

out the experiment, it further increased the gains and slightly lowered the feed requirements.

The gains were very satisfactory in both lots receiving the antibiotic.

The mixed plant and animal protein supplement without an antibiotic as fed in Lot 4 produced more rapid daily gains than did the plant protein supplement alone, soybean meal, as fed in Lot 1.

When the antibiotic was added to the mixed protein supplement in Lot 5, until the pigs reached 100 pounds, the rate of gain was unchanged but the feed requirements were slightly lowered. When the antibiotic was fed in the supplement throughout the experiment, the rate of gain was markedly increased and the feed requirements decreased.

It is evident from these results that aureomycin added to the ration, either for a limited time or for the duration of the feeding period, increased the rate of gain, and this was therefore its chief effect; the effect of the antibiotic was most marked when it was fed throughout the experiment.

The effect of the antibiotic was more apparent in the all-plant protein-fed pigs and not so effective where a mixed protein supplement was fed.

EXPERIMENT IV—Winter, 1952

The Effect of Antibiotics (Aureomycin-B₁₂ Supplement) and Vitamin B₂ Supplement on Weanling Pigs in the Dry Lot.

C. E. Aubel

This experiment was conducted this past winter with fall pigs in the dry lot. Its object was to get information on the effect of feeding a vitamin B₂ supplement along with antibiotics.

Three lots of pigs were fed. Lot 1 received a mixed animal and plant protein supplement of 4 parts tankage, 4 parts soybean meal, 1 part linseed meal, and 1 part alfalfa meal. Lot 2 received a similar protein supplement, but to which aureomycin had been added as Aurofac at the rate of 3 pounds to 100. Lot 3 received the same as Lot 2 except that a vitamin B₂ supplement, containing riboflavin, niacin, pantothenic acid, choline chloride, and folic acid, Lederle's C-49 was added at the rate of 3 pounds per 500 of the supplement.

All lots were self-fed shelled corn as well as the protein supplement, and some very poor loose alfalfa hay was offered but was consumed very sparingly.

The following table gives the results of this experiment:

EXPERIMENT IV—Winter, 1951-52

The Effect of Antibiotics (Aureomycin-B₁₂ Supplement) and Vitamin B₂ Supplement on Weanling Pigs in the Dry Lot.

(November 21, 1951, to February 26, 1952—97 days)

Ration fed.....	Shelled corn, alfalfa hay and mineral mixture (self-fed)		
	Protein mixed suplt.	Protein mixed suplt. plus aureo.-B ₁₂	Protein mixed suplt. plus aureo.-B ₁₂ and B ₂ suplt.
Lot number	1	2	3
No. pigs in lot	10	10	10
Av. initial wt. per pig	Pounds 42.35	Pounds 42.50	Pounds 42.60
Av. final wt. per pig	196.90	210.30	214.80

Av. total gain per pig	154.55	167.80	172.20
Av. daily gain per pig	1.59	1.72	1.77
Av. daily ration per pig:			
Corn	5.20	5.34	5.25
Alfalfa hay .....	.03	.04	.04
Mixed protein suplt. ....	.85	.82	.97
Feed consumed per 100 lbs. gain:			
Corn	326.43	308.99	295.87
Alfalfa hay .....	.22	.23	.27
Mixed protein suplt.	53.38	47.67	55.16
Mineral mix .....	.06	.05	.04
Feed cost per 100 lbs. gain	\$13.24	\$12.94	\$13.14

Feed prices charged: Shelled corn, \$1.86 per bushel; alfalfa hay, \$50.00 per ton; mixed protein supplement, \$90.80 per ton, in Lot 1; mineral mixture, 3c per pound; mixed protein supplement, Lot 2, with Aurofac, \$112.20 per ton; mixed protein supplement, Lot 3, with Aurofac and B₂ supplement, \$120.24 per ton; Aurofac, 43c per pound, Vitamin B₂ supplement, C-49 Lederle, 57c per pound.

Observations

When aureomycin was added to the diet as in Lot 2, the rate of gain was materially increased, and the feed requirements per 100 pounds gain were decreased.

When the vitamin B₂ supplement was added to the aureomycin diet, the result was to increase the daily gains further and decrease the feed requirements.

From the results of this experiment, it is evident that the addition of an antibiotic and vitamin B₂ supplement improved the efficiency of the ration when the protein supplement was one of mixed plant and animal proteins.

Project 236: The Relation of Physical Balance and Energy Value in Sheep Rations

A Comparison of Different Roughages Combined with Two Levels of Concentrate Allowance for Wintering Ewe Lambs.

T. Donald Bell, R. F. Cox, D. Richardson,
D. B. Parrish, and J. S. Hughes

Introduction

Many experimental trials with fattening lambs at the Kansas Agricultural Experiment Station have indicated that rations including approximately 55 percent roughage and 45 percent concentrates produce more economical gains in relation to nutrients consumed than rations containing either a higher or lower proportion of concentrates. Because of the variability of the chemical and nutritive composition of many of the roughages, this physical balance relationship of the ration may be more accurately described by the ratio of crude fiber to total digestible nutrients, and the ratio found to be most economical in lamb fattening rations has been approximately 1 part crude fiber to 4 parts T.D.N.*

Ewe lambs, being raised for breeding replacements, are commonly wintered on rations composed largely of roughages, with few if any additional concentrates. If lambs respond most economically to

*T.D.N. refers to Total Digestible Nutrients.

DIFFERENT ROUGHAGES WITH VARYING CONCENTRATE ALLOWANCES FOR WINTERING EWE LAMBS.

December 26, 1951, to March 20, 1952—85 days

1. Lot number	2		3		4		5		6	
2. Ration fed	Alfalfa hay Cottonseed meal	Milo	Alfalfa hay Cottonseed meal	Milo	Atlas stover Cottonseed meal	Milo	Atlas silage Cottonseed meal Prairie hay	Milo	Atlas silage Cottonseed meal Prairie hay	Milo
3. Ratio: Crude fiber to T.D.N.	1	1.7	1	2.5	1	2.4	3.5	1	2.3	3.1
4. No. lambs per lot	22	22	22	22	22	22	22	22	22	22
5. No. days on feed	85	85	85	85	85	85	85	85	85	85
6. Initial wt. per lamb	73.5	73.5	73.5	76.3	74.5	74.5	75.2	75.4	75.4	75.4
7. Final wt. per lamb	80.8	88.9	88.9	89.3	91.0	91.0	85.4	91.4	91.4	91.4
8. Total gain per lamb	7.3	15.4	15.4	13.0	16.5	16.5	10.2	16.0	16.0	16.0
9. Daily gain per lamb	.085	.182	.182	.152	.193	.193	.120	.188	.188	.188
10. Feed per lamb daily:										
Alfalfa	2.5	1.588					.462			.341
Prairie hay			3.452		2.541			5.155		4.171
Atlas stover										.518
Atlas silage	.053	.606								.365
Milo grain	.247	.317	.400							.02
Cottonseed meal	.02	.02	.02							
Limestone										
11. Feed per cwt. gain:										
Alfalfa	2941.2	872.5					385.0			181.4
Prairie hay			2271.0		1316.6			4295.8		2218.6
Atlas stover						265.8				275.5
Atlas silage	62.3	333.0				207.2		304.2		194.1
Milo grain	290.6	174.2	263.2							
Cottonseed meal										
12. Feed cost per cwt. gain	\$60.21	\$30.12	\$21.68		\$22.94		\$34.21		\$26.26	
13. Feed cost per lamb daily	.052	.055	.033		.039		.049		.059	
14. T.D.N. per lamb daily	1.467	1.477	1.127		1.295		1.324		1.500	
15. Gain per 100 lbs. T.D.N.	5.794	12.322	13.487		14.903		9.063		12.533	

rations containing an optimum physical balance as indicated in the tests with fattening lambs, it is possible that in years when roughage is high in price compared to concentrates, it might pay to add additional concentrates with a reduction of roughage in the rations of wintering ewe lambs.

Experimental Procedure

In the winter of 1951-52 a test was made of the response of ewe lambs to rations containing different proportions of roughages, and concentrates as well as of their response to rations made up of some of the more common roughages found in Kansas. The ewe lambs, which were of three breeding types, were secured from Southern Utah; they will be used in the subsequent breeding studies. The lambs were divided into six lots with uniform distribution of the lambs of different breeding into the various lots. The roughages compared were long alfalfa hay, ground Atlas stover, and Atlas silage in combination with prairie hay. Cottonseed meal was added to supply protein to all of the rations, and milo grain was also given in those three lots where a higher ratio of crude fiber to T.D.N. was desired. Originally, the experiments were planned for two lots of lambs to receive each of the three roughages or a combination of roughages. One of the two lots was fed a ration with a fiber-T.D.N. ratio of 1:2, and the other lot a crude fiber-T.D.N. ratio of 1:3. Because of limited digestive capacities and the lack of palatability of some of the roughages used, these ratios could not be maintained. The accompanying table gives the rations fed in the various lots, the crude fiber-T.D.N. ratios, and the response of the lambs to the various rations. Feed prices used to determine the feed costs in lines 12 and 13 were:

Alfalfa hay	\$30.00 per ton
Prairie hay	15.00 per ton
Ground sorghum stover	7.50 per ton
Atlas silage	7.50 per ton
Milo grain	2.50 per cwt.
Cottonseed meal	5.00 per cwt.

Observations

1. The replacement of roughage with concentrates increased the rate of gain of the lambs as well as the gain per 100 pounds of T.D.N. (Compare lots 1 with 2; 3 with 4; 5 with 6.) None of the levels of concentrate feeding reached a crude fiber-T.D.N. ratio of 1:4, which was found to be optimum in lamb fattening trials, but best response was shown on the three roughage rations when the ratio approached this value.
2. The alfalfa hay was of poor quality and gave the poorest and least economical gains of any of the roughages when it was fed with the lower level of concentrates, while Atlas stover produced the largest and most economical gains on the rations of lower concentration.
3. Rates of gains, and pounds produced per 100 pounds of T.D.N., were similar in all three lots of lambs receiving the different roughages and fed with the higher level of concentrates. Based on current feeding prices, however, feed cost per hundredweight of gain was lowest when sorghum stover was fed, next lowest with sorghum silage and prairie hay as the roughage, and highest when alfalfa was the roughage fed.
4. There is insufficient experimental evidence to indicate how much a ewe lamb should gain in weight or condition during the winter period, but she probably should be well grown and thrifty by spring if she is to respond best to breeding in June or July for fall and early winter lambs. It would appear from these tests that a ration of

about 3½ pounds of ground sorghum stover, 0.3 to 0.4 pound of protein supplement, plus about 1/5 ounce of limestone would provide satisfactory gains for wintering ewe lambs and would be a more economical ration than alfalfa hay when that roughage is comparatively high in price and poor in quality. A ration of sorghum silage, prairie hay, protein supplement, and limestone probably will give satisfactory results for wintering ewe lambs, but these tests indicate that gains will be lower and more expensive than rations containing ground stover.

Project 236: The Relationship of Physical Balance and Energy Value in Sheep Rations

1951 Trials with Wether Feeding Lambs
by

T. Donald Bell, Rufus F. Cox, J. S. Hughes

Lamb fattening rations varying in physical nature but virtually alike chemically have been studied at the Kansas Agricultural Experiment Station for a number of years. Previous tests have been demonstrated that the rate of gains and the efficiency of feed utilization by fattening lambs are associated closely with the physical balance or the concentration and bulkiness of the ration.

Objects of the 1951 trials:

1. To test the relative efficiency of rations which vary in the amount and in the nature or condition of the crude fiber consumed by fattening lambs.
2. To investigate the value of bicarbonate of soda in controlling digestive disorders in lambs consuming rations which are highly concentrated or which have had the roughage portion of the ration reduced by grinding and pelleting.

Plan of Feeding

- Lot 1—corn and alfalfa hay—medium concentration (Crude Fiber: total digestible nutrients—CF:TDN-1:4).
 Lot 2—corn and alfalfa hay—highly concentrated (CF:TDN ratio of 1:5.1).
 Lot 3—corn and alfalfa hay, plus bicarbonate of soda (CF:TDN ratio of 1:5.1).
 Lot 4—corn and pelleted alfalfa (CF:TDN ratio 1:4).
 Lot 5—corn and pelleted alfalfa (CF:TDN ratio 1:5.1).
 Lot 6—corn and pelleted alfalfa, plus bicarbonate of soda (CF:TDN ratio 1:5.1).

Summary

Results of the test are summarized in the accompanying table and indicate:

1. Gains were just as large with a ration of medium concentration as with those highly concentrated when chopped alfalfa hay was fed with corn. When pelleted alfalfa was fed, a ration of medium concentration produced significantly larger gains than those produced by concentrated rations.
2. Digestive disturbances were frequent in the lots receiving pelleted alfalfa and higher levels of concentrates.
3. Sodium bicarbonate was ineffective in controlling digestive disturbances in those lots receiving the more highly concentrated rations.
4. The rumen content of the lambs receiving the chopped hay was slightly more alkaline than that from lambs receiving the pelleted

PHYSICAL BALANCE IN LAMB FATTENING RATIIONS.

Feeding period—February 2 to May 4, 1951

1. Lot number	Feeding period—February 2 to May 4, 1951					
	1	2	3	4	5	6
2. Ration fed	Alfalfa	Corn Alfalfa hay	Corn Alfalfa hay Bi. soda	Corn Pelleted alfalfa	Corn Pelleted alfalfa	Corn Pelleted alfalfa Bi. soda
3. Ratio: Crude Fiber to T.D.N.	1	1	1	1	1	1
4. No. lambs per lot	10	10	9	7	8	10
5. No. days on feed	91	91	91	91	91	91
6. Initial weight per lamb	74.9	75.5	76.6	74.7	78.6	75.3
7. Final weight per lamb	99.4	99.8	101.2	103.3	101.0	93.4
8. Average weight of shorn fleece	5.25	5.35	5.39	4.71	5.30	5.20
9. Total gain per lamb	29.75	29.65	29.99	33.31	27.70	23.30
10. Daily gain per lamb	.326	.325	.329	.366	.304	.256
11. Feed per lamb daily:						
Corn	1.34	1.55	1.55	1.34	1.52	1.52
Alfalfa	1.47	1.11	1.11	1.47	1.10	1.10
Bicarbon. soda			.20			.20
12. Feed per cwt. gain:						
Corn	409	475	469	366	498	594
Alfalfa	448	341	337	399	361	427
Bicarbon. soda			19			24
13. Feed cost per cwt. gain	\$15.65	\$16.31	\$17.03	\$14.60	\$17.68	\$22.20
14. T.D.N. per lamb daily	1.89	1.87	1.87	1.87	1.87	1.84
15. Gain per 100 lbs. of T.D.N.	16.67	17.36	17.56	19.52	16.51	13.90