

pounds of alfalfa hay fed to pasture 13. This would indicate that the protein and vitamin A requirements are amply met when 4 pounds of alfalfa hay and 2.5 pounds of corn are fed per heifer daily on winter bluestem pasture.

The increased gain resulting from the replacement of a part of the alfalfa with corn indicates some value of the grain beyond the total digestible nutrient value. This could be accounted for by the higher energy value of the grain.

The heifers were grazed together during the summer with no supplemental feed. By July 23, the close of the summer phase, the difference in gain had been reduced to .10 pound per head daily, still in favor of the heifers fed alfalfa and grain.

This is the same trend observed in the previous trial.

Table 24

**A Comparison of Alfalfa and Alfalfa Plus Grain for Wintering Heifer Calves on Bluestem Pasture.**

Wintering—December 11, 1956, to March 30, 1957—109 days.

Pasture number .....	8	13
Number of heifers .....	11	11
Av. initial wt. per heifer, lbs. ....	473	469
Av. gain per heifer, lbs. ....	81	36
Av. daily gain per heifer, lbs. ....	.74	.33
Av. daily ration per heifer, lbs.:		
Alfalfa hay .....	4.0	8.0
Ground shelled corn .....	2.5	....
Bluestem pasture .....		
Av. feed cost per heifer,* \$ .....	18.30	15.50

Grazing—March 30, 1957, to July 23, 1957—115 days.

Av. initial wt. per heifer, lbs. ....	554	505
Av. gain per heifer, lbs. ....	176	200
Av. daily gain per heifer, lbs. ....	1.53	1.74
Av. feed cost per heifer, \$ .....	16.00	16.00

Summary—December 11, 1956, to July 23, 1957—224 days.

Av. initial wt. per heifer, lbs. ....	473	469
Av. final wt. per heifer, lbs. ....	730	705
Av. gain per heifer, lbs. ....	257	236
Av. daily gain per heifer, lbs. ....	1.15	1.05
Av. feed cost per heifer, \$ .....	34.30	31.50
Av. feed cost per 100 lbs. gain .....	13.35	13.35

\* The supplements were continued until April 20. This figure includes their cost to that date. Feed prices may be found on inside back cover.

**The Value of Trace Minerals in a Fattening Ration, 1957 (Project 253-2).**

R. R. Oltjen, E. F. Smith and R. F. Cox

This is the fourth in a series of experiments conducted to determine the value of trace minerals in a typical fattening ration. Three previous experiments, similar to this one, were reported in Kansas Agr. Exp. Sta. Cir. 297, 308 and 335.

Chemical analyses of feeds commonly used in cattle rations in this area show there is no deficiency in any of the trace minerals: cobalt, copper, iodine, iron, manganese and zinc. It is possible the minerals may not be adequately balanced or available to the animal at all times. The objective of this test is to determine if trace minerals, when fed at a commonly used level, will influence rate of gain and feed efficiency.

**Experimental Procedure**

Twenty head of good quality Hereford heifers, 10 head to a lot, were used in this test. They were part of a shipment of cattle from Melrose,

New Mexico. The heifers were wintered and summer grazed on bluestem pasture and allotted in such a way as to equalize any differences in prior treatment. The full-feeding period started on July 24 and continued until the heifers graded good to choice. The grain was self-fed and hay was fed in amounts readily consumed.

Both lots were handled identically except that one lot received trace minerals during the dry-lot fattening phase. The trace minerals were fed as a trace mineral premix and added to the soybean oil meal to furnish the following amounts in milligrams per head daily: cobalt 1.25; copper 3.65; iodine 1.97; iron 46.13; manganese 56.3; and zinc 3.42.

**Observations**

The addition of trace minerals to lot 2 increased the gain .37 of a pound daily over lot 1 fed no trace minerals. Lot 2 ate slightly more grain and utilized it more efficiently. Selling price per hundredweight and dressing percentage were the same in both cases, while carcass data varied only a small amount.

Table 25

**The Value of Trace Minerals in a Fattening Ration.**

July 24, 1957, to November 5, 1957—104 days.

Lot number .....	1	2
Number of heifers per lot .....	10	10
	Self-fed grain in dry-lot	Self-fed grain in dry-lot plus trace minerals
Management .....		
Av. initial wt. per heifer, lbs. ....	716	717
Av. final wt. per heifer, lbs. ....	977	1016
Av. gain per heifer, lbs. ....	261	299
Av. daily gain per heifer, lbs. ....	2.51	2.88
Daily ration per heifer, lbs.:		
Soybean oil meal .....	1.49	1.47
Corn .....	16.61	17.43
Prairie hay .....	3.60	3.51
Salt .....	.02	.02
Ground limestone .....	.09	.09
Trace minerals .....	....	yes
Feed per cwt. gain, lbs.:		
Soybean oil meal .....	59.3	51.2
Corn .....	661.9	606.4
Prairie hay .....	143.3	122.2
Ground limestone .....	3.6	3.0
Salt .....	1.0	1.0
Cost of feed per cwt. gain, \$ .....	22.75	20.64
Total feed cost .....	59.38	61.71
Selling price per cwt. at market .....	23.25	23.25
Dressing percent .....	59.6	59.6
Carcass grades, USDA:		
Choice .....	..	1
Low choice .....	4	4
High good .....	3	3
Good .....	2	1
Low good .....	1	1
Av. thickness of finish <sup>1</sup> .....	4.4	3.8
Av. degree of marbling <sup>2</sup> .....	6.6	6.5
Av. size of rib eye <sup>3</sup> .....	3.9	3.7
Av. degree of firmness <sup>4</sup> .....	3.1	3.1

1. Scores for thickness of finish: moderate 3; modest 4; slightly thin 5.
2. Scores for degree of marbling: moderate 5; modest 6; small amount 7.
3. Scores for size of rib eye: large 2; moderately large 3; modestly large 4.
4. Scores for degree of firmness: firm 2; moderately firm 3; modestly firm 4.

**A Comparison of Milo Mill Feed with Ground Sorghum, 1956-57 (Project 258-2).**

**E. F. Smith, B. A. Koch, R. F. Cox and D. Richardson**

Milo mill feed\* is a relatively new feed ingredient that has been made available to livestock producers. This test is being conducted so that the livestock industry may have some knowledge of its comparative feed value. A progress report on this test was presented in Circular 349 from this station.

**Experimental Procedure**

The milo mill feed used in this test is a by-product obtained in dry milling sorghum grain. The composition expressed as the percent by weight of each of the component milling fractions is: sorghum bran, 30 percent; sorghum germ, 45 percent; sorghum shorts, 25 percent. A chemical analysis is given in the feedstuff analysis table in this circular.

Twenty-one good-quality Hereford heifer calves from near Melrose, New Mexico, were used in the test. The heifers were assigned to their respective treatments on the basis of weight, 11 head to the milo mill feed lot and 10 head to the sorghum grain fed lot. The heifers were fed all the sorghum silage they would eat during the winter phase but each animal received the same amount of concentrate feed and alfalfa hay. The heifers were gradually placed on a full feed of sorghum grain or milo mill feed during April. During the full feeding phase the sorghum grain or milo mill feed was self-fed, as was the alfalfa hay. Soybean meal was fed at the rate of 1 pound per head daily.

**Observations**

The gain produced under the two treatments was about the same. Due to a lower consumption of milo mill feed than of sorghum grain in the respective lots during the fattening phase, the heifers fed milo mill feed showed an advantage in feed efficiency. They also showed an advantage in dressing percent. The higher financial return to the producer for heifers fed milo mill feed was due to lower feed consumption, higher yield, a few higher grading carcasses, and a 10-cents-per-cwt. advantage in feed price.

Under the conditions of this test, milo mill feed proved fully equal to ground sorghum grain.

**Table 26**

**The Value of Milo Mill Feed as Compared to Ground Sorghum Grain.<sup>1</sup>  
Phase 1—Wintering—January 9 to April 3, 1957—84 days.**

Treatment	Ground sorghum grain	Milo mill feed
Lot number	13A	17
Number of heifers per lot	10	11
Av. initial wt. per heifer, lbs.	420	422
Av. final wt. per heifer, lbs.	570	571
Av. gain per heifer, lbs.	150	149
Av. daily gain per heifer, lbs.	1.78	1.77
Daily ration per heifer, lbs.:		
Ground sorghum grain	4.98	.....
Milo mill feed <sup>1</sup>	.....	4.93
Soybean meal	.23	.23
Sorghum silage	18.62	17.1
Alfalfa hay	2.49	2.45
Salt	.07	.08
Lbs. feed per cwt. gain:		
Ground sorghum grain	277	.....
Milo mill feed	.....	272
Soybean meal	13	13
Sorghum silage	1036	945
Alfalfa hay	138	136
Av. feed cost per cwt. gain, <sup>2</sup> \$	13.29	12.71

\* The term "milo mill feed" is a trade name and has no definite or specific relation to the sorghum products or by-products contained in the material to which this term is applied.

**Table 26 (Continued)**

Phase 2—Full feeding—April 3, 1957, to August 8, 1957—127 days.		
Av. initial wt. per heifer, lbs.	570	571
Av. final wt. per heifer, lbs.	796	792
Av. gain per heifer, lbs.	226	221
Av. daily gain per heifer, lbs.	1.78	1.74
Daily ration per heifer, lbs.:		
Ground sorghum grain, self-fed	12.7	.....
Milo mill feed, self-fed	.....	11.1
Soybean meal	1.0	1.0
Sorghum silage	4.4	3.8
Alfalfa hay	5.3	4.9
Salt	.02	.02
Lbs. feed per cwt. gain:		
Ground sorghum grain	715	.....
Milo mill feed	.....	636
Soybean meal	55	56
Sorghum silage	248	216
Alfalfa hay	299	279
Av. feed cost per heifer, <sup>2</sup> \$	55.44	47.68
Av. feed cost per cwt. gain, \$	24.53	21.57
Summary of Phases 1 and 2, January 9, 1956, to August 8, 1957—211 days.		
Av. total gain per heifer, lbs.	376	370
Av. daily gain per heifer, lbs.	1.78	1.75
Av. feed cost per cwt. gain, \$	20.07	18.01
Av. total feed cost per heifer, \$	75.47	66.62
Av. initial heifer cost at \$19.50 per cwt., \$	81.90	82.29
Av. selling price per cwt., <sup>3</sup> \$	22.65	23.87
Av. return per heifer above initial cost plus feed cost, \$	16.58	33.93
Av. % shrinkage in shipping to market	3.5	3.3
Dressing %, chilled	59.0	61.6
Carcass grades, USDA:		
Low prime	.....	1
High choice	.....	.....
Av. choice	2	4
Low choice	5	4
High good	3	.....
Av. good	.....	1
Low good	.....	1
Av. grade <sup>4</sup>	12.90	13.18
Av. marbling score <sup>5</sup>	7.10	6.81
Av. fat thickness score <sup>6</sup>	3.5	3.81
Av. rib eye size, score <sup>7</sup>	4.6	4.36
Av. firmness score <sup>8</sup>	3.7	3.63

1. The milo mill feed was furnished by Grain Products, Inc., Dodge City.  
 2. Feed prices per ton: Alfalfa hay, \$25.00; sorghum silage, \$10.00; soybean meal, \$70.00 per cwt.; ground sorghum grain, \$2.50; milo mill feed, \$2.40.  
 3. Based on carcass grades with U.S. prime at 40c a pound, choice at 39c and good at 37c.  
 4. Average grade was based on low prime, 16; high choice, 15; average choice, 14; low choice, 13; high good, 12; average good, 11.  
 5. Marbling score was based on moderate, 5; modest, 6; small amount, 7; slight amount, 8.  
 6. Fat thickness score at 12th rib based on moderate, 3; modest, 4; slightly thin, 5.  
 7. Rib eye score size was based on moderately large, 3; modestly large, 4; slightly small, 5.  
 8. Firmness of rib eye was based on firm, 2; moderately firm, 3; modestly firm, 4; slightly firm, 5.

**Different Methods of Managing Bluestem Pastures, 1957 (Projects 253-3 and 253-5).**

E. F. Smith, K. L. Anderson, B. A. Koch, F. W. Boren and G. L. Walker

This experiment is to determine the effects of different stocking rates, deferred grazing, and pasture burning on cattle gains, productivity of pastures and range condition as determined by plant population changes. In addition to the yearly report, a summary of the cattle gains for the past eight years of the study is included.

**Experimental Procedure**

Good quality Hereford yearling steers weighing about 485 pounds were used to stock the pastures. They were purchased as calves near Melrose, New Mexico, in the fall of 1956. They were wintered at Manhattan in the dry-lot on sorghum silage, a limited amount of alfalfa hay, and 1 pound of protein concentrate per head daily. The method of management of each pasture was:

- Pasture 1—Normal stocking rate, 3.2 acres per head.
- Pasture 2—Overstocked, 2.3 acres per head.
- Pasture 3—Understocked, 5.6 acres per head.
- Pastures 4, 5, 6—Deferred grazing, 3.2 acres per head.

All steers were held in pastures 4 and 6 until July 1, then placed on deferred pasture 5 until August 5; from August 5 until September 4 they were allowed the run of all three pastures. On September 4 they were put back on pastures 4 and 6 for the remainder of the season.

- Pasture 9—Burned March 16, 1957, normal rate of stocking.
- Pasture 10—Burned April 10, 1957, normal rate of stocking.
- Pasture 11—Burned May 1, 1957, normal rate of stocking.

The steers were weighed off test October 3, 1957, but remained on the pastures until November 1, 1957. Results are presented in Tables 27 and 28.

**Observations**

1. The steers on the normal, over, and understocked pastures made about the same gain, while the steers on the burned pastures, especially those on the late spring burning, made the greatest gains per head.
2. Deferred and rotation grazing produced 34 pounds less gain per steer than normal, season-long grazing as practiced on pasture 1. This difference occurred primarily during July when all of the deferred and rotated steers, 57 head, were on one 60-acre pasture.
3. Pasture 3, overstocked, and pasture 9, early spring burned, had the least top growth remaining at the close of the season. The other pastures ranked approximately as follows in regard to top growth, from most to least:
  - Pasture 3—understocked
  - Pastures 5 and 6—deferred
  - Pasture 1—normally stocked
  - Pasture 4—deferred
  - Pasture 11—late spring burned
  - Pasture 10—mid-spring burned
4. Taking into consideration the condition of the grass, gain per acre and gain per steer, normal stocking, as practiced on pasture 1, appears to rank near the top in management practices tested.

**Table 27**  
**Comparison of Different Methods of Managing Bluestem Pastures.**  
**April 27, 1957, to October 3, 1957—159 days.**

Pasture number	1	2	3	4, 5, 6	9	10	11
Management	Normally stocked	Overstocked	Understocked	Deferred rotated	Early spring burned	Mid-spring burned	Late spring burned
Number steers per pasture	19	26	13	57	14	14	14
Acres in pasture	60	60	60	3-60 <sup>1</sup>	44	44	44
Number acres per head	3.2	2.3	5.6	3.2	3.1	3.1	3.1
Av. initial wt., lbs.	481	484	482	490	485	486	485
Av. final wt., lbs.	724	720	726	699	746	742	764
Av. gain per steer, lbs.	243	236	244	209	261	256	279
Av. daily gain, lbs.	1.53	1.48	1.53	1.31	1.64	1.61	1.75
Av. gain per acre, lbs.	77	103	44	65	84	83	90

1. Three 60-acre pastures.

**Table 28**  
**Yearly Account of Cattle Gains under Different Methods of Grazing Pastures; Eight-Year Summary, 1950-1957. Average Gain per Steer in Pounds for the Summer Season of Approximately 150 days.**

Pasture number	1	2	3	4, 5, 6	9	10	11
Management	Normally stocked	Overstocked	Understocked	Deferred rotated	Early spring burned	Mid-spring burned	Late spring burned
1950	221	210	214	205	216	254	230
1951	242	256	290	234	243	265	254
1952	246	209	228	197	251	278	283
1953	225	194	233	197	205	217	234
1954	261	237	214	213	270	271	306
1955	270	224	253	213	282	305	307
1956	179	184	168	154	212	234	216
1957	243	236	244	209	261	256	279
Average	236	219	233	203	243	260	264

**A Comparison of Wintering in Dry-Lot with Wintering on Bluestem Pasture for Yearling Steers on a Wintering, Grazing, and Fattening Program, 1956-57 (Project 253-4).**

E. F. Smith, B. A. Koch, F. W. Boren and G. L. Walker

This is the second test designed to study the effect of winter management on performance of yearling steers. The first was reported in Circular 349 from this station. Yearling steers are often used by Kansas producers in a program of this type. They consume large quantities of feed compared with calves and this increases cost of production considerably. This study is concerned with lowering the cost of wintering by introducing the use of low-cost, low-quality winter grass, and observing its effect on future performance, especially with regard to the effect on the carcass produced.

**Experimental Procedure**

Twenty head of good-quality yearling Hereford steers were used in the test. They originated in the vicinity of Clovis, New Mexico, and were purchased as calves by the College in the fall of 1955. They were wintered in dry-lot and then grazed on bluestem pastures during the summer of 1956. December 11, 1956, they were divided into two lots of 10 steers each. The only difference in treatment of the two lots was during the winter. The treatment for each lot was as follows:

Lot 1—Wintered in dry-lot on sorghum silage supplemented with protein; bluestem pasture from May 11 to July 18; fed grain and protein on grass from July 18 to October 26, 1957.

Lot 2—Wintered on bluestem pasture supplemented with protein and then handled for the remainder of the test in an identical manner to lot 1.

The 20 steers were grazed together from May 11 until July 18. During the grain-feeding period, July 18 to October 26, the two lots were fed in separate comparable pastures.

Half of the steers in each lot had been implanted in the spring of 1956 with either 24 or 36 mgs. of stilbestrol. The results of this treatment may be found elsewhere in this publication.

**Observations**

1. The difference in winter management produced a significant difference in winter gain. This difference was reduced somewhat during the summer but in the summary of all phases, the steers in lot 1, wintered in dry-lot, showed a gain advantage of 66 pounds per head over those wintered on bluestem pasture. In addition they produced superior carcasses, had a higher dressing percent and sold for \$1.00 per cwt. more.

2. The primary advantage for the steers wintered on pasture was their lower feed cost per hundred pounds of gain as reported in the summary of all phases. This enabled them to compare favorably with the steers wintered in dry-lot in regard to financial return to the producer.

**Table 29**

**A Comparison of Wintering in Dry-Lot with Wintering on Dry Bluestem Pasture for Yearling Steers on a Wintering, Grazing, and Fattening Program, 1956-57.**

Phase 1—Wintering—December 11, 1956, to May 11, 1957—151 days.

Lot number	1	2
Place wintered	Dry-lot	Bluestem pasture
Av. initial wt. per steer, lbs.	775	773
Av. final wt. per steer, lbs.	890	791
Av. gain per steer, lbs.	115	18
Av. daily gain per steer, lbs.	.76	.12
Feed per steer daily, lbs.:		
Soybean pellets	1.0	1.0
Sorghum silage	50.7	....
Bluestem pasture	....	Free choice
Salt	....	Free choice
Av. feed cost per steer, \$	36.92	10.04

**Table 29 (Continued)**

Phase 2—Grazing—May 11, 1957, to July 18, 1957—68 days.		
Av. gain per steer, lbs.	127	151
Av. daily gain per steer, lbs.	1.87	2.22
Av. feed cost per steer, \$	20.00	20.00
Phase 3—Fattening—July 18, 1956, to October 26, 1957—100 days.		
Av. initial wt. per steer, lbs.	1017	942
Av. final wt. per steer, lbs.	1225	1157
Av. gain per steer, lbs.	208	215
Av. daily gain per steer, lbs.	2.08	2.15
Daily ration per steer:		
Ground sorghum grain, lbs.	13.5	13.5
Soybean oil meal, lbs.	1.42	1.42
Stilbestrol, mgs.	10	10
Ground limestone, lbs.	.1	.1
Salt	....	Free choice
Bluestem pasture	....	Free choice
Feed per cwt. gain, lbs.:		
Ground sorghum grain	647	626
Soybean meal	68.0	66.0
Av. feed cost this phase, <sup>1</sup> \$	39.41	39.41
Av. feed cost per 100 lbs. gain <sup>1</sup>	18.95	18.33
Summary of Phases 1, 2 and 3—December 11, 1956, to October 26, 1957—319 days.		
Av. total gain per steer, lbs.	450	384
Av. daily gain per steer, lbs.	1.41	1.20
Av. feed cost per cwt. gain, \$	21.41	18.09
Av. total feed cost per steer	96.33	69.45
Av. initial steer cost @ \$19 per cwt.	147.25	146.87
Av. selling price per cwt.	22.00	21.00
Av. return per steer above initial cost plus feed cost	14.04	15.73
Av. % shrink in shipping to market	4.41	4.49
Av. dressing %, chilled	60.95	58.81
Carcass grades, USDA: <sup>2</sup>		
Low choice	1	....
High good	4	....
Av. good	4	....
Low good	1	3
High standard	....	3
Av. standard	....	1
Av. marbling score <sup>3</sup>	7.1	8.7
Av. fat thickness score <sup>4</sup>	4.0	3.9
Av. rib eye size, score <sup>5</sup>	4.5	4.7
Av. firmness score <sup>6</sup>	4.0	4.4

1. Feed prices may be found inside the back cover.
2. Three carcasses from lot 2 were shipped from the packing plant before carcass data were obtained from them.
3. Marbling score based on: small amount, 7; slight amount, 8; traces, 9.
4. Thickness of outside fat based on: moderate, 3; modest, 4; slightly thin, 5.
5. Rib eye size: modestly large, 4; slightly small, 5.
6. Firmness of rib eye based on: moderately firm, 3; modestly firm, 4; slightly firm, 5.

**Winter Management for Steer Calves on a Wintering, Grazing, and Fattening Program, 1956-57 (Project 253-6).**

E. F. Smith, B. A. Koch, F. W. Boren and G. L. Walker

A previous test has been reported in Circular 349 from this station. The objective of the study is to determine if winter bluestem pasture can be supplemented in such a manner that calves wintered on it will