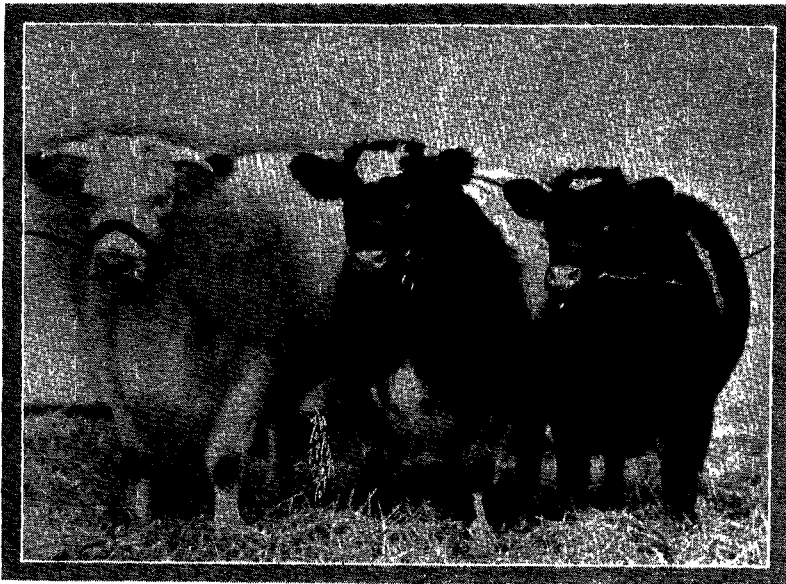


# AGRICULTURAL EXPERIMENT STATION

KANSAS STATE AGRICULTURAL COLLEGE  
MANHATTAN, KANSAS

---

DEPARTMENT OF ANIMAL HUSBANDRY



UNDEFEATED SHORTHORN GROUP OF STEERS AT KANSAS NATIONAL,  
AMERICAN ROYAL, AND INTERNATIONAL LIVE-STOCK SHOWS, 1926

*Shown by K. S. A. C*

## CATTLE FEEDING INVESTIGATIONS, 1926-'27<sup>1</sup>

B. M. ANDERSON, C. W. McCAMPBELL, AND H. W. MARSTON

The cattle feeding investigations of 1926-'27 include two rather distinct phases of the beef cattle industry. (1) Winter fattening of calves purchased in the fall. (2) Winter development and summer fattening of calves and yearlings purchased in the fall. They will be discussed as two separate parts of this circular.

---

1. Contribution No. 90 from the Department of Animal Husbandry.

**PART I**

**SILAGE AND ALFALFA HAY VERSUS SILAGE, PRAIRIE HAY, AND  
MINERALS AS THE ROUGHAGE PORTION OF A CALF-  
FATTENING RATION FED DURING THE  
WINTER IN A DRY LOT**

**B. M. ANDERSON AND H. W. MARSTON**

Alfalfa hay is recognized as a valuable roughage in a cattle-fattening ration. However, there are many persons in Kansas interested in fattening cattle for market who do not have alfalfa hay but do have prairie hay. It is well known that prairie hay is inferior to alfalfa hay either as a part of or as the entire roughage portion of a cattle-feeding ration. Chemical analyses show that prairie hay contains decidedly less protein and minerals, especially calcium, than alfalfa hay. The alfalfa hay used in this test contained 12.68 per cent protein and 8.7 per cent ash, whereas the prairie hay used contained only 5.73 per cent protein and 6.35 per cent ash. The ash consists of many minerals, but the proportion of each differs widely in these two feeds. The most outstanding difference is in the calcium (lime) content. Alfalfa hay contains eight times as much calcium as prairie hay. This being true, an attempt was made in this test to improve prairie hay as a part of the roughage portion of a cattle-fattening ration by adding enough protein and minerals rich in calcium to make it equal in these constituents to alfalfa hay.

Six lots of steer calves dropped in the spring of 1926 were used in this test. They would have graded good to choice and were bred by the Matador Land and Cattle Company on its ranch at Matador, Tex. The test covered a period of 175 days—from November 23, 1926, to May 17, 1927, the lots being fed as follows:

Lot 1—Our standard Kansas fattening ration consisting of silage, a limited amount of alfalfa hay, a full feed of corn, and a limited amount of cottonseed meal.

Lot 2—Silage, prairie hay, corn, and cottonseed meal.

Lot 3—Silage, prairie hay, corn, cottonseed meal, and finely ground limestone.

Lot 4—Silage, prairie hay, corn, cottonseed meal, and acid phosphate.

Lot 5—Silage, prairie hay, corn, cottonseed meal, and a mixture of ground limestone and acid phosphate.

Lot 6—Silage, prairie hay, corn, cottonseed meal, and bone meal.

The grain was hand-fed twice daily for the first 60 days, after which it was fed in self-feeders. The results of this test are given in detail in Table I.

CATTLE FEEDING INVESTIGATIONS, 1926-'27

TABLE I.—RESULTS OF A DRY-LOT FEEDING TEST SHOWING THE POSSIBILITY OF MAKING PRAIRIE HAY AS GOOD AS ALFALFA HAY IN A "SILAGE, HAY, COTTONSEED MEAL, AND CORN" FATTENING RATION FOR CALVES.

November 23, 1926, to May 17, 1927—175 days.

RATION.	Shelled corn, cane silage, and cottonseed meal. (Fed in each lot.)					
	Alfalfa hay.	Prairie hay.	Prairie hay and ground limestone.	Prairie hay and acid phosphate.	Prairie hay and ground limestone and acid phosphate.	Prairie hay and bone meal.
Lot No. ....	1	2	3	4	5	6
Number of steers in lot. ....	10	10	9	9	9	10
Average initial weight per calf. ....	<i>Pounds</i> 357.60	<i>Pounds</i> 355.87	<i>Pounds</i> 350.50	<i>Pounds</i> 358.40	<i>Pounds</i> 355.90	<i>Pounds</i> 355.13
Average final weight per calf. ....	794.60	734.90	781.80	742.30	768.70	760.50
Average total gain per calf. ....	437.00	379.03	431.30	383.90	412.80	405.37
Average daily gain per calf. ....	2.50	2.17	2.46	2.19	2.36	2.32
Average daily ration per calf:						
Shelled corn. ....	9.90	9.56	9.73	9.27	9.21	10.01
Cane silage. ....	8.68	8.14	9.36	7.93	9.55	8.98
Cottonseed meal. ....	1.00	1.18	1.20	1.20	1.20	1.18
Alfalfa hay. ....	2.00					
Prairie hay. ....		1.43	1.45	1.45	1.44	1.42
Ground limestone. ....			.10		.05	
Acid phosphate (16 per cent). ....				.10	.05	
Bone meal. ....						.10
Feed required for 100 pounds gain:						
Shelled corn. ....	396.43	441.50	394.88	422.80	390.64	432.30
Cane silage. ....	347.77	375.90	379.94	361.29	404.78	387.61
Cottonseed meal. ....	40.05	54.48	48.74	54.73	50.90	50.94
Alfalfa hay. ....	80.09					
Prairie hay. ....		65.96	58.84	66.11	61.24	61.43
Ground limestone. ....			4.12		2.15	
Acid phosphate (16 per cent). ....				4.61	2.15	
Bone meal. ....						4.32
Cost of 100 pounds gain. ....	\$7.64	\$8.35	\$7.58	\$8.12	\$7.67	\$8.26
Initial cost per calf at \$10 per cwt. ....	35.76	35.59	35.05	35.84	35.59	35.51
Feed cost per head. ....	33.40	31.51	32.71	31.22	31.66	33.45
Feed cost plus calf cost. ....	69.16	67.10	67.76	67.06	67.25	68.96
Value per head at home, at end of test. ....	85.41	73.49	82.09	73.12	78.79	76.05
Margin per head. ....	16.25	6.39	14.33	6.06	11.54	7.09
Necessary value per cwt. at feed lots to break even. ....	8.70	9.13	8.67	9.03	8.75	9.07
Value per cwt. at feed lot—Kansas City price minus 50 cents per cwt. ....	10.75	10.00	10.50	9.85	10.25	10.00
Margin per cwt. ....	2.05	.87	1.83	.82	1.50	.93

Feed Prices.—Corn, 77 cents a bushel; alfalfa hay, \$15 a ton; cane silage, \$5 a ton; prairie hay, \$10 a ton; cottonseed meal, \$35 a ton; ground limestone, \$1 a cwt.; bone meal, \$55 a ton; acid phosphate, \$45 a ton.

**OBSERVATIONS**

1. Lot 2, fed silage, PRAIRIE HAY, corn, and cottonseed meal, made smaller gains, more expensive gains, sold for less per pound, and showed a profit that was \$9.86 per head less than lot 1, fed silage, ALFALFA HAY, corn, and cottonseed meal. This emphasizes the superiority of alfalfa hay over prairie hay as part of the roughage portion of a cattle-fattening ration.

2. The addition of one-tenth of a pound of finely ground limestone to the silage, prairie hay, corn, and cottonseed meal fed in lot 3 resulted in greater gains, cheaper gains, a higher selling price per pound, and \$7.94 more profit per head than the silage, prairie hay corn, and cottonseed meal but no ground limestone fed in lot 2. The profits in lot 3 were only \$1.92 less per head than in lot 1, fed silage, alfalfa hay, corn, and cottonseed meal. This emphasizes the possibility of making the feeding value of prairie hay approach rather closely that of alfalfa when both are fed as a part of the roughage portion of cattle fattening rations by adding finely ground limestone to the ration.

3. The addition of acid phosphate to the silage, prairie hay, corn, and cottonseed meal ration fed in lot 4 did not return quite so much profit as was received from the silage, prairie hay, corn, and cottonseed meal but no mineral ration fed in lot 2. This would seem to indicate that acid phosphate is not a satisfactory source of calcium for cattle.

4. The addition of a half-and-half mixture of ground limestone and acid phosphate to the silage, prairie hay, corn, and cottonseed meal ration fed in lot 5 proved to be more profitable than the addition of acid phosphate in lot 4, but less profitable than the addition of ground limestone in lot 3. This further emphasizes the undesirability of acid phosphate as a source of calcium for cattle.

5. The addition of bone meal to the silage, prairie hay, corn, and cottonseed meal ration fed in lot 6 did not increase profits materially over the profits in lot 2, fed silage, prairie hay, corn, and cottonseed meal.

6. Finely ground limestone proved to be decidedly the most profitable calcium carrying mineral used in this test. The addition of 18 cents worth of finely ground limestone in lot 3 returned a profit of \$7.94 per head more than the profit made in lot 2 that received no calcium carrying mineral.

7. This test emphasize the very great value of even a small

CATTLE FEEDING INVESTIGATIONS, 1926-'27

TABLE II.—AVERAGE DAILY CONSUMPTION OF FEED BY 30-DAY PERIODS.

Lot No. ....	1	2	3	4	5	6
First 30-day period:						
Corn . . . . .	<i>Pounds</i> 2.95	<i>Pounds</i> 2.95	<i>Pounds</i> 2.95	<i>Pounds</i> 2.95	<i>Pounds</i> 2.95	<i>Pounds</i> 2.95
Cottonseed meal . . . . .	1.00	1.00	1.00	1.00	1.00	1.00
Alfalfa hay . . . . .	2.00					
Prairie hay . . . . .		2.00	2.00	2.00	2.00	2.00
Cane silage . . . . .	13.28	13.28	13.28	11.02	12.92	13.08
Ground limestone . . . . .			.10		.05	
Bone meal . . . . .						.10
Acid phosphate . . . . .				.096	.048	
Second 30-day period:						
Corn . . . . .	6.58	6.58	6.58	6.58	6.58	6.58
Cottonseed meal . . . . .	1.00	1.00	1.00	1.00	1.00	1.00
Alfalfa hay . . . . .	2.00					
Prairie hay . . . . .		2.00	2.00	2.00	2.00	2.00
Cane silage . . . . .	11.28	10.38	10.83	9.87	11.43	11.53
Ground limestone . . . . .			.10		.05	
Bone meal . . . . .						.10
Acid phosphate . . . . .				.10	.05	
Third 30-day period:						
Corn . . . . .	9.33	10.00	9.33	9.17	8.67	10.33
Cottonseed meal . . . . .	1.00	1.20	1.20	1.20	1.20	1.20
Alfalfa hay . . . . .	2.00					
Prairie hay . . . . .		1.50	1.53	1.53	1.50	1.47
Cane silage . . . . .	6.87	5.48	6.93	7.03	8.23	6.33
Ground limestone . . . . .			.10		.05	
Bone meal . . . . .						.10
Acid phosphate . . . . .				.10	.05	
Fourth 30-day period:						
Corn . . . . .	12.67	11.67	12.33	12.00	11.50	12.67
Cottonseed meal . . . . .	1.00	1.30	1.30	1.30	1.30	1.30
Alfalfa hay . . . . .	2.00					
Prairie hay . . . . .		1.00	1.00	1.00	1.00	1.00
Cane silage . . . . .	7.50	6.83	8.97	6.88	8.53	8.53
Ground limestone . . . . .			.10		.05	
Bone meal . . . . .						.10
Acid phosphate . . . . .				.10	.05	
Fifth 30-day period:						
Corn . . . . .	14.33	13.33	13.70	12.67	12.67	13.83
Cottonseed meal . . . . .	1.00	1.30	1.30	1.30	1.30	1.30
Alfalfa hay . . . . .	2.00					
Prairie hay . . . . .		1.00	1.00	1.00	1.00	1.00
Cane silage . . . . .	6.20	6.20	8.13	6.43	8.10	7.07
Ground limestone . . . . .			.10		.05	
Bone meal . . . . .						.10
Acid phosphate . . . . .				.10	.05	
Sixth 30-day period:						
Corn . . . . .	14.26	13.50	13.40	11.60	12.30	14.46
Cottonseed meal . . . . .	1.00	1.30	1.30	1.30	1.30	1.30
Alfalfa hay . . . . .	2.00					
Prairie hay . . . . .		1.00	1.00	1.00	1.00	1.00
Cane silage . . . . .	6.64	5.84	7.00	5.40	7.00	7.00
Ground limestone . . . . .			.10		.05	
Bone meal . . . . .						.10
Acid phosphate . . . . .				.10	.05	
Average for entire period—175 days:						
Corn . . . . .	9.90	9.56	9.73	9.27	9.21	10.01
Cottonseed meal . . . . .	1.00	1.20	1.20	1.20	1.20	1.20
Alfalfa hay . . . . .	2.00					
Prairie hay . . . . .		1.43	1.43	1.43	1.43	1.43
Cane silage . . . . .	8.68	8.14	9.36	7.93	9.55	8.98
Ground limestone . . . . .			.10		.05	
Bone meal . . . . .						.10
Acid phosphate . . . . .				.10	.05	

amount of alfalfa to a cattle-fattening ration as well as the fact that prairie hay plus ground limestone is a fairly satisfactory substitute for alfalfa hay.

**MANNER OF FEEDING**

The calves in this experiment were started on 2 pounds of corn per head per day. The corn was increased gradually as the experiment progressed. At the end of 1.5 days the calves were eating 2.6 pounds per head; at the end of 30 days, 4.4 pounds; at the end of 45 (days, 7 pounds; and at the end of 60 days, 8 pounds. The corn was fed in a self-feeder after the first 60 days. The calves were started on 1 pound of cottonseed meal per head per day. A full feed of silage and the 2 pounds per head per day allowance of alfalfa were fed from the beginning of the experiment.

Grain, cottonseed meal, and silage were fed twice daily-morning and night. The hay was fed at noon. The minerals were mixed with the allowance of cottonseed meal. The silage was placed in the bunks first, the corn on the silage, and the cottonseed meal and mineral on the corn. The calves had free access to salt and water at all times.

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

Lot No. ....	1	2	3	4	5	6
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
First 30-day period.....	2.15	1.96	1.81	1.59	2.01	2.39
Second 30-day period.....	2.02	1.71	1.84	1.69	1.78	1.61
Third 30-day period.....	2.44	2.43	2.59	2.78	2.57	2.83
Fourth 30-day period.....	2.93	2.27	2.59	2.04	2.22	2.13
Fifth 30-day period.....	2.87	2.57	3.29	2.67	2.82	2.33
Sixth 30-day period.....	2.58	2.04	2.70	2.45	2.84	2.66

The average daily consumption of feed by 30-day periods and for the entire period of 175 days is given in Table II. The average daily gain by 30-day periods and for the entire period of 175 days is given in Table III.

## PART II

### CALVES VERSUS YEARLINGS FOR WINTERING WELL, GRAZING WITHOUT GRAIN UNTIL AUGUST 1, THEN FULL FEEDING ON PASTURE OR IN A DRY LOT FOR 100 DAYS

C. W. McCAMPBELL, B. M. ANDERSON, AND H. W. MARSTON

In this section of the country, where grass is plentiful, roughage in the form of silage cheap and abundant, and grain often scarce and comparatively high in price, one of the problems confronting cattle feeders is the production of near market-topping fat cattle on a maximum of roughage and a minimum of grain.

Previous experiments conducted by the Agricultural Experiment Station have shown that this situation can be met in a fairly satisfactory manner by wintering yearlings on roughage and a light feed of corn—not to exceed 5 pounds per head per day—grazing them on bluestem grass without grain the first half and full feeding on bluestem grass the last half of the grazing season.

These experiments prompted two questions. (1) How do calves compare with yearlings for this plan of handling? (2) Will cattle fed in a dry lot after August 1 do as well as cattle fed on pasture after that date?

An experiment was planned for the purpose of securing data that would help answer these questions. This experiment divided itself into three phases: (1) Winter feeding, January 1 to May 11, 1926, 130 days. (2) Grazing without other feed, May 11 to August 1, 1926, 81 days. (3) Full feeding, August 1 to November 8, 1926, 100 days. Four lots of cattle were used.

Lots 1 and 2 were yearlings when the test started. Each was fed in exactly the same manner during the first two phases—wintering and grazing. During the third or full feeding phase—August 1 to November 8—lot 1 was fed in a dry lot and lot 2 on bluestem pasture.

Lots 3 and 4 were calves at the beginning of the test. Each of these two lots was fed in exactly the same manner and also in exactly the same manner as lots 1 and 2 during the first and second phases of the test—wintering and grazing. During the third or full feeding period, lot 3 was fed in a dry lot as was lot 1 (yearlings) and lot 4 on pasture as was lot 2 (yearlings). This gives a direct comparison as to how calves and yearlings respond to this plan of feeding, also how each responds to full feeding in a dry lot as compared to full feeding on pasture. The yearlings and calves used in

this test were raised by the Matador Land and Cattle Company at Matador, Tex.

**Phase I: Winter Feeding**

January 1 to May 11, 1926-130 days

During the winter-feeding phase of the test each of the four lots was fed separately but the same feeds in the following amounts: Corn, approximately 5 pounds per head per day; cottonseed meal, 1 pound per head per day; silage, all they would eat; alfalfa hay, approximately 2 pounds per head per day. This phase of the test extended over a period of 130 days. Details of the results secured are given in Table IV.

**TABLE IV. PHASE I: WINTERING CALVES VERSUS YEARLINGS**  
January 1 to May 11, 1926—130 days.

Lot No. ....	1	2	3	4
Kind of cattle. ....	Yearlings.		Calves.	
Number of steers in lot. ....	10	10	10	9
Average daily winter ration:	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Shelled corn. ....	4.92	4.92	4.98	4.98
Cottonseed meal. ....	1.00	1.00	1.00	1.00
Alfalfa hay. ....	1.98	1.98	1.98	1.98
Cane silage. ....	34.15	34.15	20.92	20.92
Average initial weight per steer. ....	631.00	613.07	457.13	472.15
Average weight to grass as two-year-olds and yearlings, May 11, 1926. ....	861.20	859.40	648.80	660.80
Total gain per steer during winter, 130 days. ....	230.20	246.33	191.67	188.74
Daily gain per steer during winter. ....	1.77	1.89	1.47	1.45
Cost per steer, January 1, 1926, calves at \$9 per cwt., yearlings at \$8 per cwt. ....	\$50.48	\$49.05	\$41.14	\$42.49
Feed cost per steer during winter. ....	23.62	23.62	19.42	19.42
Feed cost plus steer cost, May 11, 1926. ....	74.10	72.67	60.56	61.91
Necessary selling price to break even, May 11, 1926. ....	8.60	8.46	9.33	9.37
Appraised value per cwt. May 11, 1926, less 75 cents to cover shrinkage and shipping expense. ....	8.25	8.25	8.00	8.00
Margin per cwt. ....	-.35	-.21	-1.33	-1.37
Margin per steer. ....	-3.01	-1.81	-8.63	-9.06

**OBSERVATIONS OF THE WINTERING PHASE OF THE EXPERIMENT**

1. The yearlings consumed approximately 50 per cent more silage than the calves, although both yearlings and calves were fed the same amount of corn, cottonseed meal, and alfalfa hay in addition to silage.

2. The yearlings gained approximately 25 per cent more during the 130-day feeding period and the feed cost was approximately 22 per cent more than in the case of the calves.

3. The selling price to break even at the end of the winter period was 83 cents per hundredweight more and the appraised value was 25 cents per hundredweight less for the calves than for the yearlings.



4. The losses at the end of the wintering period, based upon appraised values, were \$5.94 per head greater for the calves (now yearlings) than for the yearlings (now two-year-olds). **WILL THE CALVES (NOW YEARLINGS) MAKE UP THIS DIFFERENCE BY THE END OF THE FULL-FEEDING PERIOD?**

**Phase II: Grazing Without Other Feed**

Yay 11 to August 1, 1926—81 days

During the grazing phase of the test all four lots were grazed together on bluestem grass pasture. The cattle did not have access to any other feed during this period. Due to the lateness of getting on grass in the spring, May 11, this phase of the test extended over a period of only 81 days. Details of the results of this phase of the test are given in Table V.

TABLE V.—PHASE II: GRAZING—YEARLINGS VERSUS TWO-YEAR-OLDS.  
 May 11 to August 1, 1926—81 days.

Lot No. ....	1	2	3	4
Kind of cattle .....	Two-year-olds.		Yearlings.	
Weight to grass as two-year-olds and yearlings, May 11, 1926 .....	<i>Pounds</i> 861.20	<i>Pounds</i> 859.40	<i>Pounds</i> 848.80	<i>Pounds</i> 660.89
Weight, July 31, 1926 .....	915.40	914.80	738.40	744.67
Gain per steer May 11 to August 1, 1926 .....	54.20	55.40	87.60	83.78
Daily gain per steer, May 11 to August 1, 1926 ..	.67	.68	1.08	1.03
Steer cost plus pasture at \$8 per head for entire season .....	\$82.10	\$80.67	\$68.56	\$69.91
Necessary selling price per owt. to break even, August 1, 1926 .....	8.97	8.82	9.31	9.39

**OBSERVATIONS OS THE GRAZING PHASE OF THE EXPERIMENT**

1. In studying the grazing and full-feeding phases of this test one should remember that when the term "yearlings" is used it refers to the lots 3 and 4 which were calves and the term "two-year-olds" refers to lots 1 and 2, which were yearlings when the test started.

2. The two-year-olds gained 48.06 pounds per head more than the yearlings during the winter, but the yearlings gained 30.85 pounds more than the two-year-olds during the grazing period of this test. The two-year-olds were fatter when they went to grass, and previous tests have shown that gains on grass are determined almost entirely by the amount of fat a steer carries when he goes to grass in the spring.

3. The difference in the necessary selling price to break even was only 35 cents per hundredweight in favor of the two-year-olds at

the end of this phase of the test, whereas it was 83 cents per hundredweight at the end of the wintering period. **WILL THE YEARLINGS MAKE UP THIS DIFFERENCE BY THE END OF THE FULL FEEDING PERIOD?**

**Phase III: Full Feeding**

August 1 to November 8, 1926-100 days

During this phase of the test lot 1 (now two-year-olds) and lot 3 (now yearlings) were fed in a dry lot on a ration consisting of alfalfa hay, ground corn, and cottonseed meal. Lot, 2 (now two-year-olds) and lot 4 (now yearlings) were fed on bluestem grass a ration consisting of ground corn and cottonseed meal. Each lot was fed 1 pound of cottonseed meal per head per day and all the ground corn it would eat. The cattle fed in a dry lot were fed all the alfalfa hay they would eat. Details of this phase of the test and final results from a financial standpoint are shown in Table VI.

TABLE VI.—PHASE III: FULL FEEDING—YEARLINGS VERSUS TWO-YEAR-OLDS.  
 August 1 to November 8, 1926—100 days.

Lot No. ....	1	2	3	4
Where fed.....	Dry lot.	Pasture.	Dry lot.	Pasture.
Kind of cattle.....	Two-year-olds.		Yearlings.	
Average daily ration:	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Ground corn.....	16.27	16.17	16.33	16.72
Cottonseed meal.....	1.00	.98	1.00	.99
Alfalfa hay.....	5.76	5.78	5.78	5.78
Average weight per steer, August 1, 1926.....	915.40	914.80	736.40	744.67
Average weight per steer, November 8, 1926.....	1,155.73	1,121.93	1,037.47	983.04
Gain August 1 to November 8, 1926.....	240.33	207.13	301.07	238.37
Average daily gain, August 1 to November 8, 1926.....	2.40	2.07	3.01	2.38
Feed cost, August 1 to November 8, 1926, including grass for season.....	\$30.73	\$26.22	\$30.83	\$27.06
Total cost at home November 8, 1926.....	112.83	106.89	99.39	96.97
Necessary selling price to break even.....	9.76	9.53	9.58	9.86
Selling price per cwt., November 8, 1926, less 75 cents per cwt. to cover shrinkage and shipping expense.....	10.75	10.00	11.00	10.25
Margin per cwt.....	.99	.47	1.42	.39
Margin per steer.....	11.41	5.30	14.73	3.79

Feed Prices.—Corn to May 11, 70 cents a bushel, after May 11, 84 cents a bushel; cottonseed meal, \$40 a ton; alfalfa hay, \$15 a ton; cane silage, \$5 a ton.

**OBSERVATIONS ON THE FULL FEEDING PHASE OF THE EXPERIMENT**

1. The two-year-olds full fed in a dry lot during this phase of the test—full feeding—made 33.20 pounds greater gain than the two-year-olds full fed on bluestem grass, although the grain consumption was almost the same in each lot.

2. The yearlings full fed in a dry lot during this phase of the test—full feeding—made 62.70 pounds greater gain than the yearlings

full fed on bluestem grass, although the grain consumption was almost the same in each lot.

3. The yearlings full fed in a dry lot made greater gains than the two-year-olds full fed in the dry lot and the yearlings full fed on pasture made greater gains than the two-year-olds full fed on bluestem grass in spite of the fact that each of the four lots consumed practically the same amount of grain. This is probably due to the fact that the yearlings were not so fat as the two-year-olds when the full feeding period started.

4. The difference in the necessary selling price to break even was 18 cents per hundredweight in favor of the yearlings at the end of this phase of the test where both yearlings and two-year-olds were fed in a dry lot, whereas the necessary selling price to break even at the end of both the wintering and grazing period was in favor of the two-year-olds.

5. The difference in the necessary selling price to break even was 33 cents per hundredweight in favor of the two-year-olds at the end of this phase of the test where both yearlings and two-year-olds were fed on bluestem pasture. The difference in the necessary selling price to break even on these two groups, lots 2 and 4, was also in favor of the two-year-olds at the end of both wintering and grazing phases.

6. The two-year-olds full fed in a dry lot sold for 75 cents per hundredweight more than the two-year-olds full fed on bluestem pasture. The yearlings full fed in a dry lot also sold for 75 cents a hundredweight more than the yearlings full fed on bluestem grass pasture. In each case the cattle fed in a dry lot were fatter than the cattle fed on bluestem grass pasture.

7. The two-year-olds full fed in a dry lot made \$6.11 more profit per head than the two-year-olds full fed on bluestem pasture, and the yearlings full fed in a dry lot made \$10.94 more profit per head than the yearlings full fed on bluestem grass pasture. This shows rather strikingly the advantage of full feeding either yearlings or two-year-olds in a dry lot instead of on bluestem pasture after August 1.

8. Yearlings full fed in a dry lot after August 1 made more profit than two-year-olds fed in a dry lot, but yearlings fed on bluestem grass made less profit than two-year-olds fed on bluestem pasture. This emphasizes the great advantage of feeding yearlings in a dry lot after August 1.

TABLE VII.—CALVES VERSUS YEARLINGS FOR (1) WINTERING WELL; (2) GRAZING WITHOUT GRAIN UNTIL AUGUST 1; AND (3) FULL FEEDING FOR 100 DAYS EITHER IN DRY LOT OR ON BLUESTEM PASTURE.

Lot No. ....	1	2	3	4
Kind of cattle .....	Yearlings.		Calves.	
Number of steers in lot .....	10	10	10	9
<b>WINTERING PHASE—130 DAYS, January 1 to May 11, 1926.</b>				
Daily winter ration:	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Shelled corn .....	4.92	4.92	4.98	4.98
Cottonseed meal .....	1.00	1.00	1.00	1.00
Alfalfa hay .....	1.98	1.98	1.98	1.98
Cane silage .....	34.15	34.15	20.92	20.92
Initial weight per steer, January 1, 1926 .....	631.00	631.07	457.13	472.15
Weight to grass as two-year-olds and yearlings, May 11, 1926 .....	861.20	859.40	648.80	660.89
Gain per steer during winter, 130 days .....	230.20	246.33	191.67	188.74
Daily gain per steer during winter .....	1.77	1.89	1.47	1.45
Cost per head, January 1, 1926, at \$8 per cwt. ....	\$50.48	\$49.05	\$41.14	\$42.29
Feed cost per steer during winter .....	23.62	23.62	19.42	19.42
Feed cost plus steer cost, May 11, 1926 .....	74.10	72.67	60.56	61.91
Necessary selling price to break even, May 11, 1926 .....	8.60	8.46	9.33	9.37
Appraised value per cwt, May 11, 1926, less 75 cents to cover shrinkage and shipping ex- pense .....	8.25	8.25	8.00	8.00
Margin per cwt. ....	— .35	— .21	— 1.33	— 1.37
Margin per steer .....	— 3.01	— 1.81	— 8.63	— 9.06
<b>GRAZING PHASE—81 DAYS, May 11 to August 1, 1926.</b>				
Weight to grass as two-year-olds and yearlings, May 11, 1926 .....	861.20	859.40	648.80	660.89
Weight, August 1, 1926 .....	915.40	914.80	736.40	744.67
Total gain per steer, May 11 to August 1, 1926 .....	54.20	55.40	87.60	83.78
Daily gain per steer, May 11 to August 1, 1926 .....	.67	.68	1.08	1.03
Steer cost plus pasture at \$8 per head for entire season .....	\$82.10	\$80.67	\$68.56	\$69.91
Necessary selling price per cwt. to break even, August 1, 1926 .....	8.97	8.82	9.31	9.39
<b>FULL FEEDING PHASE—100 DAYS, August 1, to November 8, 1926.</b>				
Where fed .....	Dry lot.	Pasture.	Dry lot.	Pasture.
Average daily ration:	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Ground corn .....	16.27	16.17	16.33	16.72
Cottonseed meal .....	1.00	.98	1.00	.99
Alfalfa hay .....	5.76	5.76	5.78	5.78
Weight per steer, August 1, 1926 .....	915.40	914.80	736.40	744.67
Weight per steer, November 8, 1926 .....	1,155.73	1,121.93	1,037.47	983.04
Average gain, August 1 to November 8, 1926 .....	240.33	207.13	301.07	238.37
Average daily gain, August 1 to November 8, 1926 .....	2.40	2.07	3.01	2.30
Feed cost, August 1 to November 8, 1926, includ- ing grass for season .....	\$30.75	\$26.22	\$30.83	\$27.06
Total cost at home November 8, 1926 .....	112.83	106.89	99.39	96.97
Necessary selling price to break even .....	9.76	9.53	9.58	9.86
Selling price per cwt., less 75 cents per cwt. to cover shrinkage and shipping expense, No- vember 8, 1926 .....	10.76	10.00	11.00	10.25
Margin per cwt. ....	.99	.47	1.42	.39
Margin per steer .....	11.41	5.30	14.73	3.79

Feed Prices.—Corn to May 11, 70 cents a bushel; corn after May 11, 84 cents a bushel; cottonseed meal, \$40 a ton; alfalfa hay, \$15 a ton; cane silage, \$5 a ton.

9. THE MOST STRIKING FEATURE OF THIS TEST IS THE FACT THAT THESE CATTLE MADE AN AVERAGE GAIN PER HEAD OF 526 POUNDS AND CONSUMED ONLY ABOUT 40 BUSHEL OF CORN, AND THOSE FED IN THE DRY LOT SOLD NEAR THE TOP OF THE MARKET THE DAY THEY WERE MARKETED.

#### Summary

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

#### Conclusions

1. Wintering well, grazing without other feed for first half of the grazing season, and then full feeding is a satisfactory way to handle steers, calves, or steer yearlings, if they are good, well-bred cattle.
2. A heavy feed of grain will be necessary during the full-feeding period to produce enough finish to make the most profit.

#### PUBLICATIONS ON CATTLE FEEDING

For further information on the recent experimental work of the Agricultural Experiment Station on cattle feeding, the reader is referred to the following circulars:

**Circ. No.**

105. Silage Feeding Investigations, 1922-'23. By C. W. McCampbell and W. R. Horlacher. (10 pp., 2 illus.)
117. Cattle Feeding Investigations, 1923-'24. By C. W. McCampbell, B. M. Anderson, and H. W. Marston. (11 pp., 2 illus.)
128. Cattle Feeding Investigations, 1924-'25. By C. W. McCampbell, B. M. Anderson, and H. W. Marston. (14 pp., 1 illus.)
130. Cattle Feeding Investigations, 1925-'26. By B. M. Anderson and H. W. Marston. (5 pp., 1 illus.)

Copies of any of these publications in which the reader may be interested may be secured as long as available by addressing a request to: AGRICULTURAL EXPERIMENT STATION, MANHATTAN, KAN.

**Note.**—Next year's work will be the first of a series of tests to be conducted for the purpose of determining just how well calves should be wintered to make the most profit when wintered well, grazed the first half of the summer, and then full fed for 100 days.

