NSW DPI
primefacts
PROFITABLE & SUSTAINABLE PRIMARY INDUSTRIES www.dpi.nsw.gov.au
JANUARY 2007 PRIMEFACT 295 (REPLACES AGNOTE DAI-172)

Full hand feeding of beef cattle – quantities

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Assessing the situation

The full drought phase begins when your cattle have reached the point where they should not lose any more weight and supplements are insufficient to maintain weight. Now is the time for a major reassessment. Consider the following:

- the probability of useful feed growing if the drought breaks in the near future;
- the quantity of feed required for full feeding;
- the resources required (including finance for buying feed, paying for labour and other continuing costs), and the facilities or equipment required;
- the potential benefit of continuing to feed certain classes of stock.

Cost your program on a monthly basis. You can reassess the stock you are going to feed, and perhaps reduce numbers again, to make available funds go further.

From here on, the cost of a feeding program will increase, particularly during periods of production stress such as calving and lactation, so it may be necessary to cull more heavily.

Energy requirements for maintenance

Energy is needed by animals for all body functions. Energy is measured in megajoules (MJ). Animal requirements are assessed as 'megajoules of metabolisable energy' (MJ ME). Energy in feed is assessed as 'megajoules of metabolisable energy per kilogram of dry matter' (MJ ME/kg DM, or simply M/D).

In drought, it will be the energy component of feed that will be the most limiting. Addressing this need is the first requirement in a drought feeding program. The energy requirements of cattle depend on:

- liveweight
- energy concentration of the feed (M/D)
- pregnancy
- lactation
- growth
- weather conditions.

Calculating the feed requirement for maintenance

The first step in finding the energy needs of adult cattle is to calculate the amount of feed needed to provide sufficient energy to maintain liveweight. If cows are pregnant or lactating, adjustments to the maintenance value need to be made, and these are discussed in Step 2 of the next section 'Adjusting the ration'.

To calculate the feed requirement for maintenance, you need to know the energy content of the feed or feeds to be used. A guide to the energy contained in various feeds can be found in Table 2 at the end of this Primefact. The values given are average values. Whenever possible, a feed analysis is recommended, as there can be considerable variation. Information on testing laboratories can be obtained from your local NSW Department of Primary Industries office.

Once the energy content of the feed is known, use Figure 1, at the end of this Primefact, to predict the amount of feed needed to meet maintenance requirements. Where more than one feed is being fed, the following procedure is used to calculate the energy content of the mixed ration. It is this number which is then used in Figure1.

Example

A ration contains 80% wheat (12.9 M/D) and 20% clover hay (8.9 M/D). The calculation is as follows:

$$\text{Energy content} = \frac{(80 \times 12.9) + (20 \times 8.9)}{100} = 12.1 \text{ M/D}$$

To use Figure 1, place a ruler on the appropriate point which represents the liveweight of the animal under assessment (left-hand vertical line of the figure), then run the ruler through the energy content of the feed (centre angled line). The point where the ruler cuts the right-hand line indicates how much feed (in kilograms per day) needs to be fed to maintain liveweight.

Calculating the 'as fed' amount

The calculation in the previous section assumes the feed is 100% dry matter. All feeds will contain some moisture, and this needs to be compensated for when determining how much of the fodder to feed.

Dry matter percentages for various feeds are also found at the end of this Primefact. To determine the amount of a particular fodder or ration to feed, take the calculated amount from Figure 1, multiply it by 100, and then divide this by the dry matter percentage. This is commonly known as the 'as fed' amount.

Example

6.5 kg DM/day, where the dry matter percentage is 90%:

'As fed' amount = 6.5 × 100 ÷ 90 = 7.2 kg

As a general rule, to adjust the amount of feed to an 'as fed' weight:

For grains/hay:

'As fed' amount =
feed required (kg DM /day) × 100 ÷ 90

For silages:

'As fed' amount =
feed required (kg DM /day) × 100 ÷ 30

Adjusting the ration

Step 1. Ration for dry beast

As described in the previous section, use Table 2 to get the energy (M/D) value of the feed. Then place a ruler on Figure 1 at your values for 'Liveweight (kg)' and 'Feed M/D', and read off the 'Feed required' from the right-hand side. Then adjust for dry matter content to calculate the 'as fed' quantity.

Step 2. Allowance for pregnant and lactating cows

Using Figure 1, first calculate the feed requirements for maintaining a non-pregnant cow. Then increase this amount of feed by the percentage factor given below to determine the corrected amount of feed required by a pregnant or lactating cow:

Cow 6 months pregnant: add 20%

Cow 8 months pregnant: add 40%

Cow with calf at foot: add 60%

Step 3. Allowance for cold stress

During cold, bleak weather, increase the rations for all classes of stock by 20%. The extra feed should be provided as hay.

Wet feeds such as silage or vegetables should be fed in greater quantity in proportion to their moisture content. See the section 'Calculating the 'as fed' amount'.

Feeding for survival

Feeding grain for survival involves a certain amount of stock training and gradual introduction of grain, otherwise deaths will occur. The success of grain feeding depends largely on starting well before cattle weights fall to their critical level.

Critical survival weight

When body weight falls to a critical point, called the critical survival weight, the body reserves are almost depleted, and you must be prepared to increase feed substantially to prevent stock losses.

The critical survival weights for medium-maturity British Breed cattle are as follows:

Weaners 150 kg

Yearlings 225 kg

Adult dry stock 300 kg

Breeders 350 kg

It is recommended that cattle be maintained above these weights by feeding according to the requirements given in Table 1. Extended feeding of cattle that are at critical survival weights does not allow for unexpected problems.

Adjustments should be made for larger framed or higher producing cattle. Note that individuals in the herd may be below these weights and still be in satisfactory condition.

Table 1. Maintenance[(a)] feed requirements ('as fed') for full hand feeding of cattle

Feed options: minimum weight (kg) per day 'as fed'						
Class of stock and bodyweight	Grain (12 ME) OR	Hay (8.5 ME) OR	50:50 grain:hay mix OR	80:20 grain:hay mix OR	Silage (30% dry matter and 9 ME)	Expected weight gain/day
Weaners (200 kg)	2.5	3.5	3.0	2.5	12.0	0.2 kg[(b)]
Yearlings (250 kg)	3.0	4.0	3.5	3.0	15.0	0.1 kg[(b)]
Adult dry stock (400 kg)	4.0	6.0	5.0	4.5	20.0	nil
Breeders, late pregnancy (425 kg)	5.0	8.5	7.0	6.5	27.0	nil
Breeders, lactating (425 kg)	–	10.5	9.0	8.0[(c)]	30.0	nil

(a) During periods of cold weather, these levels should be increased by 20% using hay if possible (3 kg hay is equivalent to 2 kg grain).

(b) For young stock, protein levels should be at least 9% for them to continue growing. It would be better to lot feed these cattle for production.

(c) High levels of grain cause cows to milk poorly. Feed at least 1.5 kg hay/hd/day with 6.5 kg grain/hd/day.

Suitability of various feeds

Grains

Grain is usually the most economical type of feed to use during drought. Wheat, barley, oats, rice, maize and sorghum are energy-rich feeds of similar nutritive value. They contain sufficient protein to meet the requirements of adult stock, and are all suitable for drought feeding. Grains are low in calcium, so 1.5% limestone (superfine grade) by weight must be fed with all-grain diets. Grain consumed to excess or introduced too rapidly can cause sickness or even death.

For more information on grain introduction and the use of feed additives to reduce the risk of grain poisoning, see Primefact 330 *Grain poisoning of cattle and sheep.*

Molasses

Molasses is highly suitable for supplementing paddock feed because it can be used as a carrier for other components such as protein or minerals. Molasses has about 70% of the energy value of grains. Because the protein content is negligible, molasses is usually fed with a high quality protein meal or urea. Note that if urea is fed to excess, or introduced too rapidly, it can be toxic and cause stock death. Sixty grams of urea per head per day is the maximum intake recommended. Molasses can be safely fed undiluted in troughs. Where molasses is the main feed, cattle usually regulate themselves to about 1 kg per 100 kg of bodyweight per day. Some roughage should be available to avoid molasses toxicity.

Protein-rich meals

Cottonseed (see warning box, next page), linseed and sunflower meals, and others, are rich in protein and can be used as special-purpose supplements for young stock in association with energy feeds. They are too expensive to be fed in large quantities.

Prepared feeds

Cattle and sheep nuts vary in quality between manufacturers, and even between batches. Their energy value is slightly lower than that of grain. They are a convenient but expensive form of energy and can cause digestive upsets similar to those caused by grain. When introducing and using prepared feeds, adopt the same precautions as for grain.

Protein nuts/pellets are now available and have proved to be efficient in supplying protein to cattle. Use them as you would protein meals.

Hay

Hay is a necessary drought fodder in the following circumstances:

- introducing stock to grain
- feeding during periods of cold stress
- production feeding.

Warning

White cottonseed (WCS) and de-linted cottonseed (black cottonseed) may contain residue of chemicals applied to the cotton crop during the growing season. The Australian Pesticides & Veterinary Medicines Authority (APVMA) calculates maximum residue levels on the basis of a 30% maximum dry matter (DM) intake of cottonseed (WCS and black cottonseed) in the diet. This means that using WCS at levels above 30% of the total dry matter intake could result in excessive residues in cattle. This is particularly true for cattle destined for export markets, where the 30% limit set to comply with domestic MRLs may not apply. If you have fed WCS from crops treated with chemicals within 60 days of harvest (all cottonseed would be in this category) to cattle within 60 days of sending them for sale/slaughter, then you must disclose this at Question 7 of the National Vendor Declaration (Cattle). NSW Department of Primary Industries does not recommend the use of cottonseed at more than 30% of the total dry matter intake, even in severe droughts.

NSW Department of Primary Industries and the cattle and cotton industries recommend that cotton trash not be fed to livestock due to residue concerns.

Lucerne hay and good pasture and cereal hays are more than adequate for maintaining stock. The energy value of 3 kg of these hays is equivalent to the energy value of 2 kg of grain. Lucerne and clover hays are high in protein, calcium and vitamin A, and are particularly suited to young and lactating stock.

Maintenance feed for a 400 kg dry cow is as follows:

Grain	4 kg/hd/day
Good hay	6 kg/hd/day
Poor hay	8 kg/hd/day

Poorer quality hay and straw barely meet stock maintenance requirements, 2 kg being equivalent to 1 kg grain. The fibrous nature of these feeds will limit the amount a beast can eat. They are usually low in protein and are not suitable for young or lactating stock without the addition of either grain or a mixture of molasses and a high-protein feed.

Where lactating cows are being fed grain/hay (80:20), then using a good quality hay means 1.5 kg roughage/hd/day, and a low quality hay 2.5–3.0 kg/hd/day.

Silage

Silage is suitable for cattle and can be self-fed or fed daily as a restricted ration. If weekly feeding is practised, silage should be fed in dumps rather than trails. Most types of silage are comparable in energy value on a dry matter basis, but lucerne silage and clover silage have a higher level of protein.

The feed value of wet silage is variable because of differences in palatability and moisture content. The feed value is often less than it should be because of the low crude protein content of silage. The crude protein content should be determined by a feed analysis, and sufficient urea added to bring the protein content to 12%.

Dry matter content varies from 15% to 50%. A level of 30% is considered average and has been used for calculations here. Silage with more than 30% dry matter should be fed in smaller quantities.

To calculate the amount of silage to feed, see the section ‘Calculating the ‘as fed’ amount’. High moisture content or low palatability can mean that stock won’t always eat the required quantity of silage.

Irrigated feed

Stock may be given daily access to irrigated fodder crops as follows (assuming no limit to availability and quality):

Weaners	2 hr/day
Yearlings	2 hr/day
Adult dry stock	1 hr/day
Breeders, late pregnancy	2 hr/day
Breeders, lactating	3 hr/day

By-products

By-products of the oilseed crushing industry (such as cottonseed meal, peanut meal and sunflower meal) are high in protein and energy. Seed hulls from these products are low in protein and energy but can help maintain grown cattle or serve as a source of roughage for lotfeeding.

Hull quality varies depending on the amount of kernel left after crushing. For example, cottonseed hulls are better than sunflower hulls, while rice hulls are hard to digest and can injure the gut lining. When used, rice hulls should make up only a small proportion of any ration.

At times, other materials may be available, for example citrus pulp and cannery waste. Have the feeding value of such by-products analysed before determining a feeding program.

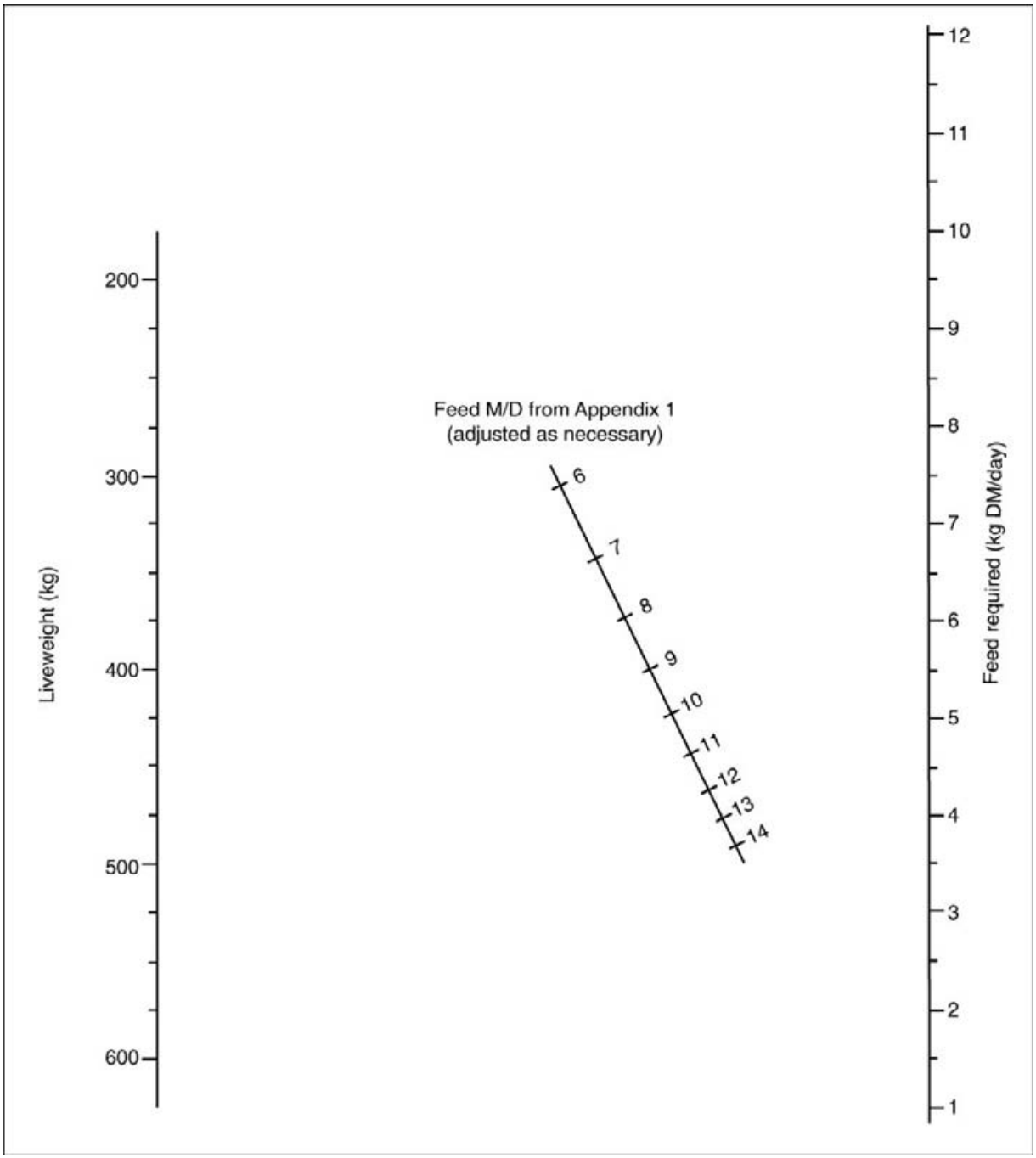
Table 2 Most likely dry matter (DM), metabolisable energy and crude protein content of feeds

Foodstuff	Dry matter (%)*	ME (MJ/kg DM, or M/D)		Crude protein %DM	
		Average*	Tested range	Average*	Tested range
Low protein dry roughages					
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	5.15	(2.9–6.3)	7.7	(4.0–11.5)
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	–	–	–
High-protein dry roughages					
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	–
Low protein wet roughages					
Maize silage	25–30	8.5	(7.5–9.5)	6.9–9.0	–
Sorghum silage	25–30	8.0	(8.0–8.5)	6.9–7.5	–
Oat, wheat, barley or rye green fodder or silage (cut at flowering stage)	25–30	8.5	(8.3–8.7)	6.0–8.0	–
High-protein wet roughages					
Lucerne green fodder	25	8.3	–	16	–
Lucerne silage	25–30	8.4	–	15	–
Pasture fodder (mixed grass & clover)	25	10.3	–	17.5	–

Pasture silage (mixed grass & clover)	20	8.2	–	16	–
Young oats, wheat, barley, rye, or millet grazing	25	9.3	–	10	–
Grains					
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)
Pulse grains					
Faba beans	90	12.5	–	25.6	–
Field peas	90	13	–	25	–
Lupins	90	13	–	32	–
Cereal grain by-products					
Wheat pollard	90	11	–	15	–
Wheat bran	90	12	–	15	–
Oat bran	90	9	–	8.0	–
Hominy	90	12.6	–	11	(10–12)
Rice bran	90	11	–	14	–
Protein-rich concentrates					
Soybean meal	90	12	–	50	–
Safflower meal	90	11	–	40–55	–
Peanut meal	90	11	–	42	–
Cottonseed meal (decorticated)	90	10.5	–	41	28–43
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	–	–	Equivalent to about 280	–
Miscellaneous					
Brewers grains (dry)	90	9.5	–	20	–
Molasses	75	13	–	3.5	–
white cotton seed	90	13	–	20	12–22
Sheep and cattle nuts	90	11	(9–13)	15	–

* This figure should be used as a guide only because of the wide variation between samples – laboratory testing of feeds is recommended.

Figure 1: Cattle maintenance requirements



NSW Department of Primary Industries laboratory testing services

NSW DPI operates a network of laboratories across the state which offer a wide range of testing services to support rural and other enterprises. All laboratories are fully accredited by NATA to international standards and use the latest methods and equipment.

Services available include:

Chemical residues: Tests include organophosphates, organochlorides, pyrethroids, and most other pesticides in a range of materials including water, soil, animal products, fodder and other produce.

Animal feeds: A full range of testing is available on pastures, silages, grains and by-products.

Water testing: Tests are tailored for agricultural uses and include pH, conductivity (salinity), alkalinity, hardness, chloride and trace metals.

Veterinary testing: Tests are available for diagnostic, market assurance and stock health monitoring purposes, as well as health certification for export purposes. Where possible, submit your samples through your veterinary practitioner or district veterinarian. WormTest kits are available through DPI offices.

For information on our services please visit our website at
www.dpi.nsw.gov.au/aboutus/services/diagnostic_and_inspection/diagnostic_and_laboratory services

Further information:
Veterinary testing (02) 4640 6327 (Camden)
Feed testing (02) 6938 1957 (Wagga Wagga)
Chemical testing (02) 6626 1103 (Wollongbar)

If you are in any doubt about the pesticide status of any unusual feed, you can have it tested for residues at one of a number of commercial laboratories. A list of these is available from your nearest NSW Department of Primary Industries office.

Further information

The NSW Department of Primary Industries website has a wealth of information available at
www.dpi.nsw.gov.au/drought

Feed Cost Calculator:
www.dpi.nsw.gov.au/reader/4439

ISSN 1832-6668

Replaces Agnote DAI-172

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Job number 7078