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DIVISION OF ANIMAL INDUSTRY

GRAIN SORGHUMS VERSUS CORN FOR FATTENING LAMBS

THIRD EXPERIMENT



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GRAIN SORGHUMS VERSUS CORN FOR FATTENING LAMBS

THIRD EXPERIMENT

BY

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According to reliable statistics emanating from the Federal Department of Agriculture, the United States is now producing approximately 144,000,000 bushels of the various grain sorghums per year, of which amount 60,000,000 is attributed to the Lone Star State. The grain sorghums are, in fact, commonly listed among the safest and most reliable crops for West Texas and the above figures accredited to this State, large though they be, concededly represent only a partial showing of the possible production. In fact, the actual production of such grains is now controlled by the farmer's estimate of the demand for them the following year. Meanwhile, Texas continues to import vast quantities of corn from the cornbelt states for feeding purposes, despite the fact that such corn has, in the past, consistently sold at figures ranging fifteen to twenty per cent. higher than the market price for grain sorghum.

Though Texas, by virtue of her natural resources, has for years been recognized in the livestock circles as holding premier rank in the production of beef cattle, and during the past three or four years has reached first place in the production of sheep, she has by no means reached the pinnacle of her possibilities in the finishing of livestock, if it be true that her grain sorghums have as great an economical feeding value as the feedstuffs which she is importing. Especially must the lamb-feeding industry surge forward in importance if scientific facts indicate the greater economy of feeding the locally produced grain sorghums. In fact, if the feeding value of these grain sorghums is amply demonstrated it is only to be lamented that Texas has not come sooner by this route to the place where she could claim her just position as the premier State in the production of fat lambs.

It would seem, then, that the question as to whether the grain sorghums which are produced so bountifully throughout Western Texas can be substituted for corn as a fattening ration for livestock, must necessarily be a vital one. Its solution is naturally a matter of interest to both farmer and stockman. And if it be demonstrated that the grain sorghums produce as economical gains as does corn in the fattening of livestock, this fact will naturally redound to the mutual benefit of the stockman and the farmer. And the farmer who is also turning a part of his attention to the fattening of a few head of livestock will be benefited in two ways, since by feeding the cheap and easily grown grain sorghums to his own stock, he can return the manure to the land and thus in a measure prevent soil depletion, which naturally results when a one-crop system is pursued year after year. Such a state of affairs must naturally encourage livestock farming, which is, without doubt, the most permanent and well-rounded system of agriculture.

It has been with the purpose of throwing some light on the problem already outlined that a series of lamb-feeding tests has been conducted during the last three years by the Division of Animal Industry of the Texas Agricultural Experiment Station at Substation No. 7, Spur, Texas.

A REVIEW OF PREVIOUS EXPERIMENTS

The first of these tests was conducted during the 1919-1920 feeding season with the object of comparing the gains and economy of gains made by lambs, some of which were fattened on corn and others on the different grain sorghums. The results of this test have been amplified at considerable length in Bulletin No. 269, entitled "Grain Sorghums Versus Corn for Fattening Lambs," issued by this Station in October, 1920.

For the particulars, reference may be made to that Bulletin, but it has been thought worth while to include herein a brief review of the results. The test was continued through a feeding period of 90 days, six lots of 20 lambs each being involved in the experiment. Alfalfa hay constituted the sole roughage for each lot, and the various lots were fed identical amounts of the respective feeds. The only difference in the rations was manifested in the kinds of grains consumed, Lot 3 being fed on ground shelled corn (corn chops), Lot 1 on ground milo heads, Lot 2 on ground threshed feterita, Lot 4 on ground threshed milo, Lot 5 on ground feterita heads, and Lot 6 on ground threshed kafir. Table 1 given below contains a concise summary and comparison of the showings made by the different lots involved in the test, reported in Texas Station Bulletin 269.

Table 1. Summary of ninety-day feeding test, 1919-20, Substation No. 7.

	Lot I. Ground Milo Heads, Cottonseed Meal, Alfalfa Hay.	Lot II. Ground Threshed Feterita, Cottonseed Meal, Alfalfa Hay.	Lot III. Ground Corn, Cottonseed Meal, Alfalfa Hay.	Lot IV. Ground Threshed Milo, Cottonseed Meal, Alfalfa Hay.	Lot V. Ground Feterita Heads, Cottonseed Meal, Alfalfa Hay.	Lot VI. Ground Threshed Kafir, Cottonseed Meal, Alfalfa Hay.
Number of lambs per lot.....	20	20	20	20	20	20
Average initial weight, lbs.....	59.330	59.000	59.880	59.730	59.960	58.630
Average final weight, lbs.....	91.910	91.420	95.250	95.160	90.460	92.130
Average total gain, lbs.....	32.580	32.420	35.370	35.430	30.500	33.500
Average daily gain, lbs.....	0.362	0.360	0.393	0.394	0.339	0.372
Average daily ration:						
1. Grain, lbs.....	1.080	1.080	1.080	1.080	1.080	1.080
2. Cottonseed meal, lbs.....	0.140	0.140	0.140	0.140	0.140	0.140
3. Alfalfa hay, lbs.....	1.890	1.890	1.890	1.890	1.890	1.890
Total feed consumed per lamb:						
1. Grain, lbs.....	97.211	97.211	97.211	97.211	97.211	97.211
2. Cottonseed meal, lbs.....	12.588	12.588	12.588	12.588	12.588	12.588
3. Alfalfa hay, lbs.....	170.400	170.400	170.400	170.400	170.400	170.400
Concentrates per 100 lbs. gain, lbs.....	337.010	338.660	310.430	309.890	359.990	327.750
Hay per 100 lbs. gain, lbs.....	523.020	525.600	481.760	480.940	558.680	508.650
Cost of feed per 100 lbs. gain.....	\$ 13.828	\$ 15.660	\$ 17.284	\$ 14.329	\$ 14.771	\$ 15.155
Average feed cost per lamb.....	4.500	5.080	6.110	5.080	4.500	5.080
Initial cost per lamb at feed lot at 13½ cents per pound.....	8.01	7.97	8.08	8.06	8.09	7.92
Interest, labor, shipping and selling charges per head, estimated.....	1.20	1.20	1.20	1.20	1.20	1.20
Total cost per lamb.....	13.71	14.25	15.39	14.34	13.79	14.20
Estimated selling weight at Fort Worth, lbs.....	84.56	84.11	87.63	87.55	83.22	84.76
Selling price per lamb at Fort Worth at \$19.50 per cwt.....	\$ 16.49	\$ 16.40	\$ 17.09	\$ 17.07	\$ 16.23	\$ 16.53
Estimated net profit per lamb.....	2.78	2.15	1.70	2.73	2.44	2.33
Necessary selling price per cwt. to break even.....	16.21	16.94	17.56	16.38	16.57	16.75

The deductions to be made from this table are that: (1) each of the lots made exceptionally good gains throughout the 90-day feeding period; (2) Lot 4, fattened on ground threshed milo, made a slightly increased gain over Lot 3, which was fed ground shelled corn; (3) the lots fattened on the grain sorghums made much more economical gains than the lambs fattened on corn which had been shipped into Texas; (4) corn imported into Texas from other States cannot compete successfully with the locally grown grain sorghums for fattening lambs.

THE 1920-1921 LAMB FEEDING EXPERIMENT

The 1919-1920 test was followed by a similar test during the next year, conducted in the same manner and for the same purpose. The results of this test have been published in Bulletin No. 285, issued in January, 1922, and carrying the same title as the previous bulletin. The particulars of that test may be had by referring to the above-mentioned bulletin. For our present purpose it will be sufficient to summarize this experiment as we did the 1919-1920 test.

The feeding period extended over 90 days. The experiment was broadened so as to include seven lots of 20 lambs each, instead of six lots of 20 lambs each. Again alfalfa hay constituted the sole roughage and cottonseed meal was fed in the same amount to all of the lots. The grain rations for the different lots were as follows:

- Lot 1. Ground milo heads.
- Lot 2. Ground threshed feterita.
- Lot 3. Ground shelled corn.
- Lot 4. Ground threshed milo.
- Lot 5. Ground feterita heads.
- Lot 6. Ground threshed kafir.
- Lot 7. Ground kafir heads.

The same grain sorghums were used in this test as in the previous year with the exception of ground kafir heads, which constituted the grain fed to the additional lot.

Table 2 is a summary showing the gains and economy of gains made by the respective lots.

Table 2. Summary of 90-day lamb-feeding test, 1920-21, Substation No. 7.

Rations.	Lot 1. Ground milo heads, cottonseed meal, alfalfa hay.	Lot 2. Ground threshed feterita, cottonseed meal, alfalfa hay.	Lot 3. Ground shelled corn, cottonseed meal, alfalfa hay.	Lot 4. Ground threshed milo, cottonseed meal, alfalfa hay.	Lot 5. Ground feterita heads, cottonseed meal, alfalfa hay.	Lot 6. Ground threshed kafir, cottonseed meal, alfalfa hay.	Lot 7. Ground kafir heads, cottonseed meal, alfalfa hay.
Number of lambs per lot.....	20	20	20	20	20	20	20
Average initial weight, pounds.....	50.633	50.516	50.283	50.350	50.483	50.600	50.200
Average final weight, pounds.....	78.633	78.566	78.333	78.633	76.433	79.483	75.700
Average gain, pounds.....	28.000	28.050	28.050	28.280	25.950	28.880	25.500
Average daily gain, pounds.....	0.311	0.312	0.312	0.314	0.288	0.321	0.283
Average daily ration:							
Grain, pounds.....	0.877	0.877	0.877	0.877	0.877	0.877	0.877
Cottonseed meal, pounds.....	0.156	0.156	0.156	0.156	0.156	0.156	0.156
Hay, pounds.....	1.477	1.475	1.471	1.469	1.473	1.481	1.451
Total feed consumed per lamb:							
Grain, pounds.....	78.93	78.93	78.93	78.93	78.93	78.93	78.93
Cottonseed meal, pounds.....	14.06	14.06	14.06	14.06	14.06	14.06	14.06
Hay, pounds.....	133.00	132.78	132.37	132.27	132.55	133.25	130.63
Concentrates per hundred pounds gain, pounds.....	332.10	331.51	331.51	328.80	358.31	321.98	364.66
Hay per hundred pounds gain, pounds.....	475.00	473.36	471.90	467.72	510.78	461.39	512.27
Average feed cost per lamb.....	\$ 2.48	\$ 2.61	\$ 3.39	\$ 2.61	\$ 2.47	\$ 2.62	\$ 2.45
Initial cost per lamb at feed lot.....	7.44	7.44	7.44	7.44	7.44	7.44	7.44
Cost of feed per hundred pounds gain.....	8.86	9.30	12.08	9.23	9.52	9.07	9.61
Interest, labor, shipping and selling charges per head.....	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Total cost per lamb.....	11.12	11.25	12.03	11.25	11.11	11.26	11.09
Weight at Fort Worth, pounds.....	73.00	74.00	74.00	71.00	71.00	75.50	71.00
Selling price at 8c per pound.....	\$ 5.84	\$ 5.92	\$ 5.92	\$ 5.68	\$ 5.68	\$ 6.04	\$ 5.68
Loss per lamb.....	5.28	5.33	6.11	5.57	5.43	5.22	5.41
Price necessary to break even.....	15.23	15.20	16.25	15.84	15.64	14.91	15.61
Per cent shrinkage en route.....	7.16	5.81	5.53	9.71	7.10	5.01	6.21

From the above table it will be observed that: (1) In this test as in that conducted during the previous season Lot 4, fattened on ground threshed milo, made a slightly larger average daily gain than did Lot 3, fattened on ground shelled corn; (2) Lot 6, fattened on ground threshed kafir, made an even larger gain than did Lot 4, and registered gains noticeably more satisfactory than those registered by Lot 3; (3) Lot 2, fattened on ground threshed feterita, made average daily gains and equal to the average daily gains made by Lot 3, fattened on ground shelled corn, while Lot 1 made gains per day only one-thousandth of a pound less than those accredited to the last two lots; (4) the costs per hundred pounds of gain, live weight, made by the sheep fattened on the grain sorghums were twenty to twenty-six per cent. less than the cost attributed to the lot fed on ground shelled corn; (5) in this test a heavy loss was incurred on each lot due to the fact that the lambs were purchased at a time when feeders were commanding around \$13 per hundred weight, but delivered to the packers at a sacrificing price of \$8 per hundred weight, after one of the most serious breaks in the history of the lamb trade had occurred.

The Kansas Experiment Station* has also conducted several tests to compare the feeding value of kafir with corn, which substantiate the above conclusions. In the test conducted in 1914, the Kansas Station compared shelled corn, whole kafir, and ground kafir fed to three lots of fifty 56-pound lambs in the following proportions: 0.9 pound grain, 0.19 pounds cottonseed meal, 1.4 pounds alfalfa hay, and 1.1 pounds sweet sorghum silage. In this test the lambs fattened on shelled corn made an average daily gain of 0.4 pound during the sixty-day trial; those fattened on whole kafir made an average daily gain of 0.35 pound; while those fattened on ground kafir made an average daily gain of 0.36 pound.

In a similar test conducted at the Kansas Station in 1915-1916 with 75 lambs to the lot, the lambs fattened on an average daily ration consisting of corn 1.01 pounds, cottonseed meal 0.16 pound, alfalfa hay 0.95 pound, and silage 1.24 pounds, made an average daily gain of 0.274 pound. The lambs fattened on an average daily ration consisting of whole kafir 1.01 pounds, cottonseed meal 0.16 pound, alfalfa hay 0.993 pound, silage 1.09 pounds, made an average daily gain of 0.247 pound per head.

In 1917-1918, the Kansas Station conducted a test in which shelled corn and alfalfa hay were compared with whole kafir and alfalfa hay for fattening lambs. The corn-fed lot received an average daily ration of corn 1.46 pounds, alfalfa hay 1.54 pounds, and made an average daily gain of 0.43 pound. The kafir lot received an average daily ration of kafir 1.39 pounds, alfalfa hay 1.74 pounds, and made an average daily gain of 0.41 pound. The Kansas experiment also pointed to the conclusion that lambs fattened on kafir, which is one of the grain sorghums, make almost the same gains as lambs fattened on corn.

*Information to the authors from the Kansas Experiment Station.

THE 1921-1922 LAMB FEEDING EXPERIMENT

OBJECT

During the past year the experimental work already outlined above was continued in the hope of securing reliable cumulative data as to the relative gains and economy of gains made by lambs fattened on the various grain sorghums as compared with lambs fattened on corn. This feeding test was extended, however, over 105 days, as compared with ninety days covered by the former tests.

RATIONS

In another respect this test was more extensive than the former tests, there being ten lots of 20 lambs each as compared with the six and seven lots involved in the tests reported in Bulletins Nos. 269 and 285. The feeds supplied to these ten lots were as follows:

Lot 1. Ground shelled corn, cottonseed meal, sorghum and alfalfa hay.

Lot 2. Ground threshed milo, cottonseed meal, sorghum and alfalfa hay.

Lot 3. Whole threshed milo, cottonseed meal, sorghum and alfalfa hay.

Lot 4. Ground milo heads, cottonseed meal, sorghum and alfalfa hay.

Lot 5. Ground threshed feterita, cottonseed meal, sorghum and alfalfa hay.

Lot 6. Ground feterita heads, cottonseed meal, sorghum and alfalfa hay.

Lot 7. Ground threshed kafir, cottonseed meal, sorghum and alfalfa hay.

Lot 8. Ground kafir heads, cottonseed meal, sorghum and alfalfa hay.

Lot 9. Ground threshed darso, cottonseed meal, sorghum and alfalfa hay.

Lot 10. Ground threshed sorgo, cottonseed meal, sorghum and alfalfa hay.

Each lot consumed identical amounts of cottonseed meal and identical amounts of the respective grains. The same amounts of roughage were placed in the different lots each day, but the various lots wasted different amounts of hay.

Representative samples of the several feeds utilized were taken near the beginning, at the close, and the middle of the experiment, and submitted to the Station Chemist for analyses. Table 3 contains his report as to the composition of the various feeds.

Table 3. Composition of feeds used during 1921-22 experiment. (Per cent.)

Feeds.	Protein.	Fat.	Crude fibre.	Nitrogen-free extract.	Water.	Ash.	No. of analyses.
Ground shelled corn.....	9.75	4.34	2.81	72.22	9.48	1.40	3
Ground threshed milo.....	10.76	2.73	2.48	72.54	9.91	1.58	3
Whole threshed milo.....	11.89	2.99	2.83	72.03	8.69	1.57	3
Ground milo heads.....	9.90	2.32	6.98	68.34	9.37	3.09	3
Ground threshed feterita.....	12.57	2.80	2.80	69.25	10.51	2.07	3
Ground feterita heads.....	11.22	2.83	6.81	65.70	10.41	3.03	3
Ground threshed kafir.....	11.73	2.67	1.84	71.29	10.75	1.52	3
Ground kafir heads.....	10.61	2.58	6.90	65.93	10.75	3.23	3
Ground threshed darso.....	8.95	3.03	2.73	74.72	9.35	1.22	3
Ground threshed sorgo.....	10.70	3.12	2.77	72.61	9.23	1.57	3
Cottonseed meal.....	45.54	7.27	9.72	25.53	6.38	5.56	3
Alfalfa hay.....	13.98	1.57	32.40	35.31	8.34	8.40	4
Sorghum hay.....	6.52	1.87	24.48	51.31	8.38	7.44	1

A good grade of mixed white and yellow corn similar to that utilized in the first two tests was used as the basis of the standard ration fed to Lot 1. The corn was sold on the Fort Worth market as Northern corn and was graded as number one mixed. The milo, feterita, and kafir used in this test were grown locally, the bulk of this feed being produced on the Substation. The heads were well filled at the base and tip, and the grains were generally mature, large, and plump, free from smut, dust, or mold. These grain sorghums were first-class and on the whole superior to grain sorghums fed in the former tests. The chemical analyses showed that they contained one to two and a half per cent. less water than the grain sorghums formerly used. The corn also contained a noticeably smaller per cent. of water. Some of the darso and sorgo was purchased and shipped from other counties. These sorghums, however, were first-class, free of smut, dust, or mold. The grains were sound, clean, plump, and bright. The cottonseed meal was of good color and quality.

The sorghum hay used during the first few days of the test was bright in color, and free from dust or mold, but contained a high per cent. of moisture. The alfalfa was obtained from several sources and ranged in quality from choice to number two.

The costs reported below are averages based on the current feed prices prevailing in the Panhandle of Texas during the period of the test.

Ground shelled corn per ton.....	\$33.88
Ground threshed milo per ton.....	17.39
Whole threshed milo per ton.....	15.67
Ground milo heads per ton.....	12.42
Ground threshed feterita per ton.....	17.39
Ground feterita heads per ton.....	12.42
Ground threshed kafir per ton.....	17.39
Ground kafir heads per ton.....	12.42
Ground threshed darso per ton.....	17.39
Ground threshed sorgo per ton.....	17.39
Cottonseed meal per ton.....	40.86
Alfalfa hay per ton.....	29.36
Sorghum hay per ton.....	6.50

Table 4. Weather conditions during test.

Year.	Month.	Maximum temperature, degrees F.	Minimum temperature, degrees F.	Precipitation, inches.
1921	November*	75.27	34.63	Trace
1921	December	68.51	30.00	.100
1922	January	55.25	25.38	.310
1922	February	66.53	32.25	Trace
1922	March†	64.20	19.60	.040

*Including November 20 and thereafter.

†Through and including March 5.

As in the former tests, the lambs in this experiment had access to shelter and for that reason the weather conditions form a negligible factor in the final results. Fortunately there was no rain on the regular weighing dates. When the weather was unusually warm the evening feedings were in a few instances delayed until the atmosphere had become cooler. During the sudden cold snaps, the lambs naturally did not drink the usual amount of water but they all remained on feed throughout the 105-day feeding test.

DURATION OF THE EXPERIMENT

The experiment was begun with the evening feed of November 20, 1921, and brought to a conclusion with the morning feed of March 5, 1922.

THE LAMBS AND THE PRELIMINARY MANAGEMENT

On October 25th, 150 grade Rambouillet lambs were purchased from Mr. A. B. Blackwell, Girard, Texas, at a cost of \$3 per head. When these lambs arrived they were placed with 71 lambs raised on the Substation and the whole flock was given access to a good grain sorghum stalk field and a splendid alfalfa patch for a few hours each day. During a week's preliminary period the lambs were fed a concentrated mixture of about 110 pounds daily, mixed in the following proportions: Milo grain 1.75 parts, kafir chops 1.75 parts, feterita chops 1.75 parts, corn 1.75 parts, cottonseed meal 3.00 parts, and sorghum hay. Two hundred lambs that were involved in this test were topped from the flock numbering 221 lambs.

FEED LOTS AND WATER SUPPLY

All of the lots utilized during this test were of similar size and structure with a southern exposure and ample shelter as protection from inclement weather. In the same way the feed racks were identical in size and structure. The water supply came from a shallow well producing what is generally known as "Gyp Water." The lambs were given access to this water three times a day. According to an analysis made by the Station Chemist, it contains 1240 parts salt (chloride of soda) per million parts of water. Of course this served to satiate in part the desire of the lambs for salt. Nevertheless, salt was always kept in the pens and 26.5 pounds were consumed by each lot.

WEIGHT RECORDS

At the beginning of the test the lambs were weighed on three consecutive days, the average being taken as the initial weight. Weights were then taken at the close of each fifteen-day interval until the end of the test. At the conclusion of the experiment the lambs were weighed on the last three consecutive days, the average being taken as the final weight. The weights were taken at the same hour of the day.

THE EXPERIMENT

On the afternoon of November 19th, the 200 lambs which were at that time selected from the flock that had been on preliminary feed were divided into ten groups of 20 lambs each and placed in different lots. The division was made with due regard to size, type, and condition, so that the various lots would be as nearly uniform as possible.

At all times the different lots were fed the respective grains on a pound-for-pound basis. At first the concentrated ration was composed of seven parts by weight of grain to three parts of cottonseed meal. After a period of three weeks the concentrated ration was changed to nine parts grain and one part cottonseed meal. That combination was then continued to the end of the experiment. During the first two weeks sorghum hay which had been passed through an ensilage cutter constituted the roughage. Alfalfa hay was then substituted for the sorghum roughage.

The lambs were fed regularly at 7 a. m. and 5 p. m. daily as punctually as possible. When the day was unusually warm the afternoon's feed was sometimes postponed until the atmosphere had cooled. The feeding process was so organized that by weighing out the feeds before feeding time, there was little delay in the distribution of the feed-stuffs to the various lots.

The hay which was not consumed was weighed back and an accurate record of the waste hay was kept.

Table 5. Comparison of ground threshed milo with ground shelled corn.

	Lot 1. Corn chops, cottonseed meal, alfalfa.	Lor 2. Milo chops, cottonseed meal, alfalfa.
Number of lambs per lot.....	20	20
Average initial weight, lbs.....	54.680	54.480
Average final weight at feed lot, lbs.....	91.970	91.330
Average weight on Fort Worth market, lbs.....	85.000	84.500
Average gain, lbs.....	37.290	36.850
Average daily gain, lbs.....	0.355	0.351
Average daily ration:		
Grain, lbs.....	0.948	0.948
Cottonseed meal, lbs.....	0.139	0.139
Roughage, lbs.....	1.626	1.619
Total feed consumed per lamb:		
Grain, lbs.....	99.530	99.530
Cottonseed meal, lbs.....	14.604	14.604
Roughage, lbs.....	170.785	169.985
Feed per hundred pounds gain:		
Grain, lbs.....	266.910	270.100
Cottonseed meal, lbs.....	39.170	39.630
Roughage, lbs.....	457.990	461.290

Table 5. Comparison of ground threshed milo with ground shelled corn—Continued.

	Lot 1. Corn chops, cottonseed meal, alfalfa.	Lot 2. Milo chops, cottonseed meal, alfalfa.
Cost of feed per one hundred lbs. gain.....	\$ 11.445	\$ 9.491
Average feed cost per lamb.....	\$ 4.268	\$ 3.497
Initial value per head at 6½ cents per pound.....	\$ 3.550	\$ 3.540
Interest, labor, shipping and selling charges per lamb.....	\$ 1.260	\$ 1.260
Total cost per lamb.....	\$ 9.078	\$ 8.297
Selling price per head at \$15.10 per cwt.....	\$ 12.835	\$ 12.760
Shrinkage en route per head, lbs.....	6.970	6.830
Shrinkage, per cent.....	7.580	7.480
Dressing per cent, basis feed lots weights.....	44.680	43.980
Dressing per cent, basis Fort Worth weights.....	48.340	47.530
Selling price per hundred pounds necessary to break even.....	\$ 10.680	\$ 9.820
Profit per lamb.....	\$ 3.757	\$ 4.463

Table 5 shows that the lambs in Lot 2, fattened on ground threshed milo, made practically the same gains as did Lot 1, fattened on ground shelled corn; the average gain per head made by the former was 37.29 pounds, while that made by the latter was 36.85 pounds.

The amount of feed required to produce one hundred pounds of gain was slightly greater for Lot 2 than for Lot 1. Nevertheless, the cost of feed per hundred pounds of gain was about seventeen and one-half per cent. less for Lot 2, which was fed the milo, than for Lot 1, which was fed the corn, the cost being \$9.491 for Lot 2 and \$11.445 for Lot 1. This naturally resulted in a considerably greater profit per lamb in Lot 2 than in Lot 1. The average daily gains made by the two lots were 0.355 pound for Lot 1 as compared with 0.351 pound for Lot 2. In the two former tests the average daily gains registered were as follows:

	Lot fed corn	Lot fed ground threshed milo
1919-1920.....	0.393 pound	0.394 pound
1920-1921.....	0.312 pound	0.314 pound

Table 6. Comparison of whole threshed milo with ground shelled corn.

	Lot 1. Corn chops, cottonseed, meal, alfalfa.	Lot 3. Whole milo, cottonseed, meal, alfalfa.
Number of lambs per lot.....	20	20
Average initial weight, lbs.....	54.680	56.460
Average final weight at feed lot, lbs.....	91.970	91.370
Average weight on Fort Worth market, lbs.....	85.000	84.500
Average gain, lbs.....	37.290	34.910
Average daily gain, lbs.....	0.355	0.332
Average daily ration:		
Grain, lbs.....	0.948	0.948
Cottonseed meal, lbs.....	0.139	0.139
Roughage, lbs.....	1.626	1.628
Total feed consumed per lamb:		
Grain, lbs.....	99.530	99.530
Cottonseed meal, lbs.....	14.604	14.604
Roughage, lbs.....	170.785	170.935
Feed per hundred pounds gain:		
Grain, lbs.....	266.910	285.100
Cottonseed meal, lbs.....	39.170	41.830
Roughage, lbs.....	457.990	489.640
Cost of feed per one hundred pounds gain.....	\$ 11.445	\$ 9.772
Average feed cost per lamb.....	\$ 4.268	\$ 3.411

Table 6. Comparison of whole threshed milo with ground shelled corn—Continued.

	Lot 1. Corn chops, cottonseed, meal, alfalfa.	Lot 3. Whole milo, cottonseed meal, alfalfa.
Initial value per head at 6½ cents per pound.....	\$ 3.550	\$ 3.670
Interest, labor, shipping and selling charges per lamb.....	\$ 1.260	\$ 1.260
Total cost per lamb.....	\$ 9.078	\$ 8.341
Selling price per head at \$15.10 per cwt.....	\$ 12.835	\$ 12.760
Shrinkage en route per head, lbs.....	6.970	6.870
Shrinkage per cent.....	7.580	7.520
Dressing per cent, basis feed lot weights.....	44.680	46.570
Dressing per cent, basis Fort Worth weights.....	48.340	50.360
Selling price per hundred lbs. necessary to break even.....	\$ 10.680	\$ 9.870
Profit per lamb.....	\$ 3.757	\$ 4.419

Table 6 indicates that Lot 1, fattened on the ground shelled corn, made noticeably better gains than did Lot 3, fattened on whole threshed milo, the former lot being accredited an average total gain per head of 37.29 pounds and an average daily gain of 0.355 pound, while the latter showed an average total gain per head of 34.91 pounds and an average daily gain per head of 0.332 pound. Since this was the only test in which whole threshed milo was employed no comparative figures from the other tests can be offered. The amount of feed required to produce one hundred pounds of gain was greater in Lot 3 than in Lot 1. Nevertheless, it cost 15 per cent. less to secure one hundred pounds gain in Lot 3, fed on the whole threshed milo than in the standard lot fed on corn, the cost for Lot 3 being \$9.772 as compared with \$11.445 for Lot 1. A much more handsome profit per lamb resulted for Lot 3.

Table 7. Comparison of ground milo heads with ground shelled corn.

	Lot 1. Corn chops, cottonseed meal, alfalfa.	Lot 4. Milo heads, cottonseed meal, alfalfa.
Number of lambs per lot.....	20	20
Average initial weight, lbs.....	54.680	55.720
Average final weight at feed lot, lbs.....	91.970	89.030
Average weight on Fort worth market, lbs.....	85.000	80.000
Average gain, lbs.....	37.290	33.310
Average daily gain, lbs.....	0.355	0.317
Average daily ration:		
Grain, lbs.....	0.948	0.948
Cottonseed meal, lbs.....	0.139	0.139
Roughage, lbs.....	1.626	1.614
Total feed consumed per lamb:		
Grain, lbs.....	99.530	99.530
Cottonseed meal, lbs.....	14.604	14.604
Roughage, lbs.....	170.785	169.425
Feed per hundred pounds gain:		
Grain, lbs.....	266.910	298.710
Cottonseed meal, lbs.....	39.170	43.830
Roughage, lbs.....	457.990	508.480
Cost of feed per hundred pounds gain.....	\$ 11.445	\$ 9.646
Average feed cost per lamb.....	\$ 4.268	\$ 3.214
Initial value per head at 6½ cents per pound.....	\$ 3.550	\$ 3.620
Interest, labor, shipping and selling charges per lamb.....	\$ 1.260	\$ 1.260
Total cost per lamb.....	\$ 9.078	\$ 8.094
Selling price per head at \$15.10 per cwt.....	\$ 12.835	\$ 12.080
Shrinkage en route per head, lbs.....	6.970	9.030
Shrinkage, per cent.....	7.580	10.140
Dressing, per cent, basis feed lot weights.....	44.680	42.660
Dressing per cent, basis Fort Worth weights.....	48.340	47.470
Selling price per hundred pounds necessary to break even.....	\$ 10.680	\$ 10.120
Profit per lamb.....	\$ 3.757	\$ 3.986

Table 7 shows that Lot 1, fed on corn, made a better average gain per head than did the lot fed on the ground milo heads. The average gain per head for Lot 1 was 37.29 pounds as compared with 33.31 pounds for Lot 4, which was being fed on ground milo heads. As regards average daily gains, Lot 1 is accredited with 0.355 pound and Lot 4 with the slightly less favorable figure of 0.317 pound per head. A comparison with the two former tests shows that the respective average daily gains per head were as follows:

	Lot fed on corn	Lot fed on milo heads
1919-1920.....	0.393 pound	0.363 pound
1920-1921.....	0.312 pound	0.311 pound

Table 7 also indicates that a noticeably greater amount of concentrates and roughage was required per hundred pounds of gain for Lot 4 than for Lot 1. The cost, however, of the feed required to make a hundred pounds of gain was \$9.646 for Lot 4 and \$11.445 for Lot 1. In other words, the cost for Lot 4 was about 16 per cent. less than the cost for Lot 1.

Table 8. Comparison of ground threshed feterita with ground shelled corn.

	Lot 1. Corn chops, cottonseed meal, alfalfa.	Lot 5. Feterita chops, cot- tonseed meal, alfalfa.
Number of lambs per lot.....	20	20
Average initial weight, lbs.....	54.680	55.900
Average final weight at feed lot, lbs.....	91.970	90.770
Average weight on Fort Worth market, lbs.....	85.000	82.000
Average gain, lbs.....	37.290	34.870
Average daily gain, lbs.....	0.355	0.332
Average daily rations:		
Grain, lbs.....	0.948	0.948
Cottonseed meal, lbs.....	0.139	0.139
Roughage, lbs.....	1.626	1.599
Total feed consumed per lamb:		
Grain, lbs.....	99.530	99.530
Cottonseed meal, lbs.....	14.604	14.604
Roughage, lbs.....	170.785	167.880
Feed per hundred pounds gain:		
Grain, lbs.....	266.910	285.430
Cottonseed meal, lbs.....	39.170	41.880
Roughage, lbs.....	457.990	481.450
Cost of feed per hundred pounds gain.....	\$ 11.445	\$ 9.945
Average feed cost per lamb.....	\$ 4.268	\$ 3.468
Initial value per head at 6½ cents per pound.....	\$ 3.550	\$ 3.630
Interest, labor, shipping and selling charges per lamb.....	\$ 1.260	\$ 1.260
Total cost per lamb.....	\$ 9.078	\$ 8.358
Selling price per head at \$15.10 per cwt.....	\$ 12.835	\$ 12.382
Shrinkage en route per head, lbs.....	6.970	8.770
Shrinkage, per cent.....	7.580	9.660
Dressing per cent, basis feed lot weights.....	44.680	44.090
Dressing per cent, basis Fort Worth weights.....	48.340	48.810
Selling price per hundred pounds necessary to break even.....	\$ 10.680	\$ 10.190
Profit per lamb.....	\$ 3.757	\$ 4.024

Table 8 shows that Lot 5, fattened on ground threshed feterita, made an average gain per head of 34.87 pounds and thus lacked 2.42 pounds of reaching the gain of 37.29 pounds, recorded by the standard lot that was being fed on corn. Or to state it differently, Lot 5 showed an average daily gain of 0.332 pound, while Lot 1 showed an average daily gain of 0.335 pound per head. This substantiates the

conclusions arrived at on the basis of the 1919-1920 test but the showing made by the lot fattened on ground threshed feterita was considerably more creditable in the second test.

Lot fed on corn	Lot fed on ground threshed feterita
1919-1920.....0.393 pound	0.360 pound
1920-1921.....0.312 pound	0.312 pound

Here again the amount of concentrates and roughage required per hundred pounds of gain was greater for the lot fattened on ground threshed feterita, but despite the above fact the economy of the gains was decisively in favor of the grain sorghum. As compared with the cost for Lot 1 of \$11.445 per hundred pounds of gain, Lot 5 registered a cost of \$9.945. In other words, with Lot 1 as the standard, the cost of producing gains in Lot 5 was thirteen and one-half per cent. cheaper.

Table 9. Comparison of ground feterita heads with ground shelled corn.

	Lot 1. Corn chops, cottonseed meal, alfalfa.	Lot 6. Feterita heads, cottonseed meal, alfalfa.
Number of lambs per lot.....	20	20
Average initial weight, lbs.....	54.680	55.830
Average final weight at feed lot, lbs.....	91.970	88.330
Average weight on Fort Worth market, lbs.....	85.000	80.500
Average gain, lbs.....	37.290	32.500
Average daily gain, lbs.....	0.355	0.309
Average daily ration:		
Grain, lbs.....	0.948	0.948
Cottonseed meal, lbs.....	0.139	0.139
Roughage, lbs.....	1.626	1.620
Total feed consumed per lamb:		
Grain, lbs.....	99.530	99.530
Cottonseed meal, lbs.....	14.604	14.604
Roughage, lbs.....	170.785	170.115
Feed per hundred pounds gain:		
Grain, lbs.....	266.910	306.250
Cottonseed meal, lbs.....	39.170	44.930
Roughage, lbs.....	457.990	523.430
Cost of feed per hundred pounds gain.....	\$ 11.445	\$ 9.917
Average feed cost per lamb.....	\$ 4.268	\$ 3.223
Initial value per head at 6½ cents per pound.....	\$ 3.550	\$ 3.630
Interest, labor, shipping and selling charges per lamb.....	\$ 1.260	\$ 1.260
Total cost per lamb.....	\$ 9.078	\$ 8.113
Selling price per head at \$15.10 per cwt.....	\$ 12.835	\$ 12.156
Shrinkage en route per head, lbs.....	6.970	7.830
Shrinkage, per cent.....	7.580	8.860
Dressing per cent, basis feed lot weights.....	44.680	42.500
Dressing per cent, basis Fort Worth weights.....	48.340	46.630
Selling price per hundred pounds necessary to break even.....	\$ 10.680	\$ 10.080
Profit per lamb.....	\$ 3.757	\$ 4.043

It will be observed from Table 9 that Lot 6, which was fattened on ground feterita heads, made an average gain per head of 32.5 pounds, while Lot 1, fed on ground shelled corn, made an average gain per head of 37.29 pounds. The average daily gain attributed to the former lot was 0.309 pound as compared with 0.335 pound per head accredited to Lot 1. Figures which bore practically the same ratio to each were secured in the first two tests.

	Lot fed on corn	Lot fed on ground feterita heads
1919-1920.....	0.393 pound	0.339 pound
1920-1921.....	0.312 pound	0.288 pound

Lot 6 consumed next to the greatest amount of concentrates and next to the greatest amount of roughage per hundred pounds gain, of any of the ten lots of lambs and far outdistanced Lot 1, which held the lowest and most favorable position in this respect. Despite this fact, the cost per hundred pounds of gain was \$9.917 for Lot 6 as compared with the \$11.445 attributed to Lot 1. In other words, the gains made by Lot 6 were about fourteen per cent. cheaper than those made by Lot 1 and the profits per lamb were 29 cents greater.

Table 10. Comparison of ground threshed kafir with ground shelled corn.

	Lot 1. Corn chops, cottonseed meal, alfalfa.	Lot 7. Kafir chops, cottonseed meal, alfalfa.
Number of lambs per lot.....	20	20
Average initial weight, lbs.....	54.680	55.470
Average final weight at feed lot, lbs.....	91.970	92.400
Average weight on Fort Worth market, lbs.....	85.000	87.000
Average gain, lbs.....	37.290	36.930
Average daily gain, lbs.....	0.355	0.352
Average daily rations:		
Grain, lbs.....	0.948	0.948
Cottonseed meal, lbs.....	0.139	0.139
Roughage, lbs.....	1.626	1.628
Total feed consumed per lamb:		
Grain, lbs.....	99.530	99.530
Cottonseed meal, lbs.....	14.604	14.604
Roughage, lbs.....	170.785	170.910
Feed per hundred pounds gain:		
Grain, lbs.....	266.910	269.510
Cottonseed meal, lbs.....	39.170	39.540
Roughage, lbs.....	457.990	462.790
Cost of feed per hundred pounds gain.....	\$ 11.445	\$ 9.508
Average feed cost per lamb.....	\$ 4.268	\$ 3.511
Initial value per head at 6½ cents per pound.....	\$ 3.550	\$ 3.610
Interest, labor, shipping and selling charges per lamb.....	\$ 1.260	\$ 1.260
Total cost per lamb.....	\$ 9.078	\$ 8.381
Selling price per head at \$15.10 per cwt.....	\$ 12.835	\$ 13.137
Shrinkage, en route per head, lbs.....	6.970	5.400
Shrinkage, per cent.....	7.580	5.840
Dressing per cent, basis feed lot weights.....	44.680	47.110
Dressing per cent, basis Fort Worth weights.....	48.340	50.040
Selling price per hundred pounds necessary to break even.....	\$ 10.680	\$ 9.630
Profit per lamb.....	\$ 3.757	\$ 4.756

It will be seen that Lot 7, fattened on ground threshed kafir, made practically the same average gains per head as did Lot 1, fed on ground shelled corn, the former lot making a gain of 36.93 pounds per head, while the latter made a gain of 37.29 pounds. Likewise there was scarcely any difference between the average daily gains of the lots, Lot 7 making the creditable showing of 0.352 pound as compared with 0.355 pound per head recorded for Lot 1. These figures support the result attained during the feeding test of the previous year and are a little more favorable for kafir-fed lambs than was the first test.

	Lot fed on corn	Lot fed on ground threshed kafir
1919-1920.....	0.392 pound	0.372 pound
1920-1921.....	0.312 pound	0.321 pound

The amount of the concentrates and roughage required per hundred pounds gain was also practically the same in the two lots, Lot 7 consuming a slightly greater amount. In the same way Lot 7 registered the small cost per hundred pounds of gain of \$9.508, while Lot 1 registered the cost of \$11.445. As regards economy, the gains made by Lot 7, fed on ground threshed kafir, were 17½ per cent. cheaper than the gains made by the lot fed on the shelled corn. The table also shows that the lambs in Lot 7 netted a profit per head which was greater by \$1 than the profit per head on the lambs in Lot 1.

Table 11. Comparison of ground kafir heads with ground shelled corn.

	Lot 1. Corn chops, cottonseed meal, alfalfa.	Lot 8. Kafir heads, cottonseed meal, alfalfa.
Number of lambs per lot.....	20	20
Average initial weight, lbs.....	54.680	54.620
Average final weight at feed lot, lbs.....	91.970	85.870
Average weight on Fort Worth market, lbs.....	85.000	79.500
Average gain, lbs.....	37.290	31.250
Average daily gain, lbs.....	0.355	0.298
Average daily ration:		
Grain, lbs.....	0.948	0.948
Cottonseed meal, lbs.....	0.139	0.139
Roughage, lbs.....	1.625	1.625
Total feed consumed per lamb:		
Grain, lbs.....	99.530	99.530
Cottonseed meal, lbs.....	14.604	14.604
Roughage, lbs.....	170.785	170.665
Feed per hundred pounds gain:		
Grain, lbs.....	266.910	318.500
Cottonseed meal, lbs.....	39.170	46.730
Roughage, lbs.....	457.990	546.130
Cost of feed per hundred pounds gain.....	\$ 11.445	\$ 10.340
Average feed cost per lamb.....	\$ 4.268	\$ 3.231
Initial value per head at 6½ cents per pound.....	\$ 3,550	\$ 3,550
Interest, labor, shipping and selling charges per lamb.....	\$ 1.260	\$ 1.260
Total cost per lamb.....	\$ 9.078	\$ 8.041
Selling price per head at \$15.10 per cwt.....	\$ 12.835	\$ 12.005
Shrinkage en route per head, lbs.....	6.970	6.370
Shrinkage, per cent.....	7.580	7.420
Dressing per cent, basis feed lot weights.....	44.680	42.010
Dressing per cent, basis Fort Worth weights.....	48.340	45.380
Selling price per hundred pounds necessary to break even.....	\$ 10.680	\$ 10.110
Profit per lamb.....	\$ 3.757	\$ 3.964

Table 11 shows that Lot 8, fattened on ground kafir heads, made an average gain per head of 31.25 pounds and an average daily gain of 0.298 pound, while the standard lot fed on corn made an average gain per head of 37.29 pounds and an average daily gain of 0.355 pound. Results of practically the same nature were secured in the test of the previous year; but no figures can be offered for 1919-20, ground kafir heads not being used in the first experiment.

	Lot fed on corn	Lot fed on ground kafir heads
1920-1921.....	0.312 pound	0.283 pound

Lot 8, fed ground kafir heads, made a smaller average daily gain than did any of the other lots in the test. The cost was, however, still below that recorded for the standard lot fed on corn. The cost for Lot 8 was \$10.34 and for Lot 1 it was \$11.445. Lot 8 still showed a greater profit per lamb than did Lot 1.

Table 12. Comparison of ground threshed darso with ground shelled corn.

	Lot 1. Corn chops, cottonseed meal, alfalfa.	Lot 9. Darso chops, cottonseed meal, alfalfa.
Number of lambs per lot.....	20	20
Average initial weight, lbs.....	54.680	54.750
Average final weight at feed lot, lbs.....	91.970	89.870
Average weight on Fort Worth market, lbs.....	85.000	81.500
Average gain, lbs.....	37.290	35.120
Average daily gain, lbs.....	0.355	0.334
Average daily ration:		
Grain, lbs.....	0.948	0.948
Cottonseed meal, lbs.....	0.139	0.139
Roughage, lbs.....	1.626	1.619
Total feed consumed per lamb:		
Grain, lbs.....	99.530	99.530
Cottonseed meal, lbs.....	14.604	14.604
Roughage, lbs.....	170.785	170.035
Feed per hundred pounds gain:		
Grain, lbs.....	266.910	283.400
Cottonseed meal, lbs.....	39.170	41.580
Roughage, lbs.....	457.990	484.150
Cost of feed per hundred pounds gain.....	\$ 11.445	\$ 9.960
Average feed cost per lamb.....	\$ 4.268	\$ 3.498
Initial value per head at 6½ cents per pound.....	\$ 3.550	\$ 3.560
Interest, labor, shipping and selling charges per lamb.....	\$ 1.260	\$ 1.260
Total cost per lamb.....	\$ 9.078	\$ 8.318
Selling price per head at \$15.10 per cwt.....	\$ 12.835	\$ 12.307
Shrinkage en route per head, lbs.....	6.970	8.370
Shrinkage, per cent.....	7.580	9.310
Dressing per cent, basis feed lot weights.....	44.680	42.850
Dressing per cent, basis Fort Worth weights.....	48.340	47.250
Selling price per hundred pounds necessary to break even.....	\$ 10.680	\$ 10.210
Profit per lamb.....	\$ 3.757	\$ 3.989

Table 12 indicates that Lot 9, fattened on ground threshed darso, made an average gain per head of 35.12 pounds and an average daily gain per head of 0.334 pound, as compared with an average gain per head of 37.29 pounds and an average daily gain per head of 0.355 pound on the part of the lambs in the lot fed on ground shelled corn. This was a favorable showing indeed, and it is to be lamented that ground threshed darso was not included in the earlier tests, so that more data could have been available with regard to its feeding value.

It will be noted that Lot 9 consumed more concentrates and more roughage per hundred pounds of gain than did the standard lot but that its showing was rather satisfactory in this respect and more favorable than the records set by a number of the other grain sorghums. The cost per hundred pounds of gain was \$9.960 for Lot 9 and \$11.445 for Lot 1. In other words, the cost registered for the gains in Lot 9 was only 87 per cent. of the cost of the gains in Lot 1.

Table 13. Comparison of ground threshed sorgo with ground shelled corn.

	Lot 1. Corn chops, cottonseed meal, alfalfa.	Lot 10. Sorgo chops, cottonseed meal, alfalfa.
Number of lambs per lot.....	20	20
Average initial weight, lbs.....	54.680	55.950
Average final weight at feed lot, lbs.....	91.970	90.200
Average weight on Fort Worth market, lbs.....	85.000	81.000
Average gain, lbs.....	37.290	34.250
Average daily gain, lbs.....	0.355	0.326
Average daily ration:		
Grain, lbs.....	0.948	0.948
Cottonseed meal, lbs.....	0.139	0.139
Roughage, lbs.....	1.626	1.630
Total feed consumed per lamb:		
Grain, lbs.....	99.530	99.530
Cottonseed meal, lbs.....	14.604	14.604
Roughage, lbs.....	170.785	171.150
Feed per hundred pounds gain:		
Grain, lbs.....	266.910	290.600
Cottonseed meal, lbs.....	39.170	42.640
Roughage, lbs.....	457.990	499.710
Cost of feed per hundred pounds gain.....	\$ 11.445	\$ 10.260
Average feed cost per lamb.....	4.268	3.514
Initial value per head at 6½ cents per pound.....	3.550	3.640
Interest, labor, shipping and selling charges per lamb.....	1.260	1.260
Total cost per lamb.....	9.078	8.414
Selling price per head at \$15.10 per cwt.....	\$ 12.835	\$ 12.231
Shrinkage en route per head, lbs.....	6.970	9.200
Shrinkage, per cent.....	7.580	10.200
Dressing per cent, basis feed lot weights.....	44.680	42.750
Dressing per cent, basis Fort Worth weights.....	48.340	47.610
Selling price per hundred pounds necessary to break even.....	\$ 10.680	\$ 10.390
Profit per lamb.....	\$ 3.757	\$ 3.817

Table 13 shows that Lot 10, which was being fattened on ground threshed sorgo, made an average gain per head of 34.25 pounds in comparison with the average gain per head by Lot 1 of 37.29 pounds. In the same way Lot 10 registered an average daily gain of 0.326 pound, while Lot 1 was recording its average daily gain of 0.355 pound. Since this was the first year that ground threshed sorgo was used in the experiment, no comparative figures are available from the first two tests. It will readily be noticed that Lot 10 consumed more concentrates and roughage per hundred pounds of gain than did Lot 1. Nevertheless, the cost of feed per hundred pounds of gain was \$10.26 for Lot 10 as compared with the \$11.445 attributed to Lot 1; or in other words, about 11 per cent. cheaper. The lot fattened on ground threshed sorgo showed a greater profit per lamb than did the lot fattened on ground shelled corn, though in this respect it stood lower than any of the other lots fed on the ground threshed grain sorghums.

Table 14. Summary of 105-day lamb feeding test, 1921-22. Substation No. 7, Spur, Texas.

Rations.	Corn chops, cottonseed meal, alfalfa.	Milo chops, cottonseed meal, alfalfa.	Whole milo, cottonseed meal, alfalfa.	Milo heads, cottonseed meal, alfalfa.	Feterita chops, cottonseed meal, alfalfa.	Feterita heads, cottonseed meal, alfalfa.	Kafir chops, cottonseed meal, alfalfa.	Kafir heads, cottonseed meal, alfalfa.	Darso chops, cottonseed meal, alfalfa.	Sorgo chops, cottonseed meal, alfalfa.
	Lot 1.	Lot 2.	Lot 3.	Lot 4.	Lot 5.	Lot 6.	Lot 7.	Lot 8.	Lot 9.	Lot 10.
Number of lambs per lot.....	20	20	20	20	20	20	20	20	20	20
Average initial weight, lbs.....	54.680	54.480	56.460	55.720	55.900	55.830	55.470	54.620	54.750	55.950
Average final weight at feed lot, lbs....	91.970	91.330	91.370	89.030	90.770	88.330	92.400	85.870	89.870	90.200
Average weight on Fort Worth market, lbs.....	85.000	84.500	84.500	80.000	82.000	82.000	80.500	87.000	79.500	81.000
Average gain, lbs.....	37.290	36.850	34.910	33.310	34.870	32.500	36.930	31.250	35.120	34.250
verage daily gain, pounds.....	0.355	0.351	0.332	0.317	0.332	0.309	0.352	0.298	0.334	0.326
Average daily ration:										
Grain, lbs.....	0.948	0.948	0.948	0.948	0.948	0.948	0.948	0.948	0.948	0.948
Cottonseed meal, lbs.....	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139
Roughage, lbs.....	1.626	1.619	1.628	1.614	1.599	1.620	1.628	1.625	1.619	1.630
Total feed consumed per lamb:										
Grain, lbs.....	99.530	99.530	99.530	99.530	99.530	99.530	99.530	99.530	99.530	99.530
Cottonseed meal, lbs.....	14.604	14.604	14.604	14.604	14.604	14.604	14.604	14.604	14.604	14.604
Roughage, lbs.....	170.785	169.985	170.935	169.425	167.880	170.115	170.910	170.665	170.035	171.150
Feed per hundred pounds gain:										
Grain, lbs.....	266.910	270.100	285.100	298.710	285.430	306.250	269.510	318.500	283.400	290.600
Cottonseed meal, lbs.....	39.170	39.630	41.830	43.830	41.880	44.930	39.540	46.730	41.580	42.640
Roughage, lbs.....	457.990	461.290	489.640	508.480	481.450	523.430	462.790	546.130	484.150	499.710
Cost of feed per hundred lbs. gain.....	\$ 11.445	\$ 9.491	\$ 9.772	\$ 9.646	\$ 9.945	\$ 9.917	\$ 9.508	\$ 10.340	\$ 9.960	\$ 10.260
Average feed cost per lamb.....	\$ 4.267	\$ 3.497	\$ 3.411	\$ 3.214	\$ 3.467	\$ 3.223	\$ 3.511	\$ 3.231	\$ 3.497	\$ 3.514
Initial value per head at 6½ cents per pound.....	\$ 3.550	\$ 3.540	\$ 3.670	\$ 3.620	\$ 3.630	\$ 3.630	\$ 3.610	\$ 3.550	\$ 3.560	\$ 3.640
Interest, labor, shipping and selling charges per lamb.....	\$ 1.260	\$ 1.260	\$ 1.260	\$ 1.260	\$ 1.260	\$ 1.260	\$ 1.260	\$ 1.260	\$ 1.260	\$ 1.260
Total cost per lamb.....	\$ 9.078	\$ 8.297	\$ 8.341	\$ 8.094	\$ 8.358	\$ 8.113	\$ 8.381	\$ 8.041	\$ 8.318	\$ 8.414
Selling price per head at \$15.10 per cwt.	\$ 12.835	\$ 12.760	\$ 12.760	\$ 12.080	\$ 12.382	\$ 12.156	\$ 13.137	\$ 12.005	\$ 12.307	\$ 12.231
Shrinkage en route per head, lbs.....	6.970	6.830	6.870	9.030	8.770	7.830	5.400	6.370	8.370	9.200
Shrinkage, per cent.....	7.580	7.480	7.520	10.140	9.660	8.860	5.840	7.420	9.310	10.200
Dressing per cent, basis feed lot weights.	44.680	43.980	46.570	42.660	44.090	42.500	47.110	42.010	42.850	42.750
Dressing per cent, basis Fort Worth weight.....	48.340	47.530	50.360	47.470	48.810	46.630	50.000	45.380	47.250	47.610
Selling price per hundred lbs. necessary to break even.....	\$ 10.680	\$ 9.820	\$ 9.870	\$ 10.120	\$ 10.190	\$ 10.080	\$ 9.630	\$ 10.110	\$ 10.210	\$ 10.390
Profit per lamb.....	\$ 3.757	\$ 4.463	\$ 4.419	\$ 3.986	\$ 4.024	\$ 4.043	\$ 4.956	\$ 3.964	\$ 3.989	\$ 3.817

Table 14 summarizes the 1921-22 experiment in which a comparison of the fattening values of corn and the various grain sorghums was made. It will be noted that with the exception of Lot 10, fattened on ground threshed sorgo, the various lots which were fattened on the *ground threshed* grain sorghums compared very favorably, as regards the average daily gains made, with the standard lot fed on ground shelled corn. The daily gains made by Lot 9, fattened on ground threshed darso, and Lot 5, fattened on ground threshed feterita, were satisfactory in comparison with the records registered to the credit of the standard lot. But the showings made by Lot 7, fattened on ground threshed kafir, and Lot 2, fattened on ground threshed milo, were even more satisfactory, since these two lots made daily gains practically identical with the daily gains attributed to Lot 1. These conclusions are supported by the tests of the previous year where ground threshed milo and ground threshed kafir proved slightly superior to ground shelled corn in the production of gains (see table 2). In the first test made in 1919-1920, ground threshed kafir made a satisfactory though not such a favorable showing; but the results with ground threshed milo again showed that the lambs fattened on it made slightly greater average daily gains than the lambs fed on corn (see table 1). It would seem then that these three tests clearly indicate that ground threshed milo and ground threshed kafir have practically the same value in the production of gains as has corn—not to mention the greater economy of gains that must be attributed to the two former grains. It would be difficult to draw a comparison between ground threshed milo and ground threshed kafir, since the former had the slight advantage in the first test and the latter the slight advantage in the last two tests, the difference at no time being very great.

With the exception of the lots fed on ground threshed milo and ground threshed kafir, the lots fed on the various grain sorghums have in all three tests required noticeably greater amounts of concentrates and roughage per hundred pounds of gain than the standard lots. In the exceptions noted, however, the amounts of roughage and concentrates required per hundred pounds of gain have hovered around the figures accredited to the lot fed on corn, sometimes falling below the latter figures.

As regards economy, the grain sorghums without exception produced much more economical gains than did the shelled corn. Lot 8, fed on ground kafir heads, which showed a higher cost per hundred pounds gain than any of the other lots fattened on the grain sorghums, produced a gain 10 per cent. cheaper than did the standard lot. During the test of the previous year the lot fed on ground kafir heads had also stood at the bottom of the list of the lots fattened on the grain sorghums so far as economy of gains was concerned.

Lot 2, fattened on ground threshed milo, and Lot 7, fattened on ground threshed kafir, showed the greatest economy of gains, there being practically no difference between these two lots. The cost per hundred pounds of gain was $17\frac{1}{2}$ per cent. lower for these two lots than for the standard lot. It should be noticed that all percentages which have been mentioned herein have been calculated on the basis of the corn-fed lot as the standard or 100 per cent. The percentages

would be much greater if the various lots fed on the grain sorghums were taken as the standards and calculations were made to show how much greater the cost for the corn-fed lot was than the cost for the lots fed on the grain sorghums.

The lot fed on ground milo heads made a good showing as regards economy of gains but not so favorable as in the first two tests, where it had claimed first place in this particular.

As was to be expected, the lots fattened on ground threshed milo and ground threshed kafir produced the greatest profit per lamb, Lot 3, fattened on whole threshed milo also showing a handsome profit. A good profit, however, was made on all of the lambs, the lot fed on corn meeting the least profit.

Table 15. The average weights of the lambs at the various weighing periods.

Date.	Lot 1.	Lot 2.	Lot 3.	Lot 4.	Lot 5.	Lot 6.	Lot 7.	Lot 8.	Lot 9.	Lot 10.
Initial weight *November 20th	54.68	54.48	56.46	55.72	55.90	55.83	55.47	54.63	54.75	55.95
December 5th	59.10	56.80	59.80	59.30	59.20	58.40	58.60	57.00	57.90	59.20
December 20th	63.70	61.00	64.50	64.30	62.60	63.30	64.60	61.40	63.00	64.70
January 4th	69.30	67.70	70.30	69.40	69.60	68.60	70.90	67.50	69.30	69.70
January 19th	75.00	73.80	75.50	74.00	75.50	74.20	77.10	73.40	75.60	76.00
February 3rd	82.00	80.00	82.30	80.30	80.80	79.40	82.40	77.70	81.10	81.50
February 18th	86.60	85.30	86.50	85.00	85.40	84.30	87.20	82.60	86.10	86.50
Final weight *March 5th	91.97	91.33	91.36	89.03	90.77	88.33	92.40	85.87	89.87	90.20

*Based on three weighings.

Table 15 shows the average weights of the lambs at the several fifteen-day periods. It indicates that on the whole the development of the lambs was consistent throughout the feeding period.

Table 16. Amount of waste hay weighrd back from each lot.

	Lot 1.	Lot 2.	Lot 3.	Lot 4.	Lot 5.	Lot 6.	Lot 7.	Lot 8.	Lot 9.	Lo
Amount per lot. . .	141.900	157.700	139.400	166.100	197.200	154.600	138.800	143.000	157.100	34
Amount per head.	7.095	7.885	6.970	8.305	9.860	7.730	6.940	7.150	7.855	6

The above table shows that the amount of hay wasted by the various lots was practically the same with the exception of Lot 5 fed on ground threshed feterita. This lot did not seem to have as great relish for its roughage as did the other lots.

Due to the fact that conditions vary slightly from year to year and one of the tests was 15 days longer than the other two, it is more or less difficult to construct a table which will summarize the salient points in all three tests. Nevertheless, Table 17 has been compiled in such manner as to eliminate most chance variations and it is fairly indicative of the relative standing of the various lots. Because feed prices vary from year to year, all values and profits are excluded from the table.

Table 17. Summary of three tests to determine the relative values of grain sorghums and corn for fattening lambs, 1919-20; 1920-21; 1921-22.

	Corn chops, cottonseed meal, alfalfa.	Ground threshed milo, cottonseed meal, alfalfa.	Whole threshed milo, cottonseed meal, alfalfa.*	Ground milo heads, cottonseed meal, alfalfa	Ground threshed feterita, cottonseed meal, alfalfa.	Ground feterita heads, cottonseed meal, alfalfa.	Ground threshed kafir, cottonseed meal, alfalfa.	Ground kafir heads, cottonseed meal, alfalfa. †	Ground threshed darso, cottonseed meal, alfalfa.*	Ground threshed sorgo, cottonseed meal, alfalfa.*
Average initial weight.....	54.944	54.853	56.460	55.226	55.138	55.426	54.566	52.410	54.750	55.950
Average daily gain.....	0.353	0.353	0.332	0.329	0.335	0.312	0.349	0.291	0.334	0.326
Average concentrates per 100 lbs. gain.	315.484	315.802	326.930	337.496	332.220	356.213	319.038	364.966	324.980	333.240
Average roughage per 100 lbs. gain....	469.888	469.525	489.640	502.498	492.837	530.566	476.830	530.502	484.150	499.710

†Average two tests. *One test.

The above table is largely self-explanatory. It will be noted that after the averages for all three years were struck, the lot fed on ground threshed milo made the same average daily gains as did the lot fed on ground shelled corn and that the lot fed on ground threshed kafir barely fell below the high record set by the two lots mentioned above. Furthermore the lot fed on ground threshed milo consumed practically the same amount of concentrates and the same amount of roughage per hundred pounds of gain as did the standard lot, while the lot fed on ground threshed kafir required slightly more concentrates and roughage per hundred pounds of gain than did the lot fed on ground shelled corn and ground threshed milo.

PRODUCTIVE VALUES CALCULATED FROM FEEDING TESTS

The productive values of the feeds used in this lamb-feeding experiment were calculated by Dr. G. S. Fraps, Chief, Division of Chemistry. As stated in Fraps' "Principles of Agricultural Chemistry," page 434, the productive value of a feed is the best measure so far devised of the net value of a feed for production of fat, heat, energy, or similar purposes. Rations have heretofore been calculated on the assumption that all digestible nutrients of the same group have the same value to the animal, regardless of the origin of the material. We now know, however, that the net value of a feed may vary widely from its value based upon the digestible nutrients and that the value of a feed for the purpose of producing energy is best measured by its productive value. For example, one pound of digested material in the form of corn is worth much more to an animal than a pound of digested material in the form of alfalfa hay.

The productive value may be expressed in terms of fat or as therms. In the past, we have expressed most of the productive values in terms of fat, but as proposed by the late Dr. H. P. Armsby, we shall, in the future, for the sake of uniformity express these values in therms.

When the productive value of a feed is stated in terms of therms this definite value can be compared with similar values of other feed-stuffs. To ascertain the productive value of a feed in feeding tests, it is necessary to take one feed as a standard, to calculate the productive value of the other feeds fed with this feed, and to assume a definite maintenance requirement for the animal. In this lamb-feeding experiment, corn was taken as the unit. The productive values of cottonseed meal and alfalfa hay were calculated, the coefficients used being those given in Fraps' "Principles of Agricultural Chemistry," page 434, and in Bulletins 185 and 203 of the Texas Agricultural Experiment Station, and the maintenance requirements given by Armsby in his "Principles of Animal Feeding."

Although the above assumptions may be claimed to lead to some uncertainty, yet since these figures are also used in connection with the other feeds compared with the standard, comparative results should be secured. This is especially the case if there is little difference between the quantity of the additional feeds fed, and no great difference in the average weights of the animals.

Table 18. Calculation of productive values from feeding experiment with lambs, 1921-1922.

	Corn chops.	Milo chops.	Milo whole.	Milo heads.	Feterita chops.	Feterita heads.	Kafir chops.	Kafir heads.	Darso Chops.	Sorgo chops.
	Lot 1.	Lot 2.	Lot 3.	Lot 4.	Lot 5.	Lot 6.	Lot 7.	Lot 8.	Lot 9.	Lot 10.
Initial weight A.....	54.680	54.480	56.460	55.720	55.900	55.830	55.470	54.620	54.750	55.950
Final weight F.....	91.970	91.330	91.370	89.030	90.770	88.330	92.400	85.870	89.870	90.200
Total weight A+F=C.....	146.650	145.810	147.830	144.850	146.760	144.160	147.870	140.490	144.620	146.150
Average for period C/2=W.....	73.330	72.910	73.920	72.380	73.340	72.080	73.940	70.250	72.310	73.080
Average daily gain G.....	0.355	0.351	0.332	0.317	0.332	0.309	0.352	0.298	0.334	0.326
Average daily ration:										
Grain N.....	0.948	0.948	0.948	0.948	0.948	0.948	0.948	0.948	0.948	0.948
Cottonseed meal Z.....	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139
Alfalfa hay.....	1.450	1.442	1.451	1.438	1.423	1.443	1.451	1.448	1.442	1.453
Sorghum Hay.....	0.177	0.177	0.177	0.176	0.176	0.177	0.177	0.176	0.177	0.177
Productive value—Grain E.....	0.832									
Productive value—Cottonseed meal R.....	0.104	0.104	0.104	0.104	0.104	0.104	0.104	0.104	0.104	0.104
Productive value—Alfalfa hay U.....	0.500	0.498	0.500	0.495	0.490	0.498	0.500	0.499	0.498	0.501
Productive value—Sorghum hay V.....	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Productive value— Total E+R+U+V=T.....	1.504									
Productive value for Supplement R+U+V=S.....		0.670	0.672	0.667	0.662	0.670	0.672	0.671	0.670	0.673
Maintenance requirement W×H=M.....	0.684	0.680	0.690	0.675	0.684	0.672	0.690	0.655	0.675	0.682
Productive balance standard ration T—M=B.....	0.820									
Therms to 1 pound gain standard ration B/G=K.....	2.309									
Value of gain K×G=L.....		0.810	0.766	0.731	0.766	0.713	0.812	0.688	0.771	0.752
Total value of ration M+L=O.....		1.490	1.456	1.406	1.450	1.385	1.502	1.343	1.446	1.434
Value of grain in therms O—S=X.....		0.824	0.784	0.739	0.788	0.715	0.830	0.672	0.776	0.761
Productive value of grain X÷N×100 therms.....		86.490	82.700	77.950	83.120	75.420	87.550	70.880	81.850	80.270

H=0.00933 therms.

The calculations of the productive values of the sorghums utilized in the feeding test with lambs reported in this Bulletin are given in Table 18. The maintenance requirements for a hundred pounds of the average weight were assumed after Armsby, as 0.933 therm. The therms required for one pound of grain in weight in Lot 1 fed corn, were 2.309. The same figure was used when the value of the gains with other feeds in terms of therms was calculated.

The productive values calculated from this test were consistent throughout and were about what we would expect. In this test the productive values of the ground grain sorghum heads fell consistently below those of the ground threshed grain. Whole threshed milo, fed to Lot 3, had a productive value of 82.7 therms as compared with 86.91 therms for ground threshed milo fed to Lot 2.

Table 19. Comparison of productive values as secured by feeding experiments with lambs at Substation No. 7.

	Productive value per 100 pounds. (Therms)			Productive value compared with corn as 100.		
	1919-20	1920-21	1921-22	1919-20	1920-21	1921-22
Ground corn (standard used).....	87.82	86.35	87.74			99.99
Ground feterita.....	77.11	86.30	83.12	87.80	99.90	94.73
Ground feterita heads.....	70.68	79.46	75.42	80.50	92.00	85.95
Ground kafir.....	80.53	88.92	87.55	91.70	102.90	99.78
Ground kafir heads.....		77.29	70.88		89.50	80.78
Ground milo.....	88.25	87.21	86.91	100.50	100.90	99.05
Ground milo heads.....	77.11	86.07	77.95	89.20	99.70	88.83
Whole milo.....			82.70			94.25
Darso chops.....			81.77			93.19
Sorgo chops.....			80.28			91.49
Sorghum hay (milo heads 76).....		37.32				
Alfalfa hay.....			35.18			

Table 19 presents a comparison of the productive values in therms secured in the several lamb-feeding experiments, which have been conducted at Substation No. 7 during recent years. The productive values of the grain sorghums utilized in the 1919-20 test are given in terms of fat in the Texas Agricultural Experiment Station Bulletin No. 269, while the results of the 1920-21 feeding experiment are presented both in terms of fat and therms in Texas Bulletin No. 285. The last three columns of Table 19 show the average productive values of these feeds as compared with corn as 100.

As we could expect, the above table shows a considerable variation in the productive values found in the three experiments. This variation can be expected with feeding experiments on account of variations in conditions which can hardly be controlled, as well as variations in digestibility of different lots of feed utilized.

By referring to the above table it will be observed that the ground threshed feterita fed in the 1919-20 test had 87.8 per cent. the value of corn, while in the 1920-21 test it had 99.9 per cent. the productive value of corn. During the test conducted in 1921-22 this feed had a productive value of 94.73 per cent. of that of corn. As compared with corn as 100, feterita heads during the three tests, as indicated in the above table, had values of 80.5, 92.0, and 85.95 respectively. In the 1919-20 test, ground threshed kafir showed a value of 102.9, and in

the 1921-22 test a value of 99.78 per cent. of that of corn. Kafir heads were not fed in the 1919-20 test, but in the two tests following they showed a value of 89.5 and 80.78 per cent. of that of corn. It is interesting to observe in the above table that ground threshed milo has shown values almost identical with those of corn during the three tests. Compared with corn as 100, the values of the ground threshed milo for the three tests were 100.5, 100.9, and 99.05, respectively. This is a fairly reliable indication that the milo has a higher feeding value than has heretofore been assigned, either by Agricultural Experiment Stations or livestock feeders. Ground milo heads showed a value of 89.2 in the 1919-20 test, 99.7 in the 1920-21 test, and 88.83 in the 1921-22 test, as compared with corn as 100. Whole threshed milo showed a value of 94.25 and ground threshed milo 99.05, in the 1921-22 test as compared with corn as 100. Darso chops (ground threshed darso) was fed for the first time during the 1921-22 test and showed a value of 93.19 as compared with corn as 100. Sorgo chops (ground threshed sweet sorghum) showed a lower value than did any of the other ground threshed grain sorghums utilized in the 1921-22 experiment. This grain had 91.49 per cent. of the productive value of corn.

These figures show that it is not possible to secure exact feeding values by means of a single series of experiments. Only by conducting a number of tests and preparing the averages, can accurate results be secured. As shown by the accompanying table, the results of one table may come out decidedly better than those of another. It can also be expected that some individual feeding tests would vary decidedly from the average productive values calculated from digestion experiments. The productive values of feeds can be corrected by comparison with the feeding tests. But since the productive values are average values, and deviations from the average may be expected close agreement can be expected only between averages, and not between individual tests.

The study of the productive values of the grain sorghums is being continued and more complete reports will be published later.

SUMMARY 1921-22 TEST

1. In this test the lot fattened on ground shelled corn made the highest average daily gain of 0.355 pound per head, but it was hard pressed by the lots fed on ground threshed milo and on ground threshed kafir, which made average daily gains of 0.351 and 0.352 pound, respectively.

2. This test substantiates the results secured in the first two tests indicating that ground threshed milo and ground threshed kafir will produce practically the same gains as ground shelled corn when fed in the same amounts as corn, to fattening lambs.

3. It has so far been impossible as a result of these studies to determine much difference in the feeding values of ground threshed milo and ground threshed kafir, the slight advantage being with the latter during the last two tests and with the former during the first test.

4. All of the lots fattened on the grain sorghums showed a noticeably greater economy of gains than did the corn-fed lot, due to the

higher purchase cost of the corn. The cost per hundred pounds of gain for the grain sorghum-fed lots varied from 10 to 17½ per cent. less than the cost per hundred pounds of gains for the standard.

5. The lot fattened on ground threshed milo and ground threshed kafir showed the greatest economy of gains, being accredited with a cost of \$9.50 per hundred pounds of gain as compared with the cost of \$11.45 recorded for the standard lot.

6. Though the lot fed on ground milo heads did not make as economical gains as it had done in the former tests, still its showing was satisfactory.

7. The lots fed on ground threshed kafir and ground threshed milo showed the greatest profit per lamb, while the lot fed on corn netted the least profit per lamb. The first mentioned lot netted \$1 more per head than the corn-fed lot.

8. The respective lots brought the same price of \$15.10 per cwt. on the Fort Worth market.

9. All of the lots carried practically the same degree of finish.

10. The productive values of the grain sorghums used have been calculated in therms. The Texas Station so far as we know was the first to calculate and publish these values as a result of extensive feeding experiments.

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