

The impact of alternative bedding material on sheep behaviour, health and welfare

Report 9

Woodchip for Livestock Bedding Project

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Mae'r Proiect Sglodion Pren ar gyfer Sarnau Dia Byw a gyflenwir gan Hybu Cig Cymru yn derbyn arian cyfatebol gan y Comisiwn Coedwigaeth, Asiantaeth yr Amgylchedd Cymru a Llywodraeth Cynulliad Cymru fel rhan o Cyswllt Ffermio.

Introduction

High straw prices and subsequent transportation costs into Wales have led to an increased interest in alternative bedding materials.

Recent studies have suggested that woodchip could be a viable bedding material. Anecdotal evidence suggests that woodchip had a behavioural impact on sheep causing them to stand for longer periods of time than when bedded on straw. It is thought that periods of unrest may have an impact on voluntary feed intake and thus feed conversion rates. The subsequent effect on lamb development is unknown.

There have been limited studies looking at Canary Reed Grass (CRG) as a bedding material. Studies have been conducted on store lambs showing that CRG was a feasible option that did not present additional health or welfare issues. As yet studies have not been carried out using pregnant ewes.

This study will allow behaviour to be monitored on each bedding type by introducing static video cameras. Subsequent lamb birth weights and any lambing difficulties will be recorded.

Experimental Protocol

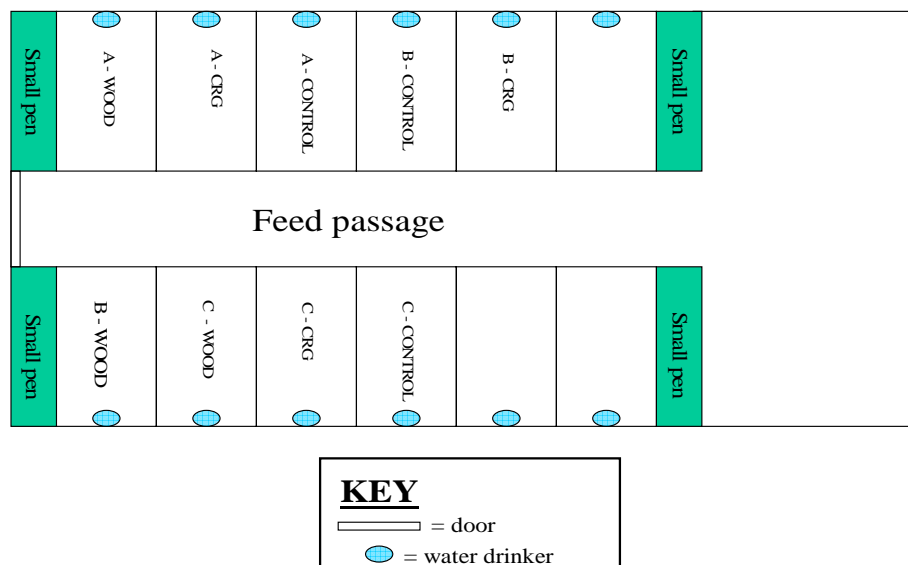
A study of the effect of each bedding material on ewe performance, behaviour, health and welfare was carried out at ADAS Pwllpeiran during the housing and lambing period of 2008 in a purpose built experimental sheep shed.

The study had a total of nine pens, each consisting of 34 twin bearing Welsh Mountain ewes. The three treatments; control (wheat straw), woodchip and CRG were replicated three times. The treatments were randomly allocated to each pen (Figure 1).

The experiment began on January 30th 2008 after scanning, when the twin bearing ewes had been established. Ewes were weighed and condition scored, before they were allocated according to weight and condition score to the treatments. Three hundred and six ewes with a condition score between 1.5 and 4.5, with sound feet and no signs of ill health were allocated to the trial.

Pens were examined daily and the quantity of bedding material used and the frequency of re-bedding were recorded for each treatment. At the start of the trial, pens were limed and bedded to a depth of 10cm. 5kg of lime was added to the front section of the pens each week. Bedding material samples were collected from each pen weekly for dry matter analysis.

Figure 1 Experiment Layout



Ewes were weighed and condition scored again on weeks 4 and 8 of the trial. The ewes were condition scored on a scale of 0-5 using intermediate half and quarter points as appropriate. Ewes were also assessed for locomotion at each weighing. Ewes were assessed for cleanliness weekly using the Meat Hygiene Service (MHS) classification. It was aimed to maintain a cleanliness score of category 2 or better.

The behaviour of the ewes on each treatment was recorded using static video cameras and infra-red for overnight recording. Assessments were made on the number of ewes standing, lying, feeding and in transition. This data was then analysed using a two-way Analysis of Variance. The lambing difficulty, lamb weights, ewe condition score and udder cleanliness were recorded on day of lambing. Lambing commenced on March 24th 2008.

For each pen feed intakes were monitored for eight weeks. The ewes ration consisted of grass clamp silage and concentrate supplement. Silage samples were sent for nutritional analysis to formulate a ration. Over the period of the trial concentrate feeding increased with standard practice for housed twin bearing ewes entering late pregnancy. Silage was offered ad-libitum (10% more than calculated required daily intake) and weighed before given. Feed refusals were weighed before fresh silage was given.

Results

Quantities of bedding material

All pens were initially bedded to a depth of 10cm and then topped up as necessary. The quantities of bedding material used in the first eight weeks are given in Table 1 and the quantities of bedding used over lambing are given in Table . As ewes lambbed the stock densities reduced to a level where re-bedding became infrequent. Pens were amalgamated within the treatments in line with standard Pwllpeiran practice. It was decided not to include the data for re-bedding after April 8th. The total cost of bedding was calculated using £63 per tonne for straw, £64 per tonne for CRG (if it was purchased) and £50 per tonne for woodchip. The woodchip had an average moisture content of 32.61%. The canary reed grass had an average moisture content of 18.53%. The straw had an average moisture content of 18.00%.

Table 1 Bedding material used in the first eight weeks

Bedding Material	Number of applications	Mean interval between applications (days)	Total weight (tonnes)	Total cost (£)
Straw	20	2.95	2.79	175.77
Woodchip	19	2.95	8.21	410.50
CRG	21	2.75	3.14	200.96

Table 2 Bedding material used per animal in the first eight weeks

Bedding Material	Weight (kg)	Total cost (£)
Straw	27.35	1.72
Woodchip	80.49	4.02
CRG	30.78	1.97

Table 3 Bedding material used over lambing (March 26th – 8th April)

Bedding Material	Number of applications	Mean interval between applications (days)	Total weight (tonnes)	Total cost (£)
Straw	5	2.20	0.84	52.61
Woodchip	4	3.25	1.09	54.45
CRG	5	2.60	0.70	44.74

Considerably more woodchip (tonnes) was used compared to straw and CRG, although less woodchip was used than in the previous study per pen. For an eight week period in the previous study 4 tonne of woodchip was used for each pen, compared to less than 3 tonne used per pen in this study, and this year the woodchip was clean enough for the shepherds to be happy to lamb the ewes on it.

Frequency of application of additional bedding material was less on the woodchip than on the straw and the CRG. A draw back of the application of woodchip is the difficulty of application and the high labour time. The cost per animal is also considerably higher for woodchip, double the cost of straw and CRG.

The relative humidities were monitored outside and inside the shed. The pens required higher frequency of bedding during periods of high relative humidity. During February the weather was unusually warm and dry which may have affected the frequency and quantity of re-bedding.

Animal feed intakes

The results for the feed intakes are given in kg Dry Matter / head / day in Table 3. The ewes were fed silage and a commercial concentrate at a stepped rate per head per day in line with stage of pregnancy. The ewes were fed 250g of concentrates per head for the first four weeks, then 350g per head for weeks 4-6, and 450g per head for weeks 6-8 in the trial.

Table 3 Silage intakes per ewe

Bedding Material	Total silage intake over 8 weeks kg fresh weight / head	Total silage intake over 8 weeks kg DMI/ head	Average silage intake kg DMI / head / day
Straw	136.31	25.05	1.09
Woodchip	137.99	25.36	1.10
CRG	135.33	24.87	1.08

There is little difference in the DMI of the ewes on the different bedding treatments. There is only 0.01 kg DMI/head/day difference between each treatment. The ewes on the woodchip had a slightly higher DMI than the ewes on the straw and CRG. The ewes on CRG had the lowest DMI.

Animal performance

Ewes were weighed and condition scored as they were put on to the trial on the 30th January and again in week four of the trial (25th February). The ewes were also condition scored at lambing. It was impractical to do the eight week weights and condition scores as lambing had already commenced. No ewes died during the trial, although one ewe was removed for health reasons and replaced. She was a ewe that was lambing for the first time and was removed from the woodchip because she was not eating and socially isolated herself.

In the first four weeks the ewe weights hardly changed. Some increased slightly while others decreased. The ewe body condition score decreased around half a body condition score in the first four weeks on straw and CRG. It is expected at this stage of pregnancy that ewes may lose some condition. The ewe body condition score of the ewes on the woodchip did not decrease in the first four weeks. By lambing the ewe body condition score had decreased further. At this point all treatments were similar.

The numbers of lambs born alive or dead were recorded along with the lamb birth weights. The lambs have also been monitored and recorded up to two weeks of age. This data is given in Table 5.

Table 5 Lamb data

Bedding material	Average birth weight (kg)	Lambs born dead (%)	Lambs died up to 2 weeks of age (%)
Straw	2.99	1.96	1.96
Woodchip	2.98	2.45	2.45
CRG	3.00	1.47	3.43

The bedding material does not appear to have affected the average birth weights of lambs and there was no obvious difference between bedding on the date of lambing. There was very little variation in the number of lambs born dead between each treatment. One ewe gave birth to premature lambs on woodchip, the bedding material was not considered responsible for this. A small number of lambs died in their first two weeks of their life, bedding treatment does not appear to affect this.

Animal behaviour

The ewes were recorded using static cameras, time lapse recorder and a video multiplexer. A pen in each treatment was recorded during the day and night at different times throughout the trial. The number of ewes standing, lying, feeding and in transition were recorded at 20 minute intervals and calculated as a percentage of the total pen. The percentage of ewes standing and lying on woodchip and CRG in comparison to straw has been graphed (Figures 2 & 3). The percentage of ewes standing does not include the ewes standing to feed at the feed face. The ewes were fed concentrates between 07:30 - 08:00 and 16:00 -16:30.

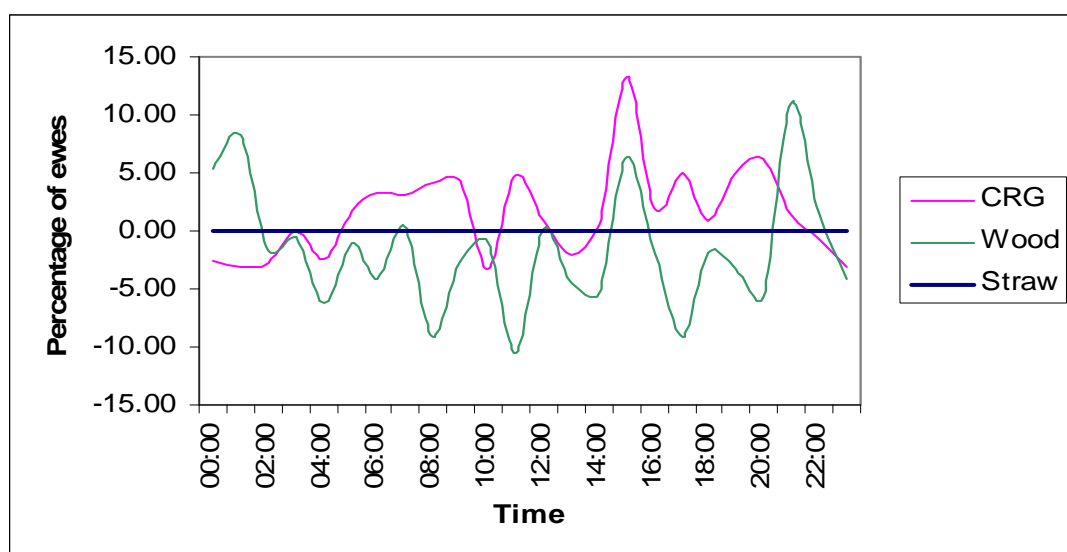


Figure 2 The percentage difference of ewes lying on woodchip and CRG compared to straw

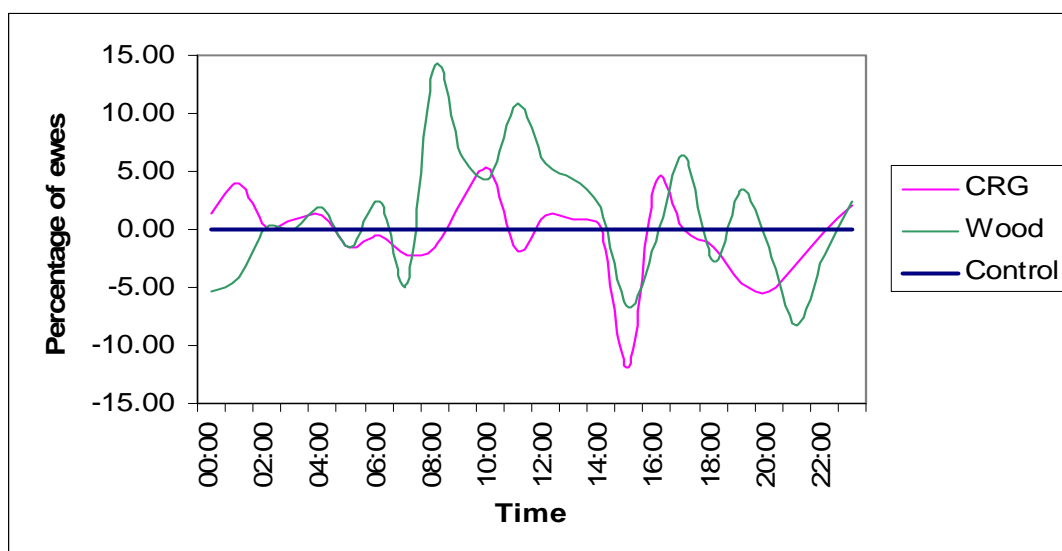


Figure 3 Percentage difference of ewes standing on woodchip and CRG compared to straw

Generally the ewes on woodchip spent less time lying than ewes on straw, with exception of the hours between 23:00 and 02:00. Consequently the ewes on woodchip spent more time standing, particularly between 07:00 and 15:00. Generally the ewes on CRG spent more time lying than ewes on straw with the exception of the hours between 22:00 and 03:00. The ewes on CRG spent similar time standing to ewes on straw with the exception of the hours between 15:30 and 22:00. The ewes on CRG had a more similar pattern of behaviour to the ewes on straw than the ewes behaviour on woodchip compared to straw. The differences observed were not statistically significant.

Animal cleanliness and health

All ewes were cleanliness score category one according to the MHS cleanliness scores, when they were put on to the trial. Cleanliness scores were recorded at the end of each week, recording an average score for the whole pen. The cleanliness score results are given in Table 6. In week 7 all ewes were crutched and ewes lambing for the first time were bellied, thus all returning to a cleanliness score category 1.

Table 6 Cleanliness scores

Bedding Material	Week							
	1	2	3	4	5	6	7	8
Straw	2	1	2	2	1	1	1	1
Woodchip	2	2	2	2	2	2	1	1
CRG	1	2	2	2	2	2	1	1

Individual cleanliness scores and locomotion scores were recorded in week 0 and week 4. The average cleanliness and locomotion scores for each treatment are given in Table 4. Over the first four weeks the ewes did get slightly dirtier, which is expected when they are first housed. There were also

some problems with feet, but this was common across all treatments. The number of ewes treated for feet problems was recorded and the data is given in Table 5. Bedding material did not appear to affect the number of feet problems or the cleanliness.

Table 4 Individual cleanliness score and locomotion

Bedding Material	Cleanliness		Locomotion	
	Week 0	Week 4	Week 0	Week 4
Straw	1	1.51	0	0.09
Woodchip	1	1.44	0	0.07
CRG	1	1.55	0	0.16

Table 5 Ewes treated for lameness

Bedding Material	Locomotion score					Total lame
	1	2	3	4	5	
Straw	6	1	3	0	0	10
Woodchip	0	6	3	2	0	11
CRG	6	1	4	0	0	11

All health problems were recorded in the study, and very few were seen. Two ewes were treated for eye infections, one from the woodchip and one from straw treatments. Both ewes were treated with Orbenin ophthalmic ointment.

When the ewes lambed, their udder cleanliness was scored. This data is available in Table 6. The majority of the ewes had clean udders on all treatments. There were nine or less ewes on all treatments with dirty udders but the teats were clean. There was one ewe on the straw and one ewe on the CRG that had a dirty udder and teats.

Table 6 Udder cleanliness (ewes lambed to date)

Bedding Material	Score		
	A	B	C
Straw	72	9	1
Woodchip	73	9	0
CRG	72	8	1

The lambing difficulty was recorded for each ewe (Table 7). The majority of the ewes did not require any assistance (score 1). Five ewes needed slight assistance, 1 on straw, 2 on woodchip and 2 on CRG. Eight ewes required more assistance where it was thought the lamb may die without help. There was very little variation between treatments. The bedding material had no effect on the lambing difficulties.

Table 7 Lambing difficulties

Bedding Material	Score					
	1	2	3	4	5	6
Straw	79	0	1	2	0	0
Woodchip	77	1	2	2	0	0
CRG	75	0	2	4	0	0

The lambs health was monitored up to two weeks after lambing. At birth all lambs had prophylactic treatment of Spectam Scour Halt and 0.5ml Duphacycline. Despite this there were four cases of joint ill (two lambs from the woodchip treatment, one from straw and one from CRG). There was also one case of watery mouth from the woodchip treatment.

Conclusion

The behaviour, health and welfare of the ewes and lambs were found to be satisfactory on all bedding materials. Woodchip and CRG can both be used as alternative bedding to straw. Despite no significant difference being found, ewes were observed spending longer periods of time standing on woodchip, compared to straw and CRG during the day. This did not seem to have any adverse affect on the ewes or their lambs. It is thought that the slight difference in feed intake is due to the amount of edible components in the bedding.

The cost of woodchip is greater than the CRG, and the cost of CRG is greater than straw. The CRG was produced on the farm and the cost has been calculated using commercial prices if it was purchased. The cost of all bedding material in this study can be reduced if they are produced on farm. It is possible to grow CRG and use waste wood on the farm to reduce the cost of bedding.

Appendix 1 Assessment Scores

Locomotion scores

	0	1	2	3	4	5
Bears weight evenly on all four feet	*					
Slight lameness – no signs of distress		*				
No weight bearing on affected limb when standing			*			
No weight bearing on affected limb when moving				*		
Extreme difficulty on rising				*		
More than one limb affected					*	
Reluctant to move					*	
Refuses to stand or move						*

Udder cleanliness scores

	CODE
Udder and teats clean	A
Udder dirty, teats clean	B
Udder and teats dirty	C

Lambing difficulty scores

	EXAMPLES	SCORE
No assistance required	Lambled without any help	1
Assisted as management decision	Intervene to avoid losses during periods when no supervision can be provided	2
Slight lambing difficulty	Slight pull, 1 leg back	3
Moderate lambing difficulty	E.g. legs back, back legs first – lamb may die without help	4
Severe lambing difficulty	E.g. lamb stuck / oversized – ewe and lamb at risk without help	5
Veterinary assistance required	Caesarean	6