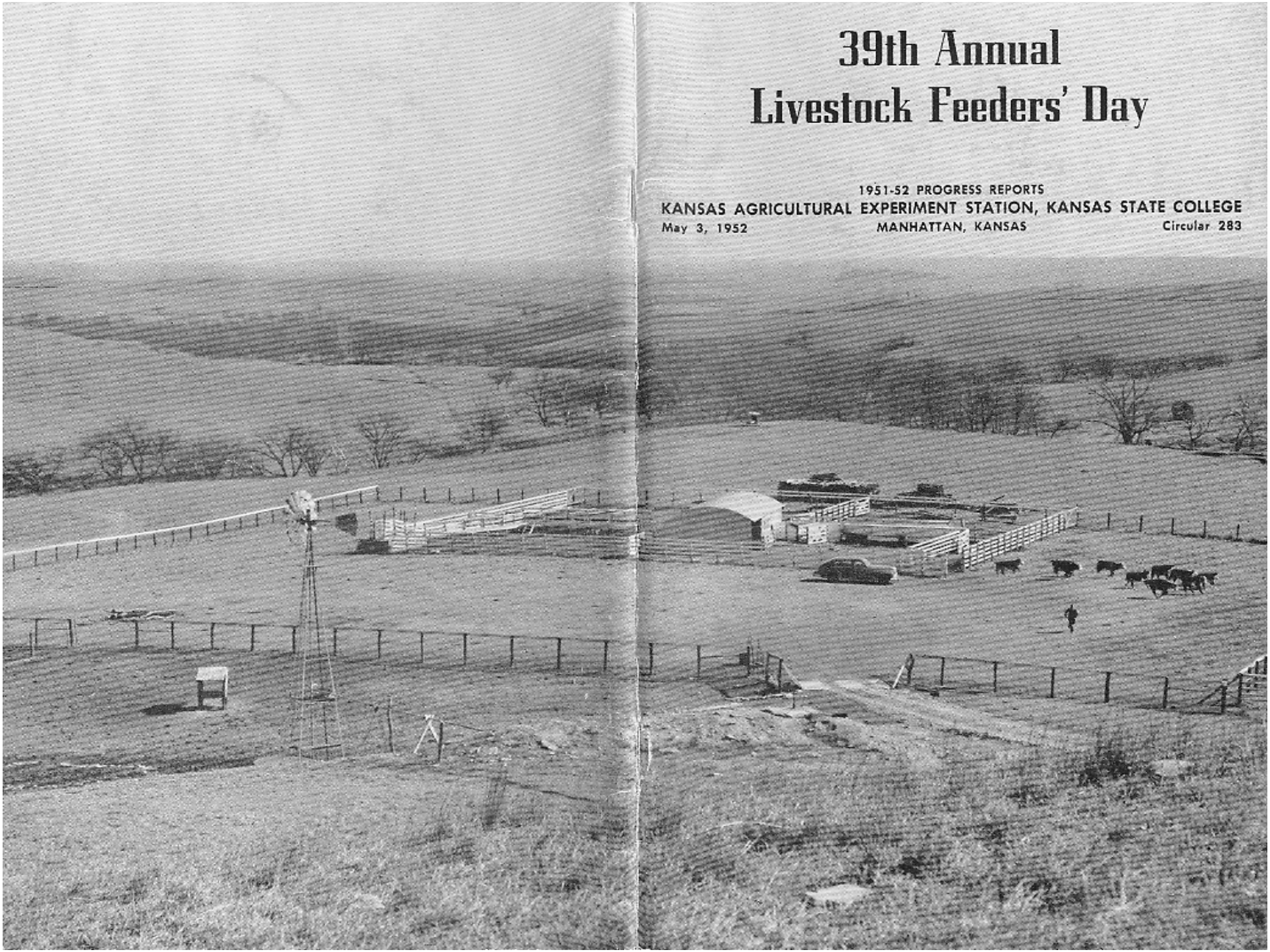
39th Annual Livestock Feeders' Day

1951-52 PROGRESS REPORTS
KANSAS AGRICULTURAL EXPERIMENT STATION, KANSAS STATE COLLEGE
May 3, 1952 MANHATTAN, KANSAS Circular 283



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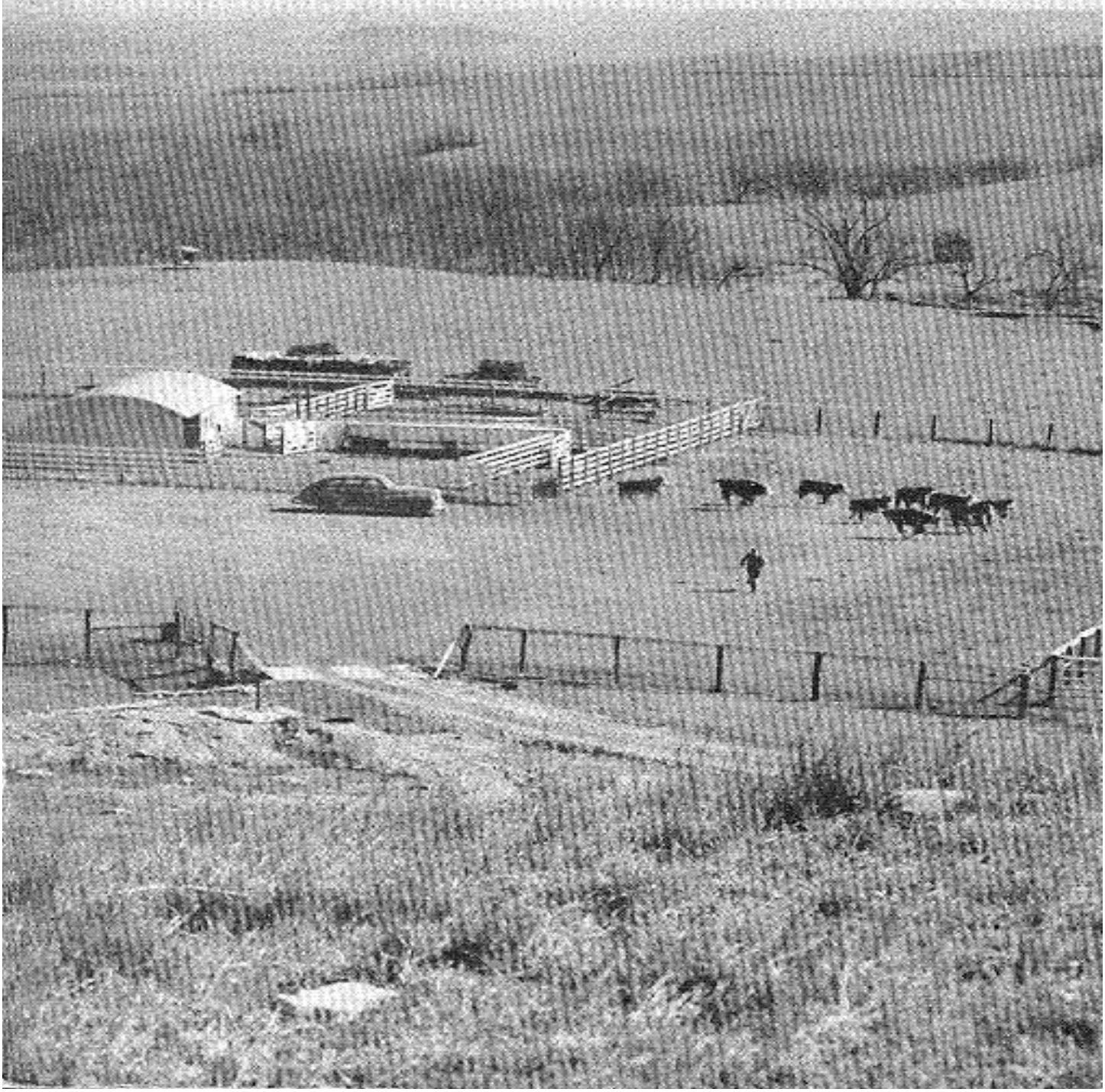

39th Annual Livestock Feeders' Day

Kansas State College
Manhattan, Kansas

SATURDAY, MAY 3, 1952

9:30 a.m.—Kansas State College Fieldhouse.

Presiding—Charles E. Waugh, Sharon Springs, Kansas, President, Kansas Livestock Association.

Welcome, Stockmen—James A. McCain, President, Kansas State College.

Livestock Feeding, Breeding and Management Experiments—Animal Husbandry Staff.

1. Wintering steer calves, yearling steers, and heifer calves on alfalfa silage, dry bluestem pasture, brome grass, prairie hay, and sorgo silage.
2. Fattening lambs with rations composed of sorghum grain and sorghum roughage.
3. Antibiotics in the rations of growing and fattening pigs.

Awards to winners in beef production contest—Walter H. Atzenweiler, Agricultural Commissioner, Chamber of Commerce, Kansas City, Mo.

12 noon—Luncheon—Fieldhouse—Served by Block and Bridle Club.

1:00 p.m.—Matters of Concern to Meat Producers—John L. Anderson, Secretary, Arkansas Valley Stock Feeders' Ass'n, Las Animas, Colorado.

Livestock Feeding, Breeding and Management Experiments—Animal Husbandry Staff.

1. Management studies on cattle grazing on bluestem pastures—early, medium and late burning; deferred and rotational grazing, stocking rates, supplemental feeding of steers and heifers on pasture.
2. Controlling death losses of lambs in the feedlot.

Inspection of Experimental Feeding, Livestock and Breeding Herds.

Questions.

Ladies' Meeting

10:00 a.m.—Calvin Lounge (Home Economics Building)

12 noon—Luncheon—Fieldhouse

Animal Husbandry Investigations

1951-52 PROGRESS REPORTS*

39th Annual
LIVESTOCK FEEDERS' DAY

Kansas Agricultural Experiment Station

KANSAS STATE COLLEGE
OF
AGRICULTURE AND APPLIED SCIENCE

R. I. THROCKMORTON, Director
A. D. WEBER, Associate Director

*Contribution No. 191 from the Department of Animal Husbandry

Contents

GEORGE W. GLICK
OUTSTANDING KANSAS CITIZEN AND STOCKMAN

C. W. McCampbell

George W. Glick was notably successful in several lines of human endeavor—as a lawyer, legislator, governor, business man, farmer, and livestock producer.

He was born on a farm near Greencastle, Ohio, on July 4, 1827, but the family moved to a farm near Fremont, Ohio, when he was five years of age. He received his education at the "Glick" country school near Fremont, in the city schools of Fremont, and at Central College in Ohio. His scholastic attainments included a knowledge of higher mathematics and languages, in which he retained a life-long interest.

Governor Glick loved farm life and had intended to make farming his life work, but soon after returning from college he was the victim of an accident in which both feet were so severely injured in a threshing machine it was thought he never again would be able to do farm work. So in 1849 he entered the law office of Buckland and Hayes of Fremont to prepare for a career as a lawyer; Buckland later became a congressman from Ohio and Hayes president of the United States.

He took the bar examination in 1851 with a group of recent graduates of the Cincinnati Law School, passed with the highest grades made in the group, and immediately started practicing law at Fremont, but soon located at Sandusky, Ohio. In the meantime he completely recovered from his accident, and his continuing interest in farming is indicated by the fact that so long as he remained in Ohio he went home each year to help with the farm work at haying and harvest times.

Governor Glick came to Atchison, Kansas, late in 1858. In a short time he formed a partnership with Judge Alfred G. Otis and developed into one of Kansas' leading lawyers. It was not long until he became the salaried attorney for two railroads and several corporations in addition to handling an extensive private practice. His fees were large but at the same time he did much legal work for poorer settlers without compensation and he never willingly saw a man sent out of court without a fair hearing because unable to pay a lawyer.

His interest in farming continued after coming to Kansas, and in 1868 and 1869 he purchased land some five miles west of Atchison totalling 640 acres, and named it Shannon Hill Stock Farm. This tract, all in one piece, was eventually developed into one of the best known and best managed livestock farms in the state.

In 1869 he decided to concentrate on the production of purebred Shorthorn cattle and went to Kentucky where he purchased three heifers and the bull Fayette 10053. This bull—calved in 1867—was undefeated in class as a yearling (1868) at all the fairs at which he was shown, including the Kentucky State Fair where he also won the Sweepstakes class for the best bull under three years of age. Fayette was a fortunate selection, for he proved to be an excellent sire. When the herd was dispersed 32 years later, the best individuals in the herd were descendants of Fayette.

In 1873 a throat ailment caused Governor Glick to give up the practice of law. He, however, consented to continue in the capacity of consultant attorney for several corporations, but after 1873 he devoted most of his time to the management of his farm and livestock. Men who knew him personally have stated that all through his years as a Shorthorn breeder he could identify from memory every animal in the herd, and that no other farmer in the community equalled him in the know-how of farm operations.

The Glick herd was built and maintained with a definite goal in

mind. This goal included big, thick-fleshed cattle that were also heavy milkers. While this goal in its entirety may not meet present-day requirements, it did meet the demands of the times when this herd was started. That the owner succeeded well in achieving the goal he had in mind is indicated by a story about this herd written by a member of the staff of the Kansas Farmer that appeared in the September 1, 1898, issue of that publication. It reads in part: "The writer never saw a grander lot of large, useful cows. Another splendid quality of these cows in addition to their size and beefy conformation is their milking quality. While Governor Glick has always been insistent as to quality of pedigree, he has also been equally insistent as to the individual excellence of the animal."

During his 32 years as a breeder of Shorthorns, Governor Glick purchased relatively few females, which means that the herd was developed principally on the basis of rigidly selected heifers of his own breeding. The exception was often a good, well-bred cow with a promising bull calf at foot.

On the other hand, only two of the bulls used as herd sires were bred by Governor Glick and they were used only for a short time. Three of the herd bulls purchased were tried sires—Claude Wetherby, six years old when secured; 8th Duke of Kirklevington, seven years old; and 53rd Grand Duke of Airdrie, eight years old. Each helped materially to improve the Glick herd, but Fayette, the first bull purchased, used 1870 to 1877 inclusive, and Waterloo Duke of Shannon Hill, used 1887 to 1892 inclusive, were the greatest sires used.

A news item published in 1875 stated that the herd numbered 50 head after sales of surplus for the current year. A similar item in 1894 gave the number as 100 head and another in 1898 shows that the number had been increased to 150 head. This last item also stated that the Glick herd "is one of the largest and most celebrated herds of the breed in Kansas and is very properly entitled to the claim of the leading Bates (Shorthorn) herd in the West." It has been stated repeatedly that no other herd contributed as much to the early improvement of the beef cattle of Kansas as did the Glick herd.

When the herd was sold in 1900, W. R. Nelson, editor of the Kansas City Star, purchased 15 of the best cows and the bull, 53rd Duke of Airdrie, as the nucleus for a herd he planned to develop on his place east of Kansas City which later became famous as Sni-A-Bar Farm.

Governor Glick was also one of the leading Berkshire breeders of the Middle West and usually bred from 30 to 40 purebred sows annually.

Despite the fact that Governor Glick seldom showed his cattle, and then usually only locally, this herd became one of the best known and most popular in the Middle West. Besides extensive sales in Kansas, Glick-bred Shorthorns found their way into herds from New York to Montana and from Minnesota to Texas.

Governor Glick was a leader in the agricultural and livestockmen's organizations of Kansas. He was one of the organizers of the Kansas Agricultural Society in 1862 that became the State Board of Agriculture in 1872, and he never missed an annual meeting of this group from 1862 to 1910. He was its president in 1897.

He was also one of the organizers of the Kansas Improved Livestock Breeders Association in 1891, an organization of purebred livestock producers which for several years was the most powerful and influential of all agricultural organizations in Kansas.

Wilson, in his book on prominent Kansans, comments that "He (Glick) is a ready and vigorous writer and has contributed many valuable essays on agriculture, stock raising, and kindred subjects to various publications and public meetings which it is hoped may someday be gathered into book form."

Governor Glick was a staunch supporter of Kansas State College. One incident stemming from his interest in this institution occurred at Manhattan June 23, 1868, while he was attending a meeting of the Board of Regents as a member of the Governor's Agricultural Advisory Committee. He introduced a resolution at this meeting and defended it so forcefully it was adopted unanimously. It reads as follows: "Resolved that a system of lecturing on agricultural subjects at the College and in populous settlements of the several counties of the state be adopted so that the benefits of farming according to correct agricultural principles may be disseminated throughout the state." Thus it is seen that Governor Glick was in reality the father of Farmers' Institutes in Kansas and they were the forerunners of Farm and Home Week.

Governor Glick was a student of government, served eight terms in the Kansas House of Representatives, an unexpired term in the State Senate, and one term as Governor. The legislatures in which he served were overwhelmingly Republican and he was an uncompromising Democrat, yet no other member received more responsible assignments than he, including three terms as chairman of the Judiciary Committee, one term as chairman of the Ways and Means Committee, and one term as Speaker Pro Tem. This indicates the high regard his fellow legislators had for his character, ability, and statesmanship. Shortly before coming to Kansas, and at the age of 31, he was nominated for Congress from his home district but declined the nomination. He also was a delegate to the National Democratic Conventions of 1859-68-84-92.

His experience as a legislator and as governor, as well as his outstanding success as a farmer and stockman, made him President Cleveland's choice for his Secretary of Agriculture, but he declined the honor.

No one realized more than Governor Glick the importance of railroads in developing pioneer areas, and he devoted a lot of time and effort in promoting and building early-day railroads in Kansas. He was one of the organizers and first directors of the Atchison and Pike's Peak railroad, now a part of the Missouri Pacific system and for a time known as the Central Branch; one of the first directors of the Atchison, Topeka, and Santa Fe; and one of the organizers, the builder, and for four years president of the Atchison and Nebraska railroad, now also a part of the Missouri Pacific system.

Despite his success in law, business, and politics, his greatest interest was his farm and livestock. As legislator and as governor, he was the champion of agriculture. Of the many laws he sponsored that have benefited Kansas farmers, two are of particular interest. One provided for a railroad commission whose responsibilities have expanded to other fields as well as railroads. We know it today as the Kansas Corporation Commission. The very great need of a railroad commission in those early days may not now be fully appreciated, because the bitter fights of long ago on the part of agriculture for better service and more equitable rates have all but been forgotten.

The other of these two laws was the one establishing a Livestock Sanitary Commission. As a legislator who understood the importance of controlling and preventing contagious livestock diseases, he had tried for many years to secure the passage of a law that would give livestock producers more adequate protection from such diseases, but with disappointing results. However, on March 3, 1884, while he was governor, foot and mouth disease was discovered in Woodson County. Two days later the governor left Topeka for a personal inspection of the situation, and on March 13 called a special session of the legislators to meet March 18 for the purpose of passing more adequate livestock disease control laws. The legislature was in session one week and passed ten bills, six of which related to livestock disease control.

Briefly stated, these six bills provided for:

(1) a livestock sanitary commission consisting of three members to be appointed by the governor;
(2) a state veterinarian who would work under the supervision of the Livestock Sanitary Commission;
(3) a fund to finance the Livestock Sanitary Commission to be derived from a tax of 2/10 of one mill on each dollar of taxable property in the state;
(4) authority for the Livestock Sanitary Commission to create and enforce quarantine against Texas Fever in any of the unorganized counties;
(5) a new and more restricted quarantine ground for Texas cattle to protect domestic cattle from Texas Fever; and
(6) authority for the Livestock Sanitary Commission to co-operate with federal authorities in the suppression of contagious diseases among domestic animals.

So finally, with the aid of an outbreak of foot and mouth disease, Governor Glick secured the passage of a livestock sanitary law for which he had worked many years. It was a good beginning, but many changes have been made in this law through the intervening years.

It might be of interest to note that sheep were subject to the provisions of the livestock sanitary laws of 1884 only in case of foot and mouth disease. The reason apparently lies in the fact that the legislature of 1883 had passed a law requiring county commissioners to appoint a county sheep inspector if and when six sheep owners in the county vouched for the presence of a contagious disease in that county. The county sheep inspector was supposed to handle the situation. However, his authority was quite limited and in a few years this separate provision for sheep was abolished.

The special attention given sheep at that early day was due to two major factors. One was the large number in the state—1,154,195 head—which was 10,000 greater than the number of cattle in the state at that time. The other was the prevalence of scab. It might also be well to mention the fact that nearly all these sheep were breeding sheep maintained for their wool. Lamb feeding had not yet appeared on the scene.

While at his winter home in Florida during the winter of 1909-10, he fell and broke a hip, from which injury he never recovered. After more than a year of suffering he died April 13, 1911, in his 84th year and his body was returned to Atchison for burial.

A veritable stream of tributes poured forth from individuals, organizations, and the press when his death was announced. The few excerpts that follow indicate the esteem in which he was held by agricultural interests.

From the State Board of Agriculture: "We mourn his death but we are proud of the splendid record of achievement he has left for our inspiration and emulation. . . . He filled many offices of trust and honor, all with dignity and characterized by sterling integrity and ability."

From comments by T. M. Potter, three times president of the State Board of Agriculture: "Humble and modest to a fault, considerate of the interests of all, and especially the humble, I know of no other man for whose sterling worth and character I have higher regard. . . . Pure in character, wise in judgment, conciliatory in all his feelings and aspirations, a despiser of pretense, . . . we have lost a wise counselor, a man of clear judgment whose interest in our organization and interest in the state are seldom equalled."

From the Kansas Farmer: "His entire life was devoted to the good of his state and his fellow men."

Governor Glick served with the Second Kansas Regiment during the Civil War, was in a number of engagements on the border, and was wounded in the Battle of the Big Blue.

In 1913, the Kansas legislature appropriated $5,000 for a marble statue of Governor Glick to be placed in Statuary Hall in Washington, D.C. It was placed June 24, 1914, and formally accepted July 18, 1914.

Project 110: Swine Feeding Investigations

EXPERIMENT I—Summer, 1951

C. E. Aubel

The Effect of Antibiotics (Aureomycin-B_{12} Supplement) on Weanling Pigs on Alfalfa Pasture.

Recently much has been written on the use of antibiotics in swine nutrition. Research has shown that different vitamin B_{12}-antibiotic supplements stimulate gains in growing and fattening swine. Some problems, however, present themselves.

First, is it necessary to feed the antibiotic supplement until the pig reaches market weight to get the full benefit of the stimulated gain, or does the stimulation resulting from feeding this supplement during early growth carry over into the fattening stage of the hog's development?

Another problem that is apparent in the use of the B_{12}-antibiotic supplement is the relative efficiency of the antibiotics in plant protein supplement diets and in mixed plant and animal protein supplement diets.

Furthermore, is antibiotic feeding as effective with pasture-fed pigs as with dry lot-fed pigs?

Experiments were conducted last summer and winter at this station with weanling pigs to determine some of the practical applications of antibiotic feeding. Lederle's Aurofac, the vitamin B_{12} and antibiotic feed supplement used in the experiments, was obtained from Lederle Laboratories Division, American Cyanamid Company, New York. It contained approximately 1.8 mg. of vitamin B_{12} and 1.8 grams aureomycin per pound. When mixed in the protein supplements, 3 pounds of Aurofac were used to each 100 pounds of the protein supplement. This amount was estimated to give the pigs about 0.5 percent of the aureomycin supplement in their total ration.

In Experiment I, begun June 13, 1951, six lots of 45-pound spring pigs were fed on alfalfa pasture. There were 10 pigs to a lot and the pigs were self-fed free choice on shelled corn, a protein supplement, and a mineral mixture. The mineral mixture was made up of equal parts of ground limestone, steamed bonemeal, and salt.

Aurofac was included in the different protein supplements, except in Lots 1 and 4; also, Aurofac was not included in the protein supplements in Lots 2 and 5 after the pigs reached the weight of 80 pounds, it being one of the purposes of this experiment to determine the carry-over effect of the early feeding of the aureomycin to the pigs. Another purpose of this experiment was to determine the relative efficiency of the antibiotics when fed in plant protein, and mixed plant and animal protein supplement diets.

Lots 1, 2, and 3 received only soybean meal as a protein supplement. Lot 2 as noted above received aureomycin in the supplement until the pigs reached 80 pounds in weight, and then they were fed only the soybean meal; Lot 3 received aureomycin in their protein supplement throughout the experiment until the pigs were finished.

Lots 4, 5, and 6 received as a protein supplement a mixture of 4 parts tankage, 4 parts soybean meal, 1 part linseed meal, and 1 part

alfalfa meal. Lot 5 as noted above received aureomycin in the supplement until the pigs reached 80 pounds in weight, and then they were fed only the mixed protein supplement. Lot 6 received aureomycin in their protein supplement throughout the experiment until the pigs were finished.

The following table gives a summary of the results of this experiment:

EXPERIMENT I—Summer, 1951

The Effect of Antibiotics (Aureomycin-B_{12} Supplement) on Weanling Pigs on Alfalfa Pasture.

(June 13, 1951, to Sept. 24, 1951—103 days)

	Alfalfa pasture, shelled corn, mineral mixture (self-fed)					
Ration fed	Soybean oil meal	Soybean oil meal plus aureo.-B_{12} to 80 lbs.	Soybean oil meal plus aureo.-B_{12} to finish	Protein mixed suplt.	Protein mixed suplt. plus aureo.-B_{12} to 80 lbs.	Protein mixed suplt. plus aureo.-B_{12} to finish
Lot number	1	2	3	4	5	6
No. pigs in lot	10	9	10	10	10	10
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Av. initial wt. per pig	45.3	44.66	45.7	46.2	46.4	46.0
Av. final wt. per pig	202.7	204.66	206.0	208.1	194.2	215.7
Av. total gain per pig	157.4	160.0	160.3	161.9	147.8	169.7
Av. daily gain per pig	1.52	1.55	1.55	1.57	1.43	1.64
Av. daily ration per pig:						
Corn	4.66	4.85	4.78	4.95	5.16	5.57
Protein suplt. mix	.74	.69	.66	.66	.48	.58
Feed consumed per 100 pounds gain:						
Corn	304.95	312.5	307.54	315.0	359.6	338.24
Protein suplt. mix	48.91	44.44	42.66	42.0	33.49	35.41
Mineral mixture	.25	.26	.24	.19	.17	.18
Feed cost per 100 lbs. gain	$11.25	$11.46	$11.51	$11.34	$11.86	$12.13

Feed prices charged: Shelled corn, $1.68 per bushel; supplement Lot 1, $86.00 per ton; supplement Lots 2, 3 with Aurofac, $110.80 per ton; supplement Lot 4, $90.80 per ton; supplement Lots 5, 6 with Aurofac, $112.20 per ton; mineral mixture, 3c per pound; Aurofac, 43c per pound.

Observations

The soybean meal supplement was efficient in supplementing the grain in Lot 1, although the gain was not quite so much as in Lot 4 where a mixed protein was fed. Adding aureomycin supplement to the soybean meal increased slightly the rate of gain per head per day, but it also increased the amount of feed consumed per 100 pounds gain and increased the cost of these gains.

There was little effect from eliminating the aureomycin from the protein supplement after the pigs had reached 80 pounds in weight in Lot 2 as compared with feeding it throughout the feeding period, in Lot 3. The daily gains were the same, but the grain consumption was a little higher and the feed costs a little lower, because the aureomycin was fed a limited time.

In Lot 4 where a mixed animal and plant protein supplement was fed, the gains were larger than when a straight plant protein was fed as in Lot 1, or when the plant protein was supplemented by aureomycin either limited as in Lot 2 or unlimited as in Lot 3.

When aureomycin was added to the mixed protein supplement and fed throughout the experiment in Lot 6, the daily gains were more rapid but the feed consumption per 100 pounds was not decreased.

For some reason or other, aureomycin added to the ration of the pigs only until they weighed 80 pounds on a mixed protein supplement, reduced the daily gain per pig and increased the feed consumed per 100 pounds gain.

In this experiment the efficiency of gain indicated by the feed requirements was not particularly in favor of the rations containing the antibiotic. In some cases, the amount of feed required was considerably more.

The feeding of the antibiotic generally increased the daily gain per pig.

It is evident from these results that the chief advantage of feeding aureomycin in these experiments was the increased rate of gain of the pigs, rather than any marked improvement in reducing the cost of the gains.

EXPERIMENT II—Summer, 1951

The Effect of Antibiotics (Aureomycin-B_{12} Supplement) on Growing Pigs on Alfalfa Pasture.

C. E. Aubel

This experiment conducted in the summer of 1951 was designed to see what effect withholding the feeding of the antibiotic would have on pigs, waiting until they were 80 pounds in weight before starting to feed it.

Four lots were self-fed corn; the pigs of all lots were self-fed a mixed protein supplement made up of 4 parts tankage, 4 parts soybean meal, 1 part linseed meal, and 1 part alfalfa meal; in addition they received a mineral mixture of equal parts ground limestone, steamed bonemeal, and salt.

An antibiotic, Aurofac, was fed in Lots 2 and 4 at the rate of 3 pounds to 100 pounds of the protein supplement.

Lots 1 and 2, in this experiment, started with 46-pound pigs and Lots 3 and 4 with 81-pound pigs. All feeds were self-fed on alfalfa pasture.

The following table gives a summary of the results of this experiment:

EXPERIMENT II—Summer, 1951

The Effect of Antibiotics (Aureomycin-B_{12} Supplement) on Growing Pigs on Alfalfa Pasture.

	Alfalfa pasture, shelled corn, mineral mixture (self-fed)			
Ration fed	Protein mixed suplt.	Protein suplt. plus aureo.-B_{12} to finish	Protein mixed suplt.	Protein mixed suplt. plus aureo.-B_{12} to finish
Lot number	1	2	3	4
No. days fed	103	103	68	68

No. pigs in lot	10	10	10	10
Av. initial wt. per pig	Pounds 46.2	Pounds 46.0	Pounds 81.8	Pounds 81.8
Av. final wt. per pig	208.1	215.7	196.1	209.1
Av. total gain per pig	161.9	169.7	114.3	127.3
Av. daily gain per pig	1.57	1.64	1.67	1.89
Av. daily ration per pig:				
Corn	4.95	5.57	6.11	6.13
Protein suplt. mix	.66	.58	.50	.61
Feed consumed per 100 pounds gain:				
Corn	315.0	338.24	363.51	327.96
Protein suplt. mix	42.0	35.41	30.18	32.99
Mineral mixture	.19	.18	.08	.07
Feed cost per 100 lbs. gain	$11.34	$12.13	$12.60	$11.69

Feed prices charged: Shelled corn, $1.68 per bushel; supplement Lots 1, 3, $90.80 per ton; supplement, Lots 2, 4 with Aurofac, $112.20 per ton; mineral mixture, 3c per pound; Aurofac, 43c per pound.

Observations

1. The addition of Aurofac aureomycin supplement to a mixed protein supplement when fed to pigs weighing initially either 46 or 81 pounds had the effect of increasing their daily gain. With the 46-pound pigs it did not decrease the amount of feed required for 100 pounds gain, but with the heavier pigs it did decrease the amount of feed required for 100 pounds gain.

It is evident from the results of this experiment that increases in the rate of gain and decreases in feed requirements are to be expected if an antibiotic is fed to pigs, even if they are older than weanling pigs.

EXPERIMENT III—Winter, 1952

The Effect of Antibiotics (Aureomycin-B_{12} Supplement) on Weanling Pigs in the Dry Lot.

C. E. Aubel

This experiment was conducted this past winter with fall pigs in the dry lot. It was designed to get information on two points. First, how much does the addition of an antibiotic improve an all-plant protein supplement or diet, and how much does it improve a mixed protein supplement of plant and animal protein for weanling pigs? The second point to get information on, was whether it is necessary to feed the antibiotic to pigs after they weighed 100 pounds.

The antibiotic used in this experiment was aureomycin fed as Aurofac and it was mixed in the protein supplements at the rate of 3 pounds to 100 pounds.

In this experiment, beginning November 21, 1951, six lots of 42-pound fall pigs were fed in the dry lot. They were self-fed free choice on shelled corn, a protein supplement, and a mineral mixture. The mineral mixture was made up of equal parts ground limestone, steamed bonemeal, and salt.

Lots 1, 2, and 3 received only soybean meal as a protein supplement; Lot 2 received aureomycin in the supplement until the pigs reached 100 pounds in weight and then they were fed only the soybean meal. Lot 3 received aureomycin in their protein supplement throughout the experiment, until the pigs were finished at a weight of 200 pounds.

Lots 4, 5, and 6 received as a protein supplement a mixture of 4

parts tankage, 4 parts soybean meal, 1 part linseed meal and 1 part alfalfa meal. Lot 5 received aureomycin in the supplement until the pigs reached 100 pounds in weight, and then they were fed only the mixed protein supplement; Lot 6 received aureomycin in their protein supplement throughout the experiment until the pigs were finished.

The following table gives a summary of the results of this experiment:

EXPERIMENT III—Winter, 1951-52

The Effect of Antibiotics (Aureomycin-B_{12} Supplement) on Weanling Pigs in the Dry Lot.

(November 21, 1951, to February 26, 1952—97 days)

	Shelled corn, alfalfa hay, mineral mixture (self-fed)					
Ration fed.....	Soybean oil meal	Soybean oil meal plus aureo.-B_{12} to 100 lbs.	Soybean oil meal plus aureo.-B_{12} to finish	Protein mixed suplt.	Protein mixed suplt. plus aureo.-B_{12} to 100 lbs.	Protein mixed suplt. plus aureo.-B_{12} to finish
Lot number	1	2	3	4	5	6
No. pigs in lot	9	10	10	10	10	10
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Av. initial wt. per pig	43.95	42.85	43.00	42.35	42.65	42.50
Av. final wt. per pig	179.88	200.30	205.00	196.90	196.60	210.30
Av. total gain per pig	135.96	157.45	162.00	154.55	153.95	167.80
Av. daily gain per pig	1.40	1.62	1.67	1.59	1.58	1.72
Av. daily ration per pig:						
Corn	3.55	4.78	4.72	5.20	4.98	5.34
Alfalfa hay	.05	.03	.05	.03	.04	.04
Protein suplt. ..	1.03	1.15	1.12	.85	.80	.82
Feed consumed per 100 lbs. gain:						
Corn	253.33	294.69	283.02	326.43	314.38	308.99
Alfalfa hay	.36	.21	.32	.22	.25	.23
Protein suplt.	73.95	71.45	67.28	53.38	50.99	47.67
Mineral mix	.13	.12	.08	.06	.05	.05
Feed cost per 100 lbs. gain	$11.60	$13.22	$13.01	$13.24	$13.05	$12.94

Feed prices charged: Shelled corn, $1.86 per bushel; soybean meal, $86.00 per ton; soybean oil meal with Aurofac, $110.00 per ton; alfalfa hay, $50.00 per ton; mixed protein supplement in Lots 5 and 6, $90.80 per ton; mineral mixture, 3c per pound; mixed protein supplement with Aurofac in Lots 5 and 6, $112.20 per ton; Aurofac, 43c per pound.

Observations

When aureomycin was added to a soybean meal protein supplement ration and fed to pigs only until they reached a weight of 100 pounds, the rate of gain was increased, as was also the feed required per 100 pounds gain. When the antibiotic was fed in the supplement through-

out the experiment, it further increased the gains and slightly lowered the feed requirements.

The gains were very satisfactory in both lots receiving the antibiotic.

The mixed plant and animal protein supplement without an antibiotic as fed in Lot 4 produced more rapid daily gains than did the plant protein supplement alone, soybean meal, as fed in Lot 1.

When the antibiotic was added to the mixed protein supplement in Lot 5, until the pigs reached 100 pounds, the rate of gain was unchanged but the feed requirements were slightly lowered. When the antibiotic was fed in the supplement throughout the experiment, the rate of gain was markedly increased and the feed requirements decreased.

It is evident from these results that aureomycin added to the ration, either for a limited time or for the duration of the feeding period, increased the rate of gain, and this was therefore its chief effect: the effect of the antibiotic was most marked when it was fed throughout the experiment.

The effect of the antibiotic was more apparent in the all-plant protein-fed pigs and not so effective where a mixed protein supplement was fed.

EXPERIMENT IV—Winter, 1952

The Effect of Antibiotics (Aureomycin-B_{12} Supplement) and Vitamin B_2 Supplement on Weanling Pigs in the Dry Lot.

C. E. Aubel

This experiment was conducted this past winter with fall pigs in the dry lot. Its object was to get information on the effect of feeding a vitamin B_2 supplement along with antibiotics.

Three lots of pigs were fed. Lot 1 received a mixed animal and plant protein supplement of 4 parts tankage, 4 parts soybean meal, 1 part linseed meal, and 1 part alfalfa meal. Lot 2 received a similar protein supplement, but to which aureomycin had been added as Aurofac at the rate of 3 pounds to 100. Lot 3 received the same as Lot 2 except that a vitamin B_2 supplement, containing riboflavin, niacin, pantothenic acid, choline chloride, and folic acid, Lederle's C-49 was added at the rate of 3 pounds per 500 of the supplement.

All lots were self-fed shelled corn as well as the protein supplement, and some very poor loose alfalfa hay was offered but was consumed very sparingly.

The following table gives the results of this experiment:

EXPERIMENT IV—Winter, 1951-52

The Effect of Antibiotics (Aureomycin-B_{12} Supplement) and Vitamin B_2 Supplement on Weanling Pigs in the Dry Lot.

(November 21, 1951, to February 26, 1952—97 days)

	Shelled corn, alfalfa hay and mineral mixture (self-fed)		
Ration fed	Protein mixed suplt.	Protein mixed suplt. plus aureo.-B_{12}	Protein mixed suplt. plus aureo.-B_{12} and B_2 suplt.
Lot number	1	2	3
No. pigs in lot	10	10	10
Av. initial wt. per pig	Pounds 42.35	Pounds 42.50	Pounds 42.60
Av. final wt. per pig	196.90	210.30	214.80

Av. total gain per pig	154.55	167.80	172.20
Av. daily gain per pig	1.59	1.72	1.77
Av. daily ration per pig:			
Corn	5.20	5.34	5.25
Alfalfa hay	.03	.04	.04
Mixed protein suplt.	.85	.82	.97
Feed consumed per 100 lbs. gain:			
Corn	326.43	308.99	295.87
Alfalfa hay	.22	.23	.27
Mixed protein suplt.	53.38	47.67	55.16
Mineral mix	.06	.05	.04
Feed cost per 100 lbs. gain	$13.24	$12.94	$13.14

Feed prices charged: Shelled corn, $1.86 per bushel; alfalfa hay, $50.00 per ton; mixed protein supplement, $90.80 per ton, in Lot 1; mineral mixture, 3c per pound; mixed protein supplement, Lot 2, with Aurofac, $112.20 per ton; mixed protein supplement, Lot 3, with Aurofac and B_{12} supplement, $120.24 per ton; Aurofac, 43c per pound, Vitamin B_{12} supplement, C-49 Lederle, 57c per pound.

Observations

When aureomycin was added to the diet as in Lot 2, the rate of gain was materially increased, and the feed requirements per 100 pounds gain were decreased.

When the vitamin B_{12} supplement was added to the aureomycin diet, the result was to increase the daily gains further and decrease the feed requirements.

From the results of this experiment, it is evident that the addition of an antibiotic and vitamin B_{12} supplement improved the efficiency of the ration when the protein supplement was one of mixed plant and animal proteins.

Project 236: The Relation of Physical Balance and Energy Value in Sheep Rations

A Comparison of Different Roughages Combined with Two Levels of Concentrate Allowance for Wintering Ewe Lambs.

T. Donald Bell, R. F. Cox, D. Richardson, D. B. Parrish, and J. S. Hughes

Introduction

Many experimental trials with fattening lambs at the Kansas Agricultural Experiment Station have indicated that rations including approximately 55 percent roughage and 45 percent concentrates produce more economical gains in relation to nutrients consumed than rations containing either a higher or lower proportion of concentrates. Because of the variability of the chemical and nutritive composition of many of the roughages, this physical balance relationship of the ration may be more accurately described by the ratio of crude fiber to total digestible nutrients, and the ratio found to be most economical in lamb fattening rations has been approximately 1 part crude fiber to 4 parts T.D.N.*

Ewe lambs, being raised for breeding replacements, are commonly wintered on rations composed largely of roughages, with few if any additional concentrates. If lambs respond most economically to

*T.D.N. refers to Total Digestible Nutrients.

DIFFERENT ROUGHAGES WITH VARYING CONCENTRATE ALLOWANCES FOR WINTERING EWE LAMBS.

December 26, 1951, to March 20, 1952—85 days

1. Lot number	1	2	3	4	5	6
2. Ration fed	Alfalfa hay Cottonseed meal Milo	Alfalfa hay Cottonseed meal Milo	Atlas stover Cottonseed meal	Atlas stover Cottonseed meal Milo	Atlas silage Cottonseed meal Prairie hay	Atlas silage Cottonseed meal Prairie hay Milo
3. Ratio: Crude fiber	1	1	1	1	1	1
to T.D.N.	1.7	2.5	2.4	3.5	2.3	3.1
4. No. lambs per lot	22	22	22	22	22	22
5. No. days on feed	85	85	85	85	85	85
6. Initial wt. per lamb	73.5	73.5	76.3	74.5	75.2	75.4
7. Final wt. per lamb	80.8	88.9	89.3	91.0	85.4	91.4
8. Total gain per lamb	7.3	15.4	13.0	16.5	10.2	16.0
9. Daily gain per lamb	.085	.182	.152	.193	.120	.188
10. Feed per lamb daily:						
Alfalfa	2.5	1.588				
Prairie hay					.462	.341
Atlas stover			3.452	2.541		
Atlas silage					5.155	4.171
Milo grain	.053	.606		.513		.518
Cottonseed meal	.247	.317	.400	.400	.365	.365
Limestone	.02	.02	.02	.02	.02	.02
11. Feed per cwt. gain:						
Alfalfa	2941.2	872.5				
Prairie hay					385.0	181.4
Atlas stover			2271.0	1316.6		
Atlas silage					4295.8	2218.6
Milo grain	62.3	333.0		265.8		275.5
Cottonseed meal	290.6	174.2	263.2	207.2	304.2	194.1
12. Feed cost per cwt. gain	$60.21	$30.12	$21.88	$22.94	$34.21	$26.26
13. Feed cost per lamb daily	.052	.055	.033	.039	.049	.059
14. T.D.N. per lamb daily	1.467	1.477	1.127	1.295	1.324	1.500
15. Gain per 100 lbs. T.D.N.	5.794	12.322	13.487	14.903	9.063	12.533

rations containing an optimum physical balance as indicated in the tests with fattening lambs, it is possible that in years when roughage is high in price compared to concentrates, it might pay to add additional concentrates with a reduction of roughage in the rations of wintering ewe lambs.

Experimental Procedure

In the winter of 1951-52 a test was made of the response of ewe lambs to rations containing different proportions of roughages, and concentrates as well as of their response to rations made up of some of the more common roughages found in Kansas. The ewe lambs, which were of three breeding types, were secured from Southern Utah; they will be used in the subsequent breeding studies. The lambs were divided into six lots with uniform distribution of the lambs of different breeding into the various lots. The roughages compared were long alfalfa hay, ground Atlas stover, and Atlas silage in combination with prairie hay. Cottonseed meal was added to supply protein to all of the rations, and milo grain was also given in those three lots where a higher ratio of crude fiber to T.D.N. was desired. Originally, the experiments were planned for two lots of lambs to receive each of the three roughages or a combination of roughages. One of the two lots was fed a ration with a fiber-T.D.N. ratio of 1:2, and the other lot a crude fiber-T.D.N. ratio of 1:3. Because of limited digestive capacities and the lack of palatability of some of the roughages used, these ratios could not be maintained. The accompanying table gives the rations fed in the various lots, the crude fiber-T.D.N. ratios, and the response of the lambs to the various rations. Feed prices used to determine the feed costs in lines 12 and 13 were:

Alfalfa hay	$30.00 per ton
Prairie hay	15.00 per ton
Ground sorghum stover	7.50 per ton
Atlas silage	7.50 per ton
Milo grain	2.50 per cwt.
Cottonseed meal	5.00 per cwt.

Observations

1. The replacement of roughage with concentrates increased the rate of gain of the lambs as well as the gain per 100 pounds of T.D.N. (Compare lots 1 with 2; 3 with 4; 5 with 6.) None of the levels of concentrate feeding reached a crude fiber-T.D.N. ratio of 1:4, which was found to be optimum in lamb fattening trials, but best response was shown on the three roughage rations when the ratio approached this value.

2. The alfalfa hay was of poor quality and gave the poorest and least economical gains of any of the roughages when it was fed with the lower level of concentrates, while Atlas stover produced the largest and most economical gains on the rations of lower concentration.

3. Rates of gains, and pounds produced per 100 pounds of T.D.N., were similar in all three lots of lambs receiving the different roughages and fed with the higher level of concentrates. Based on current feeding prices, however, feed cost per hundredweight of gain was lowest when sorghum stover was fed, next lowest with sorghum silage and prairie hay as the roughage, and highest when alfalfa was the roughage fed.

4. There is insufficient experimental evidence to indicate how much a ewe lamb should gain in weight or condition during the winter period, but she probably should be well grown and thrifty by spring if she is to respond best to breeding in June or July for fall and early winter lambs. It would appear from these tests that a ration of

about 3½ pounds of ground sorghum stover, 0.3 to 0.4 pound of protein supplement, plus about 1/5 ounce of limestone would provide satisfactory gains for wintering ewe lambs and would be a more economical ration than alfalfa hay when that roughage is comparatively high in price and poor in quality. A ration of sorghum silage, prairie hay, protein supplement, and limestone probably will give satisfactory results for wintering ewe lambs, but these tests indicate that gains will be lower and more expensive than rations containing ground stover.

Project 236: The Relationship of Physical Balance and Energy Value in Sheep Rations

1951 Trials with Wether Feeding Lambs

by

T. Donald Bell, Rufus F. Cox, J. S. Hughes

Lamb fattening rations varying in physical nature but virtually alike chemically have been studied at the Kansas Agricultural Experiment Station for a number of years. Previous tests have been demonstrated that the rate of gains and the efficiency of feed utilization by fattening lambs are associated closely with the physical balance or the concentration and bulkiness of the ration.

Objects of the 1951 trials:

1. To test the relative efficiency of rations which vary in the amount and in the nature or condition of the crude fiber consumed by fattening lambs.
2. To investigate the value of bicarbonate of soda in controlling digestive disorders in lambs consuming rations which are highly concentrated or which have had the roughage portion of the ration reduced by grinding and pelleting.

Plan of Feeding

Lot 1—corn and alfalfa hay—medium concentration (Crude Fiber: total digestible nutrients—CF:TDN-1:4).
Lot 2—corn and alfalfa hay—highly concentrated (CF:TDN ratio of 1:5.1).
Lot 3—corn and alfalfa hay, plus bicarbonate of soda (CF:TDN ratio of 1:5.1).
Lot 4—corn and pelleted alfalfa (CF:TDN ratio 1:4).
Lot 5—corn and pelleted alfalfa (CF:TDN ratio 1:5.1).
Lot 6—corn and pelleted alfalfa, plus bicarbonate of soda (CF:TDN ratio 1:5.1).

Summary

Results of the test are summarized in the accompanying table and indicate:

1. Gains were just as large with a ration of medium concentration as with those highly concentrated when chopped alfalfa hay was fed with corn. When pelleted alfalfa was fed, a ration of medium concentration produced significantly larger gains than those produced by concentrated rations.
2. Digestive disturbances were frequent in the lots receiving pelleted alfalfa and higher levels of concentrates.
3. Sodium bicarbonate was ineffective in controlling digestive disturbances in those lots receiving the more highly concentrated rations.
4. The rumen content of the lambs receiving the chopped hay was slightly more alkaline than that from lambs receiving the pelleted

PHYSICAL BALANCE IN LAMB FATTENING RATIONS.

Feeding period—February 2 to May 4, 1951

1. Lot number	1	2	3	4	5	6
2. Ration fed	Alfalfa	Corn Alfalfa hay	Corn Alfalfa hay Bi. soda	Corn Pelleted alfalfa	Corn Pelleted alfalfa	Corn Pelleted alfalfa Bi. soda
3. Ratio: Crude Fiber to T.D.N.	1 : 4	1 : 5.1	1 : 5.1	1 : 4	1 : 5.1	1 : 5.1
4. No. lambs per lot	10	10	9	7	8	10
5. No. days on feed	91	91	91	91	91	91
6. Initial weight per lamb	74.9	75.5	76.6	74.7	78.6	75.3
7. Final weight per lamb	99.4	99.8	101.2	103.3	101.0	93.4
8. Average weight of shorn fleece	5.25	5.35	5.39	4.71	5.30	5.20
9. Total gain per lamb	29.75	29.65	29.99	33.31	27.70	23.30
10. Daily gain per lamb	.326	.325	.329	.366	.304	.256
11. Feed per lamb daily:						
Corn	1.34	1.55	1.55	1.34	1.52	1.32
Alfalfa	1.47	1.11	1.11	1.47	1.10	1.10
Bicarbon. soda			.20			.20
12. Feed per cwt. gain:						
Corn	409	475	469	366	495	594
Alfalfa	448	341	337	399	361	427
Bicarbon. soda			19			24
13. Feed cost per cwt. gain	$15.65	$16.31	$17.03	$14.60	$17.68	$22.20
14. T.D.N. per lamb daily	1.89	1.87	1.87	1.87	1.87	1.84
15. Gain per 100 lbs. of T.D.N.	16.67	17.36	17.56	19.52	16.51	13.90

alfalfa. This is in agreement with previous observations.

5. The feed cost per hundredweight of gain was lowest for those lots in which a higher proportion of the ration was made up of roughage. The feeds used in the 1951 tests were purchased at the following prices:

Corn	$ 1.50 per bushel
Alfalfa hay	20.00 per ton
Alfalfa pellets	24.00 per ton
Sodium bicarbonate	4.85 per cwt.

Chemical Analysis of Feeds Used in 1951 Tests

	Protein	Ether extract	Crude fiber	Moisture	Ash	Nitrogen-free extract	Carbo-hydrates
Corn	7.81	4.08	2.06	12.06	1.43	72.56	74.52
Alfalfa hay	15.81	1.48	30.00	8.51	8.43	35.77	65.77
Alfalfa pellets	16.13	1.36	28.19	9.45	8.25	36.62	64.81

Project 111 GC: Lamb Feeding Experiments

Feedlot and Milo Stubble Fattening Tests with Feeder Lambs.

Studies Carried on by the Department of Animal Husbandry and the Garden City Branch Experiment Station.

T. Donald Bell and A. B. Erhart

The lamb feeding tests at the Garden City Branch Agricultural Experiment Station during the fall and winter feeding season of 1951-52 included the following studies:

1. A comparison of alfalfa hay and cottonseed cake as supplements for lambs running in harvested milo fields.
2. A comparison of ground milo grain and whole milo grain for fattening lambs.
3. A comparison of a ration including ground sorghum stover as the only roughage, and a ration including both stover and sorghum silage as sources of roughages.
4. Comparative performance of lambs that have received salt, with lambs that have not received salt during the entire feeding period.
5. A test of the effectiveness of vaccination against enterotoxemia and of bicarbonate of soda in the diet, in controlling "overeating" disease.
6. A comparison of hand-feeding and self-feeding.
7. Tests of the value of drenching for worm control.

Experimental Procedure

The lambs in this year's experiments were secured directly from the mountain range in Southern Utah, and included Columbia-Rambouillet crosses as well as lambs of Suffolk-Rambouillet breeding. They averaged 76 pounds at the range shipping point and 68 pounds off the cars at Garden City; after a period of 50 days of pasture and roughage feeding they were started on the experimental tests weighing 78 pounds.

The lambs were lotted into eight groups of 60 lambs each and given standard western rations of sorghum stover, sorghum grain, protein supplement, and limestone. After two lots of lambs reached an average daily grain ration of 1 pound per head, they were turned in to milo stubble. One lot was given alfalfa hay as a supplement and the other lot was given soybean pellets.

Two other lots of lambs were hand-fed grain until they were consuming nearly 2 pounds per head daily. They were then fed all of the grain and roughage that they would consume free choice. One-half

of the lambs in all lots were vaccinated against overeating disease, and one of the lots being fed free choice was given soda.

A portion of the sorghum stover was replaced by sorghum silage in one lot, the grain was ground for another lot, and the lambs in another lot received no salt.

One-half of the lambs in all lots were drenched and their gains compared with those of the undrenched lambs.

Feed Prices:

Westland milo	$ 2.50 per cwt.
Ground milo	2.50 per cwt.
Soybean pellets	101.45 per ton
Axtell stover	7.50 per ton
Alfalfa hay	40.00 per ton
Limestone	1.00 per cwt.
Salt	.90 per cwt.
Soda	4.85 per cwt.
Sorghum stubble	.01 per head per day
Axtell silage	8.00 per ton

TABLE 1.—Feedlot Tests with Fattening Lambs.
November 19, 1951, to February 21, 1952

1.	Lot number	1	2	3	4
2.	Ration fed	Milo Axtell stover Protein Limestone Salt	Milo (ground) Axtell stover Protein Limestone Salt	Milo Axtell silage Axtell stover Protein Limestone Salt	Milo Protein Axtell stover Ground limestone No salt
3.	Number of lambs per lot	60	59	60	60
4.	Number of days on feed	94	94	94	94
5.	Initial wt. per lamb	79.75	77.97	78.54	77.69
6.	Final wt. per lamb	107.60	109.89	111.17	102.34
7.	Total gain per lamb	27.85	31.92	32.63	24.65
8.	Daily gain per lamb	.296	.339	.347	.262
9.	Feed per lamb daily				
	Milo grain	1.26	1.26	1.15	1.26
	Axtell stover	2.40	2.40	.53	2.29
	Axtell silage			5.56	
	Alfalfa hay				
	Soybean pellets	.20	20	.20	.20
	Ground limestone	.019	.019	.019	.019
	Salt	.022	.027	.017	
10.	Feed per cwt. of gain				
	Milo grain	425.6	370.8	331.4	480.9
	Axtell stover	810.8	707.4	152.7	874.0
	Axtell silage			1602.3	
	Alfalfa hay				
	Soybean pellets	67.6	59.0	57.6	76.3
	Ground limestone	6.4	5.8	5.5	7.2
	Salt	7.4	7.9	4.9	
11.	Feed cost per cwt. of gain	$17.24	$15.41	$18.29	$19.24
12.	Feed cost per lamb	$ 4.80	$ 4.92	$ 5.97	$ 4.74
13.	Initial cost per lamb	$26.81	$26.21	$26.40	$26.12
14.	Number of lambs lost	0	0	0	0

15.	Cost of lamb loss*	0	0	0	0
16.	Total cost**	$31.61	$31.13	$32.37	$30.86
17.	Final cost per cwt.	$29.37	$28.33	$29.12	$30.15

* Includes initial value and cost of feed consumed by lambs lost up until death.
** Includes lines 12, 13, and 15.

TABLE 2.—Feedlot and Sorghum Stubble Pasture Fattening Tests. November 19, 1951, to February 21, 1952

1.	Lot number	5	6	7	8
		——Grain and stover—— free choice			
2.	Ration fed	Milo Axtell stover Protein Limestone Salt	Milo Axtell stover Protein Limestone Soda Salt	Milo stubble plus Alfalfa	Milo stubble plus Soybean pellets
3.	Number of lambs per lot	60	60	60	60
4.	Number of days on feed	94	94	94	94
5.	Initial wt. per lamb	77.86	77.36	77.77	78.61
6.	Final wt. per lamb	114.69	113.09	109.23	108.14
7.	Total gain per lamb	36.83	35.73	31.46	29.53
8.	Daily gain per lamb	.392	.380	.335	.320
9.	Feed per lamb daily				
	Milo grain	2.07	2.04	.11	.11
	Axtell stover	1.76	1.76	.29	.29
	Axtell silage				
	Alfalfa hay			.56	
	Soybean pellets	.20	.20	.02	.22
	Ground limestone	.019	.019	.019	.019
	Salt	.027	.019	.018	.018
	Soda		.020		
10.	Feed per cwt. gain				
	Milo grain	528.1	536.8	32.8	34.4
	Axtell stover	449.0	463.1	86.6	90.6
	Axtell silage				
	Alfalfa hay			167.2	
	Soybean pellets	51.0	52.6	6.0	68.7
	Ground limestone	4.8	5.0	5.7	5.9
	Salt	6.9	5.0	5.4	5.6
	Soda		5.3		
11.	Feed cost per cwt. gain..	$17.57	$18.19	$ 7.87	$ 7.91
12.	Feed cost per lamb	$ 6.47	$ 6.50	$ 2.47	$ 2.33
13.	Initial cost per lamb	$26.18	$26.01	$26.15	$26.43
14.	Number of lambs lost	0	0	1	1
15.	Cost of lamb loss*	0	0	$ .41	$ .68
16.	Total cost**	$32.65	$32.51	$29.03	$29.44
17.	Final cost per cwt.	$28.47	$28.75	$26.58	$27.22

* Includes initial value and cost of feed consumed by lambs lost.
** Includes lines 12, 13, and 15.

Observations

1. The two lots of lambs receiving their grain and stover free choice made larger gains than the lambs hand-fed a similar ration, but the gains were more expensive. These results are in accord with those obtained in previous years.

2. Larger and somewhat cheaper gains were made by the lambs receiving ground grain instead of whole grain. These results are in contrast to results obtained in similar studies in previous years at this and at other stations. The difference in the rate of gain of the two lots as indicated by the bi-weekly weights was small and the comparatively wide difference appeared only in the final weigh period.

3. The inclusion of silage in the ration increased the rate of gain but also increased the cost of gain by slightly more than $1.00 per hundredweight. The silage-fed lambs, however, gained at virtually the same rate as those receiving only stover as their roughage until the last 11 days of the feeding period; this test, as well as the comparison of ground and whole grain, needs to be repeated before reliable conclusions can be drawn.

4. The lambs receiving no salt in their ration made slower and more expensive gains than the lambs in any of the other lots.

5. The average daily gains of the variously treated lambs in all of the lots were as follows:

	Number of Lambs	Av. Daily Gain
Vaccinated	119	.355 lb.
Drenched	120	.321 lb.
Vaccinated and drenched	119	.331 lb.
No treatment	120	.345 lb.

The comparatively low rate of gain made by the drenched lambs was shown in nearly all of the lots and is consistent with a similar test a year ago.

The slightly larger gains made by the vaccinated lambs were not consistent in all lots and probably not significant. The death loss (two in all lots) was too low to allow any conclusions concerning the effectiveness of the vaccine or of the soda. The only lamb dying of overeating disease during the test, however, had been vaccinated.

6. The cheapest gains were made by the lambs running on the milo stubble. Slightly larger and cheaper gains were made by the lambs receiving alfalfa hay than those receiving soybean pellets. Gains were slow on the stubble during the first part of the grazing period, because of digestive disturbances; but once the lambs became accustomed to the grain, the gains were as high as those made by the self-fed lambs in the dry lot.

Comparative Lambing Dates of Untreated Ewes and Ewes Treated with Various Hormone Preparations.

T. Donald Bell and Walter H. Smith

Introduction

Many of the producers of commercial lambs in Kansas prefer to have their ewes lamb in the fall months, in order to secure more favorable lamb prices during the spring months and to avoid having the lambs on hand during the hotter summer months when parasites are more troublesome. Unfortunately, not all of the ewes will breed for fall lambs, and various systems of management as well as different treatments have been used to encourage earlier and more uniform lamb crops. In recent years considerable publicity has been given to hormones of various types and their possible effectiveness in producing earlier lamb crops. Because of this publicity and its

Table 1.—Comparative Lambing Dates of Untreated Ewes and Ewes Treated with Various Hormone Preparations.

Experimental groups			Treatments—Hormones used											
			Gonadotropic			Natural Estrogenic			Synthetic-Stilbestrol			No treatment		
Flock No.	No. of sheep	Type and age of sheep	No. in group	Average lambing date*	Number left to lamb**	No. in group	Average lambing date*	Number left to lamb**	No. in group	Average lambing date*	Number left to lamb**	No. in group	Average lambing date*	Number left to lamb**
1	62	Fine—yr.	21	Dec. 20	7	21	Dec. 20	3				20	Jan. 3	3
2	59	Fine—yr.	20	Nov. 26	0	20	Dec. 24	5				19	Dec. 1	0
3	120	Fine—mature	40	Nov. 24	4	20	Dec. 4	11	20	Dec. 5	6	40	Dec. 1	7
4	76	N.West—2 yr.	34	Dec. 20	2	17	Jan. 6	6				25	Dec. 13	1
5	203	N.West—3 yr.	53	Dec. 6	7	50	Dec. 26	20	50	Dec. 1	10	50	Dec. 3	5
6	331	Fine—6 yr.	50	Nov. 22	12	90	Dec. 9	50	90	Nov. 28	17	101	Nov. 25	7
7	78	Fine—3 yr.	31	Nov. 27	3	30	Dec. 13	7	6	Nov. 20	3	21	Nov. 23	0
8	24	Fine—mature	15	Dec. 14	3							9	Dec. 20	0
All	953		264	Dec. 3	37	238	Dec. 17	102	166	Nov. 30	36	285	Dec. 1	23

* Includes all ewes lambing up to February 1.

** Includes all ewes remaining to lamb after February 1.

influence upon Kansas sheepmen, an extensive study under controlled conditions was carried out in a number of co-operators' flocks here in Kansas.

Experimental Procedure

Approximately 1000 commercial ewes of different ages and types, and 400 purebred ewes of three different breeds, were included in the study. Three hormone preparations available on the market and similar to others being offered for sale were used. One of these was a gonadotropic hormone prepared from dried sheep pituitaries; another was a synthetic estrogenic (or heat producing) hormone known as Stilbesterol; and the third product used was a naturally-occurring estrogenic material obtained from pregnancy urine. Different groups of ewes in each flock were given these preparations during the early part of June, 1951, and their subsequent breeding and lambing dates compared with groups within each flock that were untreated. The accompanying table gives the results of the study on the commercial ewes.

Results

1. The two estrogenic hormones generally produced heat or estrual periods following injection, but the ewes commonly did not settle during this artificial heat period.
2. Only a small percentage of the ewes injected with the gonadotropic material came into heat following injection, but a large proportion of those that came into heat conceived following breeding during this period. The exact percentage responding to treatment could not be checked accurately because some of the ewes were breeding normally with or without injection during this period.
3. The hormones generally failed to produce earlier or more uniform lamb crops, and one of the hormones used apparently interfered with normal reproductive activities and produced a later and less uniform lamb crop than was obtained from the uninjected ewes.

Project Commercial 108: Salt Research with Feeder Lambs

(Chemical and Physiological Studies)

E. L. Hix, T. D. Bell, D. B. Parrish, and A. L. Good

The consumption of salt by herbivorous animals in general, and their apparent relish for salt, have been recognized for many years, but its importance may be questioned by many because of lack of knowledge of both the practical and fundamental aspects. It is commonly believed that the large amounts of potassium in feeds are antagonistic to the animal's body sodium, and this potassium causes an excretion or loss of sodium which may be adequately replaced only by practical salt (NaCl) supplementation of the feed or ration. However, this belief has not been established conclusively in all of its elaborations designed to explain why these herbivorous animals require supplemental salt.

The following summary is the result of studies with feeder lambs designed to (a) determine the influence of supplementary salt on feed-lot performance; (b) study the effect of dietary sodium to potassium ratio on performance, feed digestibility, balance of minerals (Na,K,Cl), and physiologic blood plasma constituents as they are functionally related to the water compartments of the animal's body, and (c) ascertain the existence and extent of sodium-potassium antagonism.

Experimental Procedure

In a single feeding trial, 50 feeder lambs were divided unequally into four lots. All lots received a basal ration of corn and alfalfa hay.

Table 1.—Digestibility of Corn-Alfalfa Ration by Wether Lambs. Each Lot Average of Three Lambs.

Lot No.	Experimental treatment	Na:K ratio	Average coefficient of digestibility						Index coefficient
			Dry matter	Crude protein	Ether extract	Crude fiber	NFE	Ash	
1	$KHCO_3$	1:82	75	70	55	46	87	59	65
2	$NaHCO_3$	1:2	76	72	59	45	88	64	67
3	NaCl	1:2	77	74	63	49	88	64	69
4	Basal	1:45	75	70	59	46	87	60	66

Table 2.—Physiologic Blood Plasma Constituents of Wether Lambs. Each Lot Average of Three Lambs.

Lot No	Na:K ratio	CO_2 vol. %	NPN mg %	CHON Gms %	Ib Gms %	Ca++ mg %	P++++ mg %	Mg++ mg %	Na+ mg %	Cl− mg %
1	1:82	38.3	28.5	6.54	12.0	12.7	6.2	1.83	339	356
2	1:2	54.0	31.9	6.98	13.3	12.7	7.3	1.75	354	372
3	1:2	52.0	31.7	6.45	13.0	12.5	7.4	1.89	354	388
4	1:45	46.7	32.2	6.42	12.4	13.3	6.8	2.05	352	385

In addition to the basal ration, Lot 1 received 32.3 gms of potassium bicarbonate ($KHCO_3$), adjusting the Na:K ratio to 1:82; Lot 2, 30.3 gms of sodium bicarbonate ($NaHCO_3$), adjusting the Na:K ratio to 1:2; Lot 3, salt (NaCl) ad lib (21 gms daily), adjusting the Na:K ratio to 1:2; and Lot 4, basal ration only, the Na:K ratio being 1:45.

After a feeding period of 96 days, three wether lambs from each of the four lots (total of 12 lambs) were placed in metabolism stanchions for 21 days for the mineral balance and digestibility determinations. On the last day of the balance, blood samples were taken and analyzed for carbon dioxide (CO_2 or alkali reserve), non-protein-nitrogen (NPN), protein (CHON), hemoglobin (Hb), and the minerals calcium (Ca^{++}), phosphorus (P^{++++}), magnesium (Mg^{++}), sodium (Na^{+}), potassium (K^{+}), and chloride (Cl^{-}).

On the same day the Na:K ratios in Lots 2 and 4 were changed to 1:82 (formerly 1:2) and 1:2 (formerly 1:45) respectively, for the antagonism study. The antagonism was studied for seven days.

Results

The feed-lot performance was tentatively summarized in the "38th Annual Livestock Feeders' Day." The differences in digestibility are indicated in Table 1, and changes in blood plasma constituents in Table 2.

1. Mineral balance: lambs receiving the basal ration only (Na:K-1:45), and those receiving $KHCO_3$ (Na:K = 1:82), were in negative balance, the daily losses of body sodium being 53 and 22 mg respectively. The quantitative sodium intake was equal in these two lots and the excretion of sodium appears to be a function of the Na:K ratio.

2. Lambs in negative sodium balance retained considerably more potassium than did animals receiving salt or sodium bicarbonate.

3. Excessive sodium excretion leads to potassium retention; and as the dietary sodium: potassium ratio grows progressively wider (from 1:45 to 1:82), sodium excretion increases directly.

4. Sodium: potassium antagonism definitely exists, but it may subsidize to small negative or positive sodium balances after a three-day period.

5. Withholding salt depletes the animal's body sodium through promoting Na:K antagonism, and possibly by not supplying adequate dietary sodium. It also lowers the digestibility of all nutrient components of the feed by 3 to 4 percent. The alkali reserve, or the animal's ability to neutralize nutritional acids, is also reduced.

6. Lambs on the widest Na:K ratio (1:82) performed poorly, showed less digestibility of feed, and showed significantly lower sodium and chloride levels of blood plasma; their bodies were dehydrated by approximately 4 percent.

Project 286: Improvement of Beef Cattle Through Breeding Methods

Walter Smith, Ed Smith, H. L. Ibsen, and Lewis Holland

The purebred Shorthorn herd maintained at Manhattan is being used as a primary basis for the purebred cattle breeding investigations which started at the Kansas station three years ago. The project is still in its preliminary stages, and the systems of breeding which have been adopted were regulated primarily by the pedigrees of the foundation females in the original college herd.

The project has been designed to facilitate the collection of production data which will be used to devise testing and breeding procedures

useful to cattlemen for the improvement of beef cattle through breeding methods.

In recent years attention has been directed toward research in cattle breeding which has emphasized the selection of breeding animals on the basis of economic factors such as rate of growth or weight for age, economy of gain, and type scores.

The purpose of the Shorthorn project is to study the usefulness of criteria in cattle selection and to determine the practicability of inbreeding to establish two high-producing lines of Shorthorn cattle.

An inbreeding program was initiated in 1949 to establish a line of a Wernacre Premier foundation by breeding the cow herd to College Premier 29th 2368167. Approximately one-half of the females that calved during 1950 were half sisters to College Premier 29th. These calves were placed on feeding trials in the fall of 1950. These trials were completed during the summer of 1951.

The cows in the project are pasture-bred to calve in the spring of each year. The calves are not creep-fed during the suckling period. The 1950 calves were weaned at 196 days of age and placed on feeding trials for a 196-day period following an adjustment period after weaning. Both the weaning age and feeding trial periods were shortened to 182 days in 1951 to facilitate the feeding and breeding management of the project, since data obtained from these shortened periods are believed to be as reliable and useful as those from the original plan. All calves are fed individually, and periodic gains and feed consumption records are recorded. The individual performance data provide part of the information used to select breeding animals in the project. Desirable animals are those which possess rapid gaining ability, good type scores, and efficiency of feed utilization.

The feeding trial data for the 1950 calf crop are summarized in Table 1. The steers consist of the bull calves that were castrated immediately after weaning. The full-feed ration for the bulls and steers consisted of 60 percent cracked corn and 40 percent chopped alfalfa hay, and that for the heifers consisted of 55 percent corn and 45 percent alfalfa hay.

The steers were maintained on a fattening ration following the termination of the regular feeding trials, and were slaughtered in the College meats laboratory during August and September. Detailed carcass data were obtained on these six individuals.

The bull possessing tag number 81 was used during the summer of 1951 to breed the heifers from the same calf crop. These heifers will calve as two-year-olds during the summer of 1952.

Gregg Farms Hoarfrost 2492499, a son of Edellyn Valiant Mercury 2247154, was purchased in 1949 and used as one of the sires in the Shorthorn herd during 1950. A second inbred line of Mercury breeding will be established this year. The 1951 calf crop was sired by College Premier 29th and Gregg Farms Hoarfrost.

The 1951 calf crop was weaned as the calves reached 182 days of age, and placed on feeding trials last fall. A partial summary of these calves is presented in Table 2. The feeding trials are not complete at this time but will terminate after 182 days.

Direct comparisons of data for the calves of the two sire groups are not justifiable because several nongenetic factors cause variation in these groups. The information contained in Tables 1 and 2 illustrates the variation which may be expected in the progeny of single sires.

Table 1.—Summary of the 1950 Shorthorn Calves Representing the Wernacre Premier Inbred Line.

Tag number	Coefficient of inbreeding	Birth weight	Weaning weight	Weaning score	Days fed	Initial weight	Final weight	Total gain	Av. daily gain	Final score	Lbs. TDN per 100 lbs. gain
					BULLS						
19	6.25	52.5	440	2	196	480	920	440	2.24	2	523
11	12.50	70.0	445	2+	196	495	975	480	2.45	2	538
13	18.75	74.0	455	2−	196	475	960	485	2.47	3	504
23	3.19	66.0	480	2+	196	490	980	490	2.50	2+	481
81	14.06	76.0	500	2+	196	530	1145	615	3.14	2+	514
61	0.00	90.0	510	3	196	535	1020	485	2.47	3−	516
54	14.06	74.0	440	2−	196	445	930	485	2.47	3	441
Av.	9.82	71.8	467	2	196	493	990	497	2.53	2−	502
					STEERS						
55	6.25	69.0	425	2	196	455	880	425	2.17	2+	573
90	6.25	70.0	445	2+	196	465	875	410	2.09	2	613
56	12.50	77.0	410	3+	196	425	865	440	2.24	2−	613
87	7.80	65.0	355	2	196	375	825	450	2.30	2	570
53	0.00	74.5	465	2	196	480	865	385	1.96	2+	646
760	6.25	75.0	420	2+	196	425	840	415	2.12	2	538
Av.	6.50	71.8	420	2	196	438	858	421	2.15	2	575
					HEIFERS						
189	15.60	78.5	440	2	196	475	825	350	1.79	2	663
72	0.00	71.0	475	1	196	475	850	375	1.91	1−	550
4	18.75	60.5	325	3	196	340	690	350	1.79	3	526
58	15.60	57.0	320	3+	196	360	650	290	1.48	3	579
92	15.60	67.5	435	2	196	440	760	320	1.63	2	653
2	12.50	80.0	400	2−	196	420	725	305	1.56	2−	590
39	15.60	77.0	420	2−	196	410	720	310	1.58	2−	575
14	6.25	70.0	380	2	196	425	765	340	1.73	1−	795
Av.	12.50	70.2	401	2	196	418	748	330	1.68	2	616

Table 2.—Partial Summary of the 1951 Shorthorn Calves Representing the Wernacre Premier and Mercury Inbred Lines.

Tag number	Coefficient of inbreeding	Birth weight	Weaning weight	Weaning score	Initial weight	Weight on 1/1/52	Days on trial 1/1/52	Daily gain during trial
				Wernacre Premier Line				
				BULLS				
81	6.25	78.0	470	2−	534	800	128	2.08
120	15.60	80.0	425	2−	454	687	104	2.24
189	14.06	71.0	515	2+	637	1019	128	2.98
	Av. 11.90	76.3	470	2	542	835	120	2.43
				STEERS				
39	3.10	66.0	400	3+	533	738	128	1.60
61	18.75	81.0	406	3−	555	800	128	1.92
	Av. 11.00	73.5	406	3	544	769	128	1.76
				HEIFERS				
154	0.00	69.0	410	2+	553	770	128	1.70
14	14.10	69.0	405	2−	434	662	128	1.78
72	12.50	74.0	416	2+	485	775	128	2.27
108	6.25	74.0	400	2+	416	604	104	1.80
58	15.60	66.0	358	2−	384	557	104	1.66
105	18.75	74.0	310	3	338	500	104	1.56
	Av. 11.20	71.0	382	2−	435	645	116	1.80

Table 2 cont.

Tag number	Coefficient of inbreeding	Birth weight	Weaning weight	Weaning score	Initial weight	Weight on 4/1/52	Days on trial 4/1/52	Daily gain during trial
Mercury Line								
BULLS								
760	0.00	74.0	445	1−	537	906	128	2.88
49	0.00	58.0	435	1+	Injured Jan. 21, removed from feeding trial			
Av.	0.00	65.0	440	1				
STEERS								
4	0.00	52.0	380	1−	425	702	128	2.16
92	0.00	67.0	410	2	440	762	128	2.59
Av.	0.00	59.5	395	2+	433	732	128	2.38
HEIFERS								
13	0.00	60.0	355	2	381	580	128	1.55
23	0.00	54.0	355	2	393	590	128	1.54
2	0.00	71.0	440	1	454	681	128	1.77
87	0.00	58.0	325	2−	329	504	128	1.37
53	0.00	53.0	340	2	375	645	128	2.11
90	0.00	43.0	260	3−	280	480	128	1.56
55	0.00	56.0	400	1−	471	708	128	1.85
56	0.00	59.0	343	1−	367	495	104	1.23
22	0.00	58.0	355	1−	355	530	104	1.68
180	0.00	56.0	300	2	309	520	104	2.03
Av.	0.00	57.0	347	2	371	573	121	1.67

Project 329: Factors Affecting Gains

F. W. Bell, E. F. Smith, and W. H. Smith

Cattle in the same feedlot differ considerably in their rate of gain. These differences in ability to gain can be explained only by differences in characteristics of individual animals, since all are under the same conditions of feeding and care. In this study we are trying to determine what differences in thin cattle are reliable indications of gaining ability. A record of several characteristics is made of each animal at the beginning of the feeding trials. Each animal is rated for each of the following parts and factors:

1. Head
2. Front legs
3. Chest
4. Body
5. Flank
6. Bone
7. Hips
8. Hindquarters
9. Hind legs
10. Natural fleshing
11. Disposition
12. Frame
13. Probable gain

Six different ratings are used for each factor, a rating of one being given where the part is especially good, and a rating as low as six when a part is very poor. All ratings are made by three members of the staff to obtain an average rating for each factor.

These ratings will be treated statistically to determine the degree of correlation of each factor with the actual gains made by the cattle. When a sufficient amount of this material can be analyzed and interpreted by our statistical laboratory, further conclusions can be drawn concerning factors which influence rate of gain. The following tables list the estimated rank in ability to gain as compared to actual gains of the cattle.

Table I

Three lots of steer calves—full-fed grain 225 days.

Ranking	First	Second	Third	Fourth	Fifth	Sixth
No. steers ranked	1	6	9	8	4	0
Av. gain per steer, lbs.	553	497	485	460	431	

Table II

Three lots of yearling steers wintered without grain—205 days.

Ranking	First	Second	Third	Fourth	Fifth	Sixth
No. steers ranked	2	9	10	6	3	0
Av. gain per steer, lbs.	283	263	194	139	93	

Table III

Three lots of yearling steers—wintered without grain—grazed May 8 to October 15—313 days total.

Ranking	First	Second	Third	Fourth	Fifth	Sixth
No. steers ranked	2	9	10	6	3	0
Av. gain per steer, lbs.	420	383	349	310	275	

Project 253-1: Wintering and Grazing Steer Calves

Methods of Wintering Steer Calves That Are To Be Grazed a Full Season and Sold Off Grass—1950-51.

E. F. Smith, R. F. Cox, D. L. Good

Introduction

The primary objective of this test was to find the most satisfactory method or methods of wintering steer calves that are going to be

grazed on bluestem pasture during the summer and sold off grass as feeder yearlings. This is the second in a series of three tests. The third test is now under way and the wintering phase is reported in this publication.

Experimental Procedure

Five lots of good quality Hereford steer calves, 10 head to a lot, were used in this study. All were wintered in a dry lot except Lot 1, which was fed out on bluestem pasture. The different lots received the following wintering rations from December 5, 1950, to May 1, 1951, and were then grazed together on bluestem pasture until October 5, 1951.

Lot 1—bluestem pasture and 2 pounds of soybean pellets per head daily.

Lot 2—sorghum silage (Tennessee orange) and 1 pound of soybean pellets per head daily.

Lot 3—prairie hay and 1 pound of soybean pellets per head daily.

Lot 4—prairie hay, 2 pounds of ground milo grain, and 1 pound of soybean pellets per head daily.

Lot 5—prairie hay, 4 pounds of ground milo grain, and 1 pound of soybean pellets per head daily.

The calves used in this test originated in the vicinity of Sonora, Texas, and arrived at Manhattan November 3, 1950. They were a part of a shipment of 120 head. From November 3 until they were placed on test they received prairie hay, sorghum silage, and a small amount of alfalfa. They were also taught to eat a protein concentrate during this period. They were sprayed with B.H.C. for lice.

The calves had free access to salt at all times during the test and were given free access to a mixture of 2 parts bonemeal and 1 part salt about the last third of the wintering period.

A feedstuff analysis of the feeds used in the test may be found in the back of this publication.

The final weights are full weights and should be shrunk at least 3 percent for a more complete picture of steer gain.

Observations

1. The results of this test indicate the most satisfactory method of wintering may be on dry bluestem pasture. This was also true in Experiment 1, conducted in 1949-50. The large winter gain obtained both years is probably due largely to the bluegrass present in the sheltered creek bottom pasture where the calves were wintered. The winters of 1949-50 and 1950-51 were mild and ideal for wintering cattle on dry grass in this area.

2. Lot 2, wintered on sorghum silage and 1 pound of soybean pellets, failed to make as much yearly gain as any of the other lots. This was probably due to the poor quality silage fed. It looked good but was quite acid, contained little gain, and the calves didn't like it.

3. The calves fed prairie hay cut about September 1, and 1 pound of soybean pellets daily made a larger winter gain, larger yearly gain, and returned more per steer than those fed poor quality sorghum silage.

4. The results of this test indicate it is not profitable to add grain to the wintering ration of steer calves that are going to be grazed a full season and sold off grass. Lot 4 was fed 2 pounds of grain per head daily and Lot 5 received 4 pounds of grain per head daily in addition to prairie hay and 1 pound of soybean pellets per head daily; both had a larger yearly feed cost per 100 pounds of gain and a larger yearly feed cost per steer, and returned less per steer than Lot 3 fed only prairie hay and 1 pound of soybean pellets per head daily.

Phase I—Wintering

December 5, 1950, to May 1, 1951—147 days[1]

1. Lot number	1	2	3	4	5
2. No. of steers per lot	10	12	10	10	10
3. Place wintered	Bluestem pasture	Dry lot	Dry lot	Dry lot	Dry lot
4. No. of days in phase[2]	134	147	147	147	147
5. Av. daily ration, lbs.:					
Ground milo grain				2.00	4.00
Soybean pellets	2.00	1.00	1.00	1.00	1.00
Prairie hay	.50		12.92	11.18	10.49
Sorghum silage (Tenn. orange)		28.35			
Salt	.03	.15	.05	.06	.06
Mineral mixture[3]	.02	.01	.01	.01	.01
Bluestem pasture	ad lib				
6. Av. initial weight	419	419	419	418	418
7. Av. final weight	532	529	574	597	640
8. Av. gain	113	110	155	179	222
9. Av. daily gain	.84	.75	1.05	1.22	1.50
10. Feed required for 100 lbs. gain, lbs.:					
Ground milo grain				164.80	264.86
Soybean pellets	237.17	134.09	95.16	82.40	66.22
Prairie hay	59.12		1225.61	917.99	694.68
Silage		3788.88			
Salt	3.20	19.66	5.12	4.99	4.26
Mineral mixture	2.94	.75	.65	.56	.45
Bluestem pasture	ad lib				
11. Feed cost per cwt. gain[4]	$13.88	$17.32	$11.61	$12.91	$13.14
12. Feed cost per steer[5]	$15.68	$19.05	$18.00	$23.11	$29.17

Phase II—Grazing

May 1, 1951, to October 5, 1951—157 days[1]

1. Lot number	1	2	3	4	5
2. No. of days in phase	170	157	157	157	157

3. Av. initial weight	532	529	574	597	640
4. Av. final weight	836	809	833	839	848
5. Av. gain	304	280	259	242	208
6. Av. daily gain ..	1.79	1.78	1.65	1.54	1.32
7. Cost of grazing per steer	$15.00	$15.00	$15.00	$15.00	$15.00
8. Cost of 100 lbs. pasture gain	$ 4.93	$ 5.36	$ 5.79	$ 6.20	$ 7.21

Summary of Phases I and II

December 5, 1950, to October 5, 1951—304 days

1. Lot number	1	2	3	4	5
2. Av. initial weight	419	419	419	418	418
3. Av. final weight	836	809	833	839	848
4. Average gain ..	417	390	414	421	430
5. Av. daily gain ..	1.37	1.28	1.36	1.38	1.41
6. Feed required for 100 lbs. gain:					
Milo grain				70.07	136.74
Soybean pellets	64.27	37.82	35.63	35.04	34.19
Prairie hay	16.02		458.86	390.31	358.65
Silage		1348.79			
Salt	.87	5.55	1.92	2.12	2.20
Mineral mixture	.80	.21	.24	.24	.23
Winter bluestem pasture ..	ad lib				
Summer bluestem pasture ..	ad lib	ad lib	ad lib	ad lib	ad lib
7. Feed cost per 100 lbs. gain[2] ..	$7.36	$8.73	$7.97	$9.05	$10.27
8. Feed cost per steer[3]	$30.68	$34.05	$32.99	$38.11	$44.18
9. Initial cost per steer at $31.50 cwt.	$131.99	$131.99	$131.99	$131.67	$131.67
10. Total cost of feed and steer ..	$162.67	$166.04	$164.98	$169.78	$175.85
11. Selling price per steer at $35.00[1] cwt.	$283.85	$274.75	$282.80	$284.90	$288.05

12. Return per steer above initial cost and feed cost	$121.18	$108.71	$117.82	$115.12	$112.20

1 Grazing phase for Lot 1 began April 18, 1951, rather than May 1, 1951.
2 Prairie hay was fed to Lot 1 only when snow covered the grass.
3 Mineral mixture consisted of 2 parts bonemeal and 1 part salt. Fed only last ⅓ of wintering period.
4 Selling price per steer is based on a selling price of $35.00 cwt., and market weight, which represents an average shrink of 3 percent from home weights.
5 Feed prices: Milo grain, $2.30 cwt.; Soybean pellets, $75.00 ton; Prairie hay, $13.00 ton; Sorghum silage, $6.50 ton; Salt, $12.00 ton; Steamed bonemeal, $5.50 cwt.; Winter pasture, $5.00 season; Summer pasture, $15.00 season.

Project 253-1: Wintering and Grazing Steer Calves

Methods of Wintering Steer Calves That Are To Be Grazed a Full Season and Sold Off Grass, 1951-52.

E. F. Smith, D. L. Good, and R. F. Cox

Introduction

This is a report on the wintering phase of this test. It will be completed at the close of the grazing season in 1952. This study is to determine the best method of wintering good quality steer calves that are to be grazed on bluestem pastures the following summer and sold off grass.

Experimental Procedure

Five lots of good quality Hereford steer calves, 10 head to a lot, were used in this study. They were a part of the light end of a group of 150 steer calves originating at Marfa, Texas, and purchased for experimental purposes.

They were received November 8, 1951, and started on test December 22, 1951. Until they were started on test, they were fed sorghum silage, prairie hay, and 1 pound of cottonseed cake per head daily with free access to salt. During the experiment all were fed in dry lot, except Lot 1, which was fed out on dry bluestem pasture. All lots had free access to a mineral mixture (bonemeal and salt) and salt during the winter. The different lots received the following rations from December 22, 1951, to April 5, 1952:

Lot 1—bluestem pasture and 2 pounds cottonseed meal pellets per head daily, salt, and bonemeal and salt mineral mixture.

Lot 2—sorghum silage and cottonseed cake per head daily, salt, and mineral (bonemeal and salt).

Lot 3—prairie hay and 1 pound cottonseed cake per head daily, salt, and mineral (bonemeal and salt).

Lot 4—prairie hay, 2 pounds milo grain, and 1 pound cottonseed cake per head daily, salt, and mineral (bonemeal and salt).

Lot 5—prairie hay, 4 pounds milo grain, and 1 pound cottonseed cake per head daily, salt, and mineral (bonemeal and salt).

All lots will be grazed on bluestem pasture a full season in 1952 and sold as feeder yearlings in the fall.

Observations

1. The steer calves in Lot 1, wintered on dry bluestem pasture, were strong and thrifty and made a satisfactory gain. With the exception

of the month of December and the first week of March, the winter was very favorable for wintering outside. The calves were wintered in a 190-acre bluestem pasture with 10 heifer calves. The pasture was stocked at a normal rate during the summer season, but a plentiful supply of dry, dead grass remained.

2. Lot 2, fed sorghum silage (Tennessee Orange the first half of the winter and Atlas and Black Amber mixed the last half) consumed a smaller amount of silage than normal, due to poor quality silage. They also failed to gain as much as the calves in Lot 3 fed prairie hay.

3. The steers in Lot 3 made a satisfactory gain on good quality prairie hay that was cut August 10-20.

4. The addition of grain to the wintering rations of Lots 4 and 5 increased the gains in those lots to the extent that they could be sold for less per cwt. than any of the other lots and pay initial costs plus feed costs.

Wintering and Grazing Steer Calves

Phase I—Wintering

(December 22, 1951, to April 5, 1952—105 days[1])

1.	Lot number	1	2	3	4	5
2.	No. steers in lot	10	10	10	10	10
3.	Place of wintering	Bluestem pasture	Dry lot	Dry lot	Dry lot	Dry lot
4.	Av. initial weight, lbs.	388	389	389	390	391
5.	Av. final weight, lbs.	446	463	484	527	547
6.	Av. gain, lbs. ..	58	74	95	137	156
7.	Av. daily gain, lbs.	.57[1]	.70	.90	1.30	1.49
8.	Av. daily ration, lbs.:					
	Ground milo grain				2.60	4.02
	Cottonseed cake, or pellets	1.99	1.09	1.00	1.00	1.00
	Prairie hay ..	1.42[2]		10.78	10.23	10.37
	Sorghum silage		20.67			
	Salt	.05	.12	.06	.07	.06
	Mineral mixture[3]	.04	.14	.12	.12	.09
	Dry bluestem pasture	ad lib				
9.	Feed required for 100 lbs. gain, lbs.:					
	Ground milo grain				153.28	270.51
	Cottonseed cake or pellets	346.55	141.89	110.53	76.64	67.31

	Prairie hay ..	246.55		1191.47	784.38	698.14
	Sorghum silage		2933.11			
	Salt	7.93	17.70	6.21	5.04	3.78
	Mineral mixture	6.64	19.32	13.05	9.23	6.15
	Dry bluestem pasture	ad lib				
10.	Cost of feed per 100 lbs. gain[4]	$21.56	$17.70	$15.16	$14.49	$16.51
11.	Total feed cost per steer[4]	$13.34	$13.10	$14.40	$19.86	$25.76
12.	Initial cost per steer @ $41 per cwt.	$159.08	$159.49	$159.49	$159.90	$160.31
13.	Initial cost plus feed cost	$172.42	$172.59	$173.89	$179.76	$186.07
14.	Necessary selling price per cwt. to cover initial cost plus feed cost	$38.66	$37.27	$35.93	$34.11	$34.02
15.	Appraised value per cwt. May 3, 1952	$	$	$	$	$

1 The wintering period for Lot 1 was 101 days.
2 Prairie hay was fed to Lot 1 on dry bluestem pasture only when necessary.
3 Mineral mixture was composed of 2 parts steamed bonemeal to 1 part salt.
4 Feed prices may be found on page 58 of this publication.

Wintering Steer Calves on Alfalfa Silage, 1951-52

R. F. Cox and E. F. Smith

Introduction

This test was intended to compare alfalfa silage with alfalfa hay as a roughage for wintering steer calves by feeding nonwilted alfalfa silage to one lot, wilted alfalfa silage to another, and alfalfa hay to a third lot. However, the alfalfa hay lot was omitted this year because of a lack of hay comparable to the silage.

Experimental Procedure

Eighteen good quality Hereford steer calves were used in the test. They were part of a group of 150 steer calves obtained from Marfa, Texas, for experimental purposes. They were divided into two lots of 9 head each and started on test December 22, 1951. Both lots were given free access to a mineral mixture and salt. Lot 1 was fed nonwilted alfalfa silage, and Lot 2 was fed wilted alfalfa silage. No preservative was added to either silage. Each type of silage was stored separately in small tile silos. The silage was made from second-cutting alfalfa approaching full bloom. The nonwilted silage

was somewhat more mature than the wilted silage. The calves were fed all of the silage they would eat twice daily.

Observations

1. Nonwilted or wilted alfalfa silage put up without a preservative did not prove satisfactory in this test as the only roughage for wintering steer calves.
2. Wilted alfalfa silage was superior to nonwilted alfalfa silage in producing steer gains.
3. The calves on the nonwilted alfalfa silage did not consume enough silage to meet their dry matter requirement. They simply did not get enough to eat, although they were fed all they would clean up. The test was discontinued after 86 days, due to a shortage of wilted alfalfa silage and to the condition of the calves.
4. Following is the analysis of the two types of alfalfa silage:

Type	Moisture %	Protein %	Fat %	Fiber %	N-free ext. %	Ash %	Carotene dry basis mg/100gm
Nonwilted	75.28	4.00	.93	9.84	7.44	2.51	.63
Wilted	57.00	7.58	.89	16.50	13.61	4.40	.36

Wintering Steer Calves on Alfalfa Silage

(December 22, 1951, to March 17, 1952—86 days)

1.	Lot number	1	2
2.	Number steers per lot	9	9
3.	Ration fed	Nonwilted silage	Wilted silage
4.	Average initial weight, lbs.	387	387
5.	Average final weight, lbs.	372	412
6.	Average gain, lbs.	—15	25
7.	Average daily gain, lbs.	—.17	.29
8.	Average daily ration, lbs.:		
	Nonwilted alfalfa silage, no preservative	24.87	
	Wilted alfalfa silage, no preservative		21.83
	Salt	.04	.04
	Mineral[1]	.05	.04

1 Composed of 2 parts steamed bonemeal to 1 part salt.

Project 253-2: Wintering, Grazing, and Fattening Heifers, 1950-51

E. F. Smith, R. F. Cox, D. L. Good, and D. L. Mackintosh

Introduction

This test was to obtain further information about fattening heifers in regard to the following points:

1. Cottonseed oil meal as compared to soybean oil meal as a protein supplement in winter rations.
2. Influence of the level of wintering on future gain and finishing of heifers.
3. Extending the grazing season on bluestem pasture for heifers that are to be finished for a fall market.
4. Compare full-feeding grain on brome grass to full-feeding grain in dry lot.

5. Compare various methods of wintering, grazing, and fattening heifers.

Experimental Procedure

Seventy good quality Hereford heifer calves were purchased for $31.50 a hundredweight in east central Kansas and received October 1, 1951. The pay weight was 425 pounds per head. It was necessary to dehorn most of the heifers after they were received. They were started on test November 30, 1951, at an average weight of about 440 pounds. Five heifers were removed from different lots during the wintering period, two because of lead paint poisoning and three because of no gain. The seven lots of heifers received the following treatment:

Lot 1—wintered on 2 pounds grain, soybean oil meal pellets, sorghum silage, and prairie hay; grazed May 2 to July 20 on bluestem pasture; full-fed 100 days in dry lot.

Lot 2—wintered on 2 pounds grain, soybean oil meal pellets, sorghum silage, prairie hay; grazed April 16 to July 1 on brome pasture; started on grain on brome pasture June 1; moved to dry lot July 1 for completion of 100-day full-feeding period.

Lot 3—wintered on 2 pounds grain, cottonseed oil meal pellets, sorghum silage, prairie hay; full-fed grain on brome pasture for 100 days from April 16 to July 25.

Lot 4—wintered on 2 pounds grain, cottonseed oil meal pellets, sorghum silage, prairie hay; full-fed grain 100 days in dry lot after wintering period.

Lot 5—wintered on 4 pounds of grain, soybean oil meal pellets, sorghum silage, prairie hay; full-fed 100 days in dry lot following the wintering period.

Lot 6—wintered on sorghum silage, prairie hay, soybean oil meal pellets; bluestem pasture May 2 to July 20; full-fed 100 days in dry lot after July 20.

Lot 7—wintered on sorghum silage, prairie hay, soybean oil meal pellets; bluestem pasture May 2 to August 16; fed soybean oil meal pellets July 18 to August 16 on bluestem pasture; full-fed grain 72 days in dry lot after August 16.

The sorghum silage (Tennessee Orange) was very acid and contained very little grain, and the heifers did not consume it readily. The prairie hay was cut late, about September 1, but was still fair quality hay. An analysis of the feeds used in this test may be found on page 59 of this bulletin.

Observations

1. During the wintering period, the soybean oil meal pellets (expeller type) fed to Lots 1 and 2 increased the daily gain per head by .10 and .17 pound respectively over Lots 3 and 4 fed cottonseed oil meal pellets (hydraulic extracted).

2. In this test it was profitable to feed 2 pounds of grain per head daily as compared to no grain in the wintering rations of heifers; compare Lots 1 and 6.

> Lot 1, fed 2 pounds grain per head daily (1) made a greater total gain, 41 pounds more, (2) sold for $1.00 a hundredweight more, (3) made a larger return per head, and (4) dressed slightly higher.

3. The level of winter grain feeding was compared in Lots 4 and 5 for heifers that are to be fattened after the wintering period. Lot 4 was fed 2 pounds grain per head daily in addition to the wintering ration, and Lot 5 was fed 4 pounds of grain.

> Lot 5 held the following advantages over Lot 4: (1) made a greater total gain of 24 pounds more, (2) sold for 40c a hundred-

Wintering Heifers

(November 30, 1951, to May 2, 1951[1]—153 days)

1. Lot number	1	2	3	4	5	6	7
2. Number heifers in a lot	9[1]	9[1]	9[2]	9[2]	10	9[1]	10
3. Number days in phase	153	137[3]	137[3]	137[3]	137[3]	153	153
4. Average daily ration, lbs.:							
Milo grain	2.00	2.00	2.00	2.00	4.05		
Soybean oil meal pellets (exp.)	1.00	1.00			1.00	1.00	1.00
Cottonseed oil meal pellets (hyd.)			1.00	1.00			
Prairie hay	2.45	2.02	1.52	1.40	1.13	3.79	3.33
Silage	19.73	19.91	19.58	19.43	19.55	18.95	19.54
Salt	.06	.09	.08	.10	.09	.08	.10
5. Average initial weight, lbs.	449	448	447	434	434	428	434
6. Average final weight, lbs.	619	609	586	572	621	566	556
7. Average gain, lbs.	170	161	139	138	187	138	122
8. Average daily gain, lbs.	1.11	1.13	1.01	1.01	1.36	.90	.80
9. Cost of feed per cwt. gain	$14.66	$13.69	$15.12	$15.43	$14.74	$13.58	$15.30
10. Feed cost per heifer	$34.93	$22.05	$21.43	$21.29	$27.56	$18.74	$18.66
Grazing							
11. Management followed	Grazed on bluestem pasture 5/2-7/29 1951	Grazed on bromo 4/26-6/1, 1951. Fed grain on bromo 6/1-7/1 1951				Grazed on bluestem pasture 5/2-7/29 1951	Grazed on bluestem pasture 5/2-7/18 1951. Fed 1 lb. soybean pellets on grass 7/18-8/15 1951
12. Number days in phase	79	46				79	106
13. Average initial weight, lbs.	619	609				566	556
14. Average final weight, lbs.	703	657				642	684
15. Average gain, lbs.	84	48				76	128
16. Average daily gain, lbs.	1.06	1.04				.96	1.21

Wintering Heifers (Cont.)

Full Feeding

	Lot number	1	2	3	4	5	6	7
17.	Period when full-fed and where	1/20-10/27 1951; dry lot	6/1 9/12 1953; 6/1 7/1 on brome, 7/1 9/12 in dry lot	1/14 7/25 1954; brome grass	4/16 7/25 1954; dry lot	4/16-7/25 1954; dry lot	7/20-10/27 1951; dry lot	8/16-10/27 1951; dry lot
18.	Number days in phase	99	103	102	102	102	99	72
19.	Average initial weight, lbs.	703	657	586	572	621	642	684
20.	Average final weight, lbs.	935	890	763	801	825	873	846
21.	Average gain, lbs.	232	233	177	229	204	231	162
22.	Average daily gain, lbs.	2.34	2.26	1.74	2.25	2.00	2.33	2.25
23.	Average daily ration, lbs.:							
	Milo grain	17.67	16.29	13.87	15.58	14.23	16.94	15.68
	Soybean pellets	1.54	1.08		1.44	1.17	1.54	1.50
	Prairie hay	5.45	1.82	/	4.55	3.39	4.11	5.69
	Silage				.61	.59		
	Salt	.01		.17	.03	.04	03	.03
	Alfalfa	2.06	1.43		1.65	1.65	2.06	2.00
24.	Feed per cwt. gain, lbs.:							
	Milo grain	753.83	720.00	799.44	694.03	711.25	725.83	696.73
	Soybean pellets	65.52	47.73		64.10	73.58	65.80	66.67
	Prairie hay	232.38	80.45		202.67	199.61	199.10	253.21
	Silage				27.17	29.41		
	Salt	.48	.03	9.68	1.21	1.75	1.27	1.39
	Alfalfa	87.93	63.09		73.41	82.35	88.31	88.89
25.	Cost of feed per 100 lbs. gain	$22.20	$19.51	$18.45	$20.51	$21.34	$21.21	$21.07
26.	Total feed cost this phase	$51.47	$45.46	$47.63	$46.97	$43.54	$49.00	$34.13

Wintering Heifers (Cont.)

Summary

Lot number	1	2	3	4	5	6	7
27. Average total gain (all phases)	486	442	316	367	391	445	402
28. Average daily gain (all phases)	1.47	1.55	1.32	1.54	1.64	1.34	1.21
29. Feed cost per 100 lbs. gain (all phases)	$15.71	$15.26	$21.86	$18.60	$18.17	$15.29	$13.13
30. Total cost of feed per heifer	$76.40	$67.50	$69.08	$68.27	$71.10	$68.05	$52.79
31. Initial cost per heifer @ $31.50 cwt.	$141.44	$141.12	$140.81	$136.71	$136.71	$134.82	$136.71
32. Feed cost plus heifer cost	$217.84	$208.62	$209.89	$204.98	$207.81	$202.87	$189.50
33. Selling price per cwt. at market	$35.00	$36.00	$33.58	$34.50	$34.90	$34.00	$32.70[4]
34. Selling price per heifer	$315.35	$314.64	$254.44	$268.41	$277.46	$286.62	$266.51
35. Margin per heifer above feed cost	$97.51	$106.02	$44.55	$63.43	$69.65	$83.75	$77.01
36. Percent shrink in shipping to market	3.6	1.5	1.6	2.9	3.6	3.4	3.7
37. Dressing percent	59.1	58.9	57.9	57.7	59.4	58.3	57.5
38. Carcass grades, U.S.:							
Low prime	2					1	1
High choice	1	1			3	4	5
Average choice	5	6	1	6	4	1	1
Low choice	1	2	2	2		3	2
High good			2	1	3		1
Average good			3				

1 One heifer removed because of no gain.

2 One heifer died because of lead paint poisoning.

3 For Lots 2, 3, 4, and 5, the wintering period extended only to April 16, 1951.

4 Lot sold for $33.00 cwt. with 1 selling for $30.00 cwt.

Feed prices: Milo grain, $2.30 cwt.; soybean pellets, $75.00 a ton; cottonseed pellets, $75.00 a ton; prairie hay, $13.00 a ton; sorghum silage, $6.50 a ton; salt, $12.00 a ton; alfalfa, $1.00 cwt.

weight more, (3) returned a greater profit, (4) had a higher dressing percent, and (5) made higher carcass grades.

4. Lot 7 was continued on grass after July 20 and was fed protein on grass until August 16 and then full-fed for 72 days in dry lot until October 27. Lot 6 was the check lot and was full-fed in dry lot 99 days from July 20 to October 27.

Lot 7 returned less per head than Lot 6. It failed to produce as much total gain, sold for $1.30 less per hundredweight, and had a lower dressing percent.

5. Self-feeding grain in dry lot resulted in the following advantages as compared to self-feeding grain on brome grass: (see Lots 3 and 4) (1) one-half pound more gain per head daily, (2) larger grain consumption, (3) 62c per hundredweight increase in selling price, (4) greater return per head, and (5) higher grading carcasses.

6. As measured by total gain, selling price per hundredweight, margin per heifer, and carcass grade, the systems of management represented by Lot 1 and Lot 2 appear to be above average in this test.

Project 253-2: Wintering, Grazing, and Fattening Heifers

Wintering Heifer Calves That Are To Be Fattened for the Summer or Early Fall Market, 1951-52.

E. F. Smith, D. L. Good, R. F. Cox

Introduction

This is a report of the wintering phase of this test. Following this phase, the different lots either will be full-fed or go to grass and be full-fed after the grazing period. The objective of the test is to compare different methods of wintering heifer calves that are going to be full-fed after the wintering period or after a summer grazing period.

Experimental Procedure

Forty-five good quality Hereford heifer calves were purchased in south-central Kansas for use in this test. They were fed silage, prairie hay, 1 pound of protein, and 2 pounds of milo grain per head daily until the test started December 11, 1951. The 5 lightest heifers were cut off and the 40 remaining were divided into four lots of 10 heifers each. The system of management planned for each lot follows:

Lot 1—wintered on dry bluestem pasture, 2 pounds cottonseed oil meal pellets per head daily, mineral (bonemeal and salt), and free access to salt; grazed on bluestem pasture until July 15; full-fed in dry lot to the choice grade.

Lot 2—wintered on brome pasture supplemented when necessary with protein, free access to mineral (bonemeal and salt), and salt, grazed on brome pasture until July 15; full-fed in dry lot to the choice grade.

Lot 3—wintered on sorghum silage, prairie hay, 1 pound of cottonseed cake, and 2 pounds of milo grain per head daily, free access to mineral (bonemeal and salt) and salt; grazed on bluestem pasture May 1 to July 15; full-fed in dry lot to grade choice.

Lot 4—wintered on sorghum silage, prairie hay, 1 pound of cottonseed cake, and 4 pounds of milo grain per head daily, free access to mineral (bonemeal and salt) and salt; full-fed in dry lot to grade choice.

Observations

1. The heifers carried some condition at the start of the test, which those being wintered on dry grass soon lost. The weather was favorable

for wintering out on dry grass except during the month of December and a storm the first week in March.

2. The heifers in Lot 1 wintered on dry bluestem pasture were strong and healthy at the close of winter. They were wintered in a 190-acre bluestem pasture with 10 steer calves. The pasture was stocked during the previous summer at a normal rate, but plenty of dry dead grass remained.

3. The heifers in Lot 2, wintered on brome pasture, were in strong condition and thin. They received no supplemental feed from the start of the test until February 1. From February on they were fed 2 pounds of cottonseed oil meal pellets daily; alfalfa hay was fed for a short period to break them into coming up for the cake. The brome was fertilized the previous winter with about 100 pounds of ammonium nitrate per acre. It was not grazed after July 1, and had a fair amount of dead top growth when the heifers were started on test December 11. The brome was stocked at the rate of 1½ to 2 acres per head.

4. The silage fed to Lot 3 and Lot 4 was of poor quality. The first part of the winter it was Tennessee Orange which was immature, excessively acid with very little grain. The second part of the winter, mixed Atlas sorgo and volunteer Black Amber were fed. This was dry with hardly any grain. The addition of 4 pounds of milo grain to the ration increased the gain considerably and placed Lot 4 in position that it could be sold for less per cwt. than any of the other lots and still pay for feed and initial cost of heifers.

Wintering Heifer Calves That Are To Be Fattened for the Summer or Early Fall Market, 1951-52.

Phase I—Wintering

(December 11, 1951, to April 1, 1952—122 days)

1.	Lot number	1	2	3	4
2.	Place of wintering	Bluestem pasture	Brome pasture	Dry lot	Dry lot
3.	Number heifers in lot	10	10	10	10
4.	Av. initial wt., lbs.	480	479	482	485
5.	Av. final wt., lbs.	498	460	585	645
6.	Av. gain, lbs.	18	—19	103	160
7.	Av. daily gain, lbs.	.16	—.17	.92	1.43
8.	Av. daily ration, lbs.:				
	Ground milo grain			2.60	4.00
	Cottonseed pellets or cake	1.97	.75[1]	1.00	1.00
	Sorghum silage			19.15	19.82
	Prairie hay	.83[2]	.98[2]	1.70	1.68
	Alfalfa hay[3]		.96		
	Salt	.04	ad lib	.11	.08
	Minerals[4]	.03	ad lib	.12	.09
	Bluestem pasture	ad lib			
	Brome pasture		ad lib		
9.	Feed cost per heifer[5]	$11.35	$13.97	$20.98	$27.37
10.	Initial cost of heifers, @ $40 cwt.	$192.00	$191.60	$152.80	$194.00
11.	Heifer cost plus feed cost	$203.35	$205.57	$213.78	$221.37

12.	Necessary selling price per cwt. to pay for feed and initial cost	$40.83	$44.69	$36.54	$34.32
13.	Appraised value per cwt. May 3, 1952	$	$	$	$

1 Cottonseed cake was fed to Lot 2 at the rate of 2 pounds per head daily from February 15 to April 1.
2 Prairie hay was fed to Lots 1 and 2 only when snow covered the grass.
3 Alfalfa hay was fed Lot 2 from February 1 to 15 at the rate of about 6 pounds per head daily.
4 Mineral mixture consisted of 2 pounds steamed bonemeal to 1 pound of salt.
5 Feed prices may be found on page 53 of this bulletin.

Project 253-4: Wintering and Grazing Yearling Steers

Methods of Wintering Yearling Steers on Dry Bluestem Pasture, 1950-51.

E. F. Smith and R. F. Cox

Introduction

This test is to determine if yearling steers can be wintered satisfactorily on dry bluestem pasture. Different protein supplements as well as methods of feeding them on dry bluestem pasture are being tested.

Experimental Procedure

Forty head of good quality Hereford yearling steers, four lots, 10 head to a lot, were used in this test.

All lots were wintered on dry bluestem pasture. Each lot had sufficient dry grass to winter on; the acreage varied from 6 acres per head for one lot to 19 acres per head for another lot. All pastures had been normally stocked the previous grazing season. Each lot received a supplement in addition to dry bluestem pasture as follows:

Lot 1—approximately 7 pounds of alfalfa hay per head daily.
Lot 2—four pounds of soybean pellets per head every other day (average 2 pounds a day).
Lot 3—two pounds of soybean pellets per head daily.
Lot 4—soybean oil meal and salt self-fed. (The salt was mixed with the soybean oil meal to limit its consumption and make it possible to self-feed the soybean oil meal.)

The proportions of soybean oil meal and salt varied from 100 pounds of soybean oil meal and 35 pounds of salt up to 45 pounds of salt per 100 pounds of meal. This amount of salt held meal consumption to approximately 2 pounds per head daily.

Observations

1. The steers wintered satisfactorily under all methods of feeding. The steers fed every other day made the largest winter gain. In two previous tests this was not true. The lot fed alfalfa hay made the smallest gain, which has been the case in two previous tests.

2. Steers self-fed a mixture of soybean oil meal and salt compared very favorably in gain with the steers hand-fed soybean oil meal pellets each day (see Lots 1 and 4).

3. At the close of the summer grazing phase, July 18, 1951, Lot 2, fed every second day, was still the largest gaining lot. Steers fed alfalfa hay ranked last in gain, and Lot 1, fed soybean oil meal pellets every

day, turned in about the same gain as Lot 4, self-fed the salt and soybean oil meal mixture.

4. The winter of 1950-51 was very mild and favorable for wintering cattle on dry grass in this area.

Wintering Yearling Steers on Bluestem Pasture

Phase I—December 13, 1950, to April 18, 1951—126 days.

1.	Lot number	1	2	3	4
2.	Number steers in lot	10	10	10	10
3.	Management	Fed soybean pellets daily	Fed soybean pellets every other day	Fed alfalfa hay daily	Self-fed soybean oil meal and salt mixed together
4.	Average daily ration, lbs.:				
	Soybean oil meal pellets	2.02	2.03		
	Soybean oil meal				1.97
	Alfalfa hay			7.32	
	Prairie hay[2]	.76	.75	.49	.58
	Salt	.19	.13	.05	.69
	Mineral mixture[1]	.02	.03	.01	.05
	Bluestem pasture	ad lib	ad lib	ad lib	ad lib
5.	Average initial weight	683	684	684	685
6.	Average final weight	745	759	730	739
7.	Average gain	62	75	46	54
8.	Average daily gain	.49	.60	.37	.43
9.	Total feed cost per steer	$17.91	$18.01	17.22	$18.13

Phase II—Grazing—April 18, 1951, to July 18, 1951—91 days.

10.	Number steers in lot	10	9[3]	9[3]	10
11.	Average initial weight	745	757[4]	724[4]	739
12.	Average final weight	906	934	884	916
13.	Average gain	161	177	160	177
14.	Average daily gain	1.77	1.95	1.76	1.95

Summary of Phases I and II

December 13, 1950, to July 18, 1951—217 days.

15.	Average initial weight	683	684	684	685
16.	Average final weight	906	934	884	916
17.	Average gain	223	250	200	231
18.	Average daily gain	1.03	1.15	.92	1.06
19.	Total feed cost per steer	$37.91	$38.01	$37.22	$38.13
20.	Feed cost per 100 lbs. gain	17.00	15.20	18.61	16.51
21.	Initial cost per steer @ $32.25 per cwt.	220.27	220.59	220.59	220.91
22.	Initial cost per steer plus feed costs	258.18	258.60	257.81	259.04

23.	Appraisal value per steer @ $34.00 per cwt., October 8, 1951	308.04	317.56	300.56	311.44
24.	Return per steer over initial cost plus feed cost....	49.86	58.96	42.75	52.40

1 Mineral mixture consisted of 2 parts by weight of steamed bonemeal to 1 part salt.

2 Prairie hay was fed only when snow covered the grass.

3 One steer in Lot 2 broke a leg and was butchered May 6, 1951—one steer was removed from Lot 3 for experimental purposes.

4 Difference between final weight for winter phase for Lots 3 and 4 and starting weight for grazing phase is due to removal of one steer from each lot.

Feed prices: Soybean pellets, soybean meal, $75.00 per ton; alfalfa hay, $20 per ton; prairie hay, $13 per ton; bluestem pasture, $7.50 winter, $20 summer; salt, $12 per ton; steamed bonemeal, $5.50 per cwt.

Project 253-4: Wintering and Grazing Yearling Steers

Effect of Feeding a Protein Supplement During the Latter Part of the Grazing Season to Two-Year-Old Steers on Bluestem Pasture, 1951.

E. F. Smith and R. F. Cox

Introduction

The nutritive value of bluestem pasture usually begins to decline rapidly after mid-summer. This test is concerned with what effect the feeding of a protein supplement after mid-summer will have on cattle gains and condition. It is hoped that by starting the feeding at different times the most opportune time to start feeding may be determined.

Experimental Procedure

Thirty-eight head of good quality two-year-old Hereford steers were used in this test. They were wintered on dry bluestem pasture and then grazed together until July 18, when this test started.

The steers were divided into four uniform lots and grazed on bluestem pasture with the following treatment from July 18, 1951, to October 3, 1951.

Lot 1: July 18 to October 3—received 2 pounds of soybean oil meal pellets per head daily.

Lot 2: August 10 to October 3—received 2 pound of soybean oil meal pellets per head daily.

Lot 3: September 1 to October 3—received 2 pounds of soybean oil meal pellets per head daily.

Lot 4: Received no supplemental feed.

Observations

1. In this test the feeding of a protein supplement on bluestem pasture after mid-summer was not profitable.

2. The average protein content of bluestem pasture grasses[1] in July was 8.45 percent, in August, 7.95 percent, and in September, 7.33 percent. Heavy rains fell in July, and the grass remained green until late in the season.

1. The samples selected were of immature grasses or regrowth after grazing, in an attempt to take samples of grass the cattle were consuming.

3. The lots were ranked as to degree of flesh at the close of the test Lot 4 appeared to be the fleshiest of the lots, followed by Lots 1, 3, and 2, respectively.

Effect of Feeding a Protein Supplement During the Latter Part of the Grazing Season to Two-Year-Old Steers on Bluestem Pasture
(July 18, 1951, to October 3, 1951—77 days)

Lot number	1	2	3	4
No. steers in lot	10	9	9	10
Management	Fed 2 lbs. soybean pellets daily from July 18, '51, to Oct. 3, '51	Fed 2 lbs. soybean pellets daily from Aug. 10, '51, to Oct. 3, '51	Fed 2 lbs. soybean pellets daily from Sept. 1, '51, to Oct. 3, '51	No soybean pellets fed
Av. initial wt.	915	908	905	911
Av. final wt.	1018	1012	1009	1023
Av. gain	103	104	104	112
Av. daily gain	1.34	1.35	1.35	1.45
Gain contributed to feeding of soybean pellets, lbs.	—9	—8	—8	0
Total soybean pellets fed per steer, lbs.	154	108	64	0
Selling price per cwt. on Oct. 10, '51	$34.00	$34.00	$34.00	$34.00
Gain per steer by periods, lbs.:				
July 18-Aug. 10	35	48	42	47
Aug. 10-Sept. 1	44	42	49	48
Sept. 1-Oct. 3	24	14	13	17
Total gain	103	104	104	112

Project 253-4: Wintering and Grazing Yearling Steers

Methods of Wintering Yearling Steers on Bluestem Pasture, 1951-52.

E. F. Smith, R. F. Cox, and S. B. Fansher

Introduction

The wintering phase of this test will be completed May 1, 1952. The study is to test the value of dry bluestem pasture as a winter feed for yearling steers fed different kinds and amounts of protein supplements.

Experimental Procedure

Thirty head of good quality, about 750-pound, Hereford yearling steers were used in the test which was started December 7, 1951. The steers were purchased in the spring of 1951 and had been grazed on bluestem pastures during the summer and fall. They carried a moderate amount of flesh. They lost some flesh during October and November when they were on grass alone prior to the start of winter tests. The steers were sprayed twice with B.H.C. for lice. All of the pastures in which the steers were wintered had been grazed the previous summer at normal stocking rates, but a plentiful supply of dry grass remained. From 6 to 13 acres of pasture were allowed each steer.

The 30 steers were divided into three lots of 10 steers each and received the following supplements in addition to dry bluestem pasture from December 7, 1951, to April 1, 1952:

Lot 1—2 pounds of cottonseed oil meal pellets daily, salt, and mineral (bonemeal and salt).

Lot 2—4 pounds of cottonseed oil meal pellets every other day (average 2 pounds a day), salt, and mineral (bonemeal and salt).

Lot 3—Cottonseed oil meal, salt self-fed, and mineral (bonemeal and salt). (The salt was mixed with the soybean oil meal to limit its consumption and make it possible to self-feed the cottonseed oil meal. This mixture was fed in a self-feeder.)

The cottonseed oil meal pellets were fed on the ground.

Observations

1. Weather conditions were favorable for wintering on dry grass except during the month of December and the first week in March.

2. All lots lost weight during the wintering period. Lot 1 fed every day wintered slightly better than Lot 2 fed every second day, and the steers in Lot 3 self-fed salt and cottonseed oil meal lost considerable weight, an average of 55 pounds per head for the winter. Usually April is a favorable month for cattle gains on dry grass, and some of the weight losses will probably be decreased or eliminated during April.

Wintering Yearling Steers on Bluestem Pasture

(December 7, 1951, to April 1, 1952—116 days)

Lot number	1	2	3
Number of steers per lot	10	10	10
Method of feeding	Fed cottonseed oil meal pellets daily	Fed cottonseed oil meal pellets every other day	Self-fed cottonseed oil meal and salt
Average initial weight	745	741	746
Average final weight	737	726	691
Average gain	—8	—15	—55
Average daily gain	—.06	—.13	—.47
Average daily winter ration, lbs.:			
Cottonseed oil meal pellets	2.00	2.00	
Cottonseed oil meal			2.05
Salt	.09	.07	.05
Mineral mixture[1]	.14	.12	.09
Prairie hay[2]	1.52	1.47	1.42
Bluestem pasture	ad lib	ad lib	ad lib
Total feed cost per steer[3]	$17.78	$17.61	$18.14
Initial cost per steer at $35.00 per cwt.	$260.75	$259.35	$261.10
Initial cost per steer plus feed cost	$278.53	$276.96	$279.24
Necessary selling price per cwt. to cover initial cost plus wintering costs	$37.79	$38.14	$40.41

1 Mineral mixture composed of 2 pounds steamed bonemeal to 1 of salt.
2 Prairie hay was fed only in unfavorable weather.
3 Feed prices may be found on page 58 of this bulletin.

Project 253-3: The Effect of Grazing Systems on Livestock and Vegetation

A Comparison of Different Methods of Managing Bluestem Pastures—1951.

E. F. Smith and Kling L. Anderson

Introduction

The objectives of this experiment are to determine the effects of different stocking rates, deferred and rotation grazing, and burning on livestock gains, productivity of pastures, and the vegetation itself.

Results are reported here for the third year of the experiment. Only two years' results on burning and understocking have been obtained. The results for 1949 and 1950 may be found in Kansas Agricultural Experiment Station Circulars 265 and 273, respectively.

Experimental Procedure

Good quality Hereford yearling steers, moderately thin, weighing about 520 pounds were used to stock the pastures. The method of management of each pasture was as follows:

Pasture 1—normal rate of stocking, 3.3 acres per head.

Pasture 2—over-stocked, 2.5 acres per head.

Pasture 3—under-stocked, 5 acres per head.

Pastures 4, 5, 6—deferred and rotation grazing, 3.3 acres per head. All steers were held in two pastures until July 6, then turned in to the protected pasture until it was deemed advisable to allow them the run of all three pastures, which in 1951 was August 3.

Pasture 7—burned March 22, 1951; rate of stocking was 3.4 acres per head.

Pasture 8—burned April 13, 1951; rate of stocking was 3.4 acres per head.

Pasture 9—burned April 26, 1951; rate of stocking was 3.4 acres per head.

Pasture 10—not burned; rate of stocking was 3.5 acres per head.

Due to accident, Pastures 1 through 6 were burned on April 26, 1951. The only pasture reported here that was not burned is Pasture 10.

Observations

1. In this year's test, the method of management which resulted in the greatest difference in gain per head was on the under-stocked pasture, where the steers gained 48 pounds more per head than on the normally-stocked pasture. This was not true in 1950 when the steers on the under-stocked pasture lacked 7 pounds per head gaining as much as those on the normally-stocked pasture.

2. There is probably not enough difference in gain per head among the various methods of management, other than the under-stocked pasture, to be significant. However, over a period of years, small differences may become important.

3. Deferred and rotation grazing has been compared with season-long stocking for three grazing seasons. Each year steers grazed season-long have made a greater gain per head; in 1949 it was 23 pounds, in 1950 it was 16 pounds, and in 1951 it was 8 pounds.

4. Burned Pastures 7, 8, and 9 produced comparable gains to those of Pasture 10 which was not burned.

5. The time of burning may have some effect on cattle gain. In 1950 and 1951 the early spring burning produced the least gain of the three different times of burning, and the medium spring burning the most gain; the late spring burned pasture has been between the other two in gains produced.

A COMPARISON OF DIFFERENT METHODS OF MANAGING BLUESTEM PASTURE

May 10, 1951, to October 2, 1951—145 days

Pasture number	1	2	3	4 5 6	7	8	9	10
Management	Normally-stocked, burned Apr. 26, 1951	Over-stocked, burned Apr. 26, 1951	Under-stocked, burned Apr. 26, 1951	Deferred and rotated, burned Apr. 26, 1951	Early spring burned Mar. 22, 1951	Medium spring burned Apr. 13, 1951	Late spring burned Apr. 26, 1951	Not burned
Number head per pasture	15	24	12	54	13	13	13	9
Acres in pasture	60	60	60	3 60-acre pastures	44	44	44	139
Number acres per head	3.3	2.5	5	3.3	3.4	3.4	3.4	3.51
Average initial weight, lbs.	518	522	519	522	521	521	521	520
Average final weight, lbs.	760	778	809	756	764	786	780	778
Average gain, lbs.	242	256	290	234	243	265	259	258
Average daily gain, lbs.	1.67	1.77	2.00	1.61	1.68	1.83	1.79	1.78
Average gain per acre, lbs.	73	102	58	71	71	78	76	74
Initial cost per steer at $41.00 per cwt. plus $15.00 per head for summer pasture	$227.38	$229.02	$227.79	$229.02	$228.61	$228.61	$228.61	$228.26
Average selling price per steer at $35.00 per cwt.[2]	$257.95	$264.25	$274.75	$256.55	$259.35	$266.70	$264.95	$264.25
Average return per steer	$ 30.57	$ 35.23	$ 46.96	$ 27.53	$ 30.74	$ 38.09	$ 36.34	$ 36.05

1 Pasture 10 was stocked with other steers in addition to those reported in this test.
2 The final weight was shrunk 3 percent to obtain a sale weight.

6. There seems to be a greater difference in steer gain between burned and non-burned pastures early in the season than at the close of the grazing season. This difference to date tends to favor the burned pastures. Forage yield tests conducted by the agronomy department over many years showed an early advantage for burned plots, but plots not burned rapidly overtook them, especially in dry summers.

7. The different pastures (with the exception of No. 10) were rated for degree of range use as follows:

Pasture numbers	Degree of range use	Qualitative description
3	Light	Only best plants grazed.
5	Moderate	Most of the range grazed; little or no use of poor plants.
1, 4, 7, 8, 9	Proper	All of the range grazed; primary forage species properly utilized.
6	Close	All of the range plainly shows use and major sections are closely cropped; some use of low-value plants.
2	Severe	Hedged appearance of shrubs and trampling damage; primary forage plants almost completely used; low-value plants carried grazing load.

Ratio of Roughage to Grain for Fattening Steer Calves.

D. Richardson, E. F. Smith, and R. F. Cox

This is a preliminary report covering the first 98 days of this feeding trial which is still being conducted; therefore the reader should bear in mind that the figures are in no way conclusive or complete.

The physical balance or ratio of roughage to concentrates is an important factor to consider in the ration of fattening cattle. Beef cattle serve as one of the principal means of marketing roughage. Since a large amount of roughage is produced throughout the midwest, it is desirable to have information concerning the maximum amount of roughage that can be used in fattening rations consistent with maximum and economical production. This experiment was planned to secure information on the effects of different levels of roughage on average daily gain, feed requirement per unit of gain, quality of finish, selling price, and carcass quality.

The steer calves were started on feed December 22, 1951, and worked up to ratios of roughage to grain as given below. They are being self-fed and will remain on their respective rations for the remainder of the feeding period:

Lot 1—1 pound of chopped alfalfa hay to 1 pound milo grain.
Lot 2—1 pound chopped alfalfa hay to 3 pounds milo grain.
Lot 3—1 pound chopped alfalfa hay to 5 pounds milo grain.

Table 1 contains a summary of the first 98-day results.

Observations

1. The figures on average daily feed consumption do not show the ratios described above. This is caused by including the feed consumed while the steers were being worked up to the desired ratios.

2. The average daily gain by the various lots does not vary greatly at this stage of the trial; however, it is slightly higher in Lot 2.

3. The grain required per hundred pounds of liveweight gain has increased as the level of grain in the ration has increased.

Table 1.—Ratio of Roughage to Grain for Fattening Steer Calves
(December 22, 1951, to March 29, 1952—98 days)

Lot number	1	2	3
Number steers per lot	10	10	10
Average initial weight, lbs.	502	503	504
Average final weight, lbs.	735	748	735
Average gain per steer, lbs.	233	245	231
Average daily gain per steer, lbs.	2.38	2.50	2.36
Average daily feed consumed, lbs.:			
Milo grain	9.43	12.58	12.62
Alfalfa hay	11.88	8.22	7.10
Salt	.05	.05	.04
Feed required per cwt. gain, lbs.:			
Milo grain	396.87	503.46	535.28
Alfalfa hay	499.78	329.10	301.13
Salt	2.16	2.04	1.55
Feed cost per cwt. gain	$17.37	$18.22	$18.76

A Comparison of Rolled, Coarsely Ground, and Finely Ground Milo Grain for Fattening Steer Calves.

R. F. Cox and E. F. Smith

Good to choice quality Hereford steer calves were used in this test. There were three lots, 10 head to a lot, all being fed the same except for the difference in grain preparation. The calves originated in the vicinity of Sonora, Texas. They were maintained on a roughage ration properly supplemented for about six weeks prior to starting on test on December 5, 1950. They were sprayed with B.H.C. for lice. At the start of the test, they were fed all of the sorghum silage they would clean up each day, 2 pounds of alfalfa hay and 1½ pounds of soybean oil meal pellets per head daily.

The grain was started at the rate of 1 pound per head daily and raised about 1 pound per head weekly. When the calves reached a daily grain consumption of 14 to 15 pounds per head, they were placed on a self-feeder and the silage was omitted from the ration and replaced with 3 to 4 pounds of alfalfa hay per head daily and a small amount of prairie hay. The hay and protein supplement were fed in a separate bunk from the self-fed grain.

The rolled milo was dry rolled and appeared satisfactory upon emergence from the roller; however, after sacking and when it was finally fed to the cattle, it was broken into small particles and somewhat powdered. The coarsely ground or cracked milo was the product of a burr mill. A hammer mill was used to prepare the finely ground milo, which was ground to a coarse, mealy mixture.

Observations

All three lots made about the same daily gain. The steers receiving coarsely ground milo consumed slightly more grain and thereby required slightly more grain per 100 pounds of gain than either of the other lots; however, they also graded higher in the carcass and had a

higher dressing percent. The differences present in this test were small.

A Comparison of Rolled, Coarsely Ground, and Finely Ground Milo Grain for Fattening Steer Calves

(Dec. 5, 1950, to July 9, 1951—216 days)

Lot number	6	7	8
Management	Finely ground milo	Coarsely ground milo	Rolled milo
No. steers per lot	10	10	10
Initial weight per steer, lbs.	418	419	418
Final weight per steer, lbs.	899	902	898
Gain per steer, lbs.	481	483	480
Daily gain per steer, lbs.	2.23	2.24	2.22
Daily ration per steer, lbs.:			
Milo	11.59	11.94	10.95
Soybean pellets	1.37	1.37	1.37
Sorghum silage	6.74	7.55	7.38
Alfalfa hay	2.36	2.51	2.45
Salt	.04	.05	.03
Prairie hay	.45	.45	.53
Feed required per 100 pounds gain, lbs.:			
Milo	520.40	533.95	492.58
Soybean pellets	61.68	61.43	61.81
Sorghum silage	304.68	337.47	331.35
Alfalfa hay	105.82	112.22	110.21
Salt	1.97	2.03	1.19
Prairie hay	20.27	20.19	23.96
Cost of feed per 100 lbs. gain	$ 16.45	$ 16.92	$ 15.98
Initial cost of steer @ $31.50 cwt.	$131.67	$131.99	$131.67
Feed cost per steer	$ 79.11	$ 81.72	$ 76.70
Steer cost plus feed cost	$210.78	$213.71	$208.37
Necessary selling price per cwt.	$ 23.47	$ 23.69	$ 23.20
Selling price per cwt.	$ 34.45	$ 34.45	$ 34.45
Dressing percent	59.5	60.9	59.5
Carcass grades:			
Prime	5	6	1
Choice	5	4	9
(Packer grades)			

Project 222: Fundamental Nutrition Studies of Sorghum Roughages and Grain

Digestibility of Finely Ground, Cracked, and Rolled Milo Grain, 1951.

E. F. Smith and D. B. Parrish

A digestion trial was conducted with 12 steers which were allotted into three lots of 4 steers each. A ration of sorghum silage (Tennessee Orange), soybean oil meal pellets and milo grain, salt and ground lime-

stone was fed to each lot. Lot 1 received finely ground milo, Lot 2 cracked milo and Lot 3 rolled milo.

An adjustment and preliminary period was followed by a collection period of 10 days. During the collection period, feces were collected for chemical analysis.

The digestibility of dry matter, protein, crude fiber, ether extract and nitrogen-free extract was higher for the rolled milo ration than for the cracked or finely ground milo rations. With the exception of crude fiber the digestibility of the nutrients of the cracked milo grain ration was the lowest of the three rations.

Effect of Rolling, Coarse and Fine Grinding on the Digestibility of Milo Grain

Lot No.	No. of steers	Ration	Av. apparent coefficient of digestibility percent— Dry matter	Crude protein	Ether extract	Crude fiber	N.F.E.
1	4	Fine milo, sorghum silage, soybean pellets, salt, ground limestone	71.97	60.8	72.4	51.0	78.6
2	4	Cracked milo, sorghum silage, soybean pellets, salt, ground limestone	67.60	58.8	68.0	55.0	72.4
3	4	Rolled milo, sorghum silage, soybean pellets, salt, ground limestone	75.80	63.2	73.1	56.8	82.5

Project 68: Factors Influencing the Salt Requirements of Beef Cattle[1]

The Effect of Withholding Salt on the Growth and Condition of Steers, 1950-51.

E. F. Smith, D. B. Parrish, and E. J. Splitter

This test was to find what effect the withholding of salt has on the performance of steers on either fattening rations or wintering rations.

Forty-two head of good quality Hereford steer calves were used in the test. There were four lots, 10 head to each lot, except that one lot contained 12 head. Two of the lots were full-fed grain and two of the lots were fed wintering rations. For the two lots receiving wintering rations, the test was terminated May 2, 1951. The two lots on a full feed of grain were fed until July 9, 1951. A feedstuff analysis of the feeds used in the test may be found on page — of this bulletin.

Observations

1. Lot 1, on a full feed of grain and given free access to salt, gained only slightly more than Lot 2, which also was full-fed but from which salt was withheld. There was practically no difference in amount of feed consumed or in efficiency of gain (see table, Lots 1 and 2). Lot 2 sold for less per hundredweight and graded lower in the carcass. On foot, Lot 2 did not appear to be as well finished as Lot 1.

1. This study was supported in part by the Salt Producers' Association of Detroit, Michigan.

2. The gain of steer calves on a roughage (wintering) ration was decreased appreciably when salt was withheld (see table, Lots 3 and 4). The calves given free access to salt consumed slightly more feed and were much more efficient in converting their feed into pounds of beef.

The Effect of Withholding Salt on the Growth of Steer Calves.

December 5, 1950, to July 9, 1951—Lots 1 and 2
December 5, 1950, to May 1, 1951—Lots 3 and 4

1.	Lot number	1	2	3	4
2.	No. steers in lot	10	10	12	10
3.	Management	Full fed		Wintered	
4.	Initial weight per steer	419	418	419	418
5.	Final weight per steer	902	889	529	505
6.	Gain per steer	483	471	110	87
7.	Daily gain per steer	2.24	2.18	.75	.59
8.	Daily ration per steer, lbs.:				
	Ground milo grain	11.94	11.92		
	Soybean oil meal pellets	1.37	1.37	1.00	1.00
	Sorghum silage (Tenn. Orange)	7.55	6.87	28.35	27.52
	Alfalfa hay	2.51	2.46		
	Prairie hay	.45	.53		
	Salt, free access	.05		.15	
9.	Feed required per 100 lbs. gain, lbs.:				
	Ground milo grain	533.95	546.82		
	Soybean oil meal pellets	61.43	62.45	134.09	168.97
	Sorghum silage (Tenn. Orange)	337.47	312.87	3788.88	4649.43
	Alfalfa hay	112.22	111.81		
	Prairie hay	20.19	24.05		
	Salt	2.03		19.66	
10.	Selling price per cwt., dollars	34.45	34.05		
11.	Carcass grades:				
	Prime	6	4		
	Choice	4	5		
	Good		1		

The Effect of Withholding Salt on the Growth and Condition of Steers, 1951-52.

E. F. Smith, D. B. Parrish, and E. J. Splitter

Preliminary Report

Introduction

This is a progress report on an experiment to be completed this summer, 1952, to find out what effect the withholding of salt has on the growth and fattening of steers.

Experimental Procedure

Twenty head of good quality Hereford steer calves were used in the test. They were a part of the heavy end of a group of 150 calves purchased in the vicinity of Marfa, Texas, for experimental tests. There are two lots, 10 head to a lot, and both lots are being self-fed a ground milo grain and chopped alfalfa hay mixture at the rate of 3 pounds of milo grain to 1 pound of alfalfa hay. Lot 1 has free access to salt, whereas salt is being withheld from Lot 2.

Observations

To date in this test the addition of salt to a fattening ration of ground milo grain and chopped alfalfa hay has failed to increase the rate or efficiency of gain.

The Effect of Withholding Salt on the Growth and Fattening of Steers.
(December 22, 1951, to March 29, 1952—98 days)

Lot number	1	2
Number of steers per lot	10	10
Management	Free access to salt	Fed no salt
Initial weight per steer, lbs.	503	502
Final weight per steer, lbs.	748	744
Gain per steer, lbs.	245	242
Daily gain per steer, lbs.	2.50	2.47
Daily ration per steer, lbs.:		
Cracked milo grain	12.58	12.43
Chopped alfalfa hay	8.22	8.38
Salt	.05	
Feed required per 100 lbs. gain, lbs.:		
Cracked milo grain	503.46	503.51
Chopped alfalfa hay	329.10	339.39
Salt	2.04	

Wintering, Grazing, and Fattening Steer Calves, 1951-52

The Value of Trace Minerals in a Wintering and a Fattening Ration.

Self-feeding Grain in Dry Lot vs. Self-feeding Grain on Bluestem Pasture.

E. F. Smith and R. F. Cox

Introduction

This is a report of the wintering phase of this test. Following this phase the different lots will be grazed together on bluestem pasture and then full-fed grain until they grade choice. One objective of the test is to find out the effect of trace mineralized salt containing iodine, copper, cobalt, iron, and manganese on the performance of steer calves on wintering rations and on a full feed of grain. Another phase of the test is to compare self-feeding grain in dry lot to self-feeding grain on grass for calves handled in the deferred full-feeding program. The system of deferred full-feeding using good quality steer calves consists of three phases: (1) producing 225-250 pounds of gain during the winter; (2) grazing 90 days without grain; (3) full feeding 100 days in the dry lot.

Experimental Procedure

Thirty head of good quality Hereford steer calves are being used in this test in three lots, 10 head to a lot. They were part of a shipment of 150 steer calves from Marfa, Texas. They were received November 8, 1951, and fed silage, prairie hay, and 1 pound of a protein concentrate per head daily until December 22, 1951, when they were started on test. The system of management planned for each lot follows:

Lot 1—wintered on sorghum silage, prairie hay, 5 pounds of ground grain, and 1 pound of 41 percent protein concentrate per head daily, free access to mineral (bonemal and salt) and salt; bluestem pasture May 1 to August 1; self-fed grain on bluestem pasture after August 1 to choice grade.

Lot 2—wintered on sorghum silage, prairie hay, 5 pounds of grain, and 1 pound of protein concentrate per head daily, free access to mineral (bonemeal and salt) and salt; grazed on bluestem pasture May 1 to August 1; self-fed grain in dry lot after August 1 to choice grade.

Lot 3—wintered on sorghum silage, prairie hay, 5 pounds of grain, and 1 pound of protein concentrate per head daily; free access to mineral (bonemeal and salt) and trace mineralized salt; grazed on bluestem pasture, May 1 to August 1; self-fed grain in dry lot from August 1 until they grade choice.

Observations

No differences due to treatment were apparent between the lots. The difference in gain between Lots 1 and 2 handled identically demonstrates the variability in cattle gains.

Wintering, Grazing, and Fattening Steer Calves

Phase I—Wintering—Value of Trace Minerals in a Wintering Ration.

(December 22, 1951, to April 4, 1952—104 days)

Lot number	1	2	3
Number of steers per lot	10	10	10
Ration	Sorghum silage Prairie hay Milo Cottonseed cake Mineral[1] Salt	Sorghum silage Prairie hay Milo Cottonseed cake Mineral[1] Salt	Sorghum silage Prairie hay Milo Cottonseed cake Mineral[1] Trace mineral Salt[2]
Average initial weight, lbs.	444	443	443
Average final weight, lbs.	602	588	594
Average gain, lbs.	158	145	151
Average daily gain, lbs.	1.52	1.39	1.45
Average daily ration, lbs.:			
Ground milo grain	5.11	5.11	5.10
Cottonseed cake	1.00	1.00	1.00
Sorghum silage	20.29	20.34	20.02
Prairie hay	.16	.17	.22
Mineral[1]	.11	.12	.10
Salt	.12	.12	
Trace mineral salt[2]			.08

Feed per cwt. of gain, lbs.:			
Ground milo grain	336.08	366.21	351.32
Cottonseed cake	65.82	71.72	68.87
Sorghum silage	1335.42	1458.62	1378.81
Prairie hay	10.44	11.86	15.10
Mineral	8.07	8.55	6.82
Salt	7.09	8.86	
Trace mineral salt			5.73
Feed cost per 100 pounds gain[3]	$17.56	$19.15	$18.31

1 Contains 2 pounds of steamed bonemeal to 1 of salt.
2 Composed of salt, copper, cobalt, iron, manganese, iodine.
3 Feed prices used may be found on page 58 of this publication.

Antibiotics in Beef Cattle Rations

D. Richardson and E. F. Smith

Antibiotics are generally accepted as being beneficial in the ration of swine, poultry and young dairy calves. Very little is known about the use of antibiotics in the ration of cattle after they start ruminating. Work has been started to determine the effect of antibiotics in wintering and fattening rations of beef cattle. No conclusion can be made yet; however, the results to date do not show any outstanding harmful or beneficial results.

Feed Prices Used in Beef Cattle Tests, 1951-52

Milo grain, cwt.	$ 2.80
Cottonseed oil meal, cake or pellets, ton	100.00
Prairie hay, ton	15.00
Alfalfa hay, ton	25.00
Sorghum silage, ton	6.50
Dry bluestem pasture, calves, per head per month	.50
Dry bluestem pasture, yearlings, per head per month	.75
Brome pasture, winter, per head per month	1.00
Steamed bonemeal, cwt.	5.00
Trace mineral salt, cwt.	2.00
Salt, ton	12.00

Chemical Analyses of Feeds Used in the 1950-51 Beef Cattle Feeding Trials[1]

Feeds	Moisture %	Protein %	Fat %	Fiber %	N-free extract %	Mineral matter %	Calcium %	Phos. %
Soybean oil meal	9.38	43.00	5.0	5.65	31.47	5.50		
Cottonseed oil meal								
Milo grain	12.01	8.63	2.73	2.07	73.11	1.46		
Sorghum silage (Atlas) I	71.72	2.15	.73	7.36	16.32	1.79	.04	.08
Sorghum silage (Tenn. Orange) II	15.73	1.10	.52	8.65	12.06	1.94		
Sorghum silage (Atlas) III	77.24	1.19	.52	7.88	11.44	1.77	.06	.05
Prairie hay	8.67	4.63	1.87	33.34	45.59	6.74	.32	.09
Alfalfa hay (dry grass)	8.99	14.88	1.85	35.96	34.18	6.97	1.20	.39
Bluestem pasture grasses, 1951—dry basis:								
January 1	0	3.44	1.99	36.76	48.22	9.59	.47	.10
March 6	0	3.22	1.95	35.34	51.00	8.49	.38	.03
July 5	0	7.60						
July 20	0	8.43						
August 6	0	6.39						
August 11	0	6.65						
August 17	0	7.24						
August 20	0	8.43						
August 31	0	7.32						
September 10	0	7.89						
September 21	0	5.93						
October 15	0	4.41						
November 1	0	4.20	2.12	33.98	49.87	9.50		
December 29	0	4.16	1.90	34.31	51.52	8.11		
Brome grass, December 11, 1951	4.96	6.75	2.55	34.67	42.08	8.99		

1 Analyses are reported on an as-fed basis except where noted.

Meat Investigations

David L. Mackintosh, Ralph Soule, J. L. Hall, and Dorothy Harrison

Several projects, all related to the various phases of frozen storage, are in progress under the direction of the Department of Animal Husbandry, and with the co-operation of the Departments of Chemistry and Food Economics. All work to date substantiates the Five Cardinal Points recommended in connection with freezing meat. These are: (1) select only quality products for freezing; (2) use only approved packaging materials; inferior wrapping material will shorten the storage life; (3) freeze as rapidly as possible; 0°F. or lower is recommended as a freezing temperature; (4) store at 0° or lower; temperatures higher than 0°F. will shorten the storage life, while lower temperatures will lengthen the storage period, and (5) do not store too long; freezer storage should be used in a manner similar to a checking account at the bank and not like a safety deposit box.

Work under way at the present time confirms earlier observations, that all pork should be chilled as rapidly as possible after dressing, and that processing and freezing should be done without delay. Beef and lamb may be aged for a short period but not longer than 10 to 12 days unless one likes a well-aged flavor. Antioxidants fed to hogs do not lengthen the storage life of pork, but antioxidants added to pork sausage will permit storage for a longer period than otherwise recommended.