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A guide to drought feeding of goats

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Introduction

This guide summarises the main issues that goat producers need to manage during drought and is based on a review of available information. The full technical manual is available on the RIRDC internet site at: https://rirdc.infoservices.com.au/items/05-188

Objectives and key steps

The objectives of feeding goats during droughts are:

1. to maintain live weight;
2. to meet the requirements of breeding;
3. to maintain animal welfare;
4. to maintain growth of kids to avoid permanent production loss.

Most goat producers aim to keep their breeding flock substantially intact so they can recover their stock numbers as rapidly as possible and avoid expensive purchases when the drought breaks. Culling of inferior animals will reduce the costs of feeding when prices are likely to be high.

Critical live weights

Drought feeding should be started well before the goats reach their critical live weight. The concept of critical live weight indicates the minimum live weight that will enable an animal to survive. Further weight loss may endanger the survival of the goats by leaving them too weak to walk, graze or safely obtain drinking water. The critical live weight is also used when determining feeding level and for long term budgeting and purchasing of feed (Table 1).

<table>
<thead>
<tr>
<th>Breed</th>
<th>Does</th>
<th>Wethers</th>
<th>Bucks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angora</td>
<td>27</td>
<td>32</td>
<td>37</td>
</tr>
<tr>
<td>Cashmere</td>
<td>28</td>
<td>33</td>
<td>38</td>
</tr>
<tr>
<td>Boer</td>
<td>35</td>
<td>42</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 1. Guideline to critical live weights (kg) for goats. These live weights are off pasture with an allowance for fleece growth equal to half of a shearing interval.
As each flock of goats is different, you need to determine your own critical live weight. One method is to use a weight 30% less than the recent peak live weight plus 1 kg for each year of age plus estimated fleece weight.

Critical body condition scores

Body condition scoring can be used to determine the timing of drought feeding. Drought feeding should begin when half the goats in a flock have fallen to a body condition score of low 2 (lean or backward store).

If body condition continues to fall, the feeding rate should be increased until body condition is maintained.

Stocking rate and drought

Drought feeding requirements of goats depends upon the type of goats and available paddock feed. In some grazing situations there may be more herbage available in goat grazed pastures than in sheep grazed pastures. This will allow goats to graze for a longer period before they reach a critical live weight. Goats can be out competed when grazed with sheep on pastures at high stocking rates. In these circumstances the goats may reach their critical live weight earlier than the sheep and will need more drought feeding.

Managing goats in a drought

Adult goats above the critical live weight can be allowed to lose some weight and condition at the start of a drought without drastically altering their chances of survival. Start the introduction to drought feeding when the goats are 3 kg above the critical live weight.

Introducing grain

Goats have to be brought gradually onto cereal grain such as wheat, barley, triticale, maize, sorghum and commercial pellets or "sheep nuts" or any ration that is high in starch and low in fibre. The gradual introduction is required as a sudden change in diet can cause grain poisoning.

When starting to feed inexperienced goats, use good-quality hay. The cereal grain ration should then be started at the rate of 50 grams per head per day for adult goats, (25 grams for weaners) and increased slowly at a rate of 50 g every second day until the required ration is reached.

Oats and lupins have a higher fibre content than the other grains and full rations may be built up more quickly. Train goats that have not been fed grain by including previously fed goats in the mob to encourage the inexperienced goats to feed. Weaned kids can be taught to accept grain feeding by learning from their mothers.

Control gorging and shy feeders

When goats are fed in groups, gorging is likely to occur, especially since a substantial proportion of animals (10 to 20%) could be shy feeders or non-eaters.

Gorging will result in grain poisoning and possibly death. If many cases of grain poisoning occur, particularly at the 2-3 week stage, the program should be modified by not increasing the ration for a few days and providing hay.
When roughage supply is limited or very expensive, it may be more cost effective to draft off the shy feeders and provide them with a ration of 35% roughage. The remaining goats may be fed less roughage.

Rapid introduction of feed

Research with goats fed whole grain wheat without an introduction period showed that slaked lime treated wheat diets reduced the incidence of grain poisoning compared to diets without slaked lime. These results suggest that treating wheat with 2% slaked lime (Limil) is a practical method for rapid introduction of goats to high-energy grains.

Ammonium chloride (0.5%) should be added to cereal grain to prevent formation of urinary calculi in wethers and bucks.

Frequency and methods of feeding

Experience has shown that when feeding full drought rations of cereal grains to goats it is best to feed each day when there is little or no roughage available. It is possible to feed goats less frequently than daily when cereals make up a small percentage of the ration.

Drought feed can be supplied in trails, troughs, metal feeders or broadcast from a super spreader. Depending on the feeding method, feed wastage can range from 15 to 50%. There are other factors such as weather and shy feeders that are also important to manage.

Changing feeds

It is especially important to avoid sudden changes in the ration. If it is necessary to use a different grain, arrange the supplies early and mix the old grain with the new, gradually increasing the concentration over at least a week. Feeding processed grain to goats can increase the incidence of grain poisoning and so reduce appetite.

Nutritional requirements

Selecting the types and amounts of feeds to give goats during a drought involves six steps:

1. Determining total energy and protein requirements of each class of goat;
2. Determining the energy and protein content of available and suitable feeds;
3. Calculating which of the available and suitable fodders is cheapest;
4. Calculating the amount and cost of the selected feed;
5. Assessing the proportion of feed requirements that can be met from pasture and/or crop residues;
6. Monitoring and adjusting ration up or down.

Energy requirements

Energy is a major nutrient requirement and normally the first limitation during drought. Energy requirements for maintaining live weight and for growth are given in Table

1. Energy is provided in units of metabolisable energy (ME). For growth, determine the maintenance requirement and then add the requirements for growth.

The guidelines need to be modified based on regular monitoring of the live weight and body condition score of goats.
The energy requirement of working bucks is 15% greater than the maintenance requirement listed in Table 2.

Table 2. Guide to the daily nutrient requirements for MAINTENANCE of non-breeding goats during a drought under dry conditions with minimal activity. Under cold, wet and windy conditions energy provision should be doubled

<table>
<thead>
<tr>
<th>Live weight kg</th>
<th>Energy requirement MJ ME per day(^A)</th>
<th>Crude protein requirement g per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>2.27</td>
<td>33</td>
</tr>
<tr>
<td>20</td>
<td>3.82</td>
<td>55</td>
</tr>
<tr>
<td>30</td>
<td>5.18</td>
<td>74</td>
</tr>
<tr>
<td>40</td>
<td>6.43</td>
<td>93</td>
</tr>
<tr>
<td>50</td>
<td>7.6</td>
<td>110</td>
</tr>
<tr>
<td>60</td>
<td>8.71</td>
<td>126</td>
</tr>
</tbody>
</table>

Additional requirement for growth at 50 g per day

| 1.84\(^B\) | 14 |

Additional requirement for growth at 100 g per day

| 3.67\(^B\) | 28 |

\(^A\) Megajoules of metabolisable energy (ME) \(^B\) For maximum performance of kids the ration should contain at least 10 MJ ME/kg and 16% crude protein.

Energy requirement for breeding does

The suggested energy provision for feeding pregnant and lactating does during drought is:

Up to day 66 of pregnancy, maintenance;

From day 66 of pregnancy, maintenance plus 10%;

From day 90 of pregnancy, maintenance plus 40%;

From day 110 of pregnancy, 2.0 times maintenance;

From day 140 of pregnancy and during lactation, 2.5 times maintenance.

Remember to increase the ration only at the suggested rate.

Cold stress increases energy requirements

The impact of cold stress on the energy requirements of goats is large. Under cold, wet and windy conditions the energy requirement of goats will be two or more times maintenance requirements.

A goat will increase its heat production if the air temperature falls below the critical temperature. The maximum attainable heat production of a goat cannot be maintained for more than a few hours (about 4) before death. Relative to sheep, goats appear to be more vulnerable to continuous rain at low wind speed and to intense storms.

Goats less than 30 kg live weight and with a body condition score less than 2.3 are particularly vulnerable to death from cold stress.
Goat producers are advised to listen daily to weather bureau forecasts. If any two of the following weather conditions arise, goat producers should take precautionary action to reduce the risks of goat deaths:

1. Rain, more than 5 mm;
2. Temperature, less than 10°C minimum in wet conditions, less than 3°C minimum in dry conditions;
3. Wind, stronger than 18 km/hour. The implications for drought fed goats are:
   - maintaining live weight increases susceptibility to cold stress compared with when goats are fed to grow;
   - shearing increases cold stress for 6 weeks;
   - adult goats have higher critical temperatures compared with adult Australian sheep at the same live weight;
   - when wet and windy conditions are forecast producers need to increase energy provision prior to the arrival of the weather. Given the increasing reliability of weather forecasts, it should be possible to increase energy provision 3 to 4 day prior to arrival of bad weather;
   - susceptible goats should be moved to suitable shelter;
   - feeds suitable for rapid introduction need to be kept.

If goats exhibit signs of being heat stressed, maintenance energy allowances should be increased by 7% during rapid shallow breathing and increased by 11 to 25% for deep open-mouthed panting.

Protein requirements

Protein requirements are listed in Table 2. Generally most hays, grains and purchased commercial pellets have adequate crude protein for adult non-lactating goats. It is common that dry grazed pasture, some browse plants, poorer grass hays, straw and oaten grain in southern Victoria are below 7% crude protein. As a consequence animals fed these feeds will lose weight and may drop below their critical live weight. This situation is particularly dangerous for weaners and stock below 20 kg.

Urea can be used to supplement poor-quality dry pasture, and low protein hay and grain in order to speed up the rate of digestion, increase food intake and stop animals losing weight. Urea is sprayed on to roughage or grain or fed in licks or with molasses. Precautions must be taken to prevent urea poisoning. Seek further advice if you are considering using urea in feed.

Feeding weaned kids

In severe drought conditions it is suggested that kids could be weaned at about 10 to 13 kg. At this age, the kids need very careful management and highly digestible rations. It is suggested that early-weaned kids should be fed *ad libitum* rations of about 10 MJ ME/kg DM and 16% crude protein. The idea of early weaning is to reduce the energy used to produce milk. This approach has not been clearly documented for goats but works for lambs.

Containment areas

Stock Containment Areas are recommended during drought feeding to protect the environment and natural resources and to reduce the energy used by goats in walking about and climbing hills. A special containment area should be provided for goats that are
shy feeders and for goats in backward condition. In other words, separate the goats that are in the poorest condition from the main mobs. These goats need to be fed more hay and to be fed so they can gain some live weight.

Information on setting up and funding a Stock Containment Area can be obtained from your local Catchment Management Authority.

**Feeds and feed costs**

The cost of a ration largely depends on the ME content.

The energy values of feeds can vary from 20% up to 50% of the values given in feed tables. It is best to determine energy values by testing at: FeedTest, Pastoral and Veterinary Institute, Hamilton, Victoria. Telephone 1300 655 474, Fax (03) 55 730 939.

To determine the cost of a ration requires four steps:

1. Determine the energy requirement in MJ of ME per goat per day, see Tables 2 and 3;
2. Determine the energy cost of the ration in c/MJ/day, see Table 3;
3. Multiply these two values together;
4. Multiply this value by the proportion of the ration being fed. Eg. one third during early drought up to a full ration in severe drought.

Before finalising plans to feed any feedstuff, by-product or unusual feedstuff to livestock, it is advisable to have a sample analysed. In most circumstances choose the drought feed that provides energy at the lowest cost. You must note the dry matter of by-products or unusual feeds as well, since moist feeds may appear inexpensive on an as fed basis but in fact be quite costly because of their low dry matter content.

**Table 3. The cost of energy in different feeds over a range of purchase prices on an as fed basis**

<table>
<thead>
<tr>
<th>Feed type</th>
<th>Energy MJ ME per kg</th>
<th>Cost in cents per MJ ME</th>
<th>Feed purchase price $/tonne</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat, Barley, Lupins</td>
<td>12</td>
<td>0.8 1.3 1.8 2.3 2.8</td>
<td>90 150 210 270 330</td>
</tr>
<tr>
<td>Oats, pellets</td>
<td>10</td>
<td>0.9 1.5 2.1 2.7 3.3</td>
<td>90 150 210 270 330</td>
</tr>
<tr>
<td>Lucerne hay</td>
<td>8.5</td>
<td>1.1 1.8 2.5 3.2 3.9</td>
<td>90 150 210 270 330</td>
</tr>
<tr>
<td>Good hay</td>
<td>8</td>
<td>1.1 1.9 2.6 3.4 4.1</td>
<td>90 150 210 270 330</td>
</tr>
<tr>
<td>Oaten hay</td>
<td>7</td>
<td>1.3 2.1 3.0 3.9 4.8</td>
<td>90 150 210 270 330</td>
</tr>
<tr>
<td>Poor Hay, straw</td>
<td>6</td>
<td>1.5 2.5 3.5 4.5 5.5</td>
<td>90 150 210 270 330</td>
</tr>
</tbody>
</table>

Example: what is the cost of feeding a mob of 100 dry goats averaging 35 kg for a month in a containment area?

A 35-kg goat requires 5.8 MJ ME per day for maintenance (Table 2). The cost is calculated by using Table 3.
For barley at $270/t: Daily cost = 5.8 MJ ME/day x 2.3 c/MJ ME = 13.4 cents/day.

Cost per 100 goats for each 30 day month = 100 goats x 30 days x 13.4 c/day = $402.

If one half the ration is fed out during the first month the cost would be $402 x 0.5 = $201.

The amount of feed required for 100 non breeding goats are provided in Table 4. For example, a full ration for 100 27 kg goats fed oats needs 340 kg of oats each week. If your goats are a different live weight, you can work out the requirements from these values.

Table 4. Estimated quantities of feed needed for the maintenance of 100 non breeding goats per week at selected critical live weights for goats in dry conditions with minimal activity. Values in kg of feed

<table>
<thead>
<tr>
<th>Feed type</th>
<th>Energy MJ ME per kg</th>
<th>Kid 15 kg</th>
<th>Kid 27 kg</th>
<th>Angora doe 32 kg</th>
<th>Cashmere doe 50 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat, Barley, Lupins</td>
<td>12</td>
<td>180</td>
<td>285</td>
<td>320</td>
<td>445</td>
</tr>
<tr>
<td>Oats, pellets</td>
<td>10</td>
<td>215</td>
<td>340</td>
<td>380</td>
<td>535</td>
</tr>
<tr>
<td>Lucerne hay</td>
<td>8.5</td>
<td>250</td>
<td>400</td>
<td>450</td>
<td>625</td>
</tr>
<tr>
<td>Good hay</td>
<td>8</td>
<td>270</td>
<td>425</td>
<td>475</td>
<td>670</td>
</tr>
<tr>
<td>Oaten hay</td>
<td>7</td>
<td>NR</td>
<td>485</td>
<td>545</td>
<td>760</td>
</tr>
<tr>
<td>Poor hay, Straw</td>
<td>6</td>
<td>NR</td>
<td>565</td>
<td>635</td>
<td>890</td>
</tr>
</tbody>
</table>

NR: Not suitable as a sole ration.

Other nutritional requirements

It will pay to buy or retain a small proportion of hay early in the drought so that you have some roughage in autumn when pasture or crop residue is scarce. During lactation 30% of the ration should be good hay (less if pasture is available). Hay is also required for shy feeders and if full cereal grain feeding is required.

When diets consist mainly of cereal grain, calcium must be added to prevent deficiency. Add 2% of finely ground agricultural limestone to cereal grain, ie 2 kg per 100 kg.

Sodium is deficient in most grains. Common salt (sodium chloride) can be provided at 0.5%, but often water supplies have sufficient salt to alleviate the need to supplement.

Vitamins, A and E, are the only vitamins likely to be deficient as a direct result of drought feeding. Long term feeding of grain will induce deficiencies of these vitamins.

Water

Goat farmers should ensure that adequate water and shade is provided to all goats grazing dry summer pastures and during drought feeding, especially young and light weight goats. Water intake of Angora goats grazing dry unshaded pastures has been measured as 50% greater than that of Merino sheep. There is some evidence that Boer goats consume less water than sheep.
When budgeting on a water allowance you can plan for average daily consumption (4 l/head/day), however this can change dramatically with the weather. On very hot days, intake will be greatly increased so you need to be able to supply the maximum rate (up to 9 l/head/day). Allow enough trough space so that 10% can drink at any time, or 15 metres of trough edge for 500 goats.


This report includes data on a survey of the salinity of water provided to Australian goats.

SALINITY AND WATER QUALITY ISSUES

Evidence suggests that goats have similar or slightly greater tolerances to salt in water compared with sheep. Providing saline water with up to 10,000 mg/l total dissolved solids (TDS) did not affect food intake or growth of goats. When the TDS was increased to 17,000 mg/l the food intake of goats fell but not to the extent of the decline with sheep. It is possible for goats to tolerate higher TDS than these levels but the goats need to be adapted to this saline water over a long period.

During drought the salt content of river and dam water can increase to high levels and TDS should be monitored to ensure salinity remains at safe levels. Failure to monitor TDS can lead to death due to salt poisoning and this has occurred with goats in Australia in recent droughts.

Algal blooms can occur where water has high levels of nitrogen, phosphorus and temperature. Algal blooms can be toxic. High water magnesium levels can also be toxic.

BEHAVIOURAL ISSUES

If water sources dry out or are changed during a drought, the goats should be led to new sources of water. Failure to carry this out will lead to animals dying at dry water holes.

Goats have longer legs than sheep and may venture further into muddy dams where they may become entrapped. Dams with deep muddy edges should be fence to keep stock out, or inspected several times daily.

Weeds and native vegetation

Buying in feed can introduce weed seeds to your property. Many pasture weed species in southern Australia and some native plant species have high nutritional values making the plants suitable as feed for goats. However the long term grazing of many native plants is likely to result in poor nutritional status endangering the welfare of the animals. For many plants, after the leaves have been eaten, the remaining plant stems have very low nutritive value. During grazing of native vegetation, small goats will have difficulty accessing feed as all the lower vegetation will be eaten. Smaller goats should be sold or retained and fed. In many areas of Australia, the native vegetation is protected by legislation. Goat producers should check first before releasing their goats into areas of native vegetation.

Some plants can be toxic. For example, Sugar Gum can be poisonous in circumstances where the leaves have become moisture stressed. Pine needles can cause problems in some circumstances. Further information should be obtained from Simmonds et al. (2000).
Monitoring goats during drought

The management of goats during a drought depends on knowing how the animals are faring. The only real way to know how they are going is to weigh and condition score them. Goats need to be inspected regularly. Fence lines need to be checked to release any goats caught in fences.

When the drought breaks

After the drought breaks, goats should be kept in confined areas until new pasture is well established and can provide worthwhile grazing. At that point they can be gradually weaned off drought rations and allowed some grazing. Does with kids should be fed a full ration for a few weeks to ensure the maintenance of lactation. Calcium may also be limiting so ground limestone and salt should be fed for a few weeks. Once goats are released onto the pasture continue to monitor them. Goats in poor condition and after shearing are vulnerable to wet windy weather, particularly to periods of extended rainfall or intense storms.

Goat welfare and disease

There is a national guide for acceptable goat farming practice that describes actions relevant during drought. This means that all parts of Australia are covered by this National Code of Practice. Some states have their own code of practice for goats. Producers should become familiar with these codes. Animal welfare is an important issue at all times, but especially during drought.

Activities, such as shearing or transport, may exacerbate problems associated with goats in poor condition. The main welfare issue is assessment of how much weight and body condition an animal should be allowed to lose.

There are a number of diseases that are relatively common during droughts. Producers should become familiar with the signs of these diseases and how to take preventative measure to minimise their occurrence. In particular grain poisoning, vaccination against pulpy kidney disease, coccidiosis, and listeriosis associated with spoiled silage.

Drought Action Plans

It is recommended that drought action plans be prepared and implemented. Suggested checklists have been prepared for prior to drought, at the start of drought, during drought, and as drought breaks, and are available in the full drought report. Table 5 provides the suggested check list for the start of drought.

Further reading

All the issues raised in this guide are discussed in full by: McGregor, B.A. (2005). Nutrition and management of goats in drought. RIRDC Research Report No 05/188. (RIRDC: Canberra).


All Government Departments concerned with Agriculture have drought management information on their internet sites.

Table 5. A suggested checklist of routine activities to be completed at the onset of drought

<table>
<thead>
<tr>
<th>Activity</th>
<th>□</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement Drought Plan.</td>
<td>✓</td>
</tr>
<tr>
<td>Determine amount of feed available on pastures/range.</td>
<td></td>
</tr>
<tr>
<td>Determine how much water is available and where is it.</td>
<td></td>
</tr>
<tr>
<td>Visit financial institution to confirm/implement financial plan.</td>
<td></td>
</tr>
<tr>
<td>Contact livestock agent to identify current markets, prices and marketing arrangements.</td>
<td></td>
</tr>
<tr>
<td>Evaluate (weigh and condition score) all goats suitable for sale, future breeding requirements and those that can be finished for meat.</td>
<td></td>
</tr>
<tr>
<td>Obtain latest information on feed supplies and costs.</td>
<td></td>
</tr>
<tr>
<td>Prepare updated feed budget.</td>
<td></td>
</tr>
<tr>
<td>Implement feeding program to finish suitable goats for meat market if that opportunity is economic.</td>
<td></td>
</tr>
<tr>
<td>Cull unwanted animals.</td>
<td></td>
</tr>
<tr>
<td>Day before transporting unwanted goats, draft suitable animals into the agreed size sale lines.</td>
<td></td>
</tr>
<tr>
<td>Wean capretto kids on day of transport. Identify different sale lots with raddle only on head.</td>
<td></td>
</tr>
<tr>
<td>Prepare Stock Confinement Area to admit animals.</td>
<td></td>
</tr>
<tr>
<td>Move livestock away from environmentally sensitive areas of farm.</td>
<td></td>
</tr>
<tr>
<td>Plan when livestock will move into Stock Confinement Area.</td>
<td></td>
</tr>
</tbody>
</table>

Acknowledgments

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