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Mechanization in the sheep industry has been slow, while the use of confinement or semi-confinement management systems, labor saving equipment and special constructed housing has increased rapidly in the production of cattle, poultry and swine. Confinement rearing of sheep presents the opportunity to use labor saving equipment and to intensify production. By increasing the overall efficiency and stepping up the lambing percentage, we will be able to help meet the increasing operating costs.

In many areas, increasing acreages are used for cultivated crops and less land is available for pasture. This trend will most likely continue to become more severe in the future, due to the increasing population and food demands of the world.

In confinement rearing of sheep considerations should be given towards the following points:

1. Highly tillable land will yield more in cash crops, whether grain or forage, then when used as pasture. Harvesting and feeding forage from this land to sheep will result in higher production then when pastured.

2. Losses in performance and death from parasites and bloat may be decreased.

3. The predatory problem would be lessened.

4. Automation can be used more readily.

5. No increase in shelter or equipment would be necessary.

6. Ewes could be fed according to their needs. However, proper nutrition of the ewe and lamb may also be more critical.

7. Sanitation will be more critical. Good sanitation must be practiced to prevent disease from starting and spreading.

8. Provides an excellent opportunity to expand the number of sheep produced.

9. Confinement also presents the opportunity to make use of new knowledge to induce estrus and estrus synchronization.

Experimental Procedure

In November 1966, two hundred and sixteen yearling white-faced ewes, showing predominate Columbia breeding, weighing in the range of 79 lb. to 133 lb. were stratified according to individual weight and randomly assigned to 9 different lots. The nine lots of 24 ewes each averaging 101.5 lb. were placed on three treatments. Each treatment is replicated three times. The treatments are 1. (S) confinement of ewes all year, slotted floor in building; 2. (D) confinement of ewes all year, conventional floor; and 3. (P) pasture during the summer, drylot in the winter. The buildings were used for confinement of ewes from four weeks before lambing until weaning, except when the ewes are turned out to eat. The ewes were lambed in the buildings and the lambs confined to these houses until weaning.

The lot houses contained approximately 294 square feet, while the outside pen consists roughly of 1100 square feet. The elevated slotted floor is made out of pine. The slats are 2 inches wide with a 3/4 inch spacing.

All the ewes were fed alike, except when the ewes in the pasture lot were turned out to pasture in the spring. The ewes on pasture were rotated between pastures as grass growth permits. This was approximately every two weeks on alfalfa-brome pastures. The grain ration for the ewes consisted of rolled corn 60%, whole oats 40%, salt 1%, and limestone .5%.

The ewes were randomly selected across treatments and replications to breeding groups to take out the sire effects. Hampshire, Suffolk and Columbia rams were used.

Birth weights, rate of gain (ROG) to 30 days of age, ROG to weaning and feed consumption were recorded for the lambs. The lambs were fed creep ration no.1 (table 1) until they were about 30 days old, then for 2 weeks they were fed a 50-50 mixture of rations no. 1 and 2 in 1968 and in 1969 a mixture of rations no. 1 and 3. The lambs were finished on pelleted ration no. 3.

Internal parasite infestation of ewes and lambs were compared by using the H-L 4100 McMaster's Fecal Counting Chamber, with magnesium sulfate as the solution. Six ewes and 30% of the lambs from each lot were randomly selected for this test.

Table 1. Creep Rations

Ration	# 1	# 2	# 3
Item	%	%	%
Alfalfa hay	Free choice	30	40
Cracked corn	30	35	35
Crimped oats	30	23	14
Soybean oil meal	30	11	10
Bran	10	--	--
Trace mineral salt	1	1	1
Limestone	1	.5	.5
Antibiotics[a]	.5	1 #/ton	1 #/ton

[a]Ration #1 Aureomycin Crumbles; Ration #2 and #3 Aureo-fac-10 Rations 2 and 3 were pelleted.

Ewes were removed from the experiment for reason of 1) died; 2) barren 2 years in a row; and 3) have any disease or malfunctioning that would effect their reproduction.

Results

November 2, 1966 to June 8, 1967 was a period of adaption for the ewes. This period was used for the purpose of trying to get more size and scale on the ewes. All the ewes were housed on straw bedding. The lambing percent of the ewes bred are as follows: pasture (P) 82%; slotted floor (S) 76%; and straw bedding (D) 86%. During this period of adaption four ewes were removed from the project: 2 ewes in pasture lots died, cause unknown, and 2 ewes in the straw bedding lots died during lambing.

During the past two years there have been 23 ewes removed from the project. In the pasture lots, 5 ewes have been removed due to: 1 barren ewe; 3 died, cause unknown; and 1 prolapsed. There were 9 ewes on the slotted floor treatment removed due to: 5 barren ewes; 2 died, cause unknown; 1 ewe damaged udder; and 1 ewe lossing weight rapidly, cause unknown. Nine ewes were removed from the straw bedding treatment due to: 3 barren ewes; 2 ewes damaged udders, 2 prolapse; 1 bloated; and 1 constricted vagina.

In table 2, the average feed consumption per ewe per day is shown. Ewes received more hay and grain in 1967-68 for the main reason of trying to get them to gain weight. During the second and third year the ewes were fed according to their production. The higher quality hay was fed to the ewes four weeks before lambing until weaning. During the first year the pasture growth was insufficient during flushing so the ewes on pasture receive supplemental feed of hay and grain. Bran was included in the ration four weeks before lambing and until weaning during the first year.

The average weight per ewe during a particular period is given in table 3. In 1967-68 there wasn't any weights taken when the ewes were turned out to pasture, but in 1968-69 and 1969-70, it is easily observed that the ewes on the pasture gained a lot more weight than the ewes on

confinement (second year 15.2, -.6, -1.9 and third year 44.7, -2.5, -.6 respectively, for pasture, slotted floor, and straw bedding). This is reflected by the amount of feed they consumed, as it was attempted to feed them only enough feed to maintain their body weight during this period. Ewes on the pasture treatment gained two to three times more weight during flushing then did the ewes on confinement, except in 1967-68 when the pasture growth was insufficient (first year 5.7, 7.7, 9.2; second year 9.5, 2.9, 4.0; third year 1.4, 0.4, 0.7 respectively, for pasture, slotted floor, and straw bedding). The average weight per ewe at time when ewes went on pasture was about the same for all treatments; however, ewes on the pasture treatment lost more weight from four weeks before lambing until going to pasture (first year -28.5, -26.6, -19.9 and second year -42.2, -16.7, -23.3 respectively, for pasture, slotted floor, and straw bedding). This difference in weight loss may be in part due to high condition of pasture treated ewes, a higher lambing percent and increased wool production. Weight four weeks before lambing was taken when ewes were in full fleece while weight at pasture time was taken after shearing.

The percent of barren ewes was highest for ewes in confinement (slotted floor and straw bedding lots). The average percent barren ewes for 2 years is 9.4, 16.8 and 14.3 for pasture, slotted floor and straw bedding respectively. The lambing percent of ewes bred was the lowest for ewes on the slotted floor treatment during both years, while ewes in pasture treatment had the highest lambing percentage of ewes bred the second year (first year 94.3%, 88.6%, 95.6% and the second year 134.3%, 98.4%, 101.6% respectively, for pasture, slotted floor and straw bedding). The decrease in lambing percentage of ewes bred in confinement may be accounted for by the increased percentage of barren ewes. Average birth weight for lambs from all the treatments in 1967-68 was about the same, while in 1968-69 lambs from ewes on total confinement were about one pound heavier at birth than lambs from the ewes on the pasture treatment (12.4, 13.5, 13.7 respectively, for pasture, slotted floor and straw bedding). During the first year rate of gain to 30 days of age was higher for lambs from ewes in the pasture lots than lambs from ewes on total confinement, but during the second year rate of gain to 30 days of age was highest for lambs from the ewes on the straw bedding treatment (first year .60, .52, .51 and the second year .37, .38, .49 respectively, for pasture, slotted floor and straw bedding). Rate of gain to weaning was about the same in 1967-68, while in 1968-69 rate of gain to weaning was the highest on straw bedding with slotted floor being slightly lower (.44, .51, .53 respectively, for pasture, slotted floor and straw bedding). Lambing percentage of ewes lambing could have had an effect upon rate of gain figured at 30 days of age and again at weaning. The first year pounds of feed per lb. of gain to weaning was about the same for all treatments, however pasture lots were slightly lower. During the second year pounds of feed per lb. of gain to weaning was higher than that of the previous year. The total pounds of creep consumed from birth to weaning per lamb was the lowest in the pasture lots for both years.

In 1967-68, the difference in the pounds of wool produced per ewe for the three treatment is .7 lb. (table 6) but in 1968-69, the difference is 2.1 lb. (the first year 9.9, 9.5, 9.2 and the second year 9.5, 7.4, 8.3 respectively, for pasture, slotted floor and straw bedding).

The number of eggs counted per gram of fecal material gives us an indication of the degree of infestation of internal parasites in the ewe or lamb (table 7). On May 23, phenothiazine and salt was fed to the ewes. Very sufficient pasture growth, rotation of pastures, along with the feeding of phenothiazine and salt helped keep the internal parasite egg count down. The confined ewes were essentially internal parasite free. Eggs were counted on only two occasions. Fecal samples were collected five times from lambs and no internal parasite eggs were found.

The average feed costs for two years are shown in table 9. The feed cost for ewes on pasture was about $2.60 less than for ewes on total confinement because more grain and hay was fed in order to grow out these ewes. During the second year the cost for ewes on slotted floors was about $2.00 lower then the cost for ewes on the straw bedding and comparable to the pasture lot. The reason for this difference is that there was a lot of rain and snow in the spring and straw was needed for bedding.

Summary

The performance of ewes reared in drylot, either elevated slotted floor or straw bedding in building, was compared with ewes on pasture during the summer and drylot in winter. Ewes on pasture were generally heavier and carrying more condition. However, these ewes lost more weight during lambing and lactation so that weights were about the same for all treatments at the time when pasture treated ewes went on pasture. Ewes on the pasture treatment had a higher lambing percentage, fewer barren ewes, and larger fleece weights than ewes in confinement all year. Birth weights were heavier for lambs from ewes in confinement however, pasture ewes had more twins which affected birth weights. Rate of gain to 30 days and to weaning was highest for lambs from pasture treatment during the first year but lowest the second year.

Feed costs for ewes in confinement were highest during the first year due to increased feeding to grow out ewes. The second year when confined ewes were fed according to production feed cost for ewes on slotted floors was slightly lower than for the pasture lot. The straw bedded lot was highest due to large amounts of straw needed for bedding during a wet spring.

No internal parasite eggs were found in lambs from all treatments and only on two occasions in ewes on confinement indicating these ewes were nearly free of internal parasites.

Table 2. Average Feed Consumption Per Ewe Per Day

Treatment[a]	1967-68			1968-69			1969-70		
	P	S	D	P	S	D	P	S	D
Pasture to flushing:									
hay,lb.	-	4.00	3.80	-	2.6	2.6	-	2.55	2.54
grain,lb.	-	.35	.36	-	-	-	-	-	-
straw,lb.	-	-	-	.58	-	.45	.38	-	.22
salt,lb.	-	.001	.001	.02	.019	.019	.016	.018	.018
bran,lb.	-	-	-	-	-	-	-	-	-
Flushing to breeding:									
hay,lb.	.28	3.9	3.75	-	3.00	3.00	-	3.00	3.00
grain,lb.	.21	.45	.45	-	.25	.25	-	.25	.25
straw,lb.	-	-	-	.22	-	.42	-	-	-
salt,lb.	.007	.002	.002	.03	.015	.015	.012	.017	.017
bran,lb.	-	-	-	-	-	-	-	-	-
Breeding to four weeks before lambing:									
hay,lb.	3.6	3.84	3.82	3.02	3.02	3.04			
grain,lb.	-	-	-	-	-	-			
straw,lb.	.02	-	.019	.13	-	.17			
salt,lb.	.01	.01	.01	.005	.005	.005			
bran,lb.	-	-	-	-	-	-			
Four weeks before lambing to lambing:									
hay,lb.	3.60	3.62	3.60	2.98	3.00	3.10			
grain,lb.	.34	.33	.35	.40	.40	.41			
straw,lb.	.32	-	.32	.47	-	.42			
salt,lb.	-	-	-	-	-	-			
bran,lb.	.12	.12	.12	-	-	-			
Lambing to pasture:									
hay,lb.	3.25	3.25	3.26	3.47	3.42	3.53			
grain,lb.	.70	.67	.70	1.02	1.00	1.02			
straw,lb.	.75	-	.69	1.05	-	1.14			
salt,lb.	.002	.002	.002	.005	.006	.006			
bran,lb.	.16	.16	.17	-	-	-			

[a]Treatment: pasture (P) slotted floor (S) straw bedding (D)

Table 3. Average Weight of the Ewes Taken at Beginning of Period

Treatment	1967-68			1968-69			1969-70		
	P	S	D	P	S	D	P	S	D
Pasture,lb.				109.6	109.1	112.8	99.3	108.9	106.5
Flushing,lb.	113.2	107.2	102.4	124.8	108.5	110.9	144.0	106.4	105.9
Breeding,lb.	118.9	114.9	111.6	134.3	111.4	114.9	145.4	106.8	106.6
4 wks. before lambing,lb.	138.1	135.7	132.7	141.5	125.6	129.8			

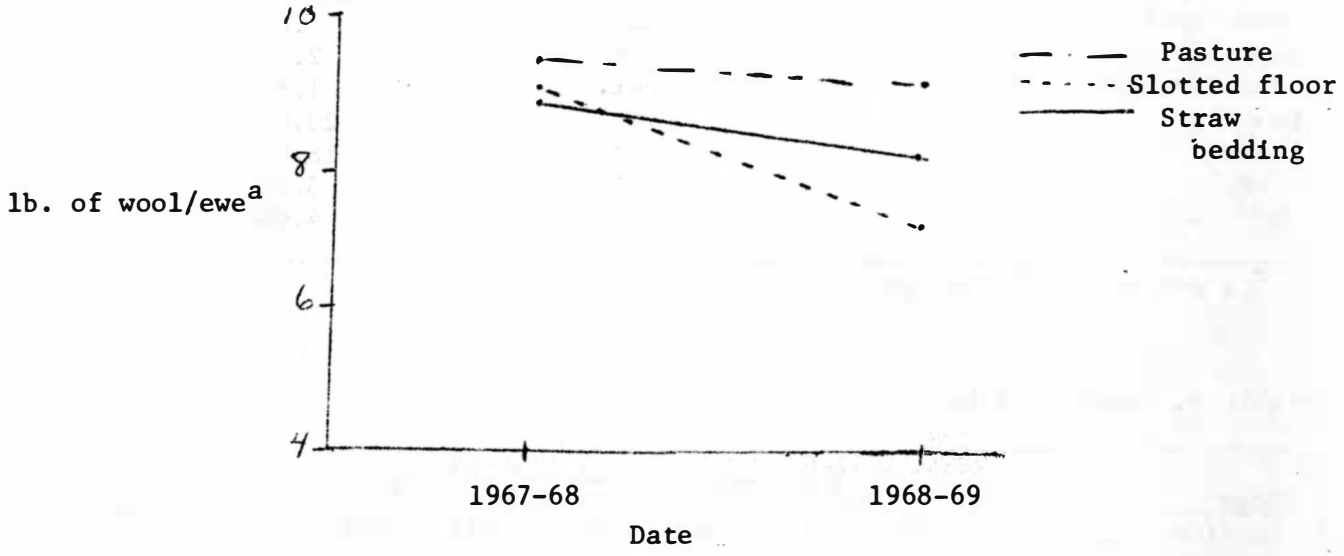
Table 4. Reproduction Performance of Ewes and Lamb Performance (1967-68)

Treatment	Pasture			Slotted Floor			Straw Bedding		
Reps	1	2	3	1	2	3	1	2	3
No. ewes bred	24	22	24	23	23	24	22	22	24
No. ewes lambed	20	18	23	21	19	19	16	21	18
No. ewes barren	4	4	1	2	4	5	6	1	6
% ewes barren	16.7	18.2	4.2	8.7	17.4	20.8	27.3	4.5	25
No. lambs born	22	21	23	23	19	20	21	24	20
Lambing % (ewes bred)	91.7	95.5	95.8	100	82.6	83.3	95.5	109.1	83.3
Lambing % (ewes lambing)	110	106.7	100	109.5	100	105.3	131.3	114.3	111.1
Av. birth wt.,lb.	12.3	10.3	11.0	12	11.5	10.7	10.7	11.4	11.3
ROG to 30 days,lb.	.61	.64	.55	.38	.57	.61	.44	.54	.55
ROG to weaning,lb.	.62	.62	.61	.60	.62	.62	.58	.65	.60
Av. wt. at weaning,lb.	60.7	54.8	53.4	56.9	56.9	53.3	51.7	62.2	57.2
Av. age at weaning,da.	78	72	70	76	74	73	72	78	75
lb. feed/lb. gain to weaning	1.01	.89	1.06	1.09	1.15	1.12	1.14	1.14	1.09
lb. creep consumed from birth to weaning	48.7	39.7	44.7	49.7	52.6	47.5	54.5	46.7	49.4

Table 5. Reproduction Performance of Ewes and Lambing Performance (1968-69)

Treatment	Pasture			Slotted Floor			Straw Bedding		
Reps	1	2	3	1	2	3	1	2	3
No. ewes bred	23	21	23	23	20	21	18	21	22
No. ewes lambed	19	21	23	20	15	17	16	19	20
No. ewes barren	4	0	0	3	5	4	2	2	2
% ewes barren	17.4	0	0	13	25	19.1	11.1	9.5	9.1
No. lambs born	27	29	34	25	16	22	18	22	22
Lambing % (ewes bred)	117.4	138	147.8	108.7	80	104.8	100	104.8	100
Lambing % (ewes lambing)	142	138	147.8	125	106.7	129.4	112.5	115.8	110
Av. birth wt.,lb.	12.4	12.8	11.9	13.6	13.8	13.2	14.6	13.5	13.1
ROG to 30 da,lb.	.41	.40	.32	.29	.45	.40	.58	.43	.48
ROG to weaning,lb.	.46	.44	.44	.51	.50	.51	.58	.45	.57
Av. wt. at weaning,lb.	49.7	49.4	51.0	51.6	59.7	57.4	57.4	55.3	56.7
Av. age at weaning,da.	77	79	79	74	76	74	74	77	75
lb.feed/lb. gain to weaning	1.6	1.4	1.3	1.7	2.2	1.6	1.5	1.8	1.3
lb. creep consumed from birth to weaning	58.3	47.3	45.9	56.1	77.3	61.2	61.9	63.2	55.4

Table 6. Wool Production



[a]Fleece weight adjusted to 1 year basis.

Table 7. Internal Parasite Egg Count

		P			S			D		
Date	Rep.	1	2	3	1	2	3	1	2	3
April 4 1969		600	1100	800	0	0	0	0	100	0
May 25		2600	10400	6100	0	0	0	0	0	0
June 20		700	600	100	0	0	0	0	0	300
July 18		0	0	0	0	0	0	0	0	0
Aug. 18		100	0	0	0	0	0	0	0	0
Sept. 8		0	100	0	0	0	0	0	0	0
Nov. 4		500	100	300	0	0	0	0	0	0

[a]Total number of egg/gram of fecal material for

Table 8. Feed Prices

Item	Unit	Price
Rolled corn	bu.	$ 1.12
Whole oats	bu.	.64
Salt	cwt.	2.40
Limestone	cwt.	1.30
Hay	ton	20.00
Straw	ton	18.00
Bran	cwt.	3.30
Pasture	1 Aum[a]	4.00

[a] 1 Aum equals 7 ewes per month.

Table 9. Feed Cost Per Ewe

	1967-68			1968-69		
Item	P	S	D	P	S	D
Cost/ewe/day,$	.038	.045	.046	.038	.037	.042
Total cost/ewe,$	13.87	16.43	16.79	13.87	13.51	15.33