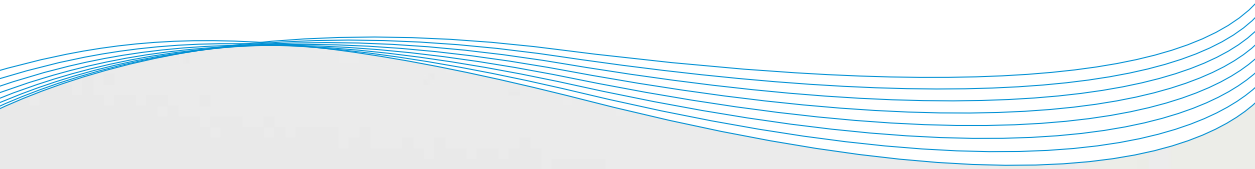


Improving ewe nutrition



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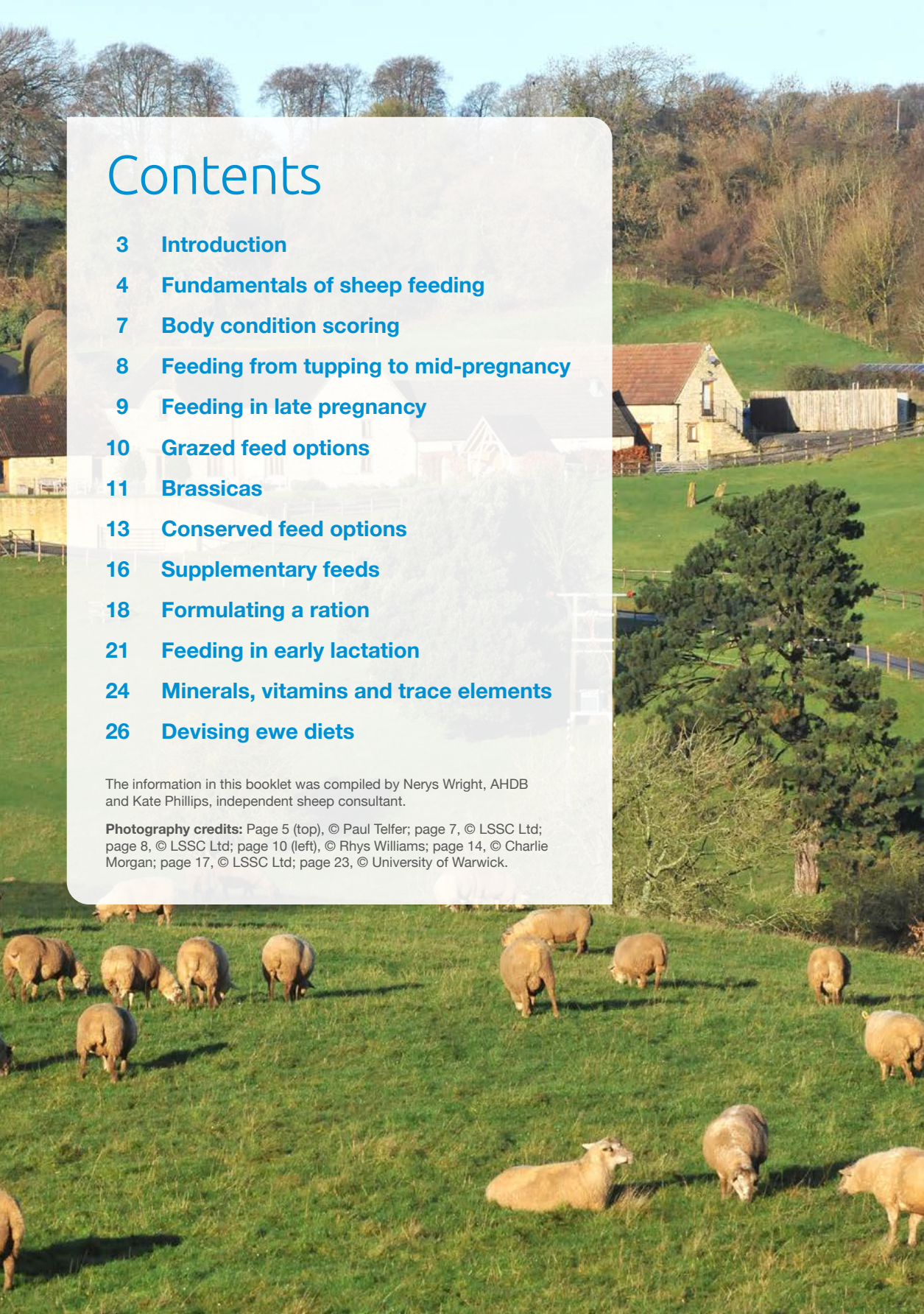
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The information in this booklet was compiled by Nerys Wright, AHDB and Kate Phillips, independent sheep consultant.

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Introduction

Good ewe nutrition is vital for successful flock performance. The feed requirements of ewes vary significantly depending on their stage of production so feeding regimes have to take account of this.

Feed and forage account for more than 50% of the total variable costs of a sheep enterprise, so it is crucial that feed is high quality and gives the animals the nutrients they need when they need them. Cutting corners is false economy and can lead to health and production problems.

Nutrients are required for maintenance, growth, lactation, reproduction and health. Poor nutrition can lead to reduced fertility, poor lamb survival, low growth rates, and can contribute to ewe and lamb mortality.

Maximising the use of forages reduces the amount of concentrates needed. Having silage or hay analysed is essential to assess the quality of forage and to allow accurate formulation of winter diets.

The best way to check that a diet is adequate and that ewes are healthy is to assess the body condition. This is an important task which, when done regularly and acted upon, can improve the physical and financial performance of the flock.

This manual looks at all the elements of ewe feeding and incorporates the latest thinking around this important topic.

Fundamentals of sheep feeding

Sheep are ruminants, which means their stomach has four compartments – the rumen, reticulum, omasum and abomasum.

Sheep feeding is based on the principle of feeding the rumen microflora, which, in turn, feed the sheep. The rumen allows sheep to digest fibre, which non-ruminants cannot. This fibre digestion is possible due to the presence of millions of bacteria, protozoa and fungi (microflora) inside the rumen. This means that sheep feeding must respect this important relationship.

Lambs, like all young ruminants, use the abomasum for digestion when the main component of their diet is milk. The rumen develops with age but is dependent on the diet the animal is fed and is usually fully functioning at around 8–10 weeks of age.

Energy

Energy is often the limiting factor in sheep diets. It can be provided in three different forms – fibre, sugar and starch. The rumen needs a balance of all three, but the amounts vary depending on the stage in the ewe's production cycle.

- Fibre – energy sources that are digested slowly by the rumen microflora and are important for rumen function
- Starch – digested faster than fibre and provides energy to the microflora

- Sugar – quickly available to the rumen microflora and helps fuel digestion of protein and other energy sources

The amount of energy within a feed is known as metabolisable energy (ME) and is measured in megajoules (MJ) in the dry matter (DM) of the feed.

A ewe's daily energy requirement can generally be achieved from grazing alone. However, extra feed may be required if the quality or supply of grass is poor, during extreme weather conditions or when nutritional requirements are high, such as in late pregnancy and lactation.

The rumen microflora use the three energy sources for growth and produce volatile fatty acids (VFAs). These are absorbed across the rumen wall and enter the ewe's bloodstream. They then travel to the liver where they are used to provide energy.

Protein

The ewe derives her protein requirement from two sources:

- Rumen Degradable Protein (RDP)
- Digestible Undegradable Protein (DUP) – this is also known as bypass protein as it is not digested in the rumen

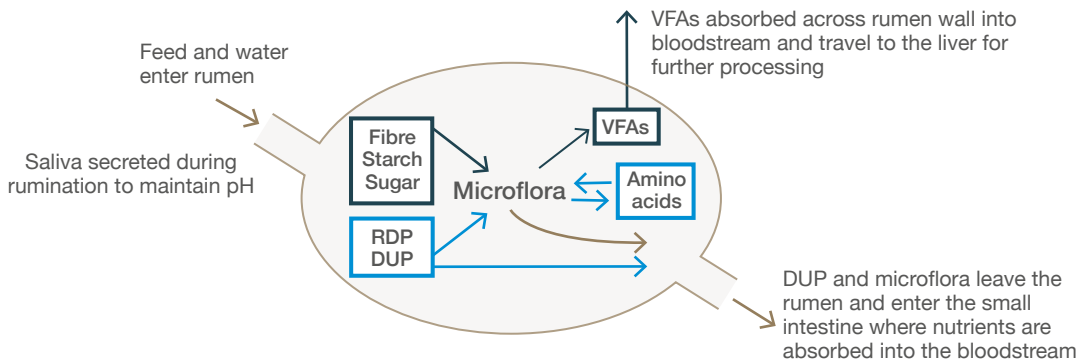


Figure 1. The inputs and outputs of a rumen

Ewes have a daily requirement for RDP which is readily found in grass, hay, silage, green leafy brassicas and many other feedstuffs. It is used by the rumen microflora to reproduce and then some of them are swept out into the small intestine for digestion.

This is called microbial protein and is the most important source of protein for ruminants. It is essential that the microflora have enough degradable protein in the diet.

RDP is usually enough to meet the ewe's protein requirements. However in late pregnancy this often cannot be met from RDP in forage alone. This is both due to reduced rumen capacity as the uterus enlarges and an increased need for protein to grow the lambs and produce milk.

This gap can be filled by feeding some high-quality DUP such as soya bean meal. Some of the protein in this type of supplement is less degradable in the rumen, so it passes through unaltered and is absorbed in the intestine. The requirement for DUP is especially important in ewes carrying multiple lambs in the last three weeks of pregnancy.

The amount of RDP and DUP in feeds will contribute to the total protein of the diet.

Grazing

Grass is chewed a little before it is swallowed and enters the rumen. Some of the sugars in the grass are used by the microflora for energy, which helps them break down RDP ready for it to be transformed into more microflora.



Ruminating

Before feed reaches the rumen, breakdown has started by the initial chewing process. Rumination (or chewing the cud) returns the feed to the mouth for further chewing. This is often done when the ewes are lying down. The time spent ruminating depends on the fibre content of the diet; the more fibre there is, the longer the ewe will ruminate.

This process breaks the feed down into smaller particles, which increases the surface area for the microflora to work on.



Energy and protein requirements

A ewe's requirements for energy and protein vary significantly during the year depending on body weight and litter size.

Table 1. Feed intake requirements of ewes at different stages of production

Stage of production	Feed intake requirements (% of bodyweight)
Dry	1.5
Late pregnancy	2
Lactation	3+

The maintenance requirement for a dry ewe weighing 70 kg is low at 8 MJ per day, but this increases significantly in late pregnancy and lactation (see Table 2).

In the last three to four weeks of pregnancy, ewes carrying multiple lambs may require an additional source of high-quality protein for lamb growth and colostrum production.

No allowance is made for liveweight gain in the ewe except for the fleece. For 50 g/day gain, in addition to the foetus, add 2.5 MJ of ME and 7 g of MP. Subtract 1 MJ of ME and 6 g/day of MP for a liveweight loss of 50 g/day in late pregnancy for ewes in BCS 3 or greater.

Speak to a nutritionist to calculate the MP supply to ensure ewes are receiving sufficient protein in their diet in late pregnancy.

Table 2. The metabolisable energy (ME) and metabolisable protein (MP) requirements of housed, pregnant ewes of different weights and litter sizes

Ewe liveweight (kg)	Number of lambs	Weeks pre-lambing							
		7		5		3		1	
		ME (MJ)	MP (g)	ME (MJ)	MP (g)	ME (MJ)	MP (g)	ME (MJ)	MP (g)
50	1	7.9	72	8.7	76	9.8	81	11.2	88
	2	8.8	77	10.1	83	11.9	92	14.2	103
60	1	9.1	80	10.0	84	11.2	90	12.8	98
	2	10.1	85	11.6	92	13.7	102	16.3	115
70	1	10.2	87	11.2	92	12.6	98	14.4	107
	2	11.4	93	13.1	101	15.3	112	18.3	126
	3	12.0	96	14.0	106	16.7	119	20.3	136
80	1	11.3	94	12.4	99	13.9	107	15.9	116
	2	12.6	100	14.4	109	17.0	122	20.2	137
	3	13.3	104	15.5	115	18.5	129	22.5	148

Source: Energy and Protein Requirements of Ruminants, AFRC 1993.

Body condition scoring

Scoring ewe body condition is useful for assessing whether the level of feeding is correct. The body condition score (BCS) scale runs from 1 (very thin) to 5 (very fat). The target varies during the year and depends on the farming system.

Having 90% of ewes at the correct BCS at key points through the year will reduce the variation within the flock and make feeding simpler. Ewes with the correct body condition score have better fertility and superior lamb performance.

It takes 6–8 weeks on good grass to gain one body condition score, so ewes need plenty of time after weaning to recover before tupping. Sort through the ewes shortly after weaning and give the thinnest the best grass and those in good condition

the poorer grazing. Investigate and cull any ewes that are not gaining condition after one month.

Once ewes are pregnant, it is harder to change their BCS without potentially affecting foetal development. Scan ewes 40–90 days after tupping so feeding in late pregnancy can be tailored to the number of lambs they are carrying. Score and group the ewes according to BCS and litter size, e.g. put thin singles in with twin ewes, as they will require the same amount of food.

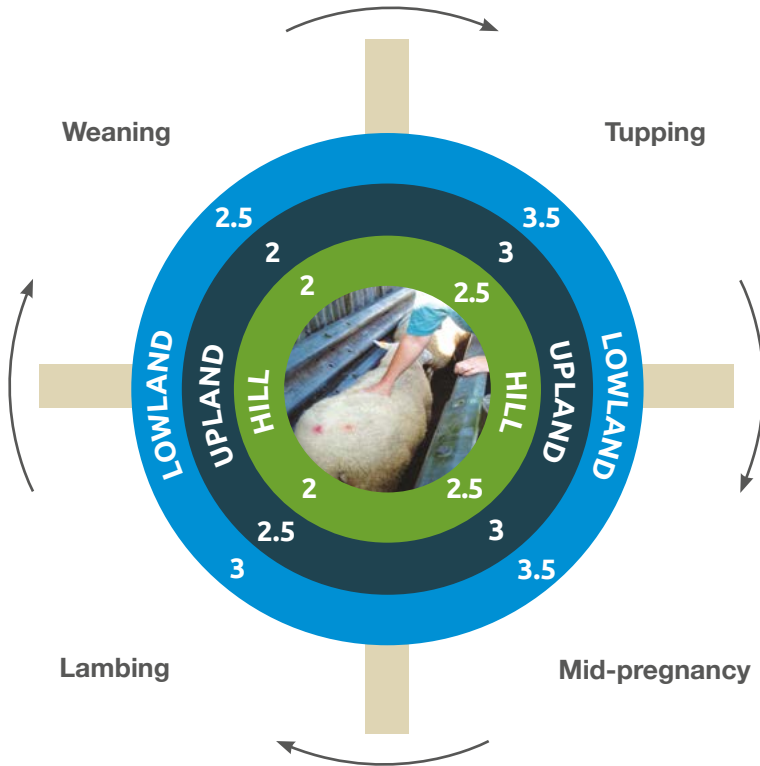


Figure 2. Target body condition scores

Feeding from tuppung to mid-pregnancy

Tuppung

Aim to have most ewes at target BCS before tuppung to optimise productivity and reduce problems in pregnancy and lactation.

Ewes in poor body condition close to tuppung or on poor grazing may need supplementary feeding with:

- Conserved forage such as hay or silage
- High-energy supplements (12 MJ/kg DM) fed at 0.25–0.50 kg per ewe per day
- Whole cereals such as barley or oats (no more than 0.2–0.5 kg/day)
- High-energy feed blocks

Avoid sudden dietary changes or stressful situations before, during and after tuppung.

Fat ewes can be as problematic as thin ewes. Any ewes above target BCS before tuppung should be grazed tightly for up to ten days before the rams join them.

Early pregnancy (month one)

Maintain a level plane of nutrition during and for the first month after tuppung. The fertilised egg(s) are not implanted until three weeks after mating, so keeping the diet stable for three weeks after the rams have been taken out is essential.

Ewe energy and protein requirements do not increase in early pregnancy. However, if supplements were fed before and during tuppung, continue to do so to reduce the stress of changing the diet.

Mid-pregnancy (months two and three)

This is when the embryo is implanted and the placenta develops. Optimal placental development will boost foetal growth and lamb birthweight.

It is important to maintain body condition in this period as this pays dividends in terms of subsequent lamb performance. Ewes below target BCS at tuppung should be allowed to gain weight slowly.

Extreme weather resulting in poor or no access to grazed grass can have unseen effects on lamb development. Access to some forage – fresh or conserved is essential at all times during this period.

Rams post-tuppung

Rams will often lose 15% of their bodyweight, or at least one unit of BCS during tuppung. After mating, give them access to good grazing. Consider a small amount of supplementary feed if rams are thin or grazing conditions are poor. Ensure any brisket sores are treated immediately.

Cull any rams not intended to be used the following breeding season.



Feeding in late pregnancy

Late pregnancy (months four and five)

The energy and protein requirements of pregnant ewes increase significantly in the last six weeks of pregnancy. During this time feed is needed for:

- Lamb growth – 70% of a lamb's birthweight is put on in the last six weeks
- Udder development – this will influence how much milk a ewe can produce
- Colostrum production – critical as a source of antibodies and energy for newborn lambs

A plentiful supply of thick, yellow colostrum indicates a well-fed ewe; a poor supply of thin, pale colostrum is a sign that a ewe has been underfed.

As lambing approaches, a ewe's feed requirements almost double, but her appetite can fall. This is due to the pressure on the rumen from the growing lamb. This means the nutrient density of the diet needs to increase to meet her nutritional requirements.

Checking feeding levels

Inadequate feeding, which causes ewes to mobilise fat stores and lose condition, can lead to metabolic health problems such as twin lamb disease. This can be picked up by regular body condition scoring.

Asking a vet to blood sample 6–8 multiple-bearing ewes in a range of body conditions, i.e. thin, ideal and fat, is another way to check whether the ration is good enough. Ewes due to lamb in the first week should be sampled 3–4 weeks before lambing to allow sufficient time to make any necessary changes to the diet.

Your vet will send the samples to a laboratory to look for:

- Beta Hydroxybutyrate (BHB) – released when fat stores are being mobilised. High levels suggest daily energy requirements are not being met through the diet
 - Normal level = <1.1 mmol/litre for scanned (twin/triplet) ewes (0.8 mmol/litre unscanned)
- Urea – low urea levels suggest the ewes have recently been short of degradable protein
 - Normal level = >1.7 mmol/litre
- Albumin – low levels of albumin suggest a longer-term absence of adequate dietary protein
 - Normal level during late pregnancy = >26 g/litre from serum or >30 g/litre from plasma

Do not blood sample ewes immediately after they have eaten supplementary feed as this could give a false result.

Grazed feed options



All-grass wintering

All-grass wintering (AGW) is a form of paddock grazing that, if well managed, can meet the nutritional requirements of pregnant ewes during winter, mainly from grass.

Key aspects:

- Requires sufficient winter grass growth, robust breeds and well-drained soils
- The grazing rotation starts when rams are still in or once they have been removed
- Lambing pastures are grazed first, giving them sufficient time to recover before spring
- Ewe health and field conditions are monitored closely and management adjusted accordingly
- Return to set stocking about 20 days before lambing
- Keep an emergency forage reserve to cope with adverse weather or poor grass growth

The costs of saved labour and feed need to offset the cost of electric fencing, additional water provision and possibly improvements to field access.

This strategy has been successfully applied to farms across England. For more information, see the online series BRP+ **All Grass Wintering of Sheep**.

Deferred grazing

Deferred grazing is where stock are removed from a field so a wedge of grass is built up, which can then be fed back by strip or block grazing to ensure good usage. A back fence is used to keep the stock off the previously grazed areas to allow pasture recovery.

This system avoids the cost of having to make that area of grass into silage or hay and the cost of feeding it.

If the wedge is being grazed in the spring, the earlier the closing date in the autumn, the higher the yield of grass will be.

In trials, the difference between shutting a field up on 30 August and 20 September was a 40% reduction in dry matter yield per hectare on 1 March. This was due to reducing day length and lower temperatures, which limited growth beyond mid-September.

However, it is also important to balance leaf production and death. The field shut up on 30 August had about 25% more dead material in the sward at the beginning of March, compared with the field closed in September. This would have had an impact on feed quality in the spring.



Brassicas

Roots and forage brassicas such as kale and forage rape can provide a high energy/protein diet for winter feeding. Before drilling a crop, do some research or discuss with your vet or nutritionist, as some crops require supplementation with minerals or other feeds to ensure a balanced diet.

Crops like this can be difficult to manage, particularly in wet weather. It is good practice to provide a run-back area or a dry pad of straw for the animals to lie on and fresh water. This is especially important in adverse weather conditions.

Take care to provide:

- 'Back-up' feeds if grazing conditions become poor
- Hay, straw or silage in racks/round feeders and concentrates (or the pre-lambing diet), 3–4 weeks before lambing, so ewes get used to a different feed
- Supplementary protein if feeding swedes and fodder beet in the last three weeks of pregnancy and early lactation, as these roots are low in protein
- Specific mineral supplements, usually with additional iodine. Root crops can suppress the function of the thyroid gland by interfering with iodine uptake

Do not let ewes become overfat as they may get stuck on their backs out in the field or have an increased risk of developing twin lamb disease.

The pros and cons of feeding brassica crops to ewes

Pros

- Good source of energy
- Cheap to grow
- Can be mob- or strip-grazed to improve usage

Cons

- Ewes can get too fat
- Not enough DUP for ewes in late pregnancy
- Yield is weather-dependent. Can be problems when grazing in wet conditions
- May need to supplement, e.g. with iodine

Sward height targets for lambing

Indoor lambing

The target grass height for turnout after lambing is a minimum of 4 cm but a sward height of 4.5–8 cm will provide maximum dry matter intake. Supplementation of ewes rearing twins is required when sward height is less than 4 cm (1,500 kg DM/ha) but if sward height is less than 3 cm (1,200 kg DM/ha) extra forage will be required as well.



Outdoor lambing

A grass height of 3–4 cm at lambing is ideal, as this will strike a balance between ewes not getting too fat or the lambs getting too big inside them, with udder development and milk production. Stocking rate should be adjusted for singles so their feed intake is lower than for ewes carrying twins.

Ewes grazing during the winter and spring may struggle to meet their requirements from grass alone if conditions are extremely wet. Grass dry matter is usually between 15–20%. Persistently wet periods may see a requirement for additional dry forage in the field.

Farm Assurance Standards

Farm assurance schemes set rules on the appropriate conditions for livestock kept outdoors in fields, corrals and forage crops. To comply with Red Tractor Standards, you must provide a well-drained lying area and shelter (natural or man-made: hedges, trees, walls). Outdoor feeding areas should be situated so that they do not become excessively poached or allow a large build-up of dung.

Red Tractor Beef & Lamb Standards, 2018.



Conserved feed options

Home-grown conserved forages are usually the most economical feeds for housed sheep, or when grass quality or quantity is limited in the field.

The nutritional value of forages can vary widely, even between batches made in the same year. So it is important to have them analysed by a reputable laboratory, so supplementation can be matched to them.

To see a list of companies that offer forage analysis, visit ahdb.org.uk/knowledge-library/soil-and-forage-testing-companies

Understanding forage analysis

A forage analysis will highlight forage quality and indicate how much additional feed is needed to fill any nutritional gaps.

Dry matter (DM%) – what is not water

If silage is too wet (less than 25% DM), ewes find it difficult to eat enough to meet their needs.

When this is the case, ewes require more supplementation.

Hay	86	GOOD	POOR	80
Clamp silage	>25	GOOD	POOR	<22
Bale silage	>30	GOOD	POOR	<22

Metabolisable energy (ME – MJ/kg DM)

A measure of the usable energy available to the animal. When buying a supplement, make sure the ME is higher than that of the forage.

Hay	>10	GOOD	POOR	<8
Silage	>11	GOOD	POOR	<10

Crude protein (CP%) – a measure of the protein content

It is important to provide enough protein in supplementary feeds to make up any protein deficit in the forage.

Hay	>12	GOOD	POOR	<9
Silage	>14	GOOD	POOR	<10

D-value – a measure of feed digestibility

The higher the D-value, the less concentrates are required for ewes pre-lambing.

Hay	60	GOOD	POOR	50
Silage	70	GOOD	POOR	58

pH – a measure of acidity in silage

Target pH will vary depending on DM% of silage. Generally, less than 3.5 is very acidic and unpalatable, and higher than 5 suggests poor fermentation and low palatability in wet silages. A high pH (>4.5) in a dry silage is not a problem.

Silage	>4	GOOD	POOR	<3 or >5
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Ash (%) – a measure of mineral and trace element content

Forage has a natural level of ash, but a level of more than 10% in silage indicates soil contamination and poor fermentation. This should not be fed to sheep. Note: Forages containing legumes may have higher levels of ash.

Ammonia (N) – A measure of protein breakdown during the ensiling process

Levels greater than 10% indicate protein breakdown and poor fermentation.

Total fermentation acids – A measure of total acid content

High levels of acids limit intake. Aim for levels <100 g/kg DM.

Silage

Silage is a good forage option for sheep, but do not feed mouldy or obviously soil-contaminated silage to ewes as there is a high risk of listeria abortion. Ensure clamps and bales are well sealed and protected against bird and vermin damage so no air can reach the silage.

For more information, see **Making grass silage for better returns**, available in hard copy and online at ahdb.org.uk

Straw

Wheat or barley straw (ME 5–7 MJ/kg DM, CP~4%) can be used as the main forage for pregnant ewes but some basic principles must be followed.

Ensure straw is:

- Clean and bright
- Offered ad lib at all times, allowing about 1.5 kg/ewe/day
- Topped up freshly each day in racks or round feeders or bedding replenished, allowing ewes to sort through to find the most digestible parts



Ewes should be:

- In good condition (lowland ewes BCS 3 or more) when starting a straw-based diet
- Moved onto straw (from grass or other forage) no later than seven weeks before lambing
- Fed a generous level of concentrates to compensate for the low energy and protein content of the straw

Complete diets/Total Mixed Rations (TMR)

A complete diet or TMR is where all the ingredients – forages, grains, straights and minerals are mixed together and usually fed out from a feeder wagon. A good mix is required to stop the ewes picking out the parts they like best. This is an ideal way to feed ewes, as it provides a constant diet throughout the day with none of the large shifts in rumen pH associated with feeding concentrates on their own.

TMRs can be formulated to meet the increasing needs of pregnant ewes. Taking advice from a competent nutritionist is strongly recommended.

Water

Requirements for water increase significantly in late pregnancy and early lactation. It is essential to provide ad-lib fresh water at all times, particularly post-lambing.

Water requirements will vary according to the dry matter of the diet.

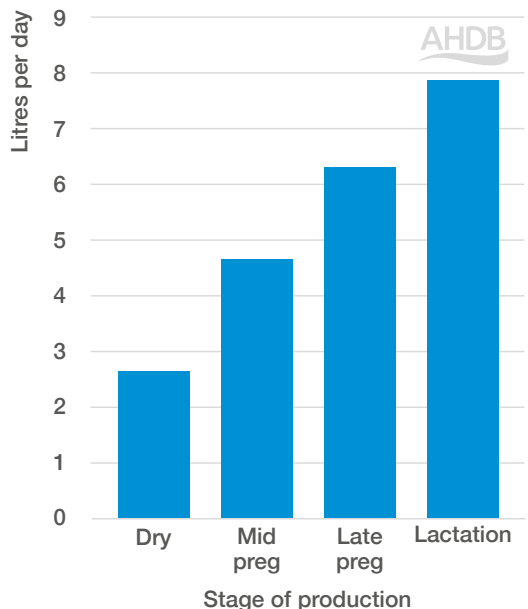


Figure 2. Daily water requirements for ewes

Supplementary feeds

Compound feeds

A compound feed should complement the forage in the diet. The compound should be purchased on the basis of the forage analysis and should aim to provide elements of the diet that cannot be provided by the forage. As well as the forage analysis, the choice of supplement should be based on:

- Other feeds available on the farm, e.g. brassicas
- Litter size, ewe body condition and bodyweight
- Facilities available to offer feed fairly, e.g. trough space

The compound feed must have a higher energy density than the forage with which it will be fed. As a rule of thumb, it should be 12.5 MJ/kg DM or more. To achieve this level of energy, cereals are likely to be a key ingredient.

Protein is the second most important factor to consider after energy. The level of protein is important but the source of protein is critical. There also needs to be a good balance of RDP and DUP (see page 4).

The ingredients determine the protein percentage of the overall compound. For example, an 18% protein compound containing 10% soya would provide far more DUP than a 20% protein feed, where the main protein source is rapeseed meal.

Example sources

Protein – Soya, rapeseed, wheat distillers grains, beans

Starch – Wheat, barley, oats

Sugar – Molasses, sugar beet pulp

Fibre – Sugar beet pulp, citrus pulp, soya hulls, wheat distillers grains

Always take a good look at the label on the feed bag, as this indicates whether the feed is appropriate for the ewes it will be fed to. See Table 3 for guidance. By law, the feed label should include details of the ingredients in descending order of inclusion. It is often worthwhile getting a sample analysed to check that the feed meets the declared specification for oil, protein, fibre and ash. A sample can be tested in a reputable laboratory but remember to keep a sample, in case further testing is required.

Table 3. Guidance for compound feeds

Component	Comment
12.5 MJ/kg DM	High-energy to meet the increasing demands of a ewe in late pregnancy
18–20% crude protein	Beware! The ingredients providing the protein content of the feed are more important than the overall percentage
5% DUP	This level is ideal for prolific ewes in late pregnancy
4.5–5.5% oil	Too much oil will restrict forage digestion
<10% fibre	Some fibre is low in energy. It is important for ewes to eat fibre but it should largely come from the forage not the compound feed
<10% ash	Ash has low nutrient value so should only be present at low levels
Cereals	~20% to achieve a high-energy feed

Feeding options

Step rate

The amount of compound offered is increased as lambing approaches to match the ewe's additional requirements for energy and protein.

Flat rate

The amount of compound feed required at the start and towards the end of the feeding period are added together and divided by two. This amount is then fed as a flat rate throughout the last 6–8 weeks of pregnancy.



This is most successful where most of the ewes are at the correct BCS for late pregnancy. It should not be done if ewes are too thin or too fat.

Do not feed more than 0.5 kg of concentrates per ewe in one feed as this will reduce rumen pH and upset fibre digestion. If feeding more than this, split into two even feeds and offer two or three times a day, if feeding more than 1 kg/day.

Feeding in troughs

Providing adequate trough space is important to ensure each ewe in a group receives her share. Minimum space requirements are:

- Ad-lib forage 12–15 cm/ewe
- Rationed concentrates 45 cm/ewe

Move troughs often to avoid poaching, if sited outdoors. Clean troughs regularly to avoid any build-up of mouldy material.

Floor feeding

Floor feeding compound nuts (7 mm+) is a good option if trough space is limited and ewes bump each other to access the feed. The bedding must be clean and dry. Sheep tend to graze the nuts out of the bedding rather than eating a large amount in one go, so this method is effectively safer than trough feeding.

However, if there is an outbreak of an infectious disease such as enzootic abortion, consider feeding in troughs instead.

Home-mixing

Simple home-mixes using cereals, pulses and sugar beet pulp are economical and have a high feed value.

Cereals can be fed whole but this depends on the forage being fed. If forage quality is high, whole cereals will pass through the rumen before being digested properly, which is wasteful. Consider rolling grain when forage has a D-value of 70 or more.

Use the AHDB **Blend calculator** to work out the composition and cost of a range of different home-mixed feeds – available at ahdb.org.uk/blend-calculator

Formulating a ration

To calculate the supplementary feed requirements of ewes, you need to know:

- Ewe weight and litter size to calculate energy (ME) requirements
- How much forage ewes will eat, i.e. what their dry matter intake (DMI) is
- The ME and DM of the forage
- The ME and DM of the additional feed options
- How many weeks until lambing

Step 1

Calculate your ewe's ME requirements by using Table 2 on page 6.

Table 4. Calculating the ME requirements of 70 kg ewes just before lambing

	Example	Your ewes
Ewe weight (kg)	70	
Number lambs	2	
Time before lambing (weeks)	1	
ME requirement (MJ/day)	18.3	

In this example, the ewes require 18.3 MJ/day.

Step 2

Work out daily dry matter intake (DMI).

Table 5. The DMI (as % of bodyweight) from forage (kg) of ewes eating various forages at different times before lambing

	ME (MJ/kg DM)	12–3 weeks pre-lambing (% ewe liveweight)	3–0 weeks pre-lambing (% ewe liveweight)
Straw	6.5	1.0	0.8
Average hay	8.5	1.5	1.1
Good hay	9.5	1.8	1.4
Poor silage	9.5	1.4	1.2
Good silage	10.5	1.6	1.4

This example is based on a twin-bearing 70 kg ewe eating good silage, one week before lambing = 1.4% of 70 kg = 0.98 kg silage dry matter.

Intake is higher with good-quality forage because it is easy to digest and moves through the rumen quickly, so ewes eat more of it. The amount eaten is likely to reduce in the final weeks of pregnancy as the uterus expands with the growing foetuses.

Ensure the amount of forage offered to ewes is adequate by weighing the forage and checking that ewes are not running out during the day. If intakes are higher or lower than predicted, the diet may need to be adjusted.

Step 3

Examine your forage analysis to discover the ME and DM

Table 6. An analysis of big bale silage

Nutritional component	Units	Analysis
D-value	%	67
Metabolisable energy (ME)	MJ/kg	10.7
Dry matter (DM)	%	30.5
pH		5.7
Crude protein (CP)	g/kg	129
RDP	g/kg	88
DUP	g/kg	15.1

This example: ME = 10.7 MJ and DM = 30.5%

Look at your forage analysis. To convert figures given in g/kg to % – convert the g to kg, divide by 1,000 then convert to % by multiplying by 100. For example, the crude protein figure of: $129 \text{ g/kg} = 129/1,000=0.129 \times 100 = 12.9\%$.

Step 4

Work out if there is enough energy in the forage to meet the ewe's requirements

Table 7. How to calculate the energy gap

	Example	Your figures
ME requirement (MJ/day)	18.3	
ME in forage (MJ/kgDM)	10.7	
Ewe weight (kg) x 1.4/100 x ME in silage	$70 \times 1.4/100 \times 10.7 = 10.5$	
Deficit	$18.3 - 10.5 = 7.8 \text{ MJ}$	

In this example: the energy deficit = 7.8 MJ/ewe/day

Step 5

Consider how to fill the energy gap

Look at the feed value of any home-grown feeds or possible purchased feeds, then see how much would be needed to fill the energy gap.

Table 8 shows an example using an 86% DM, 12.5 MJ/kg DM compound feed.

Table 8. How to fill the energy gap

	Example	Your figures
ME deficit (MJ/day)	7.8	
Additional feed required DM	$(7.8/12.5) = 0.62$ kg DM	
Ewe weight (kg) x 1.4/100 x ME in silage	$70 \times 1.4/100 \times 10.7 = 10.5$	
Additional feed – fresh weight	$0.62 / (86/100=0.86) = 0.72$ kg/ewe/day	

In this example: the energy deficit = 7.8 MJ/ewe/day

This example: the amount of compound feed needed = 0.72 kg/ewe/day

This would be split into two feeds of around 0.36 kg per feed. This is only given as a guide and in practice, forage intake may be more or less than predicted and compound-fed supplementation may need to be adjusted.

For more detailed information, see **Feeding the ewe** available online at ahdb.org.uk



Feeding in early lactation

It is crucial that lambs receive adequate colostrum (50 ml/kg birthweight) within 4–6 hours of birth (ideally, 2 hours), to provide immunity against disease.

Ewes that are in good body condition and have been well fed in late pregnancy should also have adequate colostrum to provide their lambs with energy, protein, antibodies, vitamins and minerals.

For more information, see **Improving lamb survival** available in hard copy and online at ahdb.org.uk

Energy for early lactation

Ewes in early lactation have a significant energy and protein requirement to meet the nutritional demand of milk production for their lambs. Ewes of 70 kg, rearing two and producing about 3 L of milk per day, require over 32 MJ of energy per day if they are to maintain body condition.

Essentially, a ewe's energy requirement doubles overnight. Fortunately, giving birth reduces the pressure on the rumen and a ewe's appetite increases by 50%.

Table 9 illustrates the amount of energy and protein needed by ewes in early lactation, based on their bodyweight and milk production. The ewe's requirements can be calculated to include the option to maintain or lose weight during lactation.



Table 9. The energy and protein requirements of housed, lactating ewes in early lactation

Ewe weight (kg)	Weight loss (g/day)	Milk yield (kg/ewe/day)					
		1		2		3	
		ME (MJ/day)	MP (g/day)	ME (MJ/day)	MP (g/day)	ME (MJ/day)	MP (g/day)
50	0	13.6	133	21.9	209		
	-50	11.8	127	20.0	203		
	-100	10.1	121	18.2	196		
60	0	15.6	146	23.7	222	32.2	297
	-50	13.8	140	18.2	216	30.3	291
	-100	12.1	134	20.2	209	28.5	285
70	0	17.5	158	25.6	234	33.9	309
	-50	15.8	152	23.8	228	32.0	303
	-100	14.0	146	22.0	221	30.2	297

Source: AFRC 1993. For lowland ewes outdoors, add 0.2 MJ/day and for ewes on hills add 0.8 MJ/day.



Increasing the ration

Ewes housed after lambing will need their diet adjusting from the pre-lambing ration to meet their increased demands 24 hours after giving birth. Make sure there is ad-lib access to forage and increase the compound feed allowance (based on the number of lambs they are rearing).

Ewes reach peak milk yield at 3–4 weeks post-lambing. Feeding ewes well to this point maximises the amount of milk they can produce.

Ewes below BCS target will need a diet that provides enough energy to maintain themselves while feeding their lambs. They will have less fat reserves to mobilise for milk production.

Lactation at grass

Ewes at grass will require different supplementation, depending on:

- Body condition
- Number of lambs being reared
- Grass quality and quantity

As a rule of thumb, set-stocked ewes will not require additional feeding if grass is at 4 cm or higher. Excessive supplementary feeding with concentrates in this case will displace the amount of grass the ewes will eat, turning a potentially low-cost system to high cost.

Buckets and licks containing high energy can be used pre and post-lambing. These can be a practical way of supplying extra

energy to ewes out in the field, but can be expensive in terms of p/kg of energy supplied. In addition, there is no guarantee that all ewes will feed from them.

Mastitis risk

If grass quality or quantity is limited (less than 4 cm sward height), ewes will need supplementation to support milk production. Poor feeding and low BCS are risk factors in the development of teat lesions, as the lambs damage the teats trying to stimulate more milk and this can lead to mastitis.



Performance at eight weeks post-lambing

A key performance indicator (KPI) for sheep enterprises is the weight of lambs at eight weeks of age. Lamb growth in the first few weeks of life is mainly influenced by the mother's ability to feed them.

A project working with commercial flocks has suggested that this early growth is a good indicator of future lamb performance, i.e. lambs that grow quickly during the first two months continue with faster growth rates through to finishing and vice versa for slow-growing lambs. The data also found that ewes losing the most body condition units between lambing and eight weeks had the heaviest lambs at eight weeks, but this relies on ewes having condition to lose.

Assessing ewe body condition and lamb performance at this time helps make important management decisions such as when to wean. Ewes at a lower BCS than target may need to be weaned sooner than the rest as this gives them more time to regain condition before tugging.

Minerals, vitamins and trace elements

Ewes require minerals in their diet along with vitamins and trace elements to optimise performance. Most are required in the ewe's daily diet because not all are stored within the body. Those that are stored can become depleted if not topped up regularly.

Excessive amounts of minerals, vitamins and trace elements (e.g. copper) can be as harmful as a deficiency, resulting in imbalances, leading to serious health and production problems.

Minerals

The two major minerals that affect ewe production are calcium and magnesium. Two key metabolic problems are:

Hypocalcaemia

Cause

- Calcium deficiency/imbalance in late pregnancy or early lactation due to a sharp increase in calcium requirement to produce milk
- Excessive calcium supplementation, leaving the ewe unable to tap into her own reserves
- Older ewes tend to be more susceptible

Prevention

- Minimise stress in the last weeks of pregnancy
- Avoid high levels of magnesium
- Keep calcium level at about 0.9% in the concentrate feed in late pregnancy
- Only supplement ewes where a deficiency is known

Signs

- Paralysis in the hindquarters
- Partial loss of consciousness

Treatment

- 50–80 ml of calcium borogluconate or magnesium hypophosphite and glucose injected under the skin

Hypomagnesaemia (grass staggers)

Cause

- Magnesium deficiency during peak lactation. Ewes have a daily requirement in the diet because magnesium is not stored in the body. There is high demand during lactation
- Grazing lush, heavily fertilised (K and N) spring grass

Prevention

- Do not apply high rates of nitrogen or potash fertilisers on spring grazing
- If ewes are on lush spring grass, offer hay to maintain rumen health
- Reduce stress in early lactation
- Provide rock salt or magnesium supplements. Include 0.7% magnesium in the concentrate feed, provide extra in the mineral or liquid feeds, or add soluble magnesium salts in the water

Signs

- Trembling or inability to walk
- Lying rigid with outstretched legs
- Tetanic spasms
- Sudden death

Treatment

- Seek advice from a vet
- The ewe's eyes will be sensitive to light. Cover her eyes to calm her

Trace elements and vitamins

Trace elements are needed in very small amounts but are essential for good flock health. If ewes are not performing as expected and the energy and protein supply seems adequate, consider checking the trace element status.

Take blood samples from 4–6 ewes from each management group. Key times for sampling are at weaning, pre-tupping, scanning and lambing. Forage samples can also be tested and the results of both used to decide on treatment options. Monitor results to check there is a cost-effective improvement. Do not feed trace element supplements if they are not needed as they are expensive and will not yield any results.

Copper

An essential trace element stored in the liver. Deficiency can limit fertility. Swayback, a spinal problem in lambs, is caused by copper deficiency in pregnant ewes. Excess copper is toxic, particularly to vulnerable breeds, e.g. continental breeds such as Texel and animals fed concentrates for long periods. Several minerals are antagonists to copper (iron, molybdenum and sulphur) which affects its uptake.

Copper is naturally occurring in many feed ingredients. Only give supplementary copper if advised by the vet to avoid toxicity problems.

Cobalt

Cobalt is required in the rumen for the rumen microbes to make vitamin B12. Deficiency causes poor growth and wasting in lambs and is also known to adversely affect ewe fertility. Many forages are deficient. Rumen bacteria require a daily supply of cobalt as it is not stored in the body.

Provide 0.1 mg cobalt/kg DM of feed. Consider supplementation in feed or bolus for a longer-term supply. For a shorter supply, consider an oral drench or injection of vitamin B12.

Vitamin E

Important for immunity and the prevention of white muscle disease. Improves lamb vigour at birth and growth rates to weaning. Levels are low in conserved forages. It is not stored in the body.

Ensure 100 mg/day of vitamin E in concentrate feed in late pregnancy.

Selenium

This boosts immunity and is important for ewe fertility. It is also important for lamb vigour, helping mobilise brown fat, which reduces the risk of hypothermia. Availability in pasture is influenced by soil type, e.g. soils of granite or volcanic origin are deficient. Selenium is also stored in the liver.

Maximum level in feed should be 0.5 mg/kg. Selenium has been shown to be very effective in improving lamb vigour and survival. Excess selenium can be toxic.

Iodine

Needed to control metabolic rate and for foetal development. Supplements may be needed when feeding kale, rape or other brassicas. Excess iodine in late pregnancy inhibits the lamb's ability to absorb antibodies from colostrum. Deficiency can result in stillborn lambs.

Consider the need for supplementation and then speak to a vet about the best method.

Devising ewe diets

Table 10. Nutrient value of commonly used feeds

Feed	Feed ingredient	Dry matter (%)	Energy ME (MJ/kg DM)	Protein (% in DM)	DUP (% of protein in DM)
Forages (average)	Clamp silage – grass	25	11.2	15.0	3.0
	Baled silage – grass	35	10.0	12.0	3.0
	Hay	85	8.8	9.0	2.3
	Haylage	60	10	11.5	2-3
	Wheat straw	85	5.0	4.0	0.7
Roots	Fodder beet	12–19	12–12.5	6–8	0.7
	Kale	15–17	10–11	14–17	2.1
	Stubble turnips	12–15	10–11	17–18	1.2
	Swedes	9–12	12–13	10–11	1.2
	Forage rape	10–12	10–11	19–20	1.2
Cereals and legumes	Wheat	86	13.8	12.8	1.5
	Barley	86	13.2	12.1	1.4
	Oats	86	12.2	11.0	0.8
	Beans	86	13.8	29.0	4.2
	Peas	86	12.8	24.0	3.2
Cereal by-products	Wheat feed	89	11.5	17.3	4.3
	Maize gluten	89	12.5	21.7	2.2
Oilseed by-products	Soya bean meal	88	13.8	52.0	12.3
	Rapeseed meal	88	12.1	38.5	5.5
	Sunflower meal	88	9.5	36.0	4.9
Sugar by-products	Molasses (cane)	75	12.6	6.0	0.6
	Molassed sugar beet feed	89	12.5	10.0	2.5
Other co-products	Wheat distillers grains	89	13.5	32.0	12.0
	Brewers' grains	23	11.7	24.0	5.9
Compound feed	Good quality	86	12.8	21.0	5.2
	Poor quality	86	11.0	18.6	2.9
Grazing	Spring grass	17	11.5	18.0	5-6
	Older grass ley	18	10.5	15.0	3.0

Protein figures in Table 10 are quoted in dry matter (DM) terms. To convert to 'as fed', multiply the protein % in the DM by the DM of the product and divide by 100, e.g. wheat (12.8 x 86) divided by 100 = 11% as fed. Good-quality compound feed (21 x 86) divided by 100 = 18% as fed. Good clamp silage (15 x 25) divided by 100 = 3.75% as fed.

These are average figures, use actual feed and forage analysis, if available, and check compounds.

Remember to check the copper content of wheat distillers grains.

Top tips

- Weigh a group of ewes to find the average mature liveweight of the flock – ideally, pre-tupping
 - Make the most of grass growing in the field before considering conserved forage and other supplements, as grazed grass is the cheapest feed on the farm
 - Consider the role of brassicas and root crops in the crop rotation/reseeding programme on the farm
 - Analyse forages and other home-grown crops. Their nutritional value will vary widely from year to year, between fields and between cuts
 - Discuss the forage analysis with a nutritionist and match any supplementation to fill the nutrient gaps in the forage
 - Scan ewes to ensure they are being fed to their correct litter size
 - Consider BCS when calculating feed requirements
 - If purchasing a compound feed, look at the list of ingredients. Buy one that has more energy than the forage or grass it is supplementing
- When grass quality or quantity is poor, continue feeding the ewes supplements for 3–4 weeks after lambing
 - Monitor the adequacy of the diet throughout the year by regular body condition scoring. Consider taking blood samples in late pregnancy to check that the diet is adequate

Monthly checklist

Example monthly checklist for a March lambing flock starting at weaning in June: (adjust the months for different lambing times).

June: Wean ewes – identify culls, body condition score and group accordingly

July: Check ewes are gaining condition

August: Start sourcing replacements

September: BSC ewes to ensure they are on course to reach target

October: Turn rams out with ewes

November: Analyse forages – look at supplement options

December: Remove rams and feed them during the winter

January: Scan ewes, body condition score, group according to BCS and number of lambs expected

February: Prepare for lambing. Start feeding ewes and consider taking blood samples

March: Lambing – BCS and monitor for metabolic disorders

April: Consider post-lambing supplementation if housed, or if grass quality/quantity is poor

May: Eight weeks post-lambing – body condition score ewes and weigh lambs

Further information

Other publications from AHDB

- Marketing prime lamb
- Buying a recorded ram
- Growing and finishing lambs
- Reducing lameness in sheep
- Worm control in sheep
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