Response to flushing with concentrates on fertility including scanning percentage in Dalesbred sheep

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1.0 Introduction

Across the United Kingdom (UK) the national sheep flock was estimated to be 32.7 million head in 2020 (Wilkins, 2021). Sheep production in the UK, whether that be hill, upland, or lowland systems strive for physical and financial efficiency within the flock through measured through performance. High performance figures have always driven sheep production (AHDB, 2018), with the NSA (2016) listing profitability, efficiency, and sustainability as the industry's main goals. Therein, the main aim is to produce the highest number of lambs per ewe per year with the smallest number of inputs and costs required. To achieve this, different management techniques are adopted with the aim of enhancing reproductive performance (Dziuk and Bellows, 1983), as the fertility of a flock is the main driving force behind the output per year. AHDB (2016) state that ovulation rate, which is the main influence on scanning percentage and rates of conception, is affected by a range of aspects including age, breed, stage of breeding season, nutrition, and Body Condition Score (BCS).

The industry structure seen throughout the UK is unique to this country, as the stratified sheep system used (Pollott and Stone, 2006) takes advantage of the different climates within the UK: Hill, upland, and lowland. By breeding sheep that suit these climates and then drafting them down the tiers, it utilises the natural resources and produces sheep whose characteristics are appropriate to the system (Rodriguez-Ledesma *et al,* 2011). Performance differs between these tiers with hill ewes generally producing fewer lambs with less input, and lowland ewes producing a greater number of lambs but at more expense to the farmer.

Dziuk and Bellows (1983) have determined that while nature is the main stimulus on reproduction in ewes, additional factors influencing fertility can be manipulated to be more favourable for higher fertility performances. A sheep's BCS can be extremely influential on a sheep's fertility , and can also be manipulated and examined frequently (Wolf *et al.,* 2014). BCS is an assessment of the reserves of fat and muscle (Kenyon *et al*, 2014). It does not take into account skeletal size or breed and is also uninfluenced by the fleece and gut fill (Gonzalez *et al,* 1997). Russell *et al* (1969) have determined that BCS is a better indicator than liveweight when

estimating reserves in the body, as it provides a practical and appropriate predictor and is repeatable by several individuals that would all produce similar results (Keinprecht *et al,* 2016). By reaching the optimum target of BCS 3.0 it will minimise the reproductive losses which include failure to conceive, embryo and ova loss and pre/post-natal lamb loss (Lassoued *et al,* 2004). However, the optimum varies with different breeds, with 3.0 being generally accepted for hill and upland ewes and 3.5 for lowland ewes.

A management technique which assists in enhancing BCS is flushing, which is a rising plain of nutrition. A rise in nutrition, prior to mating, is widely accepted as good commercial practice for increasing the number of lambs produced per ewe. Flushing is most effective when carried out in ewes which are near to target and between 2.0 and 4.0 (AHDB, 2016). This can be achieved by feeding grazing grass, concentrates and feedstuffs such as cut lucerne (Robertson *et al.,* 2015). Feeding additional concentrates during the flushing period could be costly , however, as a result of which the effectiveness of supplement feeding from concentrates needs to be analysed for beneficial properties, to determine whether it would be financially viable on a commercial farm.

The typical scanning percentage ranges from 115% - 130% for hill sheep (Farm Advisory Service, 2020), however, it is varying between breeds. This project looks specifically into the Dalesbred breed, which has limited research surrounding it as a breed. Similar hill sheep such as Swaledale and Scottish Blackface have been studied widely, and therefore should indicate benchmarks which the Dalesbred breed will be comparable to regarding fertility and performance and assess whether the breed then follows a standard pattern for hill breeds in general.

AHDB (2018) state that Swaledale ewes can have reproductive performance of up to 150%. Whereas, SAC Consulting (2019) indicate that the average number of lambs reared per ewe in an improved hill environment is 130%. These contrasting figures show how within a few breeds of hill sheep there is variation in performance which could be impacted on by management, nutrition and how intensively farmed they are (Slavova *et al.,* 2015).

The Dalesbred breed is a regional breed whose population is highly concentrated in the Yorkshire dales, Nidderdale and west into Lancashire, which is shown in

Appendix Two. The breed originates from the same families as Swaledale and Scottish blackface sheep. The Dalesbred ewe is on average a larger, better conformed ewe compared with the Swaledale, which therefore produces a heavier lamb (Dalesbred sheep breeders association, 2020).

Limited research has been undertaken which mentions the Dalesbred breed specifically, with it being a local breed seen in the North Pennines (Dalesbred Sheep Breeders Association, 2020). Therefore, this study will produce figures on a flock of Dalesbred ewes in order to better understand the responses and reproductive performance when flushed in different techniques and different BCS.

Aim

The research aim is to assess whether there is an effect on scanning percentage and conception rate when Dalesbred ewes are flushed with concentrates and grass compared to just grass.

Objectives

The objectives for the study are:

- To body condition score ewes and identify if there is a difference in flushing techniques at different BCS.
- Assess whether there is a significant difference in scanning percentage and conception rate when flushed with concentrate and grass and solely grass.
- Evaluate the performance of a commercial Dalesbred flock and compare the collected data with that of the benchmark for other similar hill breeds.

Null Hypothesis (H_0)

There will be no statistically significant difference between the scanning percentage of Dalesbred ewes flushed with concentrates and grass or just grass.

Experimental Hypothesis (H_1)

There will be a statistically significant difference between the scanning percentage of Dalesbred ewes flushed with concentrates and grass or just grass.

3.0 Methodology

3.1 Ethical Approval

Ethical Approval was granted by the Ethics board at Askham Bryan College in November 2020 (see Appendix One).

3.2 Subjects

The research project was undertaken at High Sykes Farm (P and S M Smith and son, Lofthouse, Harrogate, United Kingdom).

351 Dalesbred ewes were used within this study. They were randomly divided into two batches of 175 and 176, with one group being flushed with concentrates and grass and the second group being flushed on just grass two weeks prior to tupping. Ewes were monitored between the 17th October 2020 and 13th February 2021. Throughout the experiment three ewes were excluded from the study. One ewe died on the 26th November, the second ewe died on the 7th January and the third ewe was removed from the study on the 28th January due to contracting pneumonia and aborting its lamb. By the end of the experiment data was collected from 348 ewes. Body condition scoring took place three times throughout the experiment: pre-flushing (17th October 2020), at tupping (4th November 2020) and after scanning (13th February 2020). Flushing both batches began two weeks before ewes were introduced to the tups (21st October 2020).

Routine treatments were carried out throughout the experiment, as would occur on the farm normally. These were dipping, worming and tailing all ewes on the 15th October 2020. On the 17th of January 2021, all ewes were coppered and fluked. They were then scanned by an external company on the 4th February 2021. Worming was carried out again on the 11th February, when a 2ml booster of Heptavac was also administered to each ewe. Vaccination against Enzootic and Toxoplasma abortion was administered to the Shearling ewes approximately 4 weeks prior to tupping (Farm Gate Vets, 2014).

The sample size selected was based off work by Gunn *et al.* (1991), Turkyilmaz *et al.* (2017) and Kenyon *et al.* (2009), who selected similar sample sizes in their studies. Gunn *et al.* (1991) conducted a study on reproductive performance when two Welsh sheep breeds were put onto a rising plane of nutrition. The Brecknock Cheviot and Welsh Mountain had a set number of ewes observed, with 114 and 115 respectively, totalling 229 ewes, whereas, in the research by Kenyon *et al.* (2009) four groups were studied all ranging between 151 and 155. In the study by Turkyilmaz *et al.* (2017) a range of breeds were assessed for a relationship between BCS and reproduction. A total of 395 ewes were used in the study which ranged in age from 2 – 7 years. It was decided to not include a control group in this experiment due to it not being commercially viable on a working farm.

3.3 Equipment

- Coloured electrical tape. To secure on horns of ewes for identifying BCS.
- Raddle powder. Orange, green, black. For assessing conception rates and breaks of service.
- IAE weighing scales (kg). To record weights of ewes.
- Pen and paper. For recording findings.
- Farmworks F200 Electronic Platemeter. To measure grass availability.
- Coloured spray marker. To assess conception rates.

3.4 Data Collection

Body condition score was recorded three times throughout the project: pre-flushing, at tupping and after scanning. This is the minimum number of investigations required to examine BCS. The lack of handling would help to reduce unnecessary stress on the ewes during pregnancy (Dobson *et al*, 2012). BCS was assessed by the same person on all three occasions, and manually written down. Dependant on the BCS, each individual ewe had coloured electrical tape applied securely to their horns pre-flushing. For group one (flushing with concentrates) red, blue and brown were used

for BCS 2 - 2.5, 3, and 3.5+ respectively. For group 2 (flushing with purely grass) yellow, no tape and green were used for BCS 2 - 2.5, 3, and 3.5+. At tupping the BCS was recorded again. Ewes were run through the pens and if BCS had changed, the electrical tape would be altered to correspond with the condition of the ewe. This was again re-assessed after scanning to see whether ewes had kept or lost condition throughout the experiment and mating season, and also compare scanning results with BCS recordings. Whilst recording BCS, 10 randomly selected ewes of each coloured tape were weighed (kg) and an average then taken for the group. See Appendix Three for the BCS data collected.

Grass readings were taken on the day when flushing began. The two flushing fields provided had been shut off from grazing for six weeks previous. Readings were then taken every fortnightly from 4th November 2020 up until 24th December 2020, when ewes were moved from the tupping fields and batched back into two groups. From here ewes were then offered ad-lib silage. To measure the grass throughout the study, a Farmworks F200 Electronic Platemeter was used. To collect this data, the manual was followed which suggested taking 30 measurements per field. The field would be walked in a W shape to get a true representative of the availability of grass throughout the whole field (Platemeters User Manual, not dated).

The measurements obtained from the grass readings are shown in Appendix Four. AHDB (2018) have calculated the feeding requirements for hill ewes at the flushing period. For maintenance of BCS it is recommended that 4.8 MJ/day is required per ewe, which equates to 0.48 kg/DM at a quality of 10 MJ/kg DM. Autumn grass is estimated to be of this quality on average, and each batch of 175 ewes would need to have 1176 kg/DM offered for the fortnight of flushing. Therefore, the grass cover provided to the ewes prior to tupping is of sufficient quantity at 1312 kg/DM and 1217 kg/DM. Ewes in the group given additional concentrates were fed 225g of feed per head, which is a blend of Jameson's Ewedale Gold and Supaflow sugar beet. It is estimated that concentrates at 18% protein contain 12.5 MJ/kg of metabolizable energy stated by AHDB (2018), citing Ewing (1997). Hence, sufficient feed was given to the ewes through flushing. Once the ewes met the tups in November, all were given 225g of the same previous ration.

Raddle marks were applied on the 5th November 2020 to all Blue Faced Leicester tups. This is raddle powder mixed with oil, which was applied generously to the chest and below. Orange was the first colour, followed by green and finally black. Each colour was applied for two weeks and then changed on the 14th day. After the first week, ewes were marked with coloured spray at the back of the head if a raddle mark was observed. This allowed for conception rates to be measured by seeing how many ewes were tupped every 7 days and seeing if any ewes broke service. A table for conception rates is shown in Appendix Five.

Scanning of the ewes was undertaken by an external company on the 4th February 2021. During this process number of lambs in each ewe were recorded in relation to the coloured tape on their horns. A tally was taken and recorded down on paper (see Appendix Six).

3.5 Statistical Analysis

Data was manually inputted into Microsoft Excel spreadsheets. From there Minitab software was used to determine whether there was normal distribution and equal variance. Statistical tests were then run, including; Chi^2 for association, Chi^2 for goodness of fit and Fisher's exact. Any graphs produced were created using Microsoft Excel.

4.0 Results

Statistical analysis

To run the statistical tests, the research data has been identified as discrete count data, with expected frequencies for scanning percentage (0%, 100%, 200% and 300%) being observed. For conception rate a count was produced from the number of ewes raddle marked at each service. From here the returns of service could be observed for the individual groups of concentrates and grass. Therefore, it was decided that the statistical tests being run were Chi^2 for association, Fisher's Exact and Chi^2 goodness of fit.

4.1 Scanning results

Flushing technique: Association between flushing technique and scanning results

From the results found it can be determined that there is no statistically significant association between flushing Dalesbred ewes with concentrates and grass or just grass and scanning percentage (Chi^2, $\chi^2_1 = 0.518$, $p = 0.915$). The scanning percentages for flushing with concentrates was 169%, with scanning percentage for flushing with purely grass being 168%.

Body Condition Score: Association between BCS and scanning results

It can be ascertained from the study that there is a statistically significant association between BCS of Dalesbred ewes and scanning percentage (Fisher's Exact, $p < 0.05$). The average scanning percentage for BCS 2-2.5 was 151%, for BCS 3 was 165.5% and for BCS 3.5-4 was 190%.

Figure 1 shows the scanning percentage (%) achieved from the two different flushing groups and at different BCS. It shows how ewes at a greater BCS scanned at a higher percentage. However, it also shows that there is no significant difference between flushing on concentrates and grass at different BCS.

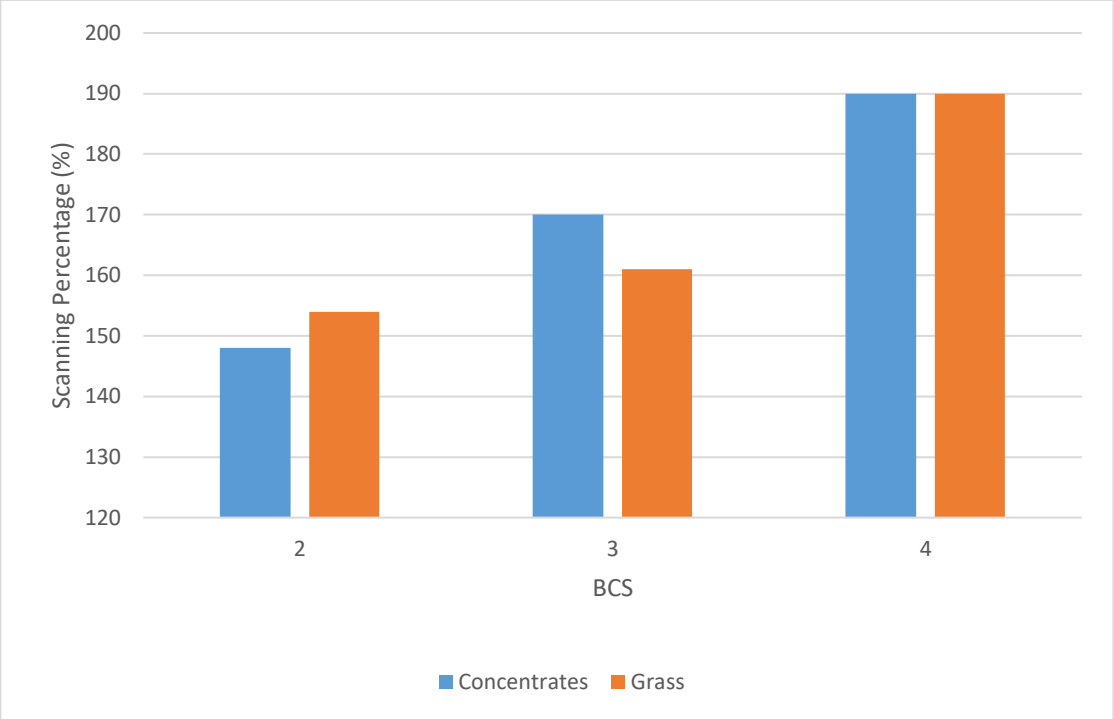

Figure 1 Scanning Percentage (%) from different flushing techniques and at certain BCS.

Figure 2 shows the number of ewes at each scanning result for BCS 2-2.5 (n=68). This graph shows that there are very similar results in scanning results at this BCS.

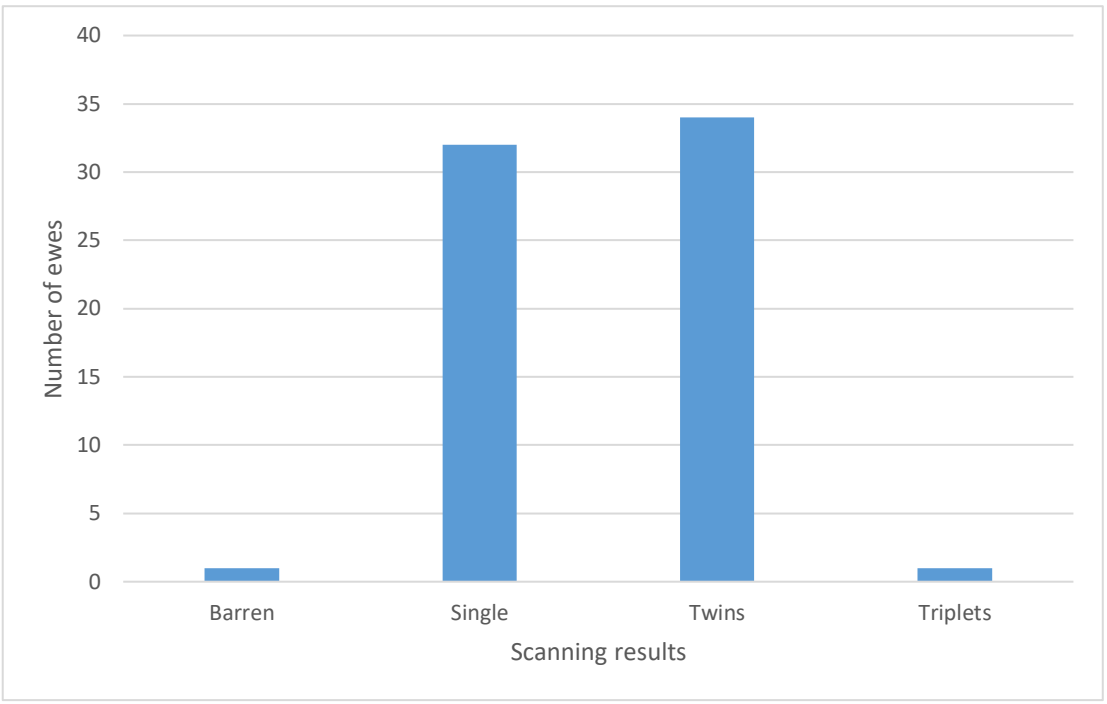

Figure 2 Number of ewes at each scanning result for BCS 2 - 2.5 (n = 68).

Figure 3 shows the number of ewes at each scanning result for BCS 3 (n=169). It shows that there is a significant difference in scanning results at this BCS, with a large proportion being scanned as twins.

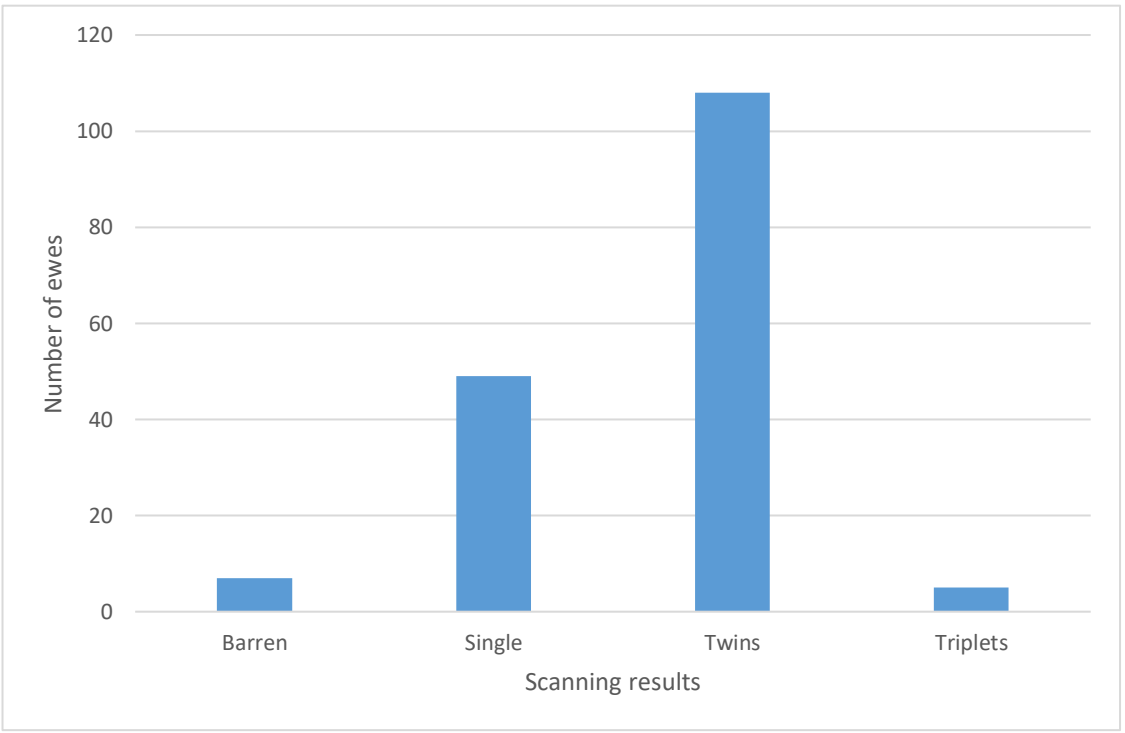

Figure 3 Number of ewes at each scanning result for BCS 3 (n = 169).

Figure 4 shows the number of ewes at each scanning result for BCS 3.5-4 (n=111). This graph is a showing a significant difference in scanning results at the BCS, with the majority of ewes scanning with twins.

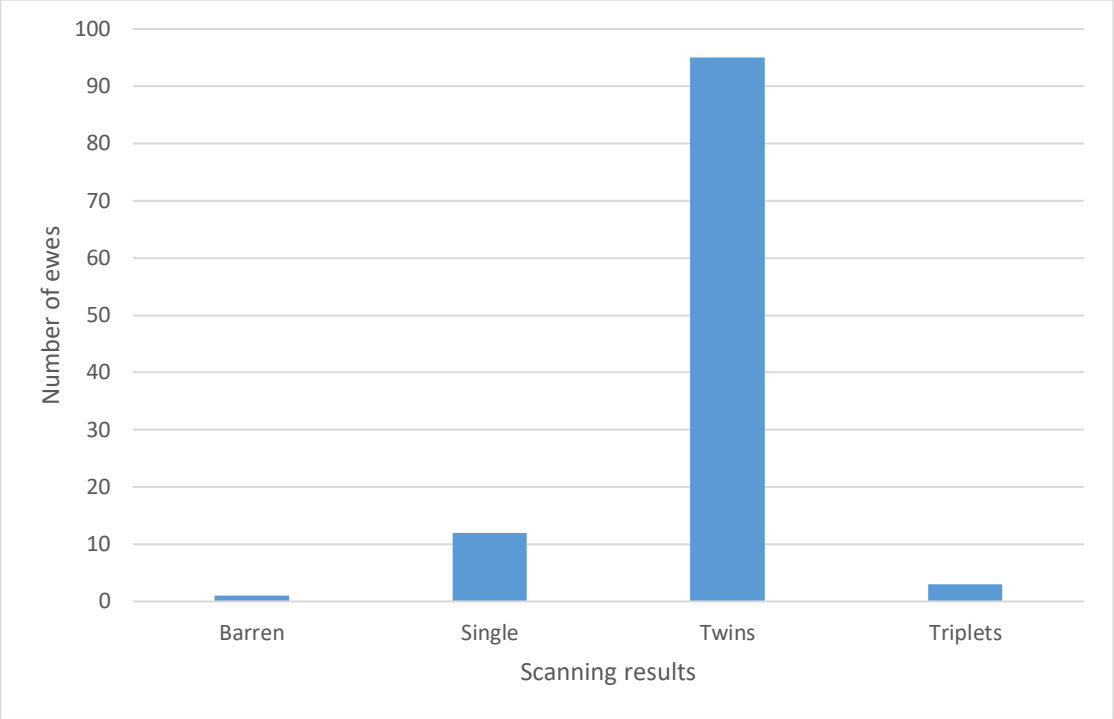

Figure 4 Number of ewes at each scanning result for BCS 3.5 – 4 (n = 111).

4.2 Conception Rate

Conception rate: Difference between number of ewes served in each cycle and flushing technique.

From the study conducted it was shown that there is no statistically significant difference between conception rates of Dalesbred ewes flushed on concentrates and grass or just grass (Chi^2, $\chi^2_1 = 0.137$, $p = 0.711$). The group on concentrates prior to tupping showed that 134 ewes were served within the first service (95.75%). When flushed on grass 128 ewes were served within the first service (91.35%). Within the second service six ewes flushed with concentrates were served (9.25%), whereas eight ewes flushed with grass were served (11.5%).

5.0 Discussion

5.1 Summary of Results

Flushing with additional concentrates compared to being flushed on grass has displayed no significant beneficial properties towards fertility in the flock of Dalesbred ewes at High Sykes Farm. There was no evidence in the study to show any enhancements to fertility by flushing with additional concentrates as both groups performed similarly. Nevertheless, when making a comparison to industry standards and the yearly average for the flock (see Appendix Seven), the scanning performance is greater. SAC Consulting (2019) provide a benchmark figure of 130% scanning percentage for improved hill ewes cross bred with tups such as Blue faced Leicesters, which the flock could be comparable to as they mated with the same breed and are farmed in similar conditions. This shows a large variation between standard industry figures and the results attained from the study, which averaged 169% across the flock.

The climate in which the study was undertaken was favourable during the period of data collection, with a relatively mild mating season and winter. Dobson *et al.* (2020) determine that with harsh weather conditions a stand-off between maintaining condition and retaining a pregnancy occurs when deciding how to react to a change in climate. Typically, an animal will focus on maintenance and therefore, there is a greater chance of decreased oestrus and embryonic loss in poorer weather conditions and the stress it causes (Sawyer and Narayan, 2019). Yet, there is no evidence to suggest this is the case in these results, due to conditions being optimal.

The factor which is likely the most influential towards the results is the current management decisions for the flock. Compared to many flocks found in improved hill and upland areas, the ewes at High Sykes farm are intensively managed, with relatively high stocking rates, finishing all lambs on creep feed and using a hands-on approach. In previous years ewes have always been flushed using grass, and therefore, the scanning rate observed in the current study is not out of place for the flock. Consequently, it could be presumed that this is the reason for a higher-than-

average scanning percentage shown across the whole flock for many years, as shown in Appendix Seven.

The greatest influence on scanning percentage has been the overall BCS of the ewes, which has also been demonstrated in studies by Kenyon *et al.* (2014) and Tait *et al.* (2019). The results show that the different BCS groups performed at different levels throughout the flock, however when compared with flushing techniques in the two batches no difference was observed. Similar results were displayed in a study by Cam *et al.* (2018) and Sejian *et al.* (2010), where ewes at certain BCS (the range of 2.5 – 3.5 and 3 – 3.5 respectively) performed better in relation to fecundity, litter size and fertility rates. Kenyon *et al.* (2004) predicted that when a BCS of 3.0 or above is shown, a longer breeding season will be observed, hence ewes may not hold to first service, as well as there being less of a response shown to improving nutrition prior to mating. Page (2020) also suggests that an increase in triplets will be shown in older ewes and prolific breeds which are already at target condition score at tupping. Therefore, flushing ewes which are already in good condition will show no advantage (Kenyon *et al,* 2004). Despite this, the results from the current study performed greatest at BCS 3.5 – 4. Research by Esmailizadeh *et al.* (2009) suggest that it is the change in BCS prior to and during mating which has the greatest effect on the ewe's reproductive performance. This indicates that the change in BCS recorded prior to and at tupping, initiated by a rise in nutrition from flushing with different techniques, could be the cause for the results obtained in the study which were higher than the flock average. Nutrition is vital in the first months of pregnancy when ovulation and development of the foetus is taking place, with Munoz *et al.* (2008) implying that a rise in nutrition is the greatest factor in managing early pregnancy. This adds further credence to the idea that a change of condition score is the greatest influence when flushing, as a rise in nutrition will help the ewe to improve condition and liveweight prior to tupping.

Studies by Henderson (1990) and Kelly (1982) state a standard industry figure for first service mating as a range between 75% and 85% of ewes, with an average return rate of service being 11%. This shows that both batches in the study showed superior conception rates at 95.75% and 91.35% respectively. The association between ovulation rate and liveweight has been shown to be positive (Thompson *et al,* 1985), with a rise in liveweight indicating an increase in overall

ovulation rate, and consequently conception rate. AHDB (2016) indicate that for every unit on the BCS scale the ovulation rate of an ewe can alter by 45%, showing how critical it is to get nutrition and management correct during the tupping period in order to achieve productive conception and scanning percentages. The superior rates of conception shown are also most likely caused by management techniques, as previously discussed, with the optimal climate conditions during the mating period, assisting in the onset of oestrus, and embryo implantation.

The difference between feeding ewes for maintenance compared to feeding ewes to gain weight can be drastic and the requirements can vary from feeding an extra 2.5 MJ/kg of ME up to 10 MJ/kg of ME (AHDB, 2018). The calculations undertaken for this study were based off figures for maintenance, which is aimed at ewes already in optimum BCS of 3.0 for hill sheep (Annett *et al.,* 2011). Consequently, ewes which were below this optimum condition score and in the batch and which were flushed on just grass would not have had enough additional feed in order to gain weight and improve condition. Undernutrition of the ewe in the early stages of pregnancy and prior can affect ovulation rate, gestation length and litter size (Cleal *et al.,* 2007), with there also being a suggestion that birth weight is observed to be lower and the development of offspring of undernourished ewes can be slower specifically in adult female sheep (Rae *et al.,* 2002). On the contrary, Munoz *et al.* (2009) recommend that in younger ewes a restriction of nutrition can cause an increase in prolificacy and maternal instincts, indicating that nutritional requirements vary greatly depending on aspects such as age and condition of the ewes. Therefore, it would be extremely difficult to get the correct nutrition for all ewes when they are run as a whole flock in large groups.Overall, caution should be taken in relation to the figures produced here as they represent one flock in one particular year.

5.2 Financial assessment

Data for this section was taken from the 2020 averages for the flock at High Sykes Farm, as well as standard figures and templates brought from the Farm Management Handbook 2019/2020 (SAC Consulting, 2019).

The results have shown that BCS has a significant influence over reproduction. For ewes in BCS 2 – 3, there is great variation in scanning results. However, when in a condition score over 3 ewes were performing at a consistent level of 190% scanning percentage. This was shown across both flushing techniques of concentrates and grass or just grass, and from this it has been determined that the optimum BCS for these Dalesbred ewes is above 3, matching the suggestion by Quality Meat Scotland (2015) of 3 and above for hill ewes. The average scanning percentage for BCS 2 – 3 has been estimated to be 155%. From this, an assessment of the financial benefits has been undertaken with gross margins produced for a scanning percentage of 155% (Appendix Eight) and 190% (Appendix Nine).

It has been identified by the current study that BCS had a greater affect than the feed ration given to the ewes. Therefore, the concentrates given to ewes in the correct BCS are unnecessarily costly. However, it could be suggested that feeding ewes at a BCS 3 or below prior to mating is a worthwhile practice that would show benefits to the flock and the performance of individual ewes. This could either be done with sufficient grass or a concentrate ration, given as dietary requirements are met for maintenance plus weight gain.

These assessments of finances and the results of different scanning rates indicate the benefits of preparing the ewes for tupping and emphasising the need for correct BCS of above 3, as the ewes are reliably performing at this stage. If this were to be achieved within the flock, the gross margins produced have shown that a further profit of £2950 per 100 ewes could be reached.

During the study there was a flushing period which lasted for 14 days. During this time, the ewes were stocked at 2.71 Livestock Units/ha. SAC Consulting (2019) indicate that stocking at this level is very intensive and would not be sustainable when increasing nutrition over a longer period of time. The flushing period needs to be adapted for different groups of BCS, with the chosen amount of time being altered by how much condition needs to be gained prior to tupping, and how these requirements for this can be met. Figures from AHDB (2018) show that per ewe, a requirement of 0.84 kg DM needs to be achieved to maintain BCS. This equates to 8,400 kg DM per 100 ewes for 100 days. However, there is a vast difference when

feeding for gaining condition score, with ewes needing to gain 1.0 on the BCS score requiring 1.54 kg DM. Meaning, 15,400 kg DM is needed for 100 ewes for 100 days, a difference of 7,000 kg DM for the increase of one condition score.

5.3 Study limitations

The main limitation of the study was the lack of a control group. The reasoning for this is mainly due to High Sykes Farm being a commercial hill farm which needs to be viable and profitable. Studies which lack a control group are stated to still provide valuable information which could represent uncommon events and adverse conditions in which the study was carried out (Fitzpatrick-Lewis *et al,* 2009).

Differing sample sizes for groups of condition scores also pose as a drawback to the project. In both the concentrate and grass groups a similar number of ewes were recorded (BCS 2-2.5 n= 37, 31, BCS 3 n = 86, 83, BCS 3.5-4 n = 50, 61). However, the difference in sample sizes is a true reflection on the condition of ewes at that time. Consequently, this study will still produce beneficial results on fertility of Dalesbred ewes in this one flock.

When analysing conception rate, a batch on 70 ewes had to be removed due to them being a mix of flushing groups which were put together at tupping. This was due to there being a limited number of tupping fields available. Therefore, the author was unable to evaluate the conception rate of this group compared to either being flushed on concentrates or grass.

6.0 Conclusion

The findings from the study have lent further support to existing knowledge on fertility of Dalesbred ewes by comparing different flushing techniques whilst also measuring BCS. It has been concluded that there is no association between flushing with additional concentrates compared to flushing on just grass and the performance of ewes relating to fertility. However, an association between BCS and fertility has been identified, with an emphasis on reaching the correct score prior to mating.

Therefore, it has been deduced that the flushing period is variable as different ewes will need to meet different feeding requirements, with some needing to maintain condition score and some needing to gain condition by differing amounts. The feeding requirements would be presumed to be met by grass, nonetheless if there is not a sufficient amount of grass or it is not of specified quality then it could be met by feeding concentrates.

When compared with past studies, the research produced has acknowledged that the Dalesbred flock has performed within the patterns surrounding breeding sheep already identified previously. The author suggests that further research into the fertility of hill sheep is needed, evaluating a range of flocks and different systems to inform farmers on the predicted outcomes of different practices. By concentrating on a small breed, this project can assist in insights of patterns in breeding, fertility, and performance, which may be applicable to a large proportion of sheep breeds. The results found, and any future research, could help to promote Dalesbred and improve the current flock numbers, which may assist in the development of more sustainable sheep farming in certain areas by introducing certain breeds and crosses (Bowles, 2015). The author recommends that in future work the focus should be on BCS and its relationship to fertility within different breeds and scores. The common aims of production and performance remain and can be achieved by incorporating the research observed in the study and applying it to individual flocks.

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8.0 Appendices

Appendix One: Ethical Approval Certificate

Appendix Two: Map of the locality of Dalesbred flocks

Appendices Three: Body Condition Score Data

Flush with concentrates (group 1)			Tupping 04/11/2020			Scanning 04/02/2021						
17/10/2020			04/11/2020			13/02/2021						
BCS	No.	Wt (kg)	BCS	No.	Wt (kg)	BCS	No.	Barren	Single	Twin	Triplet	Wt (kg)
2	9	49	2	3	48	2	7		5	2		
2.5	47	53	2.5	34	54	2.5	42	1	16	24	1	
3	89	55	3	88	56	3	86	3	16	64	3	
3.5	19	57	3.5	37	57	3.5	31	1	5	25		
4	11	57	4	13	58	4	7		2	5		
	175	55		175	56		173	5	44	120	4	57

Flush with grass (group 2)												
17/10/2020			04/11/2020			13/02/2021						
BCS	No.	Wt(kg)	BCS	No.	Wt(kg)	BCS	No.	Barren	Single	Twin	Triplet	Wt (kg)
2	7	48	2	5	49	2	9		5	4		
2.5	29	54	2.5	26	53	2.5	53	1	24	27	1	
3	89	54	3	83	54	3	69		15	51	3	
3.5	38	56	3.5	45	56	3.5	34	2	4	27	1	
4	12	58	4	16	58	4	10	1	1	8		
	176	54		176	55		175	4	49	117	5	56

Appendix Four: Grass Readings

Pre-tupping		21/10/2020							
	ha		kg/DM						
Front M	4.81		1312						
Watertanks	6.02		1217	Flushing group - fed on Jameson 50/50 Ewedale gold 18% and Sugar beet supaflow					
Tupping									
		04/11/2020		22/11/2020		07/12/2020		24/12/2020	31/01/2021
	ha		kg/DM		kg/DM		kg/DM	Moved to Watertaks or bottom	All being fed Jameson 50/50
1. Top M	5.07		1037		1006		916	175 on each	ad-lib silage
2. Jockum	6.09		1021		1015		921	ad-lib silage	
3. First end	6.83		982		917		882		
4. Far end Bottom	5.08		974		906		851		
5. Far end top	6.04		1007		989		907		
		All fed Jameson 50/50		All fed Jameson 50/50		Fed just sugarbeet supaflow until 31/01/2021			

Appendices Five: Conception Rates

1st Service			T M	J	First E	Far E B	Far E T
	Week 1		52.1	50.7	67.1	54.9	61.4
	Week 2		95.8	86.9	84.3	97.2	94.3
2nd Service							
			7.1	15.9	11.4	5.6	12.9
3rd Service							
			0	1.4	0	1.4	0

Appendix Six: Scanning Results

			Barren	Single	Twins	Triplets	%
Red	37		1	17	19	0	148
Blue	86		4	21	58	3	170
Brown	50		0	6	43	1	190
	173						
Yellow	31		0	15	15	1	154
No colour	83		3	28	50	2	161
Green	61		1	6	52	2	190
	175						

Appendix Seven: Scanning Results for the Past Five Years

Year	***Scanning Percentage (%)***
2020	172
2019	156
2018	159
2017	160
2016	159
Average %	**161**

Appendix Eight: Gross Margin for Scanning Percentage 155%

Gross Margin (155%)

		£/100 ewes	
		Scanning rate (%)	
			155%
Output			
	Ewe lambs		
	@ £90	75	6,750
	Finished lambs		
	@ £80 (42kg lwt)	80	6,400
	Cast ewes		
	@ £50	15	750
	Wool sales		
	200kg @ £0.15/kg		30
			13,930
Less			
	Ram replacement		400
			13,530
Variable costs			
	Sheep feed		
	Ewe Concentrates @ £256/t		984
	Vet and Med		783
	Bedding straw		
	£90/t (bought in)		302
	Commision, levies, haulage, scanning, tags		1,149
			3,218
Gross Margin before forage			10,312
Forage variable costs			
	0.7ha hay @ £275/ha		193
	Improved permanent pasture @ £149/ha		1,490
			1,683
Total variable costs			4,901
Gross Margin			8,629
Gross Margin per forage ha			862

Appendix Nine: Gross Margin for Scanning Percentage 190%

Gross Margin (190%)

		£/100 ewes	
		Scanning rate (%)	
			190%
Output			
	Ewe lambs		
	@ £90	90	8,100
	Finished lambs		
	@ £80 (42kg lwt)	100	8,000
	Cast ewes		
	@ £50	15	750
	Wool sales		
	200kg @ £0.15/kg		30
			16,880
Less			
	Ram replacement		400
			16,480
Variable costs			
	Sheep feed		
	Ewe Concentrates @ £256/t		984
	Vet and Med		783
	Bedding straw		
	£90/t (bought in)		302
	Commision, levies, haulage, scanning, tags		1,149
			3,218
Gross Margin before forage			13,262
Forage variable costs			
	0.7ha hay @ £275/ha		193
	Improved permanent pasture @ £149/ha		1,490
			1,683
Total variable costs			4,901
Gross Margin			11,579
Gross Margin per forage ha			1,157