



Breeding from Ewe Lambs

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Breeding from Ewe Lambs

1. BACKGROUND

English farming has been challenged to reduce its CO₂ (carbon dioxide) equivalent emissions by 11% (3 Mt) by 2020. Within the livestock sector, ruminants produce more GHG (Greenhouse Gas Emissions) per unit of meat than either pigs or poultry. The production of one tonne of beef, sheep meat, pig meat and poultry meat results in the production of 16, 17, 6 and 5 tonnes of CO₂ respectively.

The relatively high GHG emissions from sheep production could be reduced by keeping a lower number of 'unproductive' stock in the system. One way of doing this would be for more females to give birth for the first time at 12 months old instead of waiting until they are 2 years old. For a lowland spring lambing flock that breeds its own replacements or buys in ewe lambs then sheep lambing as yearlings instead of two years of age would reduce the amount of GHG generated per kg of carcass meat by about 9.4% (See Appendix 1). Under good management and in the right circumstances, lambing ewes as yearlings is also likely to improve the financial viability of sheep systems while at the same time reducing the number of breeding females kept.

2. CURRENT SITUATION

It is estimated that there are about 6.7 million breeding ewes in the English flock (Defra, June 2009 census) of which 57% (3.8 million) are in the lowlands and 43% (2.9 million) are in the hills and uplands. The mating of ewe lambs has most application in the lowlands. However, farmers on better quality hill farms have a role to play in managing female crossbred lambs (especially Mules) for earlier mating. The animals should be able to mate one to two months after being sold at 5-6 months of age to the lowland farmer. If it is assumed that the typical lowland flock replacement rate is 22% then 836,000 female replacements are required by this sector of the sheep industry each year. According to census information for England (Defra, December 2009 census) about 332,000 ewe lambs were mated in the autumn of 2009. This equates to about 40% of the requirement for female replacements in lowland English flocks. However, in reality ADAS considers that the actual percentage of ewe lambs mated is more likely to equate to about 30% of ewe lambs retained.

It is estimated that that up to about 55% of English lowland flock replacement females could give birth at one year of age. Limitations in ewe lamb size, liveweight and especially age are important factors likely to restrict the extent to which ewe lambs are bred from. A large proportion of producers that already lamb their ewe lambs could improve the reproductive performance of these sheep as performance is heavily influenced by husbandry and nutrition.

However, farm case studies (ADAS 2010) show that farmers may deliberately choose not to lamb ewe lambs because of insufficient resource. Reasons given include –

- Limited housing space for ewes so can't afford to occupy this space with low output pregnant ewe lambs
- Cannot split sheep accommodation to feed ewe lambs separately
- Extends lambing period too much – seem to be lambing forever
- Much more attention needed at lambing time for ewe lambs

3. REVIEW OF THE LITERATURE AND DISCUSSION

3.1 Production Potential

The fertility and prolificacy rates of ewe lambs are lower than those of adult ewes (Turner *et al.*, 1968). This is because the former have lower ovulation rates and higher embryo mortality (Diskin and Screenan, 1985). Progesterone concentration is lower in lambs than in ewes (Davies, 1988, Davies and Beck 1993) and consequently pregnancy rates although similar to ewes at 15 days post mating can be significantly lower by day 30 (Beck *et al.*, 1996).

However, ewes bred as lambs have a higher lifetime production rate compared with those bred as yearlings (Bowstead, 1930; Briggs, 1936; Longrigg, 1961; Hulet *et al.*, 1969; Baker *et al.*, 1978). It is also noteworthy that ewe lambs that reach puberty during their first year have a higher lifetime reproduction potential, even if they are not bred from (Hulet *et al.*, 1969).

3.2 Oestrus in Ewe Lambs

The time, onset and duration of the breeding season in sheep are known to be affected by day length (e.g. Yeates, 1949). It is also well established that puberty in ewe lambs is influenced by breed and cross, age, body weight and year.

3.2.1 Breed and Cross

In a review encompassing trial work carried out in Wales, Ireland and the USA (Hohenboken *et al.*, 1978) showed that the average age at puberty ranged from 189 days for Finn crosses to 225 days for Hampshire crosses and 240 days for Suffolk crosses. Since the time of onset of oestrus is linked to maturity, breeding from ewe lambs of certain large, late maturing lowland breeds (e.g. Lincoln Longwool, Leicester Longwool, Romney) may not be viable.

It has been shown that the incidence of oestrus in ewe lambs is negatively linked to inbreeding (Hulet *et al.*, 1969); consequently crossbred animals are more likely to breed in their first season than purebreds.

3.2.2 Body Weight

Hohenboken *et al.*, (1978) report that most ewe lambs reach puberty at a liveweight of between 36 kg and 45 kg. While reviewing the literature on breeding from ewe lambs Thomas (2010) reported that the liveweight threshold for puberty in Suffolk females was 40 kg in early season and 33 kg in late season which respectively equates to 47% and 39% of a typical Suffolk ewe mature weight of 84 kg. This analysis also demonstrates how the fertility of ewe lambs increases as day length gradually declines. Vipond, (2010) stated that ewe lamb *liveweight* at mating should be 60% of mature body weight. This author also outlined target weights for mating ewe lambs of certain popular breeds and crosses.

Breed	Mature Body Weight (kg)	Weight at mating as ewe lamb(kg)
Black Face / Hill Cheviot	55	33
Lleyn	60	36
Mule	75	45
Continental x	80	48

3.2.3 Age

Ewe lambs begin cycling later than mature ewes of the same breed or cross and their mating season is shorter in duration. Generally, lambs born relatively early in the season will cycle earlier in the year than later born lambs – this is partly due to their heavier bodyweight and partly due to their older age (Hammond *et al.*, 1983).

Conception rate in ewe lambs of less than 7 or 8 months is unlikely to be acceptable. This means that ewe lambs born in mid March will typically not be ready to be mated until late October, and those born in early April should not be mated until mid November. Lambing for these two mating times is then likely to begin in the third week of March and the second week of April.

3.3 Selection of Ewe Lambs

3.3.1 Home-bred Ewe Lambs

In systems that hinge on home breeding it is advisable to keep 25% more ewe lambs than required. There are two main reasons for this –

- 1) It is likely that even in well grown ewe lambs up to 20% of those exposed to the ram will not become pregnant. Low ovulation rates and relatively high embryo mortality often being responsible for this (Diskin and Screenan, 1985; Davies, 1988; Davies and Beck, 1993).

- 2) It increases scope for selection. Lambs that are not pregnant can be sold. It may also be desirable to apply selection pressure for lambs that hold to first service as these animals are likely to be naturally more fertile than those that become pregnant in subsequent cycles and culling the latter after the first lambing can lead to gradually improved fecundity within the flock as a whole (SAC, 2009).

Replacement ewe lambs should not be selected solely on body weight. Saving only the heaviest lambs for replacements will favour early born lambs over later born animals. This has advantages but it is also favourable for singles over twins and triplets. Replacements should ideally be selected from well grown twins (avoid selecting from triplets as this may favour large litters). This puts selection pressure on twinning rate, growth rate and milk yield. This should then provide ewe lambs that are heavy enough to cycle on time in the autumn. On top of that female replacements from ewes that are persistently lame, need excessive dagging, have prolapsed, are poor mothers or produce weak lambs should not be kept. Effective record keeping and the quick retrieval of data is essential for matching up breeding ewes with their offspring.

3.3.2 Purchased Ewe Lambs

Buying ewe lambs from one source, and if possible the same source every year, will reduce the risk of introducing disease onto the farm. If possible ewe lambs should have been sired by rams that have good EBVs (Estimated Breeding Values) for liveweight gain, muscle depth and fat depth. Information on maternal ability (determined by lamb weight at 8 weeks of age) and litter size (derived from lambing data) should also be scrutinized if this is available. The extent to which EBVs are used within the sheep industry is disappointing and closer links between pedigree breeders and commercial producers must be encouraged.

3.4 Weight Gain and Nutritional Flushing during the Breeding Season

In general ewe lambs should have a daily liveweight gain of about 250 grams per day from weaning until 6 weeks after mating. Very good quality grass should suffice but offering up to 0.5 kg/head/day of mineralised whole grain (oats or barley) if grass is in short supply, should help. Heavy feeding of very young female sheep (<5 months old) can reduce mammary gland development and this can reduce subsequent milk yield (Tolman and McKusick, 2001).

Flushing means subjecting female sheep to a rising level of food intake and weight gain as they go into the mating season and Gaskins *et al.*, (2005) reported that the probability of multiple births increased as ewe lambs gained more weight from weaning to mating.

3.5 Effect of Shearing on Fertility

Pickard and Johnson (1995) reporting on work done at ADAS Drayton UK on North Country Mule ewe lambs showed that animals shorn on 15th September and exposed to the ram for three oestrus cycles from 16th October had a barren rate of 10% whereas unshorn animals treated in a similar way had a barren rate of 27%. The same authors reported that shearing also increased the percentage of ewe lambs giving birth to twins from 19 to 30. The benefit in fecundity may be due to increased embryo survival as a result of alleviating mild heat stress (Thwaites, 1967; Ryle, 1961)

3.6 Desirable Litter Size

Since it is usually desirable for ewe lambs to rear only one lamb, there is a need to avoid multiple births (twins and triplets). This is especially the case where ewe lambs give birth later than the rest of the flock as there are then no newly lambing mature ewes with single lambs available for fostering on to. This means that ewe lambs (especially relatively heavy animals born early in the season) should not be overfed in the run up to and during the mating season.

3.7 Choice of Ram

Mating ewe lambs to rams of breeds with either a smaller mature size (e.g. crossing a North Country Mule with a Wiltshire Horn or Cheviot) should reduce the incidence of difficult births. If large continental breeds are used then a breed with a relatively small head and shoulders (e.g. Charollais) should be used.

However, whatever the choice of ram it is important to have some knowledge of the likelihood of lambing difficulties. Lambing records for lambs sired by the ram in previous seasons may be helpful. Knowledge of the ram's own birth weight can also be useful - a tup that had a relatively heavy birth weight for its breed is more likely to sire lambs with above average birth weight and cause lambing problems in yearling sheep.

3.8 Mating Management

Ewe lambs should be mated separately from mature ewes as their oestrus behaviour is less aggressive. Mature ewes tend to monopolize the rams if they run together (Lindsay, 1966).

Vasectomised (teaser) rams run with ewe lambs for either 15 days or 30 days immediately before introducing fertile rams can successfully synchronise their heat (ADAS, 2010). The mixing of fertile rams with the ewe lambs for just three weeks should result in most the females being served at least once. Lambing is therefore also focused within this defined period and can then be easier to manage. This technique could be used to select for the most fertile sheep and in the longer term lifting the prolificacy of the flock as a whole.

Ewe lambs have a shorter 'standing heat' period than ewes and this coupled with their reluctance to seek out and court a ram means that more ram power is required (Vavra *et al.*, 1978). The need for extra ram power is further increased if heat is synchronized. A ram to ewe lamb ratio of 1:25 and 1:35 is recommended respectively for synchronized and unsynchronised oestrus. Rams should be experienced but not so big that they damage the ewe lambs

Lindsay (1966) also showed that duration of heat depends on the sex drive of both ewe and ram and upon how closely they are confined together. Mating of ewe lambs should be done on relatively small areas of land.

3.9 Pregnancy Scanning

It is highly likely that there will be a higher percentage of empty ewes within a group of ewe lambs than within a group of mature ewes. Pregnancy scanning of ewe lambs is therefore a very important management tool for identifying non-pregnant animals in plenty of time and managing them differently (e.g. sell for slaughter, sell for breeding, keep for breeding in subsequent year). Information on litter size is also vital for correct feeding management.

3.10 Nutrition in Pregnancy

During early and mid pregnancy, ewe lambs require about 20% more feed than mature ewes of similar weight as their continuing body growth has to be provided for. The sheep should be in optimum body condition (body condition score 3) six weeks before lambing starts as feeding in late pregnancy must be at a moderate level only. The majority of foetal growth occurs at this time and oversized lambs and difficult births can be a problem.

3.10.1 Growth rates

The aim would be a growth rate of 250 g/day for the first two months from when the rams are introduced. From then on until six weeks before lambing a growth rate of at least 150 g/day is desirable.

It is best to feed only for maintenance and the growth of the lamb *in utero* during the last 6 weeks of pregnancy.

3.10.2 Feeding in Pregnancy

Table 1 outlines example rations for pregnancy. A flat rate feeding regime involving only moderate amounts of concentrate feed is particularly important in late pregnancy.

Table 1 Example Rations for Single and Twin Pregnancies in Ewe Lambs

From two months gestation to six weeks before lambing		Last 6 weeks of pregnancy
Moderate quality silage or hay to appetite	Winter grass and moderate quality silage or hay (all to appetite)	Moderate quality silage or hay to appetite
Concentrate (16% CP, kg/head/day) -	Concentrate (16% CP, kg/head/day) -	Concentrate (18% CP, kg/head/day) -
Singles 0.2 Twins – 0.3	Singles – 0.2 Twins – 0.3	Singles - 0.25 Twins – 0.50

Silage - DM 25%, ME 10.6 MJ/kg DM, CP 11%. Hay - ME 8.7 MJ/kg DM, CP 9%. Concentrate – ME 12.5 MJ/kg DM, CP – 16% or 18%

3.11 Time of Lambing

Producers generally manage their ewe lambs so that they start lambing just as their mature ewes are finishing. The main reasons for this are –

- 1) need to allow more time for ewe lambs to grow and mature
- 2) the positive effect of reduced day length on ewe lamb fecundity
- 3) availability of labour- ewe lambs are likely to be more troublesome at lambing so labour effort can be concentrated on them

However, lambing yearlings when the rest of the flock has finished means that newly lambed mature ewes with single lambs will not be available for adopting one lamb from ewe lambs that have produced twins. Dovetailing the lambing of most of the ewe lambs into the last two weeks of lambing the main flock can therefore be advantageous.

3.12 Lambing Problems

Lambing ewe lambs is generally more successful if the animals are housed. The need for assistance is common and higher neonatal mortality is often recorded (e.g. Dyrmondsson, 1973; Bichard *et al.*, (1974). Dystocia due to the birth of large single lambs can also be a problem if the sheep are over fed and/or the sire has predisposed the lambs to heavy birth weights and large forequarters (e.g. Laster *et al.*, 1972). The mortality rate at lambing time is generally 1-2% higher for ewe lambs than for mature ewes. However, lambing sheep as yearlings is very unlikely to have any harmful effect on future performance provided that the ewe lambs have not been damaged in the process. Indeed, it has been shown that ewe lambs that are bred from successfully in their first year have higher lifetime performance (Hulet *et al.*, 1969).

3.13 Mothering Ability

It is generally reported by farmers that mothering ability in ewe lambs is better than for sheep lambing for the first time as two year olds. Sheep that lamb for the first time also tend to be better mothers throughout their lives (Dyrmundsson, 1973).

3.14 Dealing with Multiple Births

Milk production of one year old ewes is generally lower than for ewes in later lactations (Snowder *et al.*, 2001). These authors carried out a subjective assessment of milking ability by palpating the ewe lamb's udder and noting the gut fill of the new born lambs. A score on the scale of 0 to 5 was given. About 80% of the sheep had low scores as yearlings but the proportion fell to 34% when the same ewes were two years old.

The lower milk yield of ewe lambs coupled with the need for continued growth in lactation means that yearlings should only rear one lamb in order to achieve a satisfactory liveweight gain during their second grazing season and reach optimum body condition when mated again at 18 months of age. Ewe lambs that suckle twins may have a tendency to give birth to single lambs in their second breeding season (ADAS, 2010). About 7 MJ/day of extra energy is needed by a ewe lamb rearing twins as opposed to just one lamb and this roughly equates to the energy intake needed for a very acceptable daily liveweight gain of 150 grams.

In circumstances where ewe lambs and mature ewes lamb simultaneously then there can be scope to foster lambs onto mature ewes. However, generally in situations when ewe lambs are not lambing at the same time and they give birth to twins then one of the lambs is taken from the dam within 24 hours of birth and reared on reconstituted milk substitute. It is hoped that by this time they will have received sufficient colostrum from their dams. There may sometimes be opportunities to foster one of the twins onto ewe lambs that have lost their offspring.

3.15 Health Problems in Ewe Lambs and their Offspring

Purchased ewe lambs are likely to be naive to diseases on the farm to which they have been transferred. The lambs of yearlings can also be threatened as their colostrum is unlikely to contain sufficient antibodies to the diseases present on the farm. Ewe lambs may produce insufficient colostrum (ADAS, 2010) and a supply of the frozen substance taken from mature ewes on the farm should be available. A lack of colostrum coupled with the common practice of lambing ewe lambs after the main flock demands very high standards of hygiene as the presence of disease causing organisms tends to build up in the environment as lambing progresses.

Quarantine treatment for internal and external parasites (following SCOPS principles) and foot bathing to prevent transmission of foot-rot are good practice when lambs arrive on farm. A further month of quarantine is always advisable before mixing with other sheep on farm in order to monitor

development of other diseases. Ideally ewe lambs should be kept as a separate flock and only mixed with the resident sheep after lambing. In order to avoid duplication of veterinary treatment as much information as possible should be gathered from the farm of birth. A flock health plan detailing all necessary vaccinations (e.g. for clostridial diseases and abortion) for ewe lambs should be discussed with the farm vet. Vaccinations should be given at least one month before tupping and vaccines should be spread out over a few weeks to allow full development of antibodies well before tupping.

Case studies (ADAS, 2010) indicate that lambing replacements as yearlings can result in more cases of mastitis than lambing the sheep for the first time at two years old. It seems that the udder of ewe lambs is relatively tender and teats are more easily damaged by the teeth of suckling lambs.

3.16 Ewe Lamb Nutrition in Lactation

As for pregnancy, lactating ewe lambs require about 20% more feed than mature ewes of similar weight in order to supply sufficient nutrients for their body growth.

Lactating ewe lambs should be kept as a separate group at least up until when their lambs are weaned. A plentiful supply of good quality spring grass can suffice but careful ration formulation is needed if the sheep are indoors or if grass is in short supply. If grass is in short supply then feed hay or silage to appetite along with concentrate feed (ME 12.5 MJ/kg DM, CP 18%) at a daily rate per head of 0.5 kg and 0.70 kg for ewe lambs suckling singles and twins respectively.

3.17 Creep Feeding

Lambs born to ewe lambs should be fed creep pellets to appetite from one week of age. A high energy product (ME 12.5 MJ/kg DM) with a crude protein content of 18% is needed until 8 weeks of age. After this the protein content in the creep feed can be dropped to 15-16%. The amount consumed to 14 weeks of age is likely to be about 50 kg/lamb costing £11/lamb (£230/tonne). The cost is likely to be justified for two reasons –

1. Lamb Performance. With a feed conversion ratio of 3.5:1, each kg of liveweight gain would cost 80p against a market value of £1.60. The lambs would also finish sooner. Total cost of creep would be about £11.50 compared with a current lamb market value of £58
2. Dam Performance. There would be less demand on the suckling yearling as her lamb will partly satisfy its appetite from dry food. Ewe body condition is therefore likely to be maintained and she is more likely to be in optimum body condition when served again at 18 months old.

3.18 Weaning

The high nutrient demand for growth (6 -7 MJ's for a daily gain of 200 g) in lactating ewe lambs means that their offspring should be weaned at a relatively young age and at any rate before they are 14 weeks of age. Early weaning (8-9 weeks of age) may be the best option if ewe lambs are in particularly poor condition or are smaller than expected (although good intakes of creep feed would be essential). A poor supply of grazing would be another reason for weaning early. Weaning at 8-9 weeks should be done abruptly when at least 250 g of creep is eaten/lamb/day over 3-4 days. After weaning continue feeding the creep feed (ME 12.5 MJ/kg DM, CP 16 -17%) or dilute by adding 30-40% barley or change to a home mixed ration (ME 12.5 MJ/kg DM, CP 15-16%). Lamb growth rates of 300-360 g/day and a feed conversion ratio of 3.5:1 should be expected.

Lamb weight at weaning (especially at 6 - 8 weeks) is likely to give a good assessment of mothering ability of the dam. Young ewes should be culled if disappointing performance in their lambs is due to poor milk yield or any other trait that is likely to affect lamb performance in future years.

3.19 Economics of Breeding from Ewe Lambs (Lambs weaned at 14 weeks of age)

Table 2 considers the financial aspects of breeding from ewe lambs.

Table 2 Gross margins of North Country Mule sheep purchased at 6 months old and valued at 18 months old

	£/ewe lamb purchased	
	Bred as Yearling	Not Bred as Yearling
Value of shearing (one year after purchase as ewe lamb)	130.00	120.00
*Lamb output (0.8 lambs reared per ewe lamb @ 18g carcass weight @ £3.20/kg)	46.00	0
Wool	1.00	1.00
Total output	177.00	121.00
Less 1) Purchase Price	80.00	80.00
2) Mortality	3.00 (3%)	1.00 (1%)
Output	94.00	40.00
Variable costs		
Concentrates – ewe nuts @ £170/tonne	5.10 (30 kg)	
Creep feed to sale at 14 weeks of age @ £215/tonne	11.00 (50kg)	
Forage	6.5	8.00
Vet and med	7.00	5.00
Bedding	0.70	0
Pregnancy scanning	0.60	0
Contract shearing	1.10	1.10
Lamb tags	0.80	
TOTAL VARIABLE COSTS	32.8	14.10
GROSS MARGIN	61.20	25.90

* Has not considered financial margin from any twin lambs artificially reared

The figures in Table 2 assume that ewe lambs were purchased for £80/head in the autumn. Two systems are compared –

1. Ewe lambs are mated in their first autumn and give birth as yearlings
2. Ewe lambs are not mated in their first autumn

It can be seen that estimated gross margins for animals that have given birth and those that have not lambed are £61.20 and £25.90 respectively – a difference of £35.30/sheep. It is assumed that lambing ewe lambs has increased their market value at 18 months of age by £10/head. The market value of the lamb (0.8 lambs per yearling) is assumed to be £46.

It should be borne in mind, however, that the labour requirement of lambing yearlings can be substantial. For example, the allocation of one hour per sheep at a nominal charge of £10 would reduce the apparent financial advantage of lambing replacement females as yearlings from £35.30 /head to £25.30/head.

One of the key benefits of lambing ewe lambs is the extra lamb that can be produced in the first year hence reducing the overall GHG emissions from the flock. Running ewe lambs empty only produces a fleece in the first year and slows genetic progress.

4. CHRONOLOGICAL MANAGEMENT GUIDE

Period of Year	Management Principle	Action
June/July	Selection of ewe lambs (purchased lambs)	If buying in ewe lambs try and get an understanding with the vendor so that you get the quality of sheep that you desire e.g. well grown female lambs, free from dags, physically sound and born as a twin. Reference should be made to the rams (EBVs for liveweight gain, muscle depth and fat depth) and also the dams, for example did they give birth easily, and demonstrate good maternal care with plenty of milk.
July	Selection of ewe lambs (self replacing flocks)	The criteria that applied to purchased lambs are also relevant in self replacing flocks (see above). Decide on the number of ewe lambs that should be selected in relation to the size of the flock. In the first instance the aim would be to select 25% more than is actually required in order to allow latitude for further selection at a later date.

Period of Year	Management Principle	Action
July/ August	Choosing a ram for use in ewe lambs	Use of EBVs to obtain the right balance between growth rates, carcass conformation and easy lambing. Maternal traits are also very important. Reduce the risk of lambing difficulties by mating to breeds of ram with a smaller mature size (e.g. North County Mule ewe lamb with a Wiltshire Horn or Cheviot ram). If using large continental breeds then choose a breed with a relatively small head and shoulders (e.g. Charollais). Try and obtain information on the ram's lambing history if he has been used before. A sire with a heavy birth weight relative to the rest of the breed may also be indicator of possible lambing problems.
July/August/September	Size and target growth rates to mating. Feeding for growth.	Be aware of target weight at mating. Aim for at least 55% of mature body weight. Actual weight will depend on breed and cross - medium sized breeds and crosses should weigh at least 36 kg at mating. Do not exceed a growth rate of 300 grams/day. Small lambs should not be 'forced' to reach a target mating weight and become over fat. Feed good quality grass and offer a high energy supplement if it is necessary.
September/October	Nutrition	Ewe lambs will respond well to flushing. But, in order to avoid excessive twinning do not feed too generously from 6 weeks pre-tupping until the rams are withdrawn. Well grown lambs born relatively early in the season are especially responsive to flushing.
November/December	Mating management, teasers etc.	Conception rates in ewe lambs are likely to improve as the day length lessens. Mate ewe lambs separately from mature ewes and in a fairly small area of land so that lambs in oestrus can be easily identified by the ram. Use at least one ram to 25 ewe lambs when oestrus has been synchronised by the use of a vasectomised ram otherwise one ram to 35 ewe lambs should be adequate. Rams should be experienced but not so big that they damage the ewes. The use of teaser rams for up to 17 days prior to mating is an effective of achieving a more compacted mating period. This can lead the way to leaving rams in for just one oestrus cycle and lambing within a three week period.
January	Pregnancy Scanning	It is likely that 15-25% of the ewe lambs exposed to the ram will not be pregnant and typically 30% of pregnancies will be twins. Pregnancy scanning is a very important management tool to identify barren ewes and to determine litter size. Feeding management can then be adjusted according to nutritional demand. Ideally, scan at 70 and 80 days of pregnancy.

Period of Year	Management Principle	Action
January	Dealing with barren stock	Non pregnant animals should be separated. They can be either sold for slaughter, or kept and mated in the following autumn. Ewe lambs carrying twins should also be segregated.
January/February/March	Nutrition during early and mid pregnancy	In order to allow for growth, a plane of nutrition that is 20% above that of mature ewes of similar weight is needed. Also, feed according to litter size. Moderate quality hay or silage fed to appetite should be supplemented with a high quality concentrate feed fed at a daily rate of 0.20 kg and 0.30 kg for ewe lambs carrying singles and twins respectively.
March/ April	Nutrition during late pregnancy	Careful feeding is important during the last six weeks of pregnancy. It is vital to be aware of the lambing problems that ensue from over-feeding – especially in sheep carrying single lambs. Precise diet formulation is needed. A condition score of 2.5-3.0 at lambing is recommended. Moderate quality hay or silage fed to appetite should be supplemented with a high quality concentrate feed fed at a daily rate of 0.25 kg and 0.5 kg for ewe lambs carrying singles and twins respectively.
March/April	Lambing. Coping with twins	Lambing ewe lambs after the rest of the ewes have finished giving birth is common practice. However, since ewe lambs should rear only one lamb, the absence of mature ewes for fostering onto means that one of a set of twins will probably have to be reared on milk substitute.
April/May/June	Nutrition of ewe in Lactation	Good grass should provide adequate nutrition but be ready to offer a supplementary feed if grass is in short supply. Body condition should be constantly monitored and it should not be allowed to fall below condition score 2.
April/May/June	Nutrition of lamb	Creep feed should be offered to appetite from one week of age. The creep should have high energy content (ME 12.5 MJ/ kg DM) and a crude protein content of 16-17%.
June/July	Weaning	Do not leave lambs suckling beyond 14 weeks of age. Wean lambs as early as 6-8 weeks if their dams are in particularly poor body condition (condition score < 2) or are smaller than expected.
July/August/September/October	Nutrition of the ewe before her 2 nd mating	There is a continued need to feed for growth as well as to improve body condition. Close monitoring of body condition is vital. Remember that it will take at least 8 weeks on high level of feeding to lift body condition score by a single increment. This means that a lowland sheep with a body condition score of 2 would have to be on a high plane of feeding for 3 months in order to achieve the

		target condition score of 3½ at mating. Supplementary feeding (0.5 kg/head/day of a high energy concentrate) will be required if grass is in short supply.
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5. CASE STUDIES

1. Lambing Yearlings (Currently Practiced)

1.1 Farm 1 - Purchased (Suffolk crosses)

1. *Flock size* - 1154 mature ewes and 116 ewe lambs (2010 lambing)
2. *Breed of females* - Suffolk cross Mules
3. *Breed of rams* - Texel used on ewes and Charollais on ewe lambs
4. *Lambing % of main flock* - 180
5. *Lambing date* - Ewes from early February and ewe lambs in April
6. *Advantages and Disadvantages of Lambing Yearling Sheep*

Advantages

- Big enough to breed and expensive to run them round empty
- Bonus year of production
- Allows one extra lamb in a lifetime
- Identifies non-breeders early – culls all those that are not raddled
- Temperament better as ewe lambs than un-bred yearlings
- Better colostrum as yearlings if bred as ewe lambs
- Easier lambing than maiden yearlings

Disadvantages

- Possibly lose more ewe lambs with mastitis than if lamb at two years old
- What do you do with spare lambs – foster on to other ewes if possible or artificially rear at significant expense
- Higher level of management required – need comprehensive health care as naïve to most diseases (e.g. abortion, worms etc)
- Feeding difficult to get exactly right. Does not seem to go with size of ewe lambs as seem to get small ewe lambs in lamb as well. Large and fatter ones often have smaller lambs. This is because metabolism favours dam growth rather than lamb growth

7. *Source of Stock*

- *Source* – aim is one farm only
- *Age at purchase* - 5 to 6 months
- *Selection criteria* - size to age ratio, health status, must be born as a twin
- *Criteria for culling ewes* - feet, mastitis, prolapse, poor mothering ability

8. *Do you use of EBVs for selecting ewe lambs?* No, but would like to know that good sires with good maternal abilities have been used – e.g. last farm used to use New Zealand Suffolks that had been bred for easier lambing.

9. *Management of ewe lambs*
- Grazing – all kept separate and treated as a discrete flock
 - Ewe lambs have only 21 days with the tup. Aim is to keep lambing compact
 - Feeding policy in autumn/winter - supplementary feed before mating (some feed blocks if grass limiting)
 - Feed in pregnancy – yes, but fed less than mature ewes - about 0.4 kg for singles and 0.6 kg for twins for last 2 weeks.
 - Feed in lactation - fed dry supplementary feed in early lactation if grass supply not adequate
 - Weaning – weaned at about 14 weeks of age. Rest of flock weaned at about the same time but lambs older (16 weeks maximum).
 - Dealing with twins – only one lamb left on the ewe lambs. Other lamb either reared artificially or fostered on to animals that have lost a lamb. About 10-12 kg of milk powder is fed per lamb; they are weaned at 8 weeks of age
 - Lambs are creep fed
10. *Do you use scanning results to manage ewe lambs?* Yes, empty ones taken out and two groups are run.
11. *What is the lambing performance? In 2009/2010*
- 116 ewe lambs were tupped
 - 26 empty
 - 60 singles
 - 30 twins
 - 120 lambs born
- Ewes mated that gave birth – 77%*
Lambs born from ewes mated – 103%
Twinning rate – 33% of births
12. *Scanning policy.* Scanning done then take out empty ones and then run as two groups.
13. *Breed of ram used on ewe lambs -* Charollais
14. *What breed of ram do you use on the main flock -* Texel
15. *Do you select rams especially for tupping ewe lambs* Yes – choose those with history of easy lambing
16. *Are there problems with ewe lamb/baby lamb bonding?* Generally not, we have more problems with yearlings. Occasionally, one takes a couple of hours to realise what is happening but most make good mothers. A few are very aggressive to other lambs and have to be separated.
17. *Are there more lamb deaths at birth from ewe lambs?* Not really but colostrum quality can be an issue. Need to check colostrum quantity and make sure lambs have had enough early in life. May need to top up with artificial colostrum if concerned.
18. *What is lambs reared % of flock as a whole and that of ewe lambs?* Last year 157% from whole flock (180 from ewes). This year ewe lambs – all 90 in lamb are rearing a lamb. A few lost lambs but fostered across from doubles.
19. *How do you get ewe lambs back in right body condition to go back to ram at 18 months old?* Wean early and creep feed lambs. Lambs would eat about 50 kg/head of creep feed per head.

20. *Are you happy with lambing ewe lambs and why? Yes*
21. *What would make stop lambing ewe lambs? If had to lamb outside.*

KEY MESSAGES

- Breed only from ewe lambs born as twins
- Feeding in pregnancy can be difficult to get right if ewe lambs vary in size and body condition
- Use teaser rams to synchronise heat. This can compact the mating period and a satisfactory lambing percentage could then be achieved by leaving the rams with the ewes for only one oestrus cycle
- Use easy lambing rams
- Health problems can be an issue with bought in ewe lambs as they are naive to diseases on farm
- Mastitis is more of an issue in ewe lambs
- Poor colostrum quality can be a problem in purchased ewe lambs as it lacks antibodies to diseases on farm
- Rearing lambs artificially is very expensive but at current lamb prices is worthwhile
- Good quality grass plays a vital role in early lactation hence lambing in April preferable
- Lambing ewe lambs successfully is dependant on them giving birth inside where they can be carefully scrutinised

1.2 Farm 2 - Purchased (Welsh Mules)

1. *Size of flock* - 950 ewes, 250 ewe lambs. Select 120 best ewe lambs for tupping in their first year
2. *Breed of flock* - Welsh Mules
3. *Breed of rams on ewe lambs*- Charollais and Suffolk
4. *Breed of ram on main flock* – Suffolk
5. *Lambing % of main flock* – 190
6. *Lambs reared* – 170% for main flock and 90% for ewe lambs
7. *Lambing date* – late January to March for ewes, April for ewe lambs.
8. *Advantages and disadvantages of lambing yearling sheep*

Advantages

- Having a lamb is a bonus
- Lower financial loss if lose ewe lambs than yearling

Disadvantages

- More work

9. *Source of stock* – all purchased
 - *Source* – Welshpool market
 - *Age at purchase* – 6 months
 - *Selection criteria* - health status, weight for age, good strong lambs
 - *Criteria for culling ewes.*– teeth, feet, udders, prolapse
10. *Do you use EBVs for selecting ewe lambs?* No, as buy in the market
11. *How do you manage the ewe lambs?*
 - Graze all autumn and winter – grass then kale. Supplementary feed is not fed at this time
 - Late pregnancy - grass and fodder beet ad-lib
 - Early lactation (3 weeks) - 0.75 kg 20% CP home mix
 - All weaned at same time as whole flock so lambs a couple of weeks younger – 12 to 14 weeks rather than 14 to 16 weeks
 - Do you graze them separately from flock at any time until the lambs are weaned? Yes, better to treat them completely separately for better feeding management and from disease perspective
12. *Do you use scanning results to manage ewe lambs according to litter size?* Yes, take out barren ones early and run round on grass only. Pregnant ewe lambs kept together.
13. *Do you select rams especially for tupping ewe lambs e.g. history of easy lambing?* Have done but consider success is more closely related to feeding than breeding
14. *Are there problems with ewe lamb / baby lamb bonding?* No, very good mums
15. *Do you manage those with twins differently?* Take twins off and foster onto other ewes.

16. *What is the lambing performance? In 2009/2010*

- 120 ewe lambs were tupped
- 17 empty
- 76 singles
- 27 twins
- 130 lambs born

Ewes mated that gave birth – 85%

Lambs born from ewes mated – 108%

Twinning rate – 26% of births

Lambs reared – 90% of those born

17. *Are there more lamb deaths at birth from ewe lambs? Yes a few more – particularly small twins*
18. *How do you get ewe lambs back in right body condition to go back to ram at 18 months old? Wean early and give good grazing*
19. *Are there particular health issues with lambing ewe lambs - No particular problems but need to make sure all ewe lambs are fully vaccinated.*
20. *Are you happy with lambing ewe lambs and why? Debatable – a lot of extra care and attention*
21. *What would make you stop lambing ewe lambs? A disastrous lambing. But will go back to buying stronger lambs this year. Bought smaller lambs last year because of high price but will pay more this year for bigger lambs so more will lamb as ewe lambs.*

KEY MESSAGES

- Keep separate from established flock
- Pregnancy scanning is a very important tool in order to identify barren sheep and to assess litter size
- Pregnant ewe lambs (including those carrying twins) can be adequately nourished on grass and fodder beet
- Lambing mature ewes and ewe lambs simultaneously can lead to ease of fostering when yearlings have twin lambs. But, the special husbandry demands of ewe lambs giving birth can be difficult to cope with when labour is spread over the whole flock
- A comprehensive vaccination programme can effectively overcome the naive disease status of ewe lambs
- Use easy lambing rams
- Good quality grass plays a vital role in early lactation hence lambing in April is preferable
- Lambing ewe lambs successfully is dependant on them giving birth inside where they can be carefully scrutinised

1.3 Farm 3 - Home Bred (Pedigree Charollais)

1. Flock size – 450 and 80 to 110 ewe lambs
2. Breed of females – Pedigree Charollais
3. Breed of Ram – Charollais
4. Lambing date – December/January (ewes) and March (ewe lambs)
5. Advantages and Disadvantages

Advantages

- Big enough to breed from as born early and well nourished in their first year. Born in December/ January do will be 9-10 months old when mated
- Better genetic progress in pedigree flock
- Lambing sheep as yearlings means that they are much quieter at two years of age

Disadvantages

- Ewe lambs are allowed to rear only one lamb. With twin births, one lamb has to be artificially reared as there are no newly born mature ewes available to adopt onto
- Feeding can be difficult to get right. Flat rate feeding over the last 6 weeks of pregnancy is required to reduce the incidence of difficult births
- Charollais sheep lambed as yearlings tend to take an extra 6 months to reach mature size (i.e. 3 years old as opposed to 2½ years old for those lambed for the first time)

6. Source of Stock - all homebred
7. Do you use EBV's for selecting ewe lambs? A little but not much – more concerned with looks and size. Since pedigree, a substantial amount of line breeding is used. However, prolificacy has seems to have dipped recently.
8. Management of ewe lambs.
 - Grazing – kept separate
 - Small amount of concentrate fed on a daily basis from one month of age, until 18 months of age. May be overfeeding – 55% of ewes lambed produced either twins or triplets.
 - Flat rate feeding implemented in last 6 weeks of pregnancy to reduce risk of difficult births.
9. What is lambing performance? In 2009/2010 -
 - 94 ewe lambs tupped
 - 10 empty
 - 37 singles
 - 42 twins
 - 5 triplets
 - 136 lambs born

Ewes mated that gave birth – 89%

Lambs born from ewes mated – 144%

Twins and triplets – 56%

KEY MESSAGES

- Faster genetic progress (especially important for pedigree flock) when lamb as yearlings
- Sheep lambing as yearlings are much calmer when lambed as two year olds than those than lamb for the first time one year later
- Overfeeding in two months leading up to mating can lead to an undesirable number of twins and triplet births
- Flat rate feeding over the last 6 weeks of pregnancy is very important for reducing the risk of difficult births occurring

1.4 Farm 4 - Home Bred (Lleyn)

1. *Flock size* – 600 mature ewes and 250 ewe lambs (2010 lambing)
2. *Breed of females* - Lleyn
3. *Breed of rams* – Lleyn
4. *Lambing % of main flock* - 190
5. *Lambing date* - Ewes from late February and ewe lambs in April
6. *Advantages and Disadvantages of Lambing Yearling Sheep*

Advantages

- Big enough to breed and expensive to run them round empty.
- Bonus year of production
- Allows at least one extra lamb in a lifetime
- Lleyn yearlings can cope with suckling twins
- Identifies non- breeders early
- Easier lambing than maiden yearlings

Disadvantages

- More mastitis problems. Udder is relatively tender and suckling lambs therefore cause more damage
- Can get lambing problems. Need take care not to overfeed those carrying singles

7. *Source of Stock* – all homebred
8. *Selection criteria* – all females kept. Those that reach liveweight of 38 kg by late September are mated. Hope to reach at least 41 kg in 5 weeks to 10th November when rams are introduced.
9. *Do you use of EBVs for selecting ewe lambs?* Yes – use EBVs for carcass traits and mothering ability. Some fairly close line breeding done. Selection pressure against triplets. Female and male progeny not retained for breeding if they are from a triplet family.
10. *Management of ewe lambs*
 - Grazing – all kept separate and treated as a discrete flock
 - Teasers put in with ewe lambs for two oestrus cycles (5 weeks)
 - Ewe lambs have only 25 days with the tup. Aim is to keep lambing compact
 - All ewe lambs spends winter on high quality grazing grass. They return home in mid March
 - All lambs weaned in mid- August

10.1 *Ewe Lambs Suckling Twins*

- Offered feed blocks from scanning (80 days gestation) until housing in mid March
- Fed good quality haylage to appetite and 450 grams/head/day (in 2 feeds each of 225 grams) of a high energy 18% CP concentrate from housing in mid March until turned out with their lambs in April onto good quality grass

- Grazed on clean pasture (1st year leys)
- Fed small amount of concentrate at grass (150 grams/ day) until shearing time in mid June. This helps stockmanship – especially inspection of udders for mastitis etc
- Twin lambs are fed creep feed up until early August (2 weeks before weaning)
- Ewes and twin lambs put onto summer grown forage crops in early August
- Twin lambs weaned in mid August and stay on the forage crops

10.2 *Ewe Lambs Suckling Singletons*

- Lamb outside
- Offered feed blocks from mid March until they have all lambed
- Concentrate feed is not offered in troughs as it would result in mis-mothering
- Stocked very tightly on grass to reduce the risk of oversized lambs at birth

11. *Do you use scanning results to manage ewe lambs?* Yes, empty ones taken out and sent to slaughter

12. Lambing Performance 2009/2010. What is the lambing performance?

- 250 ewe lambs were tupped
- 10 empty
- 175 singles
- 60 twins
- 5 triplets

Total 310 lambs born

Ewes mated that gave birth – 96%

Lambs born from ewes mated – 124%

Twinning rate – 25% of births

Lambs reared per ewe mated – 111%

13. *Breed of ram used on ewe lambs - Lleyn*

14. *What breed of ram do you use on the main flock – Lleyn*

15. *Do you select rams especially for tupping ewe lambs* Yes – choose those with history of easy lambing

16. *Are there problems with ewe lamb/baby lamb bonding?* No

17. *Are there more lamb deaths at birth from ewe lambs?* No

18. *What is lambs reared % of flock as a whole and that of ewe lambs?* 111% for ewe lambs

19. *How do you get ewe lambs back in right body condition to go back to ram at 18 months old?* Hard with twin bearing ones. They tend to have one lamb in Next year.

20. *Are you happy with lambing ewe lambs?* Yes

KEY MESSAGES

- With a naturally prolific breed (Lleyn) do not select for triplets. Do not retain any triplet males or females for breeding
- Feeding in pregnancy can be difficult to get right if ewe lambs vary in size and body condition
- Use vasectomised rams for two oestrus cycles to synchronise heat. A mating period of just 25 days then gives very a satisfactory lambing performance
- Mastitis is more of an issue in ewe lambs. The udder is tender and the teats are very prone to damage from the teeth of suckling lambs
- Lleyn yearlings can suckle twins successfully. However they demand very close shepherding – their udders have to be looked at daily for any signs of mastitis. A small amount of concentrate feed daily up until shearing will aids stockmanship
- Sheep that have reared twins as yearlings are likely to be less prolific in the following year and tends to produce single lambs
- Pregnant Lleyn yearlings on good quality lowland spring grass have a tendency to become fat and lambing problems can easily ensue. High stocking rates can be necessary to restrict grass intake
- Important to creep feed twin lambs until they are weaned

2. Lambing Yearlings (Practiced in Past but Given Up)

2.1 Farm 1 – Home bred (pure-bred Lleyne ewes)

Key Message

- Inability to keep ewe lambs separate from main flock was hub of problem
- Totally mixed ration (TMR) fed to flock was not suited to ewe lambs. They were often too fat and dystocia was a problem
- Poor summer grass growth on South Downs led to poor lactation performance in ewe lambs
- Early weaning of lambs not successful – lambs became stunted

2.2 Farm 2 Purchased (North Country Mules) I

Key Messages

- Need very good nutrition for overwintering ewe lambs. They can compete for food with fattening lambs
- Ewe lambs demand a disproportional amount of time at lambing
- Lambing ewe lambs after the main flock was factor involved in a high disease occurrence in offspring from ewe lambs
- With limited housing space it didn't seem viable to occupy sheds with stock that were only half as productive as sheep lambing for the first time at 2 years old
- Need for special ram (e.g Charollais) was extra expense as using Texels and very large Suffolks on rest of flock

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Appendix 1

Methane Emission Reduction Benefits of Lambing Ewe Lambs

1. Lowland ewes – culled at 6 years old

- *Scenario 1 - lambed as ewe lambs - 2010* (born), 2011 (lambled for 1st time) then lambled in each of following years - 2012, 2013, 2014, 2015, 2016. So, total of six crops (1x 0.8 lambs and 5 x 1.5 lambs) which is 8.3 lambs to sell. Total weight of lamb carcase produced by the ewe is 157.7 kg (19 kg/carcase) which equates to 26.3 kg of lamb carcase /annum over six years
- *Scenario 2- lambed at 2 years - 2010* (born), 2011 (not lambled), then lambled in each of following years - 2012, 2013, 2014, 2015, 2016. So, total of five crops (1 x 1.4 and 4x 1.5) which is 7.4 lambs to sell. Total weight of lamb carcase produced is 140.6 kg lamb carcase (19 kg/carcase) which equates to 23.43 kg of lamb carcase /annum over six years

Scenario 1 when compared with scenario 2 increases output by 12% (an additional total carcase output of 17.1 kg or 2.85 kg annum over six years).

Emissions

	N2O emission (kg N2O /yr CO2 - e)	N2O emission (kg N2O /ha CO2 - e)	Total N2O emission (kg N2O /ha CO2 - e)	Storage -CH4 emission (Kg CH4/yr CO2-e)	Enteric - CH4 emission (Kg CH4/yr CO2-e)	Average annual emissions associated With feed and fuel per ewe	Total emissions from feed and fuel over 6 years	Total kg CO2 over 6 years	Total weight of meat produced	Emissions per kg meat (kg CO2 e/kg DW) **
Scenario 1	19.9	335.0	38.8	41.4	1,744	374	2,244	4,423	157.7	28.0
Scenario 2	19.7	331.6	38.4	39.7	1672	374	2244	4,345	140.6	30.9

** 9.4% reduction

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