FUTUREDAIRY

TECH NOTE 6
Complementary Forage Systems
Growing forage rape

FutureDairy investigated options to mitigate the ever-increasing limitations imposed by land, water and labour availability and cost in Australian dairying.

A key strategy for farmers is to increase home-grown forage production and consumption. This, in turn, can improve profitability. FutureDairy has proved that forage yields from complementary forage rotations (CFR) can be more than double those of pasture. This has been demonstrated on both research and commercial farms.

Complementary forage systems (CFS) integrate CFR into pasture-based dairy systems. This can be done in many different ways and tailored to individual farmers' needs.

When using forage crops, FutureDairy's approach is to start by setting goals that are based on what is possible (and then determine what is feasible) rather than constraining goals based on known limits to the current farm situation.

FutureDairy has shown that production of ~30,000L milk/ha or ~2,000kg milksolids/ha from home-grown forages and more than 7,500L/cow (>500 kg milksolids) are achievable with only ~1t of concentrate/cow.

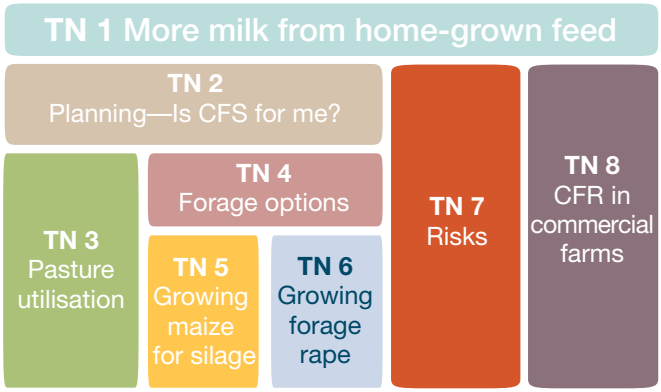
Complementary forage systems may allow you to:

- Increase total forage yield, and therefore milk from home-grown feed, and farm productivity and profitability.
- Replace more expensive bought-in supplements (thus potentially reducing economic risk).
- Increase the efficiency of use of nutrients and water.

This tech note describes:

- Key principles and practices of growing and utilising forage rape with grazing dairy cows.
- Management aspects.
- FutureDairy experimental outputs.

This tech note reports on FutureDairy's findings. Further work/discussion is needed regarding the specific application of these findings in different commercial dairy systems.



Brassicas include forage rape, turnips, canola, broccoli, kale and swedes. Although the information in this tech note relates specifically to forage rape, most of the agronomic and animal health issues apply to all brassica species. The main difference between types is in the part of the plant consumed by the cows (leaves, stems, bulbs) and therefore the crop grazing management.

Why brassicas?

Autumn and winter seasons are critical for Australian dairy farmers as pasture availability is limited. Grain feeding is typically higher during this period, resulting in increased use of bought-in feed and higher production costs.
A strategy to reduce bought-in feed costs during autumn–winter is to grow forages. For example, brassicas grow during the critical autumn-winter period, providing a similar energy level to concentrates. Brassicas, particularly forage rape and the hybrid 'leafy turnips,' can be used as alternative forage options for commercial farms.

The value of brassicas in dairy feeding systems includes:

- Part of a complementary forage rotation.
- Rapid autumn growth.
- High yield potential.
- High forage quality.
- Low establishment costs.
- High water and nitrogen efficiency.

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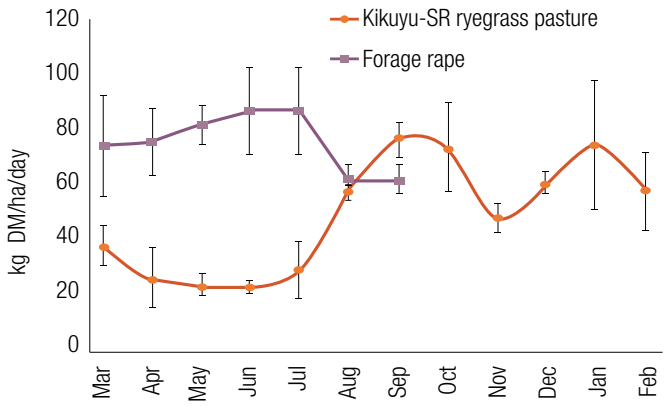

Figure 1. Monthly growth rate (kg DM/ha/day) of forage rape sown in early March and kikuyu oversown with short rotation ryegrass pasture in mid March at Camden, NSW. (means for three years).

Brassicas can be used as a disease break crop. For example, canola is a brassica that is commonly used in a cereal rotation. Brassicas contain 'isocyanides' that enable biofumigation of the soil on break down of plant debris.

Brassicas are also commonly used as part of a pasture renovation program, as they provide an added opportunity for soil preparation and to control weeds.

Rapid autumn growth and high yield

Under favourable conditions, forage rape germinates rapidly (2–4 days) in late summer and early autumn. Brassicas offer significant opportunities to boost autumn feed supply because they grow faster than most alternatives.

Feed grown at this time of year is more valuable than extra feed grown in winter and spring, making autumn-sown forage rape an excellent option for filling feed gaps and enabling longer pasture grazing intervals.

If sown early enough, growth rates of more than 100 kg DM/ha/day are achievable.

Figure 1 shows the average growth rate of forage rape over three years at Camden, compared with a typical kikuyu/short rotation ryegrass pasture.

Table 1. Nutrient content (% DM), metabolisable energy (MJ/kg DM) and water use efficiency (MJ metabolisable energy/mm water) of perennial ryegrass in its vegetative stage of growth compared with forage rape and cow requirements.

Nutrient (all figures are in % DM except where otherwise stated)	**Maize**	**Perennial ryegrass** (vegetative)	**Forage rape**	**Cow requirements[b]**
Metabolisable energy (MJ/ kg DM)	10–10.7	11.4	11.5	10.3
Nitrogen	1.4	3.9	4.3	2.4
Non-protein N	–	0.9	3.5	
Nitrate N	–	0.1	1.2	0.14[d]
Crude protein	6–9	24.3	27	15
Acid detergent fibre	28–30	23	15	18
Neutral detergent fibre	50–55	49	15	45
Water soluble carbohydrate	3–4	7.8	15–17	
Calcium	0.35	0.53	0.9	0.51
Phosphorus	0.3	0.22	0.3	0.33
Potassium	1.0	2.2	2.5	0.9
Magnesium	0.19	0.28	0.27	0.2
Sodium	0.01		0.51	0.18
Chloride	0.2	0.1	2.2	
Sulphur	0.1	0.43	0.5	0.2
ERDP:FME[a] (g/MJ)	–	17		10
Water use efficiency[c] (MJ ME/mm water)				
Winter	–	360	230	
Summer	300	160		

a. Rate of effective rumen degradable protein (ERDP) to fermentable metabolisable energy (FME)
b. Requirements for a 600 kg Holstein–Friesian cow giving 20 litres milk/day
c. Includes all water—irrigation, rain and use of soil moisture
d. Maximum content

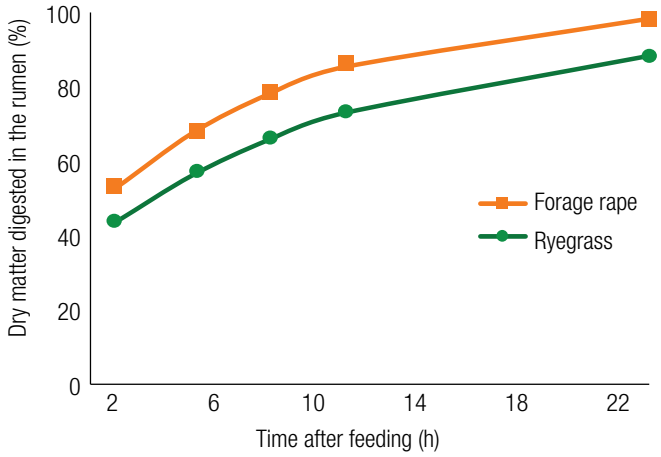

Figure 2. Rumen digestion of forage rape and annual ryegrass.

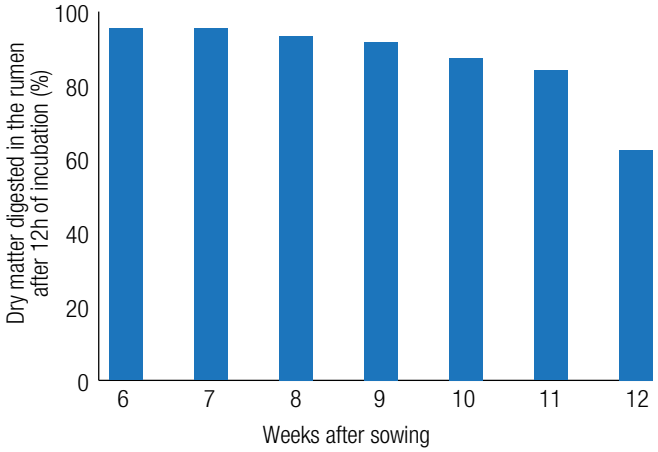

Figure 3. Total dry matter (DM) digested in the rumen after 12 hours of incubation for leaves and petioles of forage rape harvested at different times (maturity level).

Forage quality

Table 1 shows the nutritive value of forage rape compared with perennial ryegrass, and in relation to cow requirements. The nutritive value of forage rape is very high and comparable to high protein concentrates. If well fertilised and managed, forage rape contains high crude protein (CP, 27–33%), metabolisable energy (ME, 11.4–12.2 MJ/kg DM) but less fibre (NDF, 17–26%) than common pasture such as perennial ryegrass.

FutureDairy findings

Forage rape maintains its high nutritive value over the autumn-winter period. The rumen degradability of forage rape is higher than high quality ryegrass (Figure 2).

Forage rape has a key advantage over other forage crops because its quality can be maintained over a 6-week grazing period. The leaves and petioles of forage rape—which are the parts of the plants that cows eat—maintain their quality over a relatively long period from the start of grazing (six weeks after sowing) to almost 12 weeks after sowing (see Figure 3).

Forage rape is typically grazed with a very high instantaneous stocking rate (about 8–10 m^2/cow or 800–1,000 cows/ha). In practice small areas are grazed each day, resulting in relatively longer rotation lengths, so maintaining its quality over six weeks is important.

Practical message: As forage rape keeps its high nutritive value for long periods, there is less need to stagger the sowing of forage rape in the desired area. Instead, sow all the planned area at once, as early as possible in late summer-early autumn. The crop can be grazed over six weeks with the confidence that the increased accumulation of forage dry matter will hardly affect its quality.

Terminology

Complementary Forage System (CFS) refers to the whole farming system; that is the combined pasture and forage cropping area; **Complementary Forage Rotation (CFR)** refers to the area allocated to double or triple cropping.

The sequence and time of feeding forage rape is not important. An evaluation of time and sequence (in relation to maize silage) of feeding forage rape on the ruminal digestibility and rumen characteristics of sheep showed no effects of time and sequence of feeding forage rape with maize silage on rumen parameters and efficiency of feed utilisation.

Practical message: The lack of effect of time and sequence of feeding forage rape on rumen digestion suggests that, in practice, farmers could allocate the grazing of forage rape based on logistic and practical issues. This increases management flexibility.

Milk composition

FutureDairy findings

The milk from cows fed forage rape was higher in protein but lower in milk fat compared with the milk from cows fed Persian clover (Figures 4 and 5). FutureDairy conducted a grazing experiment at Camden to compare diets comprising 10 kg DM of maize silage, about 4 kg DM of grazed ryegrass-based pasture and about 4 kg DM of either forage rape or Persian clover (treatments).

Within each group, cows were supplemented with 4, 6 or 8 kg/cow of concentrate. As expected, increasing concentrate level from 4 kg/cow.day to at least 6 kg/cow.day increased milk and milk solids yields, but there was no forage effect on milk yield. However, milk fat content was higher for cows grazing clover than forage rape, whilst the opposite was true for milk protein content. These effects on milk composition were probably due to the lower fibre content of forage rape (25.8 and 24.4% NDF and ADF, respectively) compared with Persian clover (41.2 and 34.6% NDF and ADF, respectively).

Practical message: The high energy-low fibre characteristics of forage rape can be used to manipulate milk composition. The low fibre can become a problem if cows are grazing other highly digestible feeds such as annual ryegrass.

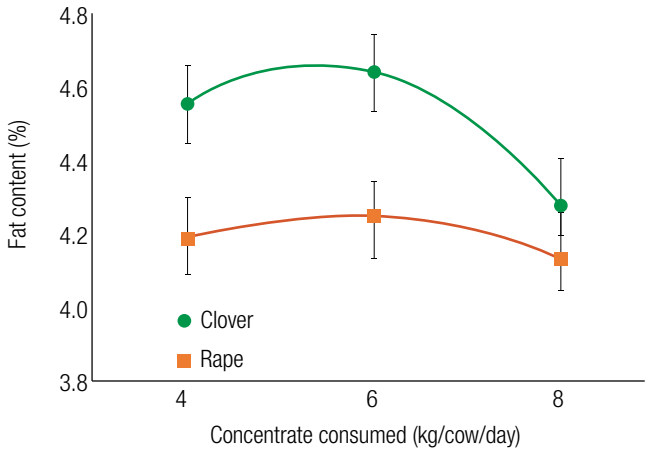

Figure 4. Effects of forage type and concentrate level on milk fat content (%).

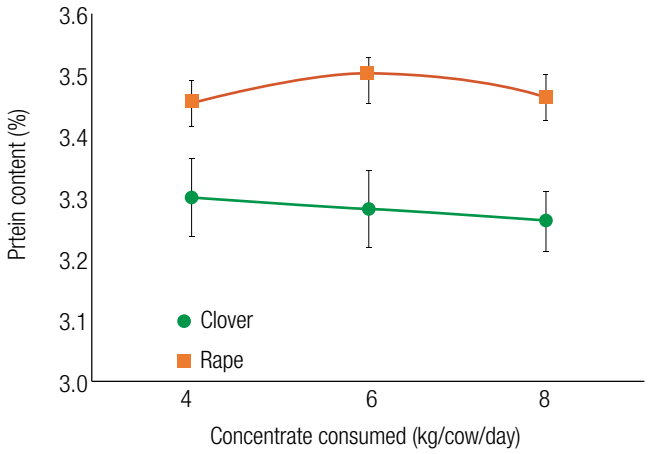

Figure 5. Effects of forage type and concentrate level milk protein content (%).

Low establishment cost

A well-grown forage rape crop can be a cheap source of feed, due to its low sowing rates (3 to 4 kg/ha) and good water and nutrient efficiency.

Water and nitrogen efficiency

Brassicas are exceptionally efficient in their use of water and nitrogen (Table 2).

Water use efficiency is the amount of dry matter grown per megalitre of irrigation water applied and nitrogen use efficiency is amount of dry matter grown per kilogram of nitrogen applied. Forage rape uses nitrogen more efficiently as its root system allows it to access nutrients from different parts of the soil profile.

Crop establishment

Area to sow to forage rape

The maximum area to sow is limited by the fact that cows cannot eat more than about 5 kg DM forage rape per day. This is due to the high nitrate and low fibre content of forage rape.

The minimum area sown should allow enough crop for animals to adapt to the plant (2–3 days) and then to provide a continuous period of grazing (at least 14 days) after adaption.

Table 2. The water use efficiency (kg DM/ML irrigation) and nitrogen use efficiency (kg DM/ kg N applied) for forage rape and short-rotation ryegrass grown on farm in East Gippsland.

Forage	Efficiency of use of	
	Water (t DM/ML irrigation)	Nitrogen (kg DM/ kg N applied)
Short rotation ryegrass	8	66
Forage rape	10	151

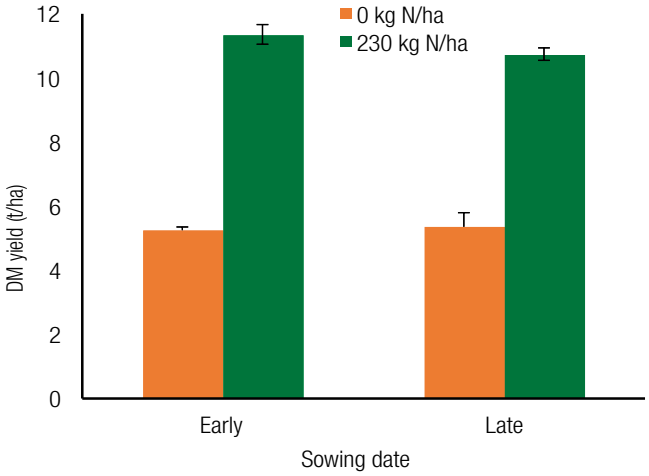

Figure 6. Nitrogen fertilisation doubled total yield of forage rape (tDM/ ha) sown either in February or March at Camden, NSW.

Plant at least 2 ha for every 100 cows. The optimum or maximum area is about 4 ha/100 cows. For a continuous supply of forage rape, sow early in two to three staggered plantings, 10–14 days apart.

Time of sowing

If adequate water is available, sow as 'early' as oats (mid-February in southern Australia and early March in northern parts of NSW and SE Qld). Sowing later tends to lose the benefit of forage rape as an autumn feed. However, its fast growth rate still makes it useful in winter for extending pasture grazing rotations.

FutureDairy findings

A controlled experiment conducted by FutureDairy at Camden showed little difference in yield between mid February and early March sowing dates. However, applying non-limiting nitrogen fertiliser (230 kg N/ha) almost doubled the total yield of forage rape compared with the treatments where no nitrogen fertiliser was applied in both early and late sowing forage rape. This response to nitrogen occurred across all irrigation treatments from zero low (33%) to high (100%) (see Figure 6).

Residual nitrogen from a previous maize crop (applied to maize sown before sowing forage rape) had no effect on yield of forage rape, indicating the need to apply nitrogen directly to the forage rape crop.

Practical message: Early sowing is always the preferred option to ensure early feed availability. Make sure you provide adequate levels of nitrogen to maximise forage yield.

Seeding rate

Sow SUPERSTRIKE®PLUS treated seed at 3 kg/ha to achieve a plant density of 40–50 plants/m^2. The superstrike coating contains anti-insect and anti-fungal agents and molybdenum.

A plant density of 40–50 plants/m^2 reduces wastage at grazing because the growing point (at the top of the stem) remains closer to the ground compared with higher sowing rates, so cows trample fewer leaves. Cows can graze to a lower residual without removing the apical growing point and setting back regrowth.

Earlier recommendations were to sow at 4–5 kg/ha to give a density of 80–100 plants/m^2 at first grazing. However, recent trials (Table 3) and farmer experience indicate that this is too high to optimise utilisation of the forage by grazing animals. When sown at 2 kg/ha or less, the canopy of forage rape remains too open and weed infestation can be high. The new recommended sowing rate of 3 kg/ha represents a middle ground.

Sowing methods

Direct drill forage rape with a tyned or disc drill. Sink the fertiliser tynes or discs to a depth of about 5–10 cm to place fertiliser at the right depth and to provide some soil to cover seed. Ensure that the seed box hoses are left to hang free so that the forage rape seed is not drilled in.

Follow with a heavy rolling, unless soil is really wet. Harrowing, rather than rolling, is quicker, as the harrows can be attached to the drill and this may be suitable under ideal moisture conditions, but otherwise rolling is far better.

Ensure that the seed is not buried too deep. Forage rape seed requires good soil/seed contact to germinate, but establishment can be adversely affected if the seed is buried deeper than 2 cm.

Table 3. The effect of sowing rate on plant density at first and second grazing and level of utilisation of forage rape at first grazing at Camden, NSW.

Seed rate (kg/ha)	1st grazing			2nd grazing plants/m^2
	Pre-grazing (kg DM/ha)	Utilised (kg DM/ha)	Plants/m^2	
1	5,700	3,307	13	11
2	6,220	3,701	28	9
4	5,740	2,927	102	13
6	5,320	2,836	145	19
8	5,110	2,871	136	21
10	4,760	1,893	201	27

Source: S. Farina and S. Garcia 2007 from trials at Camden, NSW.

Forage rape seed is vigorous, emerging after four days under ideal conditions. Under non-ideal conditions (variable sowing depth/suboptimal moisture), seeds can emerge up to two weeks after sowing.

If direct drilling into crusting clay soil, rotary hoe or power harrow to a depth of 2 cm and or apply gypsum, then follow as above.

There has been limited experience in growing forage rape under flood irrigation. Variable germination has been a problem. Anecdotal evidence suggests good establishment can be achieved by pre-watering, followed by the recommended sowing procedure above.

Oversowing with ryegrass or Persian clover

Forage rape sown in late summer/early autumn will provide three to four grazings up to about early August. For forage after this, broadcast short rotation ryegrass or Persian clover (at 20 kg/ha), preferably before the first grazing. If sown just before grazing, the cows trample the seed into the ground and this improves germination.

If planting before grazing, sow in the afternoon when the leaves are dry, so the seed will fall to the ground. Sowing after first grazing also provides good establishment.

The grass or clover emerges but stays fairly dormant under the shade of the forage rape until the forage rape density declines after the third grazing in August/September.

Soil nutrient requirements

Soil tests

Brassica crops need a high soil nutrient status. For example, brassicas are susceptible to phosphorus deficiency and are sometimes used as an indicator of soil phosphorus adequacy. Symptoms of phosphorus deficiency are stunted plants with small, yellow/purple leaves. Olsen phosphorus levels should be more than 25 mg/ kg and extractable potassium greater than 300 mg/ kg.

If soil pH (CaCl2) is below 5.3 consider applying lime. As a general rule, 5 t lime/ha should raise soil pH by approximately 0.8 pH units; however, this will depend on soil type, so seek local advice.

A forage rape crop yielding 8 t DM/ha would remove about 307 kg/ha nitrogen, 22 kg/ha phosphorus and 144 kg/ha potassium from the soil.

Actual fertiliser requirements would be 215 kg/ha nitrogen (assume 20% of nitrogen comes from recycled soil organic matter and 10% return in dung and urine), 20 kg/ha phosphorus and 130 kg/ha potassium (assume only 10% nutrients are returned in dung and urine).

The low value for nutrient return in dung or urine is due to on-off strip grazing, whereby most excreta is transferred to the next location in most cases.

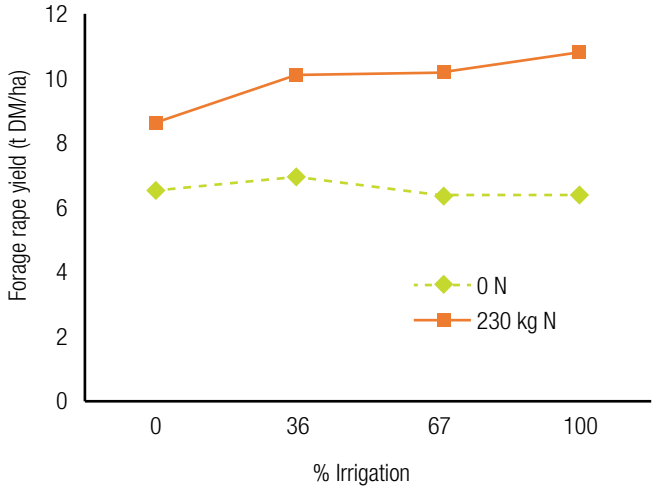

Figure 7. Forage rape yield increased with water availability, only when adequate nitrogen was applied.

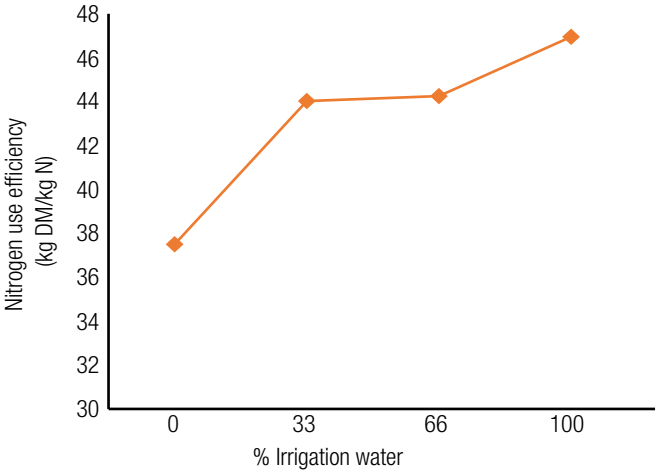

Figure 8. Increasing irrigation increases nitrogen use efficiency of forage rape.

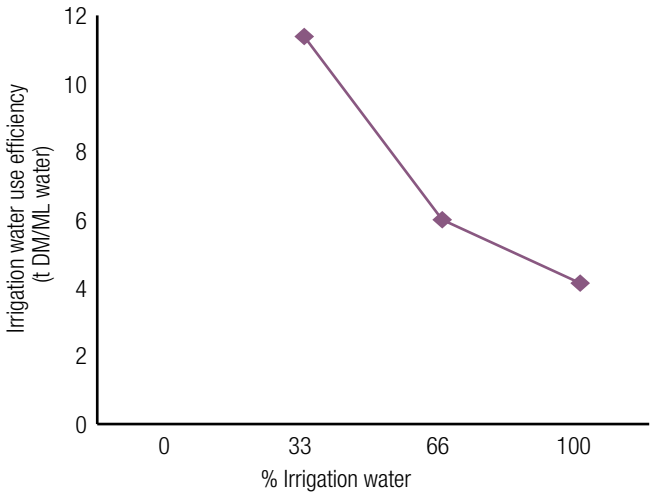

Figure 9. Increasing irrigation water decreases irrigation water use efficiency of forage rape.

Suggested fertiliser application rates

First year

Pre-sowing	100 kg molybdenum superphosphate and 600 kg 23–0–25 fertiliser mix/ha
At sowing	100 kg DAP/ha
After first grazing	100 kg urea/ha

Second year or if molybdenum is adequate

Pre-sowing	500 kg 23–0–25 mix/ha
At sowing	120 kg DAP/ha
After first grazing	150 kg urea/ha

Brassicas are unique in that they require molybdenum for growth. It can be applied as a molybdenum superphosphate mix or, if molybdenum has been recently applied, use a seed-coating such as Superstrike seed. Even if soil phosphorus and potassium are well above the recommended levels still apply some fertiliser (say 50% of requirements) to provide some readily available nutrients.

FutureDairy findings

FutureDairy's controlled experiments at Camden, NSW have shown that nitrogen is a more limiting factor than water. Water is still needed to achieve potential yields as forage rape requires about 4–5 ML of total water, but the response to water occurs only when nitrogen is not limiting (see Figure 7). At Camden rainfall provides between 2.5 and 3.5 ML in most years.

In terms of efficiency, increasing water by irrigation increases nitrogen use efficiency but decreases water use efficiency (see Figures 8 and 9). Response ranges of about 38–46 kg DM/kg N and 4–12 t DM/ML of irrigation water were obtained at Camden with well-managed forage rape.

Practical message: Both nitrogen fertiliser and irrigation water are required to maximise yield of forage rape. Responses to nitrogen are greater for areas with at least 250–350 mm of rainfall during the autumn–winter period. Plan your crops according to input availability (nitrogen and water).

Grazing management

Forage rape can be grazed in a number of ways. The best option depends on when the feed is required and available labour resources. Following are examples that provide a starting point for establishing an efficient grazing system.

Graze for optimal regrowth

To optimise regrowth, graze when forage rape is at least 50 cm high, which is usually seven to eight weeks after sowing. At this stage the plant should have more than eight mature leaves.

If grazed too early palatability is low due to high levels of nitrate and moisture. For example, dry matter changes from 5% to 8% between weeks four and seven after sowing. Nitrate content is highest at the first grazing (1.5–2%) compared to less than 0.1% for ryegrass. This is partly related to nitrogen fertiliser application. The nitrate content of the forage falls substantially after the first grazing (to less than 0.5%).

Ideally, cows should only remove the leaves and petioles, leaving the active (apical) growing point intact to ensure maximum re-growth.

Some cows may develop a real preference for forage rape and eat excessively, leading to illness or even death from nitrate poisoning.

If cows are allowed prolonged access they will continue grazing rosettes at the top of the stem that contain the active growing points. If this happens, the plant has to wait until 'dormant' buds burst on the stem, setting back regrowth by several weeks. Regrowth is also set back as more of the stem is removed because more and more plant reserves (water-soluble carbohydrates) are removed. The risks can be greatly reduced by grazing an allocated area for only a short time (1–2 hours).

Provide a relatively square area allowing 8–10 m^2/cow for maximum utilisation and the least damage to the plants. Giving a larger area or a narrow section will encourage cows to be more selective and explore more, doing more damage in the process.

Calculating a strip of forage rape for grazing

Collect the leaves and petioles from three, 1 m x 1 m representative areas, leaving the rosette (growing point) at top of the stem intact. This effectively simulates what the cows should eat.

Weigh the leaves and petioles and calculate dry matter according to the example below.

- Average wet weight of three 1m x 1m samples = 5 kg
- Assume dry matter content = 8%
- Target allocation per cow = 4 kg DM/cow/day
- Number of cows to graze crop = 250
- Area to be grazed = **250 cows x 4 kg DM/cow/day**
  5 kg x 0.08 x 10,000m^2
- Area to be grazed = **1,000 kg DM/day**
  4,000 kg DM/ha
- Area to be grazed = 0.25 ha

Graze for total removal

To make the most of autumn-sown forage rape, sow early (mid-February in the south and mid-March in the north). Continuous feeding of rape maximises the nutritional benefits to cows. If it is fed intermittently the rumen must adjust each time.

Start grazing when 6–7 t DM/ha is on offer, and then graze to ground level for next four to six weeks.

Graze for optimal regrowth then total removal

Sow the whole area early. Graze the first half to optimise regrowth. It should have 3–5 t DM/ha on offer at six to eight weeks growth.

When the feed on offer exceeds 7 t DM/ha, graze to ground level. At this stage it could have 6–8 t DM/ha, allowing up to 5 t DM/ha utilisation. This will slow the grazing rotation and allow more feed to accumulate ahead of the cows. It will give the first half a chance to regrow, which can then be grazed again, either to ground level or for optimal regrowth.

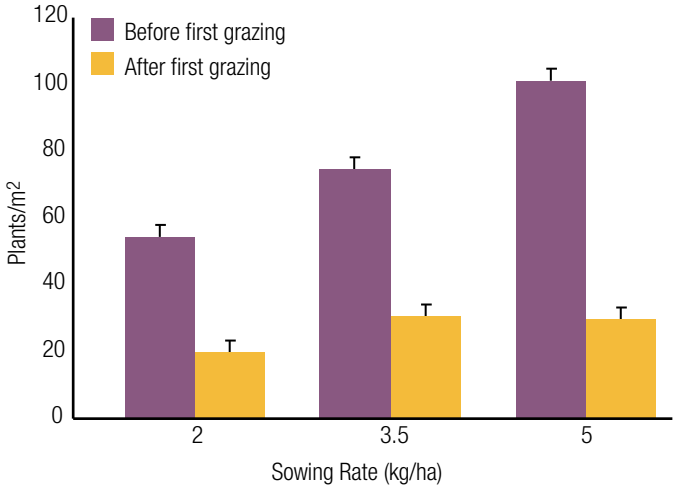

Figure 10. Plant population differences between sowing rates, before the first grazing and after the first grazing.

In a total removal grazing situation, sow Persian clover or ryegrass immediately after grazing. If the grazing is late in the season (after mid-April), better growth will be gained from using ryegrass or a winter cereal, rather than Persian clover.

The last two grazing options have the benefit of enabling most of the forage to be utilised in autumn and potential utilisation is a lot higher. Management is also simpler in that cows can be left on the forage rape without fear of nitrate toxicity or damaging plants.

Sowing rate and grazing options

FutureDairy findings

FutureDairy conducted a field study on an irrigated forage rape crop, using three sowing rates (2, 3.5 and 5 kg/ha) and two grazing methods (multiple and take-all). Multiple grazing involved lightly grazing the crop twice, to allow regrowth to occur, when it reached an approximate yield of 5 t DM/ha. Take-all grazing involved grazing the crop once—heavily—when it had reached maximum biomass.

Sowing rate did not significantly affect growth rate, yield, quality or utilisation of forage rape. This was because the number of plants stabilized after the first grazing; that is more plants died as sowing density increased (Figure 10).

Practical message: A lower sowing rate can be used without adversely affecting production.

Differences between grazing methods were relatively small, suggesting that a combination of multiple and take-all grazing offers the greatest flexibility in forage use on Australian dairy farms, without compromising on forage yield or quality.

Grazing preferences

FutureDairy findings

An evaluation of cows' behaviour and preferences of the different sowing rate treatments at Camden showed that cows preferred grazing the forage rape sown at 2 kg/ha, although this did not result in higher forage utilisation (Figure 11).

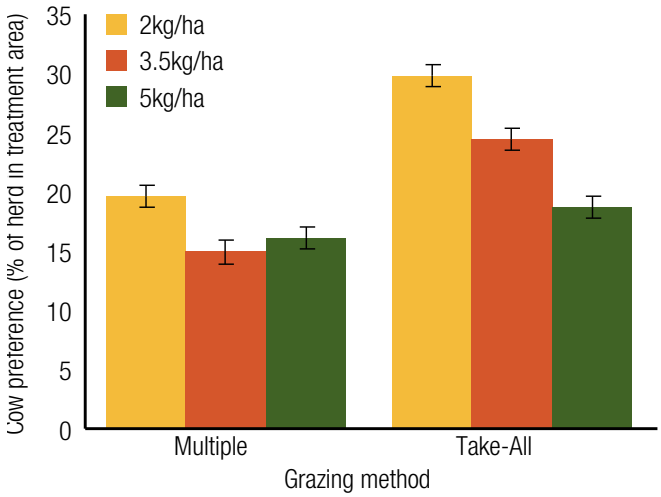

Figure 11. Cow grazing preferences for 2kg/ha, 3.5kg/ha and 5kg/ha forage rape sowing rates in the multiple grazing and take-all grazing treatments.

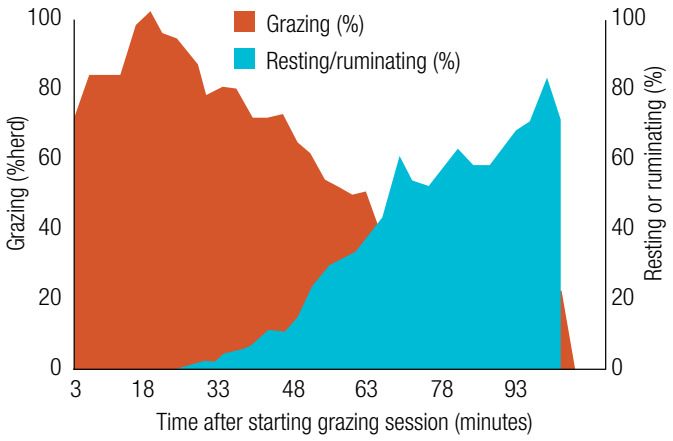

Figure 12. A typical pattern of a herd grazing forage rape showing how soon individual cows stop grazing (just 30 minutes after entering the paddock). The proportion of cows grazing decreased steadily (and the proportion of cows resting/ruminating increased). After about two hours practically no cows remained grazing.

The cows' preference for the lower density blocks was maintained over the whole grazing season. Cows started to stop grazing forage rape at about 30 min after grazing started. The number of cows that voluntarily stopped grazing increased to about half the herd by one hour after grazing started and about 80% by 1.5 hours after the grazing session started (Figure 12).

Practical message: Sow forage rape at the lowest density suitable for your farm conditions. Well-fed cows will graze brassicas for relatively short periods of time (1–2 hours), which should be taken into account when designing the logistics of using brassicas (e.g. provide a loafing area where the cows can voluntarily go after grazing brassicas).

A FutureDairy evaluation of different brassicas options showed that their nutritive value is similar (Table 4). This suggested that yield and preferences by cows might be important considerations when farmers select brassica species.

In a controlled study at Camden, FutureDairy found that dairy cows prefer forage rape over other brassicas (radish being the least preferred brassica). Forage rape also had better yields and disease resistance capacity.

The quality of forage rape depends on agronomic and management factors such as nitrogen fertiliser, sowing date, irrigation and harvest time. The following results were from controlled studies conducted by FutureDairy at Camden.

Table 4. Nutritive value of different brassica species.

	Crude protein (CP) %	Fibre		Metabolisable energy (MJ/kg/ha)
		ADF %	NDF%	
Turnip	24.1	21.8	22.0	12.4
Radish	25.3	23.1	24.0	12.2
Forage rape	26.3	20.9	22.0	12.3

Nitrogen: Applying 230 kg N/ha increased crude protein (CP) by 13% and fibre (NDF and ADF) contents by 9% compared with the control treatment with no nitrogen. However, nitrogen fertiliser did not affect the metabolisable energy content of forage rape.

Sowing date: Delaying sowing slightly increased crude protein but decreased fibre by 6% and nitrate-nitrogen by 25% compared with early sowing. Beware of the higher risk of nitrate poisoning in early-sown crops, particularly during the first grazing when concentrations are much higher.

Irrigation: An increase in irrigation water decreased crude protein content but increased fibre and sugar content of forage rape. Metabolisable energy content was not affected.

Supplementing forage rape

Forage rape is low in fibre so it should be supplemented with a high-fibre sources, such as hay, grass or maize silage, kikuyu or paspalum. To prevent acidosis, feed supplements can be fed to cows before or after the forage rape. Table 5 gives some typical autumn rations for dairy cows. The first is well-balanced; the second will give the cows a stomach-ache and the rest are alternatives that are typical but balanced to varying degrees. The ration examples are for a 20 L/milk/day cow in late lactation in autumn.

Time of day to graze forage rape

Graze forage rape after milking to avoid milk taint. Cows will graze better after the afternoon milking than morning milking because the nitrate content is lower and water soluble carbohydrates (sugars) higher.

It may be inconvenient to graze forage rape after afternoon milking as cows have to be removed late at night. Alternatively, feed forage rape after the morning milking, but never graze it immediately before milking.

Fibre supplements can be fed at any time of day to complement the low fibre levels in forage rape.

Table 5. Typical rations fed to dairy cows producing 20 L milk/day in autumn.

	Intake (kg DM/cow/day)	Metabolisable energy (MJ/ kg DM)	Acid detergent fibre (%)	Neutral detergent fibre (%)	Protein (%)
Recommended	18	10.8	319	<40	16
Well-balanced ration 4 kg forage rape 7 kg pasture 3 kg maize silage 4 kg conc. (16% protein)	18	10.9	18	33	20
Stomach-ache ration (wasted ME v. low fibre) 4 kg forage rape 8 kg pasture 6 kg concentrates	18	11.1	11.6	28	22
Alternate ration 1 (OK for fibre, low ME) 4 kg brassica 5 kg pasture 4 kg concentrates 3 kg straw	16	9.8	17	28	19
Alternate ration 2 (protein a bit high) 4 kg brassica 10 kg pasture 4 kg medium quality ryegrass hay	18	10.6	22	39	23

Symptoms of nutritional diseases

Acidosis: Cows stand around and do not eat or ruminate. Rumen is static. Very loose faeces.

Nitrate toxicity: If severe, cows gasp for breath and will go down rapidly. May be fatal.

Red water: Loss of appetite, ill thrift and passing red urine. Do not graze flowering forage rape crops as it causes digestive upsets, resulting in the symptoms above.

Rape scald or photosensitisation: Reddening and swelling of skin on face and sometimes the udder. Affected animals are agitated and seek shade. Risk is greater when immature rape crops are grazed.

Pests and diseases

White butterfly and diamond back moths

White butterfly and diamond back moths can infest forage rape crops, and the effect can be severe, particularly on plants stressed due to lack of moisture or nitrogen. If close to grazing, graze before too much damage is done.

To control, spray with chlorpyrifos-based pesticides at label rates. The threshold for spraying is one grub/leaf. Severe effects occur after about four days at this initial level of infestation.

Blackleg

Brassica crops are susceptible to the Leptosphaeria fungus, commonly known as blackleg. Fungal attack tends to set in during the third year of continually growing forage rape, although they have been discovered in the second year. Evidence of infection is black lesions on the stem and, in severe cases, a rotting of stem leading to wilting and the death of plants.

There is no chemical control for blackleg and no resistant forage rape varieties are available. The only option is to avoid sowing forage rape in the one area for more than two years in a row and allowing a two or three-year break before growing forage rape again.

More information

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Copies of these articles are available from FutureDairy, ph 02 9351 1631 or the Dairy Australia library ph 1800 824 377, email library@dairyaustralia.com.au.

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