Agricultural Experiment Station Bulletin 495

Response of Ewe Lambs To Hay Quality And Feeding Method

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March 1968

UNIVERSITY OF IDAHO
College of Agriculture

This bulletin is a result of cooperative research by the

United States Department of Agriculture

and the

University of Idaho

AGRICULTURAL EXPERIMENT STATION

University of Idaho **College of Agriculture**

Moscow, Idaho

3M SY 3-68

Summary

During a 112-day period the response of 965 Rambouillet, Targhee and Columbia replacement ewe lambs to three methods of winter feeding was investigated. The methods were: Baled alfalfa hay fed on the ground; alfalfa pellets supplied through self-feeders; and limit-fed alfalfa pellets in troughs. Alfalfa hay from a high and low quality source and fed in pelleted form was also compared. The hay-fed lambs received an average of 4.50 pounds of hay per head per day. The self-fed lambs consumed approximately 5.64 pounds per head per day and the limit-fed lambs were fed 3.40 pounds per head per day. Traits observed to measure lamb response were body weight gain, yearling body type and condition, visual wool grade, staple length and clean fleece weight.

Digestion trial results involving the three types of rations showed that the apparent digestibility of the high-quality hay, either coarse chopped or pelleted, was greater than the low-quality pelleted hay.

Self-fed lambs gained 67 percent faster than those fed long hay on the ground. Limit-fed lambs gained 41 percent faster than hay-fed lambs. On an as-fed basis 61 percent less feed was required per pound of gain in the self-fed treatments and 53 percent less feed in the limit-fed treatments than that required in the treatment where alfalfa hay was fed on the ground. Extreme waste occurred using the method of feeding hay on the ground. Quality of feed had little or no effect on feedlot gains of self-fed lambs. Quality of hay pellets had little effect on feed utilization of self-fed lambs but was important where lambs were limit-fed. Feed cost per pound of body weight gain averaged $0.16 for pellet-fed lambs and $0.25 for hay-fed lambs. These results showed that replacement ewe lambs on self-feeders attained very heavy body weight their first winter. However unless some method can be developed which will reduce the feed intake of lambs on self-feeders, it appears that this method of feeding is not practical for growing replacement lambs. The limited-feeding method appears to be the most practical of the methods reported here for feeding replacement ewe lambs.

Self-fed and limit-fed lambs produced more clean wool than the hay-fed lambs in all breed-year classifications. Many of these differences were economically important. The increased value of the clean fleece from sheep in the pelleted feeding treatments over hay feeding ranged from $0.24 to $1.02 per fleece.

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Response of Ewe Lambs To Hay Quality and Feeding Method

D. A. Price, K. R. Frederiksen, R. D. Humphrey

Many commercial sheep producers keep ewe lambs through the winter for flock replacements as yearlings. One of the major winter feeds for replacement ewe lambs is alfalfa hay. The hay is often variable in quality and is usually fed on the ground, resulting in considerable feed loss. Pelleting has developed as a new method of preparing feed and offers opportunity for reducing feed, labor and transportation costs in feeding of sheep.

Several authors have reported increased gain and improved feed efficiency resulting from pelleting of feeds for lambs and ewes (Bell et al., 1954; Cate et al., 1954; Lindahl and Davis, 1955; Neale, 1955; Lindahl and Terrill, 1963). From a review of the literature, Beardsley (1964) concluded that by grinding and pelleting an ordinary quality forage, feed intake, daily gain and feed efficiency were greatly increased. Blaxter and Graham (1956) reported a depressed digestibility on pelleted roughage, but other workers have found only a negligible or no effect (Long et al., 1955; Lindahl and Davis, 1955; Esplin et al., 1957; Meyer et al., 1959; Weir et al., 1959; Lindahl and Reynolds, 1959). Reynolds and Lindahl (1960) found an increase in digestibility of pellets over hay when calculated on an "as fed" basis. Limited information is available on the value of pelleted alfalfa as a winter feed for replacement ewe lambs.

The purpose of this experiment was to study the response of replacement ewe lambs to three methods of winter feeding — baled alfalfa hay fed on the ground, alfalfa pellets supplied through self-feeders and limit-feeding of alfalfa pellets in troughs. Alfalfa hay from a high and low quality source and fed in pelleted form was also compared.

Table 1. Numbers of lambs by treatments, breeds and years.

Treatment description	Year and Breed						No. of sheep by treatments
	1961			1962			
	Rambouillet	Targhee	Columbia	Rambouillet	Targhee	Columbia	
1—High-quality alfalfa hay, baled, fed on the ground	33	32	32	33	33	33	196
2—High-quality alfalfa hay pellets, self-fed	34	30	31	32	32	33	192
3—Low-quality alfalfa hay pellets, self-fed	34	28	31	33	33	32	191
4—High-quality alfalfa hay pellets, limit-fed	33	33	31	33	31	34	195
5—Low-quality alfalfa hay pellets, limit-fed	33	33	28	32	33	32	191
No. of sheep by breeds each year	167	156	153	163	162	164	965

Materials and Methods

This experiment was replicated in 1961 and 1962 and included a total of 965 Rambouillet, Targhee and Columbia ewe lambs which weighed about 82 pounds and were 250 days old when placed in the feedlot. The 112-day feeding period was from December through March. The five feedlot treatments are described in table 1. The lambs were allotted to the treatments by breed, type of mating and sire.

Hay quality was based on crude protein content. The baled alfalfa hay used in treatment 1 and pelleted alfalfa hay used in treatments 2 and 4 were from the same source each year. Pellets for treatments 3 and 5 were from the same source. The pelleted rations were prepared by grinding the alfalfa hay through a 6/64-inch screen and pelleting with a 1/4-inch die. Proximate analysis of the rations was obtained each year and in 1961 a conventional digestion trial was conducted to determine their apparent digestibility.

Three methods of feeding were compared. Treatment 1 represented a typical wintering practice in the Snake River Valley for range sheep. The lambs were moved to a farm from the sagebrush-grass range and baled alfalfa hay was fed on the ground twice daily. The lambs were fed all the hay they would clean up each feeding. This averaged 4.50 pounds per head per day. The amount of hay fed was determined by weighing representative bales. No attempt was made to determine weigh back on the baled hay fed.

The lambs in treatments 2 and 3 had constant access to alfalfa pellets in self-feeders. To obtain feed consumption in the self-fed treatments, all feed was weighed into the self-feeders and the uneaten feed weighed back at the end of the experiment. The 112-day average feed consumption was 5.60 pounds and 5.71 pounds per lamb daily for treatments 2 and 3, respectively.

Lambs in treatments 4 and 5 were limit-fed 3.40 pounds of pellets per head per day in wooden troughs. All lambs had free access to water and salt.

Traits observed to measure the lamb response to these treatments were body weight gain, yearling body type and condition, visual shearing grade, staple length and clean fleece weight. The lambs were weighed individually every 28 days during the 112-

Table 2. Composition[1] of high-quality hay and pellets and low-quality pellets used in 1961 and 1962.

Year	Protein (N x 6.25)	Ether extract	Crude fiber	Ash	Nitrogen-free extract	Gross energy
	(%)	(%)	(%)	(%)	(%)	(kcal/kg)
			Baled Hay			
1961	16.98	1.86	31.29	8.64	41.24	—
1962	15.73	1.53	36.03	8.02	38.69	—
			High-Quality Pellets			
1961	17.54	1.92	27.77	10.05	42.72	4348
1962	19.30	1.42	26.19	10.51	42.58	—
			Low-Quality Pellets			
1961	14.51	1.68	33.38	9.55	40.88	4256
1962	15.54	1.46	32.79	9.98	41.41	—

[1]Moisture-free basis

Table 3. Apparent digestibilities of the treatment rations in 1961.

Description	Dry matter	Protein (N x 6.25)	Ether extract	Crude fiber	N.F.E.	Gross energy
	(%)	(%)	(%)	(%)	(%)	(%)
Coarse chopped alfalfa hay	57.68	73.96	19.28	38.75	70.61	55.98
High-quality alfalfa pellets	61.38	75.72	16.33	39.77	75.75	60.25
Low-quality alfalfa pellets	54.92	68.55	25.66	35.99	68.29	52.28

day feeding period and immediately after shearing in the spring. The lambs were taken off water and feed the evening before each weigh day. Daily gain per head is the regression obtained from the five weights taken during the feedlot period. Staple length to the nearest 0.1 inch was measured on the midside of each sheep by a committee of three before shearing. Visual grades in spinning counts were observed at shearing. Clean fleece weights were estimated by the regression equation method developed by Price et al., 1964. Body type and condition scores were taken after shearing by a committee of three men working independently. Feed efficiency (pounds of feed per pound of gain) of the lambs was determined from feed consumption and gain information by treatments.

To obtain the effects of treatment, the data were analyzed separately for each breed. Although our main interest in this study was to obtain treatment effects, the main effects of age of dam, type of birth and rearing, type of mating, the linear regressions on inbreeding of dam, inbreeding of lambs, age of lamb and interactions of treatment with each of the main effects were included in the model to decrease the error variance.

Results and Discussion

The proximate composition of the alfalfa hay and pellets used in this trial is presented in table 2. The crude protein content of the high-quality pellets was higher both years than that for the low-quality pellets. However, even the lower quality pellets were of good quality. We were unable to locate alfalfa hay of poorer quality without getting alfalfa-grass hay mixed.

Results of the digestion trial in 1961 (table 3) involving the three types of rations showed that the apparent digestibility of the high-quality hay, coarse chopped or pelleted, was greater than the low-quality pelleted hay. A comparison of pelleted versus chopped hay from the same source showed that pelleting of chopped hay increased the digestibility of crude protein, crude fiber, nitrogen-free extract and gross energy.

The least squares means for yearling body type and condition, clean fleece weight, staple length, wool grade, feedlot gain per head per day, final feedlot body weight and body weight at shearing are given in table 4.

Table 4. Least squares means for fleece and body traits by treatments within years and breeds.[1]

Year, breed and treatment classification		Yearling		Clean fleece weight	Staple length	Wool grade[3]	Feedlot gain per day	Final feedlot weight	Shearing body weight
		Type[2]	Condition[2]	(lb.)	(in.)		(lb.)	(lb.)	(lb.)
1961									
Rambouillet	1	9.58c	9.08c	4.10c	3.6a	2.01a	0.20c	105c	84c
	2	7.20a	5.78a	4.70ab	3.6a	2.10a	0.53a	144a	114a
	3	8.15ab	6.79b	4.81a	3.7a	2.15a	0.44a	138a	102b
	4	8.33b	7.31b	4.61abc	3.7a	2.33a	0.35b	126b	101b
	5	9.44c	8.83c	4.21bc	3.5a	1.96a	0.26c	111c	87c
1961									
Targhee	1	9.73d	9.01c	4.30c	3.8b	2.01c	0.20c	101c	83c
	2	6.61a	5.69a	5.00a	4.0a	3.46a	0.57a	148a	112a
	3	7.58b	6.69a	5.20ab	4.0ab	2.82b	0.49a	139a	103a
	4	7.98bc	7.74b	4.61bc	3.8ab	2.42bc	0.31b	116b	95b
	5	8.76c	8.42bc	4.41c	3.8ab	2.33bc	0.33b	119b	92b
1961									
Columbia	1	8.39c	8.86c	5.00b	4.4a	4.30a	0.24c	105c	81c
	2	6.38a	5.57a	5.80a	4.4a	4.93a	0.64a	155a	114a
	3	7.20ab	6.44a	5.49ab	4.5a	4.41a	0.57a	144a	107a
	4	7.67bc	7.67b	5.49ab	4.4a	4.60a	0.33b	116b	93b
	5	8.06bc	7.90b	5.20ab	4.5a	4.42a	0.33b	119b	90b
1962									
Rambouillet	1	10.14b	9.28c	4.41b	3.4a	2.07a	0.13d	95c	82d
	2	8.17a	7.32a	4.81ab	3.5a	2.01a	0.49a	128a	101ab
	3	8.40a	7.76ab	4.89a	3.4a	2.02a	0.53a	135a	104a
	4	8.77a	8.76bc	4.89a	3.6a	2.08a	0.29b	116b	95bc
	5	8.90a	8.29abc	4.61ab	3.5a	2.12a	0.22c	107b	91cd

1962 Targhee	1	9.29d	9.36c	4.81b	3.7a	3.41a	0.11d	100c	87c
	2	7.14a	7.18a	5.71a	3.9a	4.40a	0.60a	144a	110a
	3	7.37ab	7.06a	5.49a	4.0a	4.43a	0.60a	142a	104ab
	4	8.07bc	7.73ab	5.40ab	3.8a	3.98a	0.29b	119b	98b
	5	8.62cd	8.27b	5.20ab	3.9a	4.08a	0.24c	116b	97b
1962 Columbia	1	8.31c	8.52b	5.60b	4.5a	5.57a	0.18c	103c	90c
	2	6.55a	6.17a	6.50a	4.5a	6.12a	0.64a	148a	109a
	3	6.82ab	6.66a	6.59a	4.5a	5.86a	0.64a	153a	106ab
	4	7.67bc	7.91b	6.70a	4.7a	6.59a	0.29b	122b	99b
	5	8.54c	8.60b	5.60b	4.4a	5.61a	0.22b	106c	87c

[1]Those means within a column and within a particular subclass followed by the same letter do not differ significantly from one another. All others differ significantly ($P \leq .05$).

[2]Animals with highest merit for condition and type were given a score of 1 and those with lowest merit a 15.

[3]Visual grades are coded as follows: 1 = 70's, 2 = 64's, 3 = 62's, 4 = 60's, 5 = 58's, 6 = 56's, 7 = 54's, 8 = 50's, 9 = 48's.

Feedlot Gain

Considerable differences were found between methods of feeding for rate of gain during the feeding period (table 4). In every instance the self-fed ewe lambs (treatments 2 and 3) gained faster than those on limited feeding (treatments 4 and 5) while those fed alfalfa hay on the ground (treatment 1) gained the least. Quality of the ration in the self-feeders had little or no influence on gains. In the limit-fed treatments quality of ration had an effect on the gains of the Rambouillet lambs both years and on the Targhee lambs in the second year. The lambs self-fed pellets or limit-fed pellets gained more rapidly than the hay-fed lambs. This difference was not significant in the 1961 Rambouillet subclass. The lambs in the limit-fed treatments receiving 3.40 pounds of alfalfa pellets gained on the average 41 percent faster than those lambs getting 4.50 pounds baled hay on the ground. The self-fed lambs gained 67 percent faster than the hay-fed lambs.

On an as-fed basis 53 percent less feed was required per pound of gain in the limit-fed treatments and 61 percent less feed

Table 5. Comparison of 112-day feedlot gains and wool production of replacement ewe lambs over all years and breeds.

Treatment	No. of sheep	Total body weight gain per hd.	Feed consumed per day	Feed efficiency	Feed cost per lb. gain[1]	Clean fleece weight	Increased fleece value above treat. 1[2]
		(lb.)	(lb.)	(lb. feed/ lb. gain)	($)	(lb.)	($)
1	196	20	4.50[3]	25.0	0.25	4.70	——
2	193	62	5.60	10.1	0.15	5.42	1.02
3	190	60	5.71	10.7	0.15	5.42	1.02
4	194	36	3.40	10.5	0.16	5.27	0.80
5	192	32	3.40	12.0	0.17	4.87	0.24

[1]Prices used in cost determinations are as follows:

Treatment 1—High-quality baled alfalfa hay @ $20 per ton, f.o.b. farm.

Treatments 2 and 4—High-quality alfalfa pellets @ $30 per ton, in bulk, f.o.b. mill.

Treatments 3 and 5—Low-quality alfalfa pellets @ $28 per ton, in bulk, f.o.b. mill.

[2]Average net value per pound clean wool including incentive payment = $1.41.

[3]For treatment 1, 4.50 pounds feed was fed. Feed consumed was not determined.

in the self-fed treatments than that required in the treatment where alfalfa hay was fed to the lambs on the ground. At least 30 percent waste occurs with hay fed on the ground through loss of leaves and the lambs' refusal to eat the coarser stems and soiled or trampled hay. Waste was negligible in the pellet-fed groups.

Additional losses of baled hay occur in the stack due to shrinkage and spoilage. Under conditions at the U.S. Sheep Experiment Station, losses between the time the hay is purchased in the fall and time of feeding in the winter (approximately 3 months) have been estimated to be at least 15 percent.

Final Weight and Shearing Weight

Quality of hay pellets fed produced no significant effect on final lamb weight in the self-fed treatments. In the limit-fed treatments quality of the hay pellets was important in final body weight of Rambouillet lambs in 1961 and Columbia lambs in 1962. For the remaining subclasses quality of hay was not important.

Method of feeding did have important effects on final feedlot weights. Lambs from self-fed treatments were significantly heavier than limit-fed lambs in all cases. In most instances, the lambs limit-fed pellets were significantly heavier than the hay-fed lambs. The final body weight of lambs in the self-fed treatments averaged 26 and 42 pounds heavier than limit-fed and hay-fed lambs, respectively.

After the lambs left the feedlot and trailed for 4 days to Station headquarters and then grazed 17 days on a sagebrush-grass spring range the differences in body weights were greatly reduced. The self-fed lambs continued to be significantly heavier in body weight than the hay-fed lambs in all cases. However, differences between the limit-fed lambs and self-fed lambs had decreased 48 percent by shearing time. The pellet-fed lambs (self-fed and limit-fed) maintained heavier body weights than the hay-fed lambs by shearing time, but these differences had decreased 40 percent and were not all signifiicant. Differential body weight shrink was the primary reason for the decrease in treatment differences. From final feedlot weight to shearing, body weights decreased 7, 17, and 10 percent for hay-fed, self-fed and limit-fed lambs, respectively.

These results indicate that feeding replacement ewe lambs to very heavy body weights is not economical because of the heavy body weight shrink after they leave the winter feedlot. Whether or not the heavier animals were larger in skeletal size was not studied. The effect of these extremes in body weight on subsequent lamb and wool production is being investigated. A comparison of feed efficiencies presented in table 5 shows that the faster gaining animals in the pellet-fed treatments were more efficient than the hay-fed lambs. The apparent efficiency of the hay-fed lambs was very low (25 pounds feed fed per pound of gain) because of the extreme waste discussed earlier. It was not feasible to determine their efficiency on an as-consumed basis. Feed cost per pound of gain was much higher in the hay-fed lot as a result of this waste.

Final Type and Condition Scores

Quality of alfalfa pellets had little effect on yearling type and condition scores except in the 1961 Rambouillet ewes. In this subclass quality of ration did significantly affect lamb condition in both self-fed and limit-fed treatments. Ewes on self-feeders had better type and condition scores than hay-fed lambs. Lambs receiving high-quality hay pellets in self-feeders had greater condition than either hand-fed or hay-fed lambs except in the 1962 Targhee ewe category.

The general health of the ewe lambs in all treatments was satisfactory. During the trials five ewe lambs suffered rectal prolapse in treatments 2 and 3. All prolapses occurred during the last 2 weeks of the 112 day feeding period. The high daily feed intake of the self-fed lambs, which averaged between 6.50 and 7.01 pounds of dry chopped pelleted roughage per head during the last two weeks, probably was associated with the rectal prolapse. Unless some method can be developed which will reduce the feed intake of lambs on self-feeders, it appears that this method of feeding is not practical for growing replacement ewe lambs.

Clean Fleece Weight

Self-fed and limit-fed lambs produced more clean wool than the hay-fed lambs in all breed-year classifications. While limit-fed lambs produced heavier fleeces than the hay-fed lambs the advantage was seldom significant. Although not statistically significant, many of these differences in clean fleece weight are important economically as can be seen in table 5. The increased value of the pelleted feeding methods over hay feeding is 1.02, 1.02, 0.80 and 0.24 dollars for treatments 2, 3, 4, and 5, respectively. The advantage gained over hay feeding by feeding pellets by either method was enough to pay all or a major part of the shearing costs which are currently 54¢ per head for ewes. Visual wool grade and staple length of the fleeces were not affected significantly by method or quality of feeding.

Feed Efficiency

Quality of hay pellets fed did not affect feed efficiency greatly in treatments 2 and 3 where the ewe lambs had unlimited access to the feed. However, it did appear to have an influence on feed efficiency and clean fleece weight in the limit-fed treatments. Ewes limit-fed low-quality pellets required 1.50 pounds more feed per pound of gain and had 0.40 pound less clean fleece weight.

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