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GRAIN SORGHUMS VERSUS CORN FOR FATTENING BABY BEEVES



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GRAIN SORGHUMS VERSUS CORN FOR FATTENING BABY BEEVES

BY

J. M. JONES,
R. A. BREWER,
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INTRODUCTION

The Kansas, Oklahoma, and Texas Experiment Stations have, during the past twenty years, conducted a number of exhaustive experiments on several of the more important grain sorghums, the primary object in each instance being to determine their feeding values, and also to ascertain something more definite about their adaptability to, and yield in, the semi-arid sections of the respective states.

In view of the fact that a number of the earlier station bulletins reporting the results of fattening cattle on the grain sorghums are now out of print, it has been deemed advisable to present a brief summary of some of the experiments that have been conducted at the aforementioned stations. Such a summary will give the readers of this bulletin the benefit of feeding experiments of which they have no previous knowledge.

The following paragraph, which is quoted from page 67 of Kansas Bulletin No. 67 (1897), on steer feeding, one of the earliest publications on this subject, will prove of interest not only to farmers interested in the production of the grain sorghums, but to feeders as well:

“* * * The past half dozen years have developed the fact that kafir corn can be successfully grown in seasons and in places too dry for corn; that it will grow on poorer soil than corn; and that under equally favorable conditions it will outyield corn both in forage and grain, has been proved. When we now can add to this excellent record the further fact that kafir corn is nearly equal to corn as a beef producer, the future of beef production in the West seems to me to be assured. * * *”

We feel justified in calling the reader's attention to the fact that the chemical composition of kafir, milo, and feterita closely resemble that of corn.

Oklahoma Bulletin No. 110 (1916) reports that:

“The grains of the grain sorghums contain starch in amounts varying from 55 per cent. to 64 per cent. Feterita, the milos and kafir, containing about 64 per cent. starch, seem to be especially suitable as raw materials for the manufacture of high-grade starch by the commercial processes, and if used will require practically no change in the machinery now in common use for manufacturing starch from corn.

“There were no striking differences in the appearance of the various

sorghum starches, but on the whole they resemble corn starch when subjected to the action of staining and swelling reagents.

"The fact that there are but slight differences in these starches confirm the very close botanical resemblances of the plants.

"* * * The chemical composition of feterita, kafir, and milo closely resembles that of corn, and it is both possible and reasonable that these crops should, to a great extent, replace corn in sections where annual crops of corn are not produced. * * *"

Concerning "Fats and Fatty Acids of the Grain Sorghums," the following is quoted from Oklahoma Bulletin No. 117 (1917):

"As indicated in a previous bulletin on the starches, the botanical characteristics of the grain sorghums are quite similar, and the relationship is even more pronounced in the microscopic and chemical properties of the different starches. The object of the work described in this bulletin was to ascertain the nature of the substances making up the fat in the grains of the grain sorghums, and to obtain additional evidence of the close relationship of the plants."

"Six fatty acids have been shown to be present in kafir, feterita, and milo fat; namely, oleic and linoleic, stearic and palmitic, butyric and formic, predominating in the order given. Traces of saturated acids higher than stearic acid are present in kafir and milo fat. The above data show that the physical and chemical constants of the fats and fatty acids of kafir, feterita, and milo are similar."

Some of the early investigations conducted at the Texas and Oklahoma Stations indicated that the nutrients of the grain sorghums were somewhat less digestible than those of Indian corn. The following is quoted from Texas Bulletin No. 104 (1908), by Fraps:

"The nutrients of the grain of kafir corn and milo maize are somewhat less digestible than the corresponding nutrients of Indian corn."

From Oklahoma Bulletin No. 89 (1910), the following is quoted from the summary:

"The kafir corn and kafir meal fed to chickens yielded but two per cent. less total digestible matter than corresponding corn products."

Again from Kansas Station Bulletin No. 103 (1901), p. 273, is quoted the following:

"Kafir corn stover is superior to field-cured corn stover in the digestibility of all of its food principles, but kafir corn meal is noticeably inferior to corn meal. The most striking feature in the results with the meal is the apparent entire indigestibility of its fat."

Investigations at the Oklahoma Station (Bulletin No. 46, 1900) have shown that 64.8 per cent. of the fat in kafir corn meal is digestible, while at the Texas Station (Bulletin No. 104) early experiments showed that ninety per cent. of the fat of milo is digestible while only 78 per cent. of the fat of kafir corn was shown to be digestible.

Texas Station Bulletin No. 291 (1922), reports a single experiment in which the digestibility of the nitrogen-free extract of milo meal by two sheep averaged 95.9 per cent., while according to "Compilations of Analyses," Massachusetts Agricultural Experiment Station, November, 1919 (p. 49), the average digestibility of corn in fourteen tests with ruminants was 92 per cent.

PREVIOUS FEEDING EXPERIMENTS CITED

While several of the experiment stations have conducted a series of feeding experiments in which a comparison between the grain sorghums and Indian corn has been made, it will be observed that the pioneer work in this field was undertaken by the Kansas Experiment Station.

Kansas Station Bulletin No. 67 (1897), entitled "Steer Feeding Experiments," reported a 175-day test in which a comparison of corn meal, red kafir corn meal and white kafir corn meal, was made. Five steers, averaging 1027.3 pounds at the beginning, were fed in each lot, each group receiving roughage in the form of kafir corn stover and alfalfa hay.

The steers in Lot 1, which received corn meal, made an average daily gain of 1.86 pounds; those in Lot 2, fed on kafir corn meal, made an average daily gain of 1.71 pounds; and those in Lot 3, fed on white kafir corn meal, made an average daily gain of 1.78 pounds.

Average daily rations for the respective lots were as follows:

	Lot 1 corn meal	Lot 2 red kafir meal	Lot 3 white kafir meal
Grain.....	pounds 18.59	pounds 18.59	pounds 18.59
Roughage.....	10.63	11.77	12.37

The amount of feed required per hundred pounds of gain in the respective lots was as follows:

	Lot 1 corn meal	Lot 2 red kafir meal	Lot 3 white kafir meal
Grain.....	pounds 997	pounds 1086	pounds 1041
Roughage.....	569	688	692

Oklahoma Station Report (1899-1900) reported a 112-day feeding test in which a comparison between kafir meal and corn meal was made. Five steers, averaging 976 pounds, were fed in each lot; Lots 1 and 2 received alfalfa hay while Lots 3 and 4 received kafir stover. The steers in Lot 1, which received kafir meal and alfalfa hay, made an average daily gain of 2.34 pounds; those in Lot 2, which received corn meal and alfalfa hay, made an average daily gain of 2.54 pounds; those in Lot 3, which received kafir meal and kafir stover, made an average daily gain of 2.33 pounds; and those in Lot 4, fed on corn meal and kafir stover, made an average daily gain of 2.01 pounds.

The average daily rations for the respective lots were as follows:

	Lot 1 kafir meal, alfalfa	Lot 2 corn meal, alfalfa	Lot 3 kafir meal, kafir stover	Lot 4 corn meal, kafir stover
Grain.....	pounds 17.17	pounds 17.84	pounds 23.69	pounds 18.67
Hay.....	11.45	12.87	9.50	10.33

The amount of feed required per hundred pounds of gain for the respective lots was as follows:

	Lot 1 kafir meal, alfalfa	Lot 2 corn meal, alfalfa	Lot 3 kafir meal, kafir stover	Lot 4 corn meal, kafir stover
Grain.....	pounds 735.24	pounds 700.60	pounds 1058.21	pounds 930.24
Hay.....	490.36	505.61	424.32	514.76

According to the 1900-01 Oklahoma Experiment Station Report, the experiments mentioned above were repeated during the feeding season of that year. The average initial weight of the steers was 1026 pounds.

The steers in Lot 1, which received kafir corn meal and alfalfa hay made an average daily gain of 2.72 pounds; those in Lot 2, which received corn meal and alfalfa hay, made an average daily gain of 2.73 pounds; those in Lot 3, which received kafir corn meal and kafir stover, made an average daily gain of 2.33 pounds; while those in Lot 4, which received corn meal and kafir corn stover, made an average daily gain of 2.38 pounds.

The average daily rations for the respective lots were as follows:

	Lot 1 kafir meal, alfalfa	Lot 2 corn meal, alfalfa	Lot 3 kafir meal, kafir stover	Lot 4 corn meal, kafir stover
Grain.....	pounds 20.74	pounds 18.16	pounds 23.19	pounds 22.46
Hay.....	18.88	18.02	23.69	23.42

The amount of feed required per hundred pounds of gain in the respective lots was as follows:

	Lot 1 kafir meal, alfalfa	Lot 2 corn meal, alfalfa	Lot 3 kafir meal, kafir stover	Lot 4 corn meal, kafir stover
Grain.....	pounds 762.78	pounds 663.61	pounds 994.82	pounds 950.14
Hay.....	694.44	658.47	1016.59	989.80

Kansas Station Bulletin No. 132 (1906), entitled, "Western Feeds for Beef Production," reported a 152-day feeding test in which six lots of two-year-old steers, averaging about 853 pounds, were used for a comparison of corn and cob meal and ground kafir, when supplemented with alfalfa, kafir, and sorghum hay, respectively. Eight steers were fed in each lot. Lot 1, which received corn and cob meal and alfalfa hay, made an average daily gain of 2.22 pounds. Those of Lot 2, which received ground kafir and alfalfa hay, made an average daily gain of 2.06 pounds; those of Lot 4, which received corn and cob meal and kafir hay, made an average daily gain of 1.45 pounds; those of Lot 5, which received ground kafir and kafir hay, made an average daily gain of 1.08 pounds; those of Lot 6, which received corn and cob meal and sorghum hay, made an average daily gain of 1.15 pounds; and those of Lot 7, which received ground kafir and sorghum hay, made an average daily gain of 1.05 pounds.

The average daily rations for the respective lots were as follows:

	Grain	Hay
Lot 1—corn and cob meal.....	13.10 lbs.	15.00 lbs. alfalfa
Lot 2—kafir meal.....	12.25 lbs.	15.00 lbs. alfalfa
Lot 4—corn and cob meal.....	13.10 lbs.	15.00 lbs. kafir
Lot 5—kafir meal.....	12.25 lbs.	15.00 lbs. kafir
Lot 6—corn and cob meal.....	13.00 lbs.	14.50 lbs. sorghum
Lot 7—kafir meal.....	10.87 lbs.	13.10 lbs. sorghum

The amount of feed required per hundred pounds of gain in the respective lots was as follows:

	Grain	Hay
Lot 1—corn and cob meal.....	592 lbs.	667 lbs. alfalfa
Lot 2—kafir meal.....	593 lbs.	723 lbs. alfalfa
Lot 4—corn and cob meal.....	901 lbs.	1025 lbs. kafir
Lot 5—kafir meal.....	1133 lbs.	1383 lbs. kafir
Lot 6—corn and cob meal.....	1117 lbs.	1261 lbs. sorghum
Lot 7—kafir meal.....	1174 lbs.	1425 lbs. sorghum

Texas Station Bulletin No. 97 (1907), entitled "Kafir Corn and Milo Maize for Fattening Cattle," reported a 76-day feeding test in which three-year-old grade Shorthorn steers, averaging 1237.75 pounds, were used for a comparison of Indian corn, kafir, and milo. Five steers were fed in each lot. Cottonseed hulls constituted the sole roughage in each of the several lots.

The steers in Lot 1, which received corn chops, cottonseed meal, cottonseed hulls, and a trace of molasses, made an average daily gain of 2.03 pounds; those in Lot 2, which received corn chops, cottonseed meal, molasses, and cottonseed hulls, made an average daily gain of 1.91 pounds; those in Lot 3, which received kafir chops, cottonseed meal, and cottonseed hulls, made an average daily gain of 2.59 pounds; while those in Lot 4, which received milo chops, cottonseed meal, and cottonseed hulls, made an average daily gain of 2.206 pounds. Each lot had access to sorghum hay also.

The average daily rations for the respective lots were as follows:

	Lot 1 corn chops	Lot 2 corn chops and molasses	Lot 3 kafir chops	Lot 4 milo chops
Grain.....	pounds 21.000	pounds 7.63	pounds 21.66	pounds 21.66
Cottonseed meal.....	2.910	3.00	3.00	3.00
Cottonseed hulls.....	12.350	17.24	17.24	17.24
Molasses.....	0.262	12.06		

The amount of feed required per hundred pounds of gain in the respective lots was as follows:

	Lot 1 corn chops	Lot 2 corn chops and molasses	Lot 3 kafir chops	Lot 4 milo chops
Grain.....	pounds 1036.490	pounds 399.31	pounds 834.58	pounds 982.22
Cottonseed meal.....	143.570	156.80	115.40	135.98
Cottonseed hulls.....	609.500	900.90	633.80	781.34
Molasses.....	1.296	629.02		

Texas Station Bulletin No. 110 (1908), entitled "Steer Feeding Experiments," reported a 120-day steer feeding test in which two-year-old Aberdeen-Angus steers, averaging 877 pounds, were used for a comparison of Indian corn, kafir, milo, and molasses. Six steers were fed in each lot. Cottonseed hulls constituted the sole roughage in each of the respective lots.

The steers in Lot 1, which received corn chops, cottonseed meal, and cottonseed hulls, made an average daily gain of 2.1 pounds; those in Lot 2, which received kafir chops, cottonseed meal, and cottonseed hulls, made an average daily gain of 2.47 pounds; those in Lot 3, which received milo chops, cottonseed meal, and cottonseed hulls, made an average daily gain of 2.12 pounds; and those in Lot 4, which received molasses, corn chops, cottonseed meal, and cottonseed hulls, made an average daily gain of 2.26 pounds.

The average daily rations for the respective lots were as follows:

	Lot 1 corn chops	Lot 2 kafir chops	Lot 3 milo chops	Lot 4 corn chops and molasses
	pounds	pounds	pounds	pounds
Grain.....	15.14	15.15	15.15	8.56
Cottonseed meal.....	2.95	2.95	2.95	2.95
Cottonseed hulls.....	12.63	12.63	12.63	12.63
Molasses.....				6.57

The amount of feed required per hundred pounds of gain in the respective lots was as follows:

	Lot 1 corn chops	Lot 2 kafir chops	Lot 3 milo chops	Lot 4 corn chops and molasses
	pounds	pounds	pounds	pounds
Grain.....	718.0	611.8	714.4	378.3
Cottonseed meal.....	139.9	119.1	139.1	130.3
Cottonseed hulls.....	599.4	510.3	595.8	558.5
Molasses.....				290.4

An increasing number of progressive farmers in the "grain sorghum belt" of Texas have, in recent years, been giving serious consideration to the advisability of marketing their feed crops via the live stock route rather than to continue the delivery of them to the small towns where they are finally disposed of, sometimes at very satisfactory prices, and again at rather discouraging figures. In instances where the crops are annually hauled from the farms, depletion of the soils which produce them, is certain to result.

When the grain crops are sold from the farms there is a tendency in a great many instances to utterly waste the bulk of the roughage produced in growing the grain crops. For instance, it has been estimated conservatively that the weight of the consumable roughage grown in the production of the sorghum grain crop is fully equal to the weight of the grain produced. Granting then that the estimated 60,000,000 bushels of grain sorghums accredited to West Texas is correct, there is annually produced in the "grain sorghum belt" of Texas something

like 1,680,000 tons of grain sorghum roughage, a large percentage of which is wasted when the grain crops are hauled from the farms.

Livestock production in one form or another is an enterprise that has not been omitted in the well rounded-out and permanent farming enterprises in the corn belt of the United States. In those sections of Texas where corn is not a dependable crop, but where the grain sorghums yield abundantly, the question: "Can the grain sorghums be profitably substituted in the place of corn in the rations of fattening live stock?" is important, and one, which if correctly answered, would tend to stimulate the finishing of a larger number of live stock for market annually in this State. A number of feeders believe that the grain sorghums have approximately the same feeding value as corn, while at the same time these grains are usually quoted on the Texas markets at figures ranging from ten to twenty per cent. below corn.*

It was with a view of casting some additional light on the above question that the Texas Experiment Station has, during recent years, conducted a series of lamb-feeding tests at Substation No. 7, located in the lower portion of the Panhandle. In these lamb-feeding experiments the grain sorghums have compared very favorably with corn, both in gains and economy of gains. Only a limited number of feed-lot comparisons have been made between the feed values of corn and the grain sorghums for the production of finished beef in the Panhandle district of Texas; therefore the steer-feeding test in which ground ear corn was compared with ground milo heads and ground feterita heads, at Substation No. 7 during the winter of 1920-21, has been closely followed by a large number of ranchmen and farmers residing in that section of the State.

During the 1920-21 feeding season, thousands of aged steers were fed in Texas feed lots, and in the majority of instances, as a result of abnormal conditions, heavy losses were sustained by the feeders, no matter how judiciously they had compounded and fed the rations to the fattening steers.

The steers fattened in this test were weanling calves, averaging about eight months when placed in the feed lots. Every feeder will be interested in carefully reviewing the test herein reported on account of the exceptionally good gains made by the steers and the economy of gains as compared with the cost of gains made by mature steers.

OBJECT OF EXPERIMENT

The object of the experiment herein reported was to ascertain the comparative values of ground corn and cob meal (shuck included), ground feterita heads, and ground milo heads, when fed on a pound for pound basis, each to be supplemented with an equal amount of 43 per cent. protein cottonseed meal, the source of roughage supply being alfalfa hay and sorghum hay for the fattening of baby beeves.

*(Monthly Crop Reporter, December, 1921.)

FEEDS UTILIZED

The following feeds were fed during the feeding test herein reported:

Lot 1.—Ground ear corn, shuck included.

Cottonseed meal.
Alfalfa hay.
Sorghum hay.

Lot 2.—Ground feterita heads.

Cottonseed meal.
Alfalfa hay.
Sorghum hay.

Lot 3.—Ground milo heads.

Cottonseed meal.
Alfalfa hay.
Sorghum hay.

Throughout the experiment the concentrates and roughages supplied to each of the three respective lots were fed on a pound for pound basis. Representative samples of the several feeds utilized in this test were drawn in accordance with instructions from the Station Chemist and submitted to him for analyses, the composition of the respective feeds being tabulated in Table No. 1, which follows:

Table 1.—Composition of feeds used during experiment.

Name	Protein	Fat	Crude fiber	Nitrogen free extract	Water	Ash	No. of analyses
Corn, ear and shuck included.....	8.86	3.47	9.81	67.11	8.92	1.83	3
Ground feterita heads.....	11.40	2.33	6.73	66.12	10.71	2.71	3
Ground milo heads.....	11.24	2.55	6.40	65.67	10.57	3.57	3
Cottonseed meal.....	42.70	9.35	8.86	25.92	7.02	6.15	4
Alfalfa hay.....	13.66	1.40	32.74	34.97	8.99	8.24	2
Sorghum hay.....	5.80	2.17	26.08	51.77	7.45	6.73	4

With the exception of the corn and cottonseed meal, all feeds utilized in this test were grown on Substation No. 7. The growing season of 1920 was especially favorable to corn in the vicinity of that Station; however, the grain sorghums were rather late in maturing owing to a general setback as a result of severe hail storms early in the growing season. Analyses of the grain sorghums utilized in this test revealed a higher percentage of water than was contained in more mature grain that had been fed in previous lamb-feeding tests at Substation No. 7. The analyses showed the milo and feterita utilized in this test to be about a No. 3 grade, or a full grade below the previous year's average. Representative samples of the corn utilized in this test were shucked and shelled for the purpose of ascertaining the yield, which was as follows:

Corn73.56 per cent.
Cobs13.27 per cent.
Shucks13.14 per cent.

Similar samples of the feterita and milo were not threshed since considerable data showing the percentage of threshed grain to head stems

were already available at Substation No. 7. It was considered that the figures below, which are the results of eight tests, could be regarded as representing the percentage of grain to head stems:

Feterita threshed.....	76.68 per cent.
Head stems.....	23.32 per cent.
Milo threshed.....	76.38 per cent.
Head stems.....	23.62 per cent.

COST OF FEEDS

The prices assigned to the feeds utilized in this feeding test are based on local feed prices prevailing in the Panhandle of Texas during the fall of 1920, which were as follows:

Corn and cob meal, per ton.....	\$16.88
Ground feterita heads, per ton.....	14.00
Ground milo heads, per ton.....	14.00
Cottonseed meal, per ton.....	38.00
Alfalfa hay, per ton.....	25.00
Sorghum hay, per ton.....	6.50
Feterita stover, per ton.....	5.00

Ear corn was valued at 50 cents per bushel while the grain sorghum heads were readily obtainable at a cost of \$11.00 per ton. A charge of \$3.00 per ton was allowed to cover the cost of grinding the ear corn, the feterita and milo heads.

DURATION OF EXPERIMENT

The calves used in this experiment were on preliminary feed from November 1st to 29th. The test proper, which extended over a period of 165 days, opened on November 29 and closed May 13, 1921. The cattle were shipped to the Fort Worth market May 17, being delivered to that point on the following afternoon and sold May 19.

THE CALVES

The forty-five calves used in this test were high-grade Herefords bred by Jones & Elliott, Spur, Texas. These steer calves were purchased at a cost of \$32.50 per head. They were selected from a herd of approximately one hundred steer calves; all were in good condition at the time of being placed on feed.

WEATHER CONDITIONS DURING TEST

Table 2.—Showing maximum and minimum temperatures, also the precipitation at Substation No. 7 during period of test.

Year	Month	Maximum temperature degrees F	Minimum temperature degrees F	Precipitation, inches
1920.....	November.....	88	17	2.22
1920.....	December.....	74	12	0.38
1921.....	January.....	78	6	0.30
1921.....	February.....	82	18	1.08
1921.....	March.....	87	22	0.66
1921.....	April.....	91	24	Trace
1921.....	May*.....	94	49	0.42

*Until May 13.

Table No. 2 thus shows the maximum and minimum temperatures, and also the precipitation recorded at Substation No. 7, during the period of the experiment.

FEED LOTS, WATER SUPPLY AND EQUIPMENT

The test reported in this bulletin was the first steer feeding experiment conducted at Substation No. 7, and since only limited funds were available it was necessary to construct temporary feed lots at a minimum cost. The lots were 20'x60' each, and ample shelter was provided under an open shed with a southern exposure. The feed bunks were 15' long, 3'6" wide, 10" deep, and were 30" above the ground.

Water and salt were available in each lot at all times; however, the amount of salt consumed was small, probably on account of the water's carrying salt in solution. The water supply available at Substation No. 7 headquarters comes from a shallow well, and an analysis of a sample by the Station Chemist showed that it contained 1240 parts of salt (chloride of soda) per million of water.

WEIGHT RECORDS

Each of the respective lots of steers was weighed on three consecutive days at the beginning and end of the experiment, the averages of the three initial and final weighings, respectively, being considered the initial and final weights. The steers were weighed at regular thirty-day intervals throughout the test. The weighing was begun promptly at 10:30 a. m. on the regular assigned weighing dates.

PRELIMINARY FEEDING

The calves selected for this test were cut from the herd October 18, 1920, and were driven with their mothers to the Jones and Elliott ranch headquarters and placed in a small pasture where they were supplied with a few bundles of milo daily until their delivery to the Experiment Station, October 28. The cows were driven to the Station with the calves, afterwards being returned to the ranch, some eight miles away.

The original plan was to give the calves access to the milo and feterita stover fields during the month of November; however, on account of continued heavy rains during the early part of that month it was necessary to retain them in the feed lot. During the first two or three days in the feed lot, the calves were somewhat restless and did not consume much feed, but later they went on feed as well as could be expected.

The calves were fed together in one lot from October 31 to November 21, during which time feterita heads constituted the grain portion of the ration. They were divided into three lots November 21, after which time each lot received the following rations: Lot 1, ground ear corn, cottonseed meal, alfalfa hay, and sorghum hay; Lot 2, ground feterita heads, cottonseed meal, alfalfa, and sorghum hay; Lot 3, ground milo heads, cottonseed meal, alfalfa, and sorghum hay.

The calves were weighed on three consecutive dates: October 31, November 1 and 2, the average weight at that time being 406.65 pounds

per head. The following table shows the weights, gains, and feeds consumed during the 29-day preliminary feeding period:

Table 3.—Showing weights and gains, also feeds consumed during the preliminary feeding period

Initial weight (average three weighings), pounds.....	406.650
Weight November 29 (average three weighings), pounds.....	468.370
Gain per head, pounds.....	61.720
Average daily gain per head.....	2.130
Feed consumed per head during preliminary period:	
Cottonseed meal and cottonseed cake, pounds.....	22.160
Grain, pounds.....	43.720
Alfalfa hay, pounds.....	27.000
Sorghum hay, pounds.....	27.000
Feterita bundles (headed), estimated pounds.....	210.000
Average feed supplied per head daily during preliminary period:	
Cottonseed meal or cake, pounds.....	0.760
Grain, pounds.....	1.507
Feterita stover, pounds.....	7.240
Alfalfa and sorghum hay (equal amounts), pounds.....	1.860
Average feed cost per head during preliminary period.....	\$ 1.690

The calves were divided into three lots of fifteen head each on the afternoon of November 21. Lot 1 was placed on a ration of ground ear corn, cottonseed meal, alfalfa hay, and sorghum hay; Lot 2 was placed on a ration of ground feterita heads, cottonseed meal, alfalfa hay, and sorghum hay; Lot 3 was placed on a ration consisting of ground milo heads, cottonseed meal, alfalfa hay, and sorghum hay. The preliminary feeding period continued until November 29, when the test proper began, the evening feeding being considered the initial feeding, the experiment terminating with the morning feeding May 13, 1921, one hundred and sixty-five days later.

AVERAGE RATIONS FED

Table 4 shows the average amount of feed consumed daily per head, and the average daily gain per head during the 165-day feeding test.

Table 4.—Rations and gains by periods.

Lot No.	Average rations per steer	Total gain per steer, pounds	Average daily gain, pounds
First Period—30 Days			
1	Ground ear corn, shuck included, 5.07 lbs.; cottonseed meal, 1.0 lb.; alfalfa hay, 4.96 lbs.; sorghum hay, 4.96 lbs....	59.40	1.98
2	Ground feterita heads, 5.07 lbs.; cottonseed meal, 1.0 lb.; alfalfa hay, 4.96 lbs.; sorghum hay, 4.96 lbs.....	67.53	2.25
3	Ground milo heads, 5.07 lbs.; cottonseed meal, 1.0 lb alfalfa hay, 4.96 lbs.; sorghum hay, 4.96 lbs.....	61.52	2.05
Second Period—30 Days			
1	Ground ear corn, shuck included, 7.25 lbs.; cottonseed meal, 1.29 lbs.; alfalfa hay, 4.66 lbs.; sorghum hay, 4.66 lbs....	63.64	2.120
2	Ground feterita heads, 7.25 lbs.; cottonseed meal, 1.29 lbs.; alfalfa hay, 4.66 lbs.; sorghum hay, 4.66 lbs.....	63.79	2.126
3	Ground milo heads, 7.25 lbs.; cottonseed meal, 1.29 lbs.; alfalfa hay, 4.66 lbs.; sorghum hay, 4.66 lbs.....	57.47	1.915

Table 4.—Rations and gains by periods—Continued.

Lot No.	Average rations per steer.	Total gain per steer, pounds.	Average daily gain, pounces.
Third Period—30 Days.			
1	Ground ear corn, shuck included, 8.24 lbs.; cottonseed meal, 1.47 lbs.; alfalfa hay, 4.53 lbs.; sorghum hay, 4.53 lbs. . .	53.87	1.795
2	Ground feterita heads, 8.24 lbs.; cottonseed meal, 1.47 lbs.; alfalfa hay, 4.53 lbs.; sorghum hay, 4.53 lbs.	51.04	1.700
3	Ground milo heads, 8.24 lbs.; cottonseed meal, 1.47 lbs.; alfalfa hay, 4.53; sorghum hay, 4.53 lbs.	56.29	1.876
Fourth Period—30 Days.			
1	Ground ear corn, shuck included, 9.36 lbs.; cottonseed meal, 1.63 lbs.; alfalfa hay, 2.64 lbs.; sorghum hay, 6.31 lbs. . .	77.94	2.598
2	Ground feterita heads, 9.36 lbs.; cottonseed meal, 1.63 lbs.; alfalfa hay, 2.64 lbs.; sorghum hay, 6.31 lbs.	70.22	2.341
3	Ground milo heads, 9.36 lbs., cottonseed meal, 1.63 lbs.; alfalfa hay, 2.64 lbs.; sorghum hay, 6.31 lbs.	68.30	2.276
Fifth Period—30 Days.			
1	Ground ear corn, shuck included, 10.18 lbs.; cottonseed meal 1.72 lbs.; alfalfa hay, 2.09 lbs.; sorghum hay, 6.49 lbs. . .	56.27	1.875
2	Ground feterita heads, 10.18 lbs.; cottonseed meal, 1.72 lbs.; alfalfa hay, 2.09 lbs.; sorghum hay, 6.49 lbs.	59.87	1.995
3	Ground milo heads, 10.18 lbs.; cottonseed meal, 1.72 lbs.; alfalfa hay, 2.09 lbs.; sorghum hay, 6.49 lbs.	60.00	2.000
Sixth Period—15 Days.			
1	Ground ear corn, shuck included, 10.8 lbs.; cottonseed meal, 1.75 lbs.; alfalfa hay, .053 lbs.; sorghum hay, 7.93 lbs. . .	22.84	1.522
2	Ground feterita heads, 10.8 lbs.; cottonseed meal, 1.75 lbs.; alfalfa hay, .053 lbs.; sorghum hay, 7.93 lbs.	28.31	1.887
3	Ground milo heads, 10.8 lbs.; cottonseed meal, 1.75 lbs.; alfalfa hay, .053 lbs.; sorghum hay, 7.93 lbs.	25.55	1.703

The above table shows the average daily rations of the three lots of steers by thirty-day periods. It will be observed that throughout the entire test the steers of the three lots were fed on a pound for pound basis. This plan was adhered to since it was believed that there is not enough difference in the total digestible nutrients of the several kinds of grain fed to attempt balancing the rations absolutely in accordance with the modified Wolff-Lehmann standard.

The concentrates were gradually increased throughout the test as may be seen by observing Table No. 4. The usual practice was to make a slight increase at the morning feeding, allowing the regular ration at the ensuing evening feeding. If the cattle cleaned up the increased feed nicely on the two consecutive mornings, the subsequent evening ration was increased a similar amount.

HOGS

Table 5.—Weight of hogs following steers.

Weight dates	Lot 1	Lot 2	Lot 3
Weight December 5 (4 hogs), pounds	350	370	372
Weight December 15 (4 hogs), pounds	330	352	350
Weight December 15 (2 hogs), pounds	160	168	164
Weight January 15 (2 hogs), pounds	152	158	156

Twelve shotes averaging 91 pounds per head were divided into three groups of four each and placed in the feed lots with the steers on December 5. They were weighed again ten days later, and as recorded in the above table, the hogs in each of the three lots showed a weight less of about five pounds per head. Two hogs were removed from each lot December 15. The two remaining were weighed again January 15, one month later, and still showed a further loss in weight. All hogs were removed from the steer lots at this time.

The attendant endeavored to feed the hogs 0.2 pounds of tankage per head daily, but his records showed that they failed to consume it; therefore, this feed was discontinued.

This experiment seemed to emphasize the fact that baby beeves will utilize practically all of the grain when it has been finely ground before feeding. Several feeders in Garza County reported similar experiences with hogs following baby beeves in their feeding operations during 1921-22.

DISCUSSION

All of the calves in this test remained on feed throughout the entire feeding period. There was one calf in the milo-fed lot that was wild and nervous. Each time the calves were weighed this calf would attempt to break away during the weighing operation. He broke away twice and ran to the far end of a small pasture. This naturally was a factor in lowering the average gain in Lot 3.

The calves were fed twice daily throughout the test. Regular hours of feeding were adhered to strictly during the first 120 days of the experiment; but during the latter part of the period when the calves began to put on a finish, and the weather became unusually warm, the afternoon feeding was, in some instances, delayed until the atmosphere had become cooler.

The grain and cottonseed meal were mixed in the feed bunks with the sorghum roughage, which had been previously run through a silage cutter. This method of feeding the calves proved to be very satisfactory since approximately an hour and a half were required by the calves to consume the grain; thus the digestive juices were enabled to more thoroughly assimilate the grain and cottonseed meal. The alfalfa hay was fed to the calves just as soon as they had cleaned up the sorghum roughage which had been mixed with the grain.

At the beginning of the test, equal parts of alfalfa hay and sorghum roughage were supplied and fed in the same proportion until March 4, when the sorghum was increased and the alfalfa decreased to the proportion of 2.94 pounds of sorghum hay to one pound of alfalfa hay. The alfalfa supply became exhausted April 28, after which time sorghum hay constituted the sole roughage.

Table 6 shows a summary of the experiment:

Table 6.—Summary of 165 day feeding test.

	Ground ear corn shuck on	Ground feterita heads	Ground milo heads
	Lot 1	Lot 2	Lot 3
Number of steers.....	15	15	15
Average initial weight, November 29, pounds.....	466.880	468.880	468.420
Average final weight at feed lots May 13, pounds.....	800.840	809.640	797.550
Average gain per head, feed lot weights, pounds.....	333.960	340.760	329.130
Average daily gain per head, feed lot weights, pounds..	2.020	2.060	1.990
Average final weight Fort Worth market, May 19, lbs..	749.330	764.000	736.660
Average shrinkage per head in transit, pounds.....	51.510	45.640	60.890
Average shrinkage per head, per cent.....	6.430	5.630	7.630
Average daily ration, pounds:			
Grain.....	8.275	8.275	8.275
Cottonseed meal.....	1.451	1.451	1.451
Alfalfa hay.....	3.438	3.438	3.438
Sorghum hay.....	5.621	5.621	5.621
Pounds of feed required per hundred pounds gain:			
Grain.....	408.890	400.730	414.890
Cottonseed meal.....	71.730	70.298	72.780
Alfalfa hay.....	169.879	166.489	172.370
Sorghum hay.....	277.730	272.194	281.810
Total feed consumed per head, pounds, November 29 to May 13:			
Grain.....	1365.530	1365.530	1365.530
Cottonseed meal.....	239.550	239.550	239.550
Alfalfa hay.....	567.330	567.330	567.330
Sorghum hay.....	927.530	927.530	927.530
Feed consumed per head, pounds, from May 13 to May 17:			
Grain.....	66.330	66.330	66.330
Cottonseed meal.....	5.300	5.300	5.300
Sorghum hay.....	48.000	48.000	48.000
Dressing percentage of steers.....	57.350	56.420	57.730
Percentage efficiency of grain in production of gains on cattle based on lot making greatest gain.....	98.000	100.000	96.580
Financial statement:			
Initial cost per steer.....	\$ 32.500	\$ 32.500	\$ 32.500
Cost of feed per steer, Nov. 29—May 13.....	26.182	24.216	24.216
Cost of feed per head, May 13—May 17.....	0.815	0.720	0.720
Total cost of feed per head.....	26.997	24.936	24.936
Cost of feed per hundred pounds of gain.....	7.839	7.106	7.357
Cost of feed per head, Nov. 1—Nov. 29.....	1.690	1.690	1.690
Shipping and marketing cost per head.....	4.760	4.760	4.760
Total cost per steer, labor and interest on investment not included.....	65.947	63.886	63.946
Price received per steer.....	71.186	70.670	68.141
Balance above feed and marketing cost (labor and in- terest not included).....	5.239	6.784	4.255

The foregoing table shows that each of the three lots of steers made very satisfactory gains throughout the 165-day feeding period, Lot 1 having made an average daily gain of 2.02 pounds, while Lots 2 and 3 gained 2.06 pounds and 1.99 pounds, respectively. Although the Lot 2 steers made a slightly increased gain over those in Lot 1, they did not finish quite as well as did the corn-fed steers of Lot 1. The Lot 3 steers made a satisfactory gain, but did not meet with expectations.

Lot 1 consumed 480.62 pounds of concentrates and 447.61 pounds of roughage per hundred pounds of gain. Lot 2 consumed 471.028 pounds of concentrates and 438.68 pounds of roughage per hundred pounds of gain; while Lot 3 consumed 487.68 pounds of concentrates and 454.18 pounds of roughage per hundred pounds of gain.

The cost of feed per hundred pounds of gain in Lot 1, fed on corn, was \$7.84; in Lot 2, fed on ground feterita heads, it was \$7.11; and in Lot 3, fattened on ground milo heads, it was \$7.36. The balance to be applied to labor, interest on investment, and profit after the deduction of all feed and marketing costs, was as follows:

Lot 1.....	\$5.24 per head
Lot 2.....	6.78 per head
Lot 3.....	4.25 per head

The rations supplied to each of the three lots were apparently of similar palatability. The steers of each lot consumed their respective rations with apparent relish throughout the 165-day feeding period. In this experiment no value was assigned to the manure, although in the corn belt area many feeders consider that the value of the manure offsets labor.

MARKET GRADES

The steers were offered on the Fort Worth market May 19, and were purchased by Swift & Company in line with Kansas City and Chicago top prices. These steers were declared by packer buyers to carry the best quality and finish of the year's offerings of baby beefs except for a few show cattle on the Fort Worth market.

Table 7.—The yields were as follows.

Lot No.	Rations	Average live weight, pounds	Dressed yield, per cent	Grade	Selling price
1	Ground ear corn.....	749	57.35	All choice to prime quality.....	\$ 9.50
2	Feterita heads.....	764	56.42	3 choice to prime; 12 choice.....	
3	Milo heads.....	736	57.73	All choice.....	

In a communication to the senior author, Swift & Company made the following comments regarding the grading of the steers:

"The two lots of cattle which we bought at \$9.25 alive, were choice quality beef; while three cattle that were above the average in the lot (which averaged 764 pounds alive) were choice to prime quality beef.

"The lot which we bought at \$9.50 per cwt. alive, could be classified as choice to prime quality beef, also."

Table 8.—Initial and final weights, shrinkages and dressing percentages.

	Lot 1 ground ear corn	Lot 2 ground feterita heads	Lot 3 ground milo heads
Average initial weight per head at feed lots (lbs.).....	466.88	468.88	468.42
Average final weight per head at feed lots (lbs.).....	800.84	809.64	797.55
Average selling weight per head, Fort Worth (lbs.)....	749.33	764.00	736.66
Average gain per head (basis feed lot weights) (lbs.)...	333.96	340.76	329.13
Average* gain per head (basis selling weight) (lbs.)....	282.45	295.12	268.24
Average daily gain per head (basis feed lot weights)....	2.02	2.06	1.99
Average* daily gain per head (basis selling weights)....	1.71	1.79	1.63
Dressing percentage (basis final feed lot weights).....	53.66	53.23	53.32
Dressing percentage (basis selling weights).....	57.35	56.42	57.73

*The average gains based on the final market weights would have no doubt compared quite favorably with the feed lot gains had initial weights been taken previous to a fill at the beginning of the test.

Table 8 shows the initial and final feed-lot weights as well as the feed-lot gains. Figures are also presented showing the average gains

per head based both on the final feed-lot, as well as on market or selling weights.

The above table shows that the actual gain per head in Lot 1, based on selling weights, was 282.45 pounds, or an average daily gain of 1.71 pounds per head, while the average gain per head in Lot 2, based on market weights, was 295.12 pounds, or an average daily gain of 1.79 pounds. Lot 3 showed a gain of 268.24 pounds per head, or an average daily gain of 1.63 pounds, based on market weights. The dressing percentages have also been calculated on the basis of final feed-lot weights in addition to the market live weights. Although the dressing percentages are quite uniform in each instance, it is interesting to observe that in this test Lot 3 yielded the highest percentage of dressed beef based on market weights, while based on final feed-lot weights, Lot 1 yielded the highest percentage of dressed beef. This emphasizes the importance of basing dressed yields on the final feed-lot weights as well as on the market weights.

DISCUSSION OF FINISHING BEEVES IN TEXAS FEED LOTS

It is a well known fact that severe losses have been entailed by cattle feeders generally during the feeding seasons 1918-19, 1919-20, and 1920-21, probably as a result of inflated values of farm commodities and the general financial depression which followed. Bearing this in mind, it is unreasonable to presume that the finishing of cattle in the farm feed lots is relegated to ultimate abandonment since the finishing of beef cattle has, over a long period of years, proved especially remunerative to feeders who have mastered the art and practiced it steadily.

Those who contemplate the feeding of cattle, but have had no previous experience, should familiarize themselves as thoroughly as possible with the subject of beef making. Courage, ability, and willingness to learn are necessary qualities for successful live stock feeding. The farmers of the "grain sorghum belt" of Texas, as a whole, are not experienced cattle feeders; consequently, before engaging in the feeding of cattle extensively they should, during the initial trial, test their respective abilities as feeders on one and certainly not more than two carloads at the most. Then, in the event of a financial loss, as a result of an off market, improper methods of feeding, or perhaps marketing the live stock in a "warmed up" or half fat condition, the outcome is not likely to be so discouraging or disastrous as when a large number are fed by an amateur.

The question then of marketing the grain sorghums via the live stock route is indeed an important one, and progressive farmers are recognizing the necessity of further diversification. They realize that live stock farming offers advantages, among which are:

(a) The utilization of roughages grown on the farm, a large portion of which would otherwise be wasted.

(b) A more equal distribution of the farm labor throughout the year, etc.

(c) A higher degree of soil fertility as a result of returning the manure to the land that produces the crops.

Space does not permit a lengthy discussion of the subject of cattle

feeding in this bulletin; however, the baby beef feeding experiment reported herein shows an undisputed fact that calves can be converted into choice to prime baby beefs when fed upon a properly balanced ration, the grain portion of which is ground feterita and milo heads. A splendid opportunity no doubt awaits the future feeders of baby beefs in the "grain sorghum belt" of Texas, since range calves of desirable type carrying their milk flesh are generally for sale on the adjacent ranches. This renders it possible to place the calves in the Panhandle feed lots with but little shrinkage while the average corn belt feeder of baby beefs in many instances, must concentrate his efforts upon range-bred calves which have undergone a heavy shrinkage in being delivered to the corn belt feed lots. On the other hand the corn belt feeder is much nearer the central markets and his cattle do not undergo as great shrinkage in shipping to market as do those of Texas feeders who ship to the distant markets.

The demands of the consumers of beef have undergone a radical departure from those of the earlier days of the meat trade. Where formerly the strongest demands were cuts from 1400-to-1600-pound three- and four-year-old steers, the call now centers for cuts from 850-to-1100-pound beefs. At the present time there is a strong demand for choice cuts from prime baby beefs.

Aside from the strong demand of the consumers for the smaller cuts, it is important to emphasize the fact that calves of the proper type will make one hundred pounds of gain on seventy-five to ninety per cent. of the feed that is required by two- and three-year-old steers. This is important since, if the steer calves are disposed of at weaning time each year to the feeders instead of being carried until they are two, three, and four years old, the breeding herds can be correspondingly increased and a greater number of calves can be produced annually on the ranches and ranges.

HINTS TO BEGINNERS

While it is true that baby beefs make more economical gains per unit of feed consumed than do older cattle, beginners are cautioned to give thorough consideration to several important factors which enter into an enterprise of this kind. Amateur feeders may well depend in large measure upon the judgments of feeders of recognized ability: first, to assist in the selection of a uniform lot of calves of good type; second, to assist in balancing suitable rations; and, third, to render helpful advice from time to time regarding rations, gains, degree of finish, etc., as the feeding period advances.

A great deal depends upon the condition of the calves when placed on feed as to the probable time that will be required to convert them into prime baby beef; however, in placing calves in the feed lot with a purpose of converting them into a finished product, the feeder must be prepared to keep them on feed 150 to 200 days, and possibly longer. If, for any reason it becomes imperative to bring the feeding operation to a close at approximately 120 days, the amateur feeder, in all probability, would be pursuing a wiser course if he decided to feed older steers, since they can be finished in a shorter period than calves. The beginner should keep himself posted as to the condition of the live stock markets

at all times, and finally, he should ever bear in mind the important fact that successful feeders are always particular to finish their cattle before shipping them for slaughter. The feeder who makes a practice of marketing half fat or "warmed up" beef is almost certain to meet with early disaster.

PRODUCTIVE VALUES CALCULATED FROM FEEDING TESTS

The productive values of the milo and feterita heads used in this experiment were calculated by G. S. Fraps, Chief, Division of Chemistry. As stated in Frap's "Principles of Agricultural Chemistry," page 434, the productive value of a feed is the best measure so far devised for the net value of a food 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 food 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 one pound of digested material in the form of alfalfa hay.

Table 9.—Method of calculation of productive values from feeding tests with steers, Substation No. 7, 1920-21.

	Corn, cob and shuck	Feterita heads	Milo heads
	Lot 1	Lot 2	Lot 3
Average weight (W).....	633.900	639.300	633.000
Average daily gain (G).....	2.020	2.060	1.990
Daily ration:			
Grain (S).....	8.275	8.275	8.275
Cottonseed meal.....	1.450	1.450	1.450
Alfalfa hay.....	3.438	3.438	3.438
Sorghum hay.....	5.621	5.621	5.621
Productive value:			
Grain.....	6.383	.....	.....
Cottonseed meal.....	1.160	.....	.....
Alfalfa hay.....	1.161	.....	.....
Sorghum hay.....	2.185	4.506	4.506
Total (T).....	10.889		
Maintenance requirements (W × H = M).....	4.183	4.219	4.178
Productive balance (T—M = B).....	6.706	.....	.....
Maintenance per hundred pounds (H).....	.066	.....	.....
Therms per pound gain (B ÷ G = K).....	3.320	.....	.....
Value of gain (G × K = L).....	.....	6.839	6.607
Value of ration (M + L = O).....	.....	11.058	10.785
Value of grain (O—C = X).....	.....	6.552	6.279
Productive value grain per 100 pounds, in therms (X + S × 100).....	.....	79.170	75.880
Productive value as fat.....	.....	18.450	17.680

The productive value may be expressed in terms of fat or as therms. In most of our work, we have expressed the value in terms of fat, but shall, for the sake of uniformity in the future, express the values in therms, as proposed by the late Dr. H. P. Armsby. When the productive value of a feed is stated in terms of therms, this definite value can be compared with similar values of other feeding stuffs.

In calculating 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 compared with this feed, and assume a definite maintenance requirement for the animal. In this experiment with baby bees, corn was taken as the standard. Fraps calculated the productive values of the cottonseed meal, and alfalfa and sorghum hay, using the coefficients given in his "Principles of Agricultural Chemistry," page 434, and Texas Experiment Station bulletins Nos. 185 and 203, 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.

The method of calculations of the productive values of the grain sorghums used in this test are given in Table 9. The maintenance requirements of a hundred pounds of the average weight was assumed after Armsby as 0.933 therms. The therms required for one pound in gain of weight when ground ear corn, with shuck included, was fed, was 3.32. The value of the gains with the other feeds in terms of therms was calculated, using this figure (3.32).

In the test reported in this bulletin the feterita heads fed to Lot 2 had a slightly higher feeding value than did the milo heads fed to Lot 3. However, the fact that one of the steers in Lot 3 was nervous and wild undoubtedly was a factor in lowering the productive value in that lot slightly.

Table 10.—Comparison of productive values secured by feeding tests with steers and sheep at Substation No. 7, 1920-21.

	Productive value per hundred pounds		Productive value found compared as 100
	Found as therms	Calculated as therms	
Ground corn.....		86.40	100.00
Ground corn, cob and shuck.....		77.13	89.20
Ground feterita heads (steers).....	79.17	74.85	91.63
Ground feterita heads (sheep, 1920).....	70.68	.....	81.80
Ground feterita heads (sheep, 1921).....	79.46	.....	92.00
Ground milo heads ² (steers).....	75.88	78.33	87.80
Ground milo heads (sheep, 1920).....	77.11	.....	89.20
Ground milo heads (sheep, 1921).....	86.07	.....	99.61

A comparison of the productive values secured in the feeding tests with steers, with those secured in feeding tests with sheep in 1920 and 1921, is given in Table No. 10. Ground corn was used as the standard with sheep, and ground corn, cob and shuck, was the standard with the steers.

The productive value of ground feterita heads with steers was 91.63 per cent. of that of corn; with sheep in 1920, 81.8 per cent.; and with sheep in 1921, 92.0 per cent.

With ground milo heads with steers, the productive value was 87.8 per cent. of that of corn; with sheep in 1920, 89.2 per cent.; and with sheep in 1921, 99.61 per cent.

There is a considerable variation in these figures, as would be expected with individual feeding tests. This emphasizes the fact that conditions vary in different feeding tests, and these conditions affect the final results. It also shows that in order to secure average feeding values, it is necessary to conduct a number of feeding tests. Individual tests could be expected to vary from the average, and from the calculated average productive value, as these averages are calculated from individual experiments which deviate from one another. A comparatively slight difference in the weight of animals may have a somewhat large effect upon the calculated productive values when expressed as per cent. of that of another feed.

SUMMARY

1. The steers in the respective lots made average daily gains throughout the 165 days' test as follows:

Lot 1, fed ground ear corn, shuck included.....	2.02 lbs.
Lot 2, fed ground feterita heads.....	2.06 lbs.
Lot 3, fed ground milo heads.....	1.99 lbs.

2. The steers in Lot 1, fattened on corn, finished better than the other two lots, although the difference in this respect was scarcely noticeable.

3. The Lot 1 steers sold for \$9.50 per hundredweight, while the steers comprising Lots 2 and 3, sold at \$9.25 per hundred.

4. The Lot 1 steers, fattened on corn, were all graded as choice to prime quality beef, while the steers comprising Lots 2 and 3, with the exception of three head in Lot 2, which were graded as choice to prime quality, were graded as choice beef.

5. The Lot 2 steers, which were fed on feterita heads, gained 6.8 pounds more per head during the 165-day test than did those of Lot 1, fattened on corn.

6. The steers in each of the three lots made exceptionally good and consistent gains.

7. The steers fattened on the grain sorghums made more economical gains than did the corn-fed lot.

8. Four shotes were placed in each lot early in the test, but they were removed on account of their failure to make gains.

9. Although further experimentation in the feeding of the grain sorghums is planned at this Station, the test herein reported points to the definite conclusion that choice to prime quality beef can be produced by replacing corn with the grain sorghums in fattening rations for cattle.

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