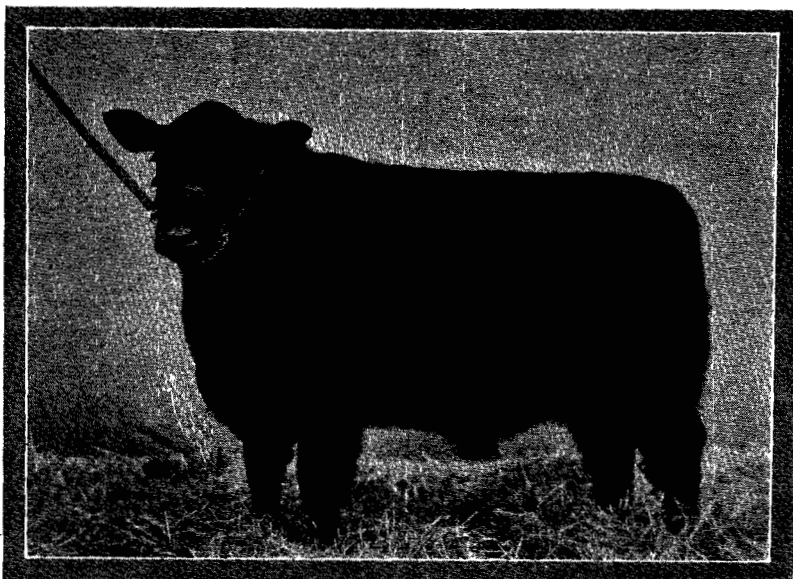


AGRICULTURAL EXPERIMENT STATION

KANSAS STATE AGRICULTURAL COLLEGE
MANHATTAN, KANSAS

DEPARTMENT OF ANIMAL HUSBANDRY



IRENMERE 3D—GRAND CHAMPION STEER, WESTERN
NATIONAL LIVE-STOCK SHOW, DENVER, 1928

Bred and Shown by K. S. A. C.

CATTLE FEEDING INVESTIGATIONS, 1927-'28¹

B. M. ANDERSON, C. W. McCAMPBELL, AND M. A. ALEXANDER

The cattle feeding investigations of 1927-'28 include studies of:
(1) The value of adding ground limestone to rations fed calves being fattened for market. (2) Full feeding versus feeding a light grain ration for a limited period and then full feeding in the case of yearlings. (3) Wintering, grazing, and fattening calves for market. (4) Wintering and grazing calves to be sold as stockers off grass.

These studies will be discussed as four separate parts of this circular.

1. Contribution No. 91 from the Department of Animal Husbandry.

PART I

THE VALUE OF ADDING GROUND LIMESTONE TO RATIONS FED CALVES BEING FATTENED FOR MARKET

B. M. ANDERSON AND M. A. ALEXANDER

Numerous tests conducted at this and other agricultural experiment stations have shown that alfalfa hay is a very valuable roughage for cattle fattening purposes. However, many persons who would fatten cattle for market do not have alfalfa hay available. Tests have also shown that prairie hay is decidedly inferior to alfalfa hay. Prairie hay contains much less protein and calcium than alfalfa hay.

A series of tests were started at this station in the fall of 1925 in which prairie hay, plus cottonseed meal to make up the protein deficiency, plus calcium carbonate to make up the calcium deficiency, was compared with alfalfa hay in calf fattening rations. The ration fed in addition to the hays described consisted of corn, cottonseed meal, and cane silage. The first year pure calcium carbonate was fed. The second and third years, finely ground limestone analyzing approximately 99 per cent calcium carbonate was used.

It might be well to mention that the calves in all three years' tests were bred by the Matador Land and Cattle Company at Matador, Texas, and were of approximately the same weights when each year's test started. This eliminated to a considerable extent variables that would result from using calves from different sections of the country raised under different conditions of climate, feed, management, etc.

Eight lots of steer calves were used in the 1927-'28 test. They would have graded good to choice. The test covered a period of 180 days, from November 23, 1927, to May 21, 1928. The different lots in this test were fed the following rations:

- Lot 1—Ground shelled corn, cottonseed meal, alfalfa hay.
- Lot 2—Ground shelled corn, cottonseed meal, alfalfa hay, plus ground limestone.
- Lot 3—Ground shelled corn, cottonseed meal, prairie hay.
- Lot 4—Ground shelled corn, cottonseed meal, prairie hay, plus ground limestone.
- Lot 5—Shelled corn, cottonseed meal, silage, alfalfa hay.
- Lot 6—Shelled corn, cottonseed meal, silage, alfalfa hay, plus ground limestone.
- Lot 7—Shelled corn, cottonseed meal, silage, prairie hay.
- Lot 8—Shelled corn, cottonseed meal, silage, prairie hay, plus ground limestone.

The grain was hand-fed twice a day for the first 60 days, after which it was self-fed. In lots 1 to 4 inclusive, where ground shelled corn was fed, the cottonseed meal was mixed with the ground corn. In lots 2 and 4, where ground limestone was fed, it was also mixed with the ground corn. In lots 5 to 8 inclusive, where shelled corn was used, the cottonseed meal was fed on the silage. In lots 6 and 8, where ground limestone was fed, it was mixed with the cottonseed meal and the mixture fed on the silage.

It will be noted that there are two series of lots in this test, 1 to 4 in which no silage was fed and 5 to 8 in which the respective rations were the same as those fed in lots 1 to 4 except that silage was added in each of the lots 5 to 8.

The results secured where no silage was fed, lots 1 to 4 inclusive, are given in detail in Table I.

OBSERVATIONS

1. A study of lots 1 and 2 indicates that it is not necessary to add ground limestone to a calf fattening ration in which the entire roughage portion of the ration is made up of alfalfa hay. In this test daily gains and costs of gains were approximately the same where alfalfa was fed with and without ground limestone. The selling price per hundred was less where the ground limestone was fed. It is well known that alfalfa hay contains a large amount of calcium (lime), approximately 200 times as much as shelled corn. Apparently alfalfa hay alone as the roughage portion of a calf fattening ration supplies enough calcium (lime).

2. A study of lots 3 and 4 indicates that it pays to add ground limestone to a calf fattening ration in which the entire roughage portion is made up of prairie hay. The cost of gains were about the same in each case, but daily gains and selling price per hundred were increased considerably by adding ground limestone to prairie hay.

3. Ground limestone added to prairie hay, lot 4, increased its value materially but did not make it as valuable as alfalfa hay. In this comparison hay, either alfalfa or prairie, constituted the entire roughage portion of the ration.

TABLE I.—THE RELATIVE VALUE OF ADDING GROUND LIMESTONE TO ALFALFA HAY AND TO PRAIRIE HAY WHEN FED TO FATTENING CALVES.

November 23, 1927, to May 21, 1928—180 days.

RATION FED.	Ground corn and cottonseed meal. (Fed in each lot.)			
	Alfalfa hay.	Alfalfa hay and ground limestone.	Prairie hay.	Prairie hay and ground limestone.
Lot No.	1	2	3	4
Number of steers in lot.	9	10	10	10
Number of days on test.	180	180	180	180
Initial weight per steer.	<i>Pounds</i> 377.96	<i>Pounds</i> 375.50	<i>Pounds</i> 370.33	<i>Pounds</i> 370.50
Final weight per steer.	821.11	814.67	757.83	776.33
Total gain per steer.	443.15	439.17	387.50	405.83
Daily gain per steer.	2.46	2.44	2.15	2.25
Average daily ration:				
Ground corn.	9.74	9.60	9.83	10.09
Cottonseed meal.	1.12	1.11	1.36	1.40
Alfalfa hay.	6.03	5.84		
Prairie hay.			4.43	5.03
Ground limestone. . . . .		.11		.12
Feed required for 100 pounds gain:				
Ground corn.	395.78	393.51	456.50	447.50
Cottonseed meal.	45.60	45.43	63.27	61.92
Alfalfa hay.	245.12	239.41		
Prairie hay.			205.63	223.01
Ground limestone.		4.57		5.15
Cost of 100 pounds gain.	\$9.31	\$9.29	\$9.91	\$9.88
Initial cost per steer at \$11 per cwt.	41.58	41.31	40.74	40.76
Feed cost per steer.	41.26	40.80	38.40	40.10
Steer cost plus feed cost.	82.84	82.11	79.14	80.86
Value per head at home.	108.80	105.91	94.73	98.98
Margin per head.	25.96	23.80	15.59	18.12
Necessary value per cwt. at feed lot to break even,	10.09	10.08	10.44	10.42
Value per cwt. at feed lot—Kansas City price minus 50 cents per cwt.	13.25	13.00	12.50	12.75
Margin per cwt.	3.16	2.92	2.06	2.33

Feed Prices.—Ground corn, 90 cents a bushel; cottonseed meal, \$50 a ton; alfalfa hay, \$15 a ton; prairie hay, \$10 a ton; ground limestone, \$20 a ton.

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The results secured where silage as well as hay, either alfalfa or prairie, was fed are given in detail in Table II.

TABLE II.—THE VALUE OF ADDING GROUND LIMESTONE TO ALFALFA HAY AND SILAGE, AND TO PRAIRIE HAY AND SILAGE, WHEN FED TO FATTENING CALVES.

November 23, 1927, to May 21, 1928—180 days.

RATION FED.	Shelled corn, cottonseed meal, and cane silage. (Fed in each lot.)			
	Alfalfa hay.	Alfalfa hay and ground limestone.	Prairie hay.	Prairie hay and ground limestone.
Lot No.	5	6	7	8
Number of steers in lot	10	10	10	10
Number of days on test.	180	180	180	180
Initial weight per steer.	<i>Pounds</i> 371.00	<i>Pounds</i> 371.33	<i>Pounds</i> 374.00	<i>Pounds</i> 372.83
Final weight per steer.	787.83	819.00	747.00	809.33
Total gain per steer.	416.83	447.67	373.00	436.50
Daily gain per steer.	2.32	2.49	2.07	2.43
Average daily ration:				
Shelled corn.	9.77	9.51	9.65	9.85
Cottonseed meal.	1.00	1.00	1.16	1.16
Cane silage.	9.71	10.05	8.91	10.14
Alfalfa hay.	2.01	2.00		
Prairie hay.			1.36	1.41
Ground limestone. ....		.10		.10
Feed required for 100 pounds gain:				
Shelled corn.	422.04	382.45	465.66	406.21
Cottonseed meal.	43.18	40.21	55.78	47.66
Cane silage.	419.49	404.15	430.03	418.16
Alfalfa hay.	86.85	80.42		
Prairie hay.			65.42	58.19
Ground limestone.		4.02		4.12
Cost of 100 pounds gain.	\$9.11	\$8.40	\$9.78	\$8.66
Initial cost per steer at \$11 per cwt.	40.81	40.85	41.14	41.01
Feed cost per steer.	37.97	37.60	36.48	37.80
Steer cost plus feed cost.	78.78	78.45	77.62	78.81
Value per head at home.	100.45	106.47	93.38	105.21
Margin per head.	21.67	28.02	15.76	26.40
Necessary value per cwt at feed lot to break even,	10.00	9.58	10.39	9.74
Value per cwt. at feed lot—Kansas City price minus 50 cents per cwt.	12.75	13.00	12.50	13.00
Margin per cwt.	2.75	3.42	2.11	3.26

Feed Prices.—Shelled corn, 84 cents a bushel; alfalfa hay, \$15 a ton; prairie hay, \$10 a ton; cottonseed meal, \$50 a ton; cane silage, \$5 a ton; ground limestone, \$30 a ton.

OBSERVATIONS

1. A study of lots 5 and 6, indicates that it pays well to add ground limestone to a calf fattening ration in which silage and a limited amount of alfalfa hay are fed as the roughage portion of the ration. In this test daily gains and selling price per hundredweight were increased and cost of gains decreased by the addition of finely ground limestone.

2. A study of lots 7 and 8 indicates that a decided advantage results from the addition of ground limestone to a calf fattening ration in which silage and a limited amount of prairie hay are fed as the roughage portion of the ration.

3. A study of lots 5 and 8 shows strikingly the possibility of improving a calf fattening ration, the roughage portion of which consists of prairie hay and silage. A ration consisting of corn, cottonseed meal, silage, and alfalfa hay has long been considered a standard cattle fattening ration. In this test the addition of ground limestone to a ration consisting of corn, cottonseed meal, silage, and prairie hay gave better results than the standard ration consisting of corn, cottonseed meal, silage, and alfalfa hay and almost as good results as the standard ration consisting of corn, cottonseed meal, silage, and alfalfa hay plus ground limestone.

4. This, as well as previous tests, emphasizes the advantages of adding ground limestone to a calf fattening ration, the roughage portion of which is made up of silage and hay, particularly when a nonlegume hay is used. It also emphasizes the fact that the more alfalfa a calf consumed the less the need of adding ground limestone and that when alfalfa hay constitutes the entire roughage portion of the ration no advantage results from the addition of ground limestone.

5. In this test the roughages used showed an increased value as a result of adding ground limestone as follows:

1. Alfalfa hay alone—no increase.
2. Prairie hay alone—increased margin per steer, \$2.53.
3. Alfalfa and dage—increased margin per steer, \$6.35.
4. Prairie hay and silage—increased margin per steer, \$10.64.

6. The margin per steer for all eight lots, each of which received corn and cottonseed meal ranked upon the basis of roughages fed, was as follows:

1. Alfalfa hay and silage plus ground limestone, \$28.02.
2. Prairie hay and silage plus ground limestone, \$26.40.
3. Alfalfa hay alone, \$25.96.
4. Alfalfa hay plus ground limestone, \$23.80.

5. Alfalfa hay and silage, \$21.67.
6. Prairie hay and ground limestone, \$18.12.
7. Prairie hay and silage, \$15.76.
8. Prairie hay, \$15.59.

7. The gain produced by the different rations fed in this test varied from 12 to 14²/₃ pounds per bushel of corn consumed.

MANNER OF FEEDING

The calves fed during the year 1927-28 were started on 2 pounds of corn per head. The corn was increased gradually as the experiment progressed. At the end of 15 days the calves were eating 4 pounds per head; at the end of 30 days, 5 pounds; at the end of 45 days, 7 pounds; at the end of 60 days, 9 pounds. After the first 60 days the corn was fed in a self-feeder. These calves were started on 1 pound of cottonseed meal per head. The average daily consumption of corn per head for all the cattle used in this test is shown in Table IV.

TABLE IV.—AVERAGE DAILY CORN CONSUMPTION PER HEAD BY 30-DAY PERIODS.

PERIOD.						Average for entire 180 days.
First 30 days.	Second 30 days.	Third 30 days.	Fourth 30 days.	Fifth 30 days.	Sixth 30 days.	
<i>Pounds</i> 3.82	<i>Pounds</i> 6.95	<i>Pounds</i> 9.77	<i>Pounds</i> 12.22	<i>Pounds</i> 12.69	<i>Pounds</i> 13.10	<i>Pounds</i> 9.76

The average daily gain of all the cattle used in this test by 30-day periods is shown in Table V.

TABLE V.—AVERAGE DAILY GAIN BY 30-DAY PERIODS.

PERIOD.						Average for entire 180 days.
First 30 days.	Second 30 days.	Third 30 days.	Fourth 30 days.	Fifth 30 days.	Sixth 30 days.	
<i>Pounds</i> 2.08	<i>Pounds</i> 2.02	<i>Pounds</i> 2.09	<i>Pounds</i> 2.87	<i>Pounds</i> 2.66	<i>Pounds</i> 2.10	<i>Pounds</i> 2.30

These figures may be used as a general guide for gains and corn consumption one might reasonably expect from calves of similar age, weight, and quality fed a well-balanced ration for 180 days.

A THREE-YEAR AVERAGE

During each of the past three years calves have been fed as follows: One lot on alfalfa hay, silage, corn, and cottonseed meal; one lot on prairie hay, silage, corn and cottonseed meal; and one lot on prairie hay, silage, corn, and cottonseed meal plus calcium carbonate. Each year's test has shown very strikingly the value of adding calcium carbonate, either as pure calcium carbonate or in the form of ground limestone showing a high per cent of calcium carbonate, to a ration consisting of prairie hay, silage, corn, and cottonseed meal. These results grouped and averaged for the three years are shown in Table III.

TABLE III.—AN AVERAGE OF THREE YEARS' RESULTS IN ADDING CALCIUM CARBONATE TO A CALF-FATTENING RATION.

RATION FED.	Corn, cottonseed meal, and cane silage. (Fed in each lot.)		
	Alfalfa hay.	Prairie hay.	Prairie hay and ground limestone.
Lot No.	a	b	c
Average daily gain per head.	<i>Pounds</i> 2.37	<i>Pounds</i> 2.12	<i>Pounds</i> 2.40
Average selling price per cwt.	\$10.83	\$10.33	\$10.75
Average margin per head.	12.90	6.00	13.59

PART II

FULL FEEDING VERSUS FEEDING A LIGHT GRAIN RATION FOR A LIMITED PERIOD AND THEN FULL FEEDING IN THE CASE OF YEARLINGS

B. M. ANDERSON AND M. A. ALEXANDER

A group of 20 yearling steers of good quality were divided into two lots of 10 each and started on feed in a dry lot October 8, 1927. Lot 1 was got up to a full feed of grain as rapidly as possible and was kept on a full feed to the end of the test, whereas lot 2 was fed only 5 pounds of grain per head per day for the first 90 days, after which it was got up to a full feed of grain as soon as possible and was kept on a full feed until the end of the test.

These two lots were appraised at the end of 150 days and again at the end of 225 days. This furnishes data relative to gains, feed consumption, prices and margin per steer for a 150-day feeding period as well as a 225-day feeding period. It also furnishes data

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relative to increasing costs of gain and increasing price to break even as a feeding period is prolonged.

These data are given in detail in Table VI.

TABLE VI.—FULL FEEDING ENTIRE PERIOD VERSUS FULL FEEDING LATTER PART OF PERIOD.

RATION FED.	Cottonseed meal, cane silage, and alfalfa hay. (Fed in each lot.)			
	Ground corn. (Full fed.)	Ground corn (a). (Full fed deferred.)	Ground corn. (Full fed.)	Ground corn (a). (Full fed deferred.)
Dates of periods fed	October 8, 1927, to March 6, 1928.		October 8, 1927, to May 20, 1928.	
Lot No.	1	2	1	2
Number of steers in lot	10	10	10	10
Number of days on test	150	150	225	225
Initial weight per steer	<i>Pounds</i> 699.00	<i>Pounds</i> 698.50	<i>Pounds</i> 699.00	<i>Pounds</i> 698.50
Final weight per steer	1,030.40	980.00	1,177.83	1,147.67
Total gain per steer	331.40	281.50	478.83	449.17
Daily gain per steer	2.21	1.88	2.13	2.00
Average daily ration:				
Ground corn	14.02	(a) 8.50	14.95	(a) 11.33
Cottonseed meal	1.00	.99	1.00	1.00
Cane silage	3.80	19.21	3.95	14.23
Alfalfa hay	4.20	5.77	3.52	4.57
Feed required for 100 pounds gain:				
Ground corn	634.76	452.93	702.46	567.71
Cottonseed meal	45.26	52.93	46.99	49.87
Cane silage	171.85	1,023.62	185.77	712.76
Alfalfa hay	190.01	307.71	165.84	228.91
Cost of 100 pounds gain	\$13.15	\$13.44	\$14.11	\$13.83
Initial cost per steer at \$10.25 per cwt.	71.65	71.60	71.65	71.60
Feed cost per steer	43.68	37.88	67.56	62.12
Steer cost plus feed cost	115.23	109.48	139.21	133.72
Value per head at home	136.53	122.50	164.90	154.94
Margin per head	21.80	13.07	25.69	21.22
Necessary value per cwt. at feed lots to break even	11.18	11.17	11.82	11.65
Value per cwt. at feed lot—Kansas City price minus 50 cents per cwt.	13.25	12.50	14.00	13.50
Margin per cwt.	2.07	1.33	2.18	1.85

Feed Prices.—Ground corn, 90 cents a bushel; cottonseed meal, \$50 a ton; cane silage, \$5 a ton; alfalfa hay, \$15 a ton.

(a) This represents a daily allowance of 5 pounds of corn per head per day for 90 days followed by corn full fed.

OBSERVATIONS

1. At the end of 150 days, lot 1, full fed from the beginning of the test, had consumed approximately 37½ bushels of corn per head, compared to 22¾ bushels in the case of lot 2, fed only 5 pounds of corn per head per day the first 90 days and then full fed; yet the cost of gains in lot 1 was slightly less and the selling price was 75 cents per hundredweight greater, resulting in an \$8.23 greater margin for the cattle full fed from the beginning of the test

2. At the end of 225 days, lot 1, full fed from the start, had consumed approximately 60 bushels of corn per head compared to 45½ bushels in the case of lot 2, fed only 5 pounds of corn per head per day the first 90 days and then full fed. The gains of lot 1 were slightly more expensive than those in lot 2 but a selling price of 50 cents per hundredweight greater in the case of lot 1 still left a margin in lot 1 that was \$4.47 per head greater than the margin in lot 2.

3. The decidedly greater return at the end of a 150-day feeding period, and the increased returns from both lots, as well as a smaller difference in the selling price per hundredweight at the end of 225 days, indicate the advisability of a heavy feed of grain for cattle of good quality that are being fattened for market, except in the case where a feeder's problem is primarily one of selling roughage to cattle.

4. This, as well as other tests, indicates the advantage, in the case of cattle of good quality, of a full feed of grain as soon as cattle can safely be got up to a full feed, rather than limiting the amount of grain fed during the fattening period.

5. This test indicates the possibility of carrying cattle of good quality on a long feed.

PART III

**WINTERING WELL; GRAZING WITHOUT GRAIN TO JULY 31;
FULL FEEDING 100 DAYS IN A DRY LOT**

C. W. McCAMPBELL, B. M. ANDERSON, AND M. A. ALEXANDER

In many sections of Kansas grass is plentiful, roughage in the form of silage is cheap, and grain is comparatively high in price, particularly compared to prices prevailing in the corn belt. This being true, one of the problems confronting cattle feeders of these sections is the production of well finished cattle with the use of a maximum of roughage and a minimum of grain.

Previous tests conducted at the Kansas Agricultural Experiment Station have shown that wintering calves on a light feed of corn

in addition to silage, alfalfa hay, and cottonseed meal, grazing without other feed to July 31, and then full feeding in a dry lot for 100 days, is a satisfactory method of producing well finished cattle in most sections of Kansas.

The question of the necessity of feeding any grain during the wintering period arose. To help answer this question a test was started December 19, 1926, in which one lot of calves was wintered on silage, alfalfa hay, and 1 pound of cottonseed meal per head per day and another lot on silage, alfalfa hay, 1 pound of cottonseed meal per head per day and a light feed of corn—an average of 4.66 pounds per head per day. Both lots were grazed together in one of the college bluestem grass pastures until July 31. On August 1 both lots were placed in small dry lots and started on a ration consisting of ground shelled corn, cottonseed meal, and alfalfa hay. They were got up to a full feed of grain as soon as safely possible.

The calves used in this test were also raised on the Matador Ranch at Matador, Texas, and would have graded good to choice when the test started. As in all other tests, the calves were sorted carefully to insure similarity in size, type, weight, and quality in each lot.

TABLE VII.—PHASE I: WINTERING.
 December 16, 1926, to April 30, 1927—135 days.

Lot No.	1	2
Number of steers in lot	10	10
Daily winter ration per steer:	<i>Pounds</i>	<i>Pounds</i>
Ground corn	4.66	.....
Cottonseed meal	1.00	1.00
Alfalfa hay	2.00	2.00
Cane silage	18.81	25.51
Initial weight per steer, December 16, 1926	330.80	327.60
Weight to grass as yearlings, May 1, 1927	612.67	537.00
Gain per steer during winter—135 days	281.87	209.40
Daily gain per steer during winter	2.09	1.55
Initial cost per steer December 16, 1926, at \$10 per cwt.	\$33.08	\$32.76
Feed cost per steer during winter	19.39	13.00
Feed cost plus steer cost May 1, 1927	52.47	45.76
Necessary selling price to break even when steers went to grass	8.56	8.52
Appraised value per cwt. May 1, 1927, less 75 cents per cwt. to cover shrinkage, shipping expenses, etc.	8.75	9.25
Margin per cwt. . . . .	.19	.73
Margin per steer	1.16	3.92

This method of feeding divides itself into three phases—wintering, grazing and full feeding—and will be discussed in detail under these three headings.

Phase I: Wintering

The wintering phase extended from December 16, 1926, to April 30, 1927, a period of 135 days. Details of the results secured are given in Table VII.

OBSERVATIONS ON THE WINTERING PHASE

1. The calves in lot 1, fed some corn, made a gain of 72.47 pounds per head more than the calves in lot 2 that received no corn. It will be interesting to note whether or not they maintain this advantage to the end of the test.

2. At the end of this phase of this test—wintering—the calves fed some corn were apparently too fat to sell to the best advantage as stockers as they were appraised at 50 cents under the appraised value per hundredweight of the calves that received no corn.

3. Had both lots of calves been sold at the end of this phase of the test, lot 2 that received no corn would have returned \$2.75 more profit per head than the calves in lot 1 that were fed some corn.

4. The gain of 1.55 pounds per head per day for 135 days made by the calves in lot 2 that received 1 pound of cottonseed meal, 2 pounds of alfalfa hay, and an average of 25.51 pounds of cane silage per head per day, but no grain, emphasizes the value of this combination of feeds as a winter ration for stock calves.

TABLE VIII.—PHASE II: GRAZING WITHOUT GRAIN.

May 1, 1927, to July 31, 1927—90 days.

Lot No.	1	2
Number of steers in lot.....	10	10
	<i>Pounds</i>	<i>Pounds</i>
Weight to grass as yearlings, May 1, 1927.....	612.67	537.00
Weight July 31, 1927.....	689.00	650.50
Gain per steer on grass—90 days.....	76.33	113.50
Daily gain per steer on grass.....	.85	1.26
Steer cost plus pasture at \$8 per head for entire season.....	\$60.47	\$53.76
Necessary selling price per cwt. to break even July 31, 1927.....	8.78	8.26

Phase II: Grazing

This phase of the test extended from May 1, 1927, to July 31, 1927, a period of 90 days. Both lots were grazed together on bluestem grass pasture. Since these cattle were approximately one year of age when they went to pasture, they will now be referred to as yearlings. Details of the results of this phase of the test are given in Table VIII.

OBSERVATIONS ON THE GRAZING PHASE

1. The yearlings in lot 2 that, were fed no grain the previous winter, and made less gain during the winter than lot 1 fed some grain, made greater gains during the grazing period. This is in keeping with a number of tests conducted by the Kansas station indicating that the gains cattle make on grass are determined, in the main, by the amount of fat they carry on their backs when they go to grass, rather than upon the nature of the feed they consumed the previous winter.

2. At the end of the grazing period the yearlings in lot 1 that received some corn the previous winter were 38.5 pounds heavier than the yearlings in lot 2 that received no corn the previous winter. At the end of the winter phase they were 75.67 pounds per head heavier. Will they make up this loss during the full feeding period or will they continue to make slower gains than the other group?

Phase III: Full Feeding

On July 31 these cattle, now yearlings, were removed from the bluestem pasture where they had grazed since May 1 to a small feed lot where they were started on a ration consisting of ground shelled corn, cottonseed meal, and alfalfa hay. They were got up to a full feed of grain as soon as possible. This phase of the test extended from July 31, 1927, to November 8, 1927, a period of 100 days. The results of this phase of the test are given in detail in Table IX.

OBSERVATIONS ON THE FULL FEEDING PHASE

1. The yearlings fed no grain during the previous winter made more gain during the grazing phase, also during the full feeding phase.

2. At the end of the wintering phase lot 1 fed some grain weighed 72.47 pounds more per head than lot 2 fed no grain; at the end of the grazing phase, 38.5 pounds more per head; and at the end of the full feeding period, only 10 pounds more per head.

TABLE IX.—PHASE III: DRY LOT FULL FEEDING.
 July 31, 1927, to November 8, 1927—100 days.

Lot No.	1	2
Number of steers in lot	10	10
Average daily ration per steer:	<i>Pounds</i>	<i>Pounds</i>
Ground corn	14.05	14.94
Cottonseed meal	1.00	1.00
Alfalfa hay	5.49	5.87
Weight per steer July 31, 1927	689.00	650.50
Weight per steer November 8, 1927	942.00	932.00
Gain per steer July 31, 1927, to November 8, 1927	253.00	281.50
Daily gain per steer July 31, 1927, to November 8, 1927	2.53	2.82
Feed cost July 31, 1927, to November 8, 1927—100 days	\$29.93	\$31.62
Total cost at home December 16, 1926, to November 8, 1927	90.40	85.38
Necessary selling price to break even November 8, 1927	9.60	9.16
Selling price per cwt. less 75 cents per cwt. to cover shrinkage and shipping expenses November 8, 1927	15.25	15.25
Margin per cwt.	5.65	6.09
Margin per steer	53.22	56.76
Dressing per cent.	61.3	59.7

3. DURING ALL THREE PHASES LOT 1 CONSUMED 9.6 BUSHELs MORE CORN PER HEAD THAN LOT 2 AND GAINED ONLY 10 POUNDS MORE TO PAY FOR THIS ADDITIONAL 9.6 BUSHELs OF CORN. This would seem to indicate that it is not necessary to add grain to a ration consisting of silage, alfalfa, and cottonseed meal of good quality in the case of calves that are to be grazed on bluestem grass to August 1 and then full fed in a dry lot for 100 days.

4. Particular attention is directed to the fact that THE CALVES IN LOT 2 THAT WERE FED NO CORN DURING THE WINTERING PHASE GAINED 604.4 POUNDS DURING THE ENTIRE PERIOD OF THIS EXPERIMENT—WINTERING, GRAZING, AND FULL FEEDING—AND CONSUMED ONLY 26½ BUSHELs OF CORN. The remainder of the feed consisted primarily of roughage—cane silage and grass. A small allowance of alfalfa hay and cottonseed meal was added during the wintering and fattening phases.

5. Wintering with grain did not prove to be quite so satisfactory as wintering without grain at the end of the experiment. Lot 1, fed some grain during the previous winter, required a selling price of \$9.60 per hundredweight to break even compared to \$9.16 per hundredweight in the case of lot 2, fed no grain during the wintering phase, and both lots sold at the same price per hundredweight.

CATTLE FEEDING INVESTIGATIONS

6. A necessary selling price of \$9.16 to \$9.60 per hundredweight to break even with corn costing from 92 cents to \$1.05 per bushel during the full feeding period also emphasizes the advantage of this method of feeding cattle.

In order that it may be easier to study this test in its entirety, the results of all three phases are combined and submitted in detail in Table X.

TABLE X.—WINTERING WELL; GRAZING WITHOUT GRAIN TO JULY 31; AND FULL FEEDING IN A DRY LOT FOR 100 DAYS.

Lot No.	1	2
Number of steers in lot	10	10
WINTERING PHASE—135 DAYS. December 16, 1926, to April 30, 1927.		
Daily winter ration per steer:	<i>Pounds</i>	<i>Pounds</i>
Ground corn	4.66	.....
Cottonseed meal	1.00	1.00
Alfalfa hay	2.00	2.00
Cane silage	18.81	25.51
Initial weight per steer, December 16, 1926	330.80	327.60
Weight to grass as yearlings, May 1, 1927	612.67	537.00
Gain per steer during winter—135 days	281.87	209.40
Daily gain per steer during winter	2.09	1.55
Initial cost per steer December 16, 1926, at \$10 per cwt.	\$33.08	\$32.76
Feed cost per steer during winter	19.39	13.00
Feed cost plus steer cost May 1, 1927	52.47	45.76
Necessary selling price to break even when steers went to grass ..	8.56	8.52
Appraised value per cwt., May 1, 1927, less 75 cents per cwt. to cover shrinkage, shipping expenses, etc.	8.75	9.25
Margin per cwt. ....	.19	.73
Margin per steer	1.16	3.92
"GRAZING PHASE—90 DAYS. May 1, to July 31, 1927.		
Weight to grass as yearlings, May 1	<i>Pounds</i>	<i>Pounds</i>
Weight July 31	612.67	537.00
Gain per steer on grass—90 days	689.00	650.50
Daily gain per steer on grass	76.33	113.50
.....	85	1.26
Steer cost plus pasture at \$8 per head for entire season	\$60.47	\$53.76
Necessary selling price per cwt. to break even July 31, 1927	8.78	8.26
FULL FEEDING PHASE—100 DAYS. July 31, to November 8, 1927.		
Daily ration per steer:	<i>Pounds</i>	<i>Pounds</i>
Ground corn	14.05	14.94
Cottonseed meal	1.00	1.00
Alfalfa hay	5.49	5.87
Weight per steer July 31	689.00	650.50
Weight per steer November 8	942.00	932.00
Gain per steer July 31 to November 8, 1927	253.00	281.50
Daily gain per steer July 31, to November 8, 1927	2.53	2.82
Feed cost July 31 to November 8, 1927—100 days	\$29.93	\$31.62
Total cost at home December 16, 1926, to November 8, 1927	90.40	85.38
Necessary selling price to break even November 8, 1927	9.60	9.16
Selling price per cwt., less 75 cents per cwt. to cover shrinkage and shipping expenses November 8, 1927	15.25	15.25
Margin per cwt.	5.65	6.09
Margin per steer	53.22	56.76
Dressing per cent	61.30	59.70

Feed Prices.—Phase I: Corn, 77 cents a bushel; cottonseed meal, \$35 a ton; alfalfa hay, \$15 a ton; cane silage, \$5 a ton. Phase III: Corn first 60 days, \$1.05 a bushel; corn last 40 days, 92 cents a bushel; cottonseed meal, \$45 a ton; alfalfa hay, \$10 a ton.

Conclusions

1. Wintering well, grazing on bluestem grass without other feed the first half of the grazing season, and then full feeding in a dry lot for approximately 100 days is a satisfactory way to handle steer calves if they are well bred, good individuals.

2. If good quality silage and alfalfa hay are available and are supplemented with 1 pound of cottonseed meal per head per day, grain need not be fed during the wintering period to calves handled in the above described manner.

3. Calves should gain approximately 200 pounds during the winter to make the best ultimate returns from this method of handling and good calves will make this much gain without grain if good quality silage and alfalfa are available.

4. A heavy feed of grain is necessary during the full feeding period—an average of 14 to 17 pounds per head per day, depending upon the weight of the calves (now yearlings) when they reach the full feeding phase of this method.

PART IV

WINTERING AND GRAZING STEER CALVES

C. W. McCAMPBELL, B. M. ANDERSON, AND M. A. ALEXANDER

Aged steers have been more popular than younger steers for grazing purposes. There are many reasons for this preference.

Aged steers get fatter on grass than younger steers, particularly yearlings, because the aged steer being practically mature converts the feed he consumes into maintenance and fat, whereas the yearling steer not being mature converts the feed he eats into maintenance, growth, and fat. The yearling steer can not eat enough grass to provide nearly so much feed for the production of fat after maintenance and growth requirements are met as the aged steer.

Many aged steers get fat enough to meet the requirements of the packer for a killing steer. They are also fat enough to satisfy the requirement of many feeders who are looking for fleshy steers for a short feed on corn. This has resulted in a packer and feeder competition for this class of cattle. On the other hand, yearling steers will not get fat enough on grass alone to satisfy the requirements of the packer for a killing steer. This class of cattle must, therefore, sell on a feed market without packer competition.

However, aged steers are becoming scarcer every year due to economic changes which make it almost impossible for the producer

to develop aged steers and sell them at a price that will ordinarily leave a profit for the man who would fatten them on grass. Furthermore, the preference of corn-belt feeders has been changing from heavy to light weight feeders, which has resulted in a decreased demand from feeders for aged steers and an increased demand for yearlings. The trade is also demanding more finish than formerly in killing cattle. This has lessened materially the per cent of grass-fat cattle that go direct to the killers. This means that there is now a more stable demand for yearlings than aged steers off grass.

These facts prompt the question, "Can Kansas bluestem grass owners graze yearlings profitably?" If so, how? Kansas bluestem grass owners may be grouped in two general classes; namely, those who raise feed crops as well as grass and those who do not raise feed crops. The grass owner who also raises feed crops, desiring to market feed crops as well as grass, naturally would probably be interested in the possibility of buying calves in the fall, wintering, and grazing. The grass owner who does not raise feed crops would probably be interested most in the possibility of buying calves for spring delivery.

The Agricultural Experiment Station is studying this big problem of utilizing profitably bluestem grass with young cattle, particularly the problem of wintering calves, grazing as yearlings, and selling as stockers and feeders. The test reported in this circular, which was started in the fall of 1926, involves the use of two lots of calves. One lot was wintered on cane silage plus 1 pound of cottonseed meal per head per day; the other on ground cane fodder plus 1 pound of cottonseed meal per head per day. Both lots were grazed together on bluestem pasture during the summer of 1927. This test, therefore, divides itself into two phases—wintering and grazing.

Phase I: Wintering

This phase of this test extended from December 19, 1926, to April 30, 1927, a period of 135 days. The weight of the calves at the start, feed consumption, gains, and other results are given in detail in Table XI.

OBSERVATIONS ON THE WINTERING PHASE

1. The cane silage and ground cane fodder fed in this test were both of good quality. The cane fodder had to be ground at intervals not longer than three days to prevent heating and spoilage.
2. These calves, fed all they would eat of each, consumed just a

TABLE XI.—WINTERING AND GRAZING STEER CALVES IN KANSAS.

Lot No.	1	2
Number of steers per lot	10	10
Age of steers	Calves	Calves
WINTERING PHASE—135 DAYS. December 16, 1926, to April 30, 1927.		
Daily winter ration per steer:	<i>Pounds</i>	<i>Pounds</i>
Corn		
Alfalfa hay		
Cottonseed meal	1.00	1.00
Cane silage		29.55
Ground cane fodder	16.55	
Initial weight per steer, December 16, 1926	324.27	328.40
Weight to grass as yearlings, May 1, 1927	501.07	503.33
Gain per steer during winter—135 days	176.80	174.93
Daily gain per steer during winter—135 days	1.31	1.30
Cost per steer into experiment at \$10 per cwt.	\$32.43	\$32.84
Feed cost per steer during winter	11.30	12.33
Steer cost plus feed cost	43.73	45.17
Necessary selling price per cwt. to break even when they went to grass...	8.72	8.98
Appraised value per cwt., May 1, 1927, less 75 cents per cwt. to cover shrinkage, shipping expenses, etc.	9.25	9.25
Margin per cwt. ....	.53	.27
Margin per steer	2.66	1.36

Feed Prices.—Cottonseed meal, \$85 a ton; cane silage, \$5 a ton; ground cane fodder, \$8 a ton.

little more than one-half as many pounds of ground cane fodder as cane silage.

3. The gains made by the calves in lot 1 fed ground cane fodder were practically the same as those of the calves in lot 2 fed cane silage. The calves in each lot were fed all the roughage they would eat. The gains were good in both lots, the average being approximately 175 pounds in 135 days.

4. The gains made in this test indicate that a ton of good cane silage is worth approximately 62½ per cent as much as a ton of good finely ground cane fodder.

5. It required 16.55 pounds of ground cane fodder containing 10.75 pounds of dry matter to produce practically the same gain as 29.55 pounds of cane silage containing 8.75 pounds of dry matter. Since the dry matter produced per acre was the same in each case this test emphasizes the fact that an acre of cane fed in the form of silage will produce more gain than an acre of cane in the form of ground fodder.

6. It should be emphasized that calves costing \$10 per hundred-weight at the beginning of this test required only \$8.85 per hundred-weight on the average to break even at feed prices charged but were appraised at \$9.25 per hundredweight at home.

7. This in turn emphasizes the advantage of buying calves in the fall and wintering on such feeds as cane silage and ground cane fodder supplemented with a small amount of cottonseed meal. They will pay a liberal price for roughages consumed and still cost less than yearlings purchased in the spring.

Phase II: Grazing

The grazing phase of this test extended from May 1 to October 7, 1927, a period of 160 days. The results of this phase are given in detail in Table XII.

TABLE XII.—WINTERING AND GRAZING STEER CALVES IN KANSAS.

RATION PREVIOUS WINTER.	Cottonseed meal.	
	Cane fodder.	Cane silage.
Lot No.	1	2
Number of steers in lot.	10	10
GRAZING PHASE—160 DAYS.		
May 1, to October 7, 1927.		
Weight to pasture as yearlings, May 1, 1927.	<i>Pounds</i> 501.07	<i>Pounds</i> 503.33
Weight off pasture October 7, 1927.	698.50	704.00
Total gain on grass May 1, to October 7—160 days.	192.43	200.67
Daily gain on grass.	1.20	1.25
Final Financial Statement.		
Cost per steer to May 1 (initial cost plus wintering cost)	\$43.73	\$45.17
Value per head October 7, 1927, at \$8.75 per cwt. (appraised value Kansas City basis minus 75 cents per cwt. to cover shrinkage and marketing expenses).	60.88	61.60
Return per head for pasture and interest (initial cost \$10 per cwt.)	16.95	16.43
Return per head for pasture, interest, and labor had selling price been:		
\$7 per cwt.	4.82	4.11
8 per cwt.	11.75	11.15
9 per cwt.	18.69	18.19
10 per cwt.	25.62	25.23
11 per cwt.	32.56	32.27
Return per head for pasture, interest, and labor had initial cost per cwt. and home price per cwt. been as follows:		
<i>Initial Cost.</i> <i>Home Price.</i>		
\$11 per cwt. \$8 per cwt.	\$8.71	\$7.87
9 per cwt.	15.65	14.91
10 per cwt.	22.58	21.95
11 per cwt.	29.52	28.99
\$12 per cwt. \$8 per cwt.	\$5.27	\$4.58
9 per cwt.	12.21	11.62
10 per cwt.	19.14	18.66
11 per cwt.	26.08	25.70

OBSERVATIONS ON THE GRAZING PHASE

1. There was very little difference in the gains made by the two different groups during the grazing season—only 8.24 pounds in favor of the group that was wintered on silage and cottonseed meal.
2. It should be noted that the combined summer and winter gains on these calves was nearly 400 pounds per head.

Observations on the Entire Test

1. Yearlings will gain as much on grass when wintered on silage as they will when wintered on dry feed providing the winter gains have been approximately the same in each case. This conclusion is fortified by previous tests conducted at the Kansas Agricultural Experiment Station and emphasizes the fact that the gain a steer makes on grass is determined, in the main, by the amount of fat he has on his back when he goes to grass rather than upon the nature of the feed consumed during the previous winter.
2. It should be emphasized that while the selling price of these cattle at home was \$1.25 per hundredweight less as yearlings than it was as calves the preceding fall, they returned an average of \$16.69 per head for the pasture consumed and interest on the investment in the cattle.
3. These calves cost \$10 per hundredweight delivered. A selling price at home of \$8 per hundredweight as yearlings the following fall would have been necessary to have returned \$10 per head for pasture, labor, and interest.
4. Had these calves cost \$11 per hundredweight delivered, a selling price at home of \$8.50 per hundredweight as yearlings the following fall would have been necessary to have returned \$10 per head for pasture, labor, and interest.
5. Had these calves cost \$12 per hundredweight delivered, a selling price at home of \$9 per hundredweight as yearlings the following fall would have been necessary to have returned \$10 per head for pasture, labor, and interest.
6. THESE FACTS EMPHASIZE THE POSSIBILITY OF GRAZING YEARLINGS INSTEAD OF AGED STEERS WHERE ONE IS IN A POSITION TO WINTER THEM ON FEEDS SIMILAR TO THOSE USED IN THIS TEST EITHER RAISED BY THE GRASS OWNER OR PURCHASED AT THE PRICES CHARGED IN THIS TEST.

