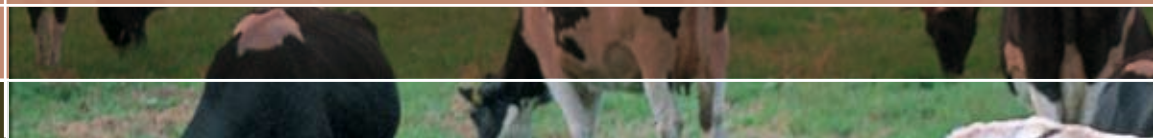




NSW DEPARTMENT OF  
PRIMARY INDUSTRIES

2007

# DAIRYING AND DROUGHT



## NSW Department of Primary Industries

Livestock Officers (Dairy)\*

### Introduction

Events such as drought, fires and flood affect the farm business. The impact of these events depends on:

- how prepared the business is to meet these challenges,
- the duration of the event,
- the period of time since the previous event,
- how extensive the event is, and
- how quickly the business can recover after the drought, fire or flood.

This Management Guide has been prepared by NSW Department of Primary Industry (NSW DPI) staff to assist dairy farmers make business decisions when facing drought conditions.

### Acknowledgement

- This publication was originally prepared as an Agnote by professional officers from NSW Agriculture's (now NSW DPI) Dairy Products Sub-program. The team was Ross Coomber, Tony Dowman, Col Griffiths and Brad Granzin and were coordinated by Alex Ashwood. This edition was revised by Ms Helen Burns, Development Officer, EH Graham Centre for Agricultural Innovation, Wagga Wagga Agricultural Institute.

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# Dairy herd management strategies in a drought

As dairying moves towards larger herds and more complex management systems, all producers should plan in advance for seasonal fluctuations and for times when feed and water will run short. When such situations arise, thoroughly assess your financial and feed situation, decide whether to continue milk production at the current level, reduce milk production, or to cease milk production.

Strategies need to be flexible, continually reassessed, and adjusted according to changing circumstances, such as:

- the availability of feed;
- increased costs associated with feeding;
- changes to stock prices; and
- changes to your financial situation.

It is also important to analyse both the short and long-term problems and solutions, and to assess the impact of any decision on your business goals.

Suitable herd numbers and feeding levels must be determined and monitored during feed shortages. One way of coping with feed shortages is to reduce stocking pressure by culling, selling, leasing or agisting stock. Regardless of how you decide to manage your herd, grouping stock according to feed and production priorities is extremely important.

The three herd management strategies available are:

- maintain current production,
- scale back production, or
- cease production.

The following options summarise the pros and cons for each strategy, but are not listed in any order of priority.

## 1. Maintain current production

### *Pros*

- Maintains a cash flow.
- Keeps herd intact, retaining breeding program, for herd improvement.
- Maintains business and family goals.
- There is potential to upgrade herd by purchasing quality cows at forced sales.

- Improves management skills.
- There is no lead-time when drought breaks.

### *Cons*

- Requires access to cash/credit.
- Increases costs of purchased feeds.
- Increases cost of production (e.g. purchased feed), which may exceed returns.
- Requires suitable facilities/infrastructure to feed intensively.
- Increases workload.
- Requires greater management skills i.e. good feed and financial budgeting skills.
- Intensive production may cause other problems, e.g. effluent, dust.
- Sourcing feed requirements may be difficult and time consuming.
- Requires constant revision of strategies.

## 2. Scale back production – i.e. milk fewer cows

Early to mid lactation cows are the main cash earners, but require a high intake of good quality feed if they are to maintain reasonable levels of milk production and reproductive performance. Cows in early lactation are also the most responsive to improved nutrition.

There are two alternatives that can be considered when scaling back production:

### **a) Reduce size of milking herd by drying off late lactation cows and keeping all dries and replacements**

#### *Pros*

- Maintains a cash flow.
- Higher milk income to feed costs ratio.
- Milking herd requires less feed.
- Less numbers to milk and feed.
- Reduces milk production costs.
- Keeps most of herd intact, minimum impact on breeding program.

#### *Cons*

- Reduces milk production and gross income (smaller milking herd).
- Need to feed milkers, dry cows and growing animals (i.e. three different rations).
- Increases number of dry stock to manage.

- Long lead-time to get some of the herd back into full production when drought breaks.
- Requires equipment to feed large numbers of dry stock.
- There is a high labour requirement to feed stock.

### **b) Keeping early to mid lactation cows and forward springers, and selling the rest including replacements**

#### *Pros*

- Maintains a cash flow in the short term.
- Income is generated from the sale of stock.
- Higher milk income to feed costs ratio.
- Less numbers to milk and feed.
- Reduces labour requirements.
- Reduced production costs (milk and feed) because of a smaller herd.
- Maintains genetic base.
- Allows time to assess position and future options.

#### *Cons*

- Reduces milk production and gross income (smaller milking herd).
- Reduces herd production.
- Cows sold on a reduced market.
- Impacts on herd replacement program – loss of two years genetic improvement.
- Availability and price of stock for restocking unknown.
- Milk production will decrease and may even cease if drought continues for a long period.

## **3. Cease production**

There are at least six alternatives that can be considered when deciding whether to cease milk production. All will cause major disruptions to the business goals.

### **a) Lease milkers and retain dry cows and replacements on farm**

#### *Pros*

- Some cash flow from leased animals.
- Reduces feed costs and feed requirements.
- No milk production costs.
- Reduces labour requirements.

- Keeps herd intact, retaining breeding program for herd improvement.
- Allows time to assess options and future alternatives

#### *Cons*

- No milk production income.
- Requires legal/contractual arrangements.
- May be difficult to find suitable co-operators.
- There are transport costs.
- Risk of herd health status issues such as BJD.
- May be difficult to lease late lactation cows

### **b) Dry off all milkers and keep all stock on farm**

#### *Pros*

- Income from sale or leasing of freshly calved cows.
- Some income from cull sales.
- Opportunity for strategic culling.
- No production ration required – reduces feed costs.
- No milk production costs.
- Keeps majority of herd intact, retaining breeding program for herd improvement.
- Allows time to assess position and future options.

#### *Cons*

- Less suited to year-round calving herds.
- No milk production income.
- All animals require hand feeding and suitable equipment.
- May have tax implications.
- Forced to sell/lease/dry-off freshly calved cows.
- Requires long lead-time to get herd back into full production.

### **c) Dry off all cows and strategically cull**

#### *Pros*

- Income from freshly calved/leased cows.
- Income from cull sales.
- Reduces feed costs and feed requirements.
- No milk production costs.
- Nucleus herd is intact, retaining breeding program for herd improvement.
- Allows time to assess position and future options.

### *Cons*

- Less suited to year-round calving herds.
- No milk production income.
- Most animals still on farm, requiring hand feeding.
- Culls sold on a reduced market.
- May have tax implications.
- Forced to sell/lease freshly calved or dry-off cows.
- Availability and price of stock for restocking unknown.
- Require long lead-time to get herd back into full production.

### **d) Sell all milkers and springers and keep all replacements**

#### *Pros*

- Income from milkers, freshly calved cows and springing heifers.
- Reduces feed costs and feed requirements.
- No milk production costs.
- Reduces average herd age.
- Maintains genetic base.
- Allows a change of calving strategy and production system when recommencing, e.g. seasonal/batch calving.
- Allows time to assess position and future options.

#### *Cons*

- Less suited to year-round calving herds.
- No milk production income and limited ongoing cash flow.
- Selling on a reduced market.
- May have tax implications.
- Interrupts herd replacement program.
- Availability and price of stock for restocking unknown.
- Requires long lead-time to get herd back into full production.

### **e) Sell replacements, dry off and keep all cows**

#### *Pros*

- Immediate income from sale of young stock.
- Income from sale/lease of freshly calved cows.
- Reduces feed costs and feed requirements.

- No milk production costs.
- Maintains genetic base (cows).
- Allows a change of calving strategy and production system when recommencing, e.g. seasonal/batch calving.
- Allows time to assess position and future options

#### *Cons*

- Less suited to year-round calving herds.
- No milk production and limited ongoing cash flow.
- Forced to sell/lease or dry-off freshly calved cows.
- Cows sold on a reduced market
- May have tax implications
- Interrupts herd replacement program.
- Loss of two years' genetic improvement.
- Unknown availability and price of stock for restocking.
- Requires long lead time to get herd back into full production.

### **f) Sell all stock\***

#### *Pros*

- Immediate income from stock sales.
- No stock to feed – reduced costs.
- No milk production costs.
- Allows a change of calving strategy and production system when recommencing, e.g. seasonal/batch calving.
- De-stocking of farm allows spelling of farm and potential disease control.
- Allows time to assess position and future options.
- Potential for debt reduction.
- Possibility of career change.
- Potential for off-farm income.

#### *Cons*

- No ongoing cash flow.
- Selling stock on a depressed market.
- Genetic loss.
- May have tax implications.
- Availability and price of stock for restocking unknown.

- Recommencement of production may not eventuate.
- No return on assets.
- Stress/worry of future and income.
- Indecision about forward planning and future.
- Loss of direction/business momentum.

**\* Warning – Option f ) Sell all stock**

The decision to sell all stock should not be made in haste, as the long-term consequences may outweigh the short-term gains. Consult all family members and partners in the business, and seek professional advice from your accountant, bank manager and industry advisers.

Before any decision is made, develop a budget and cash flow for the different options using your farm figures. The Milk Biz decision support aid can indicate the most viable option for you. Ask your nearest Livestock Officer (Dairy) for a demonstration of Milk Biz.

## Animal welfare issues, dairying and drought

### Be prepared in a drought

The management of livestock, stocking rates and nutrition are closely linked to animal health and welfare. Drought management plans must consider the best ways to adjust stocking rates and manage feed supplies for livestock.

The welfare of animals is always important, but during droughts animal welfare must be given more attention. Tough decisions will have to be made, and producers who have drought-affected stock will need to consider the effects of any intended actions on their animals. Any decision made must be humane and reasonable.

### Act early

Delaying action may seem logical, but lost time usually reduces the number of options available. Therefore, you must act early while stock are fit and strong.

### Relieve animal suffering

If the situation has deteriorated to the point where stock are suffering, you must immediately relieve the situation by feeding or agisting stock, or sending stock to slaughter. In desperate cases,

stock may need to be humanely destroyed. It is not an option to just let nature take its course.

### NSW legislation

*Prevention of Cruelty to Animals Act, 1979* states that:

‘A person in charge of an animal shall not fail to provide the animal with food, drink or shelter, or any of them, which, in each case, is proper and sufficient and which it is reasonably practicable in the circumstances for the person to provide’.

This means that even in a drought the carer of an animal must provide at least maintenance feed to prevent the animal from distress and starvation.

### Further information

- The RSPCA.
- NSW DPI – Primefact 310 Humane Destruction of Stock.
- NSW DPI – Primefact 327 Animal Welfare in Drought
- NSW Prevention of Cruelty to Animals Act, 1979.
- Australian Model Code of Practice for the Welfare of Animals. Various reports.
- Department of Agriculture, Fisheries and Forestry website [www.daff.gov.au](http://www.daff.gov.au)
- District Veterinarian, Rural Lands Protection Boards.
- Private Veterinary Practitioners.

# Financial issues for the dairy farm in a drought

Carefully assess the financial implications of a drought and any changes you plan to make to your business. A wrong decision may place the business in a position from which it cannot recover, so it is essential that you seek professional advice from your accountant, bank manager, and/or farm advisers. Accurate assessment of your financial position will have a major bearing on the most appropriate management decisions to make.

Cost of feed is the main variable cost that increases during a drought. In an average year dairy feed costs should be less than 16c per litre of milk produced, and less than 45% of total farm income. In a drought these figures can increase to 35c per litre, and exceed total income. This situation is not sustainable.

Because feed cost is the major cost, particularly during periods of drought, it is important to monitor the margin between price received per litre of milk and cost of feed per litre of milk. To provide an overall perspective this positive or negative margin needs to be calculated over milk production and length of feeding.

To calculate the margin (\$):

$$\begin{aligned} & \text{(total milk income over the expected days of feeding)} \\ & \quad \text{minus} \\ & \text{[(feed costs in c/L divided by 100) x (daily milk produced) x} \\ & \quad \text{(expected feeding days)]} \end{aligned}$$

Note: Other variable and fixed costs, debt servicing and personal drawings also have to be deducted from this margin.

Two financial assessments of your business need to be made:

**1. Develop a cash flow report** for the next 12 months after reviewing your current financial position. Use current and predicted prices for purchased feeds and milk sales, and assume that the drought and its effects will last for 12 months. Ask yourself the following questions:

- Can your business meet its financial commitments (e.g. debt servicing, overhead costs, personal commitments)?
- Can you access credit or make alternate arrangements to get you through the negative cash flow periods?
- How long before you have to make some hard decisions?

- Will the short-term cost of managing the drought be greater than the long-term business losses?

**2. Develop partial budgets** to investigate the viability of adopting alternate management plans, such as those listed in the 'Herd Management Strategies' section

Partial budgets are a quick and simple method to assess proposed farm changes. They require minimal information and are designed to only look at the net effect of a change. They compare extra costs plus income forgone, to costs saved plus extra income gained if a new proposal is adopted. The following template can be used to analyse any proposed change.

*Partial Budget Template*

Losses		Gains	
Extra costs	\$	Costs saved	\$
Income forgone	\$	Extra income	\$
Total Losses	\$	Total Gains	\$

- **Step 1.** Calculate the extra costs incurred by the proposed change.
- **Step 2.** Calculate the income forgone.
- **Step 3.** Add 'extra costs' and 'income forgone' to give 'Total Losses'
- **Step 4.** Calculate costs saved as a result of the proposed change
- **Step 5.** Calculate extra income generated by the proposed change
- **Step 6.** Add 'costs saved' and 'extra income' to give 'Total Gains'
- **Step 7.** Calculate Net Gain = Total Gains minus Total Losses
- **Step 8.** Determine if there are any non-financial benefits that may influence your decision.

## Tax implications of forced sales

The tax implications of any change to your business need to be considered. Contact your accountant or the Australian Taxation Office for advice. If you are obliged to sell livestock because of the destruction of pastures or fodder through fire, drought or flood, you can spread the profit on the livestock sale over five years. This means that one-fifth of the profit would be included in your gross income for the year of the sale of the livestock, and one-fifth would be included in the gross income for each of the following four years.

To take advantage of this concession, you must declare that the sale followed the loss or destruction of pastures or fodder because of fire,

drought or flood. In addition, you must show that the main part of the proceeds of the sale will be used to purchase replacement livestock, or will be used in the maintenance of breeding stock for restocking.

Alternatively, you may elect to have the profit on a forced livestock sale excluded from your assessable income for the year in which it was derived. The profit is then applied to reduce the cost of stock acquired during that year – or any of the five years after that sale – to replace the stock disposed of.

Where replacement stock are bred instead of purchased, you may elect to include in your assessable income, over the same period, appropriate instalments of the profit on the forced sale (as described above).

At the end of the fifth year after the year in which the forced sale occurred, any part of the profit on the disposal that has not been applied in reducing the cost of new stock purchased, or has not otherwise been included in assessable income, will be included in your assessable income for that fifth year.

### Monitoring your financial position

There are a number of computer programs available through NSW DPI that can assist you in monitoring the financial implications of the feeding regime that has been adopted to survive the drought.

- **RationCheck** will calculate the margin over feed costs as well as determining if the ration fed to the milking cows, dry cows or the replacements, is balanced for energy, protein, fibre and minerals.
- **FeedBiz** calculates the feeding efficiency and financial implications of both the home-grown and purchased feeds used on the farm over a 12 month period. These indicators are then compared to pre-determined targets set by the farmer.
- **Milk Biz** does a complete financial analysis of the business and compares both financial and physical key performance indicators to pre-determined targets set by the farmer.
- **Mini Milk Biz** is a quick and simple method of calculating the financial implications that changing feed prices, feed quality and quantity and milk prices have on the business cash flow on a daily, monthly or annual basis.

### Financial assistance

There may be some financial assistance available in the form of transport subsidies on fodder, water and stock movements, low-interest carry-on finance and low-interest loans for certain farm improvements. There may also be some Centrelink benefits available for farmers without an income. Do not assume that you will or will not be eligible for any assistance. Contact the appropriate authorities for details.

### Further information

- NSW DPI website [www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au)
- Australian Taxation Office
- Centrelink
- Rural Assistance Authority
- Rural Lands Protection Board
- Advancing Agriculture Australia
- Rural Financial Counselling Services
- Accountants, bank managers and financial advisors.

## Feeding dairy stock during droughts

### Water requirements

Dairy cattle need more water as temperature, humidity and production levels increase. Water requirements also increase as the dry matter content of the ration increases. Water intake is greatest when water is constantly available and stock show less distress when there is no competition for water.

Dairy cows require large volumes of clean water, about 120–150 L per day for lactating cows producing 20 L per day. This requirement increases with hot weather, humidity and with the increase in dry feed intake. Dry cows and young stock require 5–7 L/kg DM intake.

#### Rule of thumb water requirements

Dry cows: 35–60 L/day
Heifers to calve: 35–60 L/day
Heifers to mate: 30–50 L/day
Heifers >12 mths: 20–25 L/day
Heifers <12 mths: 15–20 L/day

## Water quality and fouling of water supplies

Water quality for dairy stock drinking water is important. Dairy stock may refuse to drink poor quality water. If the only drinking supply is stagnant water, there is increased risk of disease and death due to botulism and blue-green algae. Vaccination against botulism should be discussed with your veterinarian.

When water supplies are limited, milk quality issues should not be compromised: milking machines, vat and milking area should be cleaned as normal. An increased risk of udder infections can occur if poor quality water is used to clean udders or wash milking equipment such as cups and liners.

Considerable quantities of water can be conserved by dry scraping holding yards.

## Nutrient requirements

The relative quantities of energy, protein and minerals required by stock depend on class of stock, age, growth rate, stage of pregnancy and level of production as shown in Table 1.

Table 1. The importance of major nutrients for various stock

	Energy	Fibre	Protein	Minerals
<b>Milkers</b>				
Early (18–30 litres)	high	medium	high	high
Mid (10–17 litres)	high	medium	medium	medium
Late (5–9 litres)	medium-low	medium-low	low	low
<b>Dries (backward)</b>				
Maintenance large breeds	low	low	low	low
Maintenance small breeds	low	low	low	low
<b>Dries (forward)</b>				
Maintenance large breeds	medium	medium	medium	medium
Maintenance small breeds	medium	medium	medium	medium
<b>Replacements</b>				
Calves	medium-high	low	high	high
Weaners	medium-high	medium	medium-high	medium
Unmated heifers	medium	medium	medium	medium

## Energy

Energy deficiencies limit liveweight gain and milk production. A deficiency shows up as poor body condition, reduced peak milk production, lowered milk composition and poor fertility.

The main sources of energy are carbohydrates, including starches, sugars and fibre. Protein may also be a source of energy.

The metabolisable energy (ME) system can be used to formulate rations to meet the energy requirements of stock. All energy requirements of cattle for maintenance, milk production and reproduction are measured in MJ per day.

The energy in feeds is expressed as megajoules (MJ) of metabolisable energy (ME) per kilogram of dry matter (MJ/kgDM).

The ME of a feed is the energy available for maintenance, milk production, pregnancy and liveweight gain, as outlined in the DairyLink Realistic Rations booklet, available from NSW DPI Livestock Officers, Dairy.

Maintenance requirements include energy needed for walking and eating. Maintenance requirements vary with the size of the animal.

$$\text{Feed for maintenance (kg DM/day)} = \frac{\text{Maintenance needs (MJ/day)}}{\text{Energy of feed (MJ/kg DM)}}$$

Table 2 shows the increase in energy requirements of dairy cows during the latter stages of pregnancy.

Table 2. The energy requirement of dairy cows, additional to maintenance, during pregnancy

Month of pregnancy	Additional metabolisable energy needed per day (MJ/day)
6	7–8
7	10
8	14
9	19–20

Source: DairyLink – Realistic Rations booklet (available from NSW DPI Livestock Officers, Dairy)

Production requirements include the energy required to produce a litre of milk. This varies with the composition of the milk, as indicated in Table 3.

$$\text{Feed for milk production (kg DM/day)} = \frac{\text{Production needs (MJ/day)}}{\text{Energy of feed (MJ/kg DM)}}$$

## Protein

Low concentration of protein in feed reduces feed intake and energy utilisation, and contributes to low levels of milk production. Protein requirements are greatest during early lactation and growth. Protein deficiencies – less than 80% of requirement

– reduce milk protein, particularly with stock in poor condition.

Protein is usually the most expensive nutrient. Feeding more than is required, or can be used, is wasteful.

Urea can be used to replace protein meals for cows producing up to 20L of milk per day and save costs. However, it is important to follow the recommendations discussed in the section ‘Urea as a supplement’.

*Table 3. Metabolisable energy requirement (MJ/day) of dairy cows to produce milk of various fat and protein compositions*

Milk fat (%)	Milk protein (%)					
	2.6	2.8	3.0	3.2	3.4	3.6
3.0	4.5	4.5	4.6	4.7	4.8	4.8
3.2	4.6	4.7	4.7	4.8	4.9	5.0
3.4	4.7	4.8	4.9	4.9	5.0	5.1
3.6	4.9	4.9	5.0	5.1	5.1	5.2
3.8	5.0	5.1	5.1	5.2	5.3	5.3
4.0	5.1	5.2	5.3	5.3	5.4	5.5
4.2	5.3	5.3	5.4	5.5	5.5	5.6
4.4	5.4	5.5	5.5	5.6	5.7	5.7
4.6	5.5	5.6	5.7	5.7	5.8	5.9
4.8	5.6	5.7	5.8	5.9	5.9	6.0
5.0	5.8	5.8	5.9	6.0	6.1	6.1
5.2	5.9	6.0	6.0	6.1	6.2	6.3

Source: DairyLink – Realistic Rations booklet (available from NSW DPI Livestock Officers, Dairy)

## Roughages

The main roughage supplements are hay and silage. Additional roughage sources available may include a variety of by-product feeds such as rice hulls, cottonseed hulls and cereal straws.

*Hay.* Good quality hay contains enough energy and protein for mid to late milkers (8–12 L/day). Poor quality hay may not even be suitable for maintenance, but it can provide the necessary fibre for high grain diets if good hay supplies are short.

Three kilograms of good hay is equivalent to about 2 kg grain, whereas 4 kg of poor hay equals 1–2 kg of grain. Rations of 100% hay are unsuitable for high producing cows, as the cows are unable to eat enough to maintain production. Hay is best fed to these cows in combination with concentrates.

*Silage.* Silage is usually included in diets in combination with other feeds. It is important to have silage samples analysed and balance the ration with the addition of concentrates to ensure that energy, protein, fibre and mineral contents are adequate for the desired level of production. For example, maize silage has a low protein content

and requires protein supplements when maize silage is a significant component of the diet.

A kilogram of good silage (i.e. ME >10MJ/kg DM) is equivalent to 0.5 kg of good quality hay or 0.3 kg of grain. A ration based on good silage must be supplemented with concentrates for production above 10 L.

The ME content of a silage influences the milk production response to silage. Aim for ME levels of above 10 MJ/kg DM and good silage fermentation quality if silage is to be a major component of the diet.

*Straw.* Straw is a relatively poor source of energy, protein and minerals. Small amounts of straw (i.e. 2–3 kg) can be used as a fibre source, but it must be suitably supplemented with cereals, protein and minerals.

## Minerals

Mineral levels vary between feed types. For example, pastures provide less phosphorus but more calcium than grains, and tropical pastures are low in sodium.

Depending on the class of stock and production targets, mineral supplements may be needed for a herd to reach the production potential of the ration. Minerals are necessary on poor roughage – low grain diets.

Feeds low in calcium and phosphorus should be supplemented. Limestone provides calcium only. Common salt is the cheapest source of sodium. Magnesium oxide provides magnesium, and potassium bicarbonate, potassium.

Buffers such as magnesium oxide, potassium bicarbonate and sodium bicarbonate can reduce the incidence of grain poisoning. (See the section on ‘Feeding management’.)

## Formulating rations

### Milkers

Grain is usually the major component of drought rations. When grain is the major component roughage should provide at least 30% of the diet to avoid grain poisoning, ‘off-feed’ situations and to maintain butterfat levels in the milk. Rations for milking cows are outlined in Tables 4, 5, 6, 7, 8 and 9. These rations are a guide only, as the nutrient content of feeds varies. All feed used in rations should be analysed so that a balanced ration can be formulated.

Table 4. High grain rations: Jerseys (400 kg) in early (E) and mid-lactation (M).

Milk Yield (L/day)	Stage of lactation	Requirement* (MJ/day)	Roughage ME 8.5 (kg DM)	Concentrate** ME 12.5 (kg DM)
10	E	88	4.1	4.3
	M	102	4.4	5.2
12	E	99	4.2	5.1
	M	113	4.4	6.1
14	E	111	4.2	6.1
	M	125	4.5	7.0
16	E	122	4.2	7.1

Table 5. High grain rations: Holstein-Friesians (550 kg) in early (E) and mid-lactation (M).

Milk Yield (L/day)	Stage of lactation	Requirement* (MJ/day)	Roughage ME 8.5 (kg DM)	Concentrate** ME 12.5 (kg DM)
15	E	120	5.7	5.8
	M	134	6.1	6.6
20	E	145	6.0	7.6
	M	159	6.3	8.5
25	E	170	6.3	9.4
	M	184	6.5	10.3
30	E	195	6.4	11.3

\* Requirements = total daily energy requirements of cows. \*\* Concentrate used for early-mid lactation contains 16–18% crude protein (CP) and for mid-late lactation 12–14% CP. Note: Stock are maintaining weight in early-mid lactation, and gaining half condition score per month in late lactation.

Table 6. Hay rations – unlimited hay and assuming medium quality pasture provides 1.5 kg DM per cow per day.

Stage of lactation	Early			Mid			Late		
Milk yield (L/day)	25 L			20 L			10 L		
Feed	kg DM	kg DM	kg DM	kg DM	kg DM	kg DM	kg DM	kg DM	kg DM
Good hay (>9.5 MJ/kg DM & >15% CP)	7	-	-	7	-	-	7	-	-
Medium hay (8.5–9.5 MJ/kg DM & 12–15% CP)	-	6	-	-	6	-	-	8	-
Poor hay (<8.5 MJ/kg DM & <12% CP)	-	-	5	-	-	6	-	-	9
Cereal grain supplement *	6	7	8	5	6	7	2	2	2
Protein meal	1	1	2	1	1	2	-	-	-

\*Mineral supplement required to balance diets will depend on the source of forage. High grain diets need to be introduced gradually over two weeks. Note: cows in early lactation are losing half a condition score per month, and not gaining weight in mid-late lactation.

Table 7. Hay rations - limited hay and assuming medium quality pasture provides 1.5 kg DM per cow per day: daily allowance of feed (kg DM/550 kg cow/day)

Stage of lactation	Early	Mid	Late
Milk yield (L/day)	25	20	10
Medium hay (8.5–9.5 MJ/kg DM & 12–15% CP)	4	4	4
Grain supplement	8	7	4
Protein meal	2	2	1

Table 8. Silage rations for milkers and assuming medium quality pasture provides 1.5 kg DM per cow per day: Daily allowance of feed (kg DM/550 kg cow/day)

Stage of lactation	Early	Mid	Late
Milk yield (L/day)	25	15	10
Silage as fed*	4	4	4
Grain supplement	8	7	4
Protein meal	2	2	1

\* Pasture silage (30% DM and 60% digestibility – estimated ME 9.0 MJ/kg DM). Note: Cows in early lactation are losing half a condition score per month and not gaining weight in mid-lactation.

Table 9. Straw rations for milkers, assuming medium quality pasture provides 1.5 kg DM per cow per day and medium quality pasture provides 1.5 kg DM per cow: Daily allowance of feed (kg DM/550 kg cow/day)

Stage of lactation	Early	Mid	Late
Milk yield (L/day)	25	15	10
Cereal straw*	3	3	3
Cereal grain supplement**	10	8	5
Protein meal	2	1.5	1

\* Due to appetite limits, particularly in early lactation, straw is best chaffed to a length of 300 mm.

\*\*High grain diets need to be introduced gradually over two weeks. (See 'Feeding management'). Note: cows in early lactation are losing half a condition score per month, and not gaining weight in mid-late lactation.

Table 10. Feed requirements for dry and replacement stock – both grain and roughage (kg DM/day)

Class of stock	Grain (12.5 MJ/kg DM)	Roughage (8.5 MJ/kg DM)
<b>Backward springers (gaining 0.25 kg/day)</b>		
Jersey	3	0.75
Holstein-Friesian	5	1.2
<b>Replacements (gaining 0.25 kg/day)</b>		
6–12 months	2–3	1.5
12–24 months	3–5	2.5

Table 11. Silage rations for growing stock, with an indication of the amount of concentrate required for each grade of silage: Daily allowance of feed (kg DM/550 kg cow/day)

Liveweight (kg)	Good quality silage*	Concentrate	Poor quality silage**	Concentrate
200	22	nil	7	3.5
300	27	nil	19	2.7
400	32	nil	29	2.4
500	37	nil	30	3.5

\* Good quality silage is defined as having ME > 10 and crude protein (CP) content >15%. \*\*Poor quality silage has ME and CP levels below these.

## Dry cows and replacement and growing stock

Forward springers and suitable replacement stock require attention even though they are not producing income. Appropriate feeding gives them a greater earning potential when they calve. Table 10 shows the feed requirements for dry and replacement stock. Table 11 provides a guide for silage rations for growing stock.

A growth rate in excess of 0.7 kg/day can be achieved with good silage, but medium or poor silage must be supplemented with energy and protein.

## Rations for calves

*Birth to two months.* Calves under eight weeks should receive whole milk or milk replacer, clean water and straw and have access to calf pellets or starter rations of 20–22% crude protein. Calves may be weaned when they are eating 0.75–1 kg of pellets or starter ration a day.

*Two to six months (or as weaned, as above).* At 12–14 weeks calves can be switched to a lower protein meal or pellets i.e. 15–16% crude protein, fed at 2–3 kg/day and a minimum of 20% hay. Coarsely ground hay can be included in the starter ration

## Quality assurance

Whenever purchasing feed, remember the need to maintain your Quality Assurance program. Always ask for a feed declaration from the feed supplier.

You may have to buy feed from a variety of new suppliers or there may be a number of unusual feeds available in times of shortage. In all cases with feeds that you have not used before be careful of contamination from any source that will jeopardise your QA standing or the health of your stock. It is advisable to have a laboratory analysis of feed prior to purchase.

Take care when purchasing hay or silage as toxic plants may have been harvested with the forage which could cause health problems when fed.

## Suitability of feedstuffs

Be particularly cautious when sourcing materials not commonly used as animal feeds. Chemical residues may be present. Before purchasing feed check with the supplier as to what chemicals the crop or pasture has been, or may have been, exposed to during its production, harvest, storage, processing and transport. If the feed has been raked and baled in the field, or if it may contain soil, get additional assurances that it was harvested from land which had no previous applications of persistent organochlorines. Ideally obtain a signed Vendor Declaration Form from the supplier stipulating that the materials have been tested free of all chemical residues.

When buying any feed, you should:

- tell the seller what you are purchasing the feed for;
- ask if any chemicals have been applied to the feed;
- check that time of harvesting of the material complies with the chemicals' withholding periods;
- ask if the feed was grown on suspected contaminated country; and
- obtain a signed Vendor Declaration Form from the supplier.

## Unusual feeds

As the drought worsens and feed becomes more scarce, some dairy farmers feed by-products or unusual feeds to stock. There is often limited knowledge of how these feeds can best be fed to dairy stock.

This section aims to help you to make decisions on the purchase and use of unusual feeds.

Whether to use unusual feeds depends on their availability, cost, nutritional value, palatability and, most importantly, the absence of undesirable contaminants, such as pesticides. Unusual feeds can be cost-effective supplements, if used properly. Have by-products analysed, correct nutrient imbalances and carefully assess the cost of these feeds.

By-product feeds are generally available in large quantities seasonally and frequently vary in composition. They often have nutrient imbalances or contain less than adequate levels of nutrients.

## Brewers grain

Brewers grain is an energy and protein supplement. Its high crude protein (20%) and crude fibre (17%) and moisture content (78%) make it a very suitable supplement to high grain/low roughage diets. With an ME content of 8.5 – 9.5 MJ/kg DM, brewers grain is lower in energy than grain.

The real cost of brewers grain must be determined on a dry matter basis due to its high moisture content.

As an example, \$30–\$40 per wet tonne is equal to between \$136–181/tonne on a dry matter basis.

When using brewer's grain also consider:

- Brewers grain should be introduced gradually.
- It is not recommended for stock under the age of four months.
- Poor storage can cause moulds, which produce toxins that cause scouring and digestive disorders.
- Brewers grain can cause bacterial contamination of milk (and udders) and must be stored away from the milking shed.

### Warning – Chemical Residues

To ensure the quality of milk products, dairy farmers must assess the chemical residue status of any material fed to stock. This is particularly critical for any material that was not produced for use as stockfeed. To feed any material without a full residue risk assessment is contrary to the requirements and intentions of the Safe Food Quality Assurance Program.

Refer to Primefact 311 *Dangers in feeding waste material to livestock*, which details the associated risks, and Primefact 315 *Buying stockfeeds: minimising chemical residue risks*

Some sources of fodder have been linked with an increased risk of chemical residues in slaughter animals. While many problems have been linked to persistent chemicals such as the organochlorines (OCs), any chemical contaminant in feed can cause unacceptable residues in livestock products if present in sufficient concentration. Residues will persist after feeding of contaminated material.

For further residues information, or for submissions of samples, contact:

NSW DPI Diagnostic and Analytical Services  
1243 Bruxner Highway  
Wollongbar NSW 2477  
Telephone: (02) 6626 1103

- Brewers grain can be ensiled and stored for long periods.
- Salt and calcium supplements are needed to rectify mineral imbalances when brewer's grain is included in rations.
- WCS is not a miracle feed that automatically improves milk production and composition.
- It has high fibre levels but has a low 'chewing index' and is not a suitable replacement for long roughage.

For further information see Primefact 303 *White cottonseed – a supplementary feed for beef cattle*.

## Molasses

Molasses is an energy supplement and is usually cheaper than grain. Molasses has an ME content of 10–12 MJ/kg DM but virtually nil protein. Molasses is sticky, heavy and difficult to handle, but is a suitable carrier of unpalatable feeds such as urea, minerals and protein meals. Points to consider when using molasses include:

- Milk responses to molasses are about 70% that of grain.
- Molasses should be no more than 25% of the diet to minimise risk of digestive disorders – i.e. less than 4 kg per day for adult stock.
- It can be fed at higher levels (i.e. 40%), if introduced gradually and supplemented with adequate levels of crude fibre and crude protein.
- Molasses is an important source of potassium, copper and calcium, but it is low in phosphorus.

## Whole cottonseed (WCS)

Commonly known as white or fuzzy cotton seeds, WCS is a useful energy (14 MJ/kg DM) and protein (21% CP) supplement.

Like many by-product feeds, WCS has certain properties which restrict its use in dairy cow diets:

- WCS is a major chemical residue risk.
- It is a potential source of gossypol poisoning, which causes damage to the liver and even death.
- Feeding more than 15% of the total dry matter intake (i.e. approximately 2 kg DM/day for Jersey and 3 kg DM/day for Holstein–Friesians) for extended periods can lead to gossypol poisoning.
- As gossypol is highly toxic to calves, WCS should not be fed to calves of less than four months.
- WCS should be introduced gradually and not fed at high levels for long periods (i.e. no more than 2–3 kg for six months).
- It has a high oil content (20–22%), so make sure the whole ration contains no more than 6% fats and oils;

### Caution: Genetically modified cottonseed

Farmers using cottonseed products should consider the impact this may have on marketing their product.

Most varieties of cotton grown in NSW/ Queensland are genetically modified (GMO). Cotton received at gins is not segregated, which means that cotton seed purchased is likely to be a mix of GMO and non GMO seed.

Check the guidelines of the market you supply regarding acceptability of GMO stock feeds, before purchasing cottonseed products.

## Cottonseed meal

Cottonseed meal is very palatable and is high in energy and crude protein (about 42% CP). Over half of this protein is protected from the rumen (known as 'bypass' protein).

## Cottonseed hulls

Although virtually a waste product with a low ME (5.5 MJ/kg DM) and protein content (6% CP), hulls are excellent 'fillers' in high grain/low roughage diets.

## Rice by-products

Rice bran contains 12.5% CP, 12% crude fibre and 13.5% oil and is an attractive, palatable feed when fresh. 'Rice polishings' is a finely powdered material with similar energy and protein values but is lower in fibre than rice bran.

Both bran and polishings can replace up to 25% of the grain supplement. However, polishings have to be fed with caution. Polishings are easily digested and there is increased risk of grain poisoning when fed in diets with a high wheat component. Grain poisoning is discussed in more detail under 'Feeding management'.

Rice hulls are not recommended for dairy cow diets. They contain high levels of indigestible fibre and are low in ME (3.5 MJ/kg DM) and CP (2%). The hulls also have sharp edges that cause irritation to the digestive tract.

### **Cottonseed – maximum feeding level**

White cottonseed (WCS) and de-linted cottonseed (black cottonseed) may contain some residue of chemicals applied to the cotton crop during the growing season. The Australian Pesticides and Veterinary Medicines Authority (APVMA) assumes that cottonseed is fed at a maximum of 30% of total DM intake when it sets maximum residue limits (MRLs) for chemicals that may occur in livestock that are fed cottonseed. Feeding cottonseed at levels above 30% of the total DM intake could result in unacceptable chemical residues in cattle. Consequently, cottonseed should not be fed at more than 30% of the total DM intake.

If you have fed any purchased stockfeeds to cattle within 60 days of sending them for sale/ slaughter, pay particular attention to Question 7 of the National Vendor Declaration (Cattle). Unless you hold a commodity vendor declaration or similar statement which confirms that the feed was not harvested while still within a withholding period for any chemical treatment, you should answer 'yes' or 'don't know' to this question.

### **Sugar cane**

Farmers have fed sugar cane for many years during droughts and floods. Actual availability depends on surplus to mill contracts, with increased amount available after the cane harvest in December.

Sugar cane diets have much in common with molasses-based diets. The principal energy source is sugar, protein content is low (2% CP). With 60% digestibility, an ME content of 8 MJ kg/DM and low levels of all major minerals, the benefits of feeding sugar cane depend on the accompanying supplements.

Sugar cane is basically a source of fibre and sugar and can comprise 25–30% of the ration of milking cows. High levels of sugar cane can modify rumen fermentation patterns, which affects digestion and milk production and composition. As sugar cane already contains high levels of sugar, precautions should be taken when feeding it with molasses.

Levels of milk production from cows fed sugar cane depend on the type and amount of grain, protein and minerals fed in conjunction with the sugar cane.

### **Sugar cane silage**

Sugar cane silage can comprise up to 20% of the diet but needs to be introduced to stock gradually.

Sugar cane ferments immediately it is chopped, resulting in the conversion of sugar to alcohol and organic acids (acetic). The rate of fermentation is accelerated by fine chopping. There should be minimum delays between chopping and ensiling to minimise loss of quality due to this pre-fermentation.

Its high sugar content means sugar cane does not need inoculants but high levels of sugar may contribute to alcoholic fermentation, which reduces the quality of the silage and can lead to toxic shock. Additives such as urea (10 kg/ tonne) and slaked lime can control the breakdown of sugars. Aqueous ammonia is an alternative to urea.

Additives such as urea and ammonia improve the protein content of the silage.

Milk production from sugar cane silage depends on the supplements included in the ration, but production levels are likely to be less than diets based on traditional conserved feeds such as corn silage/lucerne hay.

### **Bagasse**

This is the fibrous residue remaining after the sugar cane stalk has been crushed and juices extracted. Bagasse is widely used as a fuel source for factory boilers and its availability is limited.

Spraying bagasse with a 30% solution of sodium hydroxide increases its digestibility from 30% to 55%. Treated bagasse fed at 10% of the total diet and supplemented with protein energy and minerals has been successfully fed in commercial feedlots, but weight gains have been lower than normal (0.7 kg/day).

Trials with ensiled and pelleted bagasse rations with dairy cows have indicated that at levels of 20–22%, cost-effective production largely depended on the additional supplements, e.g. grain, protein meals and minerals.

### **Vegetable by-products**

Unless vegetable by-products are obtained and transported at low cost they are not economic feeds. Vegetable feeds need to be introduced gradually to stock and special care has to be taken to prevent underfeeding. Choking can also cause problems with some feeds, e.g. potatoes.

*Chopped sweet potatoes* can substitute for silage or can be fed as part of the grain ration.

*Carrots* contain 8–9% CP and have an ME value of 8–9 MJ/kg DM. Fed whole or chopped, they can make up to 30% of the ration.

*Pumpkins* have a high moisture content (90%), and protein/energy values about half the value of sorghum silage.

*Potatoes* are high in moisture (80%) and have an ME content of 11.5 MJ/kg DM, about 9% CP and 2% crude fibre. Cows can eat 12–15 kg daily of raw potatoes on an as-fed basis.

Potatoes are best fed in combination with a fibrous feed such as hay. However, sprouted potatoes can be harmful to stock.

## Fruit by-products

Pineapple and citrus pulp are useful feeds. Although low in protein (6–7% CP) and high in moisture (80%) they have a high energy value (10–13 MJ/kg DM) and are very beneficial to the rumen function and intake in high grain/low roughage diets.

*Grape pulp* contains mainly skins and seeds and is of no value to dairy cows due to the low protein content and high levels of indigestible fibre.

*Banana pulp* varies in feed quality, depending on the degree of ripeness. Low in protein (6.5% CP) green bananas are a suitable source of energy (11 MJ/kg DM). At maturity bananas rapidly ferment into simple sugars and their nutrition value decreases substantially

## Salvage crops

Various drought-affected and frosted crops may be salvaged for use as stock feed – cereals, grain legume crops and canola have all been made into relatively high quality hay or silage. The quality of the hay or silage produced from these salvage crops depends on the growth stage of the crop and the management of the material from time of cutting to feeding. Well managed hay or silage made from failed crops can be of high quality.

*Canola hay and silage.* ME values range from 7.6 – 10.5 MJ/kg DM and 7.9 – 25.2% CP.

Although small, there is a risk of toxicity due to the presence of glucosinolates and nitrates. The risk appears to be greatest when hungry stock are given unlimited access to canola hay or silage and is reduced when it is fed in low roughage/high grain diets. If concerned, you should have the hay tested.

*Cereal crops.* As with all drought-affected crops, the decision to cut stressed cereal crops should be made before the quality of the standing crop begins to decline. Wheat, barley, oats and triticale can make reasonable quality hay or silage and

are a good source of roughage for dairy stock. It is important to be aware that there can be large variations in quality. ME levels range between 4.2 and 9.7 MJ/kg DM for hay and 5.4 – 10.9 MJ/kg DM for silage, and levels of 1.2 – 13.4% CP and 3.2 – 24.0% CP, respectively. Therefore, it is advisable to buy fodder on the basis of feed analyses.

They can provide a valuable base for high grain/low roughage diets.

## Further information

If you require information on unusual feeds, see [www.fao.org/ag/aga/agap/frg/afris/index\\_en](http://www.fao.org/ag/aga/agap/frg/afris/index_en) or contact your nearest NSW DPI Livestock Officer

## Urea as a supplement

Urea is usually the cheapest form of protein substitute available but because of its toxic properties, it must be used carefully. It can be fed to stock in a number of ways, although you should not rely on urea as the sole source of protein for early and mid lactation cows.

Urea should only be fed to stock over six months old. Maximum daily intake should be less than 100 g per day for adult stock, or 0.02% of bodyweight. (e.g. 400 kg X 0.02% = 80 g).

At these high feeding levels of urea, it is important to introduce urea slowly in the diet over 7–10 days and feed it in at least two batches a day. Grain-based concentrates should contain a maximum of 1.2% urea, and be aware that feeding 150 g of urea once-a-day in a grain supplement will probably cause urea poisoning.

## Urea toxicity

**WARNING:** Urea must be introduced slowly to any animals. The daily ration should be divided into a minimum of two feeds per day.

Urea supplements are often provided in the form of blocks or as loose salt mixes and sometimes with dilute molasses in roller-licker drums. Poisoning from accidental overdoses can occur regardless of how the urea is provided and often occurs when urea blocks are softened by rain, or when urea is introduced too quickly to the diet.

Stock can develop tolerance to urea if it is introduced gradually. The risk of urea toxicity will be greatly reduced if:

- Stock are given access to a dry mix of equal parts of phosphorus supplement and coarse salt

for a week or so before the introduction of the urea supplement. This will satisfy the appetite of phosphorus-hungry stock, which often occurs on the coast.

- All ingredients are thoroughly mixed to prevent 'pockets' of urea.
- Blocks and dry licks are covered or removed during wet weather.

*Urea poisoning.* The symptoms of urea poisoning are rapid breathing, nervous excitement, lack of coordination, bloating and salivation. Because poisoning occurs quickly, treatment is often too late and therefore ineffective.

The remedy for urea poisoning is to drench with a mixture of 0.5 L water, 0.5 L vinegar and 1 kg sugar or molasses. Keep treated animals under observation and give a further treatment if no improvement is evident within about 10 minutes. A relapse can occur several hours after initial response and will require further treatment.

**WARNING:** Urea poisoning is a potential danger whenever feeding at moderate to high levels.

### Urea blocks

Proprietary blocks are a convenient but expensive method of feeding urea to cattle. Blocks containing 25% to 30% urea are of most benefit to cattle. Palatability problems are often encountered, resulting in inadequate consumption to provide the necessary 60 g of urea per head each day. The major problem with urea blocks is that there is no control over intake as some stock may not consume their requirement.

**Caution:** Cattle have been poisoned by eating too much of a block that has been softened by rain or by drinking urea dissolved in rain water that has accumulated in hollows on the surface of the block.

## Purchasing feeds

In most cases it will be necessary to purchase feed. There are several things to consider:

- Know what you need, (e.g. energy, protein, fibre):
  - with some paddock feed available, stock may need energy only;
  - where pasture has hayed/dried off, they will need protein as well;
  - where there is virtually nothing left in the paddock you need to buy energy, protein and fibre;

- Know the dry matter (DM) percentage (especially with silage);
- Compare prices on a dry matter basis for energy (ME) and protein; and
- Make sure pricing is on a dry matter weight basis, do not buy per bale or bag. Some examples of why it is important to buy on a weight basis are set out in Tables 12 and 13. From these examples you should be able to identify the 'best buy' for your use.

### Where to buy feeds

If you have exhausted all of your local and usual contacts, try the Internet. NSW DPI provides a list of fodder suppliers at [www.dpi.nsw.gov.au/reader/drought](http://www.dpi.nsw.gov.au/reader/drought)

Table 12. Which is the better energy buy?

Feed	Cost	Energy
Barley	\$300/t	89% DM, ME = 13 MJ/kg DM
Molasses	\$150/t	75% DM, ME = 12.5 MJ/kg DM
Maize	\$320/t	90% DM

Calculations:

1. Convert price from fresh weight to DM:

$$\text{DM price (\$/t DM)} = \frac{\text{fresh weight feed price (\$/t)}}{\text{DM\%}}$$

2. Convert \$/t to \$/kg:

$$\text{DM price (\$/kg)} = \frac{\text{DM price (\$/t)}}{1000}$$

3. Calculate price per unit of energy (ME):

$$\$/\text{MJ} = \frac{\text{DM price (\$/kg)}}{\text{ME content of feed (MJ/kg DM)}}$$

4. Convert \$/MJ to cents/MJ

$$\$/\text{MJ} \times 100 = \text{cents/MJ}$$

Examples:

#### Barley:

$$\begin{aligned} \$300 \div 0.89 &= \$337.08/\text{t DM} \\ (89\% = 0.89) \\ \$337.08 \div 1000 \div 13 \times 100 &= 2.60 \text{ c/MJ} \end{aligned}$$

#### Molasses:

$$\begin{aligned} \$150 \div 75\% &= \$200/\text{t DM} \\ \$200 \div 1000 \div 12.5 \times 100 &= 1.60 \text{ c/MJ} \end{aligned}$$

#### Maize:

$$\begin{aligned} \$320 \div 90\% &= \$355.56/\text{t DM} \\ \$355.56 \div 1000 \div 13.5 \times 100 &= 2.63 \text{ c/MJ} \end{aligned}$$

The following example highlights the large differences in price per tonne that can be paid if fodder is purchased in bulk or on a per bale or weight basis.

Table 13. Which is the best hay to buy?

<b>Small bales @ \$15.00/bale</b>		
30–45 bales to the tonne		
30 bales	\$15	\$450/tonne
45 bales	\$15	\$675/tonne
<b>Large bales @ \$150/bale</b>		
3–5 bales to the tonne		
3 bales	\$150	\$450/tonne
5 bales	\$150	\$750/tonne
<b>Bulk price</b>		\$350/t

### Feed cost calculator

The *Feed Cost Calculator* is a NSW DPI Internet-based program that is also available on disc. It can be used to compare the value of feeds on an *energy* and *crude protein* basis. You can select a range of common feeds and then be provided with estimated values for energy, protein and dry matter. You can also insert your own figures using your feed test values. You are then able to enter a price per tonne for up to four different feeds. The program then calculates the value of the feed on an energy (ME) and crude protein basis. You can also examine the energy, protein and cost results of any combination of up to four selected feeds.

The Feed cost calculator is available at

[www.agric.nsw.gov.au/reader/choosing-feeds/dai201b.htm](http://www.agric.nsw.gov.au/reader/choosing-feeds/dai201b.htm)

### Further information

Primefact 356 *Feed cost calculator instructions*. For information of the Feed Cost Calculator version on disc, contact NSW DPI's District Livestock Officers (Dairy), listed at the back of this publication.

## Feeding management

### Nutritional issues with high grain diets

Diets must be balanced for energy, protein, fibre and minerals before considering other issues associated with high levels of grain feeding.

Important points to remember include:

- All grain should only be coarsely ground or hammered when feeding more than 8 kg/cow/day of any grain.
- Monitor the herd for signs of grain poisoning
  - a sign of possible grain poisoning on high grain diets is a drop to 3.4% butterfat or less, as a herd average;
  - sore feet (laminitis), 'tucked up' appearance (abdominal pain) and smelly scours can also be indicators of grain poisoning.
- Fibre is a priority, particularly to maintain correct rumen function.
- With heifers, grain should not be fed more than 8 kg/day. Due to their lower intakes, the grain will make up a greater proportion of their diet and therefore affects them at lower feeding levels.
- Maize and sorghum are the safest grains to feed at high levels. Wheat is the least safe.

When feeding more than 10 kg/cow/day of concentrate or grain, best results will be obtained by feeding a proportion of it away from the milking bails. Usually more than 4–5 kg per feed in the bails will prolong milking.

### Grain poisoning

Grain fermented in the rumen produces lactic acid, which is immediately absorbed into the bloodstream. Grain poisoning (also known as acidosis) is a lactic acid poisoning and occurs when:

- stock are fed high grain rations without an introductory period;
- stock gain accidental access to large amounts of grain;
- there is a quick change in the grain being fed, for example switching from oats to wheat.

Prevent grain poisoning by starting grain feeding with a small amount and gradually increase amounts each day. When changing from one grain type to another, mix the two grains together for a week or so to avoid a sudden change.

## Which grain – what risk of grain poisoning?

Are your cattle more likely to get grain poisoning with any particular grains?

As a rule of thumb, the ranking from highest to lowest risk grains are:

1. Wheat
2. Triticale
3. Barley
4. Oats
5. Maize
6. Sorghum

## Buffers

Buffers can be used to reduce the incidence or severity of acidosis.

Sodium bicarbonate is commonly used at the recommended rate is 150 g/day/cow.

If magnesium supplementation is required, each gram of magnesium oxide can replace 2 g of sodium bicarbonate. The use of sodium bentonite has negligible benefits.

It is also recommended that a rumen modifier be included at the recommended rates (for example Rumensin®).

## Tips for feeding

The following are tips for feeding dairy cattle during feed shortages.

- Commercial dairy concentrates for early milkers should contain 16–18% crude protein, depending on the level of production and the quality of roughage fed.
- Avoid fine grinding of most grains.
- Buffers can help to prevent grain poisoning at the introduction of grain diets and during prolonged feeding at unusually high levels.
- Feed definite amounts at regular intervals.
- Avoid sudden changes in the amounts and types of feed.
- Keep feed boxes clean, and remove leftover feed (particularly for calves).
- During periods of high temperatures, high grain diets allow greater energy intake than high roughage diets.
- Split the herd into low and high producing cows
  - feed the low producers grain in the bails and roughage in the paddock;

– feed the high producers grain in the bails and grain plus roughage in the paddock.

- Feed troughs in the yards need to be about 45–50 cm wide and 30–45 cm deep and allow 30 cm trough length per head for weaners and yearlings, and 60 cm for adult stock.
- Self-feeders are also satisfactory for straight grain rations.
- Stock should be introduced to high grain diets gradually to avoid digestive upsets.
- Feed in troughs or along fence lines to avoid camping and trampling losses.
- Use a number of feeding points so all animals have equal access to feed.

## Further information

NSW DPI *Realistic Rations* manual at [www.dpi.nsw.gov.au/reader/dlink-realrations](http://www.dpi.nsw.gov.au/reader/dlink-realrations)

# Dairy animal health issues in a drought

Drought conditions can increase animal health problems if precautionary measures are not taken

## Diet related issues

Animal health problems may result with diets that do not meet the minimum requirements for fibre, energy, protein and minerals, or that are grossly out of balance. Rapid changes in the diet will also cause digestive problems.

The main health problems are **ketosis** and **acidosis** (grain poisoning). Both conditions can cause a rapid loss in bodyweight, drop in intake and milk production, sick cows and death.

Ketosis can occur in freshly calved cows fed low energy diets. Affected cows can have a sweet smelling 'acetone' breath. Indicators of acidosis are low milk fat concentrations (e.g. below 3.4% for an all-year round Holstein Friesian herd) and diarrhoea. At a more advanced stage, acidosis can cause lameness and gut pain in affected cows.

High grain with low fibre diets can result in acidosis. A sudden change in the type of grain –especially to wheat – can also result in acidosis. Dairy cows can consume up to 12 kg of grain per day if the fibre level in the diet is adequate, i.e. over 25% neutral detergent fibre, and the grain is fed with the forage. Daily neutral detergent fibre intake should come

from 75% forages. The feeding of buffers (sodium bicarbonate) or additives (monensin) can reduce the incidence of acidosis. Feeding high grain diets carefully to reduce the risk of acidosis is discussed in detail in the section on 'Feeding management'.

**Urea** may be fed as a nitrogen source when the feed is protein deficient. Urea is toxic and should only be fed to stock more than 6 months old. Maximum daily intake should be less than 100 g per day for adult stock or 0.02% of bodyweight. (e.g. 400 kg x 0.02% = 80 g).

#### Urea poisoning risk

At these high feeding levels of urea, it is **IMPORTANT** to introduce urea slowly in the diet (e.g. over 7–10 days) and to feed it in at least two meals a day.

Grain-based concentrates should contain a maximum of 1.2% urea. Feeding 150 g of urea once a day in a grain supplement will probably cause urea poisoning.

Symptoms of urea poisoning include a lack of coordination and aggressive behaviour. It is wise to use caution when feeding urea. (See the section 'Urea as a supplement'.)

Both macro and micro **minerals** are essential for normal body functions. Mineral imbalances will be more pronounced during drought feeding because of lack of green forage and increased grain feeding.

Prolonged mineral imbalances can result in metabolic diseases such as grass tetany and milk fever.

Cows can tolerate mineral imbalances for less than one month. On-going mineral imbalances are seen as a more significant problem.

Feeding single component diets can result in specific mineral imbalances. Keep in mind that grain is low in calcium, legumes are high in calcium but low in phosphorus, summer forage crops are low in sulphur, and tropical grass diets are low in sodium.

All feeds should be checked for their mineral content and rations adjusted to meet the herd's needs.

It is also important to consider mineral ratios. An example is the calcium:phosphorus ratio, since imbalances affect the availability and absorption of the minerals, and can therefore affect production and reproduction.

Trace, or micro, minerals are only required in very small amounts and excess levels can be extremely toxic.

## Vitamin deficiencies

Vitamins are essential in small amounts for good health and production.

### Vitamin A

Vitamin A is required for both production and reproduction, is stored in the liver and is obtained from green pasture, hays with good green colour and yellow maize. Even a short green pick is enough to supply adequate quantities of the vitamin.

Cattle on dry feed have lower stores of vitamin A, and all classes of cattle will be deficient in vitamin A after only three months without green pasture.

### Vitamin E

Green pasture is the best source of vitamin E. Grains and hays are fair to good sources of vitamin E, although considerable variation does occur.

Vitamin E supplements can be added to the grain portion of the diet. Vitamin E injection can provide sufficient vitamin E for three months

## Internal parasites

During drought, dairy cows are under physical stress. Limit all unnecessary movement and yarding of stock. If you intend to treat stock for parasites or to administer injections, carry out all procedures during a single yarding, but first check the treatment will not harm stock. If you suspect internal parasites in stock, treat all stock with a registered product according to label instructions.

The presence of **worms** can decrease the cow's ability to use feed effectively. Poor nutrition may cause stock to have a lower resistance to parasite infestation.

Worm burdens can increase if stock are regularly fed on the ground in the same area. Close grazing of pasture can increase the chance of picking up worms. Before treating dry cows ensure that the withhold period of the treatment is less than the remaining time of pregnancy, otherwise milk will have to be withheld after calving.

If stock have access to wet areas, which may be the only green feed on the farm, consider treating for liver fluke. Seek veterinary advice before drenching for liver fluke in milking cows. Do not forget to drench herd bulls against internal parasites.

## External parasites

Ticks, lice and buffalo flies have a greater effect on animals in poor condition or under stress. Apply appropriate treatments to control these parasites according to label instructions. Always check that the product is suitable for the type of animals such as milking cows. Observe all withholding periods.

Some products require the user to be trained in chemical use and application. Ensure that suitably trained people handle and use these products.

## Clostridial and other environmental diseases

Ensure that all animals are part of an effective 5-in-1 or 7-in-1 vaccination program. The incidence of clostridial diseases increases when animals graze short and sparse pastures. Hand-feeding on the ground may also increase the incidence.

Phosphorus deficient cattle may seek out the carcasses of dead animals. Stock must not have access to carcasses of dead animals. All dead animals need to be disposed of promptly and appropriately. Burning is preferred although burying is permitted in some areas.

Botulism is a disease that occurs when animals eat decomposed animal tissue. Dead vermin, such as rats or rabbits, can become trapped during hay baling, silage making or processing grain and are a common source of the botulism toxin.

Botulism will rapidly kill cattle and horses that consume contaminated feed. Botulism can be prevented by vaccination and it is recommended that cattle receiving most of their forage as conserved fodder (hay and/or silage) should be vaccinated against botulism.

## Plant poisoning

Hungry animals may consume poisonous plants that they would not normally eat. Poisonous plants include bracken fern, red lantana, castor oil plant, smartweed, mother of millions, green cestrum, rock fern, variegated thistle and fireweed. Contact the Rural Lands Protection Board for a list of poisonous plants in your area.

Prevent animal access to poisonous plants, or remove the problem plants. Animals in poor condition will have a more severe reaction to the poisoning and take longer to recover, or may die.

Contact your veterinary practitioner or District Veterinarian if you see symptoms such as peeling skin (particularly areas of pale skin), photosensitivity, 'tucked up' animals, which are

down and kicking at their under-belly, rapid fall in milk production or other unfamiliar symptoms.

## Further information

- NSW DPI on website: [www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au)
- NSW DPI Realistic Rations manual at [www.dpi.nsw.gov.au/reader/dlink-realrations](http://www.dpi.nsw.gov.au/reader/dlink-realrations)
- District Veterinarian, Rural Lands Protection Boards.
- Private veterinary practitioners.

## Recovering from the drought

The recovery phase after a drought should not be ignored. NSW DPI has detailed information on its website [www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au) to provide assistance for farmers with the many decisions that need to be made after the drought breaks.

There are opportunities to re-appraise enterprises and farm operations, to assess your farm's future earning capacity, and to plan in order to cope better in future droughts.

Appendix 2 contains a comprehensive list of NSW DPI publications relating to drought recovery.

## Appendix 1. Approximate dry matter, metabolisable energy (ME) and crude protein contents of feeds

Foodstuff	ME (MJ/kg DM)		Crude protein (%)
	Dry Matter (%)*	Tested Average* range	Tested Average* range
<b>Low protein, dry roughages</b>			
Oaten hay	90	9.3 (8.5–9.5)	5.8
Wheaten hay	90	8.0	6.0
Pasture hay (mostly grass)	85–90	8.3	6.0
Oat, barley or wheat straw	90	5.0 (4.5–5.5)	3.0
Sorghum stubble	90	7.0 (6.5–8.0)	3.6
Cottonseed hulls	90	7.0	3.9–4.5
Rice hulls	90	2.4	2.0–3.1
Corn stubble	90	5.5 (4.5–6.5)	4.8 (2–7)
Soybean stubble	90	5.5 (4.0–6.5)	5.5 (4–6.5)
Peanut hulls	90	3.6	3.3
Oat hulls	90	5.3 (5.3–5.4)	3.8
Sorghum (failed crop)	90	9.0 (8.5–9.5)	7.4
Peanut hay	90	8.5 (8.0–9.0)	9.3 (7.6–10.7)
Soybean hay (mature)	90	6.0 (5.5–6.5)	8.1
Wheat stubble	90	5.1 (4.8–8.2)	–
Barley stubble	90	5.5 (5.1–6.2)	–
Rice stubble	90	5.7 (5.3–6.6)	–
Oat stubble	90	4.6	–
<b>High protein, dry roughages</b>			
Lucerne hay	90	8.5 (8–9.8)	15–20
Clover hay	85–90	9.0 (8.3–10.9)	13
Pasture hay (mostly clover)	85–90	8.3	11
Cowpea and field pea	90	9.5	16
Soybean hay (full pods)	90	9.5 (9–10)	13–14
Soybean hay (75% pods)	90	8.5 (8–9)	17
<b>Low protein, wet roughages</b>			
Maize silage	30–35	7.5–11	6.9–9.0
Sorghum silage	30–40	8.0–10	6.9–7.5
Oat, wheat, barley or rye green fodder or silage (cut at flowering stage)	30–40	8.5–10.5	6.0–8.0
<b>High protein, wet roughages</b>			
Lucerne green fodder	25	8.3	16
Lucerne silage	35–40	8.4–10.5	15
Pasture fodder (mixed grass & clover)	25	10.3	17.5
Pasture silage (mixed grass & clover)	30–40	8.2–11.0	16
Young grazing oats, wheat, barley, rye or millet	30–40	9.3	10
<b>Grains</b>			
Maize	90	13.5 (13–14)	9.5 (9.0–10)
Grain sorghum	90	13	9 (5–11)
Wheat	90	13 (12.5–13.5)	12 (11–13)
Barley	90	13 (12.5–13)	11 (10–12)
Oats	90	12.5 (11–13)	10.5 (10–11)
Lupins	–	13	32
<b>Cereal grain by-products</b>			
Wheat pollard	90	11	15
Wheat bran	90	12	15
Oat bran	90	9	8.0

		ME (MJ/kg DM)	Crude protein (%)
Hominy	90	12.6	11 (10–12)
Rice bran	90	11	14
<b>Protein-rich concentrates</b>			
Soybean meal	90	12	50
Safflower meal	90	11	40–55
Peanut meal	90	11	42
Cottonseed meal (decorticated)	90	10.5	41
Linseed meal	90	11.5	30–35
Sunflower meal	90	10.5	40–45
Coconut meal (6% fat)	90	12.5	21
Milk powder (cow's whole)	90	17	26.5
Milk powder (cow's skimmed)	90	12.8 (12.6–13)	36
Urea (46% nitrogen)	90	–	Equal to about 280
<b>Miscellaneous</b>			
Brewers grains (dry)	90	9.5	20
Molasses	75	13	3.5
Sheep and cattle nuts	90	11 (9–13)	15

• This figure should be used as a guide only because of the very wide variation between samples – laboratory testing of feeds is recommended. Cattle and sheep advisers can provide a list of feed testing laboratories

## Appendix 2. NSW DPI drought publications available, November 2006

Site map for drought information  
[www.dpi.nsw.gov.au/reader/drought](http://www.dpi.nsw.gov.au/reader/drought)

### Predicting the weather in drought

- Areas of NSW suffering drought conditions  
[www.dpi.nsw.gov.au/reader/drt-area](http://www.dpi.nsw.gov.au/reader/drt-area)
- Primefact 376 Assessing current pasture and vegetation conditions
- Primefact 378 Assessing future enterprise risk – the medium-term climate outlook
- Primefact 377 Assessing future enterprise risk – the short-term climate outlook
- Primefact 301 Defining 'drought'
- Primefact 371 Planning for drought
- Rainfall maps [www.agric.nsw.gov.au/climate/rain](http://www.agric.nsw.gov.au/climate/rain)
- Primefact 379 Reviewing historical climate information

### Dairy herd management strategies in a drought

- Primefact 297 Agistment guidelines
- Primefact 279 Drought hints for a beef cattle enterprise
- Primefact 307 Drought strategies for the livestock producer
- Primefact 355 Impact of drought

- Primefact 280 Prompts to assess available feed (other than pasture) in a drought

### Dairy animal welfare issues in a drought

- Primefact 327 Animal welfare in drought
- Primefact 310 Humane destruction of stock

### Financial issues in drought

- Primefact 299 Cattle transport costs – calculator instructions
- Cattle transport costs – electronic calculator  
[www.dpi.nsw.gov.au/reader/an-transport/dai235](http://www.dpi.nsw.gov.au/reader/an-transport/dai235)
- Primefact 292 Financial considerations of agisting stock in drought
- Primefact 290 Financial considerations of feeding cattle in drought
- Primefact 291 Financial considerations of leasing land for your stock in drought
- Primefact 289 Financial considerations of selling stock in drought
- Primefact 281 Prompts to assess your financial situation in drought
- Primefact 293 Tax treatment of forced livestock sales due to pasture and fodder loss

### Feeding stock during drought

- Primefact 270 Alternative roughage feeds

- Primefact 295 Calculating quantities for full handfeeding of beef cattle
- Primefact 314 Cane tops as cattle fodder
- Primefact 312 Drought increases residue risks
- Primefact 356 Feed cost calculator instructions
- Feed cost calculator  
[www.dpi.nsw.gov.au/reader/choosing-feeds/dai201b](http://www.dpi.nsw.gov.au/reader/choosing-feeds/dai201b)
- Feed evaluation database  
[www.agric.nsw.gov.au/tools/fes/index](http://www.agric.nsw.gov.au/tools/fes/index)
- Primefact 322 Feeding calves in drought
- Primefact 321 Feeding pelleted rations
- Primefact 271 Fortified molasses mixes for cattle
- Primefact 288 Full drought feeding principles
- Primefact 339 Full hand-feeding management beef cattle
- Primefact 330 Grain poisoning of cattle and sheep
- Primefact 275 Hand-feeding cattle in drought – grain
- Primefact 276 Hand-feeding cattle in drought – grain/hay
- Primefact 375 How useful are blocks and dry licks for livestock in a drought?
- Primefact 273 Making your own protein blocks for cattle
- Primefact 329 Production feeding in drought
- Primefact 334 Protein supplements for cattle in drought
- Primefact 278 Sawdust—a suitable roughage in drought?
- Primefact 285 Setting production objectives for your livestock enterprise during drought
- Suitability of feedstuffs  
[www.dpi.nsw.gov.au/reader/1715](http://www.dpi.nsw.gov.au/reader/1715)
- Primefact 287 Supplementary feeding principles
- Primefact 277 Supplementary feeds suitable for cattle in drought
- Primefact 341 Supplementation guide for beef cattle
- Primefact 286 Survival feeding in drought
- Primefact 272 Urea roller drum mixes for cattle
- Primefact 294 Vitamin and mineral additives for sheep and cattle in drought

- Primefact 303 White cottonseed – a supplementary feed for beef cattle
- Primefact 324 Measuring herbage mass – the median quadrant technique
- Primefact 325 Pasture sustainability and management in drought

### **Purchasing feeds**

- Primefact 374 Buying feed at the right price
- Buying feed on a feed value basis  
[www.dpi.nsw.gov.au/reader/1731](http://www.dpi.nsw.gov.au/reader/1731)
- Primefact 315 Buying stock feeds: minimising chemical risks
- Primefact 356 Feed cost calculator instructions
- Feed cost calculator  
[www.dpi.nsw.gov.au/reader/choosing-feeds/dai201b](http://www.dpi.nsw.gov.au/reader/choosing-feeds/dai201b)
- Feed evaluation database  
[www.agric.nsw.gov.au/tools/fes/index](http://www.agric.nsw.gov.au/tools/fes/index)

### **Dairy animal health in drought**

- Primefact 333 Cattle health during drought – common diseases and preventative management
- Primefact 274 Checklist for good beef cattle health and management in drought

### **Recovery from drought**

- Primefact 362 Animal health following drought
- Primefact 363 Drought recovery for intensive livestock industries
- Primefact 364 Grazing management following drought
- Primefact 360 Planning for drought recovery
- Primefact 397 Planning for future droughts
- Primefact 368 Reassessing water requirements after a drought
- Primefact 361 Restocking after a drought
- Primefact 367 Soil management following drought
- Primefact 370 Tree management after a drought

### **Other relevant websites**

- Bureau of Meteorology  
[www.bom.gov.au](http://www.bom.gov.au)
- NSW Association of Rural Financial Counsellors  
[www.rfcs.gov.au](http://www.rfcs.gov.au)

- NSW Rural Assistance Authority  
www.raa.nsw.gov.au
- Queensland Government: The Long Paddock  
– climate management information for rural  
Australia www.longpaddock.qld.gov.au
- Rural Lands Protection Boards  
www.rlpbnsw.org.au

### Appendix 3. NSW DPI Livestock Officers, Dairy

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