All Grass Wintering of Sheep

Better Returns Programme

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Key messages

- All Grass Wintering (AGW) could offer potential savings of £15/ewe/winter
- AGW is based on rotational grazing – managing sheep at high stocking densities and moving them frequently through electric-fenced paddocks
- AGW is suitable for farms with well-drained soils, a convenient large block of land, hardy breeds and large flock sizes
- As a guide, the rotation is from about three weeks after mating, to three weeks before lambing
- In a good grass growing winter, ewes can be sustained on grazed grass alone
- A feed budget is essential to see if there is enough grass to meet ewe requirements
- 'Plan B' is required with a back-up of conserved forage and 'sacrifice fields' for use in bad weather
- Daily to three-day shifts can work, as long as the feed is rationed accurately to maximise utilisation
- Body condition scoring (BCS) and health monitoring are required to optimise ewe productivity and welfare

Keywords:

All Grass Wintering (AGW), winter feeding of ewes, cell grazing, rotational grazing sheep, feed budgets

Contents

Introduction

The pinch point for most sheep systems is winter, as grass growth is low or zero and alternative feed choices are expensive. However, if managed well, grazed grass can supply all the needs of pregnant ewes during this time.

Through measuring grass and estimating ewe demand, feed can be allocated accurately. Regular body condition scoring, accompanied by observations of how the stock are behaving, is essential to determine whether feed allocations are enough.

Careful forward planning and rationing can offer potential savings of £15/ewe per winter. This BRP Plus+ document provides guidance on how to do this, developed from three years of demonstration work on farms in England.

With thanks to Ian Misslebrook, Kevin Bateman, Sara Gregson, Mike Dewar, DLF Trifolium and Rhidian Jones for photography.

Special thanks to all demonstration farmers that implemented All Grass Wintering on their system. This was fundamental to the compilation of these guidelines.

All Grass Wintering of ewes

Summer sward following All Grass Wintering in Cornwall

All Grass Wintering (AGW) is based on intensive rotational grazing, where sheep are managed at high stocking densities and moved frequently through electric-fenced paddocks. They eat grass that has accumulated for the winter plus winter-grown grass.

Winter grass growth varies with location and will determine if grazed grass can be used through the entire winter, as in the South West of England, or for only part of the winter, as in the North East of England.

Grazing swards tightly in the winter removes dead material, gives even distribution of dung and urine and reduces weed populations.

The resultant effect is better quality spring pastures as the more productive species benefit.

Grass is rationed to give the ewes just what they need, at a time when grass feed availability is tight and the alternatives are expensive. The available feed in the fields is assessed in kg dry matter (DM) per ha, which can be measured using a calibrated sward stick or a plate meter. The feed is then rationed and allocated to the group based on ewe requirements.

Without rationing there is risk of over- or under-estimating what grazing provides. Under-estimation represents an inefficient use of a cheap feed and can lead to over-fat ewes at lambing. Over-estimating will result in loss of ewe condition, compromising ewe health and performance.

Under set stocking, sheep may utilise 50-60% of the grass due to rejected and trampled material. AGW gives stock less opportunity to do this, so less is wasted and utilisation can be increased by 20-30%, therefore less supplementary feed is required.

AGW in England so far

Following a successful pilot in Cornwall in 2012, EBLEX and SAC Consulting extended the development of AGW to eleven other farms from 2012-2014. The aim was to determine the system's suitability over a range of soil types, ewe breeds, locations and altitude and over different winters.

The guidelines published here are based on a small sample of farms and the system is still being assessed. However, they provide a framework that can be adapted to suit other farms.

As AGW is implemented, the knowledge of a farm's winter grass growth pattern and animal demands will improve. This information will help producers fine-tune the grazing system for their farm in future winters.

Different demonstration farms that have successfully implemented All Grass Wintering

Farm suitability

Complete dependence on grazed grass over winter is not achievable on all farms, but elements of AGW can still be applied. Ideally, farms considering AGW would have:

+ Well-drained soils
+ A convenient large block of grassland for easy stock movements
+ Relatively hardy breeds that withstand restricted feeding without compromising performance
+ Flock sizes over 250 ewes. Due to the rationing calculations, smaller flock sizes leads to very small paddocks making the system less feasible

AGW is suitable for farms with well-drained soils, a convenient large block of land, hardy breeds and large flock sizes.

Typically in good winter grass growing areas, it is possible to sustain the flock on grazed grass alone, with a supply of conserved forage available to serve as a 'Plan B' should things go wrong, like a spell of very bad weather.

In good growing areas ewes can be sustained on grazed grass alone.

In Northern England or at altitudes where winter growth is slower, ewes can be rotationally grazed through small paddocks for most of the winter, but then started on concentrates for the last ten days before housing. Many farmers do currently outwinter ewes on grass and house just before lambing, so this system would suit them.

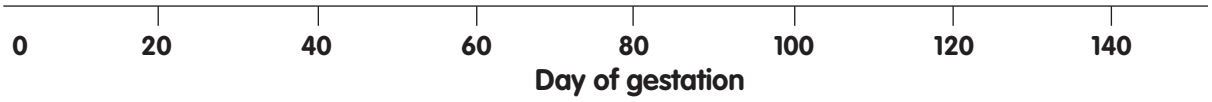
The system covers pregnancy from about three weeks after mating until three weeks before lambing.

Timescale

The system covers pregnancy from about three weeks after mating until three weeks before lambing. This works out at just over 100 days.

Table 1: AGW timescale and guideline duration for each stage

Guideline duration for each stage						
	15-25 days	All Grass Wintering rotation (100-110 days)			15-25 days	
		55-60 days		45-60 days		
Ram in, ewes set stocked or see below	Ram out	AGW Early to mid-pregnancy ewes all in one group and rationed accordingly, eg 65kg ewe gets 1.0kg grass DM/day, see estimating ewe demand section, page 5	Scanning	AGW Late pregnancy – grass allowance is increased and the singles and multiples should be split	Set stock on first 60 paddocks for lambing or paddocks near lambing shed	Lambing, flock set stocked at 10-17 ewes/ha



Start the system earlier?

Some farmers may even start the rotation while the ram is still in with the ewes, shifting at one to four day intervals. At 10 days either side of mating, it is crucial that the ewes get sufficient quality feed, therefore feed ewes to appetite (allocate 4% of bodyweight) and only allow them to eat half the green dry matter on offer.

Estimating ewe demand and grass supply

Ewe nutrition demand and grass DM supply has to be estimated to calculate a feed budget and determine paddock set-up.

Pre-scanning

For ewes being managed in an AGW system, the correct amount of grass dry matter to allocate daily to ewes in kilograms of dry matter is based on 1.5% of bodyweight up to scanning. After scanning, this must be increased to 2% of bodyweight.

This table gives further guideline allocation values.

Table 2: General intake requirements for different classes of sheep

Stock	Intake requirements (% of bodyweight)
Dry ewes Mid pregnancy ewes	1.5
Late pregnancy ewes	2.0
Mid to late lactation ewes	2.5
Early lactation ewes	3 or more
Growing lambs	4.0

NB: Allows for some feed rejection and is based on high feed quality for a flock scanning at approximately 150%.

Worked example for 65kg ewes on daily shifts

Demand in mid-pregnancy is:

65 x 0.015 (1.5%) = about **1kg DM/ewe/day**

This allows for 15% wastage, as DM intake will be 0.85kg/day. Note, on 2-3 days shifts, waste will be 15-30% and therefore allocate more.

Demand in late pregnancy is:
65 x 0.02 (2%) = **1.3kg DM feed/ewe/day**

Accounting for feed quality and number of lambs carried

Pastures with a high proportion of dead material or stems will be of lower feed quality than swards containing a high proportion of green leaf material.

The number of lambs the ewe is carrying will also affect their feed demands. Both these factors can be accounted for using Table 3.

Table 3: Daily feed requirements from scanning to lambing adjusted for pasture quality and scanning results

Feed quality	Single lamb	Twins	Triplets
	Kg DM per ewe per day for a 65kg ewe (% of bodyweight)		
Low	1.2 (1.8%)	1.5 (2.2%)	1.6 (2.5%)
High	1.1 (1.6%)	1.3 (2.0%)	1.5 (2.2%)

(Calculated using SRUC FeedByte rationing software)

Use these figures as a guide and increase allowances to 3% of liveweight per day in wet and windy weather to allow for extra demands and feed wastage. If grass growth has been poor and ewes are losing too much condition, feed up to 0.45kg of concentrates/day gradually and house if necessary. See AHDB Beef & Lamb BRP manual 12, Improving ewe nutrition for Better Returns for more information.

Contribution of body reserves to ewe nutrition

If the ewes have been tupped at body condition (BCS) 3.5, they can gently lose 0.5 BCS up to six weeks before lambing without affecting foetal development. This can act as a buffer in this system, as it will allow ewe's body reserves to contribute to her energy demand. Ewes losing too much condition should be removed from the system and allocations checked.

Managing ewes with differing feed needs

After scanning, a good strategy is to offer twin-bearing ewes 3% of bodyweight per day as grass DM leaving a residual of 1500kg DM/ha. Follow them with ewes carrying singles a couple of days later, grazing down to 1200kg DM/ha, this will help stop the singles gaining too much condition. This might be beneficial if there is a history of prolapses or difficult lambings due to over-fat single-bearing ewes.

Estimating grass supply

This starts with measuring grass dry matter per hectare (DM/ha). There are two ways of doing this:

+ Use a calibrated sward stick that converts sward height to kg DM/ha
+ Use a plate meter

NB: Sward height must be measured with sward density in order to convert to kg DM/ha, therefore conventional sward sticks cannot be used for feed budgeting.

Ewe nutrition demand and grass dry matter (DM) supply has to be estimated to calculate a feed budget and determine paddock set-up.

For both methods, adjustments must be made for the amount of bare ground or where there is a high proportion of stem, as stem holds up the plate meter more than leaf.

When using a calibrated sward stick, lightly place a flat object, such as a clipboard, over the grass to compress the sward and read off the corresponding height on the measuring stick. This gives an idea of the average plant height and density and then converts it to average plant DM weight according to the season (see Table 4).

It is based on the principle that a sward with higher density would give more resistance to an object allowed to settle on it, relative to a sward of lower grass density. It therefore provides a more accurate estimate of the total forage DM in a field.

Use a calibrated sward stick to measure grass supply

Table 4: Converting compressed grass height to dry matter (DM) quantity per ha

Season	Feed available (kg DM per ha) estimations according to compressed grass height				
	1cm	2cm	3cm	4cm	5cm
Winter	830	990	1140	1300	1460
Spring	680	1050	1340	1580	1780
Late Spring	800	1120	1400	1650	1880
Summer	930	1190	1450	1710	1980
Autumn	810	1050	1290	1540	1780

NB: These figures provide reference values, but will vary according to weather, location, grass variety, age of pasture.

Note in Table 4, how DM quantity varies with season. This is mainly based on general climate assumptions – high rainfall in spring leads to low DM content, while low rainfall in summer creates higher DM content. It also accounts for seasonal variation in the amount of seed head, green material, dead material and clover content.

Grass can also be measured using a plate meter. When this tool is placed squarely on the ground, the sward raises the plate while the metal pole drops down to the ground; thereby measuring the compressed height of the sward in a similar way to the calibrated sward stick. This is then converted to DM/ha with a calibration equation.

The default calibration equation is:

Average compressed sward height (cm) x 140 + 500

The 140 'multiplier' in the equation reflects the DM per cm of compressed sward height. The 500 'adder' in the equation is to compensate for an amount of grass at the bottom of the sward that is not measured by the plate meter.

See the EBLEX TV YouTube channel, search for AHDB Beef & Lamb Sward Stick Demonstration.

www.youtube.com/user/EblexAHDB

Rising plate meter

More on calibration

For optimum accuracy, the calibration equation needs changing for the type of grass, (eg reseed versus permanent pasture). Some farmers add 15% to permanent pasture grass cover figures to account for higher sward density and ability to withstand trampling in wet weather.

Unfortunately the information to give the DM values for all different pasture types in England is not available.

Remember that the values provided by the plate meter and sward sticks are guides. Use common sense and judgement based on what the grass type is, what it looks like, how the sheep are behaving and whether they are gaining, maintaining or losing body condition.

The number of measurements taken depends on the amount needed to reflect the amount of grass in the field accurately. Larger fields with greater variability in sward height, should have more measurements taken than small fields of consistent sward height.

Care should be taken when using a plate meter on very low swards (below 4cm) or where there are a lot of stems, as the accuracy of the readings will be reduced.

Preparing a feed budget

As a general rule of thumb, the farm grass cover should average at 2000-2500kg DM/ha before the winter system commences. Calculate a winter feed budget to gain a better understanding of how the grass supply will meet the flock demand over the period. A spreadsheet to help with this is available upon request from AHDB Beef & Lamb.

Here is a worked example of a feed budget:

For 950 ewes in a good winter grass growing area, plate meter measurements estimated average grass cover at 1982kg DM/ha, which was rounded up to 2000kg DM/ha. The feed budget was calculated using an assumed winter growth rate of 10kg DM per hectare per day of high quality grass, see table 5.

A feed budget is essential to see if there is enough grass to meet ewe requirements.

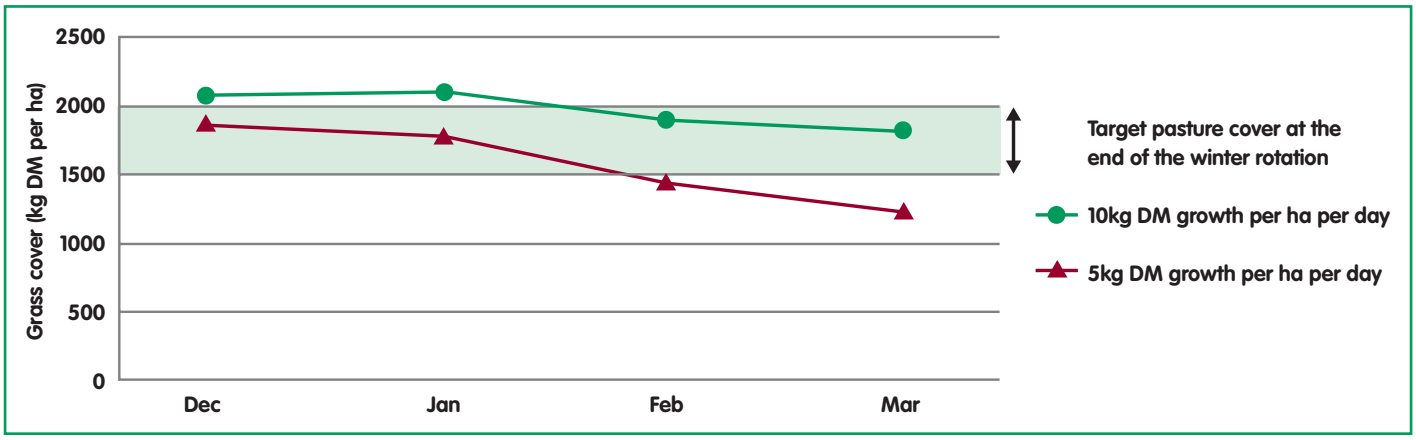
Table 5: Feed Budget for 950 mature ewes assuming 10kg DM per ha per day grass growth, high feed quality and 200% scanning.

Initial cover (kg DM/ha) 2000				
	Dec	**Jan**	**Feb**	**Mar**
Grazing area (ha)	110	110	110	110
Grazing days	31	31	28	20
Net growth rate (kg DM/ha/day)	10	10	10	10
ANIMAL INTAKES				
Number of ewes	950	950	950	950
Weight (kg)	65	67	69	70
Intake (% of bodyweight)	1.5	1.5	2.7	2.7
Daily intake (kg DM)	1.0	1.0	1.9	1.9
Total daily requirement (kg DM)	950	950	1770	1796
Total monthly animal intake (kg DM)	29450	29450	49556	35920
Animal intake per ha (kg DM/ha/day)	8.6	8.6	16	16.3
Difference between growth and intake (kg DM/ha/day)	1.4	1.4	-6.0	-6.3
Average farm cover (kg DM/ha)	2043	2086	1919	**1793**

NB: The feed budget accounts for weight increase as pregnancy progresses. Animal intake per ha per day (daily intake/area) is calculated to determine difference between intake and growth per ha which will affect cover (difference x grazing days plus starting cover).

The target cover at the end of the rotation is between 1500 and 2000kg DM per ha, illustrated in Figure 1. In this example, at 10kg DM per ha per day growth, the finishing cover would work out at 1793kg DM/ha (red shaded cell in Table 5), therefore there would be sufficient feed.

Figure 1: Comparing two winter grass growth scenarios with the spring cover target of between 1500 and 2000kg DM per ha



'Plan B'

As winter grass growth cannot be accurately forecasted, a 'Plan B' is required – with silage/hay reserves ready as a back-up. This silage/hay needs to cover a potential adverse weather event such as where snow or frost covers the ground.

An adverse weather event pre-scanning would require less silage than one post-scanning. Again, allowance should be calculated based on animal demand (Table 2).

A 'Plan B' consists of a back-up of conserved forage and 'sacrifice fields' for use in bad weather.

Worked example

Pre-scanning daily requirement

As calculated on page 5, a 65kg ewe requires 1kg DM per day pre-scanning.

At a silage wastage rate of 30%, DM allowance is increased: 1kg DM x 1.3 (130%)

= **1.3kg DM/head/day**

In terms of fresh weight (FW), silage at 40% DM will be fed at: 100/40 (silage DM content (%)) x 1.3 (feed allowance kg DM per head per day)

= **3.3kg FW/head/day**

Post-scanning daily requirement

As calculated on page 5, a 65kg ewe at 200% scanning on high quality forage requires 1.9kg DM per day post-scanning.

At 30% silage wastage, DM allowance is increased: 1.9kg DM x 1.3 (130%)

= **2.5kg DM/head/day**

In terms of fresh weight (FW), silage at 40% DM will be fed at: 100/40 (silage DM content (%)) x 2.5 (feed allowance kg DM/head/day)

= **6.3kg FW/head/day**

It is advisable to have conserved silage available for use in periods of bad weather

NB: The wastage figure is based on silage being spread on the paddocks. If fed in ring feeders, this could be reduced to 10-20% and the figures adjusted accordingly.

Silage should be analysed for more precise figures on DM percentage and energy content. An average of 10.5 megajoules of metabolisable energy (MJ ME) is required.

Five day snow cover scenario

Snow cover for five days in mid-January would result in the following:

6.3kg FW/head/day silage allowance (40% DM) x 950 ewes

= **6 tonnes silage FW requirement per day**

Over the five-day period this could use up 30 tonnes FW of silage or 50 bales (at 600kg each).

To date, the demonstration farmers have only needed to utilise two to three weeks of their 'Plan B' forage reserves due to bad weather.

Reduce poaching risk by moving stock onto a sacrifice field in wet weather

Additional 'Plan B' suggestions

Moving stock from good grazing pastures onto a 'sacrifice field' in wet weather will reduce poaching damage in the most productive fields.

High stocking rates in wet weather increases the likelihood of compaction. If possible move the ewes to a field due for reseeding or due to go into a forage crop.

If stock are brought indoors (rarely required), ensure diet changes are introduced gradually to minimise risk of rumen upset.

Some farmers have found moving every 12 hours on well-established reseeds in wet weather limits pasture damage.

Residual – the grass left after grazing

The residual is the amount of grass or cover that is left following grazing.

If this is too high, it represents a wasted feed opportunity and may compromise tiller density and feed quality in the spring.

Up to scanning, ewes can graze as hard as possible but cannot consume the last 500kg DM/ha. At 900kg DM/ha residual, they will likely be utilising some body reserves which is acceptable if in good condition.

General guideline residuals:

- 900kg DM/ha (about 2cm) pre-scanning
- 1200kg DM/ha (about 3cm) post-scanning

Moving closer to lambing, the residual increases allowing ewes with multiple litters to eat more and to ensure a better grass supply for the lactation period.

Farmers alter the residual to suit their particular needs, for example grazing the twin bearing ewes at higher residuals followed by the singles, (see page 5).

Ewe lambs that have been mated should also graze to higher residuals to allow for body growth.

Autumn preparation

Fields that will be grazed by ewes at the beginning of winter should be shut up from September. This means lambs may have to be sold earlier than usual in the first year to achieve this.

Closing up fields should be staggered to ensure they are at different stages of growth. This also means that feed quality of the grass on offer is consistent throughout the winter.

Pre-system checks:

- Teeth
- Feet
- Body condition score (BCS)

Ewes below BCS 2 should not be put onto the rotational grazing system. Teeth and feet issues should be treated and then put onto the system once the ewe has recovered.

Shearlings (two-tooths or gimmers) should be grazed separately where possible as they will struggle to keep up with full-mouthed ewes.

Setting up paddocks

Grazing the best lambing fields before scanning will give them the rest of the winter to recover before lambing starts in spring.

The English demonstration farmers that practised AGW in the winter of 2012-2013 found that daily paddock shifts work best, as the sheep often became restless and wanted to move on after a day. Daily shifts maximise utilisation but this comes at a labour cost.

Although recent research from New Zealand found that shifts every four days are feasible, the four day shift method has not worked for the English demonstration farmers.

With small flock sizes (below 250 ewes), a daily paddock size is too small to be practical and shifts every three days are recommended.

Daily to three-day shifts can work, as long as the feed is rationed accurately to maximise utilisation.

Farmers have kept flock sizes of up to 1200 ewes on AGW systems successfully. However, there is risk of ewe smother when moving between paddocks above this number, leading to possible trampling, particularly early on before the ewes have learnt the system.

Set up paddocks with electric fencing to match flock demand and days of feed available

Calculating paddock size

To decide how to divide up the fields into paddocks, deduct the residual from the grass cover for an estimate of **available grass DM**.

Multiply the ewe feed demand by the flock size to give the **daily feed demand**.

Divide the available feed by the flock demand to give the **days of feed available**.

Divide this number by frequency of flock shifts, ie one day, two days, three days and so on.

Worked example

Grass feed available

In a 4ha field.

Grass cover: **2300kg DM/ha**

Target residual: **900kg DM/ha (pre-scanning)**

Available feed = (cover - residual) x area (ha)

= (2300 - 900) x 4

= **5600kg DM**

Ewe demand

950 x 65kg ewes in mid-pregnancy budgeted for 1.5% of bodyweight per day

65 x 0.015 (1.5%) = 1.0kg/head/day

1.0 x 950 ewes

= **950kg/day**

How many daily shift paddocks?

Divide available feed by daily demand.

5600 ÷ 950

= **six days of feed available**

So split the field into six (0.7ha or 1.7 acre) daily paddocks or two three day paddocks for example

Monitoring grazing behaviour

One demonstration farmer measured grass cover when the animals were in the paddock for three days. This showed that the animals consumed 75% of the grass the first day followed by 20% then 5% on the subsequent days. Ewes were more difficult to contain by day three, therefore farmers gave the following tips:

- Use a metal wire on the bottom to give greater shock
- Put the bottom wire closer to the ground to catch their nose
- Increase click frequency

Three day shifting works better pre-scanning when they can be grazed harder.

Farmer tips for electric fencing

- Farmers found that square paddocks work best for moving sheep, achieving an even grazing pattern and grass utilisation
- It is efficient to set up a series of paddocks ahead of grazing. For daily shifts, seven paddocks can take two people half a day and subsequent daily movements take around 15 minutes. Three day shifts will reduce labour requirements
- Taking out the two posts at the corner of a paddock into the next paddock works well as a 'gate'. This may need to be large at the start before the ewes become used to moving through and the width gradually reduced as time goes on
- Some ewes might go through the fence next to the gate to start with, but will learn the system quickly
- Place gates at the top of the temporary paddock to start, as sheep prefer to run uphill
- Use a new galvanised wire and a strong battery at the start, as this will confine ewes securely, reducing the risk of break-out before they learn the system
- Use a three-strand set-up using an ATV-based fencing machine to be quick and efficient
- An ideal system consists of 600 metre reels, with corner and end posts for each separate fencing area
- Save money by using plastic top wire and stakes and not electrifying the fences in the paddocks the ewes have just left
- Move sheep at the same time each day so they know when they can expect to be moved
- Metal wires last longer but can break if kinked (reels on clutches reduce risk), other farmers prefer plastic wires

ATV-based fencing machines makes paddock set-up quick and easy

Guideline stocking rates

The previous calculations will help guide stocking rates to suit the grass supply. The demonstration farmers managed the rates below over the rotation area:

- South west farmers depending solely on grass for the whole winter stocked at 8.5 ewes/hectare
- North east farmers that fed concentrates in late pregnancy stocked at 10 ewes/hectare

Monitoring

Monitoring ewe health and body condition is essential when wintering at grass, as some ewes may not cope as well as others. Typically 5-10% of the flock will lose too much condition (fall below BCS 2) and have to be removed and managed differently. Ewes must be handled to measure body condition rather than depending on visual appraisal.

Shepherding is easier, as all the ewes have to pass the farmer when moving into the next paddock – although they are not easy to catch on daily shifts. However, they are significantly quieter when they are handled due to the regular closer human interaction. Calling ewes when shifting, trains them to respond to a voice, which can be a useful tool to bring them in for health checks.

Health

Vigilance is key as health issues, such as internal and external parasites and diseases that spread by contact with discharges (Enzootic abortion (EAE) of ewes) might pass between ewes quicker than when they are less densely stocked. Faecal egg counts (FEC) are useful for monitoring worm burdens. Ewes should only be treated when necessary to avoid the build up of anthelmintic resistant worm populations.

For more information of sheep disease and specific advice for parasite control see the:

BRP Sheep Diseases Directory

BRP Sheep Manual 8 – **Worm control in sheep for Better Returns**

BRP Sheep Manual 10 – **Controlling external parasites for Better Returns**

In windy weather, some flocks experienced snow blindness (pink eye, infectious keratoconjunctivitis) which spread through the flock quickly due to the high stocking density. Good biosecurity for incoming sheep and use of sheltered fields during storms will help prevent this.

Body condition scoring (BCS) and health monitoring are required to optimise ewe productivity and welfare.

Body condition score (BCS)

In New Zealand, body condition is assessed three weeks after the ewes have been introduced to the system, to see if they are coping. Loss of condition is expected.

Ewes at BCS 3+ at three weeks, will be able to handle this loss. However, ewes at BCS 2 or lower should be removed. A hard culling policy for those that are not suited to AGW will improve chances of success with the flock in future winters.

Changes to grass allocation can be made depending on body condition at scanning. This is another opportunity to pull thin ewes out, as well as when the flock is vaccinated for clostridial diseases. In general, those that make it to mid-December in adequate condition have adapted well and will go right through to lambing.

For more information on Body Condition Scoring, please see BRP manual 4: **Managing ewes for Better Returns**.

Blood testing

Blood testing can validate the feed budget in the crucial period up to lambing to reduce risk of twin lambs disease

Blood testing a subset of about ten ewes will determine whether energy and protein provisions are adequate. Blood testing should be done three to four weeks before lambing as the sheep enter the period of high nutritional demand. Leaving it later means there is less time to make adjustments to the ration.

Three compounds to test for are:

+ Beta-hydroxybutyrate (BHB) – an indicator of insufficient energy intake. BHB is a ketone produced by the liver when ewes are using their own body reserves (normally fat) to compensate for low carbohydrate intake. The higher the level the more body reserves they are using. If this process is too fast, pregnancy toxaemia can happen.
    - Normal level – less than 1.1mmol/litre

+ Urea – an indicator of short-term protein levels. Urea is by-product of protein breakdown in the liver, so if the levels are low it means that total protein in the diet is low. As it shows up short-term protein supply, it is very variable and will be influenced by when the last feed was.
    - Normal level – 2-3mmol/litre

+ Serum Albumin – an indicator of long-term protein levels. Serum Albumin is a protein made by the liver, so if its levels are low it can indicate a low protein diet.
    - Normal level during late pregnancy – 26-30g/litre

These figures have been supplied by the Moredun Institute. Discuss any blood test results with the vet and make changes to the diets or groups as necessary.

Blood testing can be done through the farm vets or for BHB, new on-farm tests are available.

Water provision

During a wet winter, the high water content of the grass contributes to the ewe water supply and a small moveable water trough is adequate to meet ewe requirements. However, during dry winter weather, the ewes may drink significant amounts of water (four litres/ewe/day was recorded on one farm), therefore water supply must be increased. Keep the fields with piped water for late pregnancy to meet the high water demands during this period. When feeding concentrates and conserved forage, be aware of the lower water content and ensure water supply reflects this.

Soil compaction

Soil compaction can be prevented to some extent with flexible grazing management – during dry weather, where practical, graze the fields with heavier soils or temporary leys to avoid depending on them during wet weather. In wet weather, shifting more frequently and reducing stocking density can limit damage.

Assess soil structure at the end of the winter by digging holes – our Healthy Grassland Soils tool is designed as a guide for this.

If it is solely poaching damage, the compaction will be in the top 5-10cm. A slit aerator with spikes or knives will help to alleviate the problem. Compaction at deeper levels will need a sward lifter or sub-soiler to loosen the ground. Make sure the working depth of the machinery is about 2.5cm below the depth of the compacted layer.

Aeration should only be done when the soil is moist. If it is too wet it could lead to increased damage through smearing and wheel slip. If too dry, large clods may form, the sward may tear and excessive surface heave occur. In poorly drained soils, a functioning drainage system is crucial for aeration to be successful.

In practice, remedial action has been required on less than 5% of the total area grazed.

For more information on how to assess soil structure see the AHDB Beef & Lamb and AHDB Dairy Healthy Grassland Soils tool.

Soil fertility

Carrying out regular soil tests is essential to monitor the fertility of the soil and whether this is limiting grass growth. The targets to aim for are:

- pH of 6.0-6.5,
- Phosphate (P) Index 2 (16-25mg/l)
- Potash (K) Index 2- (121-180mg/l)
- Magnesium (Mg) Index 2 (5-100mg/l)

The manuring and urination of the grazing animals will recycle P and K, this will be more evenly spread than in set stocking systems. This means levels of P and K should not be a problem.

Placement of fences along contour lines will stop the build up of P at the top of the slope where ewes prefer to lie and then defecate.

Nitrogen deficiency may be an issue, particularly if clover content is low. This is shown with a yellow tinge and paler green colouring of the leaves. Nitrogen applications in August (at the latest) of around 30-50kg/ha of N (24-40 units/acre) will boost grass growth going into the winter.

For more information on the nutrient management of grassland see BRP Manual **Managing Nutrients for Better Returns**

Grass variety choice

New grass varieties are being introduced that keep growing for longer in the autumn and start growing more quickly in the spring, extending the winter grazing season.

Farmer experience with certain festulolium types (perennial ryegrass crossed with a meadow fescue) and Italian Ryegrass have shown promise for this system. Italian ryegrass was recorded at 20-30kg DM/ha/day growth on one farm during winter 2013-14, but it is susceptible to frost.

Ask a seed merchant about varieties bred for out-of-season growth and good winter hardiness. Always buy seeds mixtures with varieties that feature in the **Recommended Grass and Clover Lists**.

Other considerations

Suitable breeds

Different breeds have succeeded on the AGW system

Breeds kept by the demonstration farmers are listed below, with some as crossbreds.

Some farmers put a mixture of different breeds on the system, eg mules and NZ Romneys and observed no differences in how they coped with AGW. There will be variation in grazing utilisation efficiency between and within breeds.

Table 6: Breeds used on eleven farms in AGW demonstration project

Breed
Dartmoor
Easy Care
Exmoor
Highlander
Romney Marsh
Lleyn
NZ Romney
North Country Mule
Suffolk Mule

Winter shearing

Winter shearing can lead to heavier lamb birth weights and therefore greater lamb survival. Housed winter-shorn ewes tend to eat 10-20% more feed and do not lose appetite later on in pregnancy, however intake effects are unknown for those outdoors on rotational grazing. Certain demonstration farmers with woolly breeds sheared in October to encourage intake.

As well as improved lamb survival, other potential advantages of shearing include:

+ Lower risk of flystrike
+ Easier teat discovery by lambs

However, there are some disadvantages:

+ Additional shearing and wool storage costs
+ Ewes are more difficult to catch and hold
+ Risk of oversized single lambs
+ Ewe welfare can be compromised in extreme winter weather
+ Risk of wool slip, where wool falls out in patches leaving bald areas which grow back slowly

Alternatively, crutching pre-lambing will prevent dagging and reduce flystrike risk.

Trace elements

Removing concentrates from the ewes' diet may also remove a source of trace elements. If a deficiency is suspected, blood and forage sampling is recommended. If deficient, boluses are more practical than pasture treatments as the ewes are moved frequently.

See BRP+ document **Trace Element Supplementation of Beef Cattle and Sheep** for more information and discuss the issue with a vet.

Catchment Sensitive Farming

A clear solution for farmers
CATCHMENT SENSITIVE FARMING

If managed poorly, out-wintering livestock can pose diffuse pollution risks – alongside possible loss of valuable soil and nutrients. However, if implemented with care and good judgement, AGW can reduce these risks.

Conventional out-wintering can lead to poaching around gateways, ring feeders, water and feed troughs and along sheep pathways. This type of poaching does not happen with AGW, so the sward surface is more even and productive, soil health and structure is maintained and the farm looks much tidier.

Poaching promotes loss of N by de-nitrification and of P by soil erosion

Representatives of the Catchment Sensitive Farming initiative were invited to visit one of the demonstration farms in mid-winter 2012-13. In general, they were encouraged by this system of management and the pasture recovery they saw. However, there are still some risks of compaction, soil run-off and sward damage.

They advise that these risks can be reduced by:

+ Avoiding intensive grazing on heavy soils
+ Grazing paddocks at the top of sloping fields first, which leaves the bottom of the paddocks to act as a buffer zone should soil erosion occur
+ Not grazing too close to Sites of Special Scientific Interest (SSSIs), rivers, streams and ponds. Consider a small buffer strip next to these sensitive areas
+ Considering the course of rivers, ditches, tracks and gateways when setting up the paddocks
+ Moving animals on when heavy rain is forecast and/or reduce stocking rate by increasing grazing area

Following these tips will reduce the chances of compaction, soil erosion and ensure long term grassland productivity without the need for costly remedial action.

Biodiversity

AGW may conflict with some biodiversity goals surrounding ground-nesting birds and growing multi-species swards. Check the environmental stewardship options for the farm to ensure there are no conflicts and consider maintaining areas of less productive land for biodiversity purposes.

AGW is an efficient way to manage sheep. So as well as the financial benefits of feed budgeting, nutrient losses to water and air are also reduced. This is because the animals are only given the amount of feed they need and can utilise and wastage is minimised.

For more information on Catchment Sensitive Farming refer to **www.naturalengland.org.uk/ourwork/farming/csf/default.aspx**

Case studies

AGW has been practiced successfully at Norton Farm for two seasons

General farm background

Area: 220ha (550 acres)

Livestock: Approximately 2400 NZ Romneys, of which 950 on AGW in 2011

Average annual rainfall: 138.5cm (54.5 inches)

Soils: Well-drained

Lambing: April

Farm 1 – Dave Sanders, Norton Farm, Cornwall

Practised AGW in winter 2011-12 and 2012-13

How they did it

Grass was measured with a plate meter from October 2011 and the sheep started grazing on 1 December (24 days after the rams were put in).

The target starting cover was 2000kg DM per ha. Mr Sanders worked out the size of the paddocks by feed budgeting – measuring the amount of grass available and then estimating how much was required for the flock.

When the grass was frozen or the initial cover was below 1200kg DM/ha, silage bales were spread out, but rarely eaten.

The grass was measured when sheep were put in and taken out of a paddock and about once a month on the rest of the grazing area.

Ewe health

Body condition was monitored by putting sheep through the race once a month. Five percent of ewes were pulled off following BCS as they were not coping.

Faecal egg counting was used to monitor worm burden and a detailed health plan drawn up with the vet.

Outcomes

Ewes lambed without supplements. 110ha sustained the 950 ewes with only 11kg FW of silage per head provided and significantly less labour than when managed in the previous conventional system.

Two people created the paddocks for the coming week in half a day. Daily sheep movements took about 15 minutes using electric fencing kit mounted on a quad bike.

Few health problems were encountered and average grass growth was 10kg per ha per day. Some fields did get very short of grass.

Preliminary calculation of the potential effect on profit (by SAC economist Robert Logan, based on the physical performance of the ewes and changes in the infrastructure required), suggest an increased profit of £17.80/ewe/year.

Ewes grazing a paddock

General farm background

Area: 170ha (420 acres)

Livestock: 900 mules and 50 spring calving cows

Average annual rainfall: 65cm (25.6 inches)

Soils: Some heavy, otherwise well-drained

Farm 2 – Northumberland farm

The farmer started AGW in winter 2012. He adapted it to suit indoor lambing and the low grass growth rates in northern England.

How they did it

All grass wintering was started on 12 December and finished on 2 April, based on daily paddocks (equating to a 111 day rotation). The grazing was started with 20ha (50 acres) at 1700-1800kg DM/ha, with the rest averaging 1500kg DM/ha.

600 ewes were put on the system and allocated 0.6ha per day based on grass availability calculations. After scanning, the ewes with singles followed those carrying twins through the paddocks, to keep condition off them and to utilise the grass better.

Four to seven daily paddocks were set up ahead of grazing. In wet weather, the electric fencing was removed behind the ewes, allowing access into the previously grazed paddocks to reduce stocking density. The one time the ewes were kept in the daily paddock when it was wet and they poached it badly.

A month before lambing the ewes were supplemented with concentrates fed via a snacker machine on the grass, before the ewes were moved to the next paddock. Ewes were fed up to 0.5kg of 18% crude protein cake per day, which was continued after housing. This gradual introduction to concentrates also ensured ewes were used to the diet before going indoors.

As ewes that were due to lamb were drafted out of the grazing flock, the paddock size was decreased accordingly.

Monitoring

Grass growth was measured using a calibrated sward stick.

Constant good stockmanship was important to check the ewes were eating enough. Their body condition was scored in September, December, at scanning and pre-lambing. Very few were pulled from the system, apart from those carrying triplets. Another batch of mature ewes of BCS 3, was added to make up the numbers to replace them.

Ewe health

Fluke was a problem in 2012 and rotavirus reduced lambing percentage to just under 160%.

Outcomes

Lambing percentage was about 10-20% down from previous years – mainly due to the health issues.

Cost savings are difficult to estimate due to the extreme winter of 2012-13. The snow in January meant the ewes were off the system for 14-18 days and given straw and feed blocks on a 4ha (10 acre) field with ring feeders. This used up half of the feed supply that was to be potentially saved by carrying out AGW.

Tips

+ Have a stock of 'storm feed' ready to last a month in case of bad snow
+ Watch the ewes carefully to make sure they are eating enough grazed grass. Generally, if they seem happy and contented the system is working

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