



Better Returns
Programme

SHEEP BRP MANUAL 12

Improving ewe nutrition for Better Returns



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Good ewe nutrition is vital for successful flock performance. The feed requirements of ewes vary significantly depending on their stage of production and 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 consumed. Having forages such as silage or hay analysed is essential, as it reveals their energy and protein content, allowing the winter diet to be formulated more accurately.

The best way to check a diet is meeting the ewe's requirements/needs is to assess the body condition of the ewes. This is an important task which, when done regularly, 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.



Nerys Wright
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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, depending on the diet and is usually fully functioning at about eight to ten weeks of age.

Energy

Energy is the most important nutrient an animal needs to exist and 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 of the ewe's production cycle.

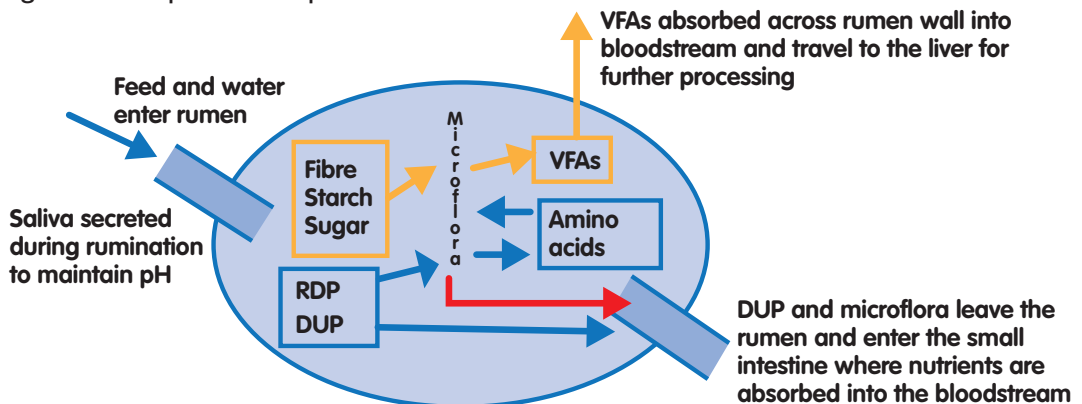
- **Fibre** – energy source that is digested slowly by the rumen microflora and is important for rumen function
- **Starch** – digested faster than fibre and provides energy to the microflora
- **Sugar** – quickly available to the rumen microflora and helps fuel digestion of protein and other energy 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.

Figure 1: The inputs and outputs of a rumen



Protein

The ewe derives her protein requirement from two sources:

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

Ewes have a daily requirement for RDP, which is readily found in grass, hay, silage and green leafy brassicas. 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, due to reduced rumen capacity as the uterus enlarges and an increased need for protein to grow the lambs and produce milk, this often cannot be met from RDP in forage alone.

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 bodyweight and litter size.

Table 1: Approximate 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 70kg is low at 8MJ 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 will require an additional source of high-quality protein for lamb growth and colostrum production.

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

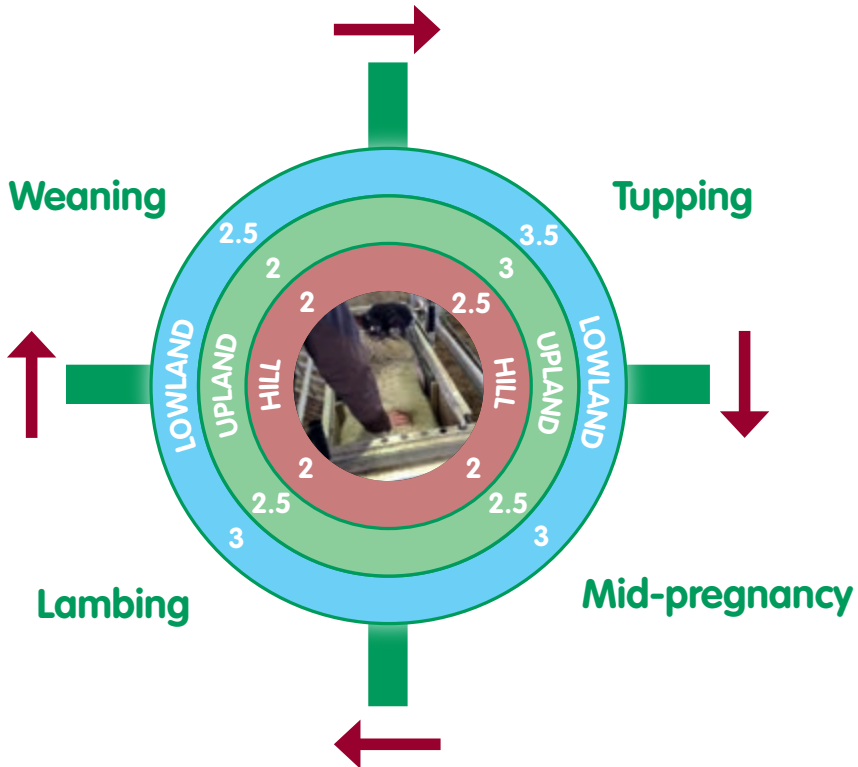
		Weeks pre-lambing							
		7		5		3		1	
Ewe weight	Number of lambs	ME (MJ)	MP (g)	ME (MJ)	MP (g)	ME (MJ)	MP (g)	ME (MJ)	MP (g)
50kg	1	7.9	72	8.7	76	9.8	81	11.2	88
	2	8.8	77	10.1	83	11.9	92	14.2	103
60kg	1	9.1	80	10.0	84	11.2	90	12.8	98
	2	10.1	85	11.6	92	13.7	102	16.3	115
70kg	1	10.2	87	11.2	92	12.6	98	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
80kg	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. No allowance made for liveweight gain in the ewe except for the fleece. For 50g/day gain, in addition to the foetus, add 2.5MJ of ME and 7g of MP. Subtract 1MJ of ME and 6g/day of MP for a liveweight loss of 50g/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.

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 have superior lamb performance.

It takes six to eight weeks on good grass to gain one unit of BCS, so ewes need plenty of time after weaning to recover before topping. 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 topping so that 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, eg put thin singles in with twin ewes, as they will require the same amount of food.

AHDB Beef & Lamb Sheep BRP Manual 4: **Managing ewes for Better Returns** has more details on managing body condition score to achieve target ewe performance; download a copy from beefandlamb.ahdb.org.uk.

Feeding from tugging → mid-pregnancy

Tugging

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

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

- Conserved forage such as hay or silage
- High-energy supplement (12MJ/kg DM) fed at 0.25-0.50kg per ewe per day
- Whole cereals such as barley, wheat or oats
- High-energy feed blocks

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

Fat ewes can be as problematic as thin ewes. Any ewes above target BCS before tugging 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 tugging. 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 tugging, 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.

Ewes tugged in the correct BCS can be allowed to lose a maximum 0.5 BCS (or 5% of bodyweight), but this must be done gradually. Ewes below target BCS at tugging should be maintained or allowed to gain a bit of 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-tugging

Rams will often lose 15% of their bodyweight, or at least one unit of BCS during tugging. 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 which are not intended to be used the following breeding season.

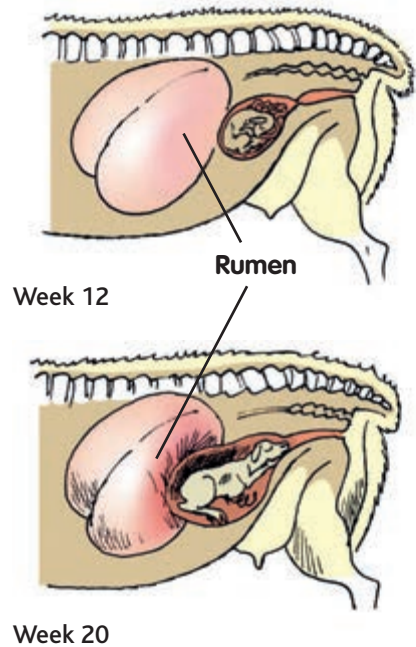
Feeding late pregnancy → lambing

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. Thick, yellow colostrum indicates a well-fed ewe; thin, pale colostrum is a sign 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 has 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 six to eight multiple-bearing ewes in a range of body conditions, ie thin, ideal and fat, is another way to check whether the ration has been good enough. Ewes due to lamb in the first week should be sampled three to four weeks before, to allow sufficient time to make changes to the diet if necessary.

The 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 requirements are not being met through the diet
Normal level = <1.1mmol/litre for scanned (twin/triplet) ewes (0.8mmol/litre unscanned)
- **Urea** – low urea levels suggest the ewes have recently been short of dietary protein
Normal level = >1.7mmol/litre
- **Albumin** – low levels of albumin suggest a longer term absence of adequate dietary protein
Normal level during late pregnancy = >26g/litre from serum or >30g/litre from plasma

NB: 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 meets the nutritional requirements of pregnant ewes during winter mainly from grass.



Key aspects:

- Sufficient winter grass growth, robust breeds and well-drained soils are required
- 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 around 20 days before lambing
- Emergency forage reserves recommended to cope with adverse weather

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

This strategy has been successfully applied to farms across England. For more information see the BRP+ online publication **All Grass Wintering of Sheep** in the BRP section of beefandlamb.ahdb.org.uk.

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 utilisation. 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 falling 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 to the field closed in September. This would have had an impact on feed quality in the spring.



Brassicac

Roots and forage brassicas such as kale and forage rape can provide a high-energy diet for winter feeding. Before drilling a crop, do some research or discuss with the vet or nutritionist, as some 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. 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), three to four weeks before lambing, so ewes can become 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 over-fat as they may get stuck on their backs out in the field or increase the risk of them developing twin lamb disease.

Table 3: The pros and cons of feeding brassica crops to ewes

Pros	Cons
Good source of energy	Ewes can get fat due to the high energy content
Cheap to grow	Not enough DUP for ewes in late pregnancy
Can be mob or strip grazed to improve utilisation	Yield is weather dependent. Can be problems when grazing in wet conditions
	May need to supplement eg with iodine

Sward height targets for lambing

Indoor lambing

The target grass height for turnout after lambing is 4cm. Aim to maintain at this level by manipulating stocking rate to reflect current grass growth.

At 4cm, only lean ewes need to be supplemented, as grass kept at this height can provide enough energy and protein for lactating ewes.

Outdoor lambing

Grass height of 3-4cm at lambing is ideal as this will strike a balance between getting ewes 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 intakes are 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, dryer forage as supplementation in the field.

Conserved feed options

Home-grown conserved forages are usually the most economic 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.

Visit beefandlamb.ahdb.org.uk for a list of companies that offer forage analysis.

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%) – A measure of 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	80 POOR
Clamp Silage	>25 GOOD	<22 POOR
Bale Silage	>30 GOOD	<22 POOR

D-value – A measure of feed digestibility

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

Hay	60 GOOD	50 POOR
Silage	70 GOOD	58 POOR

pH – A measure of acidity in silage

Target pH will vary depending on DM% of silage. Generally less than 3 or higher than 5 suggests poor fermentation and lower palatability.

Silage	>4 GOOD	<3 or >5 LOW
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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	<8 LOW
Silage	>11 GOOD	<10 LOW

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	<9 LOW
Silage	>14 GOOD	<10 LOW

Ash (%) – A measure of mineral and trace element content

Forage has a natural level of ash, but levels more than 10% in silage indicates soil contamination and poor fermentation. This should not be fed to sheep. NB: 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 <100g/kg DM.

Silage

Silage is a good forage option for sheep, but check it before feeding. Do not feed mouldy silage to ewes as there is a high risk of listeria abortion. Ensure clamps and bales are well protected against bird and vermin damage so no air can reach the silage.

Beef and Sheep BRP Manual 5: **Making grass silage for Better Returns** has more details on the best way to make good silage. Available to view on beefandlamb.ahdb.org.uk or call **024 7647 8834** to request as free copy.



Straw

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

Ensure it is:

- Clean and bright
- Offered *ad-lib* at all times, allowing 1.5kg/ewe/day
- Topped up fresh each day in racks or round feeders

Ewes should be:

- In good condition (lowland ewes BCS 3) 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 or straights, 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.

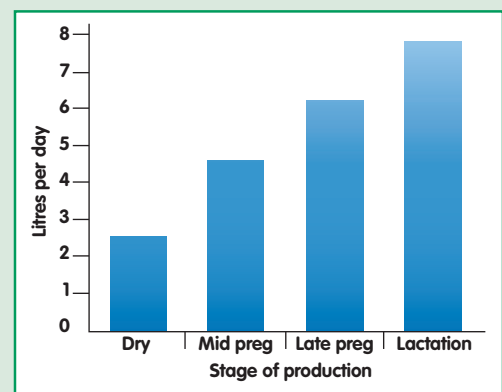
This is an ideal way to feed ewes, as it provides a constant diet throughout the day, with none of the large shifts in rumen pH associated with feeding concentrates on their own.

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.

Figure 2: Daily water requirements for ewes



NB: These will vary according to the dry matter of the diet.

Supplementary feeds

Compound feeds

A compound feed should complement the analysed forage in the diet. Do not stick with the same compound year after year – as requirements will differ according to the quality of the forage.

As well as the forage analysis, the choice of supplement should be based on the:

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

The compound feed must have a higher energy density than the forage it will be fed with. As a rule of thumb it should be 12.5MJ/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 3).

The ingredients determine what protein % the overall compound is. For example, an 18% protein compound containing 10% soya, would be a higher quality feed than a 20% protein feed where the main ingredient is urea.

Example sources of:

Protein	Soya, Rapeseed, Wheat distillers grains, Beans
Starch	Wheat, Barley, Oats
Sugar	Molasses, Sugar beet
Fibre	Sugar beet, 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 4 for guidance. If the feed label does not contain this level of detail, ask the supplier.

If the exact amounts of each ingredient are not specified, they will be listed in descending order of inclusion, ie the ingredients at the top of the list will be included at a higher rate than those lower down the list.

If the performance of a compound feed is lower than expected, a sample can be tested in a reputable laboratory. Remember to keep a sample in case further testing is required.

Table 4: Guidance for compound feeds

Component	Comment
12.5MJ/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 affect how well the feed mixes in the rumen
<10% fibre	Fibre is low in energy. It is important for ewes to eat fibre but it should come from the forage not the compound feed
<10% ash	Ash has low nutrient value so should be only 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 requirement 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 six to eight 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 0.5kg per ewe in one feed as it will reduce rumen pH and upset fibre digestion. If feeding more than this, split into twice a day feeding, or three if feeding more than 1kg/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 12-15cm/ewe
- Rationed concentrates 45cm/ewe

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

Floor feeding

Floor feeding 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 and a larger nut may be required than for trough feeding. Sheep tend to graze the nuts out of the bedding rather than eating a large amount in one go.

However, if there is an outbreak of an infectious disease such as enzootic or toxoplasma 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 when forage has a D-value of 70 or more.

Use The **AHDB Beef & Lamb Blend calculator** to work out the composition and cost of a range of different home-mixed feeds – available at beefandlamb.ahdb.org.uk.



Formulating a ration

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

- Ewe weight and litter size to calculate energy (ME) requirements
- How much forage ewes will eat, ie 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 the ewe's ME requirements by using Table 2 on page 4.

Table 5: Calculating the ME requirements of ewes

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

This example = 18.3 MJ/day taken from Table 2 on page 4

Step 2: Work out daily dry matter intake (DMI)

Table 6: The DMI (kg) of ewes eating variable quality 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 based on a twin-bearing ewe eating good silage, one week before lambing = 1.4%

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. Amounts eaten are likely to reduce in the final three weeks of pregnancy as the uterus expands with the growing foetus.

Ensure the amount of forage offered to ewes is adequate by weighing the forage and checking that ewes are able to eat the amount given to them or that they are not running out during the day. If intakes are higher or lower than predicted, the diet may need to be adjusted for this increased intake.

Step 3: Examine the forage analysis to discover the ME and DM

Table 7: 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 = 10.7MJ and DM = 30.5%

NB: To convert figures given in g/kg to % – convert the g to kg, divide by 1000 then convert to % by multiplying by 100. For example the Crude Protein figure of 129g/kg = 129/1000 = 0.129 x 100 = 12.9%.

Step 4: Work out if there is enough energy in the forage to meet the ewe's requirements

Table 8: How to calculate the energy gap

	Example
ME requirement (MJ/day)	18.3
ME from forage	10.7
Ewe weight (kg) x (DMI/100) x ME in silage	$70 \times 0.014 \times 10.7 = 10.49$
Deficit	$18.3 - 10.49 = \mathbf{7.81}$ MJ

This example: the energy deficit from forage = 7.81 MJ/ewe/day

Step 5: Consider how to fill the energy gap

Look at the feed options available on the farm or that can be purchased. Find out the ME and DM values of these feeds, then see how much would be needed to fill the energy gap.

Table 9 shows an example using an 86% DM, 12.5 ME compound feed.

Table 9: How to fill the energy gap

	Example
ME deficit (MJ/day)	7.81
Additional feed required (dry matter)	$(7.81/12.5) = 0.63$ kg DM
Additional feed (fresh weight) with 86% DM	$0.63 / (86/100 = 0.86) = \mathbf{0.73}$ kg/ewe/day

This example: the amount of compound feed needed = 0.73kg/ewe/day

This would be split into two feeds of around 0.36kg per feed

Feeding early lactation

It is crucial that lambs receive adequate colostrum (50ml/kg birthweight) within four to six hours of birth (ideally two hours), to provide immunity against disease. Ewes that 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 BRP Sheep Manual 14: **Reducing lamb losses for Better Returns** at beefandlamb.ahdb.org.uk or call **024 7647 8834** to request a copy.

Energy for early lactation

Ewes in early lactation have a significant energy and protein requirement to meet the nutritional demand of their lambs. Those rearing two lambs are producing 3kg of milk per day, require over 32MJ 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 10 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 10: The energy and protein requirements of housed, lactating ewes in early lactation

		Milk yield (kg/ewe/day)					
		1		2		3	
Ewe weight	Weight loss g/day	ME (MJ)	MP (g)	ME (MJ)	MP (g)	ME (MJ)	MP (g)
50kg	0	13.6	133	21.9	209		
	-50	11.8	127	20.0	203		
	-100	10.1	121	18.2	196		
60kg	0	15.6	146	23.7	222	32.2	297
	-50	13.8	140	22.0	216	30.3	291
	-100	12.1	134	20.2	209	28.5	285
70kg	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 0.2MJ/day and for ewes on hills add 0.8MJ/day.

Upping the ration

Ewes that are housed after lambing will need their diet adjusting from the pre-lambing ration to meet their increased demands 24 hours after giving birth. Ensure *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 three to four 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 available to provide the energy absent from their diet.

Lactation at grass

Ewes at grass will require different supplementation depending on:

- Ewe 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 4cm 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 into a higher cost enterprise.



Buckets and licks containing high-energy preparations 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 work out expensive in terms of pence/kg of energy supplied. Also there is no guarantee that all ewes will feed from them.



Mastitis risk

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

Grass staggers

When turning ewes out onto lush spring grass there is a high risk of staggers. Consider supplementary feeding ewes at risk with a feed containing magnesium, or provide additional forage (eg hay). This would slow down the passage of rich spring grass through the rumen allowing more time for magnesium to be absorbed (see page 18).

Performance at eight weeks post-lambing

A key performance indicator (KPI) for sheep enterprises is the weight of lambs at eight weeks of age. Most growth in the first few weeks of life is 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, ie 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 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 tupping.

Minerals, vitamins and trace elements

Ewes require minerals in their diet, along with vitamins and trace elements to optimise their performance. Most are required in their 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 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.

Hypocalcaemia

Cause

- Calcium deficiency in late pregnancy/early lactation due to sharp increase in calcium requirement to make milk
- Excessive calcium supplementation leaving the ewe unable to tap into her own reserves
- Older ewes are more susceptible

Prevention

- Minimise stress in the last weeks of pregnancy
- Avoid very high level of magnesium and 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

- 50-80ml 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 it is not stored in the body. There is high demand during lactation
- Grazing lush heavily fertilised spring grass

Prevention

- Do not apply high rates of nitrogen and 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 four to six ewes from each management group. Key times for sampling are at weaning, pre-tupping, scanning and lambing time. Forage samples can also be tested and the results of both used to decide 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, eg continental breeds such as Texel and animals fed concentrates for long periods. Several minerals are antagonists to copper (iron, molybdenum and sulphur), which affect the uptake of copper.



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

Cobalt

Cobalt is required in the rumen to make vitamin B₁₂. Deficiency causes poor growth and wasting in lambs. 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 0.1mg/kg DM of feed. Consider supplementation in feed or bolus for longer term supply. For a shorter supply consider an oral drench or injection of vitamin B₁₂.

For more information see **Trace Element Supplementation of Beef Cattle and Sheep**, BRP+ document at beefandlamb.ahdb.org.uk.

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 100mg/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, eg soils of granite or volcanic origin are deficient. Selenium is also stored in the liver.

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

Iodine

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

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

Top Tips for devising ewe diets



- **Weigh** a group of ewes to find the average mature liveweight of the flock
- Make the most of **grass** growing in the field before considering conserved forage and other supplements, as it 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** the feeds, 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 the flock's **BCS** when calculating feed requirements
- If purchasing a **compound** feed, look at the ingredients list. Buy one which has more energy than the forage or grass it is replacing
- When grass quality or quantity is poor, **continue** feeding ewes for three to four weeks after lambing
- **Monitor** the adequacy of the diet throughout the year by regular body condition scoring. Consider taking blood samples in late pregnancy

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

Month	Checklist
June	Wean ewes – identify culls, body condition score and group accordingly
July	Check ewes are gaining condition
August	Start sourcing replacements
September	Body condition score 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 winter
January	Scan ewes, body condition score, group according to BCS and number of lambs
February	Prepare for lambing. Start feeding ewes and consider taking blood samples
March	Lambing – body condition score and monitor for metabolic disorders
April	Consider feeding post-lambing if housed, or if grass quality/quantity is poor
May	Eight weeks post-lambing – body condition score ewes and weigh lambs

Nutrient value of commonly used feeds

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				
Soyabean 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	17.0	5-6
Older grass ley	18	10.5	15.0	3.0

Notes: Protein figures 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, eg 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 feed and forage analysis and check compounds.

*Check copper content.

Other BRP publications available

Sheep BRP

- Manual 1 – Marketing prime lamb for Better Returns
- Manual 2 – Buying a recorded ram to generate Better Returns
- Manual 3 – Target lamb management for Better Returns
- Manual 4 – Managing ewes for Better Returns
- Manual 5 – Growing and finishing lambs for Better Returns
- Manual 6 – Target easier management for Better Returns
- Manual 7 – Reducing lameness for Better Returns
- Manual 8 – Worm control in sheep for Better Returns
- Manual 9 – Improving ewe breeding for Better Returns
- Manual 10 – Controlling external parasites for Better Returns
- Manual 11 – Target ewe fertility for Better Returns
- Manual 12 – Improving ewe nutrition for Better Returns
- Manual 13 – Improving sheep handling for Better Returns
- Manual 14 – Reducing lamb losses for Better Returns

Joint Beef and Sheep BRP

- Manual 1 – Improving pasture for Better Returns
- Manual 2 – Assessing businesses for Better Returns
- Manual 3 – Improving soils for Better Returns
- Manual 4 – Managing clover for Better Returns
- Manual 5 – Making grass silage for Better Returns
- Manual 6 – Using brassicas for Better Returns
- Manual 7 – Managing nutrients for Better Returns
- Manual 8 – Planning grazing strategies for Better Returns
- Manual 9 – Minimising carcass losses for Better Returns
- Manual 10 – Growing and feeding maize silage for Better Returns

See the AHDB Beef & Lamb website beefandlamb.ahdb.org.uk for the full list of Better Returns Programme publications for beef and sheep producers.

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