Dry season resources

The resources in this booklet will assist you to plan and manage the impact of dry conditions and drought on dairy farms and herds. The information includes revising budgets, assessing feed options, maximising home grown feed, considering nitrogen usage, pest control, assessing the cash position over the coming months and sourcing an updated income estimation.

Make sure that you discuss your situation and plans with your trusted agronomist, nutritionist, farm consultant, accountant or banker.

Current information, tools and resources are available at **dairyaustralia.com.au.**

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Delivering for Dairy

Feed and pasture management

Feed budget calculator

Your own worksheet

Complete your own feed budget worksheet using Table 3 or Table 4 and 5 to determine the total feed required for the herd. Estimate the pasture available and the pasture that will be grown in the time period. Remember to calculate the net fodder available by taking into account the wastage during feed out.

		Number of head	Daily requirement (kg DM/head)	No. of days	Total feed required (t DM)	
A	Milkers					A = number × daily requirement × no. of days
B	Dry cows					B = number × daily requirement × no. of days
C	Heifers					C = number × daily requirement × no. of days
D	Yearlings/calves					D = number × daily requirement × no. of days
E	Others					E = number × daily requirement × no. of days
F	**Total (A + B + C + D + E)**					F = (A+B+C+D+E)
G	Estimated pasture available		t DM			G
H	No. days		days			H
I	Pasture areas		hectares			I
J	Estimated growth/ha/day		kg DM/ha/day			J
K	**Total pasture growth for time period**		t DM			K = (H × I × J)/1000)
L	**Total pasture available**		t DM			L = (G + K)
M	Number of cows		cows			
N	Normal grain/pellet feeding/day		kg DM/cow/day			
O	**Total grain/pellet feeding**		**t DM for X days**			O = (M × N × H)/1000
P	Conserved fodder		t DM			
Q	Purchased fodder		t DM			
R	**Fodder available**		**t DM**			R = (P + Q)
S	Feed out wastage		%			S
T	**Net fodder available**					T = (R – (S/100 × R))
U	**Total feed available**		**t DM**			U = (L + O + T)
V	**Shortfall/surplus**		**t DM**			V = (F – U)

Be careful converting as fed figures to DM: grain – 90% DM; hay – 85% DM; silage 30–50% DM.

You should allow for wastage (particularly with fodder)

If feeding on the ground up to 30% wastage; feed troughs and hay rings will still result in at least 15% wastage. Shortfall/surplus × fodder cost $/t = cost of feed for time period ($).

Table 4 Total annual feed requirements (t DM/head) for calves, yearlings and heifers at two different target liveweights

		450kg*	550kg*
	Age (months)	kg DM/day	kg DM/day
Calves yearlings	3–6	3	3.4
	6–9	3.8	4.6
	9–12	4.7	5.8
Annual total (t DM)		**1**	**1.2**
Heifers	12–15	5.6	7.2
	15–18	6.6	8.3
	18–21	7.6	10.4
	21–24	11.6	13.7
Annual total (t DM)		**2.8**	**3.6**

**Target liveweight as a 2 year old*

Table 5 Annual intake in tonnes of DM/cow @ 11 MJ ME/kg DM

Production		Liveweight (kg)					
(kg MS/cow)	litres/cow	400	450	500	550	600	650
300	3,529	3.5	3.6	3.8	3.9	4.0	4.1
350	4,216	3.8	4.0	4.1	4.2	4.3	4.5
400	4,942	4.2	4.3	4.4	4.6	4.7	4.8
450	5,713	4.5	4.6	4.8	4.9	5.0	5.1
500	6,536	4.8	5.0	5.1	5.2	5.4	5.5
550	7,418	**5.2**	5.3	5.5	5.6	5.7	5.8
600	8,370	**5.5**	**5.7**	5.8	5.9	6.1	6.2
650	9,401	**5.9**	**6.0**	**6.2**	6.3	6.4	6.6
700	10,526	**6.3**	**6.4**	**6.6**	**6.7**	6.8	6.9

Bold cells are unlikely production targets

Dry cow requirements vary between 10–15kg DM per cow per day over the dry period. For example, if cows are dry for 65 days, 65 days x 15kg DM = 975kg DM/cow is required for the dry period. Add the relevant numbers of dry cows and requirements to your own worksheet.

Complete your own worksheet on the following page using either Table 3 for daily requirements or Tables 4 and 5 for annual feed requirements. Complete the sections for pasture, fodder and grain and calculate the feed surplus or deficit. Use your own knowledge of pasture and crop growth, or speak to an advisor to get assistance.

This fact and worksheet will help do quick calculations to estimate the amount of feed that will be required this year. The Dairy Australia feed budgeting spreadsheet found at **dairyaustralia.com.au** will provide a more detailed feed budget.

Monthly back of the envelope feed budget

Use this factsheet to calculate your monthly feed surplus or shortfall

Feed budgeting is an essential planning tool for dairy farmers.

This fact sheet uses a farm example to demonstrate how to calculate the amount of feed required, the feed on hand (including pasture) and the feed deficit or surplus. The final part of this fact sheet is a worksheet for you to work through for your farm. Completing the worksheet gives you the total herd feed requirements (dry matter [DM]) for the time period you choose e.g. 30 days, 60 days. You can then work out the feed you have on hand and calculate the feed deficit.

Table 1 is a worked example to determine the feed requirements for a 30–day period for the example farm.

Key messages

Feed budgeting is an essential planning tool

Use this simple feed budget to calculate how much feed in tonnes of dry matter you need to purchase

Table 2 then calculates the amount of feed available and the feed deficit for the same farm and time period. Farm example: 250 cow herd of 550kg liveweight, calving in spring aiming to produce 500kg MS/cow. Liveweight target for 2 year olds is 550kg. Milking area is 120 hectares.

There is 20 tonne DM of conserved fodder and moderate amounts of grain/pellets are fed.

Calculations are for a 30–day time period.
Table 3 provides the daily requirements (kg DM/head) for each class of stock.

Tables 4 and 5 provide the annual feed requirements (t DM/head) for each class of stock.

Herd feed requirements for 30–day time period

Table 1 Feed requirements

		Number of head	Daily requirement (kg DM/head)	No. of days	Total feed required (t DM)	
A	Milkers	250	18	30	135	A = number × daily requirement × no. of days
B	Dry cows		12			B = number × daily requirement × no. of days
C	Heifers	50	8	30	12	C = number × daily requirement × no. of days
D	Yearlings/calves	100	4	30	12	D = number × daily requirement × no. of days
E	Others	–				E = number × daily requirement × no. of days
F	**Total (A + B + C + D + E)**				159	F = (A+B+C+D+E)

Total feed available

To calculate the total feed available complete Table 2. Firstly provide an estimate of the total pasture yield available, fodder available and the grain/pellet tonnage fed out. Wastage is added in and the total feed deficit can be calculated.

Calculate the total pasture available by completing rows G to L. Estimated pasture available is what is available now. The total pasture growth is calculated by the growth rate per day × the number of days × the pasture area. Adding the growth to the currently available pasture provides the total pasture available.

Table 2 Feed available

		Farm example		
G	**Estimated pasture available**	30	t DM	G
H	No. days	30	days	H
I	Pasture areas	120	hectares	I
J	Estimated growth/ha/day	25	kg DM/ha/day	J
K	**Total pasture growth for time period**	90	t DM	K = (H × I × J)/1000)
L	**Total pasture available**	120	t DM	L = (G + K)
M	Number of cows	250	cows	
N	Normal grain/pellet feeding/day	4	kg DM/cow/day	
O	**Total grain/pellet feeding**	30	**t DM**	O = (M × N × H)/1000
P	Conserved fodder*	20	t DM	
Q	Purchased fodder	0	t DM	
R	**Fodder available**	20	**t DM**	R = (P + Q)
S	Feed out wastage	20	%	S
T	**Net fodder available**	16		T = (R – (S/100 × R))
U	**Total feed available****	166	**t DM**	U = (L + O + T)

**Net fodder available takes into account the % wastage during feed out. See notes below.*
***Total feed available is the addition of all sources of feeds.*

Calculate the shortfall or surplus

The shortfall or surplus can be calculated by subtracting the total feed available (U from Table 2) from the total annual requirements (F from Table 1). A positive number means that feed needs to be purchased.

V	**Shortfall/surplus**	–7	**t DM**	V = (F – U)

In this farm example there will be a surplus of 7 tonnes of DM at the end of the 30–day period if all the conserved fodder is available to be used.

Note: Be careful converting as fed figures to DM

- grain – 90% DM
- hay – 85% DM
- silage 30–50% DM

Allow realistic wastage rates when feeding out fodder. Allow up to 30% if feeding on the ground. Allow up to 15% if feeding in troughs and hay rings. See the fact sheet Reducing feed wastage costs at **dairyaustralia.com.au** for further information.

Table 3 Feed available

Class of stock	Daily requirements (kg DM/herd)
Milkers	18
Dry cows	12
Heifers	8
Yearlings/calves	4

Milkers **Cows in late lactation**  (550kg, 19L, 4.2 per cent F, 3.6 per cent P, +0.1kg per day) This group needs about 180 MJ ME*, 12–14 per cent CP	Accept a lower body condition score target at dry-off	Milk production and in-calf rate will suffer next lactation unless body condition is made up during the dry period. The cow is more efficient at converting feed into body condition while she is still milking than when she is dry.
	Dry the cows off a bit early to save feed	Drying cows off early will mean less milk income to pay for the feed they need. However if cows are doing less than 10 L/day and/or are have a low body condition score (< 4.5), they can benefit from a longer dry period.
	Milk mid-late lactation cows once a day (OAD)	OAD milking of under-conditioned cows in late lactation will help these animals to recover some condition before dry-off.
	MJ ME = megajoules of metabolisable energy. CP = crude protein. *** Additional energy may be required for walking activity and to cope with adverse weather conditions.**	

Facts on alternative fibre sources

Nutritional values of high fibre by-products are particularly variable. Crunch the numbers before you buy using feed analysis results.

After major or catastrophic environmental events (e.g. floods, bushfires, droughts), when pasture may be limited or absent and fodder supplies are reduced, you may be forced to consider using alternative fibre options which you may not have used before. Many alternative fibre sources are suitable for feeding to dairy stock provided they are supplemented with high energy feeds and protein sources as part of a balanced diet. They vary widely in nutritive value, digestibility, effective fibre value, and may present risks such as ruminal acidosis, mycotoxins and chemical residues. So you need to be careful.

Alternative fibre sources which may be available depending on seasonal circumstances and location include almond hulls, palm kernel meal, cereal straw (barley, oats, triticale, wheat and rice straws) sugar cane and grape marc. As the chart below shows, the nutritional specifications of each of these products are unique, and differ greatly from those of conventional fibre sources such as hay, and grains such as wheat.

Key messages

Fibre is an essential ingredient in the diets of ruminant animals such as dairy cattle. It supplies energy, maintains normal, healthy rumen function, and in cows is utilised to produce milk fat.

The most commonly used chemical measure of the fibre content of a feed or a diet is Neutral Detergent Fibre (NDF).

The 'physically effective fibre value' of a feed or a diet is also critical. It refers to the ability of a feed to stimulate rumen contractions, stimulate chewing activity and production of saliva, which contains buffers which maintain the cow's ruminal pH in the optimal range (6.2–6.6) for growth of rumen microbes.

NDF intake should ideally be about 28 to 35% of the total diet to maximise daily dry matter intake, however they can eat up to levels of 35% of the diet with minimal impact on intake. Above 35% NDF dry matter intake will decline especially if the diet is forage based. 25% of the fibre in the diet should have a fibre length of approximately 2.5cm. Diets containing rapidly digested starch sources such as wheat should have higher levels of NDF (min 34%).

A rule of thumb for NDF intake is 1% of bodyweight as forage NDF or 1.2% of bodyweight for total NDF intake e.g. a 600kg cow can eat 6 kg DM of NDF per day from forage or 7.2kg DM of NDF/day in the total diet.

If there is not enough long or 'effective' fibre, there will not be enough chewing during eating and ruminating, and therefore not enough saliva produced, leading to a drop in ruminal pH and increased risk of ruminal acidosis.

Cattle can suffer from two forms of ruminal acidosis:

- 'Sub-acute ruminal acidosis' (SARA), where the ruminal pH is in the range 5.5–6. (Cows may not appear sick, but some will be off feed, have mild milk fat depression and be scouring).
- 'Lactic acidosis' where the ruminal pH is below 5.5 – cows will be noticeably sick. (Many cows will be off their feed, down in their milk, lame and scouring. This may then progress to 'downer cow' syndrome and death).

Almond hulls

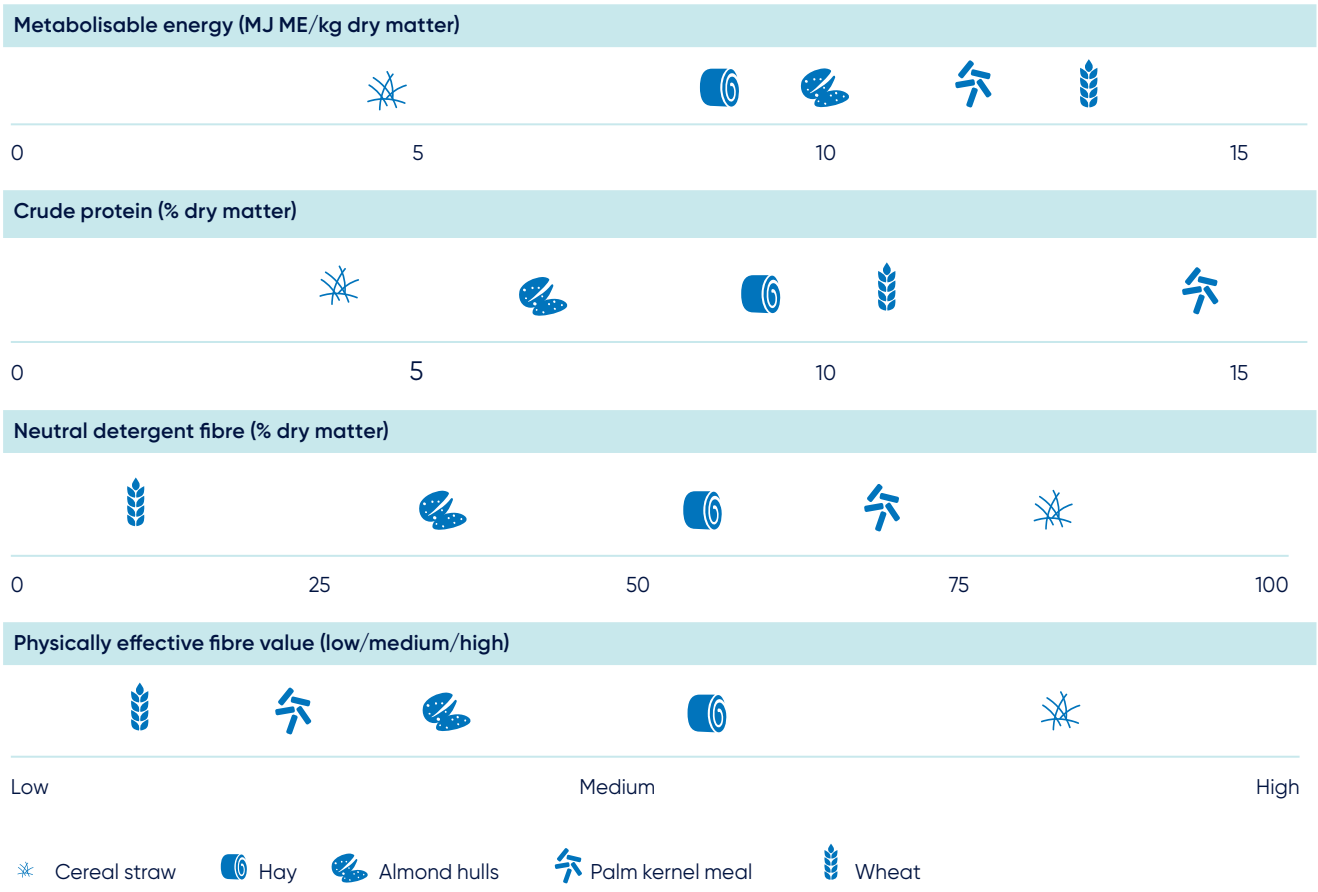
- A good forage extender, with medium effective fibre value when fed whole.
- Reasonable energy source with very good palatability.
- Low in protein.
- Available whole and milled. Whole almond hulls have a higher effective fibre value but a lower bulk density. Milled almond hulls provide no effective fibre.

Key messages

Nutritional values of high fibre by-products are particularly variable

Crunch the numbers before you buy using feed lab analysis result

Figure 1 Nutritive value of feeds



Keep in mind	Management tip
Highly palatable. If offered ad-lib, cows may consume 6+ kg/cow/day.	Limit daily consumption of almond hulls to 3–4 kg/cow/day. Always feed almond hulls with a palatable, good quality straw/hay.
Sugar level is > 20 per cent	Introduce gradually to cows' diets. Limit daily consumption to 70% of dry matter intake.
If feeding out using a front end loader (FEL), you need to know how many kilograms per bucket, to ensure you don't under or over feed.	Weigh the FEL with and without the bucket full of almond hulls, or estimate using almond hulls' bulk density (kg/litre) and your bucket's volume. Check bulk density regularly.
Can be challenging to regulate daily feed intakes and avoid excess competition and wastage.	Mix almond hulls with other higher quality feeds in a mixer wagon if possible. If offered to cattle separately, place in troughs a fair walk away from water troughs and other forage sources.
Ad-lib almond hulls will not provide the daily nutrient requirements of dry cows or young stock.	Supplement with grain/concentrates, including protein supplements.
Prone to mould growth if allowed to get wet, increasing the risk of mycotoxins (fungal toxins).	Store under cover, ideally on a dry concrete floor. Consider including a reputable mycotoxin binder product in feed.
Potential chemical residue risk.	Purchase almond hulls with a vendor commodity declaration.

Palm kernel meal

- A forage extender, not a grain replacer.
- Medium digestibility, but low effective fibre level due to small particle size.
- Low in starch and sugars.
- Oil content: 8–10%.
- Medium protein 15–18%.
- High feeding levels of PKE (>3–4 kg/day) will alter the ratio of fatty acids in milk fat, which can be an issue when processing certain products.
- PKE might also be a potential mycotoxin risk.

Keep in mind	Management tip
If offered ad-lib, cows will consume about 6 kg/day. High feeding rates for extended periods without effective fibre sources may lead to animals suffering impacted stomachs.	Limit daily consumption of palm kernel meal to 3–4 kg/cow/day. Always feed palm kernel meal with a palatable, good quality straw/hay.
If feeding out using a front end loader (FEL), you need to know how many kilograms per bucket, to ensure you don't under or over feed.	Weigh the FEL with and without the bucket full of palm kernel meal, or estimate using palm kernel meal's bulk density (kg/litre) and your bucket's volume.
Stimulates high water intakes by cattle.	Always provide plenty of access to water. If palm kernel meal is offered to cattle separately, place it a fair walk away from water troughs and forage sources to help regulate their intakes and avoid excess competition.
Ad-lib palm kernel meal/straw diet will not provide the daily nutrient requirements of springers or dry cows.	Feed palm kernel meal and grain/concentrate 50:50 with forage sources to help ensure daily nutrient requirements are met for maintenance, growth and pregnancy.
Prone to mould growth if allowed to get wet, increasing the risk of mycotoxins (fungal toxins).	Store under cover, ideally on a dry concrete floor. Can be stored in silo, but needs very steep cone. Bocce balls on top of the auger may help avoid bridging problems. Consider including a reputable mycotoxin binder product in feed.
Potential chemical residue and aflatoxin risks.	Limit daily consumption to 40% of dry matter intake. Purchase palm kernel meal with a vendor commodity declaration.

Cereal straw (barley, oat, triticale, wheat)

- A poor nutritional quality forage, but high effective fibre value.
- Its sole purpose in the diet is to help stimulate chewing and saliva production, and maintain a fibre mat in the rumen.
- Very low in energy and protein.
- If fed at substantial levels, it will reduce performance due to very low ME content and low fibre digestibility

Keep in mind	Management tip
Not very palatable. Cattle may reject if other forage choices available.	Mix cereal straw with other higher quality feeds in a mixer wagon if possible.
Conservation methods vary (variable DM, time of baling after grain harvest, storage), so products may be prone to mould growth, increasing the risk of mycotoxins (fungal toxins).	Check product before you buy, and as you feed out.
Excess intakes by far-off dry cows and young stock may result in body condition loss/poor growth. Mycotoxins may also put pregnant cows at risk.	Not an ideal feed for far-off dry cows and young stock unless well managed. May be better to feed to milkers in small amounts, e.g. 2 kg/cow/day.
Potential chemical residue risk	Limit daily consumption of cereal straw to 30% of dry matter intake. Purchase cereal straw with a vendor commodity declaration.

Acidosis – do you really understand fibre? Not sure? Ask your adviser.

Rice straw

- A poor nutritional quality forage, but high effective fibre value.
- Its sole purpose in the diet is to help stimulate chewing and saliva production, and maintain a fibre mat in the rumen.
- Low in energy and protein.
- High in silica and low in lignin compared to other straws.
- Beware palatability and intake issues.

Keep in mind	Management tip
Not very palatable. Cattle may reject if other forage choices available.	Mix rice straw with other higher quality feeds in a mixer wagon if possible. If not, provide rice straw as the sole forage source, rather than giving animals a choice between rice straw and another straw or hay.
Conservation methods vary (variable DM, time of baling after rice harvest, storage), so products may be prone to mould growth, increasing the risk of mycotoxins (fungal toxins).	Check product before you buy, and as you feed out.
Excess intakes by far-off dry cows and young stock may result in body condition loss/poor growth. Mycotoxins may also put pregnant cows at risk.	Not an ideal feed for far-off dry cows and young stock unless well managed. May be better to feed to milkers in small amounts, e.g. 2 kg/cow/day.
Prolonged feeding may result in urinary stones	Limit daily consumption of rice straw to 10% of dry matter intake.
Potential chemical residue risk	Purchase rice straw with a vendor commodity declaration.

Sugar cane product

- A low nutritional quality forage, but high effective fibre value. Varies widely in nutritive value.
- By-products of sugar production.
- Sourced from cane growers in NSW and Queensland.
- Two main products: whole plant sugar cane forage (silage or hay), and sugar cane tops (hay).
- Cane varies considerably in nutritive value depending on its age, variety and amount of frosting.
- Silage may contain some significant residual alcohol (6–17%).
- High in iron, magnesium, potassium, manganese, cobalt, and aluminium (which may interfere with phosphorus absorption).
- High DCAD value.

Keep in mind	Management tip
Wide range of nutritive values	Get a feed test so you know what you are feeding. Avoid product from cane harvested at more than 12 months of age. Avoid product from thick stemmed sugar cane varieties. Avoid severely frosted cane (with significant damage to the crown).
Low energy content	Limit sugar cane products to max. 5–8 kg DM/cow/day in lactating cow diets. If feeding to dry cows and young stock, ensure diet is well balanced for energy, protein, calcium and phosphorus.
Sugar cane has a high DCAD value	Do not formulate in transition diets pre-calving.
Cattle have a low tolerance for alcohol. Risk of alcohol poisoning (sugar cane silage).	Check that product was well ensiled, using additives. Be alert for signs of alcohol poisoning if silage has a strong alcoholic smell.
Potential chemical residue risk	Limit daily consumption of sugar cane silage to 40% of dry matter intake.* Purchase sugar cane products with a vendor commodity declaration. Purchase crops which have a good record of chemical use and a low risk of spray drift from surrounding crops. Do not accept fodder containing soil.
Reports of cases of stomach ulceration (abomasum) in cows when fed sugar cane.	Be alert for any problems.

*Maximum daily intake depends on nutrient value, age of cow and stage of lactation

Grape marc (raw) meal

- A forage extender, not a grain replacer. Varies widely in nutritive value.
- By-products of red and white wine production.
- Sourced from winemakers throughout Australia.
- Whole seeds are largely indigestible.
- High in tannins, which tend to bind much of the protein.
- May contain some residual alcohol.
- Oil content: approx. 8%.
- Likely to be low in pH. May contain some residual alcohol.

Keep in mind	Management tip
Wide range of nutritive values.	Get a feed test so you know what you are feeding.
High feeding rates for extended periods without effective fibre sources may lead to animals suffering impacted stomachs.	Always feed grape marc with a palatable, good quality straw/hay.
If feeding out using a front end loader (FEL), you need to know how many kilograms per bucket, to ensure you don't under or over feed.	Weigh the FEL with and without the bucket full of grape marc, or estimate using the grape marc's bulk density (kg/litre) and your bucket's volume.
Cattle have a low tolerance for alcohol. Risk of alcohol poisoning.	Limit daily consumption of grape marc to 10% of dry matter intake.*
Prone to mould growth if exposed to the weather for extended periods, increasing the risk of mycotoxins (fungal toxins).	Store grape marc under cover, if possible. Feed within 7 days of delivery to the farm.
Potential chemical residue risk, also heavy metals.	Limit daily consumption of grape marc to 10% of dry matter intake.* Purchase grape marc with a vendor commodity declaration.

*Maximum daily intake depends on nutrient value, age of cow and stage of lactation.

Pelleted grape marc

Buying grape marc in pelleted form may be an option. Potential advantages over raw grape marc are:

- Higher digestibility, because grape seeds and skins are dried and hammer-milled before pelleting.
- Less prone to mould growth, given dry matter content is much higher (approx. 90%).
- Can be stored in a silo, rather than on the ground.

The table below lists typical values for some alternative fibre sources. Ranges have been included in brackets.

Table 1 Nutrient values of some alternative fibre sources

Feed	Dry matter* (%)	Metab. energy* (MJ/kg DM)	Crude protein* (% DM)	NDF* (% DM)	Digestibility	Effective fibre value
Almond hulls (whole)	90 (88–92)	10 (8.5–10.5)	5 (4–6)	35 (30–45)	Medium	Medium
Almond hulls (milled)	90 (88–92)	10 (8.5–10.5)	5 (4–6)	35 (30–45)	Medium	Low
Barley straw	89 (74–93)	6.5 (2.2–8.5)	2.8 (0.2–28.8)	77 (55–87)	Low	High
Oat straw	89 (73–93)	6.2 (4.3–10)	2.8 (0.1–11.9)	73 (55–79)	Low	High
Palm kernel meal	94 (91–96)	11.1 (9.3–12.4)	15.7 (14.8–16.3)	65 (55–74)	Medium	Low
Rice straw	85 (52–94)	6.7 (5.3–8.9)	4.0 (1.9–5)	63 (54–69)	Low	High
Wheat straw	92 (65–96)	5.1 (3.8–9.3)	2.8 (0.2–8.8)	73 (54–86)	Low	High
Sugarcane (silage)	68 (37.7–97.9)	7.5 (3.0–9.5)	4.3	61	Medium	High
Sugarcane (hay)	93 (90.8–95.7)	7.5 (3.0–9.5)	6.5 (3.2–9.8)	67 (56.9–77.3)	Medium	High
Grape marc meal (raw)	55 (19.6–93.9)	6.5 (2.3–12.1)	12.2 (5.4–18.5)	48 (20.3–60.6)	Low	Low

*Nutrient values of feeds can be highly variable and there is no substitute for actual sampling and testing of the feed in question.

Glossary

Dry matter

The proportion of the feed that is not water.

Metabolisable energy

- Decide where each feed fits in with other feeds you are offering.
- Determine how many megajoules (MJ) of ME per kilogram you need to achieve your target milk production and cow body condition.

Crude protein

Cow requirements for CP vary according to stage of lactation and range from 16–18% in early lactation, dropping to 11–12% during the dry period.

Neutral Detergent Fibre (NDF)

- The suggested dietary NDF level for a high-production milker diet is 28–35% of total DM. Greater than 35% will reduce dry matter intake.
- A dietary NDF level less than 28% is high risk for ruminal acidosis.

Physically effective fibre value

This refers to the ability of a feed to stimulate chewing activity and the production of saliva. Each feed is rated high, medium or low.

Stock water planning

Have you got enough stock water?

The stock water budgeting tool has been created to help you asses your risk of running short of stock water at key times of the year. The tool has been designed to only take 10–15 minutes and to use data you are likely to already know.

To complete this tool, enter information on:

1 Your herd size and milking shed (to calculate your water use). This includes number of: milking cows, replacement heifers, calves, bulls and dry cows

2 Based on the table supplied, enter your dairy shed's water use

3 On-farm storage length, width, depth and volume (dams and tanks).

From this, you will have created a *days of water* graph which summarises your water storage and use. The graph demonstrates the number of days of water you have in storage on the first day of each month.

The data is used to estimate, from the first day of each month, how many days water supply you have available if there was no further effective rain for that month.

The estimate is only based on your onfarm storage and does not consider sources you may be able to access like spring, pumping from waterways or bores. This tool will help you to see when these alternative supplies will be most important, it can also give you an indication of the amount of water that your farm requires from these sources.

Key messages

You can't cut back cattle water requirements – you either need to save more in the dairy shed, or increase your storage

On average, a milking cow needs at least 155 litres of water per day, and more in the warmer months

Decreasing farm water use

To decrease farm water use, you need to look at water use in the dairy shed (since reducing stock water consumption by a significant amount is neither desirable nor possible). In the shed, the two largest uses of water are yard cleaning and milk cooling. The majority water savings possible in these areas comes from re-use of this water.

Increasing supply and storage

The long term solution to a shortage of stock water is very likely to be to increase farm water supply or on farm storage.

You can find the stock water planning and budgeting tool at **dairyaustralia.com.au**.

Pasture renovation in autumn

Home grown feed on a dairy farm is most often the lowest cost feed source. Repairing rundown and severely drought affected dairy pastures is a high priority but can be an expensive process. This fact sheet provides tips on methods used for resowing or renovating paddocks that should give the most cost effective and quick results.

Planning your renovation program

Start by assessing and prioritising paddocks, and in some cases parts of paddocks, that will benefit from resowing or full renovation. These may include:

- Higher fertility areas that will respond quickly with a simple resowing and start contributing to the grazing rotation. These may be the highest priority.
- Mid-range soil fertility areas that will require more preparation time and fertiliser/effluent cost but give a good response for this winter.
- Rundown pastures – perhaps regular silage/hay paddocks that will respond well to renovation as well as the addition of strategic fertiliser to support grazing early and production of multiple fodder cuts later in the year.
- Farm areas that have not performed very well for years, and require time consuming and costly renovation. These may be a lower priority and may need short term species sown before sowing back to perennial grasses e.g. an annual ryegrass followed by a fodder crop next summer.

Test soil samples from strategic areas on the farm if this has not been done in the past three years. The results will help prioritise the paddocks to resow first, determine program and application rates of base and maintenance phosphorus, potassium and sulphur. Contact your agronomist for further information.

Key messages

Select paddocks that will respond quickly to resowing/full renovation

Choose species suitable for the soil type, rainfall and climate

Paddock condition, time and budget will determine whether to oversow or do a full renovation

Use appropriate fertiliser, seed, herbicides and management for best results

The workload required and costs of the renovation program will assist in deciding what paddocks and how many paddocks can be renovated.

Ensure that contractors are booked in advance and that the budget for the program includes soil testing, fertiliser, seed, contractors and extra labour if required.

Species selection and purchasing seed

Secure your seed early. Pastures have been severely impacted in many dairying regions hence the demand for seed in autumn is expected to be high. Choose pasture and crop species appropriate to your rainfall, soil type and farming practices. The most commonly sown pasture species in dairying regions are ryegrasses. Other species options include fescue, cocksfoot, lucerne and winter cereals. Contact an agronomist in your area to seek information on species and varieties that perform well under the conditions in your district.

If insects are a potential threat to your newly sown pastures, consider combining techniques that might help improve the establishment of your pasture and/or crop. Seed treatments can provide protection against insect attack during establishment. Consider using seed with endophyte for protection against insects if sowing ryegrass or fescue pastures.

For further information on endophytes see the Dairy Australia *Understanding pasture endophytes* fact sheet. If in doubt, seek professional advice to ensure the correct choice is made for your farm.

Selecting ryegrass

A key selection criteria when choosing ryegrass is to look for varieties with heading dates appropriate to your region. The later the heading date the longer the plant will hold feed quality through spring and into summer.

Selecting species for difficult soils

In those soils where ryegrasses do not persist, for example light well drained sandy soils or heavy clay cracking soils, different species may be more suitable than ryegrass.

Other species options cereals, legume and ryegrass blends

Blends can be oversown into the existing drought damaged pasture early e.g. dry sown early or at the 'break' to get the maximum feed for winter. Some of these sowing combinations or blends of species may include:

- Oats
- Barley
- Shaftal clover
- Subterranean clover
- Annual ryegrass
- Italian ryegrass
- Winter rape crops.

Note: Insect pests could be a problem, particularly redlegged earth mite and cockchafers as well as broadleaf weeds.

Table 1 Overview of traits of different types of ryegrass.

Ryegrasses	Comments
Annual	Usually persist for one year, can cope with wet feet, and produce quick winter feed, silage and hay. Suited to 500mm rainfall and irrigation.
Italian or short term	Persist from 1 to 3 years, good winter growth, good for silage and hay. Suited to districts with normally high rainfall – 600mm+ or irrigation.
Perennials	Persist from 1 to 3 years, good winter growth, good for silage and hay. Suited to districts with normally high rainfall – 600mm+ or irrigation.
Perennials	There are many varieties to select from in this category that could be sown in districts receiving as low as 500mm rainfall through to irrigation. Avoid older varieties of ryegrasses which are now outclassed. Select from the newer varieties that are still persisting and producing well in your district under similar soil type, soil fertility and grazing conditions to your farm.See the Forage Value Index: select the ryegrass that suits your farm fact sheet for further information.

Soil types	Comments
Light sandy	There are some new varieties of cocksfoot grass that show good tillering growth and persistence in the light sandy soils, they will survive in districts down to 400mm+ rainfall. Other varieties of cocksfoot are more suited to 600mm and 700mm.Cocksfoots won't have the feed value of ryegrass, but can respond well to summer rains. Cocksfoots are also tolerant to acidic soils and elevated aluminium. Sow into cultivated seedbeds, seed rates vary from 5–10kg seed/ha.
Heavy cracking clay	Summer active tall fescue grass varieties when kept well grazed are palatable, productive and persistent under dairying conditions, however they are slow growing in winter. Fescue will tolerate heavy wet soils, low to moderate salinity, and responds well to nitrogen fertiliser. There are varieties that can survive in a range of rainfall and irrigation locations. Sow into cultivated seedbeds, seed rates vary from 20–25kg seed/ha.

Sowing method options

Resowing options include complete cultivation, shallow cultivation or oversowing. The pasture density, weed density, fibrous root mat and level of pugging damage will determine which method is most appropriate for the paddock.

Establishing ryegrass into an existing pasture

To establish ryegrass in an existing pasture removal or reduction of the clumpy pasture and weeds is critical. This can be achieved by either:

- Completely spraying out the old pasture two weeks prior to shallow cultivation and resowing.
- Grazing the damaged pasture hard, to reduce the clumpy pasture and weeds, and then spray with a very low rate of herbicide, and drill sow the following day. This allows the sown grass seed to establish whilst 'suppressing' the existing ground cover.
- For irrigation paddocks, where there are large amounts of summer grasses, e.g. paspalum and couch grass, full cultivation after herbicide application might be the appropriate sowing method. Allow at least 20 days for the spray to kill and breakdown the root material. Avoid sowing into a dense solid root mat soils without first going into a chemical control and cultivation program.

Application of nitrogen and phosphorus at sowing is recommended. These nutrients give the establishing plants the best chance to quickly develop a large root system for drawing on nutrients and moisture and becoming a strong vigorous sward.

This would suit both dryland and irrigation where there is no more than 15% fibrous rooted grasses, e.g. paspalum, couch and bent grasses.

Ryegrass seeding rates may vary for uncultivated (25kg seed/ha) or cultivated (30+kg seed/ha) sowing methods.

The recommended sowing depth for ryegrass is very shallow at 1–2cm. Roll the surface after sowing to ensure good seed soil contact. Harrowing after sowing should be avoided as this tends to bury the seed and/or breaks up the concentration of seed and fertiliser.

Graze the new sward as soon as the plants have sufficient root system to anchor them in the soil. This may be at an approximate height of 75mm. Do the 'pull' test to check. Control weeds early, preferably after the first grazing if they are chocking the pasture.

Applications of nitrogen will maintain strong vigorous pasture growth. See Dairy Australia *Nitrogen in Autumn* fact sheet for more information on using nitrogen on pastures

Forage Value Index

Select the perennial ryegrass that suits your farm

Better pastures, better profitability

Australian dairy farmers invest more than $100 million renovating pastures each year. Until recently, there has been no easy way of assessing the agronomic performance or potential economic benefit of different cultivars for use in dairy production.

The Forage Value Index (FVI) is a tool that helps Australian dairy farmers and their advisors to make more informed decisions when selecting perennial ryegrass cultivars. It provides an accurate, reliable and independent assessment of the potential economic value of perennial ryegrass cultivars in different dairy regions of south-east Australia. The selection of better performing cultivars will help to increase pasture productivity at key times of the year and ultimately, farm profitability.

Green equals success

The FVI is calculated by multiplying the Performance Value of each cultivar (i.e. total kilograms dry matter produced per hectare per season) by its Economic Value (i.e. the estimated value of this extra production per season).

Forage Value Index = Performance Value x Economic Value

Performance Values (PV) are determined by industry assessed trial data. Economic Values (EV) are determined by economic model that accounts for either the replacement cost of feed in deficit or the value of surplus feed as hay or silage in a given region, depending on the season and region. The PV is expressed as a percentage relative to a well-established reference cultivar in each of the three species (Tetila, Crusader and Victorian). The FVI for each cultivar is expressed as a colour, whereby those cultivars with the same colour are not significantly different to each other. The green colour indicates those cultivars that have performed the best in the trials and have the most potential to contribute to operating profit.

Accessing the information

The FVI information allows users to rank cultivars according to their region and user nominated attributes (e.g. seasonal yields, ploidy, heading date, endophyte). The number of trials where the cultivar has been evaluated is also included to provide some idea of robustness of the data for each variety. The FVI can be accessed on the Dairy Australia website.

Independent local data

FVI ratings are calculated annually using independent industry variety trial data. To be included in the FVI database, each Perennial ryegrass cultivar must have data from at least three three-year trials that have been conducted using strict industry protocols. Additional trial data, regional performance data, new cultivars, new traits and other pasture and forage species will be added over time. Only cultivars listed in the Australian Seed Federation Pasture Seed Database and confirmed as a 'variety' are used in the FVI. For more information visit asf.asn.au/seeds/pasture-seed-database/

An industry initiative

The FVI was developed as a partnership between several industry associations and government bodies as part of a wider strategy to increase the productivity and profitability of Australian dairy farms. They include Dairy Australia, the Pasture Trials Network, Agriculture Victoria, DairyNZ, the Australian Seed Federation and Meat and Livestock Australia.

DataGene Solutions for Herd Development

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PASTURE TRIALS NETWORK

Nitrogen pasture costs compared to other feeds

How much does pasture cost to grow using nitrogen (N)?

Pasture responses to N in autumn are often less than those in spring due to low soil moisture and high soil N, both as a consequence of dry seasons. For example, the pasture dry matter (DM) response to N fertiliser in west Gippsland, applied directly after the autumn break, showed N responses of only 6:1 when applying 20kg N/ha in 9 out of 18 years.

Nitrogen fertiliser can be applied when the pasture is actively growing to assist in filling feed gaps, but the potential response should always be compared to the cost of buying the same feed – this ensures that N fertiliser is only applied when it is more cost-effective than other options.

Applying N in dry conditions to pasture, may result in a pasture DM response of less than 5kg extra DM per kg N applied.

Table 1 Variation in the cost of additional pasture consumed at three urea prices – $600, $1200 and $1500/tonne. Utilisation column assumes this is the utilisation of the extra pasture produced. 100% utilisation of extra pasture produced is achievable.

Extra response kg DM/kg N	Utilisation (%)	Cost $/t DM at $600/t of urea	Cost $/t DM at $1200/t of urea	Cost $/t DM at $1500/t of urea
High response 20:1	100	65	130	165
	75	85	175	220
Average response 10:1	100	130	260	325
	75	175	350	435
Low response 5:1	100	260	520	650
	75	350	695	870
Very low response 3:1	100	435	870	1090
	75	580	1160	1450

Key messages

At higher N fertiliser prices, a greater response to N is required to justify the use of fertiliser to grow extra feed.

Ensure soil moisture is adequate to sustain pasture regrowth and N response.

Apply N when it is more cost effective than alternative feed sources. Use the price of the alternative feed to calculate the break even point.

Utilising as close to 100% as possible of any extra feed grown with fertiliser is key to optimise the economics of N use.

At a urea price of $1200/t and a grain price of approx $350/t DM, a response to N fertiliser of around 10:1 or greater is needed to justify the use of N fertiliser.

Table 1 shows that at a response rate of 5:1, when urea was $600/t, and utilisation was 100%, grain needed to be cheaper than $260/t DM to make it a more profitable option than N fertiliser. However this situation changes at $1200/t urea – a farmer in this situation needs to source grain less than $520/t DM to make it a more profitable choice than urea. This is the case even if 100% utilisation is achieved, if a 5:1 response is all that can be achieved. Include the costs of delivery and spreading in your urea option costs. Include the cartage and wastage costs in your grain/fodder option costs.

Knowing the pasture response rate required to be better off than purchasing other feeds is essntial.

The utilisation rate of the extra pasture grown is an important consideration, and becomes even more so when the urea price is high. It is possible to utilise 100% of the extra feed grown from urea application. However, this requires good pasture management and precise supplement allocation to the herd, to ensure that the exact same post grazing residual is left remaining in the paddock regardless of whether urea has been applied to or not.

Nitrogen (N) fertiliser use on dairy pastures

Best management practices

These were developed to ensure maximum nitrogen use efficiency (NUE), while also minimising avoidable environmental losses. Remember, losses of N are wasted input costs.

General guidelines for N management

- **Apply N strategically, rather than by a fixed recipe.** Before each N application estimate the likely N response (i.e. experience, consultants) and compare the cost of the additional pasture produced to other purchased feed options.
- **Only apply N when pasture is actively growing and can utilise the N.** Ensure that soil moisture is adequate to sustain the regrowth, rainfall is likely in the regrowth period, temperatures are conducive to good pasture growth, there is a good species composition and other major soil nutrients are non-limiting (see Fert$mart guidelines for other nutrient requirements).
- **Apply N at rates of 20 to 50 kg N/ha per application, no closer than 21 days apart at the lighter rates and preferably at least 28 days apart at high rates.** It can be useful to multiply the daily equivalent N rate by the interval between N applications (e.g. **1.5 kg N/ha per day by 21 days = 32 kg N/ha applied**). During the peak growth period, with good soil fertility and newer cultivars, it may be justified to increase the maximum rate to 60 kg N/ha for a single grazing rotation in spring.
- **Ensure that the extra pasture grown is utilised** either through grazing or as harvested forage, as utilisation has a big impact on the economics of using N. Likewise over-grazing of pasture can lead to delayed response to N in the following grazing rotation.

Right Rate

- The most efficient pasture growth responses occur when N fertiliser is applied at rates of between 20-50 kg N/ha at any one time. This is because the steepest response to N occurs at these rates and drops off as rates increase.
- Do not apply above 50 kg N/ha in any single application and do not apply N closer than 21 days apart, as this will increase N losses exponentially and may risk animal health. The exception may be on highly productive pastures, through their peak growth period, with a newer cultivar, and where soil moisture is not limiting, then pastures may respond to rates of 60 kg N/ha per application for a single grazing rotation in spring.
- Applying less than 20 kg N/ha in any single application will often produce unpredictable N responses i.e. 20 kg N/ha on 2 ha may produce less than 40 kg N on 1 ha. Likewise, 80 kg N applied to 1 hectare (80 kg N/ha) is likely to produce less pasture than applying 80 kg N to 2 hectares (40 kg N/ha) due to decreasing N responses on the flat part of the curve.

Right Place

- Apply N to pastures with a high density of desirable species. Ryegrass and kikuyu pastures will respond better to N than other less desirable pasture types or weedy pastures.
- Apply N to pastures with a good ground cover. Gaps or bare areas in pastures will result in more N lost through leaching, denitrification, run-off and volatilisation.
- Apply N to pastures that have no limitations to major soil nutrients. Regularly soil testing will establish the nutrient status of the soil and if other major nutrients or pH are limiting growth, these can be addressed before or at the same time as the N application (see Fert$mart guidelines **fertsmart.dairyingfortomorrow.com.au**/**farm-advisors**/**soil-fertility-guidelines**/ for other nutrient requirements).
- Do not apply N to pastures that are drought stressed, or water-logged (i.e. where water is running off the surface), or where they will be grazed at less than 2.5-leaf regrowth stage (or canopy closure) for temperate grasses (e.g. ryegrass) and 3-leaf stage for tropical grasses (e.g. kikuyu and paspalum).
- Consider applying less N to the front half of a paddock than the back, as cows transfer N towards the gate.
- Avoid applying N to animal hot spots (e.g. gateways, water troughs, shelter belts, stock camps) as these areas have high N loading already and are prime N loss areas on dairy farms.

Right Time

- Apply N as soon after grazing as possible, as this is when plants need access to N for maximum regrowth potential.
  - As a rule, for every day you delay applying N post-grazing, you can lose 1% of the potential N response.
- Avoid grazing until growth has reached at least the 2.5-leaf stage (or canopy closure) for temperate grasses (e.g. ryegrass), or the 3-leaf stage for tropical grasses (e.g. kikuyu, paspalum), to maximise the nitrogen use efficiency, the energy: protein ratio in the diet and therefore the amount of N excreted or lost.
- Temperate pasture grasses (e.g. ryegrass) generally respond to N fertiliser when soil temperatures (at 10 cm) are above 4°C, and subtropical pasture grasses (e.g. kikuyu) respond to N fertiliser when soil temperatures are above 10°C. Remember, this is the average soil temperature at 10 cm over the regrowth period, NOT just on the day of application.
- Autumn and summer N responses on dryland pastures are highly dependent on adequate soil moisture.
  - Don't apply N unless there is adequate soil moisture in the root zone from either irrigation or rainfall, plus there is a good prospect of irrigation or rainfall to follow through the regrowth period (e.g. summer and autumn in southern Australia).
  - In southern Australia, following a wet summer with active pasture growth, there will be little N left in the soil at the autumn break, meaning there will be a reasonable response to applied N when the rains start. In contrast, if the summer is dry there will substantial mineralisation of soil organic N, but little pasture growth to utilise this, meaning a dry soil profile with plenty of left-over N leading to a poor response to applied N at the break.
  - In sub-tropical east coast Australia, a lower N response should be expected in late summer/autumn due to high amounts of soil organic N mineralisation and N application frequency and rates can be reduced accordingly. N losses are likely to be lower in the late winter/spring so higher rates can be applied.
  - Irrigation at the start of the season should commence before the soil water content drops below the Readily Available Water (RAW) zone, as it is difficult to bring the soil water back into the RAW zone for optimum pasture growth rate, thereby limiting the potential response to N fertiliser.

Right source

- **Urea** is currently the cheapest pure source of N.
  - Assuming soil moisture is adequate for pasture growth, ammonia losses from urea fertiliser are usually not large enough to justify the price per unit N of other sources.
  - If applying N to waterlogged soils, an ammoniated source (e.g. urea, ammonium sulfate) is better than using a nitrate source (e.g. Urea Ammonium Nitrate).
  - While liquid sources of N are typically as effective as solid N sources, if applied at the same rate of N, foliar uptake of N alone is unlikely to meet the N requirements of pasture.
- As **inhibitor coated fertilisers** cost more per unit of N and seldom produce additional pasture, they are only cost-effective if the N rate applied is reduced by the expected reduction in N loss. Urease inhibitors are only required in situations where high ammonia loss is expected, such as autumn on dryland systems (see Managing ammonia losses).
- Other **inhibitor coated fertilisers** demonstrate variable effectiveness. Nitrification inhibitors (e.g. ENTEC®) have been shown to produce similar yield responses with 20% reduced application rates on heavier soils after prolonged use. Currently available slow-release urea products (e.g. polymers) are not cost effective on dairy pastures.
- **Other nutrients:** The response to N will be limited by the availability of other nutrients. Ensure adequacy of macro (P, K, S) and micro-nutrients (e.g. Molybdenum), based on regular soil and plant analysis.
- **Di-Ammonium Phosphate (DAP)** is a cost-effective source of N, if the P is needed at the same time.
  - When using DAP, calculate the P rate required first then consider 'topping up' with urea to ensure an adequate N fertiliser rate i.e. 100 kg of DAP/ha will only apply 18 kg N/ha, which may not produce a predictable N response.
  - When applying N and P fertiliser together, defer to the Fert$mart guidelines for minimising run-off losses of P.
- **Sulfur (S):** Low soil available S can reduce the response to N. Ammonium sulfate or S blends can be a useful source of both N and replacing soil S, particularly where single-superphosphate has not been applied for a few years.
  - Ammonium sulfate is an expensive form of N and it will acidify the soil rapidly with regular use.
  - Sulfate can also leach out from free draining soils during high rainfall or irrigation, so only apply the S when needed and at the recommended rate.
- **Lime:** Where N fertiliser is applied regularly and at high rates, depending on soil type, a proactive strategy of soil testing and liming may be required to prevent soil acidification.

Other factors to consider

Soil N mineralisation

- Around 1-2% of organic N will be mineralised from soil organic matter annually (approximately 150 to 250 kg N/ha), but mainly supplied in the warmer months.
- In southern Australia, soil N mineralised and not utilised by the pasture over a dry summer means there will be surplus N in the soil at the autumn break; thus only apply N later in autumn once deeper soil moisture is adequate and pasture growth has resumed. As mineralisation of organic N is low in winter, N fertiliser will be required to maximise pasture growth.
- In subtropical regions, dry periods (3-6 weeks) in spring (October) or summer (January) can cause pasture growth to cease while N mineralisation continues, building available N in the soil. However, profitable responses to applied N are still possible where rainfall events exceed 75-100 mm, especially for producing silage.

Managing ammonia losses

- Ammonia loss is highest under hot, dry, windy conditions. Ammonia losses from urea are also highest during the first 48 hours after application, while the urea granule is breaking down to ammonia (called hydrolysis).
- As a general principle, ammonia volatilisation losses from urea should be small, if best practice is followed i.e. do not apply urea where soil moisture is limiting, especially on hot and windy days.
- Between the cooler, wetter months (May to November in southern Australia), or under irrigation in the sub-tropical annual ryegrass season, ammonia volatilisation losses from urea fertiliser are too small to justify switching to higher-cost N fertiliser sources. During this period, urea does not need to be watered into the soil – assuming there is enough soil moisture, rainfall or irrigation to justify the N, as urea will be able to absorb enough moisture to dissolve.
- Ammonia volatilisation losses in summer average around 10 to 15% under dryland conditions, which still does not economically justify switching to other more expensive sources of N. Avoid applying urea fertiliser the day after a rainfall event during periods when potential evaporation is high (e.g. hot, dry and windy), as this may increase volatilisation losses above 30%. Under these conditions, irrigating after urea application will greatly reduce ammonia loss.
- If urea fertiliser is applied in drier periods without irrigation (November to March in southern Australia) you can apply the urea 2 to 3 days prior to grazing to minimise wind speed at ground level and reduce ammonia volatilisation during the critical loss period (first 48 hours). Care must be taken to avoid cows ingesting lumps of fertiliser as this could lead to ammonia toxicity.

Managing ammonia losses – spray irrigated pastures

- Apply N fertiliser within 24 hours prior to spray irrigation.
- In summer, where evaporation is high, avoid applying urea fertiliser after irrigation as this is likely to increase volatilisation losses.

Managing ammonia losses - flood irrigation

- Urea is best applied just before irrigation but minimise run off into drains, as this will carry dissolved urea. In some cases, not fertilising the last few metres of the irrigation bay can capture the urea dissolved in the irrigation head water.
- If urea fertiliser is applied after flood irrigation, soil moisture should be adequate to dissolve the urea and minimise volatilisation, but avoid wheel damage to the wet soils.

Minimising nitrate leaching and denitrification

- Avoid applying N fertiliser to warm (>10°C), waterlogged soils, as this increases the risk of N loss through denitrification.
- If applying N to cold (<10°C), wet soils use urea or ammonium based fertilisers and avoid nitrate based fertilisers (e.g. UAN).
- Avoid applying N fertiliser near streams/riparian zones and over drainage lines within a paddock.
- If irrigating, take care to avoid overwatering, as this may result in nitrate leaching and run-off of dissolved urea, as well as inefficient water use.
- Avoid applying high rates of N fertiliser to free draining soils during periods of high leaching potential (e.g. high rainfall).
- Use of nitrification inhibitors may be warranted in high drainage or waterlogged sites to prevent N losses to the environment (nitrate leaching, gaseous loss by denitrification).

Minimising surface runoff losses

- The volume of water lost as runoff determines the N lost in runoff – avoid overwatering and surface runoff.
  - Use a weather forecast to minimise runoff after N application. When soils are saturated, wait at least 2 days after rainfall for excess run-off water to drain, before applying N.
  - Where possible, re-use drainage water.
- Do not apply N fertiliser near drains, channels, dams, lakes or riparian areas. In a hump and hollow, avoiding applying N to the hollow as this is likely to receive N through surface movement anyway.

Dung and urine management

- Minimise the time that cows spend in the laneways and ensure that runoff from laneways, feedpads, sacrifice paddocks or other standoff areas drain to pastures and not directly into waterways.
- Effluent should be viewed as a valuable fertiliser resource, and nutrient testing should be used to ensure that no more than 50 kg N/ha is applied to a pasture at a time.
- High stocking density will result in high losses of N from hot spots in the farm.

Animal health and nitrogen

- Avoid high rates of N fertiliser on annual ryegrass and kikuyu, as these can accumulate potentially toxic levels of nitrate. Perennial ryegrass, fescue, cocksfoot and white clover are not known to accumulate toxic levels of nitrate.
- If nitrate toxicity is of concern, do not graze pastures 7 to 14 days after N fertilisation or if water-limited as nitrate levels increase in water-stressed plants. Likewise, do not graze pastures 14 to 18 days after N fertilisation if pastures are high in crude protein (e.g. spring or autumn with high N fertiliser rates) and animals are not receiving an energy supplement or lower quality hay or silage to counterbalance the high N in the pastures.
- Do not apply more than 60 kg N/ha in a single application, particularly with higher pasture growth in autumn and spring.
- Avoid subjecting cows to rapid diet change e.g. from low to high quality pasture, or to pasture with capeweed or volunteer brassicas, especially dry cows or heifers. Likewise, never give starved, unadapted or dry cows, unrestricted access to highly N fertilised pastures.
- Cows that are suffering as a result of excess N in their diet tend to select for lower quality roughage. A bale of low quality 'bedding' hay in the corner of the paddock can be used as an indicator of protein or nitrate stress.

Fitting winter crops into your grazing system

Autumn is a critical time to plan and invest in your feedbase. Many farmers consider a range of autumn sowing options. Depending on the region, the options may typically include:

- Re-sowing a new permanent perennial ryegrass or fescue sward
- Sowing an annual ryegrass or a bi-annual Italian ryegrass
- Sowing a winter cereal
- Sowing lucerne
- Sowing a seed blend or mix that will complement each other and provide extra dry matter in early winter, for example ryecorn and annual ryegrass or forage rape and ryegrass.

Winter cereals are an option to increase flexibility and water use efficiency, particularly in dry seasons. These may be grazed, or used as a component of a partial mixed ration or total mixed ration to compliment nutritional requirements. Winter cereals might be used as part of a long term paddock rotation strategy and as a risk management strategy.

Have you weighed up the options?

Always identify clearly where a winter cereal fits into your farming system and compare the options against other forage types suitable for your business, as well as the cost of substitute feeds on the market. Having a clear understanding why sowing a winter crop is the best option for your farm, backed up by financial analysis of how it costs compared to other options is also important.

Key messages

Identify where a winter crop fits into your system – know your monthly feed demand

Winter cereals generally provide more quick, early autumn feed than ryegrass

Cereals are often more suited to areas with low autumn rainfall levels

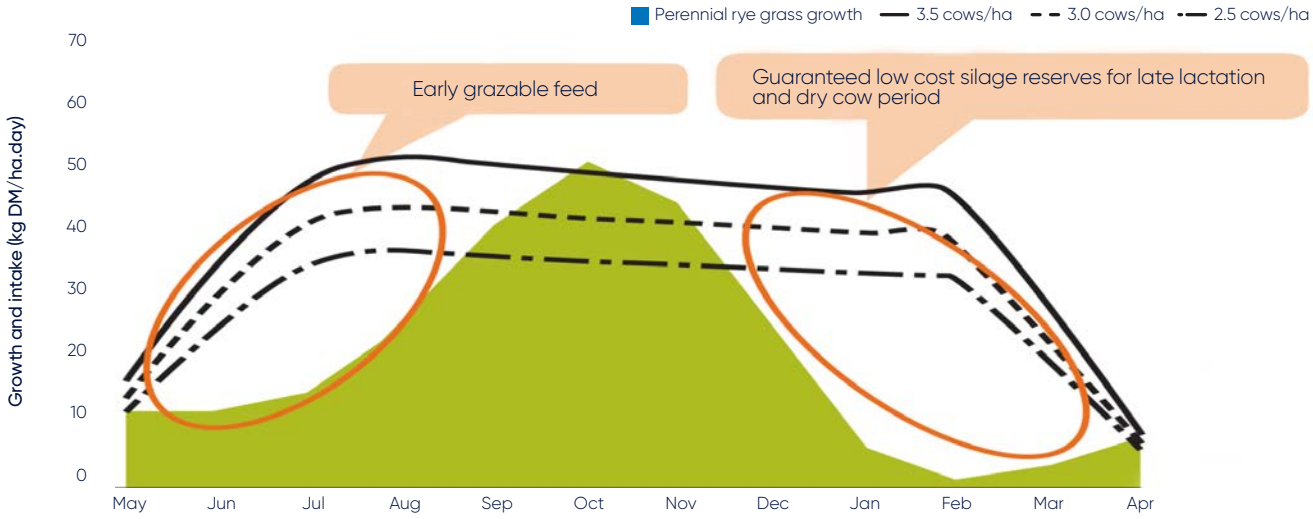
Cereals can be a good risk management tool to diversify your feedbase.

The following are some factors to consider when deciding whether to sow a winter cereal crop:

- **Feed demand:** What is the herd feed demand during autumn, winter and spring? Herd feed demand is directly related to the calving pattern and stocking rate. Farms that are predominantly or fully autumn calving will reach peak herd feed demand in early winter. On a perennial ryegrass based dairy system, the majority of annual DM is usually grown between August and December so there needs to be a strategy in place to provide feed in late autumn/early winter. Winter cereals can offer a good opportunity in these types of systems. Spring calving herds will have a lower herd feed demand in late autumn/winter and hence may not need as much area devoted to winter cropping. Figure 1 shows an example from Terang in south west Victoria of the typical perennial ryegrass growth rate and herd feed demand (May–July calving) at three different stocking rates, and where gaps in the feedbase will occur
- **For PMR and TMR systems**, with split calving periods, winter cereals can provide a range of feed including silage, hay and grain, to be used at critical times throughout the year
- **Early new growth**: Winter cereals are generally quick to establish and grow early. In some regions where perennial ryegrass does not usually persist over summer without irrigation, such as north east Victoria, sowing oats in late February/early March on 10% of the milking area successfully provides the first autumn grazing's when perennial pasture availability is very limited

- **Driving water use efficiency:** Dairy Australia's Project 30301 showed good potential for winter cereals (oats, barley, triticale) in some areas of south eastern Australia (such as Yarram in Gippsland) where autumn/early winter rainfall levels are relatively low
- In these circumstances, their higher water use efficiency means they are likely to provide more feed than annual or perennial ryegrass in early winter. On the other hand, if long range forecasts indicate higher than average rainfall from April-June, ryegrass may be a better alternative than cereals
- **Risk management:** Adding a winter crop can provide the flexibility of end products such as silage, hay or grain, providing extra options if there is a poor finish to spring.
- **Flexibility with irrigation water use:** If you have irrigation available, this may also be a factor in your decision. Winter cereals' higher water use efficiency can drive a higher return on water applied, and the versatility in end product can provide options if water availability decreases at the end of the season. Taking winter cereals to grain in an irrigated system can also provide a critical opportunity for soil remediation through complete drying of the profile and increased integration of soil organic matter through stubble incorporation
- **Utilising fragmented land or outblocks:** How your land is fragmented on the farm may also be a factor affecting your decision. Winter cereals may be grown effectively on run-off or lease blocks, or dryland areas in an irrigated system, grazed by young stock or dry cows, then harvested and used on the milking platform

Figure 1 Average perennial ryegrass growth rate (kg DM/ha. day) at Terang, Victoria, and potential intake requirements (kg DM/ha. day) for a dairy herd (May–July calving) at different stocking rates



Planning your Summer cropping

With the tight fodder supplies affecting all dairy regions, now is the time to plan your summer cropping program if you have access to water or soil moisture that will support growth.

Summer crop options

For many farmers this spring and summer, a high priority is to grow as much dry matter as possible to fill a yield and protein gap. Some of these crops have the ability to be conserved but others will be direct grazed. Most annual crops will be grazed before autumn resowing commences.

Options for summer crops will depend on your region and your access to water or soil moisture. Planning is important to get the best production from your investments. It is also important to purchase seed as early as you can, as seed will be in high demand.

The following is an outline of some of the actions you could take to start the planning process for your summer cropping program.

Plan your feedbase for your farm system and needs

1 Consider the climate and market outlooks for the upcoming season.
2 Ensure that you have soil moisture or are able to secure water to support crop growth. If you need to buy water, estimate the likely cost per tonne DM grown based on water cost ($/ML) and expected water productivity of each crop t DM/ML).
3 Consider all your options. Growing crops vs buying or contracting. Align your decisions with your budget and your appetite for risk.
4 Consider how the crop will meet the diet requirements of your herd and work with a nutritionist to develop a feed plan to ensure that the diet is balanced and milk production is maintained.
5 Ensure you have the infrastructure and system to conserve and feed out the crop, or the ability to direct graze crops that can be direct grazed.
6 Work with your agronomist to select a species and variety that will suit your production requirements.
7 Select and prepare your paddock well – this includes getting soil testing completed to ensure that nutrient and pH levels are at the required level for the crop you choose to grow. Assess any soil constraints within the paddock that will affect the growth of the chosen crop.
8 Manage weeds early. Weeds compete with crops for moisture, sunlight and nutrients.
9 Sow seed when the soil temperature is ideal for your crop and sow into moisture if possible.
10 Aim for correct seed placement, and seed-soil contact for a better emergence rate.
11 Use your agronomist to help plan and manage your crop through the season, reducing risk and helping to optimise production.

Options for summer crops include maize, sorghum, millet, chicory, and brassicas. For some, quick spring feed using annual or Italian ryegrass could be options to consider.

Of the many summer crop options, which one you choose depends on your region and climate, access to water, soil fertility, pH and physical constraints, management and infrastructure.

The following table highlights some of the features and limitations of some of the more widely chosen crops. Seek advice from your local agronomist and/or nutritionist for detailed information.

Table 1 Features of summer crop options

Crop	MJ ME/ kg DM	% CP	Potential yield t DM/ha	Water productivity t DM/ML	Advantages	Disadvantages	Potential health risks
Turnips	12–13	12–18	Up to 12	3.9[i]	Exceptional nutritional value Range of different maturity times allows for grazing during summer or autumn	Highly variable yields Needs adequate soil moisture	Low in effective fibre, feeding with silage can cause health problems. Strict allocation needed
Chicory	11–13	20–26	8–16	1.8–2.2[ii]	High nutritional value Reliable summer growth	Subject to wastage, need good grazing management Susceptible to trampling	Minimal risks if less than 50% of diet
Regrowth brassicas	11–14	15–25	Up to 17, depending on cultivars	2.4–2.9[iii]	Higher autumn growth potential than most perennial and annual pasture species Regrowth, unlike turnips	Strict grazing management needed	Similar to turnips, low in fibre, feeding with silage can cause health problems. Strict grazing management needed
Millet and sorghum	8–11	7–18	Sorghum 10–20, Millet 10–14	3.5–3.9[iv]	High tolerance to water stress Accumulate DM rapidly in warm conditions	Poor nutritional value Growth restricted by cool summer conditions	Prussic acid in sorghum, needs strict grazing management, gradual introduction to crop
Maize	10–12	7–8	Up to 25	5.0[v]	High yield potential of good quality feed No prussic acid	Low protein content Higher summer rainfall or irrigation needed	Mycoestrogen and mycotoxins when crop/ silage management sub-optimal

NB Yields and nutritional values are determined by management practices and will vary due to variety, region, irrigation or dryland, soils and fertiliser practices.

These ranges are estimates of water productivity and may vary depending on soil type, fertilizer regimes and other stress factors.

i Rawnsley & Donaghy; ii estimated; iii Future Dairy; iv Sorghum (Future Dairy), Millet 2.5 2.8 t DM/ML water; v Maize: 5.0 t DM/ML water (Donaghy & Rawnsley); 3.6 t & 4.8 t from Future Dairy in separate studies.

Pests to be aware of in autumn

Insect pests can affect your pasture and crop yield, and your budget. By carefully monitoring the pests on your farm and tracking the conditions that might allow them to thrive, you could reduce their impact on your yield.

In the coming seasons, your farm could encounter:

- Redlegged earth mite (RLEM)
- Lucerne flea
- African black beetle (ABB)
- Slugs and snails

Monitoring and managing these pests is crucial in autumn. They vary in shape, size and type of damage they cause to pastures. For more detail on each pest, please see the relevant Dairy Australia fact sheet.

Key messages

Effective pest management requires action at the right time of the year

Familiarise yourself with pests that might damage your pasture

Monitor your pasture closely

Use the right control method for the right pest

Lucerne flea. Image: Drägüs

Redlegged earth mite. Image: Cesar

African black beetle (ABB) larva. Image: Mijail Karpyn Esqueda

Black keeled slug. Source: Cesar

Small pointed snail. Source: Cesar

African black beetle (ABB) adult Image: Mijail Karpyn Esqueda

Main image: African black beetle. Image: Trevor James, AgResearch, NZ.

Pest		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
RLEM					🔍	🔍	🔍						
ABB	larva	🔍	🔍	🔍									
	adult				🔍	🔍					🔍	🔍	
Slugs and snails		🔍	🔍	🔍	🔍	🔍							
Lucerne flea					🔍	🔍	🔍	🔍					🔍

🔍 Monitor Critical management

Identifying pests

The first step to managing pests is to correctly identify them. RLEM is often confused with other mites (such as blue oat mite) and ABB is often confused with other pasture cockchafers (such as blackheaded cockchafer, redheaded cockchafer and yellow headed cockchafer). Incorrectly identifying pests can result in damage to plants, wasted pesticides, and the loss of beneficial insects.

Signs to look for

RLEM are often found on the leaf surface in feeding aggregations of up to 30. Other mite species often feed individually. They cause silvering or white discolouration of leaves.

ABB differs from other common pasture cockchafer because both larvae and adults cause damage to plants. Larvae prune the roots while adults feed on stems below or just above the soil surface. Damage is patchy and affected pasture can be rolled back like a carpet.

Slugs and snails leave feed with damage such as shredded edges, irregular shaped holes in leaves, removal of plant parts and/or entire seedlings. Fresh trails of white and clear slime (mucus) visible in the morning can also be a sign of slugs and snails.

Lucerne flea is distinctively patchy in distribution. They can 'spring-off' vegetation when disturbed. They leave distinctive 'windows' through leaves. Patches of intense feeding can move around paddocks. These can be obvious targets for spot spraying.

Management tips

General management strategies can be put in place to decrease pest populations on your farm. For more detail on managing each pest, please see the relevant Dairy Australia fact sheets.

Rotating crops: Planting crops that are unfavourable to the pest helps to break the life cycle of insects that develop under specific conditions. For example, planting a legume, chicory or brassica species in spring affects ABB larvae. In addition, ploughing may expose insects to unfavourable environmental conditions.

Control sprays help reduce pest population to manageable levels if used at the right time. These sprays require high levels of monitoring of the pest life stage to be effective. An example is to use Timerite® to obtain the optimum spring spray dates for RLEM for different regions. It is important to rotate chemicals to avoid developing resistance.

Endophytes help boost pasture persistence against insect pests. Different endophytes are more effective against some pest than others. Always consult with a professional agronomist to ensure the correct choice is made for your farm.

African black beetle

African black beetle (ABB), an introduced scarab pest, is found in Western Australia, South Australia, Victoria, New South Wales, and Queensland. ABB has not been recorded in Tasmania. ABB is a major agricultural pest, damaging several pasture species, cereal crops, horticultural crops, and some forestry species.

ABB is emerging as a major pest in pasture based agriculture, including in the dairy industry due to the use of pasture and crop species that the beetle feeds on. Pasture grass species favoured by ABB include ryegrasses, paspalum, kikuyu and phalaris. Cereal crops (including wheat, barley, triticale, maize and sorghum) are also vulnerable to ABB attack.

In addition to crop and pasture species, climate can influence ABB activity. ABB outbreaks are associated with warm springs. Larvae (the immature form) growth during spring is optimal at soil temperatures between 20–25°C, while temperatures below 15°C are detrimental to development (King *et al*. 1981a). High soil moisture during early larval development is also considered unfavourable (King *et al*. 1981b). In New Zealand, ABB distribution is limited to areas with a mean annual surface temperature above 12.8°C (Watson 1979).While there are limited chemical options available for controlling ABB, several agronomic practices can be implemented to renew damaged paddocks. As ABB is often mistaken for other scarabs in pastures and cereals, best practice management begins with correct species identification.

Identification and behaviour

ABB larvae have six legs, a brown head capsule, and a 'C-shaped' body. The larval body is grey in appearance when young but transitions to creamy-white when mature. They are ~5mm when they hatch, growing to ~25mm in length. The larvae damage pastures by pruning or completely severing grass roots close to the crown of the plant. In severe cases where infestation occurs, pastures become patchy and can be rolled back like a carpet.

African black beetle larva. Image © Western Australian Agriculture Authority (Department of Primary Industries and Regional Development, WA)

Blackheaded pasture cockchafer larva. Image: Andrew Weeks, Cesar

The adult beetle form of ABB is 12–14mm long, has a brown to black body with indented longitudinal striations on the wing covers, and flares and spurs on its legs. Adult beetles have strong nocturnal flight activity, and disperse during their 'roaming' stage primarily in autumn, leading to paddocks becoming infested. The adults feed on the stems of a variety of young plants either underground or above the soil surface, often killing growing points so that the central shoots wither and the plant dies.

ABB can be easily mistaken for other scarab pests, including the redheaded pasture cockchafer (*Adoryphous coulonii*), the blackheaded pasture cockchafer (*Acrossidius tasmaniae*), and yellowheaded cockchafers (*Sericesthis spp.*). These common cockchafer pests share features with ABB that are only discernible to a trained eye or when comparing species side-by-side. Nevertheless, ABB can be distinguished from these cockchafers by considering behaviour and biology in addition to physical attributes.

The following parameters should be considered and used in a process of elimination:

Species life stage

A key difference between ABB and other common scarabs is that ABB attack plants as both larvae and as adults. Only the larvae of blackheaded pasture cockchafer, redheaded pasture cockchafer, and yellowheaded cockchafers are regarded as pests. Therefore, if adult beetles are found with accompanying stem damage below or just above the soil surface, ABB is a likely a suspect.

Pest biology

Understanding the biology and life cycle of common scarabs can assist with distinguishing ABB at different times of the year:

ABB

ABB has a one year life cycle. Adults lay their eggs in the soil in spring, and larvae emerge in 2–5 weeks depending on temperature, and reach the most damaging third instar larval stage from mid-January to March.[1] Larvae then pupate in the soil and emerge as adults, which go on to feed on pastures and crops throughout autumn, winter and spring.

Blackheaded pasture cockchafer

Blackheaded pasture cockchafers also have a one year life cycle, but unlike ABB, adults lay their eggs between January and February. Blackheaded pasture cockchafer larvae emerge in 3–4 weeks and reach the most damaging third instar larval stage in late autumn and winter. The larvae pupate in spring and adults emerge in mid-late summer.

Redheaded pasture cockchafer

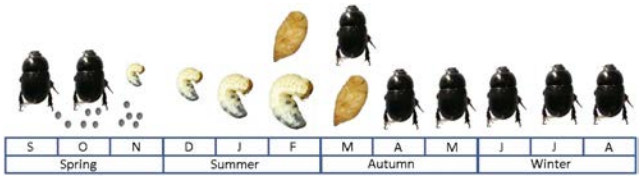
Redheaded pasture cockchafer has a two-year life cycle. In year one, redheaded cockchafer adults emerge from pupae from late summer to mid-autumn, but they do not surface from the soil until August to October when they take flight and lay eggs. The eggs hatch in late spring and the larvae reach the most damaging third instar stage by early autumn in the second year. Most damage is caused from March to June until winter temperatures hinder larval activity. Further feeding damage can occur from late August to December until pupation occurs.

1 These observations were made in New Zealand and may vary with local climate

Yellowheaded cockchafers

There are multiple yellowheaded cockchafer species and while their life cycles are largely unknown, they are thought to reach the most damaging third instar larval stage during winter.

African black beetle pasture damage. Image: Cesar



Life cycle of African black beetle (Image: Karpyn Esqueda et al. 2017)

Hosts

ABB larvae have a strong preference for forage pasture species such as ryegrass, tall fescue, kikuyu, and paspalum. Legume species are considered unfavourable, although they may feed on white clover in absence of their preferred host species (King *et al.* 1981b). In contrast, the larvae of redheaded pasture cockchafer are common in pastures with a high subterranean clover content. The larvae of blackheaded pasture cockchafer will also feed on legumes.

Larval feeding behaviour

Larvae of ABB and other scarabs are generally subterranean feeders, consuming and pruning plant roots. The blackheaded pasture cockchafer larvae, however, is the exception to this rule. After rainfall and heavy dews, blackheaded pasture cockchafer larvae move onto the surface to feed on foliage, resulting in small mounds of dirt surrounding tunnels on the soil surface.

Anal opening

Scarab larvae have an anal opening at their rear end which is visible with a hand lens. This opening is a horizontal split in ABB and redheaded cockchafers. In the yellowheaded cockchafer and blackheaded pasture cockchafer larvae, a Y-shaped anal opening is evident.

ABB, redheaded pasture cockchafer and blackheaded pasture cockchafer anal openings, respectively. Images: Agriculture Victoria

ABB, redheaded pasture cockchafer and blackheaded pasture cockchafer head capsules, respectively. Images: Agriculture Victoria

Head capsule

The head capsule of ABB larvae is mostly described as brown, whereas redheaded pasture cockchafers, yellowheaded cockchafers and blackheaded pasture cockchafers have head capsules that correspond to their common names. Note that head capsule colour alone should not be used to distinguish ABB from other scarabs due to subjectivity in colour perception from person to person, and variation in colour between individuals of the same species. In addition to differences in colour, redheaded pasture cockchafers have small pit marks on their head whereas ABB has a smooth head capsule.

Monitoring and control

There are monitoring guidelines that can be used to assess ABB pest pressure.[1] To estimate the risk of damaging larval populations over summer, take 10 random square-shaped soil samples per paddock in September (Watson *et al.* 1980). Each sample should be the width of a 20cm spade and ~10cm deep. Approximate pest pressure/m^2 can be determined by summing the number of ABB adults found in 10 samples and multiplying it by 2.5. If the average number of beetles is above 10/m^2, the paddock could be at risk from larval damage over summer (Watson & Wrenn 1979). The same method can be used in early February, in which case larvae and adult numbers exceeding 15–20/m^2 is considered a damaging level (Dairy NZ, 2012).

With few effective ABB control options available, the focus needs to be on reducing the risk of damaging levels being reached by adopting the following combination of strategies when renewing paddocks damaged by ABB:

Endophyte deterrents

Sow ryegrass varieties with endophytes that deter ABB. An endophyte is a fungus that lives harmoniously in a host plant, producing alkaloids which deter insects.

ABB adults

Egg laying by adults is reduced in pastures dominated by grasses infected with endophytes and hence larval damage may also be reduced. NEA2, AR37 and Endo5 are commercially available ryegrass endophytes which provide resistance to damage from ABB adults. Standard endophyte (SE) also provides good ABB control, however its use is not recommended as SE can cause severe ryegrass staggers and other animal health problems. AR1 endophyte will only provide a low level of protection against ABB and is unlikely to provide adequate control in situations with medium or high levels of ABB pressure. Other endophytes which provide good control of ABB include MaxP in tall fescue and U2 in festulolium.

ABB larvae

Commercially available endophyte strains do not appear to provide control of ABB larvae (Bell *et al.*, 2011).

Always seek professional advice when using endophyte infected pasture varieties to ensure the correct choice is made for your farm and prevent the development of ryegrass staggers in livestock.

Insecticides

Consider the use of insecticide treated seed when renewing pastures. Poncho® Plus seed treatment is the only chemical option registered for ABB control in grass and broadleaf pastures. Control should be expected for 3–4 weeks after sowing, although seed treatments will not control heavy populations. Chlorpyrifos is registered for ABB in maize in NSW. Off-label application of organophosphates and synthetic pyrethroids are not recommended for control of ABB in pastures. Field trials show that while foliar applications of alpha-cypermethrin (pyrethroid) and chlorpyrifos (organophosphate) may kill adult beetles, they do not necessarily reduce ensuing larval populations (Eden *et al.* 2011).

Crop rotation

Rotate ABB-affected paddocks with an unfavourable crop or pasture. Planting a legume, chicory or brassica species in spring is likely to disrupt ABB at the larval stage of development (Bell *et al.* 2011). Adult ABB is migratory and can reinvade crops and pastures sown in autumn after a break crop, however the risk can be managed using endophyte varieties and seed treatments. Delaying sowing until May (if practical) will reduce the level of feeding damage by ABB adults, which decrease their feeding activity during the colder months.

Remove feed source

Before establishing a new pasture, remove alternative food sources from in and around the paddock. This includes winter grass (*Poa annua*), paspalum, annual ryegrass, phalaris, and kikuyu. Varieties of perennial ryegrass, tall fescue, and Italian ryegrass that do not contain the appropriate endophyte deterrents should also be removed. The level of control from sowing endophyte grass varieties and break crops will be hampered if ABB has an alternative food source in the pasture or in neighbouring areas.

Manage soil pH

Keeping soil pH high at around 6 helps reduce numbers of black beetle larvae (mechanism is currently unknown) but will not prevent damaging populations from occurring.

References and useful resources

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Slugs and snails

Dairy farmers are increasingly growing more winter crops to supplement their nutritional feed gaps. These crops, particularly cereals and clover can be affected by slugs and snails at the early stages of crop establishment. Much less is known about slug and snail damage to established pasture and how they can limit pasture persistence.

Identification and behaviour

Slugs and snails have similar behaviours and biology. They seek refuge in damp or moist areas to avoid drying out and emerge during favourable conditions such as after rainfall or temperature change. Tilling less allows slugs and snails to increase in numbers. Rasping-type damage is a typical sign of slugs and snails. The damage on plants can extend from shredded edges and irregular shaped holes in leaves to removal of plant parts or entire seedlings. Slugs and snails are hermaphrodites, meaning that both members of a mating couple can lay eggs. The most obvious distinction between them is the presence of an external shell, present in snails but absent in slugs.

Life cycle

Mating usually takes place from mid-autumn to mid-winter when favourable moist conditions return after summer. Spherical pearl-white eggs are laid into moist soil two to four weeks after mating. Egg laying can continue from the break of the season to late winter. Eggs do not withstand hot and dry summer conditions and do not lie dormant in the soil. Hatching takes place two to four weeks after being laid. Slugs and snails usually become sexually mature after one year.

Hosts

Slugs and snails affect a wide range of plants used in agriculture including pastures, cereals, and pulses, among others.

Key messages

Tilling less allows slugs and snails to increase in numbers

Grazing in summer may reduce the number of slugs and snails by trampling and destroying their refuges in paddocks prior to resowing

Early detection prior to seeding is ideal as there are more control options available

Pasture systems that depend on pulses and clover might be particularly affected by slugs and snails

Monitoring and control

Early detection prior to seeding is ideal as there will be more control options available. Grazing in summer may reduce the number of slugs and snails by trampling and destroying their refuges prior to resowing. Once the crop has been seeded and germination has commenced, control options are limited to baiting.

The best time to monitor slugs and snails is on moist, warm and still nights. However, fresh trails of white and clear slime (mucus) visible in the morning can also indicate their presence.

Slugs and snails must be monitored before and after applying control measures to estimate the efficacy of the treatment and size of the population.

To estimate the numbers of slugs present in a paddock place wet carpet squares, hessian sacks or tiles on the soil surface (at least be 32x32cm in area). Place pellets under them and count the number of slugs under and around each square after a few days. Multiplying by 10 will give an estimate of slugs per square metre.

To estimate the numbers of snails present in a paddock, count snails in 50 spots (10 x 10cm square) in the paddock. Multiplying by 2 will give an estimate number per square metre.

Stages of monitoring and control strategies

January to February – assess grazing management options to reduce population of slugs and snails.

March to April – assess options for baiting.

May to August – assess options for baiting, especially along fence lines.

Thresholds

Careful monitoring is essential as the distribution of slugs and snails in crops is patchy. This table gives an indication of the level of slugs and snails required to cause damage in broadacre crops and pastures.

Black keeled slug. Source: Cesar

Reticulated slug. Image: Bruce Marlin

Small pointed snail. Source: Cesar

White Italian snail. Image: Tato Grasso

Typical slug damage on pasture. Image: Barenbrug agriseeds

	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Egg laying				■	■	■	■	■	■	■	■	■
Egg hatching							Two weeks after being laid					
Juvenile feeding							■	■	■	■	■	■
Mature form	Dormant until sexually active											

■ Present

Species	Oilseeds	Cereals	Pulses	Pastures
Black keeled slug	1–2/m²	1–2/m²	1–2/m²	5/m²
Reticulated slug	1–2/m²	5/m²	1–2/m²	5/m²
Small pointed snail	20/m²	40/m²	5 per seedling	100/m²
Vineyard snail	5/m²	20/m²	5/m²	80/m²
White Italian snail	5/m²	20/m²	5/m²	80/m²

These thresholds for control of slugs and snails in broadacre crops come from limited data. Table: Svetlana Micic

Crops and pasture mites

Australia's major mite pests are the redlegged earth mite (RLEM), blue oat mite (BOM), balaustium mite and bryobia mite.

In addition, brown wheat mite and two-spotted mite are also considered important pests however these are sporadic. Yields of many host plants can be dramatically reduced by mite damage

All of these mites look similar and can co-exist in the same area. Monitoring is critical to accurately identify the pests and control their population. The most commonly used techniques to monitor mites are visual assessments, suction sampling, pitfall traps and germinating seed baits. It is important to inspect crops, weedy areas and pastures adjoining fence lines from autumn to spring for the mites and feeding damage.

Key messages

Monitoring is essential for early detection of crop mites

Early control of summer and autumn weeds within and around paddocks can help to control mite populations

Some mites are highly tolerant of pesticides, so correct identification is necessary to apply the right control method

Source: Redlegged earth mite, Blue oat mite, respectively. Images: Cesar

Source: Balaustium mite, Bryobia mite, respectively. Images: Cesar

Table 1 Typically active period of mites in crops and pastures in Australia

Mite species	Jan	Feb	Mar	Apr	Mar	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
RLEM													
BOM													
Balaustium mite													
Bryobia mite													
Two-spotted mite													
Brown wheat mite													

Active periods

Table 2 Guide to identify mites that could affect your crop and/or pasture based on their features, behaviours and hosts

Crop and pasture mites	Distinctive features	Host	Behaviour and habits	Symptoms	Treatment
RLEM	Globular shaped; velvet black body	All crops and pastures; legume seedlings, canola, lupins and cereals are most susceptible	Feeds on leaf surfaces in large groups unlike other species	Silvering or white discolouration of leaves	Use Timerite® spray date in Spring. Heavy grazing in spring period will reduce carry over population in autumn
BOM	Orange/red marking on back	Wide range of agriculturally important plants: legume seedlings, canola, lupin and cereals are most susceptible	Feeds on leaf surfaces singularly or in very small groups	Silvering or white discolouration of leaves	High tolerance to range of pesticides, high rates are usually required for control Pesticides should be applied within three weeks of the first appearance of mites
Balaustium mite	Pad like structure on forelegs Body covered with stout hairs	Pasture legumes, lucerne, grasses, canola, lupin, and some broadleaf weeds	Typically attacks leaf edges and leaf tips of plants	Irregular white spotting or bleaching of the leaves	No pesticides registered for Balaustium mites Early control of summer and autumn weeds help to control populations
Bryobia mite	Oval shaped, flattened dorsal body that is dark grey. Long front legs up to 1.5 times its body length	Clovers, grasses, lucerne, vetch, canola, lupins and wheat	Prefers clovers and medics over grasses	Distinctive trails of whitish grey spots on leaves On grasses damage is similar to RLEM and BOM	High tolerance to pesticides, high rates are usually required for control Early control of summer and autumn weeds helpto control populations
Two spotted mite	Darker green spots on either side of the body	Wide range of hosts and has become a serious pest on many fruits, vegetables, trees, shrubs, herbs, herbaceous perennials and ornamental plants and many broadleaf weeds	Often found clustered in groups on the underside of leaves Fine webbing is visible on the lower leaf surface	Bronzing speckled appearance on the upper surface of the leaf	High tolerance to pesticides, integrated pest management is required
Brown wheat mite	Their front legs are distinctly longer than the other three pairs of legs	Common pest of wheat, barley, cotton however it can also infest other non-cultivated grasses	Feed on the tips of the leaves	Stippling of the leaves Heavily infested fields present a scorched withered	Tend to be a problem in dry conditions Heavy winter rain reduces their population Control may not be cost-effective in drought affected crops

Animal health and performance

Facts about fibre

Fibre is an essential ingredient in the diets of ruminant animals such as cattle.

Fibre is the structural carbohydrate component of plants – it keeps plants upright. Fibre is found in the plant cell wall. There are three main parts – hemicellulose, cellulose and lignin.

A key role of fibre in cattle is to promote chewing, so feeds with fibre length greater than 1.5 cm, but not longer than the width of the mouth, are preferable – they take longer to chew.

Lush, actively growing pasture is high in sugars. More leaf than stem means less fibre.

Grain is plant seed material and not structural plant material – it has high levels of starch, not fibre.

Do you know your fibre facts?

Neutral detergent fibre: evaluating fibre

Neutral Detergent Fibre (NDF) is a chemical laboratory estimate of the amounts of hemicellulose, cellulose, lignin and ash in plant material – the digestible and indigestible fibre.

Acid Detergent Fibre (ADF) estimates cellulose, lignin and ash only. NDF is expressed as a percentage of dry matter – the percentages allow feed to be compared. Deciding between fibre products is easier if you know the NDF percentage values.

Key messages

- Fibre is an essential ingredient in diets of ruminants
- Fibre length should be greater than 1.5 cm
- Neutral detergent fibre intake should be approximately 40% of total dry matter intake
- Feed a long fibre source as soon as possible after grain/concentrate feeding to help reduce the rumen pH drop

Acidosis – do you really understand fibre? Not sure? Ask your adviser.

Fibre in the total diet: are your cows getting enough?

Fibre supplies energy.

NDF intake should ideally be about 40per cent of total daily dry matter intake, with 75per cent of the fibre sources having a fibre length greater than 1.5 cm, i.e. you need to work out the fibre percentage of the kilograms of dry matter your cows are eating.

Cows filling up on grain/concentrate in the dairy or on other low fibre feeds like lush pasture may not eat poor quality fibre like straw offered in the paddock.

Heifers or less-dominant cows may not have equal access to fibre fed in the paddock – these animals may be more at risk of acidosis than others.

Fibre and saliva

Are your cows ruminating enough?

Not enough long or 'effective' fibre = not enough chewing = not enough saliva = drop in ruminal pH = increased risk of acidosis.

Cows fed diets with adequate long fibre produce more than 180 litres of saliva per day.

Feeds with no long fibre like grain do not promote much chewing during eating and ruminating, and less saliva is produced.

Chewing for about 27 to 36 minutes per kg of dry matter is normal.

Saliva has a pH of around 8.0 (alkaline) and contains bicarbonate and other naturally occurring buffers.

Saliva and ruminal pH

Do you know how to keep ruminal pH within the optimal range?

More than 2.5 kg of bicarbonate produced each day in saliva helps maintain the cow's average daily ruminal pH in the optimal range for growth of rumen microbes – 6.2–6.6.

In a healthy cow, ruminal pH fluctuates over a 24 hour period. It can drop to 5.5 or lower for several hours after eating large amounts of highly digestible feeds such as grain/ concentrate, silage or lush pasture, before recovering again.

Feeding a slower fermenting long fibre source such as hay as soon as possible after grain/concentrate or replacing lush pasture with some hay or straw, can help reduce the pH drop.

Ruminal pH and acidosis

Can you recognise the signs of sub-clinical acidosis?

If animals consume sufficient amounts of highly digestible feeds, ruminal pH drops, leading to reduced growth of fibre-utilising bacteria and increased growth of acid producing bacteria such as Strep. bovis, which continue to acidify the rumen.

If the rumen's natural buffering capacity is overwhelmed, a downward spiral can occur until the rumen shuts down.

Animals with 'sub-clinical acidosis', where the rumen pH is in the range 5.2–5.6, may not appear sick, although feed intake and production are reduced.

Animals with a ruminal pH below 5.2 will be noticeably sick. They will be off their feed, down in their milk, and scouring. This may then progress to 'downer cow' syndrome and death.

Keeping cows on the curve when changing diets

Substantial changes in diets of dairy cows should be made gradually to allow the rumen time to adapt to the new feed.

If these changes occur too abruptly, and cow responses are not monitored for early warning signs of problems, healthy rumen function, feed intake and health can be disrupted and cause reduced milk production, ill health and potentially death.

Gradual changes to diet are essential for healthy rumen function

The majority of feed that cows eat is digested by microbes in the rumen and the composition of the population of rumen microbes depends on the diet the cows eat. Changes in diet composition such as introducing a new type of feed will cause the rumenmicrobe population to change and adapt. However, this process takes time. Gradual changes to the diet will allow time to monitor how cows are responding to the new diet and make adjustments if necessary before they receive the full amount.

Sufficient levels of fibre are essential for healthy rumen function in lactating cows. Large and abrupt changes in their diet may have a risk of (temporarily) not providing enough fibre, resulting in rumen acidosis. Adding substantial amounts of a new feed into the diet may alter cows feeding routines and negatively affect intake. Gradual feed changes allow time to monitor if fibre levels remain safe.

Cows need time to adapt to the difference in palatability of feeds particularly if they have not been exposed to them before. Palatability can also affect the amount that individual cows eat.

This can be compounded by not providing equal access to the feed for all cows. Varying levels of poisonous or toxic components in the diet may cause palatability issues also. Sometimes cows have to 'learn' to graze certain crops or eat certain feeds, if they have not been exposed to them before.

Key messages

- Change cows gradually onto new feed over 7–14 days
- Rumen microbes need time to adapt to new feed sources
- Also monitor animal responses to other risk factors such as toxic components in feed
- Equal access to feed for each cow is essential
- It is not about what you feed, it is about what they eat
- Highest risk is when introducing very palatable, low fibre feeds to the diet

Examples of this might include grazed turnips or other brassicas. The slow learners might eat less and leave the new feed for the quicker learners who could consume excessive amounts.

In general, a substantial change in the diet of dairy cows should be introduced gradually in steps over a period of 7 to 14 days to provide sufficient time for most of the rumen adaptation to occur, and to monitor and correct for any other ill effects. However, this timeframe may change depending on the magnitude of the dietary change, types of feed used and the risk factors involved with the diet.

Before making any substantial diet changes or introducing new feed products and types to your cows, determine the risks and take mitigating action.

Changing diets

Rumen adaptation

New feeds or substantial changes to a diet should be introduced in increments of not more than 2kg DM/cow, and in a minimum of three to four steps spread out over 7 to 14 days. The last steps can be a bit smaller, when getting close to the maximum that can be fed.

For example when introducing 6kg DM of a new feed, provided no ill effects are observed during the changeover onto the new feed: on day one start with 2kg, day four raise to 3.5kg, day seven to 5kg, and day 10 to 6kg.

Changing from a full TMR to a diet consisting only of grazing pasture and concentrate in the bail (and reverse) will require a longer changeover period of about three weeks, changing pasture allocation in steps of about 2kg DM/cow every three days, while reducing the TMR quantity and adjusting its composition.

Major changes like these often require a separate 'in-between' PMR type diet to be fed mid-way, to aid in a seamless changeover onto the new diet. If introducing a new concentrate feed, then it is recommended to be more conservative, and only adjust the amount by 1kg DM/day of concentrate.

Recent Australian research indicates that changing cows from a grazed pasture-based diet to a conserved forage-based diet, as may be necessary in late spring/early summer, should be done gradually over a 10–day period to keep cows on their target lactation curves.

If the changeover is made abruptly, cows may drop in milk as a result of:

- Reduced feed digestibility due to disruption in rumen function
- Reduced daily energy intake and rumen microbial protein production.

Very palatable feeds

Equal access to the feed for each cow is very important to avoid over-eating by some cows in the herd. When animals have to compete for trough space on a feed pad (ideal to have at least 0.7m/cow feed space), or when fodder crops are strip grazed, some groups of cows can miss out on the feed, and others can eat far too much. Examples of this is when strip-grazing turnips and the strip face lay-out is wrong, or when cows trickle back into a paddock after milking over a long period of a few hours. If it takes a long time before the last cows have reached the turnips, it might be that the first part of the herd has eaten it all, resulting in some cows eating too much to ill effect, and some have eaten none.

Less palatable feeds

These feeds have a low risk of being over-eaten as intake will be slow and 'self-limiting'. However, it can still result in essential components of a diet, such as fibre, not being eaten in sufficient quantities by some or all cows. Slow changeover to these feeds can help cows get used to eating them, and feeding practices can be adapted during this process to improve intake. When introducing extra feed into a diet, sometimes the intake of these less palatable feeds can drop off.

Poisonous or toxic components

Feed products can contain poisonous components, toxins and/or mycotoxins. If it is not possible to analyse feeds beforehand, manage feeds that have known risks by limiting the amount offered. Introducing a new feed slowly in small increments provides the opportunity to monitor the cows for health issues, particularly in the first few days, to assess if the new feed is of higher risk than expected.

Monitor cows when changing to paddocks with a high proportion of clover where there is the risk of bloat, or to a brassica crop where unique amino acids can cause liver damage resulting in photosensitisation and dark red urine. Some fodder crops or lush autumn grass can contain higher levels of toxic nitrate, especially in drier years and/or with higher N-fertiliser rates.

Equal and limited access is important to reduce risks. Hungry cows that have unequal or unlimited access can gorge themselves and easily consume these toxic components above safe thresholds, resulting in severe illness and even death.

'Learning' to eat

If cows have not been exposed to a new feed before, they might have to 'learn' to eat it. This occurs sometimes when starting to feed certain crops or feeds. Extending the time between the first steps of changing over onto that feed can help train them eat the feed. For example, it can take a few days before cows learn that they actually should be eating the fodder beet bulbs. The slow learners eat none or less and leave the new feed for the fast learners, who may consume excessive amounts.

Ruminal acidosis risk assessment

For assessing factors affecting rumen function and risk of acidosis in cows

Healthy, efficient rumen function is the cornerstone of dairy production. There are many factors including herd, feed and feeding management that affect the risk of cows becoming unwell with ruminal acidosis. Ruminal acidosis impacts on cow productivity, health and welfare. This tool will help you identify high risk factors for ruminal acidosis on your farm, so you can consider actions that may reduce the risk.

For each factor under 'Herd', 'Feeds' and 'Feeding management', highlight the statement which best describes what currently happens on your farm. Consider each factor for which you are High or Moderate risk and how you may possibly be able to reduce the risk level.

Herd

LOW risk Green zone	MODERATE risk Orange zone	HIGH risk Red zone
Small variation in cow liveweight within the herd		Large variation in cow liveweight within the herd (mixed breed herd or high proportion of heifers)
Many older cows in herd		Many first calvers in herd
Many mid-late lactation cows in herd		Many freshly calved cows in herd
Small variation in Days in Milk (as per seasonal calving herd)		Large variation in Days in Milk (as per split or year-round calving herd)
Cows not exposed to cold, wet, windy weather conditions	Cows exposed to some periods of cold, wet, windy weather conditions but constantly provided with forage	Cows exposed to persistent cold, wet, windy weather conditions with periods without access to forage for >2 hours
Cows not subjected to hot weather conditions at all or not subjected to heat stress during hot weather conditions	Cows subjected to some periods of moderate/high heat stress during hot weather conditions but have a heat stress management plan in place	Cows subjected to long periods of high/severe heat stress during hot weather conditions but do not have a heat stress management plan in place

Feeds

LOW risk Green zone	MODERATE risk Orange zone	HIGH risk Red zone
Maize/sorghum/barley	Grain blends containing >50% wheat/triticale	Triticale/wheat
Grains coarsely ground – minimum powder seen in dairy when grain fed		Grains finely ground – powder seen in dairy air when grain fed into bins
<3kg grain/concentrate fed per cow per feed	3–5kg grain/concentrate fed per cow per feed	> 5kg grain/concentrate fed per cow per feed
Quantity of grain/concentrate fed per day = <25% of total DMI	Quantity of grain/concentrate fed per day = 25–40% total DMI	Quantity of grain/concentrate fed per day ≥40% of total DMI
>36% NDF in total diet	32–36% NDF in total diet	<32% NDF in total diet
75% of fibre sources in diet are >1.5cm length in PMRs/TMRs	65% of fibre sources in diet are >1.5cm length in PMRs/TMRs	<50% of fibre sources in diet are >1.5cm length in PMRs/TMRs
Forage: concentrate ratio of diet 60/40	Forage: concentrate ratio of diet 50/50	Forage: concentrate ratio of diet 40/60
Adequate protein in diet (>18% CP)	16–18% CP	Inadequate protein in diet (<16% CP)
Longer stem, mature pasture		Young, lush, leafy, rapidly growing pasture- e.g. ryegrass at 1–2 leaf stage, high vegetative legume or herb
No low pH silages or acid-dump feeds (e.g. corn gluten) fed		Significant amounts of low pH silages or acid-dump feeds (e.g. corn gluten) fed
No high starch byproduct (bread, cereal meal, potatoes etc.) fed	High starch byproduct (bread, cereal meal, potatoes etc.) included as component of concentrate or PMR/TMR and fed at up to 10% total DMI	High starch byproduct (bread, cereal meal, potatoes, etc.) included as component of concentrate or PMR/TMR and fed at >10% total DMI
No high sugar feeds fed	Supplementary sugar fed in dairy	High sugar byproducts fed
Forages and high fibre by-products kept dry during storage and feed-out		Forages and high fibre byproducts allowed to get wet during storage and feed-out (mycotoxins)
Wet feeds e.g. grape marc, veggie waste, brewers grains fed within 7 days of delivery to the farm		Wet feeds e.g. grape marc, veggie, waste, brewers grains, etc. not fed within 7 days of delivery to the farm
Risk level appropriate buffers, neutralising agents and rumen modifiers included in diet at adequate feeding rates/cow/day		Risk level appropriate buffers, neutralising agents and rumen modifiers not included in diet at all or at inadequate feeding rates/cow/day

Feeding management

LOW risk Green zone	MODERATE risk Orange zone	HIGH risk Red zone
Pasture only or TMR feeding system	PMR feeding system	Bail feeding system
Cows put onto ryegrass pasture at ≥3 leaf stage in winter, ≥2.5 leaf stage in spring/summer	Cows put onto ryegrass pasture at 2–3 leaf stage in winter, 1.5–2 leaf in spring/summer	Cows put onto ryegrass pasture at 1–2 leaf stage in winter, 1–1.5 leaf in spring/summer
Low proportion of legume/herbs in diet		High proportion of vegetative legumes and herbs in diet
High proportion of mature C4 pastures or C4 grazing crops in diet	High proportion of vegetative C4 pastures	
Good control over the quantities of grain/ concentrate dispensed to each cow by the dairy feeding system		Poor control over the quantities of grain/ concentrate dispensed to each cow by the dairy feeding system
Grain/concentrate feeding 3× per day in dairy	Grain/concentrate feeding 2× per day in dairy	Grain/concentrate feeding 1× per day or every second or third day in dairy
If feeding >6kg DM of concentrate per cow per day, quantity over and above first 6kg is fed via PMR	If feeding >8kg DM of concentrate per cow per day, quantity over and above first 8kg is fed via PMR	If feeding >8kg DM of concentrate per cow per day, quantity over and above first 8kg is not fed via PMR

Feeding management continued

LOW risk Green zone	MODERATE risk Orange zone	HIGH risk Red zone
Little separation of feed ingredients and additives by the dairy feeding system		Significant separation of feed ingredients and additives by the bail feeding system in dairy
Variable grain/concentrate feeding rate to cows in dairy		Flat feeding rate to cows in dairy
Increases to the amount and types of feed made gradually		Increases to the amount and types of feed made abruptly
Cows are allowed to go straight to forage after milking	Cows are held back for 15–60 minutes from forage after milking	Cows are held back for >60 minutes from forage after milking
Cows always have access to forage when not being milked	Cows periodically run out of forage or pasture	Cows are utilising a high proportion (>80%) of pasture on offer or all of PMR. Evidence of overgrazing
Cows are not hungry when given unrestricted access to large amounts of feed in paddock or elsewhere		Cows are hungry when given unrestricted access to large amounts of feed in paddock or elsewhere
Pre-calving transition cows and heifers are fed a diet including half the quantity of concentrate they will be fed post-calving for 3 weeks, so their rumens are well adapted		Pre-calving transition cows and heifers are fed less than half the quantity of concentrate they will be fed post-calving and/or are fed concentrate for <3 weeks, so their rumens are not well adapted
Fresh cows are managed with a targeted feeding program with access to additional forage, reduced quantities of grain, and possibly slower fermenting grain types such as maize	Fresh cows are managed with a targeted feeding program with reduced quantities of grain only	Fresh cows go straight into the milking herd on same diet as the rest of herd
Grain/concentrates, high fibre byproducts and forages are fed in multiple feeds over the 24 hours of each day using a mixer wagon/forage cart and feed pad/troughs		Grain/concentrates are fed in dairy bail only, separate to forages
Consistent daily feeding routine is used, with little variation in timing and amounts fed		Inconsistent daily feeding routine is used, with great variation in timing and amounts fed
Short intervals between feeding of forages and grain/concentrates each day		Long intervals between feeding of forages and grain/concentrates each day
TMR or PMR feed space = cow width + more than 10%/cow or >1 hay feeder per 20 cows	TMR or PMR feed space = cow width + up to 10%/cow or >1 hay feeder per 30 cows	TMR or PMR feed space = cow width or less/cow or >1 hay feeder per 40 cows
All cows are given adequate time to consume targeted level of supplementary forage		Cows are pushed off supplementary forage while still eating. Last cows milked or arriving to feed have restricted time to consume forage

The impacts of your feeding decisions

While it is important to provide optimum nutrition to your stock for growth, pregnancy and milk production, with unfavourably seasonal conditions, it may be tempting to cut corners and feed less to your herd.

In a feed shortage, it is better to fully feed less animals rather than a larger herd at restricted levels of feed intake. Regardless of the stock type, underfeeding animals only transfers the problem into the following season.

Reducing feed to young stock will likely cost much more in the long run. In addition, compromising on dry cow feeding will strip condition off these cows and will result in more empty cows after breeding.

Key messages

Underfeeding animals can have implications beyond the current season

Fully feed fewer animals

Calves and heifers	You may decide to	Consider the implications
	Go for free choice palm kernel extract (PKE) meal and keep the grain/concentrate up to them.	This diet is likely to be nutritionally unbalanced and too low in effective fibre for healthy rumen function unless long fibre sources are also fed.
	Accept a lower growth rate just for this year, assuming they will compensate down the track.	Smaller heifers will produce less milk this year and in years to come. They are also far less likely to get back in calf during their first lactation, and therefore are more likely to be culled. This may have big financial implications for several years as these animals move through the milking herd.
	Rear a smaller number of better quality animals.	

Weaning to 12 months - Depending on size, this group needs 40–80 MJ ME, 15–17 per cent CP
12 months to calving - Depending on size, this group needs 80–100 MJ ME, 13–15 per cent CP

Bulls	You may decide to	Consider the implications
	Worry about them later.	Don't forget these guys. More empty cows are likely if the bulls aren't kept in good body condition. This may result in the effects of a poor season this year being felt next year which should always be avoided.
	Reduce your bull numbers to save on feed and use more AI strategically for replacements.	This will increase the overall cost of AI but removes the risk of infertile bulls due to poor nutrition. Use beef semen or cheaper conventional semen on cows not earmarked for breeding replacements. Remember more resources will be required for heat detection if using less bulls.

(700 kg, no liveweight change) This group needs about 80 MJ ME, 12 per cent CP

Dry cows	You may decide to	Consider the implications
	Feed them a little less than you normally would and allow them to strip off some body condition before calving.	You need to feed 35 MJ ME to put on a kg of bodyweight, but you only get 28 MJ ME back when the cow mobilises it. That's like paying a 20 per cent 'interest rate'. Cows in poorer body condition at calving will have low body reserves and take longer to get back into positive nutrient balance. These cows will be at increased risk of metabolic problems (e.g. milk fever, ketosis) and mastitis, produce less milk and have poorer in-calf rates, at a time when optimal health, milk production and fertility are essential.
	Not worry too much about their transition feeding management in the 2–3 weeks before calving.	Poor transition management will result in even greater metabolic problems in fresh/early lactation cows, higher risk of acidosis and abomasal displacements, and even greater impacts on milk production and fertility.
	Both of the above strategies run the risk of dragging a problem this season into next year and even further down the track. A large rise in empty cows can throw a well-tuned farm system off course for several seasons and should always be avoided. In a tough season, try and 'limit the damage to one year'.	

(550 kg, no liveweight change). This group needs about 90–100 MJ ME, 11–12 per cent CP

Milkers Cows in early lactation	You may decide to	Consider the implications
	Increase energy intake of early lactation cows by offering more grain/concentrate in the dairy.	Cows' rumens may not be adapted to handle that much grain/concentrate, and the risk of acidosis will be increased. Smaller cows and first calvers are at greatest risk. Monitor these animals closely and ensure they have equal access to feed.
	Place cows in a sacrifice paddock to feed grain/concentrates and other supplements, in order to slow the paddock rotation and build a pasture feed wedge	Effective fibre levels and total energy intakes may not be sufficient to maintain production and prevent body condition loss whilst the pasture feed wedge is being built. Ensure diet and daily feeding rate are adequate.
(550kg, 30L, 3.8 per cent F, 3.2 per cent P, -0.2kg per day) This group needs about 220 MJ ME*, 16–18 per cent CP	Put cows into paddocks before pasture has reached the three-leaf stage	Pasture still at the 1–2 leaf stage will provide cows with less NDF and less effective fibre. The pasture will take longer to recover from grazing and you'll grow less feed. Make sure pasture is an absolute minimum of 2 leaves before grazing.
Milkers **Cows in mid lactation**	Use silage supplies to feed this group	
	Give cows sudden, unrestricted access to young, lush pastures or forage crops	Risk of nitrate poisoning. Avoid feeding high-risk plants to hungry cows. Delay feeding until plants are more mature. Dilute high-risk plants with hay or other low nitrate forages.
	Buy hay from other regions	Ensure you acquire a feed test prior to purchasing. Be mindful of the risk of introducing weeds to your property. Buy feeds from reliable sources and feed all hay out in one designated paddock if possible. Remove any weeds before they set seed.
(550kg, 25L, 4 per cent F, 3.4 per cent P, +0.1kg per day) This group needs about 200 MJ ME*, 14–16 per cent CP	Use high fibre by-products where the history of agchemical use is unknown	Risk of chemical residues. Buy feeds with a Commodity Vendor Declaration. Introduce new feeds gradually. Feed in limited proportions of the diet e.g. < 20%.

Cow health and welfare

Making decisions in tough times

Showing we care

Farmers want to do what's best for their cows. But in tough times, making decisions that relate to the cows' health and welfare can be particularly difficult. We want to ensure that no matter what the situation, we can always be proud of the way we treat our cows.

Taking time to look and being patient

Obviously careful monitoring of the herd at all times is vital if we are going to pick up on problems early. When times are tough, it can be easy to forget to check, or even become impatient. This could lead to more stress in the cows, which can increase the risk of them becoming sick or lame. Try to remain calm and patient around the cows at all times.

Making early decisions

The most important aspect of maintaining optimal welfare through tough times is to make early decisions about treatment of sick or injured cows.

If a cow is showing signs of pain, is injured or is sick, the most important step you can take is to act decisively.

You have three main options:

1 Treat the cow yourself

2 Call the vet

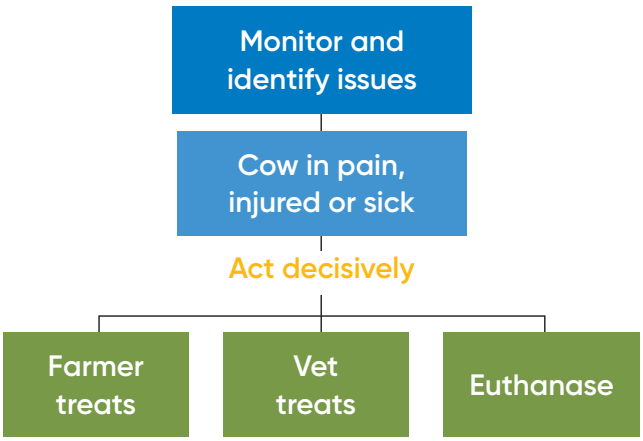
3 Euthanase the cow.

Sometimes these decisions can be tough to make, but the most important thing is that a cow is not suffering unnecessarily, or for any prolonged period of time.

Management of a down cow

The following principles apply to all down cows, whatever the cause:

- check the cow's environment
- determine the cause (get a diagnosis) immediately
- treat the problem appropriately and promptly – early treatment promotes early recovery
- if possible, get her back on her feet quickly to avoid secondary damage
- if her chances of recovery are low "or a high standard of care is not able to be provided", arrange for the cow to be humanely "ethanased" on site without delay.



Resources available

- Body condition scoring handbook
- Animal welfare standards and guidelines for cattle
- Caring for our cows booklet
- Healthy Hooves field guide
- How to manage a down cow booklet, wall chart and online videos, visit **dairyaustralia.com.au**

Looking after young stock

Heifers present a significant investment on dairy farms. At the point of calving, it is estimated that a heifer has cost the dairy farm owner approximately $2000 when all of the costs associated with rearing heifers are accounted for.

Therefore, for every 100 heifers raised on a farm, it has cost the enterprise some $200,000. To receive a return on this significant investment, heifers must get in calf quickly, calve without difficulty, produce well and get back in calf easily.

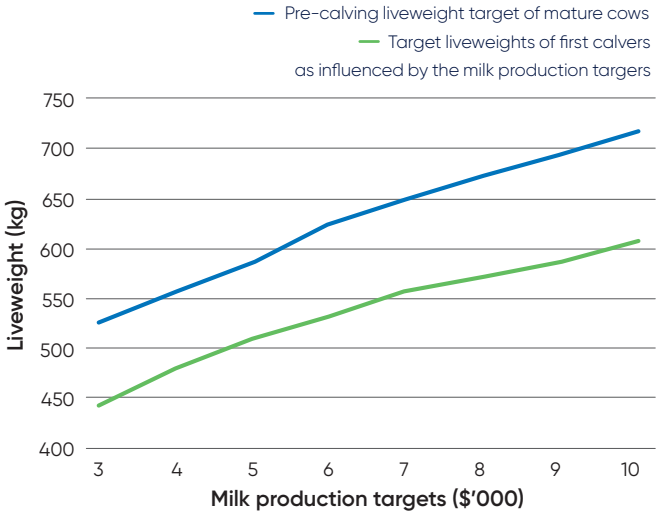
Dairy Australia and its InCalf program have identified good heifer rearing as an opportunity to improve herd profitability. Research has shown that the most profitable heifers calve for the first time at 24 months of age or less and are well grown from day one. Heifers that calve six months later at 30 months of age add $300–$500 per heifer in extra rearing costs. More heifers entering the herd result in a younger herd. Younger herds are inherently more fertile and less likely to have the milk quality issues associated with older cows. Increasing the number of heifers allows the opportunity to cull more selectively, or to earn an alternative income with the sale of excess animals.

Refer to the growing heifers well resources, visit **dairyaustralia.com.au**.

Key messages

- Heifers need to be actively managed, not just left in a paddock
- Heifers are the most important animals on the farm
- As soon as paddock feed quality decreases, start feeding replacement heifers

Figure 1 Correlation between milk production, mature-cow and first-calving liveweight (from Smart 2010).



Target weights

Research has shown that the desired weight at calving for the first time is 85% of mature liveweight. Therefore, for a herd with an optimal mature weight of 600 kg, the ideal heifer is 510 kg at the time of first calving. The target weight at calving of a first-calving heifer will depend on her mature weight and her milk production target, as shown in Figure 1. Regular monitoring and weighing of young stock must be done to help achieve target weight at first calving.

Benefits of well grown heifers

Extensive research undertaken in Australia has shown that heifers that reach target weights perform much better in several key areas:

Heifer fertility

Heifers that are well grown commence cycling at an earlier age and get in calf more rapidly than their lighter herd mates. In seasonal and split-calving herds with a fixed Mate-Start Date the lighter heifers will have poorer reproductive performance than their heavier mates, whereas in year-round calving systems the lighter heifers will have a delayed first joining. Both scenarios decrease profitability.

First calver fertility

The reproductive performance of first-calving heifers is largely dependent on their size and condition at calving. Well grown first-calving heifers that are in good condition have been shown to have superior reproductive performance to middle aged cows whereas smaller, poorer condition ones will have lower reproductive rates.

Table 1 Percentage of heifers in calf by three weeks and six weeks at different pre-calving liveweights

Liveweight at first calving (kg)	3 week in-calf rate %	6 week in-calf rate %
<400	36	79
400–440	49	80
441–470	55	91
471–510	65	90
510–540	53	88
>540	68	94

Table 2 Effect of liveweight at first calving on subsequent six-week in-calf rate, 21–week empty rate and potential late-calvers as second calvers in seasonal/split calving herds

Liveweight at first calving (kg)	6 week in-calf rate %	21 week in-calf rate %	Late calvers at 2nd calving
<400	49	79	30
400–440	60	87	27
441–470	68	89	21
471–510	68	87	19
510–540	75	88	13
>540	77	87	10

Well grown first-calving heifers will cycle sooner and conceive earlier than poorer grown ones so they are more likely to calve earlier in subsequent lactations and are less likely to be culled for being not-in-calf or late. Reduced culling of heifers results in a need for fewer replacements to be reared, which results in decreased costs for farmers and better welfare outcomes for the dairy industry. It also allows greater opportunity to cull older animals for important reasons such as poor milk quality, or for farmers to derive an income from the sale of excess animals.

In year-round calving herds there were similar trends, with heavier heifers having better reproductive performance than light heifers, as shown in Table 3, where the median 100-day in-calf rate of 4–7 year-old cows in this study was 51%.

Comparing the reproductive performance of the first-calved heifers to the herd average is a good way to assess how well you have reared your heifers. (Table 4).

First calver production

Several studies across different dairy farming systems in Australia have shown increased milk volume and milk solids from heavier first-calving heifers in their first lactation and that this benefit was transmitted to their second and third lactations. For a heifer calving 50 kg heavier than her herd mates there is an increase of 1041 litres of milk, 38.5 kg butterfat and 42.5 kg protein (81 kg MS) over the first three lactations. Depending on the farming system, this equates to an extra $400 to $500 in milk income per heifer.

Growing young stock

Grazed pasture is the cheapest feed source on most dairy farms for growing cattle. However, it must be of sufficient quality and quantity to satisfy the requirements for growth as well as maintenance. When pasture quality and quantity is not adequate supplementation will be required. Usually, protein and energy supplements will be required when pasture quality deteriorates. As a general rule when pasture quality is poor, high-quality supplements containing at least 11.5 MJ ME/kg dry matter and 16% crude protein will be required. The macro and micro-mineral needs of heifers also need to be considered as in much of Australia selenium and copper deficiency is common and cobalt deficiency can be present. In southern Australia, calcium and phosphorus concentrations in pasture can be inverted and insufficient for desired skeletal growth. There are several tools available to assist with the calculation of nutrient requirements of growing cattle. Heifer management tools developed by Dairy Australia are available at **dairyaustralia.com.au**.

Table 3 Effect of liveweight at first calving on subsequent 100– and 200–day in-calf rate for year-round calving herds

Liveweight at first calving (kg)	100-day in-calf rate %	200-day in-calf rate %
<400	38	75
400–440	46	80
441–470	53	82
471–510	52	79
510–540	61	81
>540	61	77

Table 4 Recommended measures of replacement heifer rearing performance

Key measure	Measurement	Target	Trigger
Age of first calving		24 months	>27 months
Heifer fertility	% calved by 3 weeks % calved by 6 weeks	70% 95%	<60% <85%
First calf heifer fertility	6-week in-calf rate 21-week not in-calf rate 100-day in-calf rate 200-day not in-calf rate	60% 6% 53% 12%	<50% >10% <45% >18%
Production	Relative to mature-cows	>85%	<80%
Longevity	% second calvers to first calvers % of cows 4–8 years old	>85% >50%	<80% <40%

Drinking water access and quality

Are they limiting your cows' productivity and health?

Water is often ignored in dairy herd nutrition. However, it is the first nutrient. Unrestricted access to clean, fresh drinking water is essential for dairy cow productivity, health and welfare, be that under normal conditions or during/after adverse events.

Cows are sensitive to water access and quality problems

A cow's body is between 60–80 per cent water. Milk is 87 per cent water. Water is essential for regulation of body temperature, rumen fermentation, flow of feed through the digestive tract, nutrient absorption, metabolism and waste removal. Water also has structural and functional roles in all cells and all body fluids.

Lactating dairy cows are more sensitive to drinking water access and quality problems than other production animals because:

- They require larger volumes of water per unit of body mass
- Their rumen pH needs to be maintained within a relatively narrow range for good rumen function.
- Their rumen function may be altered by water containing a high total bacteria count.

How much water do cows drink?

The amount of water a cow drinks (also known as free drinking water consumed) depends on:

- Cow size and milk yield
- Daily dry matter intake
- Percent dry matter in feed offered
- Percent protein, sodium and potassium in feed offered
- Environmental temperature and relative humidity
- Water availability, temperature and other water quality parameters.

Cows must maintain a balance between the water inputs and outputs.

Key messages

Cows are sensitive to water access and quality problems

Check water source(s) and see if there has been any damage to pumps or contamination of water supplying house, dairy shed and water troughs

During hot weather, a lactating cow can drink 200+ litres of water per day

Provide water troughs in each paddock as well as in laneways

Give cows the opportunity to drink immediately before and after milking

Cows on a sacrifice paddock or feedpad should have access to two water troughs at all times

Water troughs should be easy to clean, and be cleaned regularly

The only way to know if your farm's water is fit for your cows to drink is to get it tested by a specialist laboratory

Inputs	Outputs
Free drinking water consumed + Water in feed consumed + Metabolic water	Water losses in • urine • manure • milk • sweat • respiration

During hot weather, a lactating cow can drink 200+ litres of water per day. Water palatability, and therefore intake, may be negatively impacted if the water contains high levels of iron (Fe), manganese (Mn) and salts. Cows prefer to drink warm water.

Cow	Daily water requirement
Non-pregnant cows in cool environment (<15°C)	About 3.5 litres of water per kg of dry matter consumed (e.g. Cow consuming 20kg DM: approx. 70 litres)
Pregnant cows in warm environment (21–25°C)	Up to 7.1 litres of water per kg of dry matter consumed (e.g. Cow consuming 20kg DM: approx. 142 litres)
Lactating cows	6 litres of water per kg of dry matter consumed + 1 litre of water per litre of milk + additional allowances for hot weather (e.g. 30 litre cow: approx. 120 + 30 litres + weather allowance)

Source: *Feeding Dairy Cows manual*, 2015

Providing drinking water to cows

Check water source(s) and see if there has been any damage to pumps or contamination of water supplying house, dairy shed and water troughs. Test water as necessary. If multiple water sources are available, use the source with the least nutrient and microbial contamination. Consult an expert for advice if necessary.

Cows should have access to fresh, clean water at all times. The most common water nutrition problem on most dairy farms, accepting that water quality is suitable, is providing cows with insufficient water troughs and/or troughs that don't re-fill at a fast enough rate during drinking. The result is that cows' opportunities to drink during their daily routine may be limited. This impacts on their milk production and health.

High flow rates are essential. Water pipes should be 75mm in diameter. There needs to be sufficient pressure to provide 20 litres per cow per hour. A cow can drink 20 litres per minute so flow rates are critical. Large volume troughs will help to maintain supply during high demand.

In paddocks and laneways

In grazing systems, providing troughs in each paddock is important. A recent study found that cows drank less water, spent less time drinking and had fewer drinking events when the trough was in a laneway up to 150m away from paddock vs. in the paddock. Subordinate cows drank less than dominant cows when their trough was in the laneway. Another study found that providing cows water in each paddock improved dry matter intake and milk production.

In hot weather, having water troughs in every paddock will help to keep cows grazing longer. The less distance cows have to walk to drink, the less chance that they will stop grazing due to the heat.

At the dairy

Providing cows with access to water near the exit from the dairy shed and in the dairy holding yard in addition to laneways and paddocks is also important, as cows may consume 30–50 per cent of their daily water intake within one hour of milking.

Water access at the dairy is particularly important if:

- Weather is hot and cows are carrying a heat load
- Cows spend more than 45 minutes waiting in the holding yard before milking
- Cows must walk a considerable distance after milking to the paddock.

On a sacrifice paddock or feedpad

When on a sacrifice paddock or feedpad, cows should have access to two water troughs at all times.

Cows appear to prefer larger, higher troughs to smaller, lower troughs. Large volume concrete troughs help keep drinking water appropriately cool during hot weather.

Look out for cows queuing up to drink, or empty troughs.

TIPS

Install an alarm on your farm's water pumps to alert you quickly if it fails

Fit a large white or yellow float ball at each paddock water trough visible from a long distance

Position water trough near exit from dairy shed on a wide section of track to minimise cow congestion

Avoid running black poly pipe along the ground as the water will become very hot

Cows drinking from water trough near dairy shed exit

Large, bright float balls make it easy to see a problem. Source: HEICC

Cleaning water troughs

Many different microorganisms can survive in drinking water supply systems and are potentially hazardous. Water troughs are of particular concern as they can become readily contaminated with cud and manure, faeces from birds, rodents, recycled water, dust, feed, bedding material, and microbes entering through the water pipe. These contaminants can provide a nutrient-rich substrate for bacterial growth and survival at the bottom of a trough.

E.coli count per 100ml is used as an indicator of faecal contamination and possible presence of pathogens in water.

Trough hygiene should therefore be an important aspect of good water management. On many dairy farms overseas, water troughs are routinely cleaned and sanitised e.g. weekly, and being able to see the bottom of trough is expected. Yet in Australia we tend to give trough hygiene little attention.

TIP

If installing or upgrading water troughs, try to use ones which have a large bung/release valve at the bottom so that regular cleaning of the trough is much easier.

Sludge in bottom of a water trough not drained and cleaned for over two years

Water quality – does it matter?

Good water may be defined as clear and colourless, with low total solids, and no disease organisms, pesticides, undesirable odours, flavours or objectionable gases.

Parameters that may impact on cows' water intake and/or health and productivity include:

- Temperature, turbidity, colour, taste, odour
- Total dissolved solids (salinity)
- Sulphur, sulphate, hydrogen sulphide
- Iron and manganese
- Nitrate
- Heavy metals
- Microbial contamination.

Parameters that may impact on water flow through farm's drinking water system:

- hardness
- pH.

The impact of high microbial contamination of drinking water on cows' health and productivity is uncertain. More research is required.

Water quality analysis

The only way to know if your farm's water is fit for your cows to drink is to get it tested by a specialist laboratory.

- If you know or suspect that your herd's water intake, feed intake, and animal performance are sub-optimal, get the water tested.
- Routinely testing your herd's drinking water every year is good practice. It will alert you to any changes in your water quality.

Collect first water sample from a trough currently being used by cows.

Expect to pay about $150–200 for a comprehensive water test which assesses levels of: total dissolved salts (TDS), pH, hardness, specific minerals/compounds, heavy metals, other toxic compounds and microbes. Your nutrition adviser can assist you in ticking the appropriate boxes on the lab submission form.

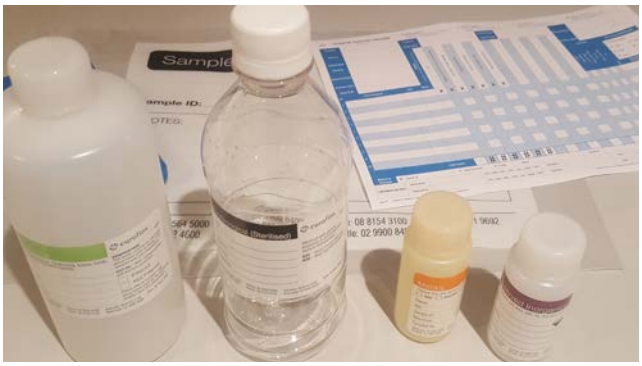
If results for some parameters are above recommended levels, collect a second sample from the water source.

If results of analysis indicate water quality problems, consider whether an alternate water source can be used or if a water treatment system may be worth installing. A range of water treatment methods are available to improve specific water quality problems. These treatment methods include chlorination with filtration, ion exchange, ozonation and reverse osmosis.

TIPS

When collecting a water sample:

- Use appropriate sample bottles provided by lab
- Use aseptic technique
- Pack bottles in cooler with ice block
- Courier to lab within 24 hours



Water sample bottles and lab form

Recommended acceptable water quality levels for dairy cattle

There is no thoroughly researched, universally agreed set of recommended acceptable water quality levels specifically for dairy cattle. However, here are four recently published sets of recommended acceptable levels which provide a guide.

Parameter tested	**Unit**	**Dairy NRC** 2001	**Socha** 2003	**Beede** 2006 **Adams & Sharpe** 1995	**Oetzel** 2008
Ammonia (as N)	mg/L				
Chlorine	mg/L	–	<100 (<300)		<250
Nitrate (as N)	mg/L	<10	<20 (<100)	<100	<25
pH	pH units	6.5–8.5	6.5–8.5	5.1–9	6–9
Sodium adsorption ratio*	mg/L				
Sulphate (as SO_4)	mg/L	<1000	<150 (<900)	<2000	<250
Total dissolved solids	mg/L	<1000	<960 (<3000)	<3000	<1000
Alkali metals					
Calcium	mg/L	–	<100 (<200)	<500	<200
Magnesium	mg/L	–	<50 (<100)	<125	<80
Potassium	mg/L	–	<20	–	<20
Sodium	mg/L	–	<50 (<300)	–	<100
Alkalinity (speciated)					
Total alkalinity (as $CaCO_3$)	mg/L	–	–	<5000	<500
Hardness set					
Hardness mg equivalent $CaCO_3$/L	mg/L	–	–	–	–
Arsenic	mg/L	<0.05	<0.2	<0.2	<0.2
Cadmium	mg/L	<0.005	<0.01 (<0.05)	<0.05	<0.05
Chromium	mg/L	<0.1	<0.1 (<1)	–	<0.1
Copper	mg/L	<1	<0.2 (<0.5)	<1	<0.5
Iron	mg/L	–	<0.2 (<0.4)	<0.3	<0.3
Lead	mg/L	<0.015	<0.05 (<0.1)	<0.1	<0.1
Manganese	mg/L	<0.05	<0.05 (<0.5)	<0.05	<0.05
Mercury	mg/L	<0.01	<0.01	<0.01	<0.01
Nickel	mg/L	<0.25	<0.25 (0.1)		<1
Zinc	mg/L	<5	<5 (<25)	<25	<25
Pathogens					
E. coli	MPN/100ml	–	–	–	–
Total coliforms	MPN/100ml	–	<0.5	<1 for calves <50 for cows	–

Business management

DairyBase budgeting

Introduction

The **DairyBase Budgeting** is an enhancement to the existing DairyBase tool that will assist farmers with forward planning. The budgeting function allows users to select a historical dataset in DairyBase and adjust some key financial parameters to enable forward planning.

DairyBase was established in 2015 to enable dairy farmers and their advisors to measure and compare farm business performance over time. By recording information farmers are able to identify opportunities to drive profit and manage risk. As a result, farmers are better equipped to make informed decisions in their business.

The **DairyBase Budgeting** feature enables existing DairyBase users to leverage their historical data and make forward estimations of their business performance to assist with forward planning and managing risk.

The budgeting function does not allow any changes to physical characteristics of the farm either from systems change, stocking rate or milk production. These changes require a complex analysis of the capabilities of the individual farm based on the resources available to them, and the interaction between the physical and financial components of the dairy business.

Getting Started

The **DairyBase Budgeting** function is accessible within **DairyBase**. Budgets can be created either by selecting the Create Budget button at the top of the main screen or by selecting an existing historical dataset and creating a budget from the initial popup modal or from within the historical year.

Figure 1 Load dataset modal

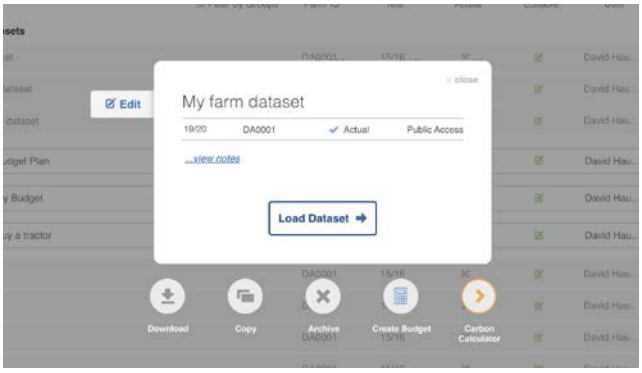
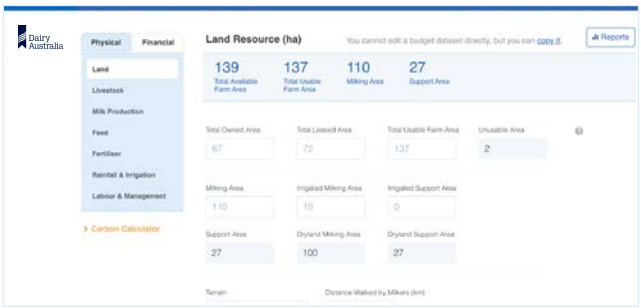


Figure 2 Budget option within historical year



Creating a budget

Whilst many people will utilise the most recent financial year as the source data for their budget, it is possible to use any of your historical datasets for the purpose of creating a budget. Given the budget does not enable adjustment to any physical aspects of your farm you may look to select the historical year that best represents the predicted season ahead in terms of both operating structure, so land area and milker number, along with predicted seasonal conditions, so the season that most closely matches potential homegrown feed capabilities.

Prior to completing a budget it is worth having some information in front of you, such as your milk income estimate and the predicted prices you will pay for purchased feed, fertiliser and any irrigation costs for the year, along with a prediction on any change to livestock sales or purchases.

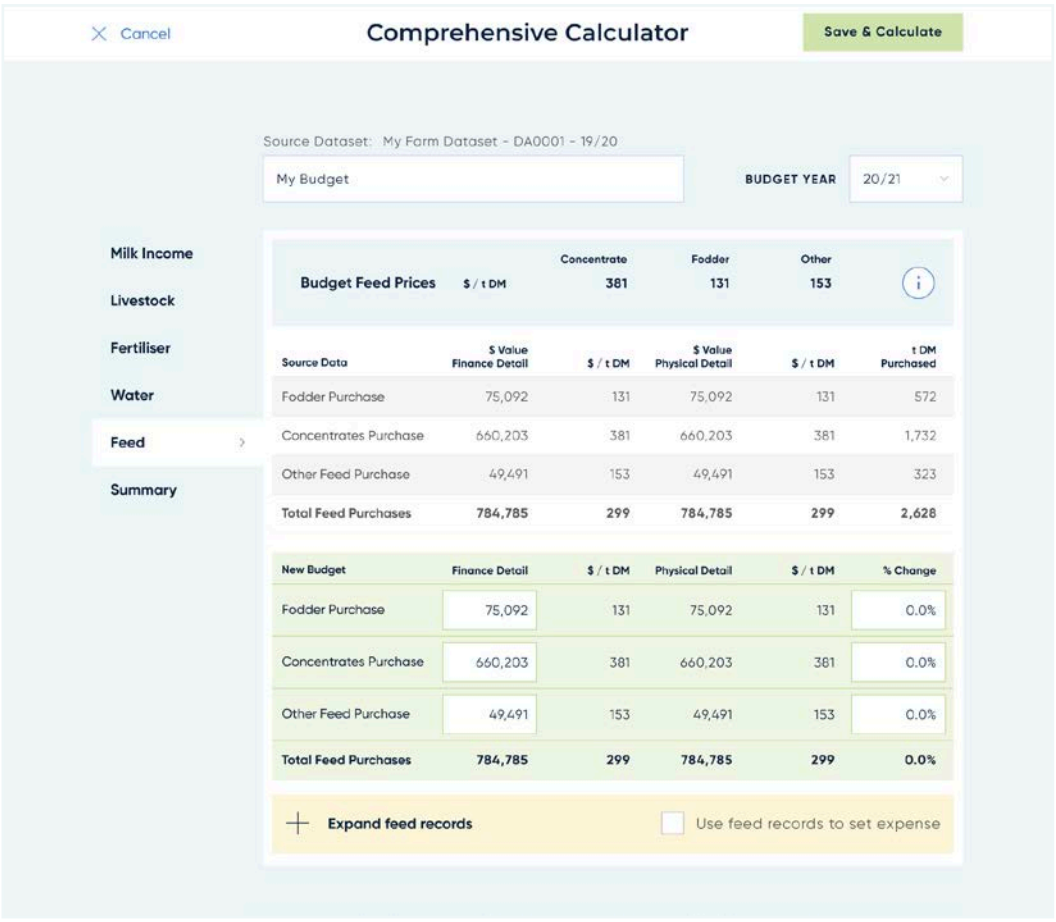
As with DairyBase, there are embedded descriptions within the title of the data entry boxes and help icons throughout the budget tool which provide further details about the data required in each section.

In the top of each tab, users can select whether they want to review their data on a $ per kilogram milksolids ($/kgMS) basis or cents per litre (cpl) to best align with the way they are paid for their milk.

Whilst the livestock and water tabs only enable you to change the total dollars, the other tabs give users a number of options to change the source data, including $/kgMS, cpl and $ per tonne and per cent change to give greater flexibility in the way people undertake budgeting.

The feed tab provides the source and budget data in two ways. The finance detail view is based on the total purchased feed costs entered in the variable costs section of DairyBase divided by the tonnes of each feed type purchased. The physical detail view however, is based on the quantities purchased and per tonne purchase price entered for each feed type in the feed tab of DairyBase. It is recommended that these two views have been aligned with each other in the historical dataset selected, to ensure an accurate budget for the year ahead.

You can elect to either change the total $ value for fodder, concentrate and other feed purchases or users can select the tick box that will enable them to change the $ per tonne price for each individual feed from the source dataset

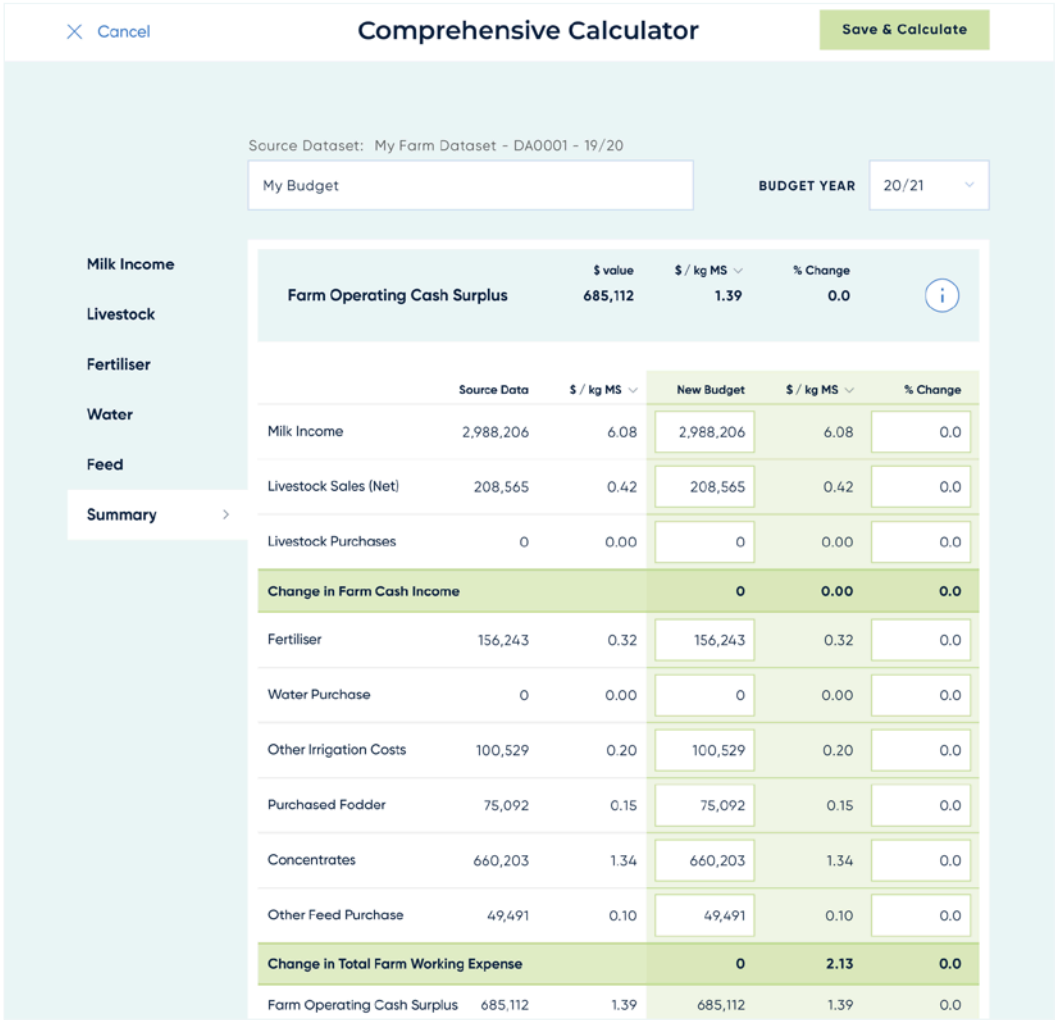


Reports

The DairyBase Budgeting function has a Summary tab that shows the new Farm Operating Cash Surplus for the business, as a result of the changes made in the budget.

Users can also elect to utilise the Summary tab for the purpose of budgeting by making all the required changes within this tab rather than using all the other individual tabs.

Once a budget is completed you can then view the budget in all the existing report formats available in DairyBase. If for example, you want to look at a comparison report, the budget year and historical source dataset will prepopulate as the selected datasets and you can then select other historical years or budgets to compare your business across multiples years and against any regional benchmarks.



Farm Business Snapshot

The Farm Business Snapshot provides an analysis of the historical performance of a dairy farm business, helping users to better understand their production costs and overall profitability. The reports will provide additional information to support the decision-making process and enable farmers to take actions in their business that best suit their needs.

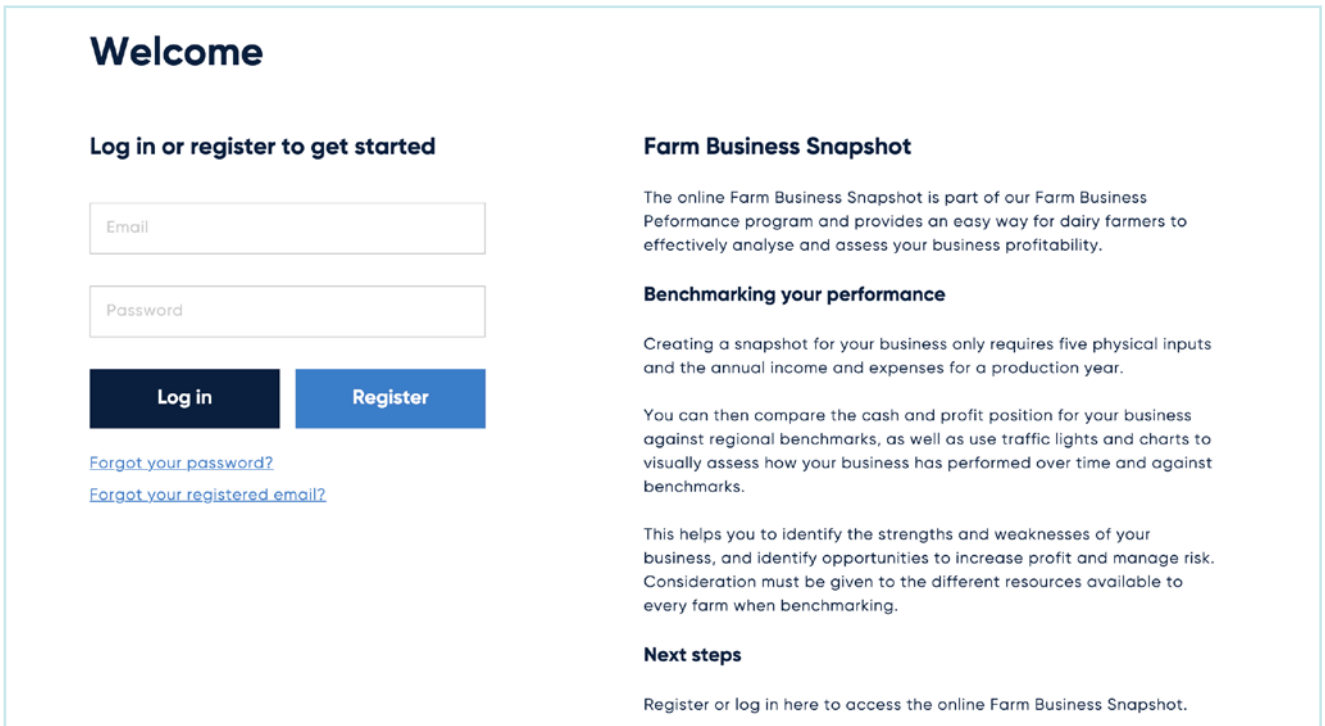
This will show the overall cash and profit position of your business and enable you to assess these as a measure of efficiency against the key inputs.

Benchmarking your own farm year on year is the best way to review your business. This enables you to determine the strengths and weaknesses of the business and identify opportunities to increase profit and manage risk. Comparing against regional benchmarks can also assist with assessing your business performance but consideration must be given to the difference in resources available to every farm.

Getting Started

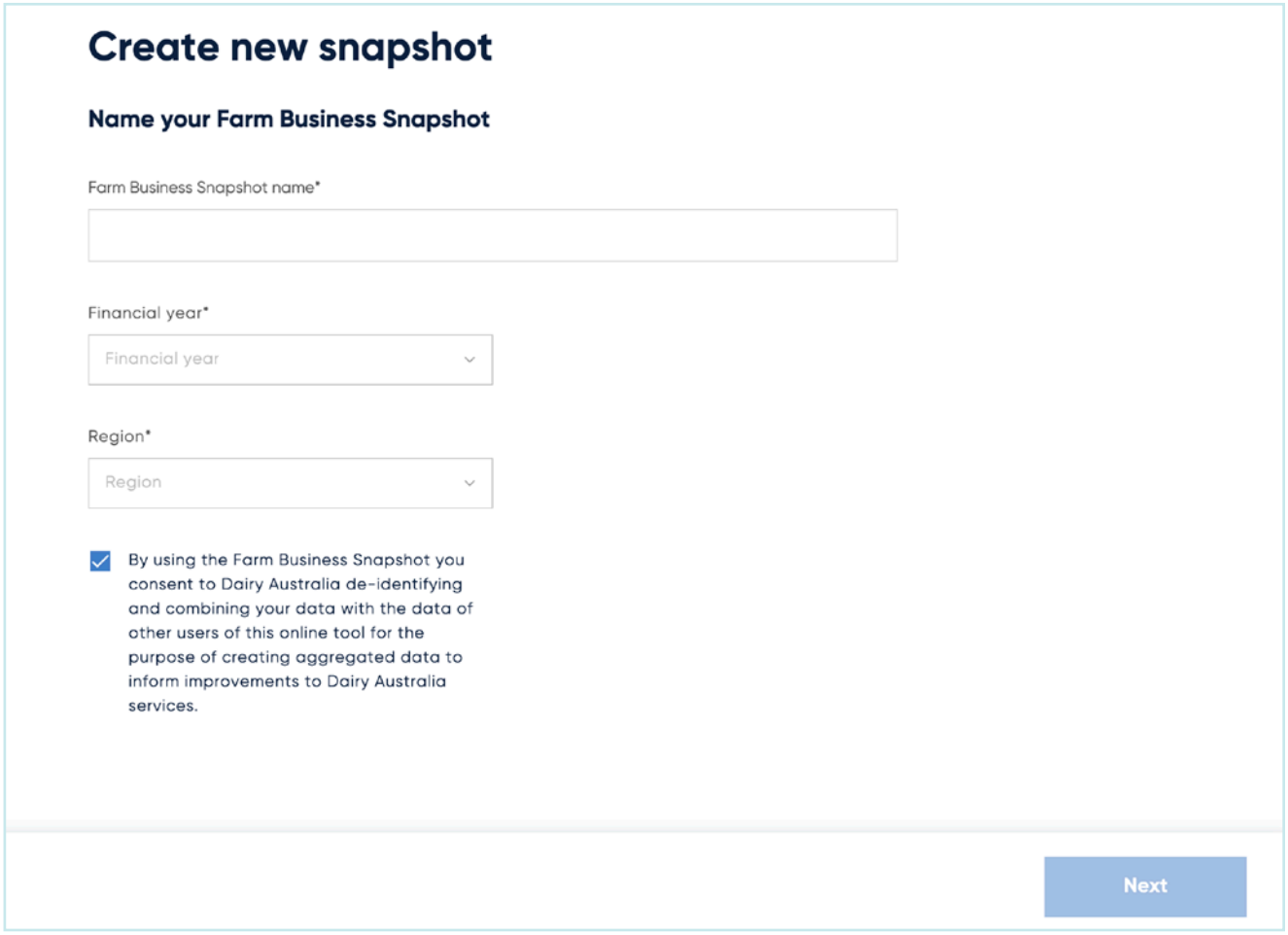
The Farm Business Snapshot is accessible by registering through Dairy Australia's Salesforce communities platform. It is preferable that when registering, you use an email address that is already used by Dairy Australia for communicating with you.

Once you have registered you will initially need to agree to the terms and conditions on the way in which the data is stored by Dairy Australia. You will also be given access to the Get Started page that will provide the steps on how to use the tool.



Creating a snapshot

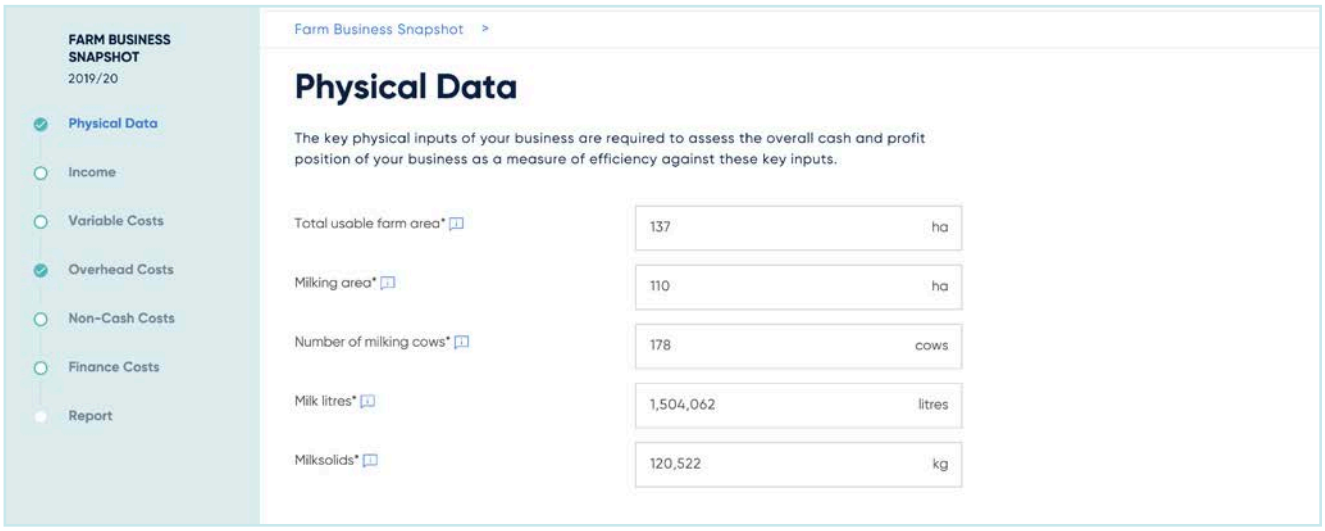
When you first create a snapshot you will need to name the snapshot and select the region and financial year to which it applies. You will also be given the option to give Dairy Australia the ability to de-identify and combine your data with the data of other users of this tool for the purpose of creating aggregated data to inform improvements to Dairy Australia services.



Entering your data

You will need access to your financial records, either from your financial statements or directly from your accounting program, along with five key pieces of physical data.

There are help icons for each data entry point which provide descriptions of the information that should be entered in each section. These are also present in the output reports to provide information about the calculated outputs.



The Matching Principle

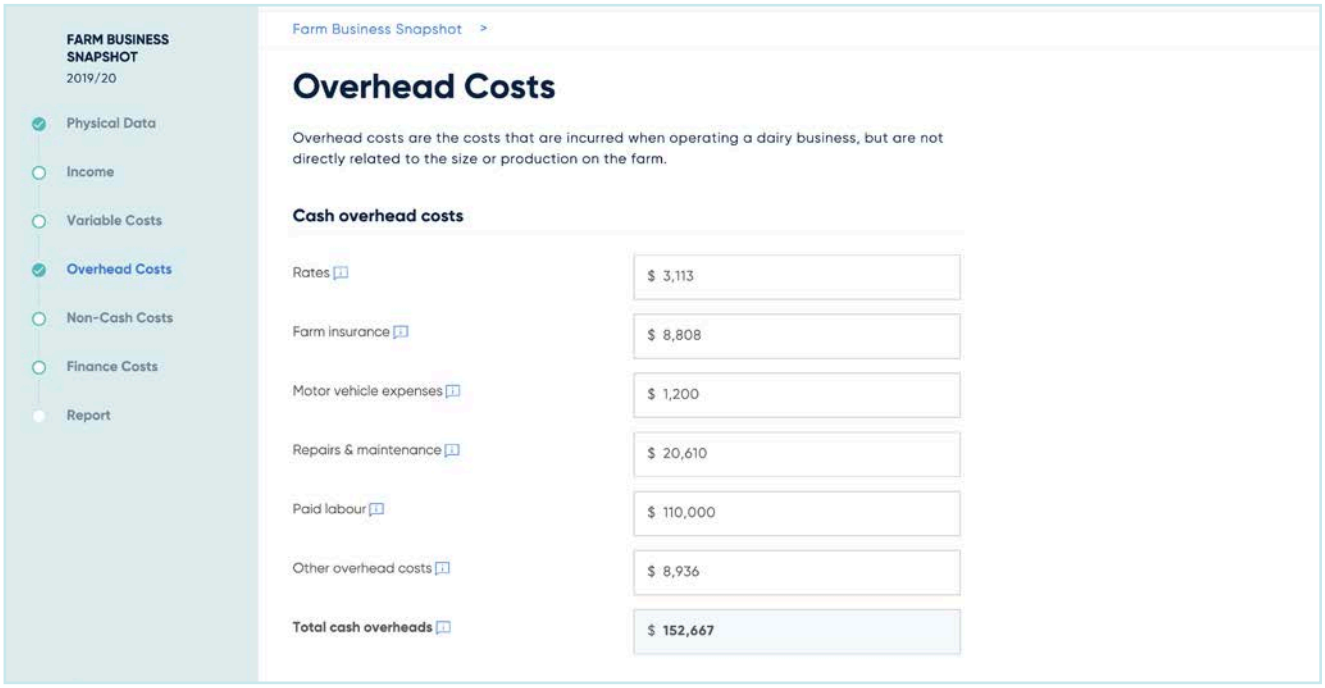
Dairy business analysis examines in detail the production of milk for a set period, commonly the financial year. So, all the income and expenses must relate to that production only, to ensure that the reported profit fairly reflects performance. Accounts need to be adjusted at the start and end of the year to ensure they match the milk production, (unless you use an accrual accounting system rather than the more common cash system). Your June milk statement is the best place to access your milk income to ensure it matches the production year.

With your costs you may need to make manual adjustments for items such as prepaid fertiliser, or prepaid interest.

If you have had considerable capital expenditure during the year that your accountant has included in your Repairs and Maintenance expense then it is also worth moving them out of Repairs and Maintenance and into Capital Purchases.

Non-cash costs

The non-cash costs are required to enable you to measure the profit position of your business versus the cash position. You will need to estimate the dollar value of the inventory changes in your business along with the depreciation and imputed labour expense, with help notes included for each item.



Reports

The reports will enable you to review the cash and profit position of your business, and also compare your performance to the regional benchmarks. Reports will provide results in actual dollars, but also in relation to the production ($ /kg milk solids or cents/litre) and to the key assets ($/ha or $/cow).

If the regional benchmarks do not appear, it may be because the year you have selected for your snapshot does not yet have finalised benchmarks. Please use the Financial year drop-down box, at the top of the report, to select the most recent financial year to get the benchmark data for your region.

Traffic Lights

There are traffic lights next to each output in both the cash and profit reports for each of the tabs, except the actual dollar tab, where comparison to benchmarks has no meaning. Each traffic light shows your performance in each measure in comparison to the regional benchmarks for that financial year. The reference is against both the regional average and Top 25%. The benchmark data comes from the Dairy Farm Monitor Project and Queensland Dairy Accounting Scheme and matches the benchmarks utilised in DairyBase.

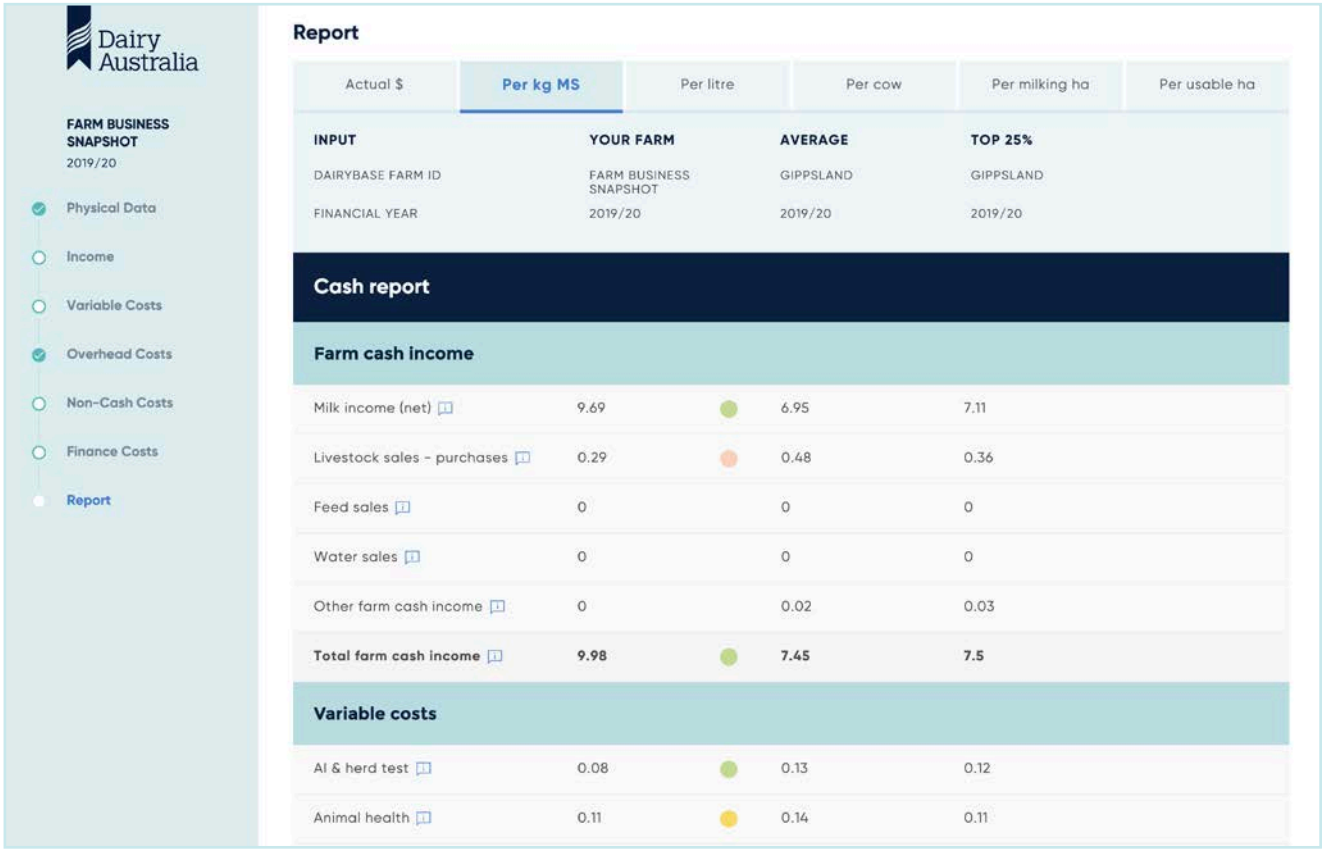
There is more information about interpreting the traffic lights in the downloadable benchmarking document in the tool. The reports can be downloaded as both PDF and excel documents.

Linking to DairyBase

For users who would like to extend the analysis of their farm business, they can transition from the Farm Business Snapshot to DairyBase, which provides a more in-depth analysis of the business, particularly in respect to the performance of the physical resources in the business and the impact on wealth. A snapshot will automatically appear as a dataset in DairyBase for existing users or will be accessible for new users when they login. You cannot edit the snapshot in DairyBase but you can create a copy and then update information in the copied version to complete the DairyBase analysis.

FOR FURTHER INFORMATION

Visit dairyaustralia.com.au/fbs



People

Managing your farm team

Taking care of yourself, your family, staff and your neighbours is always a priority

Staying safe

During challenging situations, a number of things can happen on the farm that can end up causing a safety issue. It may be that people are undertaking tasks they are not familiar with or they are fatigued more than usual which can create increased risk.

Read more about farm safety and order resources at **thepeopleindairy.org.au/farmsafety**.

Look out for yourself and your team

Resilience is the willingness and capacity to accept that there will be good and bad times ahead, and where possible, putting strategies in place to manage these unforseen events. Read more about resilience on the **People in dairy** website.

Make time for an interest off-farm

In challenging times, it can be difficult to think of anything outside what is happening on your farm. Having time away (or off-farm) even for a few hours, can help clear your mind and allow you to make better decisions when back at work.

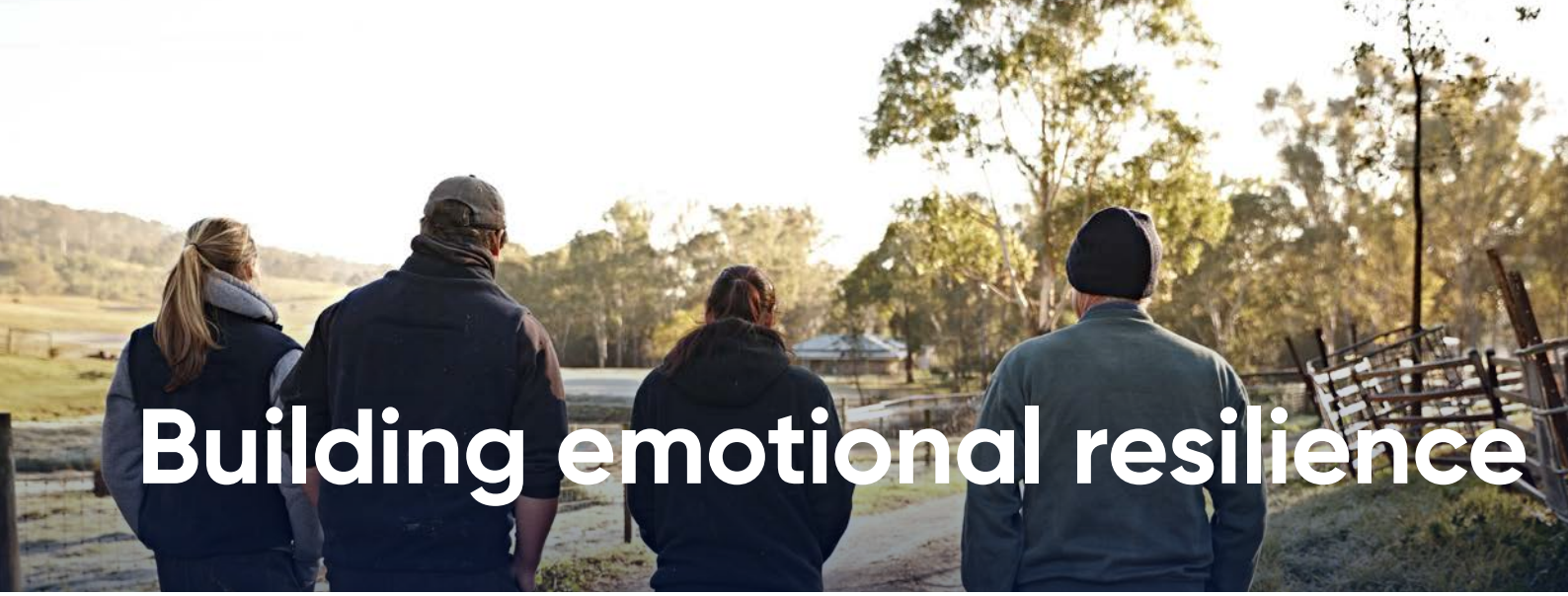
This might be catching up with family and friends, sporting or community related activities, or being involved in a local group like the Young Dairy Network (YDN) or a discussion group.

If you employ people

The current situation may impact on their future employment within your farm business – it's important to keep the lines of the communication open so your staff feel informed and supported.

Before doing anything:

- Consider how you can roster staff to ensure you get some time to rest, knowing the farm is being operated in a safe manner
- Think about how you can maximise staff expertise and hours in your dairy business, as well as having adequate staff cover for leave etc
- Consider the employment arrangements and systems you have in place, including employee entitlements.



Building emotional resilience

Farmer health

Emotional resilience is the ability to adapt to stressful situations, and cope with life's ups and downs. Resilience does not eliminate stress or erase life's difficulties, but allows you to tackle or accept problems, live through adversity and move on with life.

Resilience is a process, not a trait of an individual or an event. It takes preparation and even practice to develop and maintain emotional resilience.

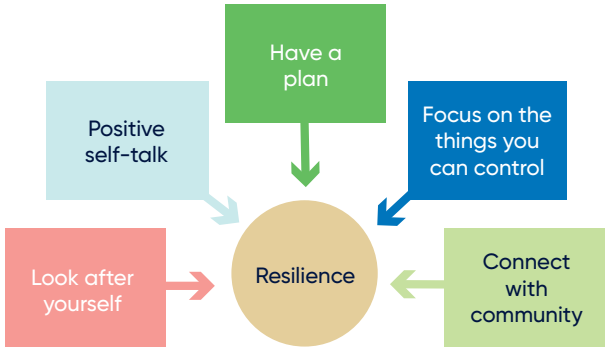
A resilient person has the capacity to find the resources they need, apply strategies, and make plans to overcome challenges, allowing them to function effectively for their business, family and community.

Seasons will be volatile, good things and unfortunate things will happen, change and challenges will occur. It is not whether these things will happen or to what extent, it is just a matter of when. Resilience is about how we deal with these events.

Resilience is your ability to:

- recognise and accept challenging times in life;
- recognise your own reactions and symptoms to challenging situations; and
- have strategies to enjoy life's ups and downs so you stay well, in control and feel energised.

Figure 1 Five key strategies to help build mental and emotional resilience



In challenging times, it is normal for people to exhibit the following behaviours:

Flight: Avoidance behaviours where individuals do not talk about the situation, deny the nature of it, and even lie about the seriousness of the situation.

Fight: Individuals get annoyed or angry and often 'shoot the messenger' rather than addressing the message.

Freeze: Individuals feel overwhelmed and don't know what to do.

The way individuals react, and what they need to manage their reaction in a positive way, will vary from person to person.

Five key strategies to build resilience

1 Look after yourself

By looking after yourself you increase your capacity to handle the challenges around you.

- **Physical health:** Exercise, a balanced diet and rest are crucial factors. Make it a priority to see a doctor and dentist. This may be difficult in some rural areas, but schedule them at least twice a year, every year.
- **Mental health:** De-stressing and quality of sleep. Think about whether you get a good night's sleep, are able to wind down and de-stress. Consider methods that can help you with this, such as practising good sleep hygiene.
- **Connectivity and social networks:** Stay connected with your friends, family and in your community through local groups, clubs and online social networks.
- **Spirituality:** This will mean something different for each individual. It is about what you believe and your values, and could involve spending time in nature, meditating, appreciating music, art, or prayer.

Feeling good doesn't just happen. Living a balanced life requires taking the time to renew yourself and improve your personal well-being.

Remember every day provides a new opportunity to re-charge and look after yourself.

Give yourself a break. Taking time away from the farm can be a source of stress and potential conflict among family members. Even during busy times consider taking a break of up to four days to re-charge, and increase your effectiveness when back at work. During 'down time' you should take a break for a minimum of four days.

Tip

If you can't look after yourself, you can't look after your family, your mates or the business.

2 Positive self-talk and listening to your inner voice

When challenged, what is your self-talk? What do you hear yourself saying when you are facing a tough situation? If you have negative self talk, does it influence your actions and how people interact with you?

Your self-talk reflects how you feel and think about yourself. During difficult times it can be hard to remember all the skills it takes to run a farm business. Rather than focusing on the negatives, consider the vast array of attributes and skills you have that contribute to your business and family life, including advanced negotiation, practical problem-solving, high work ethic, technology skills, etc.

Change your self-talk so it is positive. Try and describe the situation in another way. Reframing your self-talk won't make the problem or challenge go away, but it may move you away from the flight-fight-freeze responses into problem-solving behaviour.

3 Planning

It can be difficult to adapt in the face of adversity or significant sources of stress, so it is important to plan and have mechanisms in place to apply in difficult times.

Begin by understanding what 'pushes your buttons' and might threaten your resilience. Knowing what reaction you have when your 'buttons are pushed' enables you to make a plan to counter any adverse reactions, and adopt a different strategy or reaction.

Create a plan, find out what works for you, and build on it continually.

Time management is also important to help create a stable and certain environment so you can better handle any surprises. Simple time management will help you get in control, and create a sense of certainty. Having a plan, even a simple to-do list, will remind yourself of the steps you are taking and the progress being made.

4 Focus on the things you can control

Be clear as to your 'why' and have a plan to achieve it. Those who are clear as to this 'why' will be clearer in their aspirations and intentions, which can make it easier to accept the good with the bad. Those who are uncertain as to their 'why' will struggle to endure the more challenging times and will become unclear as to where to put their energies.

Become adept at knowing what you can control as opposed to wasting energy on the things you can't. Be realistic. Ask yourself, 'What can be done about this, or at least part of this?' It might be overwhelming but consider if there are parts that can be addressed to get some positive return.

Sometimes it can be difficult to know the difference between things that can be controlled and those that can't. Don't ignore the things you can't control, acknowledge them, and then focus energy and time on the things you can control.

5 Connecting with community

It is essential to stay involved with family, work and the community for many positive reasons, such as being able to contribute, to be valued and critically to maintain perspective. The more people you interact with, the greater the likelihood that you will meet people who have experienced, survived and grown through similar experiences.

Look for ways to connect with the community through work, volunteering, sporting clubs, charity clubs, and get your friends involved in the activities as well. There is scope for positive engagement through the virtual community. Social media such as Twitter, Facebook, etc, are valuable tools to stay connected and engaged both locally and further afield.

Some individuals have the ability to build people up or drag them down. Positive people attract positive people, and all the benefits that come with that. Negative people attract negative people, and everything that goes with that. Make the choice to be positive, surround yourself with positive people and reap the benefits.

Spotting the early warning signs

People go through changes that can put emotions and feelings out of balance. If they remain so for an extended period of time they can cause significant impairment affecting our ability to function, and can become a clinical condition.

It is important to be able to recognise the signs and symptoms that indicate your resilience is slipping. They can be different for each individual.

Depression is a mood disorder that is characterised by an unusually persistent sad mood that does not go away, a loss of enjoyment and interest in once pleasurable activities, a lack of energy and tiredness.

It is helpful for people to understand what depression is and what it isn't. It is not something to be ashamed of or to feel guilty about. It is not a character flaw or a sign of weakness, or a lack of discipline or personal strength. It is not just a mood that someone can 'snap out of'. More importantly depression is not permanent and the chances for recovery are very good.

Some risk factors for depression include:

- loneliness;
- lack of social support;
- recent stressful life experiences;
- family history of depression;
- marital or relationship problems;
- financial strain;
- early childhood trauma or abuse;
- alcohol or drug misuse;
- unemployment or
- underemployment; and
- chronic pain and other health problems.

Why are farmers more vulnerable?

- intense periods of work;
- lack of sleep;
- isolation;
- lower exercise levels;
- services not readily available;
- self sufficiency and independent
- attitude;
- 'just get on with it' attitude; and
- the stigma around mental illness and a general reluctance to seek help.

Table 1 Symptoms of reducing resilience

Emotions	Thoughts	Behaviours	Physical symptoms
• Sadness • Anxiety • Guilt • Anger • Overwhelmed • Irritable • Mood swings • Lack of emotions • Helplessness • Hopelessness • Lacking confidence • Indecisive	• Frequent self-criticism • Self-blame • Pessimism • Impaired memory and concentration • Indecisiveness and confusion • Tendency to believe others see you in a negative light • Thoughts of death and suicide	• Withdrawal from others • Worrying • Neglecting responsibilities • Loss of interest in personal appearance • Loss of motivation • Not doing usual enjoyable activities • Unable to concentrate • Crying spells	• Chronic fatigue • Lack of energy • Sleeping too much or too little • Overeating, loss or change ofappetite • Constipation • Weight loss or gain • Irregular menstrual cycle • Loss of sexual desire • Unexplained aches and pains

Source: Lessons Learnt Counsulting

C	A	R	E
Compassion	Access to experts	Revitalising work	Exercise
Show compassion for the person	Check if they have access	Get them focussed and active if possible	Encourage some form of physical exercise

If you are worried about someone you CARE for, remember these points

Tip

As a guide, if someone experiences symptoms for more than two weeks in a row with no explainable reason and it is affecting their ability to function, then they should seek professional help.

To build a resilient lifestyle, get used to doing the following:

- Get comfortable with feelings. Have the courage to ask the question 'How are you going?' and follow up with the 'I am concerned for you' and 'I am here for you if you need'.
- Care for your mates, colleagues and families. Keep connected in the community and talk yourself and your mates up.
- Give your self a break, take some time out and get away. Get good quality sleep.
- Don't suffer from the 'I wish I had a ...' syndrome.

Maintaining resilience is an ongoing exercise. Having a plan and looking at it once is not enough. It needs to be part of your life.

Remember, a resilient mindset, and dealing with everyday life issues in a calm and balanced manner consists of:

- Accepting yourself and others for who you are, and accepting responsibility for looking after yourself.
- Listening to your inner voice and having positive self-talk.
- Understanding 'what pushes your buttons' and how you do and should respond. It's our reactions that cause the stress!
- Empathy and viewing life through the eyes of others.
- Communicating effectively.
- Robust decision making mechanisms.
- Dealing with mistakes.
- Dealing well with success and know what you're good at.
- Being reinforced in the environment that you are in.
- Following through and maintain a resilient life.

Watch the kids

Children hear and interpret far more than most of us realise. In times of adversity or stress, communicate clearly with your children and reassure them.
Be conscious of the conversations you have with others when your children are around.

Useful resources

Lifeline - 13 11 14, **lifeline.org.au**

Beyondblue - 1300 224 636, **beyondblue.org.au**

Black Dog Institute, blackdoginstitute.org.au

Headspace - 1800 650 890, **headspace.org.au**

National Centre for Farmer Health - **farmerhealth.org.au**

Rural Financial Counselling Service - 1800 686 175
agriculture.gov.au/agriculture-land/farm-food-drought/drought/rural-financial-counselling-service

Flying Doctor Wellbeing - 03 8412 0480,
flyingdoctor.org.au

More information

General Practitioners

If you or a loved one need support during difficult times contact your local GP for mental health support.

Dairy Australia regional contacts

Gippsland
info@gippsdairy.com.au
03 5624 3900

Murray
murray@dairyaustralia.com.au
03 4811 6008

New South Wales
info@dairynsw.com.au
1800 004 377

South Australia
southaustralia@dairyaustralia.com.au
1800 004 377

Subtropical
brad@subtropicaldairy.com.au
0431 197 479

Tasmania
admin@dairytas.net.au
03 6432 2233

Western Australia
westernaustralia@dairyaustralia.com.au
1800 004 377

Western Victoria
info@westvicdairy.com.au
03 5557 1000

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Dairy Australia

1800 004 377
enquiries@dairyaustralia.com.au
dairyaustralia.com.au

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