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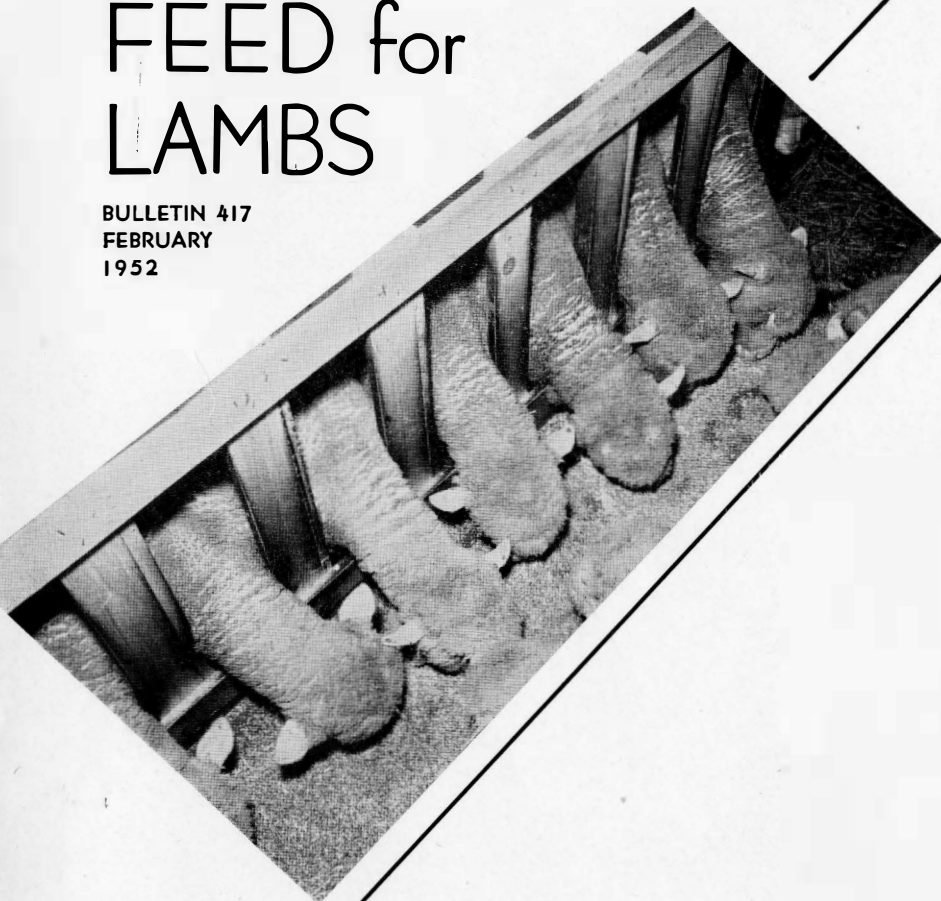
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SORGHUM

as a
FEED for
LAMBS

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**ANIMAL
HUSBANDRY
DEPARTMENT**

AGRICULTURAL EXPERIMENT STATION
SOUTH DAKOTA STATE COLLEGE
BROOKINGS



SORGHUM AS A FEED FOR LAMBS

By R. M. JORDAN, W. H. BURKITT and J. W. WILSON¹

Livestock producers of central South Dakota are interested in growing a dependable row crop that will not only supplement the usually plentiful winter roughage supply but also provide feed for fattening the greatest number of stock for market. New varieties of sorghum, developed by the South Dakota Experiment Station, may be an answer to this problem. As these varieties are drought resistant, they are a more reliable crop than corn in the central part of the state in seasons of limited rainfall.

Granted that sorghum is a more dependable crop than corn, how does it compare with corn as a feed? There is nothing new about the feeding of sorghum to cattle, sheep or swine. However, the majority of the work published has been based on varieties that are adapted to the southwest. These varieties often do not mature in South Dakota and are actually a detri-

ment to our crop production. Generally speaking, these grain sorghums, when mature, have been 85 to 95 percent as valuable as corn as a livestock feed.

How do varieties that are adapted to South Dakota stand up as a feed in comparison with corn? This is the question that the Animal Husbandry department of the South Dakota Agricultural Experiment Station set about to answer, following the development of adapted varieties of sorghums for South Dakota. The purpose of this bulletin is to publish the results obtained during five different feeding years and thus offer opportunity for the livestock producer to familiarize himself with the feeding of sorghum to lambs, whether it be fed standing in the field or dry lot.

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Two Methods of Feeding Sorghum Tested

Two methods of feeding sorghum as compared to feeding corn for lambs were tested: (1) lambing-off corn and sorghum grain and (2) corn versus sorghum in dry lot fattening. All of the lambs used in these experiments were typical western feeder lambs that were purchased at South Dakota markets. Upon arriving at the Experiment Station the lambs were given several days of rest. Fresh water, salt and native hay were provided during this period. Following this rest period the lambs were weighed individually and divided into various lots upon basis of weight, sex, and general condition. In all of the trials that are reported herein the lambs were weighed every 28 days during the trial.

During the feeding period an attempt was made to keep all the lambs on full feed, regardless of the type of feed being fed, in order to ascertain whether lambs have a preference for some varieties as determined by the amount of grain consumed. Inasmuch as this bulletin contains information on lambing-off sorghums and also on dry lot feeding of various varieties during different years, it seems best to discuss each system and each year separately.

Lambing-off Corn and Sorghum Grains

The practice of lambing-off corn or sorghum, or gleaning grain fields, is a popular one though not always profitable. Too often fall weather is such that lambs make poor gains in the field, and a considerable amount of grain is trampled into the mud following a rainy spell. In a blizzard,

lambs must be removed from the grain fields and provision made for them at the barn lot or ranch headquarters. These lambs must then be finished in dry lot. Should the lambs not be brought in prior to the blizzard, severe weight or death losses may result. In spite of these disadvantages, systems of lambing-off grain or gleaning grain fields can fit in South Dakota's sheep feeding program. Lambing-off small grain or cornfields unfit for harvest does offer an opportunity to put on cheap gains with a minimum of equipment and also salvage some grain that is impossible to harvest with ordinary machinery.

During the years 1942-43 and 1943-44, replications, or duplications, of the feeding trials were made. Rather than have one large field with 30 lambs in it, two smaller fields with 15 lambs each were employed. Such a system of duplicating the treatments allows for more accurate measurement of the results. However, in Table 1, the feeding results of all the lambs receiving the same grain are grouped together in order to simplify the tables.

The results of lambing-off corn and sorghum grains during the years of 1941, 42, 43 are given in Table 1. During these years corn was compared with *Sooner Milo*, a variety of grain sorghum that was being grown in South Dakota during that period, and with a low prussic acid cane sorghum developed at the South Dakota Experiment Station.

All lots of lambs were fed about one pound of alfalfa hay per head daily. It

might be mentioned at this time that one of the difficulties in comparing these grains was to get the corn to mature about the same time as the sorghum.

Results of Lambing-off Sorghums

The lambs lambing-off corn made a greater daily gain than those lambing-off sorghum each of the three years. This was true when corn and alfalfa were compared with either Sooner Milo and alfalfa, or low prussic acid sorghum and alfalfa. The 0.3 of a pound daily gain made by the lambs in the corn field during 1942-43, compares favorably with dry lot gains. Thus this experiment shows quite distinctly that during the years when weather is not a problem, lambs will take to the standing ear corn and consume enough of it to make satisfactory gains.

The average daily gains made by the lambs lambing-off the Sooner

Milo ranked second each of the three years, and the lambs eating the low prussic acid sorghums made the poorest gains. Lambs fed Sooner Milo gained 0.24, 0.21, and 0.21 pound per head daily during 1941, 1942 and 1943, respectively. Lambs fed low prussic acid cane gained 0.18, 0.17, and 0.20 pound in 1941, 1942 and 1943, respectively. The relatively low gains made by lambs receiving the low prussic acid sorghum have been observed at other stations, and it is an accepted fact that grains from sweet sorghums do not have the feeding value that regular grain sorghums have, such as Sooner Milo, Colby, or the more recent Norghum sorghum.

The reason for this can best be explained by examining Table 2, which shows the chemical composition of the grains fed during 1941.

It should be noticed that all of the sorghums, with the exception of the low prussic acid cane, are low in fiber

Table 1. Result of Lambing-off Corn and Sorghum Grains

	1941			1942			1943			3 Yr.-Av.		
	Corn, Alfalfa	Sooner Milo, Alfalfa	Low Prussic Acid Cane & Alf.	Corn, Alfalfa	Sooner Milo, Alfalfa	Low Prussic Acid Cane & Alf.	Corn, Alfalfa	Sooner Milo, Alfalfa	Low Prussic Acid Cane & Alf.	Corn, Alfalfa	Sooner Milo, Alfalfa	Low Prussic Acid Cane & Alf.
Number lambs per lot	20	29	29	29	30	29	29	15	29	78	74	87
Initial weight, lbs.	64.3	64.5	64.0	60.8	60.4	60.4	60.5	60.4	60.4	61.8	62.0	61.6
Final weight, lbs.	77.0	80.8	76.1	78.5	74.7	71.7	78.5	74.7	74.2	78.0	77.1	74.0
Days in field	42	69	69	67	67	67	68	68	68	59	68	68
Average daily gain, lbs. ....	.30	.24	.18	.26	.21	.17	.26	.21	.20	.27	.22	.18
Acres in field	2	3	3	5.75	5.52	5.52	.....†	.....	.....	.....	.....	.....
Gain per acre,* lbs.	126.9	152.2	116.8	93.0	75.3	61.4	.....	.....	.....	.....	.....	.....

*The relatively high acre gains in 1941 made by the lambs consuming Sooner Milo and low prussic acid sorghum can be explained by the larger number of lambs and the greater number of days they were in the fields.

†Data unavailable.

Table 2. Chemical Composition of Sorghum Grain Fed, 1941, Moisture-free Basis

	Sooner Milo	Colby	Low Prussic Acid	
			Cane	Corn
Ether extract (fat)	2.35	3.59	2.84	3.78
Crude fiber	2.23	1.87	10.47	2.69
Crude protein	13.74	14.44	12.43	11.08
Nitrogen-free extract (largely carbohydrates)	80.13	78.48	71.79	80.94

and all of them including the low prussic acid cane are higher in protein than is corn. The high fiber content (10.5 percent) and the low nitrogen-free extract content (71.8 percent) of the low prussic acid sorghum, undoubtedly account for a considerable part of the poor results that are obtained when grains from sweet sorghums are fed.

During 1941 and 1942 data were obtained on gains per acre. These figures are also given in Table 1. For corn they range from a low of 93 pounds per acre during the fall of 1942, to a high of 126.9 pounds during the fall of 1941. The lambs were removed from these fields long before all of the grain was harvested, as there was about as much grain left in the fields as the lambs consumed. In farm practice this could be picked up by older sheep or by brood sows turned in to clean up the fields. With lambs it is not felt advisable to leave them in the corn or sorghum fields after the grain has become scarce because of the poor rate of gain.

Sorghum Compared to Corn in the Dry Lot

In the fall of 1941, an experiment was started in which Sooner Milo, low prussic acid sorghum, Colby and Kalo Milo were all compared with the standard ration of alfalfa and corn. These lambs were all full-fed in dry lot and all of the lambs consumed about two pounds of alfalfa hay per head daily along with a full feed of grain sorghum or corn, depending upon which they were receiving. A summary of the results from feeding the various sorghum grains to lambs is given in Table 3 for the year 1941-42.

There were 24 lambs in each lot at the commencement of the trial and they were fed for a period of 98 days. With the exception of Colby sorghum, a sorghum developed in Kansas for the southwest, the other sorghum grains did not compare so favorably with corn as a lamb fattening feed. Sooner Milo- and Kalo Milo-fed lambs gained 0.37 of a pound per head daily during the feeding trial. Again it

Table 3. Results of Feeding Various Sorghum Grains and Yellow Corn to Lambs (1941-42)

Lot No.	I	II	III	IV	V
	Alfalfa, Sooner Milo	Alfalfa, 39-30-S Cane*	Alfalfa, Colby Milo	Alfalfa, Corn	Alfalfa, Kalo Milo
Ration Fed—All Lots Fed 98 Days					
Number of lambs	24	24	24	24	23
Average initial weight per lamb, lbs.	67.8	67.6	67.6	67.7	67.7
Average final weight per lamb, lbs.	104.0	101.4	107.3	107.1	103.6
Total gain per lamb, lbs.	36.2	33.8	39.7	39.4	35.9
Average daily gain per lamb, lbs.	0.37	0.34	0.40	0.40	0.37
Dressing percentage	50.8	47.8	51.8	51.5	50.5
Average daily ration per lamb, lbs.					
Alfalfa	2.0	1.9	1.9	1.9	2.0
Grain	1.4	1.5	1.3	1.3	1.4
Total	3.4	3.4	3.2	3.2	3.4
Feed consumed per 100 lbs. gain					
Alfalfa	538	557	480	480	545
Grain	369	434	331	323	382

*Low prussic acid content

can be noticed that the lambs fed the grain from low prussic acid sorghum, a sweet sorghum type, made the smallest gain, 0.34 of a pound daily. The Colby-fed lambs and the corn-fed lambs gained 0.40 of a pound a day. The feed efficiency is in favor of the corn-fed group (480 lbs. alfalfa and 323 lbs. corn per 100 pounds of gain) followed closely by the Colby group (480 lbs. alfalfa and 331 lbs. Colby sorghum per 100 pounds of gain). As might be expected, the lambs receiving the low prussic acid sorghum required the most grain and alfalfa for 100 pounds of gain (557 lbs. alfalfa and 434 lbs. sorghum per 100 pounds gain).

Following the release of a new variety of sorghum, called Norghum, which was developed at the South Dakota Experiment Station, it was deemed advisable to compare the feeding value of this type of sorghum with the Colby sorghum and corn. The trial was initiated during the fall of 1949, at which time 25 lambs were placed in each lot and fed for a period

of 75 days. These lambs received a full feed of whole grain sorghum while a control group was given a full feed of shelled yellow corn. Brome hay was used as the roughage and soybean oil meal was fed at the rate of one-tenth of the amount of grain being fed. The results of this trial are presented in Table 4.

Lambs offered Norghum gained 0.33 of a pound a day, the Colby-fed group gained 0.36 of a pound a day, and the corn-fed group gained 0.33 of a pound a day. From the standpoint of average daily gain, the new variety of sorghum compared quite favorably with corn. The old Colby sorghum compared most favorably, and in this particular trial it produced gains which exceeded the gains made by the corn-fed lambs. Comparing the grain required for 100 pounds of gain, it can be noted in Table 4 that the corn-fed lambs required less concentrates than either the Colby- or Norghum-fed groups. It is rather interesting to note that the daily grain consumed was the greatest in the lot receiving the Colby

Table 4. Sorghum Grains Compared to Shelled Yellow Corn when Fed in Dry Lot, 1949-50

Lot Number	I	II	III
	Norghum Sorghum Brome Hay Soybean Meal	Colby Sorghum Brome Hay Soybean Meal	Shelled Yellow Corn Brome Hay Soybean Meal
Ration Fed—All Lots Fed 75 Days			
Number lambs per lot	25	24	25
Average initial weight, lbs.	70.7	70.2	70.5
Average final weight, lbs.	95.5	97.3	95.0
Total gain, lbs.	24.8	27.1	24.5
Average daily gain per lamb, lbs. ...	.33	.36	.33
Average daily ration, lbs.			
Brome hay	1.18	1.20	1.19
Grain	1.72	1.96	1.64
Soybean meal .....	.17	.19	.16
Feed per 100 lbs. gain			
Brome hay	351	328	358
Grain	513	538	495
Soybean meal	51.3	53.8	49.5

sorghum followed by the Norghum group; the corn-fed group ate the least. These lambs were full-fed at all times so the amount of feed consumed would reflect the palatability of the sorghums.

Following the marketing of this group of lambs, a second group of lambs was purchased and put on feed during the early winter of 1949-50. There were 23 lambs in the lot receiving corn, alfalfa and soybean oil meal and 24 in the group receiving Norghum sorghum, alfalfa and soybean oil meal. These lambs were fed for a period of 119 days.

During this trial the corn-fed group gained 0.36 of a pound and the Norghum-fed group gained 0.34 of a pound per head daily. While the corn-fed group excelled slightly in daily gains, both groups gained satisfactorily. The average daily feed consumption showed the same tendency as in the first trial; that is, the sorghum-fed groups consumed more grain per head daily than the corn-fed group.

It might be added at this point that the lambs receiving Norghum sorghum were easier to get on full feed and showed less tendency to tire of their feed than did the corn-fed group. However, the shelled yellow corn ration was more efficient than the Norghum, in that the group on the corn ration was able to convert 380 pounds of alfalfa and 526 pounds of shelled corn into 100 pounds of gain as compared to 398 pounds alfalfa and 601 pounds Norghum per 100 pounds gain required by the group receiving Norghum. The results of this trial are reported in Table 5.

During the fall of 1950-51, two more groups of lambs were placed on trial in which there were 25 lambs in each group. Group I received Norghum, alfalfa and soybean meal and Group 2 received shelled corn, alfalfa and soybean meal. They were fed for a period of 64 days during which time the Norghum-fed group gained 0.41 of a pound per head daily as compared to the corn-fed group which

Table 5. Sorghum Grain Compared to Shelled Yellow Corn When Fed to Lambs in Dry Lot, Second Experiment, 1949-50

Lot Number	I Corn Alfalfa Soybean Meal	II Norghum Alfalfa Soybean Meal
Ration Fed—Both Lots Fed 119 Days		
Lambs per lot	23	24
Initial average weight, lbs.	57.3	56.4
Final average weight, lbs.	100.2	96.9
Total gain per lamb, lbs.	42.9	40.5
Average daily gain per lamb, lbs. ....	.36	.34
Average daily ration, lbs.		
Alfalfa	1.37	1.34
Grain	1.90	2.03
Soybean meal .....	.2	.2
Feed consumed per 100 lbs. gain		
Alfalfa	380	398
Grain	526	601
Soybean meal	53	60

Table 6. Norghum Sorghum as Compared to Shelled Yellow Corn When Fed to Lambs in Dry Lot, 1950-51

Lot Number	I Norghum Alfalfa Soybean Meal	II Corn Alfalfa Soybean Meal
Ration Fed—Both Lots Fed 64 Days		
Number of lambs per lot	25	25
Initial average weight, lbs.	69	71.6
Final average weight, lbs.	95.1	96.3
Total gain per lamb, lbs.	26.1	24.7
Average daily gain per lamb, lbs. ....	.41	.39
Average daily ration, lbs.		
Alfalfa	1.60	1.60
Grain	1.92	1.76
Soybean meal .....	.19	.18
Feed consumed per 100 lbs. gain		
Alfalfa	393	414.8
Grain	473.2	457.2
Soybean meal	46.9	47.6

gained 0.39 of a pound daily. The complete results of this trial are given in Table 6.

The average daily ration shows that the Norghum-fed group ate over 1.92 pounds of sorghum per head as compared to 1.76 pounds for the shelled yellow corn group. Again it is quite obvious, as was shown in the two preceding trials, that the lambs seem to find Norghum palatable, and consequently ate more of it per head daily than they did of shelled yellow corn.

On the other hand, it was observed that even though the Norghum-fed lambs gained more per head daily, they required more concentrates for 100 pounds of gain. In this trial, the Norghum-fed group required 393 pounds of alfalfa and 473 pounds of sorghum, in addition to the protein supplement, per 100 pounds of gain as compared to 414 pounds of alfalfa and 457 pounds of corn for the corn-fed group per 100 pounds of gain.

Digestibility of Sorghum

Since sorghum compares very favorably with corn in chemical composition, it was necessary to determine why more sorghum is required for 100 pounds of gain than in the case of corn. Therefore, a digestion trial was used to study this factor. Four lambs were placed on trial and fed slightly less than two pounds of Norghum a day. No hay was fed during the trial. A 10-day preliminary period and a 10-day collection period were used. Dur-

ing the collection period all the feeds fed and all the feces were weighed accurately. The feces were collected in a canvas sack fastened by means of a harness to the lamb. In this way it was possible, after determining the amount of nutrients offered in the feed and the amount of nutrients excreted in the feces, to determine how much of the various nutrients were being digested by the lambs.

It had been noticed during all of the

sorghum trials that a considerable amount of the sorghum passed through the lamb in the whole state but in spite of that, the digestibility compared quite favorably with corn. This substantiates the results of feeding trials which show that it is not economically practical to grind sorghums for lambs as they seem to be able to digest the grain satisfactorily even though a considerable amount does pass through them whole. No doubt the fact that the lambs were on full feed had a tendency to increase

the amount of sorghum that passed through them. This possibly accounts for the lower efficiency that has been observed during these trials. Table 7 gives the coefficients of digestibility of sorghum grains that were fed to lambs without roughage, as compared to those of dent corn, grade No. 2. The chemical composition of the Norghum fed during this trial and of the yellow corn is given in Table 8.²

²The coefficients of digestibility and the chemical composition reported for the corn are those for No. 2 yellow corn. F. B. Morrison, *Feeds and Feeding* (21st ed.; Ithaca, N. Y.: Morrison Publishing Co.)

Table 7. Digestive Coefficients of Norghum Sorghum When Fed to Lambs Without Roughage

	Dry Matter %	Crude Protein %	Ether Extract %	Crude Fiber %	N-free Extract %
Lamb No. 1	88.35	74.98	83.07	51.93	93.34
Lamb No. 2	85.20	71.40	78.97	28.42	91.16
Lamb No. 3	86.18	70.20	75.13	37.91	91.86
Lamb No. 4	88.51	81.12	84.32	38.12	92.28
Average for all lambs	87.06	74.43	80.37	39.10	92.16
Dent corn, grade No. 2*	77.00	77.00	90.00	57.00	93.00

*Coefficient of digestibility as given in Morrison's *Feeds and Feeding*, 21st ed.

Table 8. Chemical Analysis of the Norghum and the Corn Fed to Lambs During Digestion Trial

	Total Dry Matter	Crude Protein	Ether Extract	Crude Fiber	N-free Extract
Norghum	91.17	12.15	2.79	1.78	72.97
Dent corn, grade No. 2*	85.0	8.6	3.9	2.0	69.3

*Average analysis as given in Morrison's *Feeds and Feeding*, 21st ed.

Summary

The results of five years of feeding sorghum to lambs as compared to feeding corn, both in dry lot and by lambing-off sorghum of various varieties, show that:

1. Grain from grain-type sorghums compares favorably with corn in chemical composition and usually exceeds corn in protein content.

2. Sorghum grain from sweet-type sorghums is lower in nitrogen-free extract and higher in fiber than either grain sorghums or corn.

3. Grain sorghums can be lambed-off satisfactorily. However, lambs lambing-off corn made consistently greater gains than those lambing-off sorghum grains. Average daily gains

made during three trials were: corn 0.27; grain sorghum 0.22; sweet-type sorghum 0.18 pound per head daily.

4. Results of four trials conducted during a 3-year period show that lambs fed grain from grain sorghums made 92 to 100 percent as much daily gains as lambs fed shelled corn.

5. The corn ration was more efficient than the sorghum ration, inasmuch as lambs required 4 to 8 percent less feed per 100 pounds of gain.

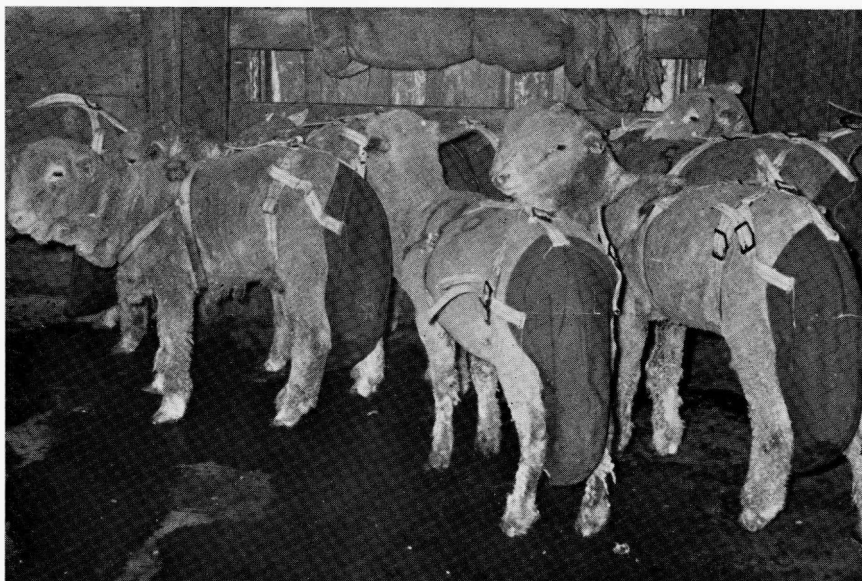
6. Grain sorghums proved to be palatable, since in each trial the sorghum-fed lambs consumed more grain per head daily than the corn-fed lambs.

7. A considerable amount of the sorghum grain passed through the

lambs whole, but in spite of this, the digestibility of sorghum grains, as shown in a digestion trial, compared favorably with the digestibility of shelled corn.

8. Grinding the grain of sorghum for lambs is not economically practical.

9. These lamb feeding trials show that grain sorghums compare quite favorably with corn for lamb feeding. Therefore, in those areas of the state where grain sorghums are a more reliable crop than corn, and where the yield per acre of sorghum grain will exceed corn, grain sorghums may well be grown and fed.



Canvas sacks fastened to the lambs made it possible to gather and weigh feces accurately. After determining the amount of nutrients offered in the feed and the amount excreted in the feces, it was possible to calculate how much of the various nutrients were being digested.