow/day or 1 hour grazing for the first 5 days. Increase to a maximum of 5 kg DM/cow/day. Turnips should make up no more than 5% of the ration
- Additional fibre (e.g. mature pasture, hay, straw) should always be fed in conjunction with brassicas
- Ensure animals have a full gut before grazing the crop and do not allow animals to gorge. It is useful to give animals a new break in the afternoon rather than the morning, as nitrate levels are likely to be lower in the afternoon
- Choking is a risk in cows grazing turnips in summer, so it’s important to ensure that the turnip crop is fully mature to ensure the bulbs are sufficient in size and are less likely to be swallowed whole
- Feed appropriate stages of the crop, i.e. do not feed flowering brassicas to animals unless they are accustomed to it. In the case of suspect nitrate levels, let the crop mature and preferably test it for nitrate prior to feeding (ask your Agri Manager)
- Ensure stock have adequate levels of trace elements before grazing brassica crops; otherwise supplement them at an appropriate time during grazing
- Avoid any sudden changes in the diet
- Always be vigilant and remove animals showing any signs of ill health from the crop immediately

Sowing

Sowing should occur when soil temperatures reach 12°C and are rising, either broadcast or drilled. In light soils or if seed is roller drilled, the use of a Cambridge roller after drilling is advised to ensure good soil/seed contact and moisture is drawn up into the seed zone for faster and more even establishment. Turnip seed should be sown at 2-3kg/ha, with the use of treated seed preferable to reduce the potential crop/yield loss through insects at establishment. Sowing depth is important when drilling with the optimum being 10mm. This can be achieved with a roller or air drill. Post drilling it is recommended to spread slug bait onto paddock after the final roll.

Turnips establishes well from mid spring (October) with the time of first grazing being the driver behind when to plant. Turnips have different maturity dates so write down the timeframe when you want to start grazing, then take away 1 week (to allow for germination), then the crop maturity to get the ideal planting date.
Marco turnip is the shortest maturing turnip available at 55-60 days maturity, where other summer turnip cultivars are 60+ days, without affecting the yield of the crop. There are a number of practical advantages to this:

1. Reduced time out of pasture production
2. The option of getting two summer turnip crops from the same paddock in Northern regions
3. Ability to sow Marco and a later maturing turnip in different paddocks at the same time to stagger crop maturity allowing maximum quantity and quality of grazed crop
Chicory crops are a great tool to increase either milk production or live-weight gain in milking cows, sheep and cattle due to the high feed quality and deep tap root allowing access to moisture deeper in the soil profile.

Chicory can be used as a specialist crop, either a short term summer crop or a perennial forage crop sown with or without clover, or as a summer active component of a grass/clover mixture. The addition of clover will generally reduce the space weeds have to invade the crops as chicory grows upright causing bare ground after grazing, increasing the weed potential.

The use of chicory as a summer crop is increasing due to the very good trial results, backed up by on-farm experiences. Over summer periods the quality of ryegrass can drop, especially in dry/drought conditions, whereas the quality of spring sown chicory will range in quality from 11.5 – 13 MJ ME/kg DM. This lift in quality, combined with the increased production of chicory over the summer period can lift milk production by 17% over purely ryegrass based pasture (DairyNZ – Chicory and plantain programme).

**Soil requirements**

Chicory will tolerate a wide range of soil types including sand, peat and silt loams although persistence on heavy clay loams or poorly drained soils will be poorer. Under heavy, summer moist soils, chicory will be able to grow extremely well over the summer/autumn period. However the long term persistency of the chicory stand will be adversely affected as the plant cannot tolerate long term water-logging due to crown damage and tap root rots caused by *Sclerotinia spp*. Therefore chicory should only be sown in heavy, moist soils if you are looking for a short term crop.

Under free draining soils chicory will perform very well allowing the tap root to grow unrestrained. While its summer/autumn growth may not be as high as in heavy soils, the long term persistence of the plant will increase resulting in a high yielding crop that should persist for 3+ years.

**Optimum nutrient status for chicory**

<table>
<thead>
<tr>
<th>Soil pH</th>
<th>Olsen P</th>
<th>QT Potassium</th>
<th>Sulphate-S</th>
<th>QT Magnesium</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.6 - 6.0</td>
<td>20-30 (sedimentary and ash) 35-45 (pumice and peat)</td>
<td>7-10</td>
<td>10-12</td>
<td>8-10</td>
</tr>
</tbody>
</table>

**Area required**

The total area to be sown in a dairy farm situation depends on the amount to be feed to each cow per day. For every 100 cows, sow 1ha of chicory per kg DM/ha being fed - assuming a grazing rotation of 21 days over the summer period.

E.g. for 100 cows being fed 2kg DM/day, sow 2ha, for 100 cows being fed 4kg DM/day of chicory sow 4ha.

It may be an option to stagger planting date with different paddocks, 2 weeks apart, for a couple of reasons;

1. Summer is when pasture is under the most pressure by taking a reasonable area out of the round we are putting pressure on pasture on the rest of the farm
2. When the first grazing comes around it is not all ready at the same time, so optimum feed value is obtained.
Sowing

Sowing should occur when the soil temperatures reach 12°C and are rising. Chicory establishes well from mid spring (October) with first grazing possible by mid-December. In cooler environments, e.g. Southland, November sowings will be better. Sowing depth is important with the optimum being 10mm and this can be achieved with a roller or air drill. Chicory should not be sown after legume or brassica crop to avoid problems with Sclerotinia.

In specialist forages, chicory is sown at 6-8 kg/ha in pure chicory stands and 4-5 kg/ha together with large leafed white clover at 4 kg/ha and red clover at 4 kg/ha. Treated chicory seed will improve germination percentage and seedling vigour. In addition to any capital fertiliser or lime that may be required 165 kg DAP/ha should be sown at planting, avoiding any contact between seed and fertiliser.

In light soils or if seed is roller drilled, the use of a Cambridge roller after drilling is advised to ensure good soil/seed contact and moisture is drawn up into the seed zone for faster and more even establishment. It is recommended to spread slug bait onto paddocks after the final roll.

At 10-12 weeks after sowing, a side dressing of 25 kg N/ha should be made.

Post Sowing Management

After sowing, careful monitoring of weeds and insects should occur. Flumetsulam (AIM) herbicides are safe to use on seedling chicory to control broadleaf weeds such as amaranthus (redroot), black nightshade, buttercups, chickweed, cresses, hedge mustard, wild radish, mallow, fathen, wire weed and cape weed (suppression only). Haloxyfop (Valiant 520) is advised if grass weeds or storksbill weeds are present.

The time from sowing to first graze will depend on the soil conditions at the time of sowing and the stage of the crop. The first grazing should occur when the plants have reached the 7 leaf stage. This should occur within 8-12 weeks given adequate soil moisture and temperature. The first couple of grazing’s may be whole paddock grazing’s to allow good establishment of the crop, after that, break fencing can be made in proportion to the required animal allocation.

To ensure persistence of the stand, prolonged gazing with heavy set stocking should be avoided, as should high stocking rates during heavy rainfall. Rotational gazing is recommended for maximum animal and plant performance, aiming for a pre-grazing height of 20-25cm, with post-grazing residuals of around 5cm. Back fencing is recommended. Over winter, grazing should be kept to a minimum, with only 1 or 2 light grazing’s when the soil is firm. Specialty chicory pastures may be conserved with cuts made no later than mid-November producing excellent quality wilted silage.

Speak to your local Agri Manager or Ravensdown Agronomist for post chicory options.

Maintenance fertiliser

The actual rates required will depend on soil type, stocking rate, soil test levels and fertiliser history but a generalised programme would include:

- August: 35 kg N; 35 kg P; 35 kg K and 20-30 kg S per hectare.
- Early December: 20-25 kg N/ha
- Late Feb/early March: 20-25 kg N/ha (where autumn growth rates are good)

Animal health

The feed value of chicory is very high, offering high amounts of minerals, energy and protein for grazing animals. In addition chicory is very high in beneficial trace elements such as Zinc, Copper and Iron (see table 1).
**Table 1: Mineral Analysis: Chicory, Perennial Ryegrass and Lucerne (Summer)**

<table>
<thead>
<tr>
<th>Element (ppm)</th>
<th>Chicory</th>
<th>Lucerne</th>
<th>Perennial Ryegrass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>0.9-1.3</td>
<td>1.8-2.0</td>
<td>0.25-0.3</td>
</tr>
<tr>
<td>Copper</td>
<td>13</td>
<td>7-10</td>
<td>6-7</td>
</tr>
<tr>
<td>Iron</td>
<td>300</td>
<td>100</td>
<td>25-30</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.28-0.44</td>
<td>1</td>
<td>0.16-0.2</td>
</tr>
<tr>
<td>Manganese</td>
<td>210-400</td>
<td>50</td>
<td>50-300</td>
</tr>
<tr>
<td>Phosphorous</td>
<td>0.3-0.5</td>
<td>0.3</td>
<td>0.35-0.4</td>
</tr>
<tr>
<td>Potassium</td>
<td>2.6-6.9</td>
<td>1.0</td>
<td>2.0-2.5</td>
</tr>
<tr>
<td>Sulphur</td>
<td>0.5</td>
<td>0.2-0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Zinc</td>
<td>66-117</td>
<td>15-20</td>
<td>14-20</td>
</tr>
</tbody>
</table>

*(NSW Agriculture, Reme Soils Goulburn and Ag Research New Zealand)*

As with most rapidly growing forages, nitrate poisoning can occur under certain environmental conditions (high N uptake but cool cloudy conditions). If in doubt perform a herbage nitrate test before feeding. The high energy content in chicory can cause pulpy kidney in lambs and these or any other at risk animals should be revaccinated before grazing this crop for any length of time.

**Trial Results**

**Figure 1:** MJME/kg DM of Chico chicory from samples taken at Paterangi, Waikato Jan – June 2007. ME Analysis conducted by NZLABS Ltd, Ruakura Research Centre, Hamilton.

![Metabolisable energy content of Chico Chicory over summer and autumn](image_url)
On farm performance results back-up the increased quality and production of chicory. A trial run by Alliance (2013) has shown the benefit for increasing the % of lambs reaching 44kg (Figure 2) after 28 days grazing chicory, and the total production per hectare (kg meat/ha/day) of chicory (figure 3).

**Figure 2:** The percentage of lambs that reached 44kg after 28 days of grazing for each type of forage typed. Animal trial work conducted jointly by Cropmark Seeds and Alliance Group Ltd, Gore, 2011.

**Figure 3:** The total volume of meat (kg meat/ha/day) grown using different forages. Animal trial work conducted jointly by Cropmark Seeds and Alliance Group Ltd, Gore, 2011.
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