38th Annual Livestock Feeders' Day

1950-51 PROGRESS REPORTS
KANSAS AGRICULTURAL EXPERIMENT STATION, KANSAS STATE COLLEGE
May 5, 1951 MANHATTAN, KANSAS Circular 273

38th Annual Livestock Feeders' Day

Kansas State College
Manhattan, Kansas

SATURDAY, MAY 5, 1951

9:30-12:00 a.m.—Fieldhouse

Presiding—Bob White, Garnett, Kansas, President, Kansas Livestock Association.

Opening Remarks—A. D. Weber, Associate Director, Kansas Agr. Expt. Station.

PROGRAM FOR THE DAY—Rufus F. Cox, Head, Department of Animal Husbandry.

Awards to Winners in beef, swine and sheep production contests—Walter H. Atzenweiler, Agricultural Commissioner, Chamber of Commerce, Kansas City, Mo., assisted by Lot F. Taylor, M. B. Powell, and Carl G. Elling.

Report of experimental results—beef cattle, sheep, hogs, and meats—R. F. Cox, C. W. McCampbell, T. Donald Bell, F. W. Bell, H. L. Ibsen, C. E. Aubel, D. L. Mackintosh, R. B. Cathcart, Ed F. Smith, Don L. Good, E. P. Margerum, Walter H. Smith.

Presentation of Winning International Livestock Judging Team and Coach.

NOON—Luncheon, served by the Block and Bridle Club. **Fieldhouse.**

1:00 p.m.-3:00 p.m.—AFTERNOON PROGRAM—Fieldhouse.

Greetings to Visiting Stockmen—R. I. Throckmorton, Director, Kansas Agricultural Experiment Station.

Special Feature.

Things of Fundamental Importance to Stockmen—Fred Olander, National Livestock Company, Kansas City, Mo.

Completion of report of experimental results.

3:00 p.m.—Tour of barns and feedlots.
QUESTION BOX.

For the Ladies

10:00 a.m.—Coffee Hour—Calvin Lounge (Home Economics Building) Get acquainted social gathering.

11:00 a.m.—To general meeting—Fieldhouse.

12 noon—Luncheon—Fieldhouse.

Animal Husbandry Investigations

1950-51 PROGRESS REPORTS*

38th 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. 185 from the Department of Animal Husbandry

Contents

Project 246: Studies in the Development of the Livestock Industry of Kansas—1950-51

THOMAS MITCHELL POTTER

By C. W. McCampbell

The man whom we honor today is the late Thomas Mitchell Potter. He was one of Kansas' most successful livestockmen and a leading citizen of the state. It is interesting to note that a son, G. P. Potter, and a grandson, Tom Potter, both graduated from Kansas State College with majors in Animal Husbandry; also that Tom Potter was an active member of Block and Bridle Club and a member of the Kansas State College livestock judging team that won the Bronze bull at the International Intercollegiate Judging Contest at Chicago in 1936.

Thomas Mitchell Potter was born near Chelsa, Michigan, April 16, 1840 and grew up on a farm in that vicinity. While a student at the University of Michigan in 1863, he enlisted in Company F, 134th Illinois Infantry, in which he served until the end of the Civil War.

The war over, he returned to Michigan where he farmed until he came to Kansas in the fall of 1869. His means of transportation from Michigan to Kansas was a buckboard drawn by a team of ponies and his cash assets amounted to $400, carefully tucked away in a money belt.

The following winter (1869-70) he traded the ponies for a yoke of oxen with which he started farming the next spring on what is now known as Hill Crest Farm one mile southeast of Peabody, Kansas, and the present home of the son, G. P. Potter.

During his earlier days in Kansas, he combined other activities with farming. The first of these activities was that of Superintendent of Schools in Marion in 1870. Another was laying out the town of Peabody in 1871. Still another was organizing a high school in Marion in 1873 and for a few years, he was also engaged in the real estate business.

He began early to accumulate both farm and pasture land in the vicinities of Florence and Peabody and eventually owned some 3500 acres. He also soon became engaged in the livestock business, especially feeding cattle for market, and it was not many years until his farming and livestock business required all his time and attention.

An item in the August 8, 1877 issue of the Peabody Gazette indicates that by that date he had become prominently identified with the livestock industry of Kansas. This item reads: "Caton Brothers shipped from Peabody Stockyards last Monday ten car loads of fat cattle. This was the finest as well as the largest lot of cattle ever shipped from here. They were 1200 pound cattle, all natives and very handsome. Mr. T. M. Potter made the sale to Caton Brothers who shipped them to Kansas City . . . ." Eventually Mr. Potter marketed around 2000 cattle annually.

Despite the demands his extensive business operations made upon his time, he became one of Kansas' outstanding pioneer leaders in agricultural and livestock organizations. He was one of the organizers in 1894 of what is now known as the Kansas Livestock Association, its vice president from 1894 to 1909 and its president from 1909 to 1913 inclusive.

Previous to 1913, he had felt for some time that the Kansas Livestock Association should be reorganized on a broader scope and that it should be better financed so he finally called a meeting for December 10, 1913 to be held at Topeka for the purpose, as he stated, "of developing an association that can look after the interests of its members and also the general livestock interests of the state more effectively than the present organization." He presented a plan for

reorganization which was adopted unanimously and the Kansas Livestock Association as we know it today came into being.

Mr. Potter was elected a member of the State Board of Agriculture in 1885 and every year thereafter for 33 years. He was president for three successive terms and upon being urged to accept a fourth successive term he stepped down from the chair, declined the nomination, stating that there were others in the organization as worthy of the honor as he, and placed ex-governor George W. Glick in nomination. Governor Glick was elected unanimously. No person was ever assigned more responsible jobs and commissions as a member of the board than Mr. T. M. Potter.

Mr. Potter devoted considerable time and talent to public service on a state wide basis as well as locally. Included in this service was one term as State Senator and eight years as a member of the Board of Regents of Kansas University. Incidentally, Potter Lake on the campus of Kansas University was named in his honor.

Mr. Potter was a man of high ideals and a real statesman who abhorred insincerity and chicanery in politics and his outspoken criticism of them militated against political preferment in a large way.

Mr. Potter was also a religious man and very active in church work. Of the many honors that came to him, none gave more satisfaction than his selection as commissioner to the General Assembly of the Presbyterian Church. One of the many fine things he did for the churches of his community was the establishment of an endowment for an annual Sunday School picnic of all the churches in Peabody and nearby towns.

After his death many tributes were paid Mr. Potter by the press and by the organizations to which he belonged. Space will allow only a few excerpts:

The KANSAS STOCKMAN, official publication of the Kansas Livestock Association, stated that "few men gave time, talent, thought and action to public questions with greater zeal and devotion than he. He was dignified, upright, fearless, sincere, honest and faithful to the cause he pursued. He had a high concept of duty and never hesitated to speak against those things he considered unjust."

A tribute which appears in the minutes of the annual meeting of the Kansas State Board of Agriculture of January 8-10-1930 includes: "In the passing of Thomas M. Potter, Kansas was bereft of a pioneer builder to whom the present structure of the state owes much. A man of large heart, great ability, and unusual achievement, his personal influence upon the fabric of Kansas is at once pronounced and indelible."

Mr. Potter died at Piedmont, California, December 3, 1929.

Project 110: Swine Feeding Investigations

EXPERIMENT I—Summer, 1950

C. E. Aubel

The Value of Sorghum Distillers Dried Solubles* in Protein Feed Mixtures When Fed As a Supplement to Shelled Corn for Fattening Spring Pigs on Alfalfa Pasture.

In recent years much attention has been given to the feeding of distillers by-products to livestock. One of these is distillers dried solubles derived from the malting of various grains. In addition to other nutrients, it furnishes some of the B vitamins that have lately been shown to be important in swine feeding.

* The sorghum distillers dried solubles used in the experiment were furnished through the courtesy of the Midwest Solvents Co., Inc., Atchison, Kansas.

A discussion of an experiment conducted at Kansas State College to determine the value of sorghum distillers dried solubles in protein supplements for swine follows:

EXPERIMENTAL PROCEDURE

Five lots of pigs were self-fed shelled corn on alfalfa pasture. In addition to the corn ration, protein supplements were fed as follows: in Lot 1, tankage; in Lot 2, a mixture of tankage 50%, soybean meal 50%; in Lot 3, a mixture of tankage 50%; dried solubles 50%; in Lot 4, a mixture of soybean meal 50%, dried solubles 50%; in Lot 5, a mixture of tankage ⅓, soybean meal ⅓ and dried solubles ⅓.

The protein content of the tankage was 60%, soybean meal 43%, and the dried solubles 25%.

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

EXPERIMENT I—Summer, 1950

The Value of Sorghum Distillers Dried Solubles in Protein Feed Mixtures When Fed As a Supplement to Shelled Corn for Fattening Spring Pigs on Alfalfa Pasture.

(June 7, 1950 to Aug. 21, 1950—76 days)

	SHELLED CORN, MINERAL MIXTURE (self-fed)—ALFALFA PASTURE				
Ration fed	Tankage (self-fed)	Tankage 50% Soybean meal 50% (self-fed)	Tankage 50% Distillers solubles 50% (self-fed)	Soybean meal 50% Distillers solubles 50% (self-fed)	Tankage ⅓ Soybean meal ⅓ Distillers solubles ⅓ (self-fed)
Lot number	1	2	3	4	5
Number pigs per lot	10	10	10	10	10
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Average initial weight per pig	66.75	67.10	66.94	67.95	67.35
Average final weight per pig	196.50	203.20	194.66	199.00	196.60
Average total gain per pig	129.75	136.10	127.72	131.05	129.25
Average daily gain per pig	1.70	1.78	1.67	1.72	1.70
Average daily ration per pig					
Shelled corn	4.48	4.59	4.48	4.61	4.50
Tankage	.33	.37	.44		.32
Soybean meal		.37		.35	.32
Distillers Sol.			.44	.35	.32
Mineral mixture	.017	.014	.015	.013	.013
Feed consumed per 100 pounds gain					
Shelled corn	262.83	256.42	266.20	267.45	264.60
Tankage	19.65	20.94	26.62		18.83
Soybean meal		20.94		20.53	18.83
Distillers Sol.			26.62	20.53	18.83
Mineral mixture	.99	.80	.93	.76	.77
Feed cost per 100 pounds gain	$7.65	$8.19	$9.17	$8.11	$8.95

Feed prices charged: Shelled corn $1.40 per bu.; Tankage $110.00 per ton; Sorghum distillers dried solubles $80.00 per ton; Soybean meal $60.00 per ton.

Methods of feeding: All lots were self-fed shelled corn and a mineral mixture, made up of equal parts steamed bone meal, ground limestone and salt. The pigs were all pastured on alfalfa. The protein supplements were mixed in the proportions indicated and self-fed in a separate compartment from the corn and minerals.

DISCUSSION OF RESULTS

It will be seen from the foregoing figures that Lots 3, 4 and 5 which received the sorghum dried solubles made very similar gains ranging from 1.67 to 1.70 pounds per head daily. The gains made in Lots 1 and 2 which received no solubles were as good or better than in the solubles-fed lots. In fact, the lot receiving equal parts of tankage and soybean meal made the largest daily gains of all. The feed consumption per 100 pounds gain varied in about the same relation. There was no appreciable difference in favor of the dried solubles-fed pigs.

EXPERIMENT III—Winter, 1951

Testing the Comparative Palatability of Different Sorghums

C. E. Aubel, Kansas State College and A. F. Swanson, Fort Hays Branch Agricultural Experiment Station

Plant breeders at the Fort Hays Branch Agricultural Experiment Station desired to know the relative palatability for livestock feeding of many of the new varieties of sorghum grain they had produced. They asked the Animal Husbandry Department to test this quality in nine of the varieties.

To do this, three pigs were individually fed. Three self-feeders, each containing three compartments, were placed before each pig. In each of the compartments, twenty-five pounds of one of the varieties of ground sorghum grains was placed. In this manner, each pig was given free access to the nine varieties. No other feed was given except a daily allowance of tankage. As soon as the first allowance of twenty-five pounds of a variety was consumed by the pig, an additional fifteen pounds was placed in the compartment. When this was consumed, the feeder which contained this variety was shifted to a different position in the pen, and another fifteen pounds added. When the third allowance was consumed, no more of that particular sorghum grain was supplied. This made it necessary for the pig to make a second choice from the remaining eight varieties. Other choices followed the second and were made in turn from the remaining varieties left after each choice.

It was assumed that a pig, self-fed in this manner with the sorghums to be tested, would eat first those that he liked best, and that a preference for a variety and thus its relative palatability would be indicated, if the pig would consume a total of fifty-five pounds of a certain variety before as much of any other was consumed. It would especially indicate a preference if the last fifteen pounds was consumed after the pig had hunted it out from a changed position.

The following table shows the varieties of sorghums and the order of their selection by each pig:

Order of choice	Pig No. 1	Pig No. 2	Pig No. 3
1	Westland	Cody x Wonder Club	Gurno
2	Westland x Cody	Westland	Midland
3	Martin	Gurno	Midland x Wonder Club
4	Cody	Midland	

5	Midland x Wonder Club	Midland x Wonder Club	Westland
6	Gurno	Cody	Martin
7	Leoti x Atlas	Martin	Cody
8	Midland	Leoti x Atlas	Cody x Wonder Club
9	Cody x Wonder Club	Westland x Cody	Westland x Cody
			Leoti x Atlas

In order to make a final placing of the palatability of the sorghums, each variety was given the number in the order it was selected by each pig and the sum of these placings was divided by the number of pigs in the test.

The following table shows the averages and the indicated relative palatability of the varieties:

Order of choice	Variety	Individual placing	Total	Average
1	Westland	1-2-4	7	2.33
2	Gurno	6-3-1	10	3.33
3	Midland x Wonder Club	5-5-3	13	4.33
4	Midland	8-4-2	14	4.66
5	Martin	3-7-5	15	5.00
6	Cody (waxy)	4-6-6	16	5.33
7	Cady x Wonder Club (waxy)	9-1-7	17	5.66
8	Westland x Cody (waxy)	2-9-8	19	6.33
9	Leoti x Atlas (waxy)	7-8-9	24	8.00

Although there is no complete accord in the tastes of the several pigs, yet the above order represents to some degree the combined tastes of the several pigs for the various varieties of sorghums tested. It is interesting that the first five varieties are the so-called non-waxy-endosperm type of sorghum, and the last four are waxy. The waxy type has rather a bland taste, the non-waxy has a stronger flavor.

EXPERIMENT IV—Winter, 1950-51

The Preparation of Milo Grain for Finishing Pigs Full-Fed in the Dry Lot.

C. E. Aubel

Swine feeders have complained for some time of the difficulty of grinding sorghum grains in hammer mills because of pulverizing, which has been thought to interfere somewhat with the economy of grain consumption when full-fed to pigs. Since the introduction of rolling mills and their adoption in grain preparation, the question has arisen whether rolling milo is a better method of preparing it than grinding. Consequently, an experiment was set up and three lots of pigs were fed; one received whole milo, one ground milo and another rolled milo. In rolling the milo in this experiment, there was some pulverizing as the milo was exceedingly dry.

Discussion of Results

It would seem from this experiment that slightly better results are to be secured from rolling sorghum, in preparation for full-feeding fattening and growing pigs, than by feeding it whole or grinding it. The ground milo and the rolled milo seemed more palatable than the whole milo for more was consumed daily. However, it required more ground or rolled milo than whole milo per 100 pounds gain, but the pigs consuming the whole milo consumed more tankage per 100 pounds gain than those fed processed grain.

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

EXPERIMENT IV—Winter, 1950-51

The Preparation of Milo Grain for Finishing Pigs Full-Fed in the Dry Lot.

(December 1, 1950 to February 27, 1951—89 days)

Ration fed	Tankage, alfalfa hay (self-fed) Whole milo (self-fed)	Ground milo (self-fed)	Rolled milo (self-fed)
Lot number	1	2	3
Number pigs in lot	10	10	10
Average initial weight per pig	61.80	63.00	61.15
Average final weight per pig	196.60	203.10	203.70
Average total gain per pig	134.80	140.10	141.55
Average daily gain per pig	1.51	1.57	1.58
Average daily ration per pig			
Whole milo	4.56		
Ground milo		5.25	
Rolled milo			5.17
Tankage	.72	.62	.59
Alfalfa hay	.24	.23	.27
Feed consumed per 100 pounds gain			
Whole milo	301.55		
Ground milo		333.69	
Rolled milo			325.32
Tankage	47.47	39.97	37.44
Alfalfa hay	16.32	16.31	17.37
Feed cost per 100 pounds gain	$10.12	$10.35	$10.01

Feed prices charged: Milo $2.25 cwt.; Tankage $130.00 ton; Alfalfa hay $30.00 ton.

Methods of feeding: The pigs in all lots were self-fed, free choice. The pigs were fed in a dry lot. The ground milo was processed through a ⅜" screen and the rolled milo was rolled dry.

EXPERIMENT V—Winter, 1950-51

The Effect of an APF-Aureomycin Supplement in Swine Rations.

C. E. Aubel

Recently much has been written on the use of the "Animal Protein Factor" (APF) supplements and different antibiotics in swine nutrition. The results indicate so far that there is a wide use for them in swine feeding. Vitamin B_{12}, one of the important components of the so-called "animal protein factor," has been assigned a part in swine nutrition. Now the antibiotics, another component of the "animal protein factor," are recognized from recent experiments as being important factors in promoting rapid gains in pigs.

An experiment was conducted this past winter at this station, with growing and fattening pigs in the dry lot, to determine some of the practical applications of an "APF supplement" which contained, besides vitamin B_{12}, one of the antibiotics (aureomycin). Lederle's Aurofac, 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. For convenience of reference it is designated as APF in this report.

In this experiment, beginning on December 1, 1950, four lots of 44-pound fall pigs were fed in the dry lot to market weight. There were 10 pigs to a lot and the pigs were self-fed free choice on shelled corn, a protein supplement, alfalfa hay and a mineral mixture. The

mineral mixture was made up of equal parts ground limestone, steamed bone meal and salt.

Three pounds of the APF supplement were included in the different protein supplements in Lots 2 and 4. This amount was estimated to give the pigs about 0.5 per cent of APF supplement in the total ration.

Lots 1 and 2 received only soybean meal and alfalfa hay as protein supplements. Lot 2 as noted above had APF added. Lots 3 and 4 received as a protein supplement a mixture of four parts meat and bone scraps, four parts soybean oil meal, one part linseed oil meal and one part alfalfa meal. Lot 4 as noted above had the APF supplement added.

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

EXPERIMENT V—Winter, 1950-51
The Effect of an APF-Aureomycin Supplement in Swine Rations.
(December 1, 1950 to March 9, 1951—98 days)

	Shelled corn, alfalfa hay, mineral mixture (self-fed)			
Ration fed	Soybean oil meal	Soybean oil meal plus APF	Protein Supit.	Protein Supit. plus APF
Lot number	1	2	3	4
Number pigs per lot	10	10	10	10
Average initial weight per pig	44.00	43.55	44.35	43.85
Average final weight per pig	179.50	204.40	189.50	213.00
Average total gain per pig	135.50	160.85	145.15	169.15
Average daily gain per pig	1.38	1.64	1.48	1.72
Average daily ration per pig:				
Corn	3.74	4.47	4.44	5.15
Protein supplement	1.48	1.53	.92	.91
Alfalfa hay	.10	.12	.12	.13
Feed consumed per 100 pounds gain:				
Corn	262.06	272.61	300.37	298.84
Protein supplement	107.74	93.25	62.69	53.20
Alfalfa hay	7.60	7.58	8.81	8.04
Mineral mixture	.72	.49	.20	.17
Feed cost per 100 pounds gain	$11.01	$11.65	$11.07	$11.41
Average per cent APF in total ration		.75		.44

Feed prices charged: Shelled corn $1.50 per bu.; Supplement Lot 1 $72.00 per ton, Supplement Lot 2 including APF $93.84 per ton, Supplement Lot 3 $92.80 per ton, Supplement Lot 4 including APF $114.04 per ton; Alfalfa hay $30.00 per ton; Mineral mixture 3c a pound; APF 40c a pound.

OBSERVATIONS

The soybean oil meal-alfalfa hay supplement was efficient in supplementing the grain in Lot 1, although the gain was not quite so much as in Lot 3 where a mixed protein was fed. Adding APF-aureomycin supplement to the soybean meal-alfalfa hay supplement increased the rate of gain about ¼ pound per head per day but it also increased the amount of feed consumed per 100 pounds gain and increased the cost of these gains 64c a hundred.

In Lot 3 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 but not so large as where the APF was added to the plant protein as in Lot 2. The costs per 100 pounds gain were less in Lot 3 also. Adding APF to a mixed protein supplement as fed in Lot 3 increased the rate of gain, reduced the amount of feed consumed per 100 pounds gain, but increased the cost of the gains.

In this experiment, the efficiency of gain, indicated by the feed requirements, was in favor of the rations containing APF. The lots receiving APF also had a marked increase in the rate of gain.

The cost of gain increased slightly when the APF was fed with the different supplements.

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

EXPERIMENT II—Summer, 1950

The Value of Thyroprotein in the Ration of Growing and Fattening Spring Pigs in the Dry Lot.

C. E. Aubel

It has long been known that the thyroid gland influences growth, metabolism and other functions in the body. In recent years numerous attempts have been made to influence growth, fattening, reproduction, milk and egg production in farm animals. Some trials have shown that an increased secretion of the thyroid gland or hyperthyroidism has, within certain limits, increased the growth rate in certain species of animals.

In this experiment, the effects of hyperthyroidism in swine were studied through the feeding of thyroprotein, which in this case was thyroactive iodinated casein. It contains the hormone produced by the thyroid gland and its administration results in hyperthyroidism.

In the trial reported here, three lots of pigs weighing about 50 pounds were self-fed a basal ration of corn and wheat with a good protein and mineral mixture. One lot received only the basal ration, one received 5 grams (0.011%) of thyroprotein to each 100 pounds of the basal ration and a third lot received 10 grams (0.022%) to each 100 pounds of basal ration.

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

EXPERIMENT II—Summer, 1950

The Value of Thyroprotein in the Ration of Growing and Fattening Spring Pigs in the Dry Lot.

(June 9, 1950 to September 3, 1950—87 days)

Ration fed	Basal ration only	Basal Ration (self-fed) 5 grams thyroprotein per 100 lbs. basal ration	Basal Ration (self-fed) 10 grams thyroprotein per 100 lbs. basal ration
Lot number	1	2	3
Number pigs per lot	6	6	6
Average initial weight per pig	Pounds 47.83	Pounds 48.33	Pounds 49.08
Average final weight per pig	199.83	200.00	194.50
Average total gain per pig	152.00	151.67	145.42
Average daily gain per pig	1.74	1.74	1.67
Average daily ration per pig Feed mixture	6.11	6.13	6.25
Feed consumed per 100 pounds gain Feed mixture	349.78	351.64	374.20

Methods of Feeding: A basal ration was self-fed in a feeder in the dry lot. The basal ration was composed of 66% corn, 20% wheat, 13% protein mixture and 1% mineral mixture. The mineral mixture was equal parts steamed bone meal, ground limestone and salt. The protein mixture was 4 parts meat scraps, 4 parts soybean meal, 1 part linseed meal and 1 part alfalfa leaf meal.

Discussion of Results

The addition of 5 grams (0.011%) of thyroprotein to 100 pounds of the basal ration did not affect the rate or total gain of the pigs as compared to another lot which did not receive thyroprotein. The amount of feeds per 100 pounds gain was practically the same in both lots.

In the lot that received 10 grams (0.022%) of thyroprotein or double the amount in the other lot, the gains were depressed and the feed consumption per 100 pounds gain was increased.

It would therefore seem, from this experiment, that the addition of thyroprotein to the ration of growing and fattening pigs was of no benefit so far as growing and fattening were concerned.

LAMB FEEDING EXPERIMENTS

Wheat Pasture and Feedlot Fattening Tests with Lambs.

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

By T. Donald Bell and A. B. Erhart.

This year's experiments included first, a series of wheat pasture tests, and later, various feedlot fattening tests. In the five lots of lambs on wheat pasture the effect of withholding salt, the value of additional roughage, and the efficiency of soda as well as vaccination in the control of over-eating disease, were studied. A check lot was fed a standard western Kansas feedlot ration.

Because of insufficient wheat pasture the lambs were removed after 39 days of grazing. They were re-sorted, weighed, and re-allotted into 11 lots and a new series of tests was started. Sorghum stover of different ages and other roughages were compared. The value of salt in the ration, as well as the value of drenching for worm control, were also studied.

Lambs:

New Mexico whiteface lambs were used in this year's tests. They were smooth and of good quality but because of drouth conditions the lambs were lighter when received at the range loading point than in previous years. After a preliminary feeding period the lambs went on the initial tests weighing about 64 pounds.

Feed Prices:

Westland Milo	$ 2.00 per cwt.
Alfalfa	25.00 per ton
Current year's Axtell Stover	7.00 per ton
One-year-old Axtell Stover	5.00 per ton
Two-year-old Axtell Stover	5.00 per ton
Axtell Tailings	7.00 per ton
Soybean oil meal pellets	86.00 per ton
Salt	.90 per cwt.
Ground limestone	1.00 per cwt.
Bicarbonate of Soda	4.85 per cwt.
Wheat Pasture	.30 per head per month

Thirteen of the 642 lambs died during the experimental feeding periods, a loss of 2 per cent. Six of these lambs died during the period that they were grazing on wheat pasture and seven died during the tests in the feedlot.

WHEAT PASTURE LAMB FEEDING EXPERIMENT

Table I—November 6, 1950 to December 15, 1950—39 Days

1. Lot number	1	2	3	4	5	6
2. Ration fed	Westland grain Alfalfa Axtell Stover Soybean pellets Limestone Salt	Wheat pasture No salt	Wheat pasture Salt	Wheat pasture Alfalfa hay Salt	Wheat pasture Salt Vaccinated against entero-toxemia	Wheat pasture Soda Salt
3. Number lambs per lot	50	118	118	119	119	118
4. Number of days on feed	39	39	39	39	39	39
5. Initial weight per lamb	64.4	64.7	64.3	64.9	64.2	64.5
6. Final weight per lamb	79.5	75.4	74.5	76.4	74.8	75.7
7. Total gain per lamb	15.1	10.7	10.2	11.5	10.6	11.2
8. Daily gain per lamb	.39	.27	.26	.29	.27	.29
9. Feed per lamb daily						
Wheat pasture		W.P.	W.P.	W.P.	W.P.	W.P.
Milo grain	1.00					
Alfalfa hay	1.34			.16		
Axtell Stover	.75					
Soybean oil pellets	.20					
Ground limestone	.005					
Soda						.0014
Salt	.013		.013	.014	.013	
11. Feed cost per cwt. gain	$12.50	$4.14	$4.13	$4.51	$3.95	$4.25
12. Initial cost per lamb into feed lot*	$15.73	$15.80	$15.70	$15.85	$15.83**	$15.75
13. Feed cost per lamb	$1.88	.44	.42	.52	.42	.48
14. Lamb cost plus feed cost	$17.61	$16.24	$16.12	$16.37	$16.25	$16.23
15. Final cost per cwt.	$22.15	$21.53	$21.63	$21.42	$21.72	$21.44
16. Death loss by lots	0	3	1	0	1	2

* Based on lambs finishing test.

**Includes 15 cents for vaccination.

FEEDLOT TESTS

Table II—December 18, 1950 to March 20, 1951

1. Lot number	1[1]	2[2]	3[2]	4	5	7
2. Ration fed	Westland grain Axtell Stover Soybean pellets Limestone Salt	Westland grain Axtell Stover Soybean pellets Limestone Salt	Westland grain Axtell Stover Soybean pellets Limestone No salt	Westland grain Axtell Stover Soybean pellets Limestone Salt Drenched	Westland grain Axtell Stover Soybean pellets Limestone Salt	Westland milo grain Alfalfa hay
3. Number of lambs per lot	50	55	55	55	55	55
4. Number of days on feed	92	92	92	92	92	92
5. Initial weight per lamb	79.4	74.5	74.4	75.0	75.4	76.4
6. Final weight per lamb	87.2	87.3	83.1	83.7	85.0	93.5
7. Av. weight of shorn fleece	6.6	6.7	6.6	6.9	6.6	7.3
8. Total gain per lamb	14.4	19.5	15.3	15.6	16.2	25.4
9. Daily gain per lamb	.16	.21	.17	.17	.18	.28
10. Feed per lamb daily						
Milo grain	1.22	1.17	1.17	1.17	1.17	1.17
Alfalfa hay	—	—	—	—	—	—
Axtell Stover	2.14	2.26	2.24	2.23	2.27	2.32
Axtell tailings	—	—	—	—	—	—
Soybean oil pellets	.20	.20	.20	.20	.20	—
Ground limestone	.017	.016	.016	.016	.016	—
Salt	.027	.025	—	.026	.026	.026
11. Feed cost per cwt. gain	$26.09	$19.60	$24.52	$23.72[4]	$23.16	$19.12
12. Initial cost per lamb into feed lot[3]	$17.93	$16.63	$16.32	$16.31	$16.54	$16.25
13. Feed cost per lamb	$3.76	$3.82	$3.75	$3.70	$3.75	$4.86
14. Lamb cost plus feed cost	$21.69	$20.45	$20.07	$20.01	$20.29	$21.11
15. Final cost per cwt.	$23.12	$21.75	$22.37	$22.09	$22.15	$20.94
16. Death loss by lots	1	2	1	0	1	0

1 Lot 1 had been on feed in the dry lot since November 6 and therefore are not directly comparable to the other lots that were made up of lambs previously run on wheat pasture.

2 The lambs making up lots 2 and 3 received no salt while on wheat pasture.

3 Death loss charged into this cost in lots where lambs died.

4 Includes cost of drenching.

FEEDLOT TESTS

Table III—December 18, 1950 to March 20, 1951

1. Lot number	8	9	10	11	12
2. Ration fed	Westland grain Alfalfa Axtell Stover Soybean pellets Salt	Westland grain 2-yr.-old Axtell Stover Soybean pellets Limestone Salt	Westland grain 1-yr.-old Axtell Stover Soybean pellets Limestone Salt	Westland grain Axtell tailings Soybean pellets Limestone Salt	Westland grain Axtell Stover Soybean pellets Limestone Salt Axtell tailings
3. Number of lambs per lot	55	55	55	55	55
4. Number of days on feed	92	92	92	92	92
5. Initial weight per lamb	75.2	74.5	75.2	74.8	76.0
6. Final weight per lamb	93.5	80.9	81.9	84.0	85.5
7. Av. weight of shorn fleece	6.7	6.2	5.9	6.2	6.6
8. Total gain per lamb	25.0	12.6	12.6	15.4	16.1
9. Daily gain per lamb	.27	.14	.14	.17	.18
10. Feed per lamb daily					
Milo grain	1.17	1.17	1.17	1.17	1.17
Alfalfa hay	1.08	—	—	—	—
Axtell Stover ..	1.08	1.48	1.48	—	1.66
Axtell tailings ..	—	—	—	2.03	1.67
Soybean pellets	0.90	0.20	0.20	0.20	0.20
Limestone	0.10	.016	.016	.016	.016
Salt	.029	.026	.026	.026	.026
11. Feed cost per cwt. gain	$17.74	$26.70	$26.18	$23.96	$23.42
12. Initial cost per lamb into feed lot	$16.21	$16.34	$16.21	$16.41	$16.38
13. Feed cost per lamb	$4.43	$3.36	$3.30	$3.69	$3.77
14. Lamb cost plus feed cost	$20.64	$19.70	$19.51	$20.10	$20.15
15. Final cost per cwt.	$20.60	$22.62	$22.22	$22.28	$22.34
16. Death loss by lots	0	1	0	1	0

SUMMARY

Wheat Pasture Tests

Gains on wheat pasture during the 39 day grazing period ranged from .26 pound per head daily to .29 pound. While gains are not as high as those obtained last year, the results are similar to those obtained in other tests conducted on wheat pasture.

Lambs fed in the drylot gained considerably more than lambs fed on wheat pasture but the cost per pound of gain in the feedlot was about three times the cost of gains on wheat pasture.

Lambs fed no salt on wheat pasture gained just as well as those having access to salt. It is probable that the grazing period was too short to show any ill effects of a diet containing no supplemental salt.

There was an indication that the addition of a small amount of alfalfa hay to wheat pasture increased the rate of gain but the cost per pound was also increased.

No losses occurred from over-eating disease or digestive trouble during the grazing period; therefore it was impossible to check the efficiency of either vaccination or soda in their control.

SUMMARY

Feedlot Tests

Feedlot gains shown in Tables II and III are much lower than in previous years when apparently similar lambs and similar feeds were used in the tests. The lambs were shorn the last week in Februrary and may have been affected by some of the stormy weather occurring during early March. The final weights used in determining the amount of gains were taken on March 20. While conditions were apparently normal, weights taken six days later showed an average increase in weight per lamb of about seven pounds, indicating that the March 20 weights were lower than normally would be expected. However, all lots were weighed under similar conditions on that date so that comparisons between the various lots should not be biased.

Alfalfa fed as the sole roughage or replacing one-half of the sorghum roughage produced larger and more economical gains than the sorghum roughages. Alfalfa and Axtell stover, equal parts, produced slightly lower gains but at less cost per pound of gain than alfalfa as the only roughage.

The low gains of lot 3 indicate that salt is needed for good gains when the feeding period is of 130 days duration.

Drenching for worm control was ineffective in increasing the rate of gain. The drenched lambs appeared to be affected adversely by the drench and failed to gain the first 14 days of the feeding period.

One-year-old and two-year-old Axtell stover produced the lowest gains of any of the lots and at the highest cost per pound of gain. Chemical analyses failed to show much difference in sorghums grown the current year and the older Axtell stover but the lambs did not relish the older stover and would not consume as much roughage.

Axtell tailings or "pummies" appeared to be virtually equal to Axtell stover in feeding value. About the same rate of gain was obtained when the tailings were fed as the sole roughage as when they were fed in equal parts with Axtell stover.

PHYSICAL BALANCE IN SHEEP FATTENING RATIONS

THE RELATIONSHIP OF PHYSICAL BALANCE AND ENERGY VALUE IN SHEEP RATIONS STUDIES CARRIED OUT AT THE KANSAS AGRICULTURAL EXPERIMENT STATION MANHATTAN, KANSAS

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 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. The results of the experiments conducted during the summer of 1950 as well as the preliminary results of the 1951 trials are reported.

Objects:

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 1:5.5)

Lot 3—Corn and alfalfa hay, plus bicarbonate of soda (CF:TDN ratio of 1:5.5)

Lot 4—Corn and pelleted alfalfa (CF:TDN ratio 1:4)

Lot 5—Corn and pelleted alfalfa (CF:TDN ratio 1:5.5)

Lot 6—Corn and pelleted alfalfa, plus bicarbonate of soda (CF:TDN ratio 1:5.5)

SUMMARY

1. The lambs in the 1950 tests were secured late in the spring and were not uniform in condition or quality. They refused to consume the amount of feed that the lambs have eaten in previous tests or in the 1951 studies. Because of the comparatively low consumption of feed, digestive disturbances were not common and very small differences in economy of gains were shown between the lots of lambs receiving corn and alfalfa in medium concentration and those receiving the same feeds in high concentration. The lots of lambs receiving the pelleted alfalfa gained just as well as those receiving alfalfa hay. These results are in decided contrast to the results obtained in the 1949 trials when the lambs consumed larger amounts of feed.

2. In the 1951 studies the lambs have eaten more corn and alfalfa than in the 1950 studies and difference in rate and economy of gain are indicated for the first 56 days of the feeding period in the accompanying table.

The lambs receiving corn and alfalfa in medium concentration are making as large or larger gains with less feed than the lambs receiving the higher proportion of concentrates.

The two lots of lambs receiving the pelleted alfalfa and corn in heavy concentration have had digestive disturbances and have been off-feed on several occasions. Bicarbonate of soda has not entirely prevented these digestive difficulties, but the lambs in the lot receiving the soda have made somewhat larger gains than the lambs fed the same amounts of corn and pelleted alfalfa without soda.

These results are similar to those obtained in the 1949 tests when the rations for the various lots were fed in virtually the same amounts.

EXPERIMENTAL LAMB FEEDING TEST

May 3, 1950 to August 21, 1950

Lot number	1	2	3	4	5	6
Ration fed	Corn Alfalfa Hay	Corn Alfalfa Hay	Corn Alfalfa Bicarbonate of Soda	Corn Pelleted Alfalfa	Corn Pelleted Alfalfa	Corn Pelleted Alfalfa Bicarbonate of Soda
Ratio Crude Fiber to T. D. N.	1 to 4	1 to 5.5	1 to 5.5	1 to 4	1 to 5.5	1 to 5.5
Number of lambs per lot	10	10	10	10	10	10
Deaths per lot	2	0	0	0	1	1
Number of days on feed	110	110	110	110	110	110
Initial weight per lamb	69	69	69	69	70	69
Final weight per lamb	90	95	92	97	95	96
Total gain per lamb	21	26	23	28	25	27
Daily gain per lamb	.20	.24	.21	.25	.23	.25
Feed per lamb daily						
Corn (pounds)	1.16	1.41	1.41	1.20	1.41	1.41
Alfalfa hay (pounds)	1.23	.92	.92	1.09	.92	.92
Soda (ounces)	0	0	.2	0	0	.24
Feed per cwt. gain						
Corn	576	609	672	482	631	584
Alfalfa Hay	613	395	436	433	408	377
Soda	0	0	6	0	0	5.7
T. D. N. per lamb daily	1.60	1.65	1.65	1.62	1.64	1.64
Gain per 100 pounds of T. D. N.	12.47	14.54	12.72	15.43	14.02	14.02

EXPERIMENTAL LAMB FEEDING TEST

(First portion of feeding period)

February 2, 1931 to March 30, 1931

Lot number	1	2	3	4	5	6
Ration fed	Corn Alfalfa Hay	Corn Alfalfa Hay	Corn Alfalfa Bicarbonate of Soda	Corn Pelleted Alfalfa	Corn Pelleted Alfalfa	Corn Pelleted Alfalfa Bicarbonate of Soda
Ratio Crude Fiber to T. D. N.	1 : 4	1 : 5.5	1 : 5.5	1 : 4	1 : 5.5	1 : 5.5
Feed per lamb daily						
Corn	1.37	1.62	1.62	1.37	1.62	1.62
Alfalfa	1.45	1.02	1.02	1.45	1.02	1.02
Soda (ounces)	0	0	.2	0	0	.2
Daily gain per lamb	.40	.38	.41	.42	.33	.35

FACTORS INFLUENCING SALT REQUIREMENTS OF SHEEP

Preliminary Report on the Effects of Withholding Salt and the Effects of High and Low Potassium-Sodium Ratios Upon the Feedlot Performance of Lambs.

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

Many of the feeder lambs coming into Kansas have not had access to salt for several weeks and some of the lamb feeders do not add salt to their lamb fattening rations because of the possible losses in getting the lambs again accustomed to eating salt. The experimental studies, initiated this year, should indicate whether such a practice results in poorer feedlot performance. The studies should also lead to a clearer understanding of the physiological function of salt in the sheep's diet.

EXPERIMENTAL PROCEDURE

Fifty-four feeder lambs were divided into four lots and treated according to the following plan.

Lot 1 (17 lambs)—Basal ration (1.25 pounds corn and 1.45 pounds chopped alfalfa hay).
Lot 2 (17 lambs)—Basal ration plus salt ad libitum.
Lot 3 (10 lambs)—Basal ration plus potassium bicarbonate sufficient to provide a potassium-sodium ratio of 60:1.
Lot 4 (10 lambs)—Basal ration plus sodium bicarbonate sufficient to provide a potassium-sodium ratio of 2:1.5.

At the conclusion of the test mineral balance studies with three lambs from each lot will be conducted. Balance of sodium, potassium, and chlorine in the lambs from each of these groups will be determined. Blood samples will be taken and analyzed for sodium, potassium, magnesium, calcium, chlorine, bicarbonate, plasma protein, and hemoglobin.

OBSERVATIONS

After 67 days of experimental treatment the following results are indicated:

1. The largest average daily gains (0.33 pound) are shown by the lambs in Lot 2 receiving the basal ration plus salt. The lambs in Lot 1, receiving the basal ration without salt, have gained 0.29 pound per head daily. They have consumed the same amount of corn as the lambs in Lot 1, but have eaten a little less alfalfa hay.

2. The exact potassium-sodium ratios initially planned in Lots 3 and 4 could not be attained. Lot 3 received a potassium-sodium ratio of 57:1 and Lot 4 a potassium-sodium ratio of 2:1.5. Lot 4 gained an average of 0.30 pound per head daily, while Lot 3 gained only 0.23 pound per head daily during the first 67 days of the experimental feeding period. The salt consumption ad libitum in Lot 2 has been 0.04 pound per head daily.

Project Commercial No. 65

Performance of Steers Sired by Bulls of Different Sizes

A Comparison of Hereford Steers Sired by Small, Medium, and Large Size Bulls

A. D. Weber, D. L. Mackintosh, D. L. Good, E. F. Smith

The Kansas, Oklahoma, and Ohio Agricultural Experiment Stations co-operated in this study, which was supported by grants from the American Hereford Association. The project involved comparisons of steer

calves sired by small, medium, and large size bulls. Each size group at each station was handled under the following systems of feeding and management:

System I—immediate full feeding for 225 days.

System II—a deferred full-feeding program in which the steer calves are wintered well, grazed without grain from May 1 to August 1, and then full-fed in dry lot 100 days.

System III—the production of two-year-old grass-fat steers without the feeding of grain. Phases under this system include: wintering as calves without grain; grazing as yearlings a full season without supplemental feed; wintering as yearlings without grain; grazing as two-year-olds without supplemental feed and selling as slaughter cattle directly off pasture.

A complete report of the average results obtained at the three stations with each system of feeding and management appeared in the March 15, 1951 issue of the American Hereford Journal. Reprints of this report may be obtained from the American Hereford Association, 300 West 11th Street, Kansas City 6, Missouri.

A complete report on the results at the Kansas station with Systems I and II, and a progress report on the results with System III, were released May 6, 1950 in Kansas Agricultural Experiment Station Circular No. 265. Final data for System III at the Kansas station are presented in Table I which follows.

Table I—A Comparison of Hereford Steers Sired by Small, Medium, and Large Size Bulls

System III—Wintering and Grazing, Two Seasons

Phase I—Wintering as Calves

November 29, 1948 to May 1, 1949—153 Days

1. Lot number	7	8	9
2. Size of sires	Small	Medium	Large
3. Number of steers per lot	10	10	10
4. Initial weight per steer	427	442	454
5. Final weight per steer	574	588	620
6. Gain per steer	147	146	166
7. Daily gain per steer	.96	.95	1.08
8. Daily ration per steer, pounds:			
Soybean meal	1.00	1.00	1.00
Atlas sorgo silage	19.52	19.95	19.82
Prairie hay	5.39	4.88	5.30
9. Feed required per 100 pounds of gain, pounds:			
Soybean meal	104.08	104.79	92.17
Atlas sorgo silage	2032.31	2090.75	1826.81
Prairie hay	561.50	511.58	488.73
10. Cost of feed per 100 pounds gain	$14.62	$14.46	$12.97
11. Total feed cost per steer	$21.49	$21.11	$21.53

Phase II—Grazing as Yearlings

May 1, 1949 to October 15, 1949—167 Days

12. Initial weight per steer	574	588	620
13. Final weight per steer	762	790	834
14. Gain per steer	188	202	214
15. Daily gain per steer	1.13	1.21	1.28

16. Cost of grazing per steer (bluestem pasture)	$12.00	$12.00	$12.00
17. Cost of 100 pounds of pasture gain..	$6.38	$5.94	$5.61

Phase III—Wintering as Yearlings

October 15, 1949 to May 8, 1950—205 Days

18. Initial weight per steer	762	790	834
19. Final weight per steer	923	991	1044
20. Gain per steer	161	201	210
21. Daily gain per steer	.79	.98	1.02
22. Daily ration per steer, pounds:			
Soybean meal	1.01	1.01	1.01
Sorghum silage	38.20	43.46	41.67
Prairie hay	3.98	4.00	4.65
23. Feed required for 100 pounds gain, pounds:			
Soybean meal	128.58	102.99	98.57
Sorghum silage	4863.66	4432.69	4067.76
Prairie hay	506.89	407.76	453.57
24. Cost of feed per 100 pounds gain	$24.43	$21.33	$20.32
25. Total feed cost per steer	$39.33	$42.87	$42.66

Phase IV—Wintering as Two-Year-Olds

May 8, 1950 to August 24, 1950—108 Days

26. Initial weight per steer	923	991	1044
27. Final weight per steer	1076	1152	1203
28. Gain per steer	153	161	159
29. Daily gain per steer	1.42	1.49	1.47
30. Cost of grazing per steer (bluestem pasture)	$15.00	$15.00	$15.00
31. Cost of 100 pounds of pasture gain..	$9.80	$9.32	$9.43

Summary of Phases I, II, III and IV

November 29, 1948 to August 24, 1950—633 Days

32. Initial weight per steer	427	442	454
33. Final weight per steer	1076	1152	1203
34. Gain per steer	649	710	749
35. Daily gain per steer	1.03	1.12	1.18
36. Feed required per 100 pounds gain:			
Soybean meal	72.58	65.57	61.02
Sorghum silage	2181.05	2178.91	1961.83
Prairie hay	330.95	285.34	298.95
Pasture—two seasons			
37. Feed cost per 100 pounds gain	$13.53	$12.81	$12.17
38. Total feed cost per steer	$87.82	$90.98	$91.19
39. Shrink in transit to market:			
Pounds per steer	57	63	60
Percentage	5.3	5.5	5.0
40. Dressing per cent*	59.8	59.8	59.0

* Includes 2% cooler shrink.

41. On-foot grades:			
Low good	1	1	
High medium	5	2	2
Average medium	4	7	6
Low medium			2
42. Carcass grades:			
High commercial	6	5	5
Average commercial	1	5	4
Low commercial	3		
High utility			1
43. Selling price per cwt.	$27.65**	$28.00	$27.50

** Selling price was $28.00 with two out at $26.00, figures $27.65.

The following general summary appeared in the report published in the American Hereford Journal, and is based on the overall results obtained with the three systems of feeding and management at the three stations co-operating in the study:

"1. There was a definite tendency for the steers sired by large-size bulls to gain more than those sired by medium-size bulls, and in turn for those sired by medium-size bulls to gain more than those sired by small-size bulls. These gain advantages tended to be more pronounced during the wintering and grazing phases than during the full-feeding phase.

"2. Overall differences among the three groups in economy of gain were too small to be significant. However, when the ration consisted largely of roughage or grass the steers sired by medium- and large-size bulls produced gains at significantly lower costs than those sired by small-size bulls.

"3. When full-feeding was deferred or omitted entirely, the large steers showed less finish at the conclusion of the test, which was reflected in lower slaughter and carcass grades. But when the steers were full-fed immediately after weaning, there were no significant differences in the slaughter and carcass grades of the three size groups.

"4. The results of these tests indicate that medium-size cattle tend to combine the gaining ability of large cattle and the finishing ability of small cattle without sacrifice of efficiency of gain."

Project 286: Improvement of Beef Cattle Through Breeding Methods, 1950-51

Walter H. Smith, Ed F. Smith and Heman L. Ibsen

A National Beef Cattle Breeding Research Program has been initiated and is organized in three areas which are referred to as the Western, Southern, and North Central Regions in the United States. The Kansas Agricultural Experiment Station is co-operating with 12 other states in the North Central Region. The purebred Shorthorn herd maintained at Manhattan is being used as the primary basis for the purebred cattle breeding investigations conducted by the Kansas station.

The objectives of the project are:

1. To develop testing procedures for the evaluation of breeding animals.
2. To collect data pertaining to the inheritance of physical characteristics of Shorthorn cattle.
3. To determine the practicability of inbreeding for the establishment of two high-producing lines of Shorthorn cattle.

The project is in its preliminary stages and the systems of breeding that have been adopted have been regulated primarily by the founda-

TABLE I—PARTIAL SUMMARY OF CALVES PRODUCED IN SPRING OF 1950. REPRESENTING THE INBRED LINE OF THE WERNACRE'S PREMIER FOUNDATION

Calf No.	Sex	Birth weight pounds	Weaning weight pounds	Daily gain birth to weaning pounds	Feeding trial information*			
					Initial weight pounds	Weight April 1, 1951 pounds	Days on trial April, 1951	Daily gain during trial pounds
81	Bull	76	500	2.20	530	990	149	3.09
61	Bull	90	510	2.20	535	910	149	2.52
23	Bull	66	480	2.09	490	870	149	2.55
13	Bull	74	455	1.91	475	835	149	2.42
11	Bull	75	455	1.96	495	880	156	2.47
49	Bull	52½	440	1.98	480	820	156	2.18
760	Steer	75	420	1.77	425	730	149	2.04
87	Steer	65	355	1.48	375	725	149	2.35
90	Steer	70	445	1.89	465	790	149	2.18
56	Steer	77	410	1.69	425	765	149	2.28
55	Steer	69	425	1.79	455	755	149	2.01
53	Steer	74½	465	2.00	480	750	149	1.81
54	Steer	74	440	1.85	445	680	89	2.64
189	Heifer	78½	440	1.81	475	740	156	1.70
72	Heifer	71	475	2.05	475	785	156	1.99
92	Heifer	67½	435	1.90	440	680	149	1.61
58	Heifer	57	320	1.32	360	570	149	1.41
4	Heifer	60½	335	1.39	340	585	149	1.64
2	Heifer	80	400	1.68	420	625	149	1.38
14	Heifer	70	380	1.58	425	540	67	1.72
39	Heifer	77	420	1.76	410	545	89	1.52

* Feeding trials will be of 196 days' duration for each calf.

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

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 at a time when sufficient breeding stock has been produced in the project. The 1951 calf crop is sired by both College Premier 29th and Gregg Farms Hoarfrost.

The cows included in the project are pasture-bred to calve in the spring of each year. The calves are not creep-fed during the suckling period and are weaned at 196 days of age. After a 30-day adjustment period they are placed on individual feeding trials for a 196-day period. The performance data obtained from these feeding trials will provide part of the information used to select breeding animals in the project. Fast-gaining animals with good type will be retained for breeding purposes as the project progresses.

No conclusive information is available at this time; however, a partial summary of the 1950 calf crop is presented in Table I.

ROLLED VS. GROUND GRAIN FOR FATTENING YEARLING HEIFERS—1950

R. F. Cox, E. F. Smith

INTRODUCTION

A great deal of interest in rolled grain has been expressed. Some commercial feeders have purchased rollers in preference to grinders; a few feeders truck grain to town to have it rolled in preference to grinding grain at home. The usual recommendation for grain preparation for fattening commercial cattle has been to have it cracked or medium ground, not finely ground. Rolled grain has been considered by most people to be equal to medium ground or cracked grain and by some to be superior to medium ground or cracked grain. No conclusive experimental evidence was available as to the best method of grain preparation for fattening cattle. The objective of this study then is to find out which is the best method of grain preparation: rolling, coarse grinding or fine grinding.

EXPERIMENTAL PROCEDURE

Thirty-five good quality yearling Hereford heifers were divided into three equal lots and fed identical rations for 142 days except lot 1 received finely ground grain, lot 2 coarsely ground grain and lot 3 rolled grain.

After the heifers were on feed, they were self-fed grain. Prairie hay was fed in amounts that would be cleaned up. Soybean oil meal pellets were fed twice daily in a bunk separate from the grain.

Barley was fed as the only grain for the first ⅔ of the test and barley and corn were fed the remainder of the test.

The finely ground grain was prepared with a hammer mill and had a coarse mealy texture. The coarsely ground grain was prepared with a burr mill. The rolled grain was dry rolled which worked fine on the barley. The corn was properly rolled at the time it came out of the roller but through handling, it tended to break up into smaller particles.

OBSERVATIONS

All lots gained the same and only small differences occurred in grain

consumption and efficiency of gain. General opinion is that rolled and cracked grains are more palatable than finely ground grains. This test did not show this to be true.

TABLE I—Comparison of Rolled, Coarse and Finely Ground Grain for Fattening Yearling Heifers

(July 12, 1950 to December 1, 1950 (142 days)

Lot number	1	2	3
Method of grain preparation	Fine ground	Coarse ground	Rolled
Number heifers per lot	12	12	11
Average initial weight	543	543	544
Average final weight	834	834	834
Average gain	291	291	290
Average daily gain	2.05	2.05	2.04
Average daily ration, pounds:			
Barley	8.70	9.01	8.37
Corn	3.39	2.80	3.27
Soybean oil meal pellets	1.90	1.90	1.90
Prairie hay	4.99	5.63	5.73
Ground limestone	.08	.08	.08
Salt	.05	.05	.04
Feed required per 100 lbs. gain, pounds:			
Barley	424.68	439.69	409.97
Corn	165.61	136.77	157.12
Soybean oil meal pellets	92.87	92.70	93.13
Prairie hay	243.41	274.71	280.50
Ground limestone	3.72	3.72	4.08
Salt	2.23	2.41	1.80
Cost of feed per 100 lbs. gain	$18.09	$17.98	$17.83

Feed Prices: Barley, $1.05 a bu.; Corn, $1.25 a bu.; soybean pellets, $75.00 a ton; prairie hay, $13.00 a ton; ground limestone or salt, $12.00 per ton.

A COMPARISON OF ROLLED, COARSE GROUND AND FINE GROUND MILO GRAIN FOR FATTENING STEER CALVES, 1950-51

R. F. Cox and E. F. Smith

INTRODUCTION

This is a progress report on full feeding rolled, coarse ground, and fine ground milo grain to steer calves. The test will be completed in July, 1951 when the steers will have been on full feed about 225 days.

The objective of the test is to determine which is the most profitable method of preparing milo grain for full feeding, rolling, coarse grinding, or fine grinding.

EXPERIMENTAL PROCEDURE

Good quality Hereford steer calves are being used in this study. There are three lots, 10 head to a lot, all being fed the same except for the difference in grain preparation. They were started on test December 5, 1950. At the beginning of the test they were fed all of the sorghum silage they would eat, 2 pounds of alfalfa hay, and 1½ pounds of soybean pellets per head daily. The grain was started at one pound per head daily and raised one 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 a total of three to four pounds of alfalfa hay per head daily, which was about what they would clean up in a day.

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 coarse ground or cracked milo was the product of a burr mill. A hammer mill was used to prepare the fine ground milo, which was ground to a coarse mealy mixture.

OBSERVATIONS

1. Only small differences in daily gain have occurred; all lots have made very satisfactory gains to date.
2. Grain consumption was about the same for all lots. The steers fed coarse ground milo consumed slightly more grain than steers fed either rolled milo or fine ground milo.
3. Little or no difference is apparent at this time between the lots in regard to efficiency of gain or cost of production.

A Comparison of Rolled, Coarse Ground and Fine Ground Milo Grain for Fattening Steer Calves

December 5, 1950 to April 13, 1951—129 days

1. Lot number	6	7	8
2. Management	Fine Ground Milo	Coarse Ground Milo	Rolled Milo
3. Number of steers per lot	10	10	10
4. Initial weight per steer	418	419	418
5. Final weight per steer	713	727	718
6. Gain per steer	295	308	300
7. Daily gain per steer	2.29	2.39	2.33
8. Daily ration per steer, lbs.:			
Milo grain	8.97	9.11	8.86
Soybean oil meal pellets	1.37	1.37	1.37
Sorghum silage	11.28	12.64	12.33
Alfalfa hay	2.25	2.45	2.33
Salt	.05	.06	.04
9. Feed required per 100 pounds of gain, lbs.:			
Milo grain	392.08	381.40	381.00
Soybean oil meal pellets	59.83	57.31	58.83
Sorghum silage	493.39	529.22	530.17
Alfalfa hay	98.31	102.76	100.00
Salt	2.40	2.30	1.60
10. Cost of feed per 100 pounds of gain	$13.84	$13.66	$13.68
11. Initial cost per steer into feed lot @ $31.50 per cwt.	$131.67	$131.99	$131.67
12. Feed cost per steer	$40.82	$42.06	$41.03
13. Steer cost plus feed cost	$172.49	$174.05	$172.70
14. Necessary selling price per cwt. to meet steer cost plus feed cost	$24.19	$23.94	$24.05
15. Appraised value per cwt. May 5, 1951			

Project 253-1: Wintering and Grazing Steer Calves

Methods of Wintering Steer Calves That Are To Be Grazed a Full Season and Sold Off of Grass—1949-1950

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

INTRODUCTION

It is a well known fact that thin steers usually gain more on grass than fleshy steers. However, little information is available about the total gain, winter and summer, of steers wintered in different ways and then grazed on bluestem pasture. The primary objective of this test is to determine how steer calves that are to be grazed a full season on bluestem pasture and sold off of grass should be wintered. This is the first year's work on a three-year project.

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 November 25, 1949 to May 1, 1950 and were then grazed together on bluestem pasture until September 29, 1950.

Lot 1—Bluestem pasture and 2 pounds of soybean pellets per head daily.
Lot 2—Silage 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 corn and 1 pound of soybean pellets per head daily.
Lot 5—Prairie hay, 4 pounds of corn and 1 pound of soybean pellets per head daily.

OBSERVATIONS

1. This first test indicates that the most satisfactory way of wintering steer calves may be out on dry bluestem pasture if they are to be grazed a full season and sold in the fall. The winter of 1949-50 was exceptionally mild with very little rain or snow and the calves wintered on grass were in a creek bottom bluestem pasture with considerable bluegrass in it.
2. Steer calves wintered on dry bluestem grass (lot 1) had the lowest feed cost per 100 pounds of gain, the lowest total feed cost per steer and made the greatest return per steer.
3. Lot 5, fed 4 pounds of grain per head daily during the winter, gained 51 pounds more than any other lot and due to this large gain made practically as much money as lot 1, which was wintered out on the grass.
4. The lots that made the smallest winter gain made the largest summer gain.
5. The steer calves wintered on prairie hay supplemented with protein did not make quite as much total gain as did the calves wintered on silage supplemented with protein.

TABLE I—Methods of Wintering Steer Calves That Are To Be Grazed a Full Season and Sold Off of Grass

PHASE I—WINTERING

November 25, 1949-May 8, 1950—164 days

1. Lot number	1	2	3	4	5
2. Number of steers per lot	10	9	9	10	10

3.	Place wintered ..	Bluestem Pasture	Dry lot	Dry lot	Dry lot	Dry lot
4.	Number of days in phase	157	164	164	164	164
5.	Average daily ration:					
	Corn	—	—	—	2.00	4.00
	Soybean pellets	2.00	1.00	1.00	1.00	1.00
	Silage	—	28.99	—	—	—
	Prairie hay[2]	.04[2]	—	12.25	10.95	9.00
	Salt	.06	.07	.06	.06	.06
	Bluestem pasture	Ad lib				
6.	Average initial weight	431	430	434	432	432
7.	Average final weight	578	588	594	618	687
8.	Average gain	147	158	160	186	255
9.	Average daily gain	.94	.96	.98	1.13	1.55
10.	Feed required for 100 lbs. gain					
	Corn	—	—	—	176.34	257.25
	Soybean pellets	213.61	103.80	102.55	88.17	64.31
	Silage	—	3009.49	—	—	—
	Prairie hay	4.08	—	1286.53	965.27	642.59
	Salt	6.87	6.97	6.63	5.67	3.92
	Bluestem grass	Ad lib				
11.	Feed cost per cwt. gain[3]	$12.16	13.56	12.25	13.55	12.35
12.	Feed cost per steer[3]	$17.88	21.42	19.60	25.20	31.49

PHASE II—GRAZING

May 8, 1950-September 29, 1950—144 days'

13.	Lot number	1	2	3	4	5
14.	Days in phase	151[1]	144	144	144	144
15.	Average initial weight	578	588	594	618	687
16.	Average final weight	836	834	819	837	888
17.	Average gain	258	246	225	219	201
18.	Average daily gain	1.71	1.71	1.56	1.52	1.40
19.	Cost of grazing per steer (bluestem)	$12.00	12.00	12.00	12.00	12.00
20.	Cost of 100 lbs. of pasture gain ..	$4.65	4.88	5.33	5.48	5.97

SUMMARY OF PHASES I & II

November 25, 1949-September 29, 1950—308 days

21.	Lot number	1	2	3	4	5

22. Average initial weight	431	430	434	432	432
23. Average final weight	836	834	819	837	888
24. Average gain ..	405	404	385	405	456
25. Average daily gain	1.31	1.31	1.25	1.31	1.48
26. Feed required for 100 lbs. gain					
Corn	—	—	—	80.99	143.86
Soybean pellets	77.53	40.59	42.60	40.49	35.96
Silage	—	1176.98	—	—	—
Prairie hay	1.48	—	534.66	443.30	359.34
Salt	2.49	2.73	2.76	2.60	2.19
27. Feed cost per 100 lbs. gain[3] ..	$7.38	$8.27	$8.20	$9.19	$9.54
28. Total feed cost per steer[3]	$29.88	$33.42	$31.60	$37.20	$43.49
29. Initial cost per steer at $24.50 a cwt.	$105.60	$105.35	$106.33	$105.84	$105.84
30. Total cost of steer and feed ..	$135.48	$138.77	$137.93	$143.04	$149.33
31. Selling price per steer at $27.50 per cwt.[4]	$220.55	$220.00	$215.88	$220.83	$234.30
32. Return per steer	$85.07	$81.23	$77.95	$77.79	$84.97

1. Grazing phase for lot 1 began May 1, 1950 rather than May 8, 1950.
2. Prairie hay was fed to lot 1 only when snow covered the grass.
3. Feed prices: ground shelled corn, $1.25 a bu.; soybean pellets, $75 per ton; prairie hay, $13.00 per ton; silage, $6.50 per ton; bluestem pasture per head, $6.00 for the winter, $12.00 for the summer; salt $12.00 per ton.
4. Selling price per steer is based on a selling price of $27.50 a cwt. and market weight which represents an average shrink of 4.1% from home weight.

Project 253-1: Wintering and Grazing Steer Calves

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

E. F. Smith, D. L. Good, 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 1951. The purpose of 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. All were fed in dry lot, except lot 1, which was

fed out on dry bluestem pasture. The different lots received the following rations from December 5, 1950 to April 16, 1951.

Lot 1—Bluestem pasture and 2 pounds of soybean oil meal pellets per head daily.

Lot 2—Sorghum silage and 1 pound of soybean oil meal pellets per head daily.

Lot 3—Prairie hay and 1 pound of soybean oil meal pellets per head daily.

Lot 4—Prairie hay, 2 pounds of milo grain and 1 pound of soybean oil meal pellets per head daily.

Lot 5—Prairie hay, 4 pounds of milo grain and 1 pound of soybean oil meal pellets per head daily.

All lots will be grazed on bluestem pasture a full season in 1951 and sold as feeder yearlings in the fall.

OBSERVATIONS

1. Steer calves wintered on dry bluestem pasture were in a strong thrifty condition at the close of the winter and made a very satisfactory gain. The pasture these calves were wintered in was a creek bottom bluestem pasture with considerable bluegrass in it. The pasture was grazed the previous season but there was an abundance of dry grass and each calf had about six acres. The winter was mild and very favorable for wintering out on dry grass.

2. Due to the poor quality silage (it appeared to be of good quality but was quite acid and the calves didn't like it) fed in Lot 2, the calves in this lot did not gain as much as those fed prairie hay or the calves wintered out on dry grass.

3. The steers in Lot 3, although fed late-cut prairie hay (about September 1), made a very satisfactory gain.

4. Grain added to the ration in Lots 3 and 4 increased the gains in those lots to the extent that they could be sold for less money per cwt. at this date than any of the other lots and pay initial cost plus feed costs.

Wintering and Grazing Steer Calves

Phase I—Wintering

December 5, 1950 to April 16, 1951—132 Days[1]

Lot number	1	2	3	4	5
Number steers per lot	10	12	10	10	10
Place of wintering	Bluestem grass	Dry lot	Dry lot	Dry lot	Dry lot
Average initial weight	419	419	419	418	418
Average final weight	532	524	558	578	607
Average gain	113	105	139	160	189
Average daily gain	.84	.80	1.05	1.21	1.43
Average daily ration, lbs.:					
Ground milo	—	—	—	2.00	4.02
Soybean pellets	2.00	1.00	1.00	1.00	1.00
Prairie hay	.50[2]	—	12.95	11.15	10.44
Sorghum silage	—	27.85	—	—	—
Bluestem pasture	ad lib	—	—	—	—
Salt	.03	.15	.06	.07	.07
Mineral mixture[3]	.02	—	—	—	—

Feed required for 100 lbs. gain, lbs.:					
Ground milo	—	—	—	165.63	280.42
Soybean pellets ..	237.17	126.19	95.32	82.81	70.11
Prairie hay	59.12	—	1230.14	919.88	729.31
Silage	—	3501.06	—	—	—
Salt	3.20	18.26	5.92	5.50	4.66
Mineral mixture ..	2.94	—	—	—	—
Cost of feed per 100 lbs. gain	$14.76	$16.05	$11.61	$12.93	$13.85
Total feed cost per steer	$16.68	$16.85	$16.14	$20.69	$26.18
Initial cost per steer @ $31.50 per cwt. ..	$131.99	$131.99	$131.99	$131.67	$131.67
Initial cost plus feed cost	$148.67	$148.84	$148.13	$152.36	$157.85
Necessary selling price per cwt. to cover initial cost plus feed cost	$27.95	$28.40	$26.55	$26.36	$26.00
Appraised value per cwt. May 5, 1951					

1. The wintering period for Lot 1 was 134 days.
2. Prairie hay was fed to Lot 1 only when snow covered the grass.
3. Mineral mixture consisted of 2 parts steamed bone meal to 1 of salt by weight.

Feed prices: Milo grain, $2.30 a cwt.; soybean pellets, $75.00 a ton; prairie hay, $13.00 a ton; sorghum silage, $6.50 a ton; salt, $12.00 a ton; steamed bone meal, $5.50 a cwt.

Project 253-2: Wintering, Grazing and Fattening Heifers

Fattening Heifers for the Fall Market, 1949-50

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

INTRODUCTION

The purpose of this experiment is to develop a desirable system of fattening heifer calves similar to the deferred full-feeding system for steer calves. The system developed for good quality steer calves consists of three phases: (1) producing 225-250 pounds of gain during the winter, which usually requires the feeding of four to five pounds of grain per head daily; (2) grazing 90 days without grain; (3) full-feeding 100 days in the dry lot.

Some of the problems which it is hoped this experiment will answer are:

(1) How well should heifer calves be wintered that are going to grass and be full-fed later?

(2) Should the full-feeding of grain take place on grass or in the dry lot?

Cottonseed oil meal (solvent process) and soybean oil meal (expeller process) were compared in the wintering period.

EXPERIMENTAL PROCEDURE

Good quality Hereford heifer calves were used in this test. The system of management followed with each lot is as follows:

Lot 1—**Wintered on 2 pounds of corn, solvent extracted cottonseed oil meal,** sorghum silage and prairie hay; grazed on bluestem pasture May 8 to July 15; **then full-fed in dry lot 100 days.**

Lot 2—**Wintered on 2 pounds of corn,** expeller processed soybean oil meal, sorghum silage and prairie hay; grazed on bluestem pasture May 8 to July 15; **then full-fed on bluestem pasture 100 days.**

Lot 3—**Wintered on soybean oil meal pellets,** sorghum silage and prairie hay; grazed May 8 to July 15 on bluestem pasture; **then full-fed 100 days in dry lot.**

Lot 4—**Wintered on soybean oil meal pellets,** sorghum silage and prairie hay; grazed May 8 to July 15 on bluestem pasture; **then full-fed 100 days on bluestem pasture.**

Lot 5—**Wintered on soybean oil meal pellets,** sorghum silage and prairie hay; grazed May 8 to August 10 on bluestem pasture; **fed 1½ pounds of soybean oil meal pellets per head daily on pasture from July 15 to August 10, then full-fed in dry lot for about 75 days.**

OBSERVATIONS

1. Heifer calves in Lot 2 fed soybean oil meal pellets gained slightly more than calves in Lot 1 fed cottonseed oil meal. This difference is probably not large enough to be significant, since Lots 3, 4 and 5 were all fed soybean oil meal pellets and varied just as much in gain as did Lots 1 and 2.

2. Lots 3 and 4, wintered without grain and grazed the same length of time as Lots 1 and 2, weighed nearly as much as Lots 1 and 2 at the close of the grazing phase.

3. Lot 5 was fed 1½ pounds of soybean oil meal pellets per head daily from July 15 to August 10 prior to going on full-feed in dry lot. This 26-day additional period on grass resulted in 48 pounds more grass gain for this lot as compared to the average combined grass gains for Lots 3 and 4.

4. Full-feeding grain on grass resulted in the following benefits as compared to full-feeding in dry lot:

   a. Slightly greater gains, which is the reverse of 1948-49 tests which showed a definite advantage for full-feeding in dry lot over full-feeding on bluestem pasture.
   b. Appreciably lower feed costs for the full-feeding phase.
   c. A larger return per head. See line 34.

5. Two pounds of corn fed per heifer daily during the winter period was not profitable in this test. Heifers fed 2 pounds of corn per head daily during the winter period:

   a. Graded slightly higher in the carcass; compare Lots 1 and 2 with Lots 3 and 4.
   b. Produced about the same amount of total gain as heifers fed no grain during the winter.
   c. Sold for more per cwt. in one comparison; Lot 1 sold for $29, Lot 3 sold for $28.50, both were full-fed in dry lot; Lot 1 received 2 pounds of corn per head daily during the winter, Lot 3 received no grain during the winter. In another comparison, the selling price per cwt. was the same; compare Lot 2 and Lot 4.

6. Heifers continued on grass after July 15 (Lot 5) and fed protein until August 10 and then full-fed for a short period of about 75 days in dry lot returned less profit than some of the other lots due to their low gain during full-feeding. They sold for less per cwt. than any other lot and graded lower in the carcass than any other lot.

TABLE I—FATTENING HEIFERS FOR THE SUMMER OR EARLY FALL MARKET, 1949-50

Phase I—Wintering

November 21, 1949 to May 8, 1950—168 days

1. Lot number	1	2	3	4	5
2. Number heifers per lot	10	11	11	10	10
3. Average daily ration, pounds					
Corn	2.00	2.00	—	—	—
Cottonseed oil meal (solvent process)	1.00	—	—	—	—
Soybean oil meal pellets (expeller process)	—	1.00	1.00	1.00	1.00
Silage	20.00	20.00	20.00	20.00	19.94
Prairie hay	2.78	2.74	3.48	3.42	3.55
Salt	.08	.07	.05	.05	.05
4. Average initial weight	418.00	417.00	418.00	420.00	417.00
5. Average final weight	607.00	618.00	582.00	595.00	577.00
6. Average gain ..	189.00	201.00	164.00	175.00	160.00
7. Average daily gain	1.13	1.20	.98	1.04	.95
8. Feed cost per cwt. gain	$14.79	$13.96	$12.75	$11.91	$12.65
9. Feed cost per heifer	$27.95	$28.06	$20.91	$20.84	$20.24

Phase II—Grazing—Bluestem Pasture

May 8 to July 15, 1950*

Lot number	1	2	3	4	5*
10. Number days in phase	68	68	68	68	94
11. Average initial weight	607	618	582	595	577
12. Average final weight	690	704	690	687	725
13. Average gain ..	83	86	108	92	148
14. Average daily gain	1.22	1.26	1.59	1.35	1.57

* Lot 5 was continued on grass until August 10 and fed 1½ pounds of soybean oil meal pellets per head daily from July 15 to August 10.

Phase III—Full Feeding

Lot number	1	2	3	4	5
15. Period when fed and where	7/15/50-10/26/50 dry lot	7/15/50-10/26/50 bluestem pasture	7/15/50-10/26/50 dry lot	7/15/50-10/26/50 bluestem pasture	8/10/50 10/26/50 dry lot
16. Number days in phase	103	103	103	103	77

17. Average initial weight	690	704	690	687	725
18. Average final weight	877	895	883	898	853
19. Average gain	187	191	193	211	128
20. Average daily gain	1.82	1.85	1.87	2.05	1.66
21. Average daily ration, pounds:					
Corn	12.14	11.11	11.91	11.11	10.94
Soybean oil meal pellets	1.49	1.82	1.49	1.82	1.49
Alfalfa hay	1.96	—	1.77	—	2.00
Prairie hay	5.76	—	5.44	—	5.12
Salt	.02	—	.03	—	.03
Limestone	.10	.08	.09	.08	.10
22. Bushels corn fed per heifer during this phase	22.33	20.43	21.91	20.43	15.05
23. Feed per cwt. of gain, pounds:					
Corn	668.72	598.90	635.70	542.13	658.32
Soybean oil meal pellets	82.09	98.18	79.44	88.87	89.84
Alfalfa hay	108.02	—	94.21	—	120.31
Prairie hay	317.27	—	290.49	—	307.81
Salt	1.19	—	1.50	—	1.56
Limestone	5.40	4.29	4.76	3.88	6.02
24. Cost of feed per 100 pounds gain	$21.17	$17.06	$20.02	$15.45	$21.30
25. Total feed cost this phase	$39.59	$32.59	$38.64	$32.59	$27.26

Summary of Phases I, II, III

26. Average total gain (all phases)	459	478	465	478	436
27. Average daily gain (all phases)	1.35	1.41	1.37	1.41	1.29
28. Feed cost for 100 pounds gain (all phases)	$17.33	$15.20	$15.39	$14.37	$13.97
29. Total cost of feed, grass per heifer	$79.54	$72.65	$71.55	$68.69	$60.91
30. Initial cost per heifer at $23.50 cwt.	$98.23	$98.00	$98.23	$98.70	$98.00
31. Selling price per cwt. at market	$29.00	$29.00	$28.50	$29.00	$27.50
32. Selling price per heifer	$248.24	$247.37	$246.24	$250.85	$231.83

33. Margin per heifer above feed cost, initial cost	$70.47	$76.72	$76.46	$83.46	$72.92
34. Per cent shrink in shipping to market	2.4	4.7	2.2	3.7	1.2
35. Dressing per cent	60.3	61.9	59.6	61.3	57.3
36. Carcass grades, U. S.					
Average good ..	—	—	—	1	—
Low good	3	3	—	2	—
High commercial	5	3	5	5	3
Average commercial	2	5	6	2	5
Low commercial	—	—	—	—	2

Feed prices: Ground shelled corn, $1.25 per bu.; cottonseed meal and soybean pellets, $75.00 per ton; sorghum silage, $6.50 per ton; prairie hay, $13.00 per ton; alfalfa hay, $17.00 per ton; salt and ground limestone, $12.00 a ton.

Project 253-2: Wintering, Grazing and Fattening Heifers, 1949-50

The Use of Brome Grass in Fattening Yearling Heifers as Compared to Fattening in a Dry Lot—1950.

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

INTRODUCTION

The purpose of this study is to develop a system of fattening heifers for feeders who do not have native pasture or have no pasture. The plan of production is to buy good quality heifer calves in the fall, winter them well (which entails the feeding of about two pounds of grain per head daily in addition to roughage and protein). Following the winter period there are three alternatives being tested: full feed in dry lot; full feed on brome grass pasture; graze brome pasture early, then full feed in dry lot.

EXPERIMENTAL PROCEDURE

Thirty good quality Hereford heifer calves were divided into three lots and wintered on 20 pounds of silage, 4-5 pounds of prairie hay, and 2 pounds of corn per head daily, with different protein supplements being fed during the winter. The heifers were relotted on April 15 after the wintering period and received the following treatment after that date:

Lot 1—Full fed 104 days in dry lot (April 15-July 28)
Lot 2—Full fed 104 days on brome pasture (April 15-July 28)
Lot 3—Grazed 48 days on brome pasture (April 15-June 2); started on feed on brome pasture (June 2-July 1); full fed in dry lot (July 1-September 15), a total of 105 days on full feed.

OBSERVATIONS

1. Lot 3, which was grazed on brome 48 days and then full fed for

105 days, made the largest total gain, the largest full fed gain, returned more per heifer and graded the highest in the carcass.

2. Lot 2, full fed out on brome grass, gained slightly more than Lot 1 full fed in dry lot. In two previous tests, the reverse has been true.

3. Feed costs per heifer were higher for feeding out on brome grass than in dry lot due to the cost of brome grass charged at 10c per head per day.

TABLE I—Full Feeding in Dry Lot vs. Brome Grass, 1950

Lot number	1	2	3
Number heifers per lot	10	10	10
Method of management	Wintered well then full fed in dry lot for 104 days	Wintered well then full fed on brome grass pasture for 104 days	Wintered well; grazed on brome grass April 15-June 2; full fed 105 days from June 2-Sept. 15, the first 30 days on brome grass and the rest in dry lot
Average initial weight	583	582	585
Average final weight	785	800	870
Average pasture gain (48 days)			46
Average full fed gain (104 days; Lot 3, 105 days)	202	218	239
Average total gain—pasture and full fed	202	218	285
Full feeding ration—average daily—pounds:			
Ground shelled corn	12.06	12.00	11.63
Soybean oil meal pellets	1.39	.53	1.11
Alfalfa hay	1.67	—	1.45
Prairie hay	3.29	—	2.16
Sorghum silage	1.78	—	—
Ground limestone	.08	—	.07
Salt	.05	Free access	.02
Brome grass	—	4/15-7/28	6/2-7/1
Corn consumed per heifer, bushels	22.4	22.3	21.8
Initial cost per heifer @ appraised value of $26.25 cwt.—4/15/50	$153.04	$152.78	$153.56
Feed cost per heifer	$38.02	$40.31	$ 42.36
Heifer cost plus feed cost	$191.06	$193.09	$195.92
Selling price per cwt. @ market	$29.00	$29.00	$28.40
Selling price per heifer	$227.65	$232.00	$247.08
Margin per heifer above feed cost and initial cost	$36.59	$38.91	$51.16
Carcass grades—U. S.			
Average good	—	—	1
Low good	2	2	4
High commercial	8	6	4
Average commercial	—	2	1

Feed prices: Corn, $1.25 a bu.; soybean pellets, $75 a ton; alfalfa hay, $17.00 a ton; prairie hay, $13.00 a ton; silage, $6.50 a ton; ground limestone or salt, $12.00 a ton; Brome grass, 10c per head per day.

Project 253-2: Wintering, Grazing and Fattening Heifers

Wintering Heifer Calves That Are To Be Fattened for the Summer or Early Fall Market, 1950-51

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 will either be full-fed or go to grass and be full-fed after the grazing period. The objective of the test is to develop a method of fattening heifers similar to the deferred full-feeding system for steer calves.

The 1950-51 wintering test included:

(1) a comparison of grain and no grain in the wintering ration of heifer calves;

(2) a comparison of expeller type soybean oil meal pellets and hydraulic extracted cottonseed oil meal pellets.

EXPERIMENTAL PROCEDURE

Seventy good quality Hereford heifer calves were used in this test. They were divided into seven lots of 10 head each. The system of management planned for each lot follows:

Lot (1) wintered with 2 pounds grain, soybean oil meal pellets (expeller type), sorghum silage and prairie hay; grazed May 1 to July 15 on bluestem pasture; full-fed 100 days in dry lot.

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

Lot (3) wintered with 2 pounds grain, cottonseed oil meal pellets (hydraulic extracted), sorghum silage, prairie hay; full-fed grain on brome pasture for 100 days following winter period.

Lot (4) wintered with 2 pounds of grain, cottonseed oil meal pellets (hydraulic extracted), sorghum silage, prairie hay; full-fed 100 days in dry lot after wintering period.

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

Lot (6) wintered with sorghum silage, prairie hay, soybean oil meal pellets; bluestem pasture May 1 to July 15; full-fed in dry lot 100 days after July 15.

Lot (7) wintered with sorghum silage, prairie hay, soybean oil meal pellets; bluestem pasture May 1 to August 10; fed protein July 15 to August 10 on bluestem pasture; full-fed in dry lot after August 10 for about 75 days.

OBSERVATIONS

1. The addition of 2 pounds of milo grain to the ration increased the gain approximately a quarter of a pound per head daily. Compare Lots (1) and (2) with Lots (6) and (7).

2. The addition of 4 pounds of milo grain to the ration increased

WINTERING HEIFER CALVES THAT ARE TO BE FATTENED FOR THE SUMMER OR EARLY FALL MARKET

Phase I—Wintering

November 30, 1950 to April 16, 1951—137 days

	1	2	3	4	5	6	7
1. Lot number							
2. Number of heifers per lot	9[1]	9[1]	9[2]	9[2]	10	9[1]	10
3. Ration fed	Milo, expeller type SBP, prairie hay, silage	Milo, expeller type SBP, prairie hay, silage	Milo, hydraulic extracted CSP, prairie hay, silage	Milo, hydraulic extracted CSP, prairie hay, silage	Milo, expeller type SBP, prairie hay, silage	Expeller type SBP, prairie hay, silage	Expeller type SBP, prairie hay, silage
4. Average daily ration, lbs.:							
Ground milo grain	2.00	2.00	2.00	2.00	4.05	—	—
Soybean pellets (expeller type)	1.00	1.00	—	—	1.00	1.00	1.00
Cottonseed meal pellets (hydraulic extracted)	—	—	1.00	1.00	—	—	—
Prairie hay	2.05	2.02	1.52	1.40	1.13	3.42	2.97
Silage	19.95	19.91	19.58	19.43	19.55	19.07	19.63
Salt	.07	.09	.08	.10	.09	.08	.10
5. Average initial weight	449.00	448.00	447.00	434.00	434.00	428.00	434.00
6. Average final weight	614.00	609.00	586.00	572.00	621.00	556.00	553.00
7. Average gain	165.00	161.00	139.00	138.00	187.00	128.00	119.00
8. Average daily gain	1.20	1.18	1.01	1.01	1.36	.93	.87
9. Feed required per 100 lbs. gain, lbs.:							
Ground milo grain	166.06	170.19	197.12	198.55	297.06	—	—
Soybean pellets (expeller type)	83.03	85.09	—	—	73.26	107.03	115.13
Cottonseed meal pellets (hydraulic extracted)	—	—	98.56	99.28	—	—	—
Prairie hay	169.80	172.05	149.48	139.29	82.63	365.81	342.27
Silage	1656.06	1694.10	1929.45	1928.54	1432.62	2040.66	2259.66
Salt	5.76	8.07	7.43	10.10	6.35	8.62	11.30
10. Cost of feed per 100 lbs. gain	$13.37	$13.69	$15.42	$15.43	$14.74	$12.97	$13.84
11. Feed cost per heifer	$22.06	$22.05	$21.43	$21.29	$27.56	$16.61	$16.47
12. Initial cost heifers @ $31.50 cwt.	$141.44	$141.12	$140.81	$136.71	$136.71	$134.82	$136.71
13. Heifer cost plus feed cost	$163.50	$163.17	$162.24	$158.00	$164.27	$151.43	$153.18
14. Necessary selling price per cwt. to pay for feed and initial cost	$26.63	$26.79	$27.69	$27.62	$26.45	$27.24	$27.70
15. Appraised value per cwt., May 5, 1950							

1. One heifer removed because of no gain.

2. One heifer died—lead paint poisoning.

the daily gain nearly one-half pound. Compare Lot (5) with Lots (6) and (7).

3. In this test, the heifer calves, Lots (1) and (2), fed expellor type soybean oil meal pellets, gained considerably more than those fed hydraulic extracted cottonseed oil meal pellets.

4. The gains of all lots are lower than might be expected. The silage fed was very acid, particularly the last third of the silo. Some of the lots did not clean up their silage each day until noon and it was necessary to withhold the prairie hay that was fed until the silage was eaten each day.

Project 253-4: Wintering and Grazing Yearling Steers

Methods of Wintering Yearling Steers on Bluestem Pasture, 1949-50

E. F. Smith, R. F. Cox

INTRODUCTION

The primary purpose of this 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

Forty head of good quality, 625-pound Hereford yearling steers were used in this test which was started December 11, 1949. All of the pastures in which the steers were wintered had been grazed the previous summer but a plentiful supply of dry grass remained. From 6 to 19 acres of pasture were allowed each steer.

The forty steers were divided into four lots and received the following supplements in addition to bluestem grass from December 11, 1949 to May 1, 1950.

Lot 1: Two pounds of soybean oil meal pellets per steer daily.

Lot 2: Four pounds of soybean oil meal pellets per steer fed every other day (average of 2 pounds per steer daily).

Lot 3: Six and nine-tenths pounds of alfalfa hay per steer 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 protein supplement). The proportions of soybean oil meal and salt were 100 pounds of soybean oil meal and about 35 pounds of salt.

After the wintering period, all the steers were grazed together on bluestem pasture until July 15, 1950.

OBSERVATIONS

1. The winter of 1949-50 was very mild, extremely dry, and ideal for wintering cattle.

2. This test indicates that daily feeding results in greater gains than feeding every other day when steers are on dry grass.

3. The steers fed alfalfa hay as a protein supplement and those self-fed a mixture of soybean oil meal and salt gained about the same but they gained only about half as much as steers that were fed soybean oil meal pellets every day.

4. No ill effects were noted from feeding the meal-salt mixture to the steers in Lot 4 although they did present a somewhat rougher appearance than the other lots at the close of the wintering period.

5. All lots lost weight during the month of March. Lot 1 lost six pounds per steer, Lot 2 lost 7 pounds per steer, Lot 3 lost 13 pounds per steer, and Lot 4 lost 43 pounds per steer. All lots made large gains during April.

6. There was a tendency for the lots that made the lowest winter gain to make the largest summer gain.

7. At the close of the grazing period on July 15, 1950, the alfalfa hay-fed lot and the soybean oil meal-salt-fed lot gained 47 and 44 pounds, respectively, less per steer than Lot 1 which was hand-fed daily.

TABLE I—Wintering Yearling Steers on Bluestem Pasture.

Phase I—Wintering—Dec. 11, 1949-May 1, 1950—141 days

Lot number	1	2	3	4
Number steers per lot	10	10	10	10
Management	Fed SBP daily	Fed SBP every other day	Fed Alfalfa hay daily	Self-fed SBM, salt mixed together
Average daily ration, pounds:				
Soybean oil meal pellets	2.00	2.01	—	—
Soybean oil meal	—	—	—	1.84
Alfalfa hay	—	—	6.88	—
Prairie hay[1]	.34[1]	.34[1]	.21[1]	.81[1]
Salt	.10	.10	.07	.58
Bluestem pasture	ad lib	ad lib	ad lib	ad lib
Average initial weight	624.00	622.00	623.00	623.00
Average final weight	723.00	701.00	668.00	669.00
Average gain	99.00	79.00	45.00	46.00
Average daily gain	.70	.56	.32	.33
Total feed cost per steer	$16.98	$17.04	$15.95	$16.94
Appraised value per cwt. May 5, 1950	$28.75	$28.75	$28.75	$28.75
Phase II—Grazing—May 1, 1950-July 15, 1950—75 days				
Number steers per lot	10	9[2]	10	10
Average initial weight	723.00	701.00	668.00	669.00
Average final weight	879.00	861.00	831.00	834.00
Average gain	156.00	160.00	163.00	165.00
Average daily gain	2.08	2.13	2.17	2.20
Summary of Phases I and II—Dec. 11, 1949-July 15, 1950—216 days				
Average initial weight	624.00	622.00	623.00	623.00
Average final weight	879.00	861.00	831.00	834.00
Average gain	255.00	239.00	208.00	211.00
Average daily gain	1.18	1.11	.96	.98
Total feed cost	$31.98	$32.04	$30.95	$31.94
Feed cost per 100 lbs. gain	$12.54	$13.41	$14.88	$15.14
Initial cost per steer @ $24.75 per cwt.	$154.44	$153.95	$154.19	$154.19
Initial cost per steer plus feed costs	$186.42	$185.99	$185.14	$186.13
Appraisal value per steer @ $28.00 cwt. July 15, 1950	$246.12	$241.08	$232.68	$233.52
Return per steer over initial cost plus feed cost	$59.70	$55.09	$47.54	$47.39

1. Prairie hay was fed only when snow covered the grass except lot 4 was fed some hay at the start of the test to get them started on the salt-meal mixture.

2. One steer in lot 2 developed an infected foot shortly after the winter period and was removed from the test.

Feed prices: Soybean pellets, soybean meal, $75.00 a ton; Alfalfa hay $17.00 a ton; Prairie hay, $13.00 a ton; Bluestem pasture, $6.00 for the winter; Salt, $12.00 a ton.

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—1950.

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

Forty head of good quality 2-year-old Hereford steers were used in this test. They were wintered on dry bluestem pasture and then grazed together until July 15, when this test started.

The steers were divided into four uniform lots and grazed on bluestem pasture with the following treatment from July 15, 1950 to September 29, 1950.

Lot 1:—July 15 to September 29—received 3 pounds of soybean oil meal pellets per head daily.

Lot 2:—August 10 to September 29—received 3 pounds of soybean oil meal pellets per head daily.

Lot 3:—September 1 to September 29—received 3 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 from July 15 to September 29 was not profitable.

2. The greatest benefit from feeding protein was in the month of September where lots 1 and 2 each gained 23 pounds more per head than lot 4 which received no protein. See line 12 of table 1.

3. The average protein content of bluestem pasture grasses[1] in July was 9%, in August 8.7%, and in September 7.1%. Large rains were received in July and August; late season grazing was good.

4. When marketed lot 1 was the fleshiest of the lots; the other lots appeared to be about the same in amount of flesh. No difference was noted in the hair coats among the lots. They all sold for the same price per hundred pounds.

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1. The samples were of immature grasses or regrowth after grazing. The September average includes an October 1 sample.

TABLE I—Effect of Feeding a Protein Supplement During the Latter Part of the Grazing Season to Two-Year-Old Steers on Bluestem Pasture

July 15, 1950 to September 29, 1950—(76 days)

1. Lot number	1	2	3	4
2. Number of steers per lot ..	9	10	10	10

3. Management	Fed 3 lbs. Soybean Pellets from July 15-Sept. 29, 1950	Fed 3 lbs. Soybean Pellets from Aug. 10-Sept. 29, 1950	Fed 3 lbs. Soybean Pellets from Sept. 1-Sept. 29, 1950	No Soybean Pellets fed
4. Av. initial weight	850	851	851	852
5. Av. final weight	979	975	947	947
6. Average gain	129	124	96	97
7. Av. daily gain	1.70	1.63	1.26	1.28
8. Gain contributed to feeding of soybean pellets, lbs.	32	27	−1	0
9. Total soybean pellets fed per steer, lbs.	228	150	84	0
10. Gain per cwt. of soybean pellets fed, lbs.	14.04	18.00	0	0
11. Selling price per cwt. on Oct. 3	$28.00	$28.00	$28.00	$28.00
12. Gain per steer by periods, pounds:				
July 15-August 10	47	49	46	37
August 10-Sept. 1	33	26	30	34
September 1-Sept. 29	49	49	20	26
Total gain	129	124	96	97

Project 253-4: Wintering and Grazing Yearling Steers

Wintering Yearling Steers on Dry Bluestem Pasture, 1950-51

E. F. Smith, R. F. Cox

INTRODUCTION

The primary purpose of this test is to determine if yearling steers can be satisfactorily wintered 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—4 pounds of soybean pellets per head every other day (average 2 pounds a day)
Lot 3—2 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. Yearling steers were satisfactorily wintered on dry bluestem grass and a protein supplement. The average gain for the lots varied from 46 to 75 pounds per head for the winter.

2. In this test steers fed every other day made the largest gain, followed by steers fed daily. The lowest gaining lot was fed alfalfa hay, which has been true in two previous trials. Lot 4, which was fed the meal-salt mixture, did not gain quite as much as the steers fed every day in lot 1, but did compare very favorably with them.

3. Although not shown, it is of interest that all lots lost weight during February except lot 2 which was fed every other day.

4. It was very difficult to regulate the salt-meal intake of lot 4 so as to maintain meal consumption at approximately 2 pounds per head daily.

5. The winter of 1950-51 was very mild and favorable for wintering cattle on dry grass.

Wintering Yearling Steers on Bluestem Pasture

December 13, 1950 to April 18, 1951—126 Days

1. Lot number	1	2	3	4
2. Number of steers per lot	10	10	10	10
3. Method of feeding	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 winter ration, lbs.:				
Soybean pellets	2.02	2.03	—	—
Soybean oil meal	—	—	—	1.97
Salt	.19	.13	.05	.69
Alfalfa hay	—	—	7.32	—
Mineral mixture[1]	.02	.03	.01	.05
Prairie hay[2]	.76	.75	.49	.58
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	$16.41	$16.51	$15.72	$16.63
10. Initial cost per steer at $32.25 per cwt.	$220.27	$220.59	$220.59	$220.91
11. Initial cost per steer plus feed cost	$236.68	$237.10	$236.31	$237.54
12. Necessary selling price per cwt. to cover initial cost plus wintering cost	$31.77	$31.24	$32.37	$32.14
13. Appraised value per cwt. on May 5, 1951				

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

2. Prairie hay was fed only when snow covered the grass. Feed prices: Soybean pellets, soybean meal, $75.00 a ton; alfalfa hay, $20.00 a ton; prairie hay, $13.00 a ton; bluestem pasture, $6.00 for the winter; salt, $12.00 a ton; steamed bone meal, $5.50 a cwt.

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

A Comparison of Different Methods of Managing Bluestem Pastures —1950.

E. F. Smith and Kling Anderson

INTRODUCTION

In the present series the first test to compare different methods of grazing bluestem pasture was conducted in 1949 and was reported in Kansas Agricultural Experiment Station Circular 265. This report is concerned with the second test conducted in 1950.

The objective of this experiment is to find out what the carrying capacity of bluestem pasture is, how deferred and rotation grazing compare with season long grazing, and if bluestem pastures should be burned or not.

EXPERIMENTAL PROCEDURE

One hundred and twenty-eight moderately fleshed, good quality, yearling Hereford steers weighing about 620 pounds per head on May 8 were used to stock the pastures.

The method of management of each pasture was as follows:

Pasture 1: Normal rate of stocking, 4 acres per head.

Pasture 2. Over-stocked, 3 acres per head.

Pasture 3: Under-stocked, 6 acres per head.

Pastures 4, 5, 6: Deferred and rotation grazing, 3.6 acres per head. All steers were held in two pastures until June 20, then turned into the protected pasture until it was deemed advisable to allow them the run of all three pastures, which in 1950 was August 1.

Pasture 7: Rate of stocking—4 acres per head. This pasture was burned March 24, 1950.

Pasture 8: Rate of stocking—4 acres per head. This pasture was burned April 13, 1950.

Pasture 9: Rate of stocking—4 acres per head. This pasture was burned May 2, 1950.

OBSERVATIONS

1. Among all the methods of management tested, there was not a large difference in gain per steer except on the medium-burned pasture where the steers gained 33 pounds more per head than on Pasture 1 which was normally stocked. Several years' work will be required to verify results of this type.

2. The largest gain per acre occurred on the over-stocked pasture and the smallest gain per acre on the under-stocked pasture.

3. At the close of the grazing season, 1950, the burned pastures did not appear to be as heavily grazed as the non-burned Pasture 1. More spot grazing took place in the non-burned pasture. Pasture 2 appeared to be closely grazed and Pasture 3 lightly grazed. The deferred and rotated pastures, 4, 5, and 6, compared favorably with Pasture 1 which was grazed straight through the summer.

4. The effects of grazing management on the vegetation are being studied chiefly in terms of plant populations because the species population in a given pasture is the best indicator of its range condition. By means of annual sampling, the relative amounts of each important native species have been determined each year since 1947. On the basis of these records, any changes brought about in the management can be detected by future sampling. If species like the bluestems, Indiangrass, and switchgrass become more abundant, it may be taken

as evidence of improvement. If, on the other hand, the shorter grasses like buffalograss and the gramas increase or if weedy species invade, deterioration will be indicated. Any such trends can then be correlated with livestock responses.

Studies on the relation of soil type to plant population were started in 1950 when a detailed soils map of pastures 1 to 6 was made. Plant population samples from each of 10 major soil categories were compared, and certain ones were found to be alike so far as vegetative cover was concerned. This made it possible to combine them into 4 categories, and future sampling will take these groups into account.

Considering pastures 1 to 6 as a whole, the following vegetative populations have been observed:

Species	% of Total Population
Big bluestem	17.6
Little bluestem	24.1
Indiangrass	7.7
Sideoats grama	8.1
Blue grama	3.5
Hairy grama	2.7
Buffalograss	4.5
Kentucky bluegrass	8.3
All other perennial grasses	7.8
Total perennial grasses	84.3
Sedges and rushes	6.0
Annual grasses	1.7
Total grass and grasslike species	92.0
Perennial broad-leaf plants	5.5
Annual broad-leaf plants	2.2
Shrubs	0.3

Population counts like these and measurements of actual areas occupied by each species have been made for each pasture, for each year, and for each soil type. They will furnish the basis for evaluating any trends that develop as the experiments progress.

TABLE I: A COMPARISON OF DIFFERENT METHODS OF MANAGING BLUESTEM PASTURE

May 8, 1950 to October 5, 1950—150 days

Pasture number	1	2	3	4 5 6[3]	7[1]	8	9
Management	Normally stocked	Over-stocked	Under-stocked	Deferred and rotated	Early Spring burned Mr. 24,'50	Medium Spring burned Ap. 13,'50	Late Spring burned My. 2,'50
Number head per pasture	15	20	10	50	11	11	11
Acres in pasture	60	60	60	3—60 acre pastures	44	44	44
Number acres per head	4	3	6	3.6	4	4	4
Average initial weight	619	619	619	619	622	619	619
Average final weight	840	829	833	824	838	873	849
Average gain	221	210	214	205	216	254	230
Average daily gain	1.47	1.40	1.43	1.37	1.44	1.69	1.53
Average gain per acre	55	70	36	57	54	63.5	57.5
Initial cost per steer @ $27.12 per cwt. plus $12 per head for summer pasture	$179.87	$179.87	$179.87	$179.87	$180.69	$179.87	$179.87
Average net selling price per steer[2]	$219.61	$216.67	$217.74	$215.34	$219.08	$228.40	$222.01
Average return per steer	$39.74	$36.80	$37.87	$35.47	$38.39	$48.53	$42.14

1. Only 10 steers were used to compute results—one steer developed an infected ear in August and did not do well. He remained in pasture entire season.

2. Net selling price per steer is based on selling price of $28.15 per cwt. and market weight which represents a 5.3% shrink from home weight less average marketing costs of $4.32 per head.

3. Deferred and rotated grazing—all steers were held in two pastures until June 20, then moved into protected pasture until August 1, at which time they were allowed the run of all three pastures.

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

I. The Effect of Withholding Salt on the Growth and Condition of Steers—1949-1950.

E. F. Smith, D. B. Parrish, A. J. Clawson

Ten good quality Hereford steer calves were used in this study. They were divided into two equal lots. Both lots were treated similarly except salt was withheld from one lot. The calves were started on the test December 14, 1949, wintered, used in a spring digestion trial, full-fed in dry lot and marketed on November 2, 1950.

OBSERVATIONS

1. During the wintering phase, the calves allowed access to salt consumed slightly more silage and gained 139 pounds per head, as compared to 80 pounds per head for those not fed salt.
2. The non-salt steers required about 60 per cent more silage and 74 per cent more soybean pellets per 100 pounds of gain during the wintering phase.
3. During the dry lot, full-feeding phase, the gains were as follows: steers allowed access to salt, 363 pounds; steers from which salt was withheld, 386 pounds. The steers from which salt was withheld drank more water and used slightly less feed per 100 pounds of gain.
4. Over the entire test, the steers allowed free access to salt gained 22 pounds more than those not given salt. There was little difference in carcass grades between the two lots and the selling price per hundred weight was the same.
5. It is significant that in this test and in a similar test conducted in 1948-49 during those periods where the ration was composed largely of roughage, the steers allowed access to salt gained considerably more than those fed no salt, whereas when the ration was composed largely of grain, this difference did not appear.

TABLE I—The Effect of Withholding Salt on the Growth and Condition of Steers

Phase I—Wintering—Dec. 14, '49-April 25, '50—132 days

	Salt free access	No salt
1. Management		
2. Lot number	1	2
3. Number of head per lot	5	5
4. Average daily ration, pounds:		
Atlas Sorgo silage	28.37	26.14
Soybean oil meal	1.00	1.00
Salt	.054	None
5. Average initial weight, pounds	448.00	448.00
6. Average final weight, pounds	587.00	528.00
7. Average total gain, pounds	139.00	80.00
8. Average daily gain, pounds	1.05	.61
9. Feed required per 100 pounds gain, pounds:		
Atlas Sorgo silage	2694.24	4312.50
Soybean oil meal	94.96	165.00
Salt	5.18	None

(1) This study is supported by the Salt Producers Association, Detroit, Mich.

Phase II—Full-Feeding—May 26, '50-Nov. 12, '50 (170 days)

10. Average daily ration, pounds:		
Prairie hay	6.44	6.42
Alfalfa hay	1.98	1.98
Corn	11.60	11.88
Soybean meal	1.05	1.05
Water (gallons)	7.27	8.89
Salt	.03	None
11. Average initial weight, pounds	557.00	510.00
12. Average final weight, pounds	920.00	896.00
13. Average total gain, pounds	363.00	386.00
14. Average daily gain, pounds	2.14	2.27
15. Feed required per 100 pounds gain, pounds:		
Prairie hay	302.70	282.59
Alfalfa hay	92.56	87.05
Corn	543.11	523.26
Soybean oil meal	49.45	46.50
Salt	1.19	None

Summary of Phases I and II—Dec. 14, '49-Nov. 12, '50 (333 days)

16. Initial weight per steer, pounds	448.00	448.00
17. Final weight per steer, pounds	920.00	896.00
18. Total gain per steer, pounds	472.00	448.00
19. Daily gain per steer, pounds	1.42	1.35
20. Dressing per cent	58.3	59.3
21. U. S. carcass grades:		
Low good	2	1
High commercial		2
Average commercial	3	2
22. Selling price per cwt. at market	$28.00	$28.00

II. THE EFFECT OF WITHHOLDING SALT ON THE DIGESTIBILITY OF RATIONS BY STEERS

(1948-49 and 1949-50 data)

In three different trials, using a total of 22 animals, the digestibility of rations (silage and protein supplement only) by steer calves that for four to five months had received no salt, was compared with that by steers that had received the same rations plus either 20 or 28 gm. of salt daily. In each of the trials the average apparent coefficients of digestibility of dry matter, crude protein, ether extract, crude fiber, and nitrogen free extract, were from 0 to 4 (av. 1.6) per cent greater by steers receiving salt than by those not receiving salt. Thus, a trend toward greater digestibility of the rations by steers receiving salt was evident, but differences were small.

TABLE II—Comparison of Coefficients of Digestibility of Rations by Steers Receiving No Salt and by Steers Receiving the Same Rations Plus Salt.

Trial	No. of Steers	Ration	Av. apparent coefficient of digestibility of: Dry Matter	Crude Protein	Ether Extract	Crude Fiber	N.F.E.	Ash
1	3	C. S. M. silage salt[1]	61	62	66	58	64	41

	3	C. S. M. silage	60	62	66	57	63	36
2	3	Dehy. Alf. pellets, silage salt[1]	60	62	61	49	68	48
	3	Dehy. Alf. pellets, silage	57	60	59	45	66	41
3	5	S. B. M. silage salt[2]	60	66	67	61	63	40
	5	S. B. M. silage	59	65	65	59	62	37

1. 28 gms. salt daily during the digestion trial; for previous 5 months these steers had consumed approximately 18 gms. of salt per head daily **ad lib.**

2. 20 gms. salt daily during the digestion trial; for previous 5 months these steers had consumed approximately 22 gms. of salt per head daily **ad lib.**

Project 68: Factors Influencing the Salt Requirements of Beef Cattle

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

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

Preliminary Report

INTRODUCTION

This is a progress report on an experiment to be completed this summer, 1951. The purpose of the test is to find out what effect the withholding of salt has on the growth of steers.

EXPERIMENTAL PROCEDURE

Forty-two head of good quality Hereford steer calves are on this test. There are four lots, 10 head to each lot except one lot which contains 12 head. Two of the lots are full-fed and two of the lots are being wintered. Salt is withheld from one lot on each feeding regimen.

The two full-fed lots will be marketed in July, 1951 after about 225 days of feeding. The two lots receiving wintering rations will be weighed about May 1, 1951 and that part of the test terminated. Sodium and chloride studies of the blood will be made, and of tissues where possible.

OBSERVATIONS

1. Gains of steer calves on full-feed or on wintering rations were decreased appreciably when salt was not fed.

2. Steers having access to salt consume more feed, especially on full-feed; compare Lots 1 and 2. They are also more efficient gainers.

3. In this test, full-fed steers consuming about five cents worth of salt and $2.00 worth of extra feed gained about 50 pounds more than steers not receiving salt.

The Effect of Withholding Salt on the Growth of Steers
December 5, 1950 to April 13[1], 1951—129 days

Lot number	1	2	3	4
Number of steers per lot	10	10	10	12
Management	Full-fed		Wintered	
Initial weight per steer	419	418	419	418
Final weight per steer	727	677	524	502
Gain per steer	308	259	105	84
Daily gain per steer	2.39	2.01	.80	.64
Daily ration per steer, lbs.:				
Cracked milo	9.11	8.67	—	—
Soybean pellets	1.37	1.37	1.00	1.00
Sorghum silage	12.64	11.50	27.85	27.31
Alfalfa hay	2.45	2.33	—	—
Salt, free access	.06	—	.15	—
Feed required per 100 lbs. gain, lbs.:				
Cracked milo	381.40	432.05	—	—
Soybean pellets	57.31	68.15	126.19	157.14
Sorghum silage	529.22	572.59	3501.06	4291.67
Alfalfa hay	102.76	115.83	—	—
Salt	2.30	—	18.26	—

(1) Lots 3 and 4 were fed until April 16, 1951.

CHEMICAL ANALYSIS OF FEEDS USED IN THE 1949-50 BEEF CATTLE FEEDING TRIALS

	Moisture %	Protein %	Fat %	Fiber %	N-free extract %	Mineral Matter %	Calcium %	Phosphorus %
Corn	10.26	9.31	4.00	2.08	72.93	1.42	.01	.36
Soybean oil meal (expeller process)	7.64	43.56	5.71	5.65	31.68	5.76	.10	.78
Cottonseed oil meal (solvent extracted)	7.28	41.44	2.79	11.30	31.14	6.05	.10	1.15
Cottonseed oil meal (hydraulic extracted)	7.24	41.38	3.97	11.89	29.70	5.82	.10	1.11
Dehydrated alfalfa pellets	7.10	17.50	3.76	19.85	41.53	10.25	1.25	.44
Dehydrated red clover pellets	7.48	15.75	2.97	23.47	41.43	8.90	.98	.24
Prairie hay I	4.70	5.56	1.87	33.43	47.20	7.24	.32	.18
Prairie hay II	4.42	4.69	2.01	34.10	47.84	6.95	.31	.17
Sorghum silage[1] (Tenn. Orange) I	6.50	5.75	2.50	21.87	57.34	6.00		
Sorghum silage[2] (Tenn. Orange) II	7.16	4.91	2.24	21.55	57.78	6.33		
Bluestem pasture grasses 1950 (Dry basis)								
January 1	0	2.75	2.04	34.94	50.93	9.31	.39	
February 1	0	3.10	1.92	34.58	51.12	9.25	.46	.08
March 1	0	3.03	1.61	35.85	49.79	9.69	.44	.03
April 1	0	2.98	1.64	33.60	50.00	11.77	.51	.07
May 10	0	13.56						
May 20	0	12.10						
June 10	0	10.25	2.36	39.21	41.03	7.12	.32	.13
June 20	0	8.43						
July 1	0	8.58	3.10	29.36	51.53	7.40	.48	.15
July 10	0	9.33						
July 20	0	8.97						
Aug. 1	0	8.90	3.48	31.02	48.00	8.60	.40	.16
Aug. 10	0	9.55						
Aug. 20	0	7.76						
September 1	0	8.54	2.10	31.70	49.03	8.63	.22	.07
September 10	0	7.62						
October 1	0	5.27						
October 10	0	4.30	2.17	32.62	51.99	8.92	.53	.06
December 15	0	4.04	1.89	37.03	47.72	9.32	.50	.05

1. Original dry matter 31.6%.

2. Original dry matter 30.4%.

TEMPERATURE AND RAINFALL RECORD—Manhattan, Kansas[1]

November 1, 1949 to April 15, 1951

	Average temperature for period. Degrees Fahrenheit	Average daily rainfall for period. Inches
1949		
November 1 to November 15	50.5	.000
November 16 to November 30	43.5	.000
December 1 to December 15	34.2	.045
December 16 to December 31	32.7	.050
1950		
January 1 to January 15	31.7	.009
January 16 to January 31	26.0	.003
February 1 to February 15	33.0	.018
February 16 to February 28	39.5	.029
March 1 to March 15	35.7	.007
March 16 to March 31	44.2	.040
April 1 to April 15	48.5	.053
April 16 to April 30	53.3	.081
May 1 to May 15	62.9	.068
May 16 to May 31	66.4	.201
June 1 to June 15	71.2	.075
June 16 to June 30	76.8	.083
July 1 to July 15	70.9	.471
July 16 to July 31	71.2	.394
August 1 to August 15	74.6	.221
August 16 to August 31	69.3	.065
September 1 to September 15	64.7	.005
September 16 to September 30	68.0	.010
October 1 to October 15	60.8	.088
October 16 to October 31	63.3	.000
November 1 to November 15	43.3	.033
November 16 to November 30	35.4	.003
December 1 to December 15	29.7	.002
December 16 to December 31	31.4	.000
1951		
January 1 to January 15	30.5	.023
January 16 to January 31	27.0	.011
February 1 to February 15	26.9	.008
February 16 to February 28	42.2	.101
March 1 to March 15	33.9	.104
March 16 to March 31	41.1	.076
April 1 to April 15	43.1	.085

1. From daily records of the Physics Department, Kansas State College, Manhattan, Kansas.

FREEZING AND STORING MEAT WITH PARTICULAR REFERENCE TO THE HOME STORAGE UNIT

David L. Mackintosh, D. B. Watt and Fred Boren

Preservation of foods by freezing continues to increase in favor with the American housewife. The increasing use of this method of food preservation has brought forth many questions which have required investigation.

It is estimated that over 50% of the families in Kansas store some portion of their food in a frozen condition. A substantial part may well be in home storage units, as there are about two and one-half million of these units now in use in the United States.

Freezing can be conveniently classified under three headings: (1) slow freezing, (2) sharp freezing, and (3) quick freezing. Slow freezing is freezing at temperatures above 0°F. Sharp freezing is somewhat faster and can be described as freezing between 0°F. and -20°F. Quick freezing is freezing at temperatures lower than -20°F. This is extremely rapid and therefore rather expensive. It is used mostly by large commercial food packers. Experimental work indicates that the faster the freezing process, the more desirable the product, but for all practical purposes, sharp freezing is satisfactory.

It has likewise been demonstrated that when foods are stored in a frozen condition, the temperature of the storage unit should be maintained at 0°F. or lower. When selecting a home storage unit, these observations should be foremost in the mind of the purchaser.

Having purchased a home unit, the first question usually asked by a new owner is, How much meat or other foods can I freeze in this unit? or Can I now do all my own processing?

Work done at the Kansas Agricultural Experiment Station during recent years indicates that with a well-built unit that will maintain a storage temperature of 0°F., a considerable amount of meat may be frozen at home if certain precautions are taken. The work was done with eight- to ten-cubic foot units. The results indicate that when a unit is half-filled with stored products, there is a definite limit to the load that may be frozen. With some boxes not more than 50 pounds should be frozen while in others, up to 100 pounds of meat may be frozen at home. When a temperature control is on the unit, it should be moved over to maximum capacity just before loading with fresh meat and held at that point for 24 hours and then returned to normal operation. On the average, it costs just twice as much to operate the unit at the maximum load as at normal operation, which should maintain a storage temperature of 0°F. While costs per box differ, an average figure would seem to be 0.18 to 0.20 KWH every 24 hours of operation for a normal load and 0.30 to 0.40 KWH for every 24-hour period that the unit is operated at maximum load.

It is recommended that for economic operation, the unit be turned to maximum load for a 24-hour period during the freezing process, and then operated at that point which will provide a storage temperature of 0°F. for regular storage. Never overload the unit, as overloading will cause the storage temperature to rise above zero which is undesirable. A moderate quantity of food may be frozen efficiently at home, but for large quantities it is advisable to have it processed and frozen at a locker plant and to maintain the home unit primarily for storage.

SOME OBSERVATIONS RELATED TO THE FREEZING AND STORAGE OF FROZEN FOODS

David L. Mackintosh, Edwin P. Margerum, J. L. Hall and Dorothy Harrison

Meat investigations at the Kansas Agricultural Experiment Station are largely co-operative between the departments of Animal Husbandry, Chemistry and Foods and Nutrition. During the past several years, the greater part of the experimental work has been related to the preservation and storage of foods in a frozen condition, and has included physical, chemical and organoleptic tests.

Recommendations based on experimental work to date include the following: select only approved wrapping material, wrap tight, and do not store too long. More than 30 wrapping materials have been tested in the laboratory and several have been found to be inefficient. Ordinary butcher paper, parchment paper, and wax papers should not be used. There are many good available materials including the following: cellophane; MSAT 87 with an outside wrapper to offer mechanical

protection to the cellophane; cellophane laminate; glassine laminate; and polyethelyne on a Kraft paper backing. Wax-dip, a plastic into which the frozen meat is dipped, offers ideal protection but requires additional equipment. Plyofilm with a paper backing is also very efficient as is aluminum foil and aluminum laminated paper. Other materials will be developed as time goes on.

It is as important to apply the wrapping material properly as it is to select a good paper. The paper should be wrapped tightly to remove as much air from the package as possible, as the presence of air in the package may hasten the development of rancidity. The package must also be well sealed to keep out as much air as possible.

Butcher's style and confectioner's style of wrapping are commonly used and much has been said about both methods of wrapping, but evidence indicates that there is little difference in the method of wrapping if the wrapping is done properly, all the air possible excluded, and the package sealed tight. Double wrapping with an inferior paper does not increase the protection to the meat.

Beef and lamb, owing primarily to the nature of the animal fat, may be stored longer than pork, ground meat, poultry, or rabbit. Beef may be stored at 0°F. from 9 to 12 months. Pork, on the other hand, should not be stored longer than 6 to 9 months. After six months storage, pork fat will tend to develop rancidity thereby reducing its acceptability to many people. Ground beef and pork sausage should not be stored longer than six months as is true of poultry and rabbit. Temperatures lower than 0°F. will permit safe storage for longer periods but is much more expensive to maintain. Today preservation by freezing is the simplest, safest and sanest method of food preservation.