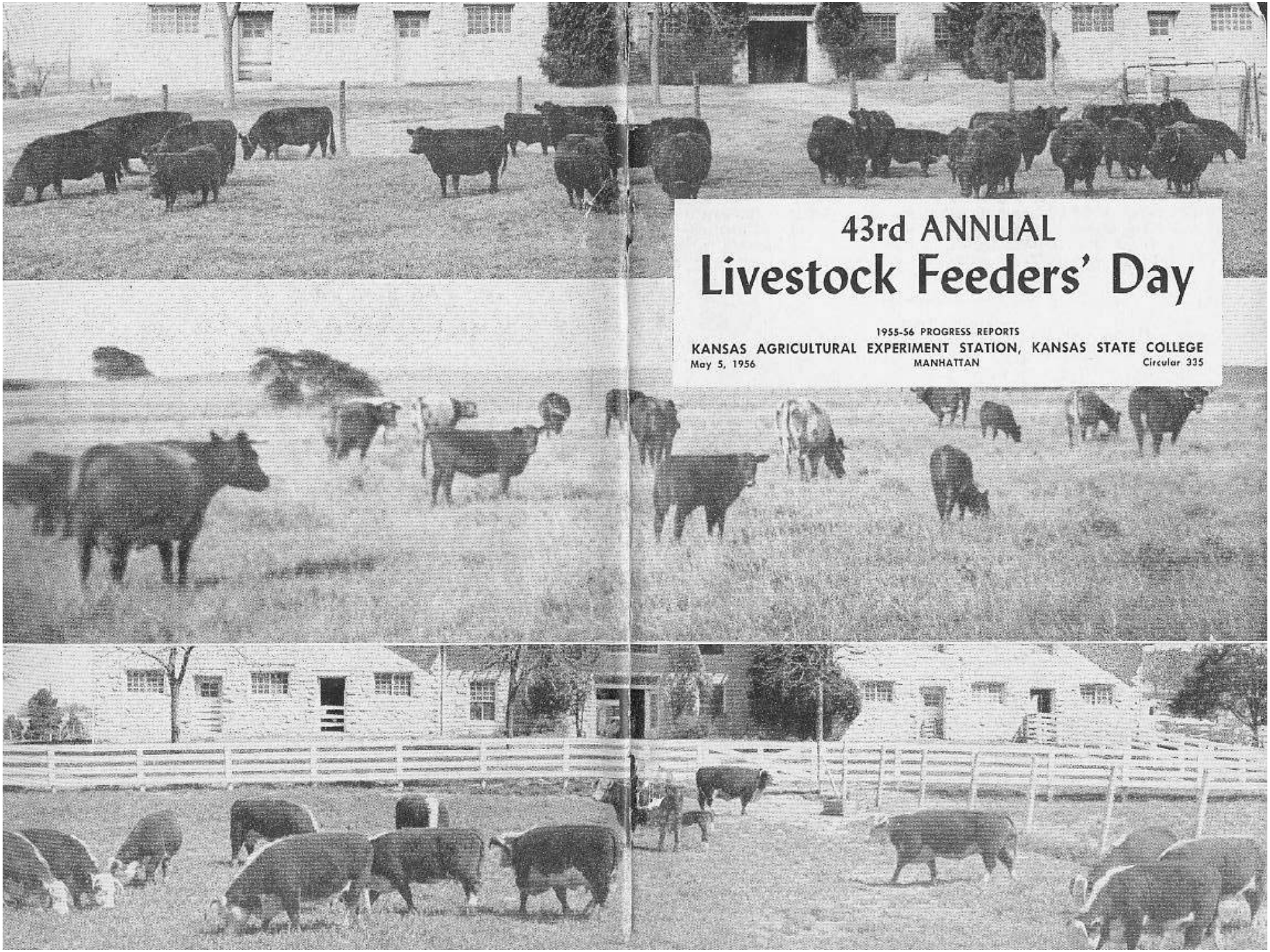

43rd ANNUAL
Livestock Feeders' Day

1955-56 PROGRESS REPORTS

KANSAS AGRICULTURAL EXPERIMENT STATION, KANSAS STATE COLLEGE

May 5, 1956 MANHATTAN Circular 335

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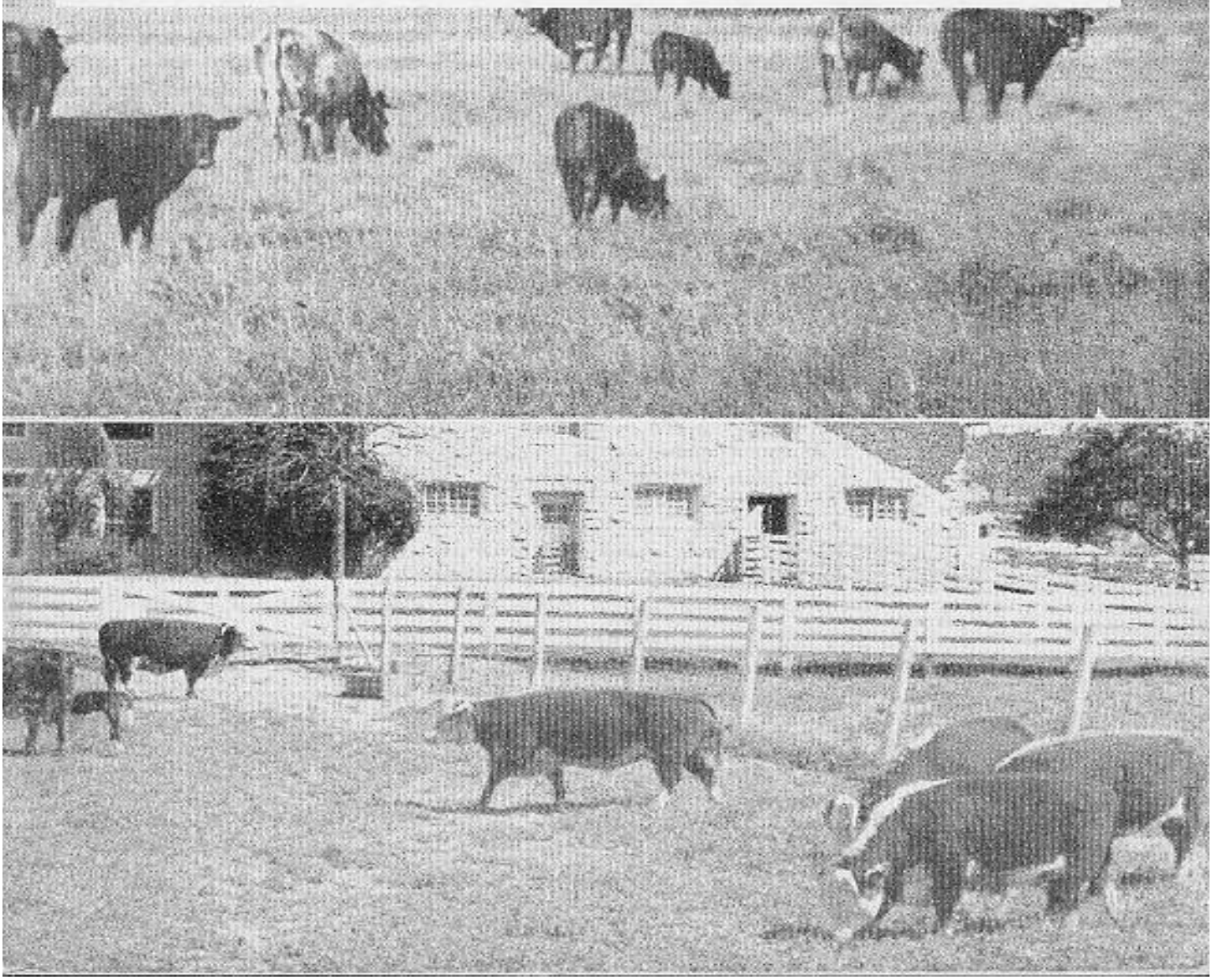

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MANHATTAN

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43rd ANNUAL LIVESTOCK FEEDERS' DAY

KANSAS STATE COLLEGE

MANHATTAN, KANSAS

SATURDAY, MAY 5, 1956

9:30 a.m.—Inspection of livestock—breeding and experimental herds of cattle, sheep, swine and Quarter horses.

11:30 a.m.—Lunch—Served by Block and Bridle Club, Livestock Pavilion.

1:30 p.m.—Livestock Pavilion. Presiding, Fred Winzeler, Lamont, Kansas, President, Kansas Livestock Association.

Coordinating the Agricultural Services of Kansas State College—Dean A. D. Weber

Awards to Deferred Feeding, Feeder Calf and Creep Feeding Performance Winners.

Reports of Livestock Feeding, Breeding and Grazing Experiments.

Questions and Open Discussion.

FOR THE LADIES

Friday, May 4, 1956

6:30 p.m.—Dutch Treat Dinner—Gillett Hotel. Kansas Cow Belles and Visiting Ladies (Make reservations with Mrs. Orville Burtis, Manhattan, Kansas).

Saturday, May 5, 1956

10:00 a.m.—Coffee—Room 11, Umberger (Extension) Hall, by Animal Husbandry Wives.

11:30 a.m.—Lunch—Livestock Pavilion (See above).

1:30 p.m.—Williams Memorial Auditorium, Umberger Hall

Presiding—Mrs. Mel Harper, Sitka, Kansas, President Kansas Cow Belles.

Musical number

Home Economics in Australia—Miss Marjorie Rouse, Head of Home Science, Technical University, Sydney, Australia.

Modern Beef Cuts (Demonstration)—Prof. Ralph P. Soule, Jr., Department of Animal Husbandry, KSC.

Meat Purchasing and Meat Cookery—Dr. Grayce E. Goertz, Department of Foods and Nutrition, KSC.

6:30 p.m.—Block and Bridle Banquet for students, their parents, and visiting stockmen and ladies. Wareham Hotel.

Honoring—Paul B. Gwin, Cal Floyd, E. D. (Doc) Mustoe

Contribution No. 213, Department of Animal Husbandry; No. 10, Garden City Branch; No. 544, Department of Chemistry; and No. 194, Department of Home Economics, Kansas Agricultural Experiment Station, Manhattan.

CONTENTS

BEEF CATTLE

SHEEP

SWINE

Beef Cattle

Improvement of Beef Cattle Through Breeding.

PROJECT 286

Walter H. Smith, Lewis A. Holland, and John Wheat

The purebred Shorthorn cattle breeding project, established to study the production traits and the effects of inbreeding, was continued during the last year. Two inbred lines were established by the use of the two herd sires, College Premier 29th 2368167 and Gregg Farm's Hoarfrost 2492499. The two breeding groups are referred to as the Wernacre Premier and the Mercury lines, respectively, in reference to the foundation sires. The Wernacre Premier line has entered the third generation of inbreeding and the Mercury line is as yet in the first generation of inbreeding.

The calves of the Wernacre Premier line for 1954 were sired by College Premier 29th and one of his inbred sons, KSC Premier C 11th. This inbred son and another, KSC Premier C 14th, were used during the 1954 and 1955 breeding seasons. The 1955 Wernacre Premier calf crop represents progeny of both of these sires.

The noninbred calves in the Mercury line for 1954 were sired by Gregg Farm's Hoarfrost. The inbred calves were sired by one of his sons, KSC Mercury. The 1955 Mercury line calves were sired by KSC Mercury 4th, another son of Gregg Farm's Hoarfrost. The inbreeding program in the Mercury line was initiated by mating the daughters of Gregg Farm's Hoarfrost to his sons.

The females in the project produce calves in the spring of each year as a result of pasture breeding. The calves are not creep fed during the suckling period while the cows are on grass. All calves are weaned at approximately 182 days of age and placed on individual feeding trials for 182 days after a three-week adjustment period following weaning.

The full-feed ration for the bulls and steers consists of 75 percent cracked corn and 25 percent chopped alfalfa hay; that for the heifers, 55 percent cracked corn and 45 percent chopped alfalfa hay.

The feeding trial data for the 1954 calf crop are summarized in Table 1, and a partial summary of the 1955 calf crop is presented in Table 2. Since the feeding trials for the 1955 calves are not complete, the number of days of feeding as of April 1, 1956, is designated for each calf.

Table 1

Summary of the 1954 Shorthorn Calves of the Wernacre Premier and Mercury Lines.

Tag number	Coefficient of inbreeding%	Birth weight	Weaning weight	Weaning score	Days fed	Initial weight	Final weight	Total gain	Average daily gain, lbs.	Final score	Lbs. corn per 100 lbs. gain	Lbs. alfalfa per 100 lbs. gain
Wernacre Premier Line:												
Steers												
82	15.62	75	401	3	182	416	805	389	2.14	3	452	221
9	23.44	82	380	3-	182	388	835	447	2.46	3	414	202
108	14.06	82	445	3+	182	449	857	408	2.24	3	444	223
18	23.44	58	351	3	182	443	835	392	2.15	3	449	261
Av.	19.14	74	394	3	182	424	833	409	2.25	3	440	227
Heifers												
10	14.06	75	332	3-	182	335	535	200	1.10	3-	343	300
Mercury Line												
Bulls												
30	00.00	61	430	1	182	413	917	504	2.77	1	395	192
79	00.00	65	402	1-	182	400	858	458	2.52	1-	348	186
61	25.00	69	382	2	182	350	755	405	2.23	2	360	184
Av.	8.33	65	405	1-	182	388	843	456	2.51	1-	368	187

						Steers						
14	00.00	61	435	2+	182	424	830	406	2.23	3	458	221
189	3.12	72	365	2-	182	361	709	348	1.91	4+	467	216
23	12.50	69	331	2-	182	341	780	439	2.41	3	410	204
Av.	5.21	67	377	2	182	375	740	398	2.18	3-	445	214
						Heifers						
105	00.00	70	372	1-	182	435	777	342	1.88	1	325	292
58	14.06	67	315	2	182	313	620	307	1.69	2+	321	293
22	3.12	61	320	2	182	314	650	336	1.85	1-	347	310
90	12.50	67	331	2	182	350	673	323	1.77	1-	406	359
134	7.81	53	305	2-	182	285	605	320	1.76	2	383	356
56	12.50	48	261	3+	182	255	557	302	1.66	3+	337	315
760	00.00	56	261	2-	183	268	563	295	1.62	1-	369	353
Av.	7.14	61	309	2	182	317	635	318	1.75	2+	355	325

1. The coefficient of inbreeding means the percentage of inbreeding. Individuals from full brother-sister matings are 25 percent inbred. Individuals produced from mating half-brothers and -sisters are 12.5 percent inbred.

2. No bulls were fed from this group of calves.

Table 2

Partial Summary of the 1955 Shorthorn Calves of the Wernacre Premier and Mercury Lines.

Tag number	Coefficient of inbreeding	Birth weight	Weaning weight	Weaning score	Initial weight	Weight on 4-1-55	Days on trial	Daily gain during trial
				Wernacre Premier Line				
				Bulls				
151	32.03	77	446	2–	486	863	166	2.27
760	23.56	64	310	3	332	410	82	.95
Av.	27.80	71	378	3+	409	637		1.61
				Steers				
11	22.98	56	310	2–	345	610	131	2.02
				Heifers				
68	23.44	79	370	2–	425	702	166	1.67
14	15.35	75	360	3+	395	655	166	1.57
23	15.45	60	370	2+	425	681	166	1.54
18	15.09	76	311	3	360	620	166	1.57
10	23.74	59	290	3	330	582	166	1.52
7	20.70	69	305	3	340	580	131	1.83
50	23.10	56	300	3	320	522	131	1.54
Av.	19.60	68	329	3+	371	620		1.61

Mercury Line

Bulls

82	6.44	72	450	2+	500	894	166	2.37
15	14.18	57	340	1-	410	847	166	2.63
30	1.76	61	350	1-	402	750	131	2.66
8	14.45	60	365	2+	400	835	131	3.32
Av.	9.21	63	376	1-	428	832		2.75

Steers

184	14.26	66	360	2-	445	835	166	2.35
198	12.92	61	305	2+	350	675	166	1.96
58	12.50	57	308	2	350	710	166	2.17
12	14.30	57	260	3+	300	562	131	1.54
61	13.48	71	325	2-	325	453	82	1.56
Av.	13.49	62	312	2-	354	635		1.92

Heifers

9	1.80	62	356	2	372	625	166	1.52
180	1.68	59	395	2+	420	590	166	1.02
31	14.30	55	326	1-	365	595	166	1.39
1	4.01	57	310	2-	325	530	131	1.56
49	13.48	62	312	2	340	582	131	1.85
55	25.00	62	300	2+	300	505	131	1.56
2	1.96	66	283	3+	290	530	131	1.83
90	16.50	72	355	2+	375	466	82	1.11
22	15.72	71	330	2+	352	471	82	1.45
Av.	10.49	63	330	2	349	544		1.48

Methods of Wintering Steer Calves That Are To Be Grazed on Bluestem Pasture the Following Summer, 1954-55.

PROJECT 253-1

E. F. Smith, F. H. Baker, R. F. Cox, D. L. Good, and G. L. Walker

This test is to compare methods of winter management and supplements for steer calves that are to be grazed the following summer. Results of the test are measured primarily by the combined winter and summer performances.

The following comparisons are being made:

1. Wintering in dry lot on prairie hay with wintering on dry bluestem pasture.
2. Different levels of protein feeding on dry bluestem pasture.
3. A combination of grain and a protein supplement with a protein supplement on dry bluestem pasture.

Experimental Procedure

Forty good to choice Hereford steer calves, from the Lonker Ranch at Medicine Lodge, Kan., were divided into four lots of 10 each. One lot was wintered in dry lot at the experimental barn, while the other three lots were wintered on dry bluestem pasture. The pastures had been stocked the previous summer but sufficient grass remained to winter the steers. The steers on pasture during the winter were moved from pasture to pasture the first day of each month to minimize pasture differences. All steers received mineral (steamed bonemeal and salt) and salt free choice.

The treatment each lot received was as follows:

Lot 1—(Dry lot) Prairie hay and 1 pound of soybean pellets per head daily.

Lot 2—Dry bluestem pasture, 1 pound of soybean pellets per head daily.

Lot 3—Dry bluestem pasture. 1 pound of soybean pellets and 1 pound of corn per head daily.

Lot 4—Dry bluestem pasture, 2 pounds of soybean pellets per head daily.

Prairie hay was fed when snow covered the grass.

Observations

1. On the basis of winter and summer gain combined the most economical method of wintering steer calves was on dry bluestem pasture, with 2 pounds of supplemental feed.

2. Apparently in this test 1 pound of 41 percent protein supplement did not furnish quite enough protein or protein and energy combined for calves wintered on dry grass.

3. One pound of corn and 1 pound of soybean pellets were equal to 2 pounds of soybean pellets. This was also true in a previous test reported in Circular 308.

Table 3

Methods of Wintering Steer Calves That Are To Be Grazed on Bluestem Pasture the Following Summer.

Phase 1, Wintering, November 10, 1954, to April 6, 1955—147 days.

Lot number	1	2	3	4
Number of steers	10	10	10	10
Place of wintering	Dry lot	Bluestem pasture	Bluestem pasture	Bluestem pasture
Initial wt. of steer	519	519	520	516
Final wt. of steer	653	534	561	561
Gain per steer	134	15	41	45
Daily gain per steer	.91	.10	.28	.31

Table 3 (Continued).

Daily ration per steer:				
Soybean pellets	1.00	1.00	1.00	2.00
Prairie hay	12.11	1.59[1]	1.59[1]	1.59[1]
Corn			1.00	
Dry bluestem pasture		Free choice	Free choice	Free choice
Salt	Free choice	Free choice	Free choice	Free choice
Minerals[2]	Free choice	Free choice	Free choice	Free choice
Feed cost per steer[3]	$24.11	$11.17	$14.99	$17.49
Feed cost per cwt. gain[3]	18.00	74.46	36.56	38.86
Phase 2, Grazing, April 6 to August 2, 1955—118 days.				
Initial wt. of steer	653	534	561	561
Final wt. per steer	816	776	813	802
Gain per steer	163	242	252	241
Daily gain per steer	1.38	2.05	2.14	2.04
Cost per 100 lbs. pasture gain[3]	$9.81	$6.61	$6.34	$6.63
Summary of Phases 1 and 2 November 10, 1954, to August 2, 1955—265 days.				
Initial wt. per steer	519	519	520	516
Final wt. per steer	816	776	813	802
Gain per steer	297	257	293	286
Daily gain per steer	1.12	.97	1.11	1.08
Feed cost per 100 lbs. gain[3]	$13.50	$10.57	$10.57	$11.70
Feed cost per steer[3]	$40.11	$27.17	$30.99	$33.49

1. Prairie hay was fed lots 2, 3, and 4 only when snow covered the grass.
2. Mineral was 2 parts steamed bonemeal and 1 part salt.
3. Feed prices are found on inside back cover.

Supplements for Yearling Steers on Bluestem Pastures During the Latter Part of the Grazing Season, 1955.

PROJECT 253-1

E. F. Smith, F. H. Baker, and G. L. Walker

The nutritive value of bluestem pasture usually declines rapidly after mid-summer. This test is an attempt to find ways to economically increase the rate of gain after mid-summer with small quantities of concentrate feed.

Experimental Procedure

Thirty-six head of good-quality yearling Hereford steers were used in this test. They had been grazing together on bluestem pasture previous to the test. The steers were divided into three lots of 12 steers each, in a manner to equalize any difference due to previous winter treatments. They were grazed on bluestem pasture and received the following treatment from August 2, 1953, to October 17, 1955.

Lot 1—No supplement.
Lot 2—Two pounds of soybean pellets per head daily.
Lot 3—Two pounds of corn per head daily.

The steers were rotated on the pastures every 15 days to help equalize any differences that might be due to pastures.

Observations

1. Both supplements increased the rate of gain. The soybean pellets increased the rate of gain enough to make their feeding profitable, which the corn failed to do.

2. The grass was brown for the most part and the late summer season was dry. July was dry with 2.45 inches of rainfall; effective rainfall was 1.3 inches on July 1 and .84 on July 19. No moisture of any consequence was received in August, or until September 26 and 27, when 1.35 inches fell.

Table 4

Effects of Feeding a Protein Supplement During the Latter Part of the Grazing Season to Yearling Steers on Bluestem Pasture.

August 2 to October 17, 1955—76 days.

Lot number	1	2	3
Number steers per lot	12	12	12
Management	No supplement	2 pounds soybean pellets	2 pounds corn
Initial wt. per steer	802	806	803
Final wt. per steer	880	925	897
Gain per steer	78	119	94
Daily gain per steer	1.03	1.57	1.24
Gain in lbs. contributed to feeding soybean pellets or corn		41	16
Total soybean pellets or corn fed per steer, lbs.:			
Soybeans		152	
Corn			152
Gain per steer by periods:			
August 2-September 2	51	28	49
September 2-October 1	2	51	7
October 1-October 17	25	40	38
Total gain August 2-October 17	78	119	94

Level of Winter Protein Supplementation for Steer Calves Both Wintered and Summer Grazed on Bluestem Pasture, 1955-56.

PROJECT 253-1

E. F. Smith, B. A. Koch, D. L. Good, and G. L. Walker

This is a progress report of the wintering phase of the third trial of this experiment. The results of the other two tests are reported in Circular 308 and elsewhere in this publication. The test is designed to study the level of protein supplementation most desirable for wintering steer calves to be sold off summer grass as stocker or feeder yearlings. Results of the experiment are measured by the combined winter and summer performance of the steers.

Experimental Procedure

Thirty good-quality Hereford steer calves purchased from the Williams Ranches near Lovington, N. M., were used in the test. They were the heaviest steer calves of 256 purchased. They were divided on the basis of weight into three lots of 10 calves each and grazed together on a 190-acre bluestem pasture during the winter. Each morning they were gathered and divided into three feeding pens to receive their supplements. The treatment assigned to each lot was as follows:

Lot 12A—One pound of soybean oil meal pellets per head daily.
Lot 12B—Two pounds of soybean oil meal pellets per head daily.
Lot 12C—One pound of soybean oil meal pellets and 1 pound of corn per head daily.

All had free choice of dry bluestem pasture, salt, and mineral (steamed bonemeal and salt).

Observations

Results in this test are measured on the basis of winter and summer performance combined. This is a progress report on only the wintering phase. It is interesting to note that at this stage 1 pound of a 41 percent protein concentrate is apparently not enough supplemental feed for calves wintered on dry bluestem pasture. This has been true on the basis of the combined winter and summer gain in the two previous trials.

Table 5

Level of Protein Supplementation for Steer Calves Wintered on Dry Bluestem Pasture, 1955-56.

Phase 1, January 4, 1956, to April 7, 1956—93 days.

Lot number	12A	12B	12C
Number steers	10	10	9
Initial wt. per steer, lbs.	581	590	591
Final wt. per steer, lbs.	604	647	634
Gain per steer, lbs.	23	57	43
Daily gain per steer, lbs.	.25	.61	.46
Daily ration per steer, lbs.:			
Soybean oil meal pellets	1.0	2.0	1.0
Ground corn			1.0
Prairie and alfalfa hay[1]	1.0	1.0	1.0
Dry bluestem pasture	Free choice, all lots		
Salt	Free choice, all lots		
Mineral (bonemeal and salt)	Free choice, all lots		
Feed cost per steer,[2] $	6.26	9.52	8.96

1. Fed only when snow covered the grass.

2. Feed prices may be found inside back cover. $1 was charged per steer for mineral and salt.

The Value of Dry Bluestem Pasture and a Comparison of Supplements for Heifer Calves in a Wintering, Grazing, and Fattening Program, 1955-56.

PROJECT 253-2

E. F. Smith, B. A. Koch, D. L. Good, and V. D. Severns

Circular 320 from this station contains a three-year summary comparing heifers wintered in dry lot with heifers wintered on dry grass and the effect of this winter treatment on their total performance in a wintering, grazing, and fattening program. The results of this test showed the heifers wintered on dry grass gained 32 pounds less for the year, had a lower dressing percentage, graded lower, and sold for about $1 a hundred less than heifers wintered in dry lot. However, the heifers wintered on dry grass returned as much money above feed costs as the heifers wintered in dry lot, due primarily to lower winter feed costs and high summer grass gains.

In this test the plane of nutrition has been raised slightly for the heifers wintered on dry grass, to acquire some of the desirable characteristics associated with dry-lot wintering, but still maintaining low winter feed costs. In addition different levels of protein supplementation are being compared.

Experimental Procedure

Thirty head of good-quality Hereford heifer calves purchased from the Williams Ranches at Lovington, N. M., were used in the test. They were divided on the basis of weight and quality into three lots of 10 calves each and assigned to the following treatments:

Lot 4—Wintered in dry lot on sorghum silage, 3 pounds of alfalfa hay, and 1½ pounds of corn per head daily, to be grazed on bluestem pasture from May 1 until August 1, fattened to choice grade in dry lot starting August 1.

Lot 7—Wintered on dry bluestem pasture, 3 pounds of alfalfa hay, and 1½ pounds of corn per head daily, to be grazed on bluestem pasture until August 1, fattened to choice grade in dry lot starting August 1.

Lot 8—Wintered on dry bluestem pasture and 6 pounds of alfalfa hay per head daily, to be grazed on bluestem pasture until August 1, fattened to choice grade in dry lot starting August 1.

All lots have free access to salt and mineral (equal parts of bonemeal and salt).

Four of the heifers in each lot were implanted with 48 mg. of stilbestrol, results of which will be reported elsewhere.

Observations

This is a progress report on the wintering phase, and only tentative statements are in order. It may be noted, however, that a much larger gain has been made in dry lot. The heifers receiving only 3 pounds of alfalfa hay on dry grass are apparently receiving sufficient protein, since their gain with the additional 1½ pounds of grain is the same as for the heifers receiving 6 pounds of alfalfa hay per head daily.

Table 6

The Value of Dry Bluestem Pasture and a Comparison of Supplements for Heifer Calves in a Wintering, Grazing, and Fattening Program, 1955-56.

PROJECT 253-2

Wintering, November 15, 1955, to April 7, 1956—144 days.

Lot number	4	7	8
Number of heifers	10	9[1]	10
Place wintered	dry lot	bluestem pasture	bluestem pasture
Initial wt. per heifer, lbs.	473	474	477
Final wt. per heifer, lbs.	644	501	503
Gain per heifer, lbs.	171	27	26
Daily gain per heifer, lbs.	1.19	.19	.18
Daily ration per heifer, lbs.:			
Alfalfa hay	3.00	3.00	6.00
Corn	1.40	1.50	
Sorghum silage	28.0		
Dry bluesteam pasture		free choice	free choice
Prairie and alfalfa hay[2]		.28	.28
Salt	.07	.03	.03
Mineral (bonemeal and salt)	.09	.04	.04
Feed cost per heifer,[3] $	23.80	14.19	12.23

1. One heifer was removed from Lot 7 with a prolapsed vagina.
2. A limited quantity of prairie and alfalfa hay was fed when snow covered the ground.
3. Feed prices may be found inside the back cover.

Different Methods of Managing Bluestem Pastures, 1955.

PROJECTS 253-3 and 253-5

E. F. Smith, K. L. Anderson, F. H. Baker, and G. L. Walker

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

Experimental Procedure

Good-quality Hereford two-year-old steers weighing about 700 pounds were used to stock the pastures. They were the light end of the steers used on the pastures in 1954. The method of management of each pasture was:

Pasture 1—Normal rate of stocking, 5 acres per head (5.9 acres per animal unit).

Pasture 2—Overstocked, 3.5 acres per head (4.2 acres per animal unit).

Pasture 3—Understocked, 7.5 acres per head (8.8 acres per animal unit).

Pastures 4, 5, 6—Deferred grazing, 5 acres per head (5.9 acres per animal unit). All steers were held in pastures 4 and 5 until early July, then placed on deferred pasture 6 until mid-September. From mid-September on, they were allowed the run of all three pastures.

Pasture 9—Burned March 8, 1955; normal rate of stocking (5.9 acres per animal unit).

Pasture 10—Burned April 1, 1955; normal rate of stocking.

Pasture 11—Burned April 25, 1955; normal rate of stocking.

The steers were weighed off test September 29, 1955, but remained on the pastures until October 19. From September 29 to October 19 they received about 1.5 pounds of cottonseed cake per head daily.

Observations

1. The cattle gains were greatest on the mid- and late-spring-burned pastures and least on the deferred and on the overstocked pastures.

2. Ample moisture was received early in the season for grass growth, but after early June little moisture was received. It rained 1.31 inches July 1 and 0.84 inch July 19. The total for August was only 0.23 inch. September was extremely dry, with 0.61 inch September 26 and 0.71 inch September 27. Gains were low in August, less than 1 pound per head daily, and steers on most of the pastures showed a weight loss for September except those on pastures 1, 3, and 11.

3. Cattle gains have not yet reflected fully the response of the vegetation to the impact of grazing treatment. During recent drought years there has been a decline in total plant population and in actual amounts of major forage grasses on all pastures. The greatest decline has occurred on the overstocked pasture. Taken as percentage of total plant population to indicate relative importance, the decrease of major forage grasses has been especially pronounced on the overstocked pasture. Such grasses as bluegrass, the gramas, and buffalograss tend to make up an increasing percentage of the plant population under close grazing. They have increased sharply over most of pasture 2 and on a small area, along the eastern edge of pasture 1, which, due to location, is grazed closely.

Another criterion by which the impact of grazing on vegetation may be judged is degree of use. Significantly greater amounts of forage residue remained at the close of the grazing season on pastures 3 (understocked) and 4, 5, 6 (deferred) than on the other pastures. Pastures 2 (overstocked) and 9 (burned in early spring) had the least top growth remaining after the grazing season.

Table 8

Comparison of Different Methods of Managing Bluestem Pastures.

April 28 to September 29, 1955—155 days.

Pasture number	1	2	3	4, 5, 6	9	10	11
Management	Normally stocked	Over-stocked	Under-stocked	Deferred rotated	Early spring burned	Mid-spring burned	Late spring burned
Number of steers per pasture	12	17	8	36	9	9	9
Acres in pasture	60	60	60	3-60[1]	44	44	44
Number acres per head	5	3.53	7.5	5	4.89	4.89	4.89
Initial wt., lbs.	697	695	688	692	700	693	697
Final wt., lbs.	967	919	941	905	982	998	1004
Gain per steer, lbs.	270	224	253	213	282	305	307
Daily gain, lbs.	1.74	1.45	1.63	1.37	1.82	1.97	1.98
Gain per acre, lbs.	54	63.46	33.73	42.6	57.67	62.37	62.78

1. Three 60-acre pastures.

(140)

Table 9

Yearly Account of Cattle Gains under Different Methods of Grazing Pastures.

Six-Year Summary, 1950-1955.

Gain per Steer in Pounds for the Summer Season of Approximately 150 Days.

Pasture number	1	2	3	4, 5, 6	9	10	11
Management	Normally stocked	Over-stocked	Under-stocked	Deferred-rotation grazing	Early spring burned	Mid-spring burned	Late spring burned
1950	221	210	214	205	216	254	230
1951	242	256	290	234	243	265	254
1952	246	209	228	197	251	278	283
1953	226	194	233	197	205	217	234
1954	261	237	236	214	270	271	306
1955	270	224	253	213	282	305	307
Average	244	222	242	210	245	265	269

Table 10

Trends in Relative Amounts of Native Grasses on Ordinary Upland Range Sites[1] as Affected by Grazing Treatment. Amounts Expressed as Percentage of Total Vegetation.

	Portion of total plant population			
	Decreasers[2]		Increasers[3]	
	1950	1955	1950	1955
	%	%	%	%
Overstocked, Pasture 2	60	29	26	57
Moderately stocked, Pasture 1	69	56	17	20
Understocked, Pasture 3	55	53	31	26
Deferred-rotation, Pastures 4, 5, 6	65	44	25	35

1. Rolling uplands with deep, permeable soils constitute the major portion of the trial area.

2. The more valuable forage grasses, mainly bluestems and indiangrass.

3. The less valuable forage grasses, mainly bluegrass, gramas, buffalograss, and other short grass types.

A Comparison of Wintering in Dry Lot with Wintering on Dry Bluestem Pasture for Yearling Steers on a Wintering, Grazing, and Fattening Program, 1955-56.

PROJECT 253-4

E. F. Smith, B. A. Koch, R. F. Cox, and G. L. Walker

Yearling steers often are used by Kansas producers in a wintering, grazing, and fattening program or some variation of it. They can usually be purchased at a lower price per hundredweight than steer calves and may be finished with a relatively shorter feeding period in the late summer or fall. They consume large quantities of roughage, which may increase their feed cost considerably in the wintering phase. This study is concerned with lowering the cost of wintering and its effect on future performance, especially with respect to the effect on the carcass produced. The steers will be grazed on bluestem pasture until about July 1, when they will be started on a full feed of grain. They will be marketed when they reach the choice slaughter grade.

Experimental Procedure

Twenty head of good-quality yearling Hereford steers were used in the test. They were purchased from the Lonker Ranch, Medicine Lodge, Kan., as calves and were grazed on bluestem pastures during the summer of 1955. November 16, they were divided into two lots of 10 steers each. The only difference in treatment planned for the two lots is in the method of wintering. The treatment for each lot is as follows:

Lot 11—wintered in dry lot on good-quality roughage supplemented with protein; grazed on bluestem pasture from May to July 1; full fed grain on grass from July 1, until they grade choice.

Lot 12—Wintered on dry bluestem pasture supplemented with protein; grazed on bluestem pasture until July 1; full fed grain on grass from July 1, until they grade choice.

Observations

Since the results of the test will be measured primarily by the yearly performance of the steers, this report is intended only as a progress report on the wintering phase. Wintering in dry lot on good-quality roughage has proved much superior to wintering on dry grass at this stage. The steers wintered on dry grass just about maintained their weight, whereas those in dry lot gained 230 pounds each.

Table 11

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

PROJECT 253-1

Phase 1, Wintering, November 16, 1955, to April 7, 1956—143 days.

Lot number	11	12
Place wintered	Dry lot	Bluestem pasture
Initial wt. per steer, lbs.	881	876
Final wt. per steer, lbs.	1114	867
Gain per steer, lbs.	230	—9
Daily gain per steer, lbs.	1.61	—.06
Feed per steer daily, lbs.:		
Soybean oil meal pellets	1.0	1.0
Sorghum silage	64.8	
Dry bluestem pasture		Free choice
Prairie hay	1.6[1]	1.0[2]
Salt	.09	Free choice
Mineral (bonemeal and salt)	.06	Free choice
Feed cost per steer,[3] $	37.79	11.37

1. A limited quantity of prairie hay was fed the last three weeks of the test to lot 1.

2. Prairie hay was fed to pasture 12 only when snow covered the grass; a small quantity of alfalfa was fed when prairie hay was not available.

3. See inside back cover for feed prices.

Supplementing Bluestem Pasture After Mid-Summer with Protein for Two-Year-Old Steers, 1955. Three-Year Summary, 1953-55.

PROJECT 253-4

E. F. Smith, F. H. Baker, R. F. Cox, and G. L. Walker

The nutritive value of bluestem pasture usually declines after mid-summer. This study is concerned with the effect of supplementing the grass after mid-summer with protein to determine if it will profitably increase steer gains. This is the third test; the other two tests are reported in Circulars 308 and 320. A summary of the three tests is reported here.

Experimental Procedure

Twenty head of good-quality two-year-old steers were used. They had been wintered and summer grazed on bluestem pasture until this test started. The steers were divided into two uniform lots on the basis of previous treatment and weight. They were grazed on bluestem pasture from August 2 to October 17, 1955, with the following treatment.

Lot 1—No supplement.
Lot 2—Two pounds of soybean oil meal pellets per head daily.

The steers were rotated on the two pastures each 15 days to minimize differences due to pastures.

Observations

The grass was brown and dry during most of the test; the late summer season was dry. It rained 2.45 inches in July, with 1.3 inches July 1 and .84 inch July 19. No moisture of any consequence was received in August nor in September until September 26 and 27, when 1.35 inches fell.

Feeding the protein supplement increased the gain of each steer only 8 pounds and was not profitable in this test. The steers fed the pro-

tein supplement did not appear to be in any better condition or carry any more bloom than those not fed protein.

Table 12

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

August 2 to October 17, 1955—76 days.

Lot number	1	2
Number steers in lot	10	10
Soybean pellets fed per steer daily, lbs.	0	2
Initial wt. per steer, lbs.	889	894
Final wt. per steer, lbs.	937	950
Gain per steer, lbs.	48	56
Daily gain per steer, lbs.	.63	.74
Gain in wt. attributed to soybean pellets, lbs. per steer	0	8
Total soybean pellets fed per steer, lbs.	0	152
Gain per steer by periods, lbs.:		
August 2 to September 2	19	28
September 2 to October 1	0	17
October 1 to October 17	29[1]	11

1. Had the September 26-27 rain not come, this gain would probably have been less.

Three-Year Summary, 1953-54-55.

For the three-year average, Table 13, 152 pounds of protein concentrate produced 23 pounds additional gain. On the basis of gain alone, this would hardly be profitable. In two of the three years the steers receiving the protein supplement were judged by a committee of animal husbandmen to be fleshier. It appears, from these tests, that two-year-old steers, supplemented with small amounts of protein in late summer, would have to sell for a higher price compared with non-supplemented cattle to make caking worth while on bluestem pastures.

A study of similar nature is reported in Circular 297; it, too, is a three-year summary for the years 1950-52. Protein supplementation in those tests failed to increase rate of gain.

Table 13

Three-Year Summary. Effect of Feeding a Protein Supplement During the Late Summer to Two-Year-Old Steers on Bluestem Pasture, 1953-55.

August to October—76 days.

Lot number	1	2
Number steers	30	30
Protein fed per steer daily, lbs.	0	2
Initial wt. per steer, lbs.	997	997
Final wt. per steer, lbs.	1066	1089
Gain per steer, lbs.	69	92
Daily gain per steer, lbs.	.91	1.21
Gain in wt. attributed to protein supplement, lbs. per steer	0	23
Total protein fed per steer, lbs.	0	152
Gain per steer by periods, lbs.:		
1st period	35	30
2nd period	19	47
3rd period	15	15

Level of Winter Protein Feeding for Yearling Steers Wintered and Then Summer Grazed on Bluestem Pasture, 1954-55.

Three-Year Summary, 1952-55.

PROJECT 253-4

E. F. Smith, F. H. Baker, R. F. Cox, and G. L. Walker

Earlier experiments conducted at this station demonstrated that yearling steers could be successfully wintered on dry bluestem pasture supplemented with 1½ to 2 pounds of cottonseed cake or soybean oil meal pellets per head daily. The test reported here is the third of a series to determine if this level of winter protein feeding may be lowered to 1 pound per head daily. The first test was reported in Kansas Agr. Expt. Sta. Cir. 308, the second in Cir. 320. The third test and a summary of the three tests are reported here.

Procedure

For the 1954-55 test 20 head of good-quality yearling Hereford steers were divided into two lots of 10 steers each. They were purchased as calves from the Joyce Ranch at Carlsbad, N.M., in the fall of 1953. During the summer of 1954 the steers were used in pasture-management studies. This test was started November 10, 1954, and continued to August 2, 1955. The winter pastures the steers were grazed on had been stocked at a normal rate during the previous summer, but had sufficient grass remaining to provide ample winter grazing. During the winter phase the steers were rotated among pastures to minimize pasture differences.

In addition to dry bluestem pasture, the steers were fed as follows during the winter:

Lot 1—One pound of soybean oil meal pellets per head daily.

Lot 2—Two pounds of soybean oil meal pellets per head daily.

The steers of both lots were grazed together during the summer of 1955.

Observations

In 1954-55 feeding 1 additional pound of soybean pellets during the winter increased the yearly gain by 35 pounds, enough to pay for the additional protein fed. The cost of production was lowered slightly where only 1 pound of soybean oil meal pellets was fed per head daily. Either level of feeding appeared satisfactory. The 2-pound level might have some additional advantage if it gave the cattle better appearance at sale time.

Table 14

Level of Winter Protein Feeding for Yearling Steers Wintered and Summer Grazed on Bluestem Pasture.

Phase 1. Wintering, November 10, 1954, to April 6, 1955—147 days.

Method of feeding	1 lb. soybean pellets daily on dry grass	2 lbs. soybean pellets daily on dry grass
Lot number	1	2
Number steers per lot	10	10
Initial wt. per steer, lbs.	601	597
Final wt. per steer, lbs.	633	663
Gain per steer, lbs.	32	66
Daily gain per steer, lbs.	.22	.45
Daily ration per steer, lbs.:		
Soybean cake	1.00	2.00
Prairie hay[1]	1.83	1.83
Dry bluestem pasture	Free choice	Free choice
Salt	Free choice	Free choice
Mineral (bonemeal and salt)	Free choice	Free choice
Feed cost per steer[2]	$11.22	$17.24

Table 14 (Continued).

Phase 2, Grazing, April 6 to August 2, 1955—118 days.		
Initial wt. per steer, lbs.	633	663
Final wt. per steer, lbs.	876	907
Gain per steer, lbs.	243	244
Daily gain per steer, lbs.	2.06	2.06
Cost per 100 lbs. pasture gain[2]	$8.23	$8.19
Summary, Phases 1 and 2		
Initial wt. per steer, lbs.	601	597
Final wt. per steer, lbs.	876	907
Gain per steer, lbs.	275	310
Total feed cost per steer[2]	$31.22	$37.24
Feed cost per cwt. gain[2]	$11.35	$12.01

1. Fed only when snow covered the grass.
2. See inside back cover for feed prices.

Three-Year Summary, 1952-55.

When the three years are combined, as shown in Table 15, it appears that the 1-pound level is somewhat superior, based on winter and summer gains combined. An additional 143 pounds of protein fed during the winter produced only 14 pounds more gain. To make the additional pound of protein pay, it would be necessary to establish that it increases the bloom or condition of the steers so that they would sell for enough more to pay for the additional protein fed.

Table 15

Three-Year Summary, Level of Winter Protein Feeding for Steers Wintered and Summer Grazed on Bluestem Pastures, 1952-55.

Phase 1, Wintering, November to April—143 days.		
Method of feeding	1 lb. protein[1]	2 lbs. protein[1]
Lot number	1	2
Number steers per lot	30	30
Initial wt. per steer	687	687
Final wt. per steer	752	789
Gain per steer, lbs.	65	102
Daily gain per steer, lbs.	.45	.71
Daily ration per steer, lbs.:		
Protein[1]	1.00	2.00
Prairie hay[2]	1.61	1.61
Dry bluestem pasture	Free choice	Free choice
Salt	Free choice	Free choice
Mineral[3]	.19	.16
Feed cost per steer	$11.33	$16.91
Phase 2, Grazing, April to August—110 days.		
Initial wt. per steer	752	789
Final wt. per steer	990	1004
Gain per steer, lbs.	238	215
Daily gain per steer, lbs.	2.16	1.95
Cost per 100 lbs. pasture gain	$6.72	$7.44
Summary of Phases 1 and 2—253 days.		
Initial wt. per steer, lbs.	687	687
Final wt. per steer, lbs.	990	1004
Gain per steer, lbs.	303	317
Daily gain per steer, lbs.	1.20	1.25
Total feed cost per steer	$28.67	$34.24
Feed cost per cwt. gain	$9.46	$10.80

1. Soybean oil meal pellets were fed in 1952-53 and 1954-55; cottonseed cake was fed in 1953-54.
2. Prairie hay was fed only when snow covered the grass.
3. The mineral was 2 parts bonemeal to 1 part salt.

The Use of Stilbestrol[1] Implants for Steer Calves on a Wintering Ration.

PROJECT 253-6

G. L. Walker, E. F. Smith, R. F. Cox, D. Richardson, and B. A. Koch

This test was conducted to study the effect of stilbestrol implants on steer calves fed a wintering type ration. Its value as a growth stimulant in fattening-type rations has been extensively studied; however, little information is available on its use with calves fed high roughage rations.

Experimental Procedure

Twenty-seven steer calves, weighing approximately 399 pounds each, were divided into two lots of 9 and 18[2] animals. The lot with 18 animals served as a control and the other lot was implanted with 36 mg. of stilbestrol at the base of the right ear.

Sorghum silage was used as the roughage in both lots and the calves were fed all they would consume each day. The concentrate part of the ration consisted of 4 pounds of ground milo grain and 1 pound soybean oil meal pellets for each steer. A mineral mixture consisting of equal parts of bonemeal and salt and salt alone were fed free choice.

Observations

1. Undesirable side effects often noted as a result of stilbestrol implants such as high tailheads or increase in size of reproductive organs were not readily apparent.
2. Stilbestrol increased rate of rain .23 pound per day.
3. Feed efficiency was not increased by stilbestrol implants.

Table 16

The Use of Stilbestrol Implants for Steer Calves on Wintering-Type Rations.

November 30, 1955, to April 7, 1956—129 days.

Lot number	6	17
Number steers	9	18
Initial wt. per steer, lbs.	399	399
Final wt. per steer, lbs.	643	614
Gain per steer, lbs.	244	215
Daily gain per steer, lbs.	1.89	1.66
Daily ration per steer, lbs.:		
Ground milo grain	3.90	3.90
Soybean oil meal pellets	1	1
Sorghum silage	32.98	29.68
Mineral (bonemeal and salt)	.08	.03
Salt	.07	.04
Lbs. feed required per 100 lbs. gain:		
Ground milo grain	206	236
Soybean oil meal pellets	52.86	60.43
Sorghum silage	1744	1795
Mineral (bonemeal and salt)	4.73	2.21
Salt	4.18	2.75
Feed cost per 100 lbs. gain, $	12.56	13.53

Winter Management for Steer Calves on a Wintering, Grazing, and Fattening Program, 1955-56.

PROJECT 253-6

E. F. Smith, B. A. Koch, R. F. Cox, and G. L. Walker

Dry bluestem pasture has been used successfully several years at this station as a source of winter roughage for steer calves that are

1. Supplied by Wick and Fry, Inc., Cumberland, Ind.
2. Eighteen animals were placed in one lot because it was to be divided into two lots at a later date for other experimental work.

to be grazed during the summer and sold off grass as feeder or stocker yearlings. This is the first attempt to supplement dry grass during the winter with several pounds of grain combined with protein, in an effort to attain sufficient winter gain so the calves could be finished on grain in the late summer and sold as fat yearlings. The test is to determine if dry grass can be supplemented in such a manner that calves will compare favorably in total performance with steer calves wintered on good-quality roughages.

The steers will be grazed until August 1 on bluestem pasture, then fattened in dry lot to choice grade.

Experimental Procedure

Seventeen head of good-quality Hereford steer calves purchased from the Williams Ranches near Lovington, N. M., were assigned to the test. The calves were allotted to their respective treatments on the basis of weight and quality. Eight calves were assigned to the pasture group and nine to the dry-lot group. Nine other calves on a similar treatment were wintered with the dry-lot group.

The treatment assigned to each lot in this experiment is as follows:

Lot 18—Wintered in dry lot on sorghum silage, 4 pounds of ground milo, and 1 pound of soybean pellets per head daily, free access to salt and mineral (bonemeal plus salt); grazed on bluestem from May 1 to August 1, fattened in dry lot from August 1 until they grade choice.

Lot 15—Wintered on dry bluestem pasture, 4 pounds of milo, and 1 pound of soybean pellets per head daily; continued on grass from May 1 to August 1 without supplemental feed; fattened in dry lot from August 1 until they grade choice.

Observations

Since the results of the test will be measured primarily by the yearly performance of the steers, this report is intended only as a progress report on the wintering phase. The steers wintered in dry lot (18) have made a much larger gain at a lower cost per cwt. than the steers in Lot 15 wintered on dry bluestem pasture.

Table 17

Winter Management for Steer Calves on a Wintering, Grazing, and Fattening Program, Progress Report for 1955-56.

November 30, 1955, to April 7, 1956—129 days.

Lot number	18	15
Number steers	9[1]	8
Place of wintering	Dry lot	Bluestem pasture
Initial wt. per steer, lbs.	391	379
Final wt. per steer, lbs.	622	501
Gain per steer, lbs.	231	118
Daily gain per steer, lbs.	1.79	.92
Daily ration per steer, lbs.:		
Ground milo grain	3.9	3.6
Soybean oil meal pellets	1	1
Sorghum silage	29.7	
Prairie and alfalfa hay[2]		.57
Dry bluestem pasture		
Salt	.04	.05
Mineral (bonemeal and salt)	.03	.04
Feed cost per steer,[3] $	29.05	19.56
Feed cost per 100 lbs. gain,[3] $	12.58	16.58

1. Nine other calves on a similar treatment were wintered with the dry-lot group, making a total of 18 head for the winter.
2. Prairie or alfalfa hay was fed to Lot 15 when snow covered the grass.
3. Feed prices may be found inside the back cover.

Trace Minerals[1] in a Calf Wintering Ration and a Yearling Fattening Ration, 1954-55. Three-Year Summary, 1951-52, 1952-53, 1954-55.

PROJECT 253-6

E. F. Smith, F. H. Baker, R. F. Cox, and G. L. Walker

This test was to study the value of adding trace minerals (copper, cobalt, iron, manganese, iodine, and zinc) to a wintering type ration and a fattening ration. This report includes the results for the third year of the test and a summary of the three years' work. Previous work is reported in greater detail in Circulars 297 and 308.

Experimental Procedure

Each year 10 steer calves were assigned to each treatment. In 1954-55 eight steers in each lot came from the Lonker ranch near Medicine Lodge, Kan., the other two from the Currie ranch near Westmoreland, Kan.

The system of management followed with each lot each year was as follows: wintered on sorghum silage and prairie hay (no prairie hay was fed in 1954-55) and 4 to 5 pounds of grain and 1 pound of a 41 percent protein concentrate per head daily, free access to mineral (bonemeal and salt) and salt; from about May 1 to August 1 they were grazed on bluestem pasture, then self-fed grain in dry lot from August 1 until they graded good to choice.

Both lots were handled identically except that one lot received trace minerals during the winter and in the dry-lot fattening ration.

The first year, 1951-52, the trace minerals were supplied free choice as a trace mineralized salt during the winter and during the fattening period.

The trace mineral salt contained the following minerals: Manganese carbonate, 0.400 percent; iron oxide, 0.250 percent; copper carbonate, 0.060 percent; sodium thiosulphate, 0.100 percent; sodium carbonate, 0.100 percent; cobalt carbonate, 0.022 percent; potassium iodide, 0.010 percent; sodium chloride, 99.058 percent.

The second and third years the trace minerals were fed as a trace mineral premix added to the soybean oilmeal to furnish the following amounts in milligrams per head daily in the wintering and fattening rations, respectively: manganese 25.0, 56.3; iodine 0.87, 1.97; cobalt 0.55, 1.25; iron 20.5, 46.13; copper 1.62, 3.65; zinc 1.52, 3.42.

Observations

During the 1954-55 test, as shown in Table 18, the addition of trace minerals appeared to have no significant effect on the performance of the steers on either the wintering or fattening ration. Due largely to an unexplained difference in shrink to market, the trace mineral-fed steers showed a larger return above initial cost plus feed cost. In the tests reported here the only time the addition of trace minerals appeared to affect the response of the steers to any great degree was in the fattening phase in 1953 when the gains were increased .58 pound per head daily. Since this did not occur in the other two years, additional research is needed. Perhaps the source of the steers or the particular feeds used that year were responsible for the differences observed. It may be worth noting that corn was the grain fed in the fattening ration in 1953 when the gain was increased by trace minerals. In the other two years when no response was received from the addition of trace minerals, milo grain was fed (see Table 18).

1. The trace mineral premix used in the test was supplied by the Calcium Carbonate Co., Chicago, Ill.

Table 18

Trace Minerals in Steer Calf Wintering Rations and Yearling Fattening Rations, 1954-55.

Phase 1, Wintering, November 16, 1954, to May 3, 1955—168 days.

Lot number	15	9
Management	Standard ration	Standard ration plus trace mineral
Number of steers per lot	10	10
Initial wt. per steer, lbs.	456	456
Final wt. per steer, lbs.	760	769
Gain per steer, lbs.	304	313
Daily gain per steer, lbs.	1.81	1.86
Lbs. daily ration per steer:		
Soybean meal	1.00	1.00
Milo	4.00	4.00
Sorghum silage	30.58	30.46
Salt	.10	.09
Bonemeal and salt	.09	.10
Trace minerals	No	Yes
Feed cost per cwt. gain	$12.70	$12.28
Feed cost per steer	$38.61	$38.54

Phase 2, Grazing, May 3 to August 1, 1955—90 days.

Initial wt. per steer, lbs.	760	769
Final wt. per steer, lbs.	845	854
Gain per steer, lbs.	85	85
Daily gain per steer, lbs.	.94	.94

Phase 3, Full Feeding, August 1 to November 12, 1955—104 days.

Management	Self-fed grain in dry lot	Self-fed grain in dry lot plus trace minerals
Initial wt. per steer, lbs.	845	854
Final wt. per steer, lbs.	1103	1119
Gain per steer, lbs.	258	265
Daily gain per steer, lbs.	2.48	2.55
Daily ration per steer, lbs.:		
Soybean meal	1.51	1.51
Milo	19.73	19.20
Prairie hay	6.60	6.65
Salt	.01	.01
Ground limestone	.10	.10
Trace minerals	No	Yes
Feed per cwt. gain, lbs.:		
Soybean meal	60.89	59.28
Milo	795.31	753.39
Prairie hay	266.27	261.16
Salt	.46	.45
Ground limestone	3.91	3.81
Cost of feed per cwt. gain	$23.53	$22.42
Total feed cost this phase	60.67	59.42

Summary of Phases 1, 2, and 3, November 16, 1954, to November 12, 1955—362 days.

Total gain per steer (all phases), lbs.	647	663
Daily gain per steer (all phases), lbs.	1.79	1.83
Feed cost per cwt. gain (all phases)	$17.83	$17.26
Total feed cost per steer	115.28	113.96
Initial steer cost at $22.50 cwt.	102.60	102.60
Feed cost plus steer cost	217.88	216.56
Selling price per cwt. at market	20.00	20.00

Table 18 (Continued).

Selling price per steer[1]	211.50	219.70
Return or loss per steer, above initial cost and feed cost	—6.98	3.14
% shrink in shipping to market	4.08	1.79
Dressing percentage (chilled)	60.5	60.6
Carcass grades:		
Choice		1
Choice —	1	
Good +	3	4
Good	3	4
Good —	3	1
Marbling:		
Moderate	3	1
Modest		5
Small amount	5	3
Slight amount	2	1

1. Based on market weights.
2. See inside back cover for feed prices.

Table 19

Three-year Summary. The Value of Trace Minerals in a Calf Wintering Ration and a Yearling Fattening Ration, 1951-52, 1952-53, 1954-55.

Management	Standard ration				Standard ration plus trace minerals			
Wintering phase:								
Year	51–52	52–53	54–55	Av.	51–52	52–53	54–55	Av.
Daily gain per steer, lbs.	1.26	2.09	1.81	1.72	1.36	2.08	1.86	1.76
Daily winter ration per steer, lbs.:								
Ground milo	5.3		4.0		5.3		4.0	
Ground corn		5.1		4.8		5.1		4.8
Soybean pellets		1.0	1.0			1.0	1.0	
Cottonseed pellets	1.0			1.0	1.0			1.0
Sorghum silage	20.3	19.2	30.6	23.4	20.0	19.2	30.5	23.2
Prairie hay	.2	2.2	.	.8	.2	2.2		.8
Mineral	.1	.1	.1	.1	.1	.1	.1	.1
Salt	.11	.05	.10	.08		.05	.09	.07
Trace mineral salt					.08			
Fattening phase:								
Year	1952	1953	1955	Av.	1952	1953	1955	Av.
Daily gain per steer, lbs.	2.65	2.44	2.48	2.52	2.60	3.02	2.55	2.72

Table 19 (Continued).

Daily fattening ration per steer, lbs.:								
Ground milo	19.3		19.7		19.0		19.2	
Ground corn		14.1		17.7		15.9		18.0
Cottonseed pellets	2.0				2.0			
Soybean pellets		1.4	1.5	1.6		1.5	1.5	1.7
Prairie hay	5.9	4.9	6.6	5.8	5.9	4.6	6.7	5.7
Ground limestone	.1	.1	.1	.1	.1	.1	.1	.1
Salt	.02	.09	.01	.04		.08	.01	.04
Trace mineral salt					.02			
Lbs. feed required per cwt. gain:								
Ground milo	727		795		732		753	
Ground corn		577		700		525		670
Cottonseed pellets	75				77			
Soybean pellets		59	61	65		48	59	62
Prairie hay	223	167	266	219	227	153	261	214
Ground limestone	4	4	4	4	4	3	4	4
Salt	1	4	1	2	1	3	1	2
Average carcass grade[2]	13.0	11.2	11.2	11.8	11.8	12.3	11.6	11.9

1. Mineral was 2 parts bonemeal and 1 part salt; salt was fed free choice.

2. The following numbers were assigned to the USDA grades: High choice, 15; av. choice, 14; low choice, 13; high good, 12; av. good, 11; low good, 10.

Self-Feeding Grain to Yearling Steers on Bluestem Pasture Compared to Self-Feeding Grain in Dry Lot During the Late Summer of 1955, with a Three-Year Summary, 1952, 1953, 1955.

PROJECT 253-6

E. F. Smith, F. H. Baker, R. F. Cox, D. L. Good, and G. L. Walker

Producers following the deferred full-feeding plan sometimes prefer to leave steers on grass from August to November and fatten them there with grain instead of moving them to dry lot for grain full feeding. The steers used in this test were handled on the deferred full-feeding program. Hand feeding of grain on grass after mid-summer compared with dry-lot feeding had been studied previously at this station with heifers. Generally, the heifers fed on grass gained less and graded slightly lower than those fed in dry lot. The purpose of this study was to compare the self-feeding of grain to yearling steers on bluestem pasture with self-feeding grain in dry lot, starting about August 1 and feeding until the cattle graded good to choice.

Experimental Procedure

Twenty good-to-choice Hereford steer calves were used in each test. They were assigned to lots in the fall. Both lots were wintered identically on sorghum silage, 4 pounds of grain, and 1 pound of 41 percent protein concentrate per head daily, free access to mineral (bonemeal and salt) and salt. The two lots were grazed together until August 1. On this date, one lot was moved to dry lot and self-fed grain. The other remained on bluestem pasture and was self-fed grain there.

Observations

In the 1955 tests, the steers self-fed in dry lot were superior in daily gain, grain consumption efficiency, and selling price, and they had slightly higher grading carcasses than the steers self-fed on grass.

Because of lower grain consumption on grass, steers on grass received less protein concentrate, since the protein was fed mixed with the grain in the same ratio for each lot. Equal quantities of protein concentrate should have been fed to each lot.

The steers under each treatment performed somewhat similarly up to the 1955 test except that the steers self-fed on grass tended to sell lower on the market but were consistent in producing beef at a lower cost. Since the results in the third test were so different in many respects from those in the first two tests, a fourth trial will be conducted to reach more definite conclusions.

Each year, the steers self-fed on grass had the lowest cost per 100 pounds gain, although they sold on an average for $1 per hundred less and tended to grade slightly lower (see Table 21). Detailed reports on previous tests may be found in Circulars 297 and 308.

Table 20

Self-Feeding Grain to Yearling Steers on Bluestem Pasture Compared with Self-Feeding Grain in Dry Lot.

August 1, 1955, to November 12, 1955—104 days.

Management	Self-fed grain in dry lot	Self-fed grain on bluestem pasture
Initial wt. per steer, lbs.	845	860
Final wt. per steer, lbs.	1103	1057
Gain per steer, lbs.	258	197
Daily gain per steer, lbs.	2.48	1.89
Daily ration per steer, lbs.:		
Soybean meal	1.51	1.21
Ground milo grain	19.73	14.39
Prairie hay	6.60	
Bluestem pasture		Free choice
Salt	.01	Free choice
Ground limestone	.10	.07

Table 20 (Continued).

Feed per cwt. lbs. of gain, lbs.:		
Soybean meal	60.9	63.8
Ground milo grain	795.3	759.6
Prairie hay	266.3	
Bluestem pasture		Free choice
Salt	.5	Free choice
Ground limestone	3.9	3.8
Total feed cost,[1] $	60.67	42.77
Cost of feed per cwt. lbs. gain,[1] $	23.51	21.71
Selling price per cwt., $	20.00	18.00
% wt. shrink in shipping to market	4.12	1.41
Dressing %, based on chilled carcass wt.	60.5	61.5
Carcass grades, number of steers grading:		
Low choice	1	
High good	3	
Av. good	3	7
Low good	3	3
Marbling:		
Moderate	3	
Modest	5	2
Small amount	2	5
Slight amount		3

1. Feed prices may be found on inside back cover.

Table 21

Three-Year Summary of Self-Feeding Grain to Yearling Steers on Bluestem Pasture Compared with Self-Feeding Grain in Dry Lot.

August 1, 1952, to December 6, 1952—127 days.
July 31, 1953, to November 7, 1953—99 days.
August 1, 1955, to November 12, 1955—104 days.

Management	Self-fed grain in dry lot				Self-fed grain on pasture			
Year	1952	1953	1955	Average	1952	1953	1955	Average
Daily gain, lbs.	2.65	2.44	2.48	2.52	2.65	2.45	1.89	2.33
Lbs. daily ration:								
Ground milo	19.3		19.7	17.7	19.3		14.4	15.8
Ground corn		14.1				13.7		
Cottonseed pellets	2.0			1.6	1.7			1.4
Soybean pellets		1.4	1.5			1.4	1.21	
Prairie hay	5.9	4.9	6.6	5.8				
Ground limestone	.1	.1	.1	.1	.1	.1	.1	.1
Salt	.02	.1	.01	.04	.02	Free choice		
Cost of feed per 100 lbs. gain, $	25.96	21.23	23.51	23.57	23.91	18.65	21.71	21.42
Sale price per cwt., $	27.50	22.00	20.00	23.17	26.50	22.00	18.00	22.17
Carcass grade, score[1]	13.0	11.1	11.2	11.8	12.5	11.0	10.7	11.4

1. The following numbers were assigned the carcass grades: High choice, 15; av. choice, 14; low choice, 13; high good, 12; av. good, 11; low good, 10; high commercial, 9.

Nutritive Value of Forages as Affected by Soil and Climatic Differences.

PROJECT 430

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

There has long been evidence that forages produced on different types of soil in the same general area give significantly different results when fed to animals. Further information is needed on the composition and nutritive value of forages grown on soils differing in origin, fertility, and other characteristics.

This is a progress report of the wintering phase of the first trial in this study. The study has been designed to measure differences in the results obtained when cattle are grazed on forages growing on limestone or sandstone soils.

Experimental Procedure

Thirty-nine choice Hereford heifer calves purchased from the Williams Ranches in Lovington, N. M., were used in this study. The heifers were spayed before the start of the study to eliminate the possibility of their being bred during the trial. They were then divided into two lots of approximately the same average weight. Twenty of the heifers were wintered on a native sandstone pasture and 19 were wintered on a native limestone pasture. The predominant species in both pastures was bluestem grass. The pastures were located within eight miles of each other in Ellsworth county. Both lots of heifers received 1½ pounds of cottonseed cake daily as protein supplement throughout the winter period. Soil, water, and forage samples were collected during the period for detailed chemical studies. At the end of the winter period the heifers were weighed. Blood samples were also taken from a representative number of each group for chemical analysis.

The cattle will be continued on the two different treatments until they reach market weight. Further observations and blood studies will be made at regular intervals as the trial progresses.

Observations

Both lots of heifers appeared to be in excellent condition at the end of the winter period.

Those on the sandstone pasture gained an average of only 6 pounds during the period, while those on the limestone pasture made an average gain of 63 pounds.

These differences in gain cannot be fully explained at this time.

Complete results of the various chemical studies are not yet available.

Further information will be summarized in future reports.

Ratio of Roughage to Concentrate for Fattening Heifers, 1955

PROJECT 222

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

This is the fourth test in an experiment planned to secure information on the effects of different levels of roughage on average daily gain, feed required per unit of gain, and carcass quality. Since Kansas normally produces a large amount of roughage, it is desirable to have information concerning the maximum amount of roughage that can be used in fattening rations which will permit maximum and economical gains and, at the same time, produce a desirable carcass.

Experimental Procedure

Fifty Hereford heifers were divided into five lots as equally as possible on the basis of weight, size, conformation, and previous treatment. The heifers were wintered, 10 per lot, as calves on the following rations: (1) Alfalfa hay and 4 pounds milo grain; (2) Atlas sorghum silage, 2 pounds milo grain, and 1 pound soybean oil meal; (3) Atlas sorghum

silage and 3 pounds special supplement; (4) prairie hay, 3 pounds milo grain, and 1 pound soybean oil meal; (5) corn cobs, 2.5 pounds milo grain, and 1.5 pounds soybean oil meal. A mineral supplement of steamed bonemeal and salt was available at all times. Two heifers from each lot on the above wintering rations were allotted to each of the five lots in this experiment. That gave a total of 10 animals per lot. All animals had gained well during the winter and were fairly fleshy at the beginning of this test.

The feeds used were good-quality chopped alfalfa hay and coarsely cracked milo grain and corn. One lot of animals received corn so that a comparison of milo grain and corn could be made. The hay and grain were mixed in a self-feeder and kept before the animals all the time. Water, salt, and ground limestone were also provided free choice at all times.

All animals were started on a ration of equal parts of hay and grain. The grain was increased until each lot was on the ration indicated as follows:

Lot 1—1 pound of alfalfa hay to 1 pound milo grain
Lot 2—1 pound of alfalfa hay to 3 pounds corn
Lot 3—1 pound of alfalfa hay to 3 pounds milo grain
Lot 4—1 pound of alfalfa hay to 5 pounds milo grain
Lot 5—Changing ratio, started at 1 pound alfalfa hay to 1 pound milo grain. Each succeeding 28 days the grain was increased until the ratio was 1 pound hay to 5 pounds grain at the end of the test.

Results and Discussion

Table 22 gives a summary of the results obtained in the feed-lot test. The weather was very hot; however, the rates of gain in all lots were very satisfactory. Lot 1 animals on equal parts of hay and grain made better gains and graded higher than on any of the previous tests. Lot 3 contained one animal that was a chronic bloater and another that bloated occasionally. This affected the rate of gain for the lot. Taking this into consideration, there was practically no difference in rate of gain and carcass quality in lots 2, 3, and 4. The gains in lot 5 were just as good; however, the carcasses did not grade quite so high as those of lots 2, 3, and 4. The results of this test agree with those of previous tests in that 1 part hay to 3 parts concentrate or 25 percent roughage gives just as good results as rations containing a greater concentration of grain.

Table 23 gives the average daily gains of animals based upon their wintering ration.

Table 22

Ratio of Roughage to Concentrates for Fattening Heifers.

May 17 to September 19, 1955—125 days.

Lot number	1	2	3	4	5
Ratio of roughage to concentrate	1 hay 1 milo	1 hay 3 corn	1 hay 3 milo	1 hay 5 milo	changing ratio
Number heifers per lot	9	10	10	10	10
Av. initial wt., lbs.	711	702	712	704	705
Av. gain per heifer, lbs.	276	295	275	290	290
Av. daily gain per heifer, lbs.	2.21	2.36	2.20	2.32	2.32
Total feed per head, lbs.:					
Milo grain	1665.5		2097.9	2289.0	2158.5
Corn		1891.4			
Alfalfa hay	1665.5	658.8	734.3	522.8	1018.7
Av. daily feed per head, lbs.:					
Milo grain	13.32		16.78	18.31	17.27
Corn		15.13			
Alfalfa hay	13.32	5.27	5.87	4.18	8.15

Table 22 (Continued).

Feed per 100 lbs. gain:					
Milo grain	603.4		762.9	789.3	744.3
Corn		641.2			
Alfalfa hay	603.4	223.3	267.0	180.3	351.3
Days to reach ratio	0	11.0	11.0	18.0	
Feed cost per 100 lbs. gain[2]	$20.21	$20.57	$20.60	$20.35	$21.00
Percent shrink to market	4.94	5.18	4.75	3.80	4.24
Av. dressing percent (including cooler shrink)	59.48	60.58	61.98	59.61	59.83
Carcass grades:					
Top choice		2	2	1	
Average choice	2	1	2	2	2
Low choice	4	3	4	1	2
Top good	3	3	2	4	4
Average good		1		2	2
Degree of marbling:					
Moderately abundant				1	
Moderate		2	2		
Slightly abundant				1	
Modest	2	2	4	1	2
Small amount	4	3	2		1
Slight amount	3	2	2	5	6
Traces		1		2	1

1. One animal died from bloat.
2. Corn $1.60 per bu.; milo $2.35 per cwt.; alfalfa hay $20 per T.

Table 23

Average Daily Gain per Head Based upon Wintering Ration with 10 Animals per Lot.

Previous treatment	Prairie hay, 3 lbs. milo grain, 1 lb. S.B.O.M.	Corn cobs, 2.5 lbs. milo grain, 1.5 lbs. S.B.O.M.	Alfalfa hay, 4 lbs. milo grain,	Atlas sorgo silage, 2 lbs. milo grain, 1 lb. S.B.O.M.	Atlas sorgo silage, 3 lbs. spec. supplement
Av. daily gain during 125-day fattening period, lbs.	2.32	2.52	2.02	2.27	2.27

Ratio of Roughage to Concentrate for Fattening Beef Cattle—Summary

PROJECT 222

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

Four tests, one with steer calves and three with heifers, were conducted to study the ratio of roughage to concentrate in beef cattle fattening rations. Beef cattle are naturally large consumers of roughage and serve as one of the principal means of marketing this product. Since a large amount of roughage normally is produced in Kansas, it is desirable to have information concerning the maximum roughage that can be used in fattening rations, consistent with maximum production and economical gains which, at the same time, produces the kind of carcass desired. This information should help plan the best way to use one's available feed supply.

Experimental Procedure

The rations used in each test were the same except for the variation in quantities of roughage and concentrate. The ingredients used were primarily alfalfa hay and milo grain or corn. The ratios used were:

(1) One part roughage (50%) to one part concentrate, (2) one part roughage (25%) to three parts concentrate, (3) one part roughage (16%) to five parts concentrate, (4) changing ratio—the amount of grain was increased each 28 days. The chopped hay and coarsely ground grain were mixed and fed in a self-feeder. The concentrate was increased as fast as advisable until animals in each lot were on their proper ratio. Water, limestone, and salt were available at all times.

Hereford steer calves and heifers were used in this experiment. Animals were divided into lots as equally as possible on the basis of weight, conformation, and previous treatment. Yearling Hereford steers were used in the digestion study. Carcass data were obtained on each animal at time of slaughter.

This experiment was planned to secure information on the effects of different levels of roughage on (1) digestibility of nutrients, (2) average daily gain, (3) feed required per unit of gain, and (4) carcass quality. For further details on individual tests, refer to the 40th, 41st, 42nd, and 43rd Annual Livestock Feeders' Day Reports, Kansas Agricultural Experiment Station Circulars 297, 308, 320, and 335.

Results

Table 24 gives the results of digestion studies with 11 yearling Hereford steers. This shows the effect of various levels of roughage upon the digestibility of the nutrients in the ration.

Table 25 gives the feed-lot results with Hereford steer calves and Table 28 gives the results of three tests with Hereford heifers.

Table 24

Average digestion coefficients of 11 yearling steers on different ratios of roughage to concentrate.

Ratio of alfalfa hay to milo grain	% Apparent Digestibility of				% total dig. nutr.
	Crude protein	Ether extract	Crude fiber	N-free extract	
1 to 1	64.6	50.8	51.7	75.0	61.7
1 to 3	66.1	64.0	57.5	79.6	69.0
1 to 5	63.2	62.3	49.2	78.9	68.5

Observations

1. Greatest digestibility of all nutrients was obtained with a ratio of 1 part roughage to 3 parts grain (25% roughage). One part roughage to 5 parts grain (16% roughage) was next with the 1 to 1 ratio of roughage to grain (50% roughage) being the lowest. This indicates that there is an optimum level of roughage that promotes greatest digestibility of the nutrients in the ration. When this level is greatly increased or decreased in cattle rations, the digestibility of the nutrients will be decreased.

2. Animals receiving 1 part roughage to 1 part concentrate ate more total pounds of feed; however, there was very little difference in the other ratios. At the ratio of 1 to 5 the daily grain consumption increased over the 1 to 3 ratio; however, the difference was not so great as the increase at the 1 to 3 ratio over that consumed at the 1 to 1 ratio. The results indicate that there is a limit to the amount of concentrate an animal will consume even under conditions of restricted roughage consumption.

3. Rate of gain varied between and within individual tests. Rate of gain tended to increase as concentrates increased with the heifers; however, the reverse was true with the steer calves. It is suggested that length of feeding period be considered in determining the amount of roughage to be used. Roughage should be more restricted for short feeding periods than longer lengths of time, if maximum gains are to be obtained. Increasing the grain each 28 days does not seem to be beneficial. Results indicate that it is best to determine the level of grain one wants to feed, increase the quantity up to this level, and then prevent further change in the feed insofar as possible. Gains were

satisfactory on the 1 to 1 ratio; however, there was a tendency toward growth and not enough finish.

4. The ration containing the most roughage required the most feed per 100 pounds gain. There was a tendency for the total feed to decrease as the concentrate was increased in the ration.

5. There were no differences in carcass quality of animals fed 1 to 3 and 1 to 5 ratios as measured by carcass grade, degree of marbling, and dressing percentage. Animals that received the changing ratio graded slightly lower. Carcass values were lowest for the animals on the 1 to 1 ratio. They failed to put on enough finish because of their limited supply of grain.

Table 25

Ratio of Roughage to Concentrate for Fattening Steer Calves.

December 22, 1951, to July 12, 1952—203 days.

Ration (ratio of lbs. alfalfa hay to milo grain)	1 hay to 1 concentrate	1 hay to 3 concentrate	1 hay to 5 concentrate
Number steers per lot	10	10	9[1]
Av. initial wt., lbs.	502	503	505
Av. final wt., lbs.	934	949	933
Av. gain per steer, lbs.	432	446	428
Av. daily gain per steer, lbs.	2.13	2.20	2.10
Av. total feed per head, lbs.:			
Alfalfa hay	2480	1351	1031
Milo grain	2240	2878	2902
Av. daily feed per head, lbs.:			
Alfalfa hay	12.22	6.66	5.08
Milo grain	11.03	14.18	14.30
Av. feed per 100 lbs. gain:			
Alfalfa hay	574	303	241
Milo grain	519	645	678
Av. dressing percent (includes cooler shrink)	58.6	60.0	60.3
Carcass grades:			
Prime		1	
Top choice		6	2
Av. choice	2		5
Low choice	6	1	2
Top good	1	2	
Av. good	1		

1. One died, cause unknown.

Comparison of Corn and Milo Grain in Fattening Ration of Beef Cattle—Summary, 1956.

PROJECT 222

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

Kansas is surpassed only by Texas in total sorghum acreage and production. A large part of this acreage consists of the type that has a short stalk and is, therefore, suitable for harvesting the grain with a combine. This means that there is a large amount of the grain available for feeding livestock.

This experiment was planned to study the relative value of corn and milo grain in the fattening ration of beef cattle. Rate of gain, feed consumption, economy of gain, dressing percentage, carcass grade, and degree of marbling were used to make comparisons.

Experimental Procedure

Three tests were conducted with Hereford heifers over a period of three years (see Table 26 for time). Twenty heifers were used in each

test. They were divided as equally as possible into lots of 10 animals each on the basis of previous treatment, weight, and conformation.

The ration consisted of chopped hay and coarsely cracked grain mixed and self-fed. Good-quality alfalfa hay was the roughage in each test except test 1 in which equal parts of alfalfa and bromegrass hay were used. After starting the animals on feed, grain was increased until they were receiving 1 pound of hay to 3 pounds of grain. Salt and water were available at all times.

The animals were marketed and slaughtered at the end of each test. Dressing percentage, U.S. Government Grade, and degree of marbling were obtained at the packing plant.

Results

A summary of the three tests is given in Table 26. Note that results for each test and an average of the three are given.

Observations

1. Rate of gain varied in individual tests. There appears to be some difference in favor of corn, but it is doubtful that there is any practical difference in rate of gain between the two grains.

2. The average daily consumption of milo grain was greater than corn in all tests. Milo grain seemed to be more palatable and the animals seemed to go on full feed faster with fewer digestive disturbances.

3. Less corn was required per 100 pounds of gain. This indicates that corn is more efficient on a pound-for-pound basis. However, one must not lose sight of economy of gain from the standpoint of cost. At present prices (corn $1.40 per bu. and milo grain $2 per 100 lbs.), the gains were more economical with milo grain, even though a greater quantity was needed per pound of gain.

4. There was no difference in dressing percentage.

5. There were no differences in carcass grade or degree of marbling. The statement is sometimes made that carcass grades and marbling are not so good with cattle fed milo grain as with cattle fed corn. The results of this experiment indicate no practical differences.

Table 26

Summary of Three Tests Comparing Corn and Milo Grain in Beef Cattle Fattening Rations.

Test 1—May 14 to August 13, 1953—91 days.
Test 2—May 7 to October 8, 1954—154 days.
Test 3—May 17 to September 19, 1955—125 days.

	Test number	Grain used: Corn	Grain used: Milo
Number of heifers per lot	1	10	10
	2	10	10
	3	10	10
Av. initial wt. per heifer, lbs.	1	639	639
	2	511	512
	3	702	712
	Av.	617	621
Av. final wt. per heifer, lbs.	1	818	845
	2	860	815
	3	997	987
	Av.	892	882
Av. gain per heifer, lbs.	1	179	206
	2	349	303
	3	295	275
	Av.	274	261
Av. daily gain per heifer, lbs.	1	1.97	2.27
	2	2.27	1.97
	3	2.36	2.20
	Av.	2.20	2.18

Table 26 (Continued).

Av. total feed per head, lbs.:			
Hay	1	663	657
	2	925	950
	3	659	734
	Av.	749	780
Grain	1	1287	1561
	2	2108	2183
	3	1891	2098
	Av.	1762	1947
Av. daily feed per head, lbs.:			
Hay	1	6.2	7.2
	2	6.0	6.2
	3	5.3	5.9
	Av.	5.8	6.4
Grain	1	14.2	17.1
	2	13.7	14.2
	3	15.1	16.8
	Av.	14.3	16.0
Feed per 100 lbs. gain:			
Hay	1	370	318
	2	265	313
	3	223.3	267
	Av.	286	299
Grain	1	706	754
	2	604	720
	3	641.2	763
	Av.	650	746
Av. dressing % (includes cooler shrink)	1	58.8	59.4
	2	61.8	60.9
	3	60.6	62.0
	Av.	60.4	60.8

	Test				Test			
	1	2	3	Tot.	1	2	3	Tot.
Carcass grades:[3]								
Low prime					1			1
Top choice			2	2		2	2	2
Av. choice	2	4	1	7		2	2	4
Low choice	3	4	3	10	4	4	4	12
Top good	3	2	3	8	4	3	2	9
Av. good	2		1	3	1	1		2
Av. grade[1]				12.20				12.13

	Test				Test			
	1	2	3	Tot.	1	2	3	Tot.
Degree of marbling:[3]								
Slightly abundant					1			1
Moderate		1	2	3		1	2	3
Modest	3	6	2	11			4	4
Small amount	2	1	3	6	5	3	2	10
Slight amount	1	2	2	5	4	6	2	12
Traces	4		1	5				
Av. degree of marbling[2]				6.93				6.97

1. Based on low prime 6, top choice 8, av. choice 10, low choice 12, top good 14, and av. good 16.

2. Based on slightly abundant 4, moderate 5, modest 6, small amount 7, slight amount 8, and traces 9.

3. Obtained through courtesy of L. P. Stream, District Supervisor, U.S.D.A. Grading Service, Kansas City.

Table 28

Summary of Three Tests Comparing Ratio of Roughage to Concentrate for Fattening Heifers.

Test 1—May 14 to August 13, 1953—91 days.
Test 2—May 7 to October 8, 1954—154 days.
Test 3—May 17 to September 19, 1955—125 days.

	Test No.	1 hay to 1 concentrate	1 hay to 3 concentrate	1 hay to 5 concentrate	Changing ratio
Number heifers per lot	1	10	10	10	10
	2	10	10	10	10
	3	9	10	10	10
Av. initial wt. per heifer, lbs.	1	639	639	637	638
	2	518	512	515	518
	3	711	712	703	705
	Av.	623	621	618	620
Av. final wt. per heifer, lbs.	1	806	818	850	800
	2	807	815	845	833
	3	987	987	993	995
	Av.	867	873	896	876
Av. gain per heifer, lbs.	1	167	179	213	162
	2	289	303	330	315
	3	276	275	290	290
	Av.	244	252	278	256
Av. daily gain per heifer, lbs.	1	1.83	1.97	2.34	1.77
	2	1.88	1.97	2.14	2.04
	3	2.21	2.20	2.32	2.32
	Av.	1.97	2.05	2.27	2.04
Av. total feed per head, lbs.:					
Hay: alfalfa-brome ..	1	1045	663	507	698
alfalfa	2	1657	950	771	1158
alfalfa	3	1666	734	523	1019
	Av.	1456	782	600	958
Grain: corn	1	1035	1287	1472	1109
sorghum	2	1588	2183	2348	2002
sorghum	3	1666	2098	2289	2159
	Av.	1430	1856	2036	1757
Av. daily feed per head, lbs.:					
Hay: alfalfa-brome ..	1	11.5	6.2	5.6	7.7
alfalfa	2	10.7	6.2	5.0	7.5
alfalfa	3	13.3	5.9	4.2	8.2
	Av.	11.8	6.1	4.9	7.8
Grain: corn	1	11.4	14.2	16.2	12.2
sorghum	2	10.3	14.2	15.2	13.0
sorghum	3	13.3	16.8	18.3	17.3
	Av.	11.7	15.1	16.9	14.2

Table 28 (Continued).

Feed per 100 lbs. gain:					
Hay: alfalfa-brome ..	1	630	370	238	431
alfalfa	2	573	313	234	368
alfalfa	3	603.4	267	180.3	351.3
	Av.	602	317	217	383
Grain: corn	1	623	706	691.3	684.4
sorghum	2	549	720	711	635
sorghum	3	603.4	763	789.3	744.3
	Av.	592	730	730	688
Av. dressing percent (includes cooler shrink)	1	58.3	58.8	60.0	58.0
	2	59.8	60.9	61.0	60.0
	3	59.5	62.0	59.6	59.8
	Av.	59.2	60.6	60.2	59.3

	Test				Test				Test				Test			
	1	2	3	Tot.	1	2	3	Tot.	1	2	3	Tot.	1	2	3	Tot.
Carcass grades:																
Low prime	1			1												
Top choice							2	2	1	1	1	3				
Av. choice			2	2	2	2	2	6	1	3	2	6	1	2	2	5
Low choice		3	4	7	3	4	4	11	4	5	1	10	3	5	2	9
Top good	2	5	3	10	3	3	2	8	3	1	4	8	1	1	4	6
Av. good	4	1		5	2	1		3	1		2	3	3	2	2	7
Low good	2	1		3									3			3
Top com.	1			1												
Av. grade[1]		13.93				12.27				12.13				13.6		
Degree of marbling:																
Moderately abundant											1	1				
Slightly abundant	1			1							1	1				
Moderate						1	2	3	1			1				
Modest			2	2	3		4	7		6	1	7	1	4	2	7
Small amount	2	1	4	7	2	3	2	7	5	2		8	3	1	1	5
Slight amount	3	9	3	15	1	6	2	9	2	1	5	8	2	5	6	13
Traces	4			4	4			4	1		2	3	4		1	5
Av. degree marbling[2]		7.62				7.13				6.93				7.53		

1. Based on low prime 6, top choice 8, av. choice 10, low choice 12, top good 14, av. good 16, low good 18, and top commercial 20.

2. Based on moderately abundant 3, slightly abundant 4, moderate 5, modest 6, small amount 7, slight amount 8, and traces 9.

Effect of Previous Treatment upon Fattening Gains of Heifers—Summary.

PROJECT 222

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

The way that animals are fed and managed before going into the feed lot may influence the rate and efficiency of gain on a fattening ration. This is particularly true with pigs. This experiment was planned to obtain information on the response of heifers on a **fattening** ration after having received different kinds of roughage in their **wintering** rations. The different rations were supplemented to make them similar in protein, total digestible nutrients, vitamins, and minerals.

Experimental Procedure

In each of three wintering tests, 50 Hereford heifer calves were divided into five lots of 10 animals each. They were wintered on the

Table 20

The Influence of Different Roughages Fed in Wintering Rations upon Subsequent Gains on Fattening Rations.

Year	Test No.	Prairie hay Av. daily gain		Corn cobs Av. daily gain		Alfalfa hay Av. daily gain		Atlas silage (8p. sup.) Av. daily gain		Atlas silage (Grain & prot.) Av. daily gain		Winter Av. by test	Fattening Av. by test
		Winter	Fattening	Winter	Fattening	Winter	Fattening	Winter	Fattening	Winter	Fattening		
1953	1	1.60	2.05	1.43	1.68	1.24	2.41	1.69	2.00	1.72	1.95	1.53	2.02
1954	2	1.27	2.03	1.25	2.12	1.52	2.18	1.73	2.05	1.65	1.92	1.48	2.06
1955	3	1.50	2.32	1.36	2.52	1.68	2.02	1.89	2.27	1.55	2.27	1.60	2.28
	Av.	1.46	2.13	1.35	2.11	1.48	2.20	1.77	2.11	1.64	2.05		

following rations: (1) prairie hay plus grain and protein concentrate; (2) corn cobs plus grain, protein concentrate, and vitamin A; (3) alfalfa hay plus grain; (4) atlas sorghum silage plus a special supplement; (5) atlas sorghum silage plus grain and protein concentrate. As already pointed out, these rations were supplemented in such a way as to make them similar in nutritive value.

At the end of the wintering period, two heifers from each of the above wintering rations were allotted to each of five lots for a fattening test. This gave five lots of 10 animals each. The animals were regrouped according to previous treatment at the end of the fattening period, in order to determine the rate of gain.

Results and Discussion

The results of this experiment are given in Table 29. There are variations in results obtained; however, it is apparent that none of the roughages in the wintering ration, or previous treatment, had a consistent effect upon the fattening results following the wintering period. It should be remembered that all of these roughages were supplemented to make them similar in calculated nutritive value.

The Value of Stilbestrol in Beef Cattle Rations—Wintering, Grazing, and Fattening Phases.

PROJECT 370

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

Stilbestrol, a synthetic compound which has a hormonelike effect when taken into the body, has been recognized as a growth-stimulating factor in beef cattle fattening rations. Most of the market cattle in Kansas are handled under the deferred system of feeding. Information was needed on the value of this growth-stimulating ingredient in the deferred cattle-feeding program.

This experiment was planned to obtain information on the value of stilbestrol (1) in the wintering ration of beef calves, (2) during grazing, (3) effect of removing stilbestrol from the animals while grazing, (4) when animals return to the feed lot after grazing, (5) effect of long-time continuous feeding, (6) effect upon digestibility of feed, (7) carcass grade, and (8) cooking quality of the meat. The results of the wintering phase are repeated in Table 30. For more complete details on this and the digestion studies, see the 42nd Annual Livestock Feeders' Day Report, Kansas Agricultural Experiment Station, Circular 320, pages 50-53, 1955.

Experimental Procedure

Thirty Hereford steer calves averaging about 450 pounds were divided as equally as possible into three lots of 10 animals each. Lot 1 served as the control throughout the test. Lot 2 received stilbestrol during the wintering and fattening phases (Phases 1 and 3 of the Kansas Deferred System) but not on grass. Lot 3 received stilbestrol throughout all three phases of the feeding operation. (Note—there were two control lots during the wintering phase but only one thereafter.) Stilbestrol was fed at the rate of 10 mg. per head daily throughout the test. Otherwise, feeding and management were the same for all animals except Lot 3, which received stilbestrol in ½ pound of soybean oil meal per head daily while on grass. Grain was self-fed during the fattening phase.

Ten Hereford heifers averaging about 335 pounds each were divided as equally as possible into two lots. Lot 1 served as the control and Lot 2 received stilbestrol. These calves were fed a wintering ration for 140 days and then put on a fattening ration. They did not go to pasture as did the steers.

At the time of marketing and slaughter, carcass data were obtained on individual animals. A wholesale rib cut from each animal was purchased for chemical and cooking studies.

Results

The information obtained is shown in Table 30 for the steers and Table 32 for the heifers. Results of the cooking tests of roasts from the steer and heifer carcasses are shown in Tables 31 and 33, respectively.

Observations

Wintering phase:

1. There was a tendency toward increased gains with stilbestrol in the wintering ration of calves; however, it is doubtful that this difference is great enough to offset the additional cost and be of economic advantage.
2. There were no significant differences in rate of feed consumption or efficiency of feed utilization.
3. Approximately one-half of the calves receiving stilbestrol developed high tailheads and depressed or weak loins. The heifers showed an enlargement of the vulva and developed more of a cow appearance. These differences varied with individual animals. There was a tendency for these effects to be less apparent as the animals grew older. In fact, they were noticeable in only a few animals at the time of slaughter.

Grazing phase:

1. The rate of gain on grass for all lots was less than might normally be expected; however, these calves had made excellent gains during the winter and therefore would not be expected to make large gains on grass.
2. The feeding of stilbestrol on grass did not produce an increased rate of gain.
3. A decrease in rate of gain on grass was obtained with animals that received stilbestrol in the wintering ration but did not receive stilbestrol on grass. This indicates that there is no beneficial carryover effect from feeding stilbestrol during the winter for animals that are going to pasture.

Fattening phase:

1. There was no apparent advantage to long-time, continuous feeding of stilbestrol (309 and 361 days). It is suggested that nature adjusts the body to the intake of stilbestrol when taken over a long period of time. Therefore, less beneficial effect is obtained when the animals are put on a fattening ration. Lot 2 steers that did not receive stilbestrol on grass but did in the feed lot showed a beneficial effect in rate and economy of gain from stilbestrol.
2. Stilbestrol had no apparent effect upon quantity of feed consumed. (Grain and hay were fed free choice during the fattening phase.)
3. There were only small differences in shrink to market and in cooler shrink; however, there was a tendency for higher dressing percentage with the control animals.
4. There was a tendency for animals fed stilbestrol to grade slightly lower. This was caused primarily by less marbling. This effect seemed to be greatest with animals having received stilbestrol continuously over a long period of time.
5. Stilbestrol fed animals showed slightly less rib-eye area, slight increase in fat thickness over 12th rib, slightly less firmness (often accompanied by greater release of fluid at cut), slight differences in total moisture in rib-eye and fat but a tendency toward a greater quantity of press fluid from the rib-eye.
6. Cooking tests with rib roasts from each animal did not reveal any outstanding differences. The palatability scores tended to be higher for roasts from animals fed stilbestrol. The press fluid was also greater from the cooked rib-eye of roasts from animals fed stilbestrol.

Table 30

Results with and without Stilbestrol in Wintering, Grazing, and Fattening Ration of Steers.

Wintering phase, November 16, 1954, to May 3, 1955—168 days.

Lot	1	2[1]	3[2]
Number steer calves per lot	10	10	10
Av. initial wt., lbs.	456	456	455
Av. final wt., lbs.	760	770	786
Av. total gain, lbs.	304	314	331
Av. daily gain, lbs.	1.81[3]	1.87	1.97
Av. daily ration, lbs.:			
Soybean oil meal	1.00	1.00	1.00
Ground milo grain	4.00	4.00	4.00
Atlas sorghum silage	29.04	28.94	29.05
Salt	.11	.13	.13
Mineral (½ bonemeal, ½ salt)	.10	.09	.09
Lbs. feed per 100 lbs. gain:			
Soybean oil meal	54.45	52.43	51.13
Ground milo grain	217.81	209.74	204.53
Atlas sorghum silage	1581.09	1517.60	1485.57
Salt	5.72	6.62	6.87
Mineral (½ bonemeal, ½ salt)	5.60	4.83	5.08
Feed cost per 100 lbs. gain	$13.99	$13.86	$13.56

1. 10 mg. stilbestrol per head daily in wintering and fattening phase @ 0.8c.
2. 10 mg. stilbestrol per head daily during entire experiment @ 0.8c.
3. A similar control lot made 1.92 average daily gain at $13.38 per cwt. cost.

Steers, grazing phase, May 3, 1955, to August 1, 1955—89 days.

Av. initial wt., lbs.	760	770[1]	786[2]
Av. final wt., lbs.	845	843	874
Av. total gain, lbs.	85	73	88
Av. daily gain, lbs.	0.96	0.82	0.99

1. Stilbestrol discontinued while on grass.
2. Received 10 mg. stilbestrol in 0.5 lb. soybean oil meal per head daily.

Fattening Phase, August 1, 1955, to November 12, 1955—104 days.

Av. initial wt., lbs.	845	843	874
Av. final wt., lbs.	1103	1121	1143
Av. total gain, lbs.	258	278	269
Av. daily gain, lbs.	2.49	2.67	2.59
Av. daily ration, lbs.:			
Soybean oil meal	1.51	1.51	1.51
Ground milo grain	19.73	19.39	19.98
Prairie hay	6.61	7.23	7.65
Limestone	.1	.1	.1
Lbs. feed per 100 lbs. gain:			
Soybean oil meal	60.1	56.5	58.4
Ground milo grain	795.3	725.4	772.5
Prairie hay	266.3	270.3	295.7
Limestone	3.9	3.6	3.7
Feed cost per 100 lbs. gain[1]	$24.64	$23.04	$24.54
	1	2	3
% shrink to market	3.94	2.68	3.54
Dressing % (hot wt.)	61.29	59.98	60.86
Dressing % (chilled wt.)	60.44	59.17	60.12

Table 30 (Continued).

Actual 48-hr. cooler shrink, lbs. ..	90.00		88.00		82.00	
% 48-hr. cooler shrink	1.38		1.34		1.22	
Carcass grade before and after ribbing:[2]	before	after	before	after	before	after
Low choice		1		1	2	
Top good	4	3	1	1	2	
Av. good	5	3	7	2	5	5
Low good	1	3	2	5	1	5
Top commercial				1		
Degree of marbling:						
Moderate		3		1		1
Modest				1		
Small amount		5		2		4
Slight amount		2		5		5
Traces				1		
Av. size rib-eye, sq. in.	11.22		10.64		11.11	
Av. fat thickness, cm.	1.64		1.79		1.82	
Av. firmness[3]	3.8		4.3		3.8	
Av. % moisture in rib-eye	72.61		73.10		72.88	
Av. % moisture in fat	7.49		7.61		7.74	
Av. press fluid in rib-eye, ml./25 gm.	7.42		8.46		8.57	

1. Soybean oil meal @ $70.00 per T., ground milo @ $2.50 per cwt., prairie hay @ $20.00 per T., stilbestrol @ .6c per head daily.

2. Carcass data obtained through courtesy of L. P. Stream, district supervisor, USDA Grading Service, Kansas City, Mo.

3. Based on very firm, 1; firm, 2; moderately firm, 3; modestly firm, 4; slightly soft, 5; soft, 6.

Table 31

Average Results of Cooking Rib Roasts from Steers Fed Rations with and without Stilbestrol.

	Control	10 mg. stilbestrol per head daily for wintering and fattening phase	10 mg. stilbestrol per head daily for 361 days
Number of roasts	10	10	10
% total loss	22.2	22.4	21.2
% volatile loss	17.0	17.0	16.4
% drip loss	5.2	5.5	4.8
Cooking time, min. per lb.	37.1	37.5	36.5
Internal temperature, from oven	158 °F.	158 °F.	158 °F.
Internal temperature, maximum	162 °F.	162 °F.	162 °F.
Palatability scores:[1]			
Aroma	9.0	9.0	9.1
Flavor, lean	8.6	8.9	9.0
Flavor, fat	8.4	8.3	8.5
Tenderness	8.3	8.4	8.5
Juiciness	7.8	8.4	8.4
Shear value, lbs.[2]	17.2	18.1	16.3
Press fluid yields, ml./25 gm.:[2]			
Total	7.1	7.8	7.9
Serum	6.3	7.0	6.8
Fat	.8	.9	1.1

1. The higher the figure, the more desirable the score (10 = maximum).
2. Values obtained from rib-eye.

Table 32

Results with and without Stilbestrol in the Wintering and Fattening Ration of Heifer Calves.

Wintering Phase, November 16, 1954, to April 5, 1955—140 days.

Lot	1	2[1]
Number heifers per lot	5	5
Av. initial wt., lbs.	336	338
Av. final wt., lbs.	577	592
Av. total gain, lbs.	241	254
Av. daily gain, lbs.	1.72	1.82
Av. daily ration, lbs.:		
Soybean oil meal	1.00	1.00
Ground milo grain	4.00	4.00
Atlas sorghum silage	22.57	22.54
Salt	.13	.11
Mineral (½ bonemeal, ½ salt)	.18	.18
Lbs. feed per 100 lbs. gain:		
Soybean oil meal	58.09	55.03
Ground milo grain	232.37	220.13
Atlas sorghum silage	1311.2	1240.17
Salt	7.72	5.90
Mineral (½ bonemeal, ½ salt)	10.79	10.22
Feed cost per 100 lbs. gain	$13.63	$13.33

Fattening Phase, April 5, 1955, to September 20, 1955—169 days.

Av. initial wt., lbs.	577	592
Av. final wt., lbs.	919	955
Av. total gain, lbs.	342	363
Av. daily gain, lbs.	2.02	2.15
Av. daily ration, lbs.:		
Soybean oil meal	1.00	1.00
Ground milo grain	15.74	16.44
Alfalfa hay	1.78	1.78
Prairie hay	3.26	3.59
Lbs. feed per 100 lbs. gain:		
Soybean oil meal	49.1	46.3
Ground milo grain	778.1	765.3
Alfalfa hay	87.7	82.6
Prairie hay	161.4	167.2
Feed cost per 100 lbs. gain[2]	23.88	23.78
% shrink to market	4.46	5.34
Dressing % (hot wt.)	61.18	59.87
Dressing % (chilled wt.)	59.93	58.72
Actual 48-hr. cooler shrink (lbs.)	55.0	52.0
% 48-hr. cooler shrink	2.05	1.92

Carcass grade:	1 before ribbing	1 after ribbing	2 before ribbing	2 after ribbing
Low prime				1
Top choice			1	
Av. choice	2	3		
Low choice	2	2	1	
Top good	1		3	1
Av. good				1
Low good				2
Degree of marbling:				
Slightly abundant			1	
Moderate				
Modest	4			
Small	1			
Slight			3	
Traces			1	

1. Received 10 milligrams stilbestrol per head daily.

2. Soybean oil meal, $70 per T.; milo grain, $2.50 per cwt.; alfalfa hay, $25 per T.; prairie hay, $20 per T.; stilbestrol @ .7c per head daily.

Table 32 (Continued).

Av. size rib-eye, sq. in.	11.52	10.92
Av. fat thickness, cm.	1.55	1.79
Av. firmness[3]	2.8	3.6
Av. % moisture in rib-eye	73.43	73.10
Av. press fluid in rib-eye, ml./25 gm.	5.68	7.12
Av. % moisture in fat	8.02	7.27

3. Based on very firm, 1; firm, 2; moderately firm, 3; modestly firm, 4; slightly soft, 5; soft, 6.

Table 33

Average Results of Cooking Rib Roasts from Heifers Fed Rations with and without Stilbestrol.

	Control	10 mg. stilbestrol per head daily for 309 days
Number of roasts	5	5
% total loss	22.1	20.6
% volatile loss	16.8	15.0
% drip loss	5.3	5.6
Cooking time, min. per lb.	40.0	38.1
Internal temperature, from oven	158 °F.	158 °F.
Internal temperature, maximum	162 °F.	162 °F.
Palatability scores:[1]		
Aroma	9.1	8.9
Flavor, lean	8.2	8.9
Flavor, fat	8.3	8.6
Tenderness	8.3	8.5
Juiciness	8.1	8.4
Shear values, lbs.[2]	17.9	18.0
Press fluid yields, ml./25 gm.:[2]		
Total	7.8	9.1
Serum	6.3	7.6
Fat	1.5	1.5

1. The higher the figure, the more desirable the score (10 = maximum).
2. Values obtained from rib-eye.

The Value of Stilbestrol in Beef Cattle Rations.

PROJECT 370

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

This is the second test in an experiment to determine the value of stilbestrol in the deferred cattle-feeding program. This report gives information on the wintering phase of this test.

Experimental Procedure

Twenty-seven Hereford steer calves were divided as equally as possible into three lots of 9 animals each. One lot received stilbestrol at the rate of 5 milligrams per head daily for the first 56 days. The rate was increased to 10 milligrams per head daily for the remainder of the test. Previous work indicated a lower level for young calves might be more desirable during the first part of the feeding period. The other two lots served as controls. Due to lack of pen space, they were fed together. All animals will graze bromegrass pasture without stilbestrol this summer. After returning to the feed lot, all animals except one control lot will receive stilbestrol in the fattening ration.

Results

The results of this test are shown in Table 34.

Observations

1. Rate and efficiency of gain were higher for animals fed stilbestrol.
2. Marked differences in high tailheads and weak loins were not ob-

served. This test and previous work indicate that a low level (5 mg. per head daily) of stilbestrol may be more desirable than a higher level (10 mg. per head daily) when fed to steer calves.

Table 34

Results with and without Stilbestrol in the Wintering Ration of Beef Steer Calves.

November 30, 1955, to April 17, 1956—129 days.

Lot number	5[1]	17A	17B
Number steers per lot	9	9	9
Av. initial wt., lbs.	397	402	397
Av. final wt., lbs.	645	622	607
Av. total gain, lbs.	248	220	210
Av. daily gain, lbs.	1.92	1.70	1.63
Av. daily ration, lbs.:			
Soybean oil meal	1.0	1.0	1.0
Ground milo	3.9	3.9	3.9
Atlas sorgo silage	30.1	29.7	29.7
Mineral (bonemeal and salt)	.08	.03	.03
Salt	.08	.04	.04
Lbs. feed per 100 lbs. gain:			
Soybean oil meal	52.0	58.6	61.4
Ground milo	203.2	229.1	240.0
Atlas sorgo silage	1563.7	1741.3	1824.2
Mineral (bonemeal and salt)	4.3	1.8	1.9
Salt	4.3	2.3	2.4
Feed cost per 100 lbs. gain,[2] $	12.48	12.98	13.81

1. Received 5 milligrams of stilbestrol per head daily for first 56 days and 10 milligrams per head daily thereafter.
2. Stilbestrol cost figured at .06 cent per milligram.

The Effect of Spaying and Feeding of Stilbestrol[1] on the Performance of Heifer Calves on Wintering (High Roughage) Rations, 1955-56.

PROJECT 370

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

Spaying is the act of removing the ovaries, which are the primary source of the estrogenic hormones. Stilbestrol is a synthetic compound resembling these estrogenic hormones in its physiological action. Experimental evidence indicates that spaying lowers the rate of gain, whereas stilbestrol has been successfully used in increasing rate of gain in fattening yearling steers. This test is a study of the effect of: 1. spaying, 2. spaying plus stilbestrol, 3. nonspaying, and 4. nonspaying plus stilbestrol, on the performance of heifer calves on a high roughage ration.

Experimental Procedure

Forty good-quality Hereford heifer calves from the Williams Ranches near Lovington, N. M., were used in the test. They were divided into four lots of 10 heifers each on the basis of weight and quality. The heifers were started on test November 16, 1955. November 17 two lots were spayed. The four lots of heifers were fed the same feeds: 3.8 pounds of ground milo grain and 1 pound of soybean oil meal per head daily, all of the sorghum silage they would eat, and free access to bonemeal and salt. About 6 pounds of alfalfa hay was fed per head daily during the last 17 days of the test.

1. The stilbestrol was furnished by the Eli Lilly Company, Indianapolis, Ind., as Stilbosol (a diethylstilbestrol premix).

The experimental treatment for each lot was as follows:

Lot 7—Spayed.

Lot 8—Spayed plus 5 mg. of stilbestrol per head daily the first 56 days, and 10 mg. per head daily during the remainder of the test.

Lot 9—Nonspayed (control lot).

Lot 10—Nonspayed plus 5 mg. of stilbestrol per head daily during the first 56 days of the test and 10 mg. per head daily during the remainder of the test.

The stilbestrol was fed mixed with the soybean oil meal.

Observations

1. Spaying depressed the rate of gain (compare Lots 7 and 9). Apparently the spaying operation itself did not seriously retard the heifers, as may be seen in the table showing the gain of the spayed and nonspayed heifers by periods. The nonspayed heifers made their greatest increase in gain over the spayed heifers during the latter part of the feeding trial. The spayed heifers were least efficient in converting feed to weight gains.

2. Stilbestrol increased the daily gain on spayed heifers by .17 pound (see Lots 7 and 8). However, the spayed heifers fed stilbestrol, Lot 8, did not perform so well as the nonspayed control group, Lot 9.

3. Stilbestrol did not increase the gain of nonspayed heifers.

4. Stilbestrol did not seem to have any harmful effects except that one heifer in Lot 10 had a slightly protruding vagina, but she appears to have recovered with no treatment.

Table 35

The Effect of Spaying and Feeding of Stilbestrol on the Performance of Heifer Calves on Wintering Rations.

November 16, 1955, to April 7, 1956—143 days.

Treatment	Spayed	Spayed[1] plus stilbestrol	Nonspayed	Nonspayed[1] plus stilbestrol
Lot number	7	8	9	10
Number heifers per lot	10	10	10	10
Initial wt. per heifer, lbs.	366	365	364	365
Final wt. per heifer, lbs.	574	597	613	613
Gain per heifer, lbs.	208	232	249	248
Daily gain per heifer, lbs.	1.45	1.62	1.74	1.73
Daily ration per heifer, lbs.:				
Ground milo grain	3.81	3.81	3.81	3.81
Soybean oil meal	1.02	1.02	1.02	1.02
Sorghum silage	25.54	25.29	24.86	25.10
Alfalfa hay[2]	.82	.81	.82	.81
Mineral (bonemeal and salt)	.07	.08	.05	.06
Salt	.07	.06	.05	.07
Lbs. feed required per 100 lbs. gain:				
Ground milo grain	262	235	219	220
Soybean oil meal	70	63	59	59
Sorghum silage	1756	1559	1428	1448
Alfalfa hay	56	51	47	47
Mineral (bonemeal and salt)	5	3	3	4
Salt	5	5	3	4
Feed cost per 100 lbs. gain[3]	15.48	13.55	12.44	12.85

1. Five mg. of stilbestrol was fed the first 56 days of the test and 10 mg. thereafter.

2. Alfalfa hay was fed only the last 17 days of the test at the rate of about 6 pounds per head daily.

3. Feed prices may be found inside the back cover; .8 cent per head per day was charged for 10 mg. of stilbestrol.

Table 36

Daily Gain per Heifer by Periods, Chronologically, for Spayed and Nonspayed Heifers.

	Spayed lbs. per day	Nonspayed lbs. per day
Lot number	7	9
1 (14 days)	1.21	1.43
2 (28 days)	1.64	1.64
3 (28 days)	1.89	1.86
4 (29 days)	1.51	2.27
5 (28 days)	.86	.96
6 (16 days)	1.56	2.37
143-day average	1.45	1.73

The Value of Stilbestrol in the Fattening Ration of Beef Steers.

PROJECT A-550[1]

D. Richardson, D. L. Mackintosh, J. D. Wheat, C. S. Menzies, and R. F. Cox

The addition of stilbestrol to a high-energy fattening ration has consistently demonstrated its ability to increase rate of gain with older or heavier feeder cattle. At the time this test was initiated, there was considerable confusion as to the effect of stilbestrol upon carcass quality. This cooperative test with large numbers of cattle was conducted to obtain further information on rate and efficiency of gain and the effect upon carcass quality.

Experimental Procedure

Two hundred twenty-five head of good- to choice-quality feeder steers were selected from a group of more than 300. These steers had been assembled at the feed yard and had been on feed two to four weeks before the test began. After 225 steers were selected they were divided into three lots of 75 each by gate cut. Inspection of the lots indicated that they had been divided about as equally as possible. They were weighed and allotted to each treatment at random.

Lot 4 received 10 mg. of stilbestrol per head daily throughout the test. Lot 5 served as the control. Lot 6 was fed 10 mg. of stilbestrol per head daily for the first 56 days only. At the time, many thought that stilbestrol-fed cattle were being discriminated against. Some thought that stilbestrol could be fed for the first part of the feeding period, receive the benefits, and yet show no effects at market time. Therefore, Lot 6 was used to test this theory.

All lots were fed and managed the same except for the addition of stilbestrol. At the end of the feeding period, the cattle were trucked to Oklahoma City for slaughter at the plant of Armour and company. Carcass data, including shrinkage, were obtained on individual animals. (Note—one animal was removed from Lot 5 because of kidney infection; two died in Lot 6 because of urinary calculi and foamy bloat. Weights and feed of these were removed from the results.)

Results

A summary of the results is shown in Table 37.

Observations

1. The addition of stilbestrol to the fattening ration of large steers produced a marked increase in rate and economy of gain. There was no advantage in removing stilbestrol after the first 56 days in this test. Evidence indicates that it is doubtful that the removal of stil-

1. This was a cooperative project. Armour and company supplied the cattle, Eli Lilly and company the stilbestrol premix, and the cattle were fed by Brookover Feedyards Co.

bestrol from the feed during normal-length fattening periods would be beneficial.

2. Stilbestrol did not produce high tailheads, weak loins, or other undesirable effects in this experiment.

3. Shrink to market was greater with animals fed stilbestrol throughout the test; however, it was lower for those fed stilbestrol only 56 days.

4. There were no differences in dressing percentages; however, animals fed stilbestrol showed a greater 48-hour cooler shrink.

5. Liver weights were greater for animals fed stilbestrol.

6. There were no significant differences in carcass grade, degree of marbling, size of rib-eye, fat thickness over the 12th rib, color and degree of firmness; however, it was observed that there was a tendency for greater "leakage" or oozing of fluid in carcasses when ribbed from animals fed stilbestrol.

Table 37

Results with and without Stilbestrol in Fattening Ration of Beef Steers.

June 2, 1955, to September 10, 1955—100 days.

	10 milligrams stilbestrol	Control	10 milligrams stilbestrol fed 56 days and discontinued
Lot	4	5	6
Number steers per lot	75	74	73
Total starting weight, lbs.	61985	61256	59038
Av. starting weight, lbs.	826.5	827.8	808.7
Total final weight (Garden City), lbs.	84265	80705	79260
Av. final weight, lbs.	1123.5	1090.61	1085.73
Total gain, lbs.	22280	19449	20222
Av. gain per steer, lbs.	297.06	262.82	277.01
Days on experiment	100	100	100
Av. daily gain, lbs.	2.97	2.63	2.77
Total final weight (Ok. City), lbs.	79450	76570	75450
Av. final weight (Ok. City), lbs.	1059.3	1034.7	1033.5
Total lbs. shrink to market	4815	4135	3810
Av. lbs. shrink to market	64.20	55.87	52.19
% shrink to market	5.71	5.12	4.81
Total hot dressed wt., lbs.	51455	49515	48616
Av. hot weight, lbs.	686.06	669.12	665.97
Dressing % (hot wt.)	64.76	64.67	64.43
Total 48-hr. chilled wt., lbs.	50327	48468	47575
Av. 48-hr. chilled wt., lbs.	671.02	654.97	651.71
Dressing % (chilled wt.)	63.34	63.30	63.06
Total 48-hr. shrink, lbs.	1128	1047	1041
Av. 48-hr. shrink, lbs.	15.04	14.15	14.26
% 48-hr. cooler shrink	2.19	2.11	2.14
48-hr. diff. in shrink (based on control), lbs.	+.89		+.11
Av. liver weight, lbs.	16.83	15.57	16.24
Av. carcass grade before ribbing[1]	13.60	13.89	14.36
Av. carcass grade after ribbing[2]	13.63	14.00	14.08
Number carcasses upgraded	26	20	27
Number carcasses downgraded	28	20	21
Av. fat thickness over 12th rib, cm.	1.59	1.67	1.59
Av. degree of marbling[3]	6.15	6.38	6.40
Av. size of rib-eye, sq. in.	11.66	11.64	11.53

Table 37 (Continued).

Av. color	A 4.12	A 4.34	A 4.23
Av. firmness[4]	4.08	4.04	4.07
U.S. grades:			
Choice	33	29	29
Good	40	44	42
Commercial	2	1	2
Av. daily ration, lbs.:			
Alfalfa hay	1.45	1.41	1.42
Sorghum silage	4.47	4.48	4.40
Cottonseed meal	0.95	0.95	0.97
Milo grain	18.71	19.00	18.14
Molasses feed	1.97	1.98	1.98
Alfalfa pellets	.41	.42	.41
Molasses	.55	.63	.81
Stilbestrol feed	1.04		.62
Lbs. feed per 100 lbs. gain:			
Alfalfa hay	48.7	53.4	51.1
Sorghum silage	150.5	170.5	158.8
Cottonseed meal	32.0	36.2	34.9
Milo grain	629.7	723.1	654.9
Molasses feed	66.2	75.4	71.4
Alfalfa pellets	13.9	16.1	14.6
Molasses	18.5	24.0	29.1
Stilbestrol feed	34.8		22.2
Total feed	994.3	1098.7	1037.0
Feed cost per 100 lbs. gain[5]	$20.23	$22.02	$20.92

1. Carcass data obtained through courtesy of Raymond A. Fowler, district supervisor, USDA Grading Service, Oklahoma City.

2. Carcass grade based on top choice, 8; av. choice, 10; low choice, 12; top good, 14; or good, 16; low good, 18; top commercial, 20.

3. Based on moderately abundant, 3; slightly abundant, 4; moderate, 5; modest, 6; small amount, 7; slight amount, 8; traces, 9.

4. Based on very firm, 1; firm, 2; moderately firm, 3; modestly firm, 4; slightly soft, 5; soft, 6.

5. Based upon following prices: Alfalfa hay, $25 per T.; sorghum silage, $9 per T.; cottonseed meal, $68 per T.; milo grain, $2.35 cwt.; molasses feed, $2.10 cwt.; alfalfa pellets, $2.15 cwt.; molasses, $1.80 cwt.; and stilbestrol feed, $2.95 cwt.

General Observations on Feeding Stilbestrol to Beef Cattle.

By Animal Husbandry Staff

There are obviously many factors that influence the response obtained from feeding stilbestrol to beef cattle. A survey of the results indicates some variations; however, the following general observations seem appropriate at this time:

1. **Age**—Rate of gain and feed efficiency seem to be greater with older animals than with animals about 1 year or less in age. One finds it more difficult to improve the natural gaining ability of young animals that are being properly fed.

2. **Weight**—Since weight usually expresses maturity, it is an important factor. Heavier animals, assuming they are not already fleshy, usually give a greater response.

3. **Sex**—The rate of gain is usually increased with heifers; however, the amount and consistency of gains seem to be greater with steers. Preliminary results indicate little difference between open and spayed heifers.

4. **Estrogenic content of feed**—Natural estrogens or hormonelike substances are found in our natural feedstuffs. The amount appears not only to vary from one kind of feedstuff to another but also within the same kind of feedstuff. This fact played an important role in the development of feeding stilbestrol and other hormonelike substances.

It is also highly probable that this fact largely explains differences obtained in feeding stilbestrol.

5. **Kind of ration**—It is obvious that the greatest response is obtained with a high-energy, fattening-type ration. There is a tendency for greater gains on a wintering ration, but it is extremely doubtful that this is a good practice.

6. **On pasture**—Both good and adverse results have been reported. This certainly appears to be a doubtful practice in a strictly grazing program. It may have possibilities where cattle are being fed a fattening ration on grass.

7. **Length of feeding period**—There seems to be no benefit from feeding stilbestrol over a longer time than normal fattening periods. In fact, most results indicate that more benefit is obtained in 50 to 60 days after the animals are on feed than at any other time. One might reason that the body adjusts itself to the intake of this hormonelike substance. It is not desirable to remove stilbestrol from the feed during the fattening period.

8. **Digestion**—Available data indicate that stilbestrol has no beneficial effect upon digestion but may cause increased nitrogen retention. Therefore, it is logical to assume that other factor(s) is (are) responsible for the increased rate and efficiency of gain.

9. **Shrink** (a) **To market**—Data on this subject do not agree; more information would be helpful. There seems to be a tendency for greater shrink with animals fed stilbestrol; however, it should be recognized that differences, if any, are small. (b) **Cooler shrink**—Here again the differences are small; however, there is a slight tendency for carcasses of animals fed stilbestrol to shrink slightly more in the cooler.

10. **Carcass quality**—It is apparent that feeding stilbestrol to older, heavier cattle in the fattening ration, as approved, has little effect upon carcass quality. If it has any effect on the carcass, it tends to lower the grade. This seems to be more nearly true with younger cattle and those fed stilbestrol over unusually long periods. If the grade is affected, it seems to be brought about by less marbling and more free fluid in the meat.

11. **Side effects**—High tailheads, weakened loins, increased teat length, and other minor effects have been observed. Under proper feeding conditions as approved these are of no practical significance.

12. **Cooking**—Cooking data do not reveal any significant differences in cooked roasts from animals fed stilbestrol compared with animals that did not receive stilbestrol.

13. **Rate of gain and cost**—Results indicate that the only economically desirable place to feed stilbestrol is in the fattening ration of older animals. Increasing rate of gain more than 0.15 pound per day and increased feed efficiency should result in a profit to the feeder.

14. **Residue in meat and gastro-intestinal tract**—Present means of testing indicate that there is no residue of stilbestrol in the meat or gastro-intestinal tract.

15. **Swine in feed lot with cattle**—Results to date indicate that breeding, gestation, and farrowing of swine are not affected by following beef cattle receiving stilbestrol in the feed lot.

16. **Effect upon breeding animals**—Animals to be used for breeding purposes should not receive stilbestrol.

Sources of Phosphorus for Wintering Beef Heifer Calves in Dry Lot.

PROJECT 536[1]

D. Richardson, E. F. Smith, C. S. Menzies, and R. F. Cox

In a previous test, it was found that phosphoric acid could be used as a source of phosphorus for beef heifers on dry bluestem pasture.

1. This project was in cooperation with Westvaco Mineral Products Division, Food Machinery and Chemical Corporation, New York 17, N.Y.

2. Ground corn cobs used in this test were supplied by John Clay, John Clay Sales Company, Kansas City, Mo.

A phosphorus balance study with lambs also indicated efficient utilization of phosphorus from phosphoric acid. This test was conducted to further evaluate phosphoric acid as a source of phosphorus in the wintering ration of beef calves in dry lot.

Experimental Procedure

Seventy-four Hereford heifer calves were divided into five lots as equally as possible on the basis of weight and type. Lot 12, which served as the control lot, contained 10 animals and the others 16 animals each.

The control ration consisted of ¾ pound of soybean oil meal, ½ pound of dehydrated alfalfa meal, 2 pounds of dehydrated ammoniated hydrol product (Dex-Mo-Lass made with ammoniated hydrol), and all of a corncob-blackstrap molasses mixture that the animals would clean up each day. The corncob-molasses mixture contained approximately 22 percent molasses for the first 84 days. It was then increased to 40-45 percent molasses. When the molasses concentration was increased, 1½ percent each of ground limestone and salt was added to retard "setting up" of the mixture. The limestone was decreased to ¾ of 1 percent after about 30 days. The soybean oil meal and dehydrated alfalfa meal were made into pellets containing approximately 10 percent molasses. The added phosphorus was put in these pellets in the form of phosphoric acid or steamed bonemeal. A mixture of ground limestone and salt and salt alone were available to all animals free choice.

The control ration supplied approximately 6 grams of phosphorus per head per day. This is one-half of the National Research Council recommendation of 12 grams per head per day. Source and amount of phosphorus in the ration was the only variation. The treatments were as follows, which indicate the amount of added phosphorus per head per day:

Lot 12—Control ration.

Lot 13—Control ration + 3 grams phosphorus from phosphoric acid.

Lot 14—Control ration + 6 grams phosphorus from phosphoric acid.

Lot 15—Control ration + 3 grams phosphorus from steamed bonemeal.

Lot 16—Control ration + 6 grams phosphorus from steamed bonemeal.

Blood samples will be taken at the end of the experiment to determine serum phosphorus and calcium levels.

Results and Discussion

The feed-lot results are presented in Table 38. The reader should recognize that the experimental ration used in this test was designed to contain a low amount of phosphorus. Therefore, the roughage and source of energy had to be from ingredients low in phosphorus. There was considerable variation from time to time in consumption of the corncob-molasses mixture; however, no difficulty was experienced in keeping the animals on feed. After increasing the percentage of molasses, the animals were getting approximately 1 pound of molasses per 100 pounds body weight. Trouble with scouring was observed when the consumption of molasses exceeded this amount.

Observations

1. No harmful or ill effects of any kind were observed from feeding phosphoric acid as a source of phosphorus.
2. No deficiency symptoms, phosphorus, vitamin A, etc,. were observed. Animals in all lots gnawed on the fence; however, there were no differences among lots.
3. Feed containing phosphoric acid was highly palatable and the total consumption tended to be greater.
4. Rate of gain and feed efficiency increased as the level of phosphorus was increased. There was no difference between steamed bone-

meal and phosphoric acid as a source of phosphorus at the higher level; however, phosphoric acid tended to be more efficient at the lower level.

Table 38

Sources of Phosphorus for Beef Heifer Calves.

November 9, 1955, to April 11, 1956—154 days.

Lot number	12	13	14	15	16
Added phosphorus	None	3 gm. from phos. acid	6 gm. from phos. acid	3 gm. from steamed bonemeal	6 gm. from steamed bonemeal
Number heifers per lot	10	16	16	16	16[1]
Av. initial wt., lbs.	441	442	440	441	442
Av. final wt., lbs.	603	612	623	606	624
Av. total gain, lbs.	162	170	183	165	182
Av. daily gain, lbs.	1.05	1.11	1.18	1.07	1.18
Av. daily ration, lbs.:					
Corncob-molasses mixture	9.02	10.37	10.03	9.87	9.80
Soybean oil meal-dehydrated alfalfa pellets	1.30	1.30	1.30	1.30	1.30
Dehydrated am. hydrol product	2.00	2.00	2.00	2.00	2.00
Limestone and salt	.03	.02	.02	.02	.02
Salt	.05	.04	.02	.04	.03
Lbs. feed per 100 lbs. gain:					
Corncob-molasses mixture	857.7	939.8	844.1	921.0	828.8
Soybean oil meal-dehydrated alfalfa pellets	123.5	118.8	110.4	122.4	111.0
Dehydrated am. hydrol product	190.1	181.2	168.3	186.7	169.2
Limestone and salt	2.6	1.8	1.7	1.9	1.4
Salt	5.1	3.8	1.7	3.7	2.6

1. Data on 15 animals, one sick animal removed.

The Value of Ammoniated Hydrol in Beef Cattle Wintering Rations, 1955-56.

PROJECT 537[1]

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

This is the second test in an experiment to determine the value of ammoniated hydrol (corn molasses) in the wintering ration of beef heifer calves.

Experimental Procedure

Thirty Hereford heifer calves averaging about 400 pounds each were divided as equally as possible into three lots of 10 animals each. All lots received all the sorghum silage they would clean up each day. A mineral mixture of equal parts steamed bonemeal and salt and salt alone were fed free choice. Other ingredients, which varied in the different rations, were as follows:

Lot 1—Control, 1 pound soybean oil meal + 3 pounds milo grain.

Lot 2—Two pounds dehydrated ammoniated hydrol product + 2 pounds milo grain.

Lot 3—0.6 pound soybean oil meal, 2 pounds liquid ammoniated hydrol, and 1.9 pounds milo grain.

All rations were calculated to contain approximately the same amount of protein equivalent and total digestible nutrients. The liquid ammoniated hydrol contained 14.4 percent protein equivalent and the dehydrated ammoniated hydrol product contained 21.2 percent protein

1. This project was partially supported by Clinton Foods, Inc., Clinton, Iowa.

equivalent. The dehydrated product is similar to Dex-Mo-Lass except that ammoniated hydrol was used instead of plain hydrol to dry on corn oil meal and corn gluten meal. Soybean oil meal was not used in Lot 2.

Results

Results of this test are shown in Table 39.

Observations

1. Rate and efficiency of gain were essentially the same in Lots 1 and 3. This indicates that liquid ammoniated hydrol can satisfactorily replace part of soybean oil meal in cattle rations.

2. Animals in Lot 2 made satisfactory gains; however, they were not so great or efficient as those of the other lots. This indicates that a product of this kind can be used alone; however, better results probably would be obtained when used with an ingredient such as soybean oil meal.

3. After being on feed about 60 days, animals in Lot 3 seemed to show greater watery discharge from the eyes than did the others. This cleared up in 30 to 40 days. No other harmful or ill effects or unusual behavior were observed.

Table 39

Results of Feeding Ammoniated Hydrol in the Wintering Ration of Beef Heifer Calves.

November 9, 1955, to April 11, 1956—154 days.

Lot number	1	2	3
Number heifers per lot	10	10	10
Av. initial wt., lbs.	400	399	398
Av. final wt., lbs.	656	609	645
Av. gain per heifer, lbs.	256	210	247
Av. daily gain per heifer, lbs.	1.66	1.36	1.60
Av. daily ration, lbs.:			
Sorghum silage	30.9	28.0	28.8
Soybean oil meal	1.0		0.6
Milo grain	2.9	1.9	1.8
Dehydrated am. hydrol product		2.0	
Liquid ammoniated hydrol			2.0
Mineral (bonemeal and salt)	.06	.05	.07
Salt	.09	.05	.09
Lbs. feed per 100 lbs. gain:			
Sorghum silage	1858.4	2053.6	1796.6
Soybean oil meal	60.2		37.4
Milo grain	172.7	137.1	110.4
Dehydrated am. hydrol product		146.7	
Liquid ammoniated hydrol			124.7
Mineral (bonemeal and salt)	3.6	3.9	4.3
Salt	5.6	3.9	5.6

The Use of Live-Yeast Suspensions in Beef Cattle Rations.

PROJECT 370

D. Richardson, F. H. Baker, J. O. Harris, E. F. Smith, R. F. Cox, and O. M. Bowman

The rumen, or paunch, of cattle and sheep normally contains innumerable microorganisms. It has long been recognized that these microscopic organisms help break down complex carbohydrates such as fiber and help synthesize nutrients for the host animal. The efficiency of utilization of rations fed to cattle and sheep is largely determined by the proper balance of these microorganisms in the rumen and a supply of certain basic nutrients such as protein, minerals, and readily available energy.

Two strains of live yeast were used as an additive in this experiment to study (1) their value in wintering and fattening rations of steer calves (2) their effect upon digestion and (3) any carryover effect from wintering to grazing.

Experimental Procedure

Thirty choice-quality Hereford steer calves were divided as equally as possible into three lots of 10 animals each. The feeding and management were the same for all lots throughout the wintering (168 days), grazing (89 days), and fattening (103 days) phases except for the addition of the yeast. Roughages used were Atlas sorghum silage in the wintering phase and prairie hay in the fattening phase. Soybean oil meal and milo grain were used as the concentrates. Grazing consisted of native bluestem pasture.

The two live-yeast strains used in this experiment were **Torula utilis** and **Saccharomyces cerevisiae.** The suspensions were prepared weekly by the bacteriology department and stored under refrigeration until used. They were prepared by adding 1 pound of peeled potatoes to a liter of water which was steamed for one hour, and then filtering through cheesecloth. Two percent sucrose was added to the filtrate which was then sterilized by autoclaving. The cells were then grown 48 hours in this potato-sucrose broth on a shaking machine at 30 degrees Centigrade. After growth of the cells, concentrations were adjusted by photoelectric turbidity measurements to give 3 billion cells per steer per day. The cells were not washed, but were diluted with sterile water to adjust the count to the desired level.

The yeast suspensions were mixed with approximately ½ pint of water and sprinkled over the feed. This was done each morning.

The digestion study was conducted with 11 yearling Hereford steers that averaged approximately 700 pounds. The ration consisted of 1 part chopped alfalfa hay to 3 parts ground milo grain. The yeast suspensions were added to the ration of each individual steer daily. Yeast cell counts were made to determine the number present in the feces. Fecal samples were obtained on the last day of the collection period during the digestion study. The counts were obtained by diluting 10 grams of moist feces in sterile water blanks and plating after making appropriate dilutions.

Results

A summary of the experiment, including the wintering, grazing, and fattening phases, is shown in Table 40. The results of the digestion study with 11 yearling steers on a fattening-type ration are shown in Table 39. Yeast cells per milliliter of feces are shown in Table 42.

Observations

Live yeast suspensions of **Torula utilis** and **Saccharomyces cerevisiae** were fed to beef steers in the feed lot and in digestion studies at the rate of approximately 3 billion cells per head per day. The following observations were made under the conditions of this experiment:

1. Rate of gain and feed efficiency were essentially the same for the wintering phase.
2. There was some but not a great difference in the rate of gain during the grazing phase. Animals that had been fed yeast did not gain quite so well as those that did not receive yeast.
3. Animals receiving **Torula utilis** did not gain so well in the fattening phase as the others. They also showed a decreased feed efficiency.
4. Fecal counts showed the presence of yeast in feces of beef cattle; however, the number of yeast cells was increased by feeding live yeast suspensions.
5. A more pungent fecal odor was observed among the steers fed yeast during the digestion study. It was not so great in the feed-lot tests.
6. Animals fed **Torula utilis** did not show the bloom and general appearance normally exhibited by animals in feed lots. There was a certain amount of scurfy or scaly condition of the skin, somewhat like

dandruff in the hair. A small amount of this was present in the animals fed **Saccharomyces cerevisiae** but none in the control animals.

7. No difference was observed in the quantity of grain in the feces of steers fed yeast and the control steers.

8. The addition of yeast did not improve the digestibility of the ration.

9. Under the conditions of this experiment, the addition of live yeast suspensions to beef cattle rations is not desirable.

Table 40

Feeding Live Yeast Cultures to Steer Calves.

Phase 1, Wintering, November 16, 1954, to May 3, 1955—168 days.

Lot number	1	2	3
Experimental treatment	Control	Torula utilis yeast	Saccharomyces cerevisiae yeast
Number steers in lot	10	10	10
Initial wt. per steer, lbs.	456	454	456
Final wt. per steer, lbs.	750	763	758
Gain per steer, lbs.	304	309	302
Daily gain per steer, lbs.	1.81	1.84	1.80
Lbs. daily ration per steer:			
Soybean meal	1.00	1.00	1.00
Ground milo	4.00	4.00	4.00
Atlas sorgo silage	29.04	28.93	29.04
Salt	.11	.10	.12
Mineral	.10	.10	.10
Lbs. feed per cwt. gain:			
Soybean meal	54.45	54.24	54.52
Milo	217.81	216.97	218.07
Atlas sorgo silage	1581.09	1569.15	1582.94
Salt	5.72	5.58	6.31
Mineral	5.60	5.66	5.69
Feed cost per cwt. gain, $	13.99	13.93	14.02
Feed cost per steer, $	42.53	43.04	42.34
Phase 2, Grazing, May 3 to August 1, 1955—89 days.			
Initial wt. per steer, lbs.	760	763	758
Final wt. per steer, lbs.	845	838	828
Gain per steer, lbs.	85	75	70
Daily gain per steer, lbs.	0.96	0.84	0.79
Phase 3, Full Feeding, August 1 to November 12, 1955—103 days. (All self-fed grain in dry lot)			
Initial wt. per steer, lbs.	845	838	828
Final wt. per steer, lbs.	1103	1073	1093
Gain per steer, lbs.	258	235	265
Daily gain per steer, lbs.	2.49	2.28	2.57
Daily ration per steer, lbs.:			
Soybean meal	1.51	1.51	1.51
Milo	19.73	18.28	19.22
Prairie hay	6.61	6.70	6.83
Limestone	.10	.10	.10
Lbs. feed per cwt. gain:			
Soybean meal	60.1	66.85	59.28
Milo	795.3	801.23	747.16
Prairie hay	266.3	293.82	265.47
Limestone	3.9	4.29	3.81
Feed cost per cwt. gain, $	23.48	24.15	22.32
Feed cost per steer (fattening phase), $	60.58	56.75	59.16
Total gain per steer (all phases), lbs.	647	619	637

Table 40 (Continued).

Daily gain per steer (all phases), lbs.	1.79	1.71	1.76
Feed cost per cwt. gain (all phases), $	17.99	18.71	18.45
Total feed cost per steer, $	119.11	115.79	117.50
Initial steer cost at $22.50 per cwt., $	102.60	102.15	102.60
Feed cost + steer cost, $	221.71	217.94	220.10
Selling price per cwt. at market, $	20.00	19.00	20.00
Selling price per steer, $	220.60	196.94	210.70
$ loss per steer above initial cost + feed cost[1]	—1.11	—21.00	—10.40
% wt. shrink to market	3.94	3.36	3.61
Dressing % (chilled)	60.44	61.07	60.21
Carcass grades:			
Low choice	1		1
Top good	3	2	
Av. good	3	4	4
Low good	3	2	4
Top commercial		2	1
Marbling:			
Moderate	3		1
Modest		3	1
Small amount	5	4	5
Slight amount	2	2	2
Traces		1	1

1. Cost of yeast not included.

Table 41

Digestion Coefficients for Cattle-Fattening Rations That Contained Live Yeast Suspensions.

	Crude protein	Ether extract	Crude fiber	Nitrogen-free extract	Total digestible nutrients
Control	66.1	64.0	57.5	79.6	69.0
Torula utilis	66.31	60.38	52.54	80.82	68.49
Saccharomyces cerevisiae	58.34	54.60	57.45	75.98	65.17

Table 42

Average Yeast Counts in Feces of Steers Used in the Digestion Study.
(Cells per milliliter)

Control	Torula utilis	Saccharomyces cerevisiae
1,122	1,575	9,632

Sheep

Lamb-Feeding Experiments

Feed lot and pasture fattening tests with feeder lambs. Studies carried on by the Department of Animal Husbandry and the Garden City Branch Experiment Station.

PROJECT 111 GC

T. Donald Bell and A. B. Erhart

The tests this year included both pasture and feed-lot studies. One group of 50 lambs was pastured on irrigated drilled wheat; another group of 50 was pastured on irrigated volunteer wheat. One half of the lambs in each of these lots was implanted with 6 mg. pellets of stilbestrol at the beginning of the pasturing period. One group of lambs was pastured on dryland milo stubble; another group on irrigated milo stubble. Supplemental alfalfa hay was provided for the lambs on milo pasture and supplemental milo grain was given during the latter part of the grazing period. After a 95-day grazing period on the milo stubble, one of the groups was finished in the dry lot and the other in the dry lot and on wheat pasture.

The roughage comparisons in the dry-lot studies included: (1) All sorghum stover; (2) sorghum stover and alfalfa hay; (3) sorghum silage and alfalfa hay; and (4) beet-top silage and alfalfa hay.

The lambs in one lot on the standard sorghum stover-milo grain-cottonseed meal ration were implanted with pellets containing 6 mg. of stilbestrol at the beginning of the feeding period; another lot on the standard ration received estradiol-progesterone (Synovex) pellet implants at the start of the tests; and another lot of lambs was given 2 mg. of stilbestrol per lamb daily in the standard ration.

The lambs on wheat pasture, those receiving beet-top silage, and those receiving sorghum silage were marketed at the end of a 95-day feeding period. The lambs in the other lots were shorn and continued on feed.

Lambs

The lambs for the tests came from near Casper, Wyo., and were almost entirely fine-wool wethers. They weighed an average of 77.7 pounds at the loading point and weighed 68.2 pounds off the cars in Garden City. The lambs were started on feed about 20 days later, weighing approximately 80 pounds.

Feed prices: Milo grain, $1.62 per cwt.; salt, $.90 per cwt.; limestone, $1 per cwt.; sorghum silage, $8 per ton; beet-top silage, $8 per ton; cottonseed meal, $68 per ton; ground sorghum stover, $10 per ton; alfalfa hay, $25 per ton; milo stubble, $1 per acre (1 acre per lamb provided); and wheat pasture, $.50 per head per month.

Table 43

Lot number	6		11		7	8
	Defiled wheat pasture		Volunteer wheat pasture			
Treatment	Stilbestrol	No Stil.	Stilbestrol	No Stil.	Beet-top silage, Alfalfa hay, Milo grain	Sorghum silage, Alfalfa hay, Milo grain
Number lambs per lot	25	25	25	25	50	50
Days on feed	95	95	95	95	95	95
Initial wt. per lamb, lbs.	80.8	81.1	80.2	78.8	80.5	78.7
Final wt. per lamb, lbs.	125.4	114.6	123.2	113.0	111.0	106.2
Total gain per lamb, lbs.	44.6	33.5	43.0	34.2	30.5	27.5
Daily gain per lamb, lbs.	.469	.353	.452	.360	.321	.290
Lbs. feed per lamb daily:						
Alfalfa hay					.787	.791
Milo					1.294	1.294
Beet-top silage					7.521	
Sorghum silage						4.073
Salt	.012	.012	.011	.011	.019	.017
Lbs. feed per cwt. of gain:						
Alfalfa hay					244.67	272.67
Milo					402.57	446.26
Beet-top silage					2339.64	
Sorghum silage						1404.40
Salt	2.55	3.40	2.43	3.06	6.03	5.80
Feed cost per cwt. gain, $	3.58	4.76	3.71	4.66	18.996	16.307
Feed costs per lamb, $	1.60	1.60	1.60	1.60	5.809	4.494
Hormone cost per lamb, $	.02		.02			
Initial cost per lamb, $	14.87	14.92	14.76	14.50	14.81	14.48
Number lambs lost		1			1	1
Cost of death loss, $		.69			.352	.387

Table 43 (Continued).

Total cost per lamb, $	16.49	17.21	16.38	16.10	21.01	19.36
Final cost per cwt., $	13.15	15.02	13.29	14.35	18.93	18.22
% shrink on G.C. wt.	4.92	3.81	9.10	8.53	7.89	7.49
Lbs. shrink per lamb	6.17	4.37	11.22	9.61	8.76	7.96
Value St. Joseph per cwt. G.C.[1]	16.47	17.59	16.63	16.70	16.84	16.90
Value St. Joseph per lamb[1]	20.65	20.16	20.49	18.88	18.70	17.95
Net return per cwt., $	3.32	2.57	3.34	2.45	−2.09	−1.32
Net return per lamb, $	4.16	2.95	4.11	2.74	−2.31	−1.41
Carcass wt. per lamb	57.52	53.83	51.48	49.92	52.06	49.98
Carcass yield per G.C. wt.	45.87	46.97	41.78	44.18	46.90	47.06
% carcass grades—choice	12	16.7		8	32.7	30.6
—good	76	79.2	76	92	63.3	65.3
—utility	12	4.2	24		4.1	4.1

1. Marketing charges not included.

Table 44

Lot number	1	2	3	4
Ration fed	Estradiol-progesterone implants,[1] Whole milo, Axtell stover, C.S. meal, Salt, Limestone	Stilbestrol implants (containing 6 mg.) Whole milo, Axtell stover, C.S. meal, Salt, Limestone	Stilbestrol in feed (2 mg. daily) Whole milo, Axtell stover, C.S. meal, Salt, Limestone	No hormone Whole milo, Axtell stover, C.S. meal, Salt, Limestone
Number lambs per lot	50	50	50	50
Number days on feed	137	137	137	137
Initial wt. per lamb, lbs.	81.0	80.4	80.8	80.1
Final wt. per lamb, lbs.	114.4	111.4	115.0	105.0
Av. wt. of shorn fleece, lbs.	6.2	6.6	6.9	7.4
Total gain per lamb, lbs.	39.6	37.6	41.1	32.3
Daily gain per lamb, lbs.	.289	.274	.300	.236
Lbs. feed per lamb daily:				
Milo grain	1.36	1.36	1.36	1.36
Axtell stover	2.77	2.88	3.02	2.61
Alfalfa hay	.12	.12	.12	.12
Cottonseed meal	.20	.20	.20	.20
Salt	.026	.023	.027	.018
Limestone	.013	.013	.013	.013
Lbs. feed per cwt. gain:				
Milo grain	472	497	455	578
Axtell stover	959	1051	1007	1108
Alfalfa hay	41	44	40	51
Cottonseed meal	70	74	68	86
Salt	9.2	8.4	9.2	7.8
Limestone	4.5	4.7	4.3	5.5
Feed cost per cwt. gain, $	15.45	16.50	15.33	18.58
Hormone cost per lamb, $	.50	.02	.14	
Feed cost per lamb, $	6.12	6.20	6.30	5.99
Initial cost per lamb, $	14.90	14.79	14.87	14.74
Number of lambs lost	1	0	0	2
Cost of lamb loss, $	.38	0	0	.65
Total cost per lamb, $	21.90	20.91	21.31	21.38
Final cost per cwt., $	19.14	18.77	18.53	20.36
Estimated wool credit, $	2.60	2.80	2.95	3.20
Selling price per cwt., Kansas City, $	17.50	17.50	17.50	17.50

1. Each lamb received 200 mg. of progesterone and 3.5 mg. estradiol.

Table 45

Lot number	9	5	10
Treatment	Sorghum stover, Alfalfa hay, Milo grain, Salt	Dryland milo, Stubble-pasture, Alfalfa hay, Milo grain, Salt	Irrigated milo, Stubble-pasture, Alfalfa hay, Milo grain, Salt
Number lambs per lot	50	50	50
Days on feed	137	95	95
Initial wt. per lamb, lbs.	79.5	80.8	79.6
Final wt. per lamb, lbs.	105.0	94.8	91.4
Av. wt. of shorn fleece, lbs.	7.3	(6.8)[1]	(5.9)[1]
Total gain per lamb, lbs.	32.8	14.0	11.8
Av. daily gain, lbs.	.239	.147	.124
Lbs. feed per lamb daily:			
Milo grain	1.36	.31	.31
Axtell stover	2.12	.57	.59
Alfalfa hay	.81	.49	.49
Salt	.016	.011	.009

Table 45 (Continued).

Lbs. feed per cwt. gain:			
Milo grain	570	209	247
Axtell stover	887	388	477
Alfalfa hay	337	333	393
Salt	6.5	7.4	7.6
Feed cost per cwt. gain, $	17.93	9.56	11.36
Pasture cost per cwt. gain, $		7.16	8.46
Total cost per cwt. gain, $	17.93	16.72	19.82
Feed cost per lamb, $	5.88	2.34	2.34
Initial cost per lamb, $	14.63	14.87	14.65
Total cost per lamb, $	20.51	17.21	16.99
Cost per cwt., $	19.53	18.15	18.59
		Into dry lot	Into dry lot and wheat pasture
Additional days on feed		42	42
Av. daily gain, lbs.		.359	.085
Feed cost per lamb, $		2.21	1.05
Pasture cost per lamb, $		0	.70
Total cost per lamb, 137 days, $		19.42	19.09[2]
Final wt., lbs.		103.1	89.16
Final cost per cwt., $		18.84	21.41
Estimated wool credit, $	3.15	2.90	2.45
Selling price per cwt., Kansas City, $	17.00	17.00	17.00

1. Shorn following this period.
2. Includes charge for loss of one lamb.

Observations

The largest and cheapest gains were made by the lambs on wheat pasture. Implants of 6 mg. stilbestrol at the beginning of the pasturing period increased the rate of gain approximately one-third and increased the return per lamb approximately $1.25. The pastured lambs receiving the hormone implants yielded less and their carcasses graded slightly lower than the untreated lambs.

The lambs receiving either beet-top silage or sorghum silage as a part of their roughage rations gained faster than lambs receiving only sorghum stover or sorghum stover and alfalfa hay as the roughage part of their rations. The gains were more expensive on the beet-top silage, however, than on the other roughage rations at the prices charged for feeds used.

The gains made on the standard ration of ground sorghum stover, milo grain, cottonseed meal, limestone, and salt were lower than usual. The inclusion of about .8 pound of alfalfa hay as a part of the roughage ration failed to increase the rate of gain, but at prices charged, alfalfa lowered cost of gains slightly.

The lambs receiving implants (estradiol-progesterone or stilbestrol) or stilbestrol in the feed gained about 20 percent more than lambs on similar rations but receiving no hormone. Hormone-fed or -implanted lambs in previous trials on similar rations yielded less and graded lower than lambs receiving no hormone, but the difference was small between the lambs receiving the 6 mg. stilbestrol implants and the untreated lambs in the 1955 trials. Ten lambs from each of the three hormone-treated lots and the control lot were taken to Manhattan for detailed slaughter, carcass, and tissue studies. Shrink to market, carcass yields, and carcass grades were obtained on the rest of the lambs when they were sent to market. This information is given in a supplemental report.

Gains on sorghum stubble supplemented with alfalfa hay and some grain toward the end of the grazing period were lower than those obtained in previous years. The dryland stubble was eaten more readily than the irrigated stubble and the lambs gained slightly more on the dryland stubble. The lambs from the dryland stubble were finished in the dry lot on a ration of alfalfa hay, sorghum silage, and milo grain. They made satisfactory gains of .36 pound per day during the 42-day

feeding period. The lambs from the irrigated milo were on wheat pasture 16 days and fed alfalfa hay, sorghum stover, and milo grain in dry lot 26 days. Their gains were disappointing (.08 pound per head daily) during this 42-day period and they lacked the finish of lambs in the other lots.

Seven lambs were lost during the trials. Four died from enterotoxemia—one in Lot 2, two in Lot 4, and one in Lot 8. One in Lot 6 was smothered in hauling to the station at the end of the test; one in Lot 7 died from urinary calculi; and one in Lot 10 died from enteritis and pneumonia. Although the rations or treatments may not have been responsible, each lot has been charged with the cost of the lambs that died and the feed they consumed.

Appreciation is expressed to the Eli Lilly company of Indianapolis, Ind., which furnished the stilbestrol premix fed to the lambs; to the Norden laboratories of Lincoln, Nebr., which furnished the stilbestrol pellets; and to the Chemical Specialties company of New York, N.Y., for the estradiol-progesterone (Synovex) pellets.

Table 46

Chemical Analyses of Feeds Used in the Lamb-Feeding Trials at the Garden City Station.

	Protein (N×6.25) %	Ether extract %	Crude fiber %	Moisture %	Ash %	N-Free extract %	Carbo-hydrates %	P_2O_5 %	Calcium %
Milo grain	11.69	3.17	1.76	10.35	1.65	71.38	73.14	0.33	0.02
Alfalfa hay	16.75	1.72	29.03	6.88	11.51	34.11	63.14	0.23	1.47
Drilled wheat (as received)	22.76	2.34	14.16	20.00	10.84	29.90	44.06	0.30	0.23
Drilled wheat (dry basis)	28.46	2.93	17.70		13.56	37.35	55.05	0.37	0.29
Volunteer wheat (as received)	13.03	2.60	15.62	20.00	11.77	36.98	52.60	0.26	0.30
Volunteer wheat (dry basis)	16.30	3.30	19.54		14.71	46.15	65.69	0.33	0.38
Irrigated sorghum stubble	3.00	1.20	33.33	3.45	14.14	44.88	78.21	0.08	0.36
Dryland sorghum, small heads (as received)	8.57	1.18	22.55	12.00	11.23	44.47	67.02	0.13	0.41
Dryland sorghum, small heads (dry basis)	9.75	1.35	25.65		12.77	50.48	76.13	0.15	0.47
Axtell stover (as received)	4.14	1.90	24.09	17.40	9.27	43.20	67.29	0.08	0.38
Axtell stover (dry basis)	5.00	2.30	29.15		11.21	52.34	81.49	0.10	0.46
Dryland sorghum, no heads	9.31	1.45	22.86	5.00	12.40	48.98	71.84	0.14	0.42
Sorghum silage (as received)	3.08	0.92	8.88	60.00	3.96	23.16	32.04	0.08	0.12
Sorghum silage (dry basis)	7.70	2.32	22.24		9.92	57.82	80.06	0.21	0.30
Beet-top silage (as received)	4.26	0.48	3.96	74.73	6.83	9.74	13.70	0.04	0.26
Beet-top silage (dry basis)	16.81	1.90	15.64		27.02	38.63	54.27	0.17	1.04

Lamb-Feeding Experiments. Supplemental Report Concerning the Use of Hormones.

PROJECT 111-GC

T. Donald Bell, Walter H. Smith, A. B. Erhart, and D. L. Mackintosh

For the past three years, a group of lambs from the control lots and the hormone-fed or -implanted lots in the Garden City test have been taken to the Manhattan station for detailed studies. The remaining lambs from each of the lots have been shipped to a central market where carcass and slaughter data were obtained. Table 47 shows the percentage of weight shrinkage in transit from Garden City to the Kansas City market and the carcass grades and yields of the control and hormone-treated lambs for the past two years. Similar information is shown in Table 48 for the lambs brought to Manhattan following the end of the feeding period at Garden City in 1956.

Table 47

Shrinkage to Market, Carcass Grades, and Yields of Hormone-Treated and Control Lambs in Lot Tests, 1955 and 1956.

Year 1955	Lot 1[1]	Lot 2[1]	Lot 3[1]	Lot 4[1]
Number of lambs	39	39	40	40
% wt. shrinkage—Garden City to Kansas City	12.0	13.6	11.3	12.3
Carcass yield, %	52.0	51.5	50.0	51.0
Carcass grades:				
Choice	10	7	2	6
High good	13	15	8	14
Average good	4	5	8	9
Low good	5	9	7	6
High utility	2	3	9	1
Average utility	4	1	2	3
Low utility	0	0	3	1
Cull	1	0	0	0
Year 1956				
Number of lambs	38	40	38	40
% wt. shrinkage—Garden City to Kansas City	7.5	10.0	8.2	8.0
Carcass yield, %	50.7	50.2	49.1	48.3
Carcass grades:				
Choice	6	3	1	1
High good	13	10	6	14
Average good	12	14	8	8
Low good	6	11	12	12
High utility	1	1	8	3
Average utility	0	0	2	1
Low utility	0	1	1	0
Cull	0	0	0	1

1. Lot 1—Controls. Lot 2—6 mg. implants of stilbestrol. Lot 3—Synovex pellets (1955—10 mg. estradiol and 250 mg. progesterone); (1956—3.5 mg. estradiol and 200 mg. progesterone). Lot 4—2 mg. daily oral administration of stilbestrol.

Table 48

Shrinkage in Transit, Yields, and Carcass Grades of Hormone-Treated and Untreated Lambs Slaughtered in Manhattan.

	Controls	6 mg. stilbestrol implants	Synovex[1] implants	2 mg. stilbestrol daily in feed
Number of lambs	10	10	10	10
% wt. shrinkage—Garden City to Manhattan	7.1	8.4	7.5	8.4
Carcass yield, %	50.4	50.1	49.1	48.3

Table 48 (Continued).

Carcass grades:				
Choice	0	0	1	0
Low choice	3	2	2	1
High good	2	5	2	1
Average good	5	3	2	2
Low good	0	0	2	6
High utility	0	0	1	0

1. Pellets contained 3.5 mg. estradiol and 200 mg. progesterone.

In the 1952-53 tests with stilbestrol implants, some losses resulted from the abnormal development of the accessory reproductive organs. Since that time, careful measurements have been made of the organs usually affected. The measurements taken from the control and hormone-treated lambs in this year's studies are shown in Table 49. Table 48 shows the average weight of some of the endocrine glands of the treated and untreated lambs and comparative teat lengths.

Table 49

Comparative Size of Organs of Urogenital System of Wether Lambs Given Hormones and of Untreated Lambs.

	Number of lambs	Seminal vesicles		Bladder		Ampullae dia., mm.	Urethra and prostate dia., mm.	Cowper's glands dia., mm.
		Length, mm.	Width, mm.	Length, mm.	Width, mm.			
No hormones	10	7.6	17.3	48.9	28.3	3.4	12.1	9.1
6 mg. stilbestrol implants	10	11.3	22.0	54.8	33.8	4.6	15.8	14.4
Synovex implants 3.5 mg. estradiol and 200 mg. progesterone	10	14.2	24.8	56.9	31.0	6.0	18.3	15.4
Stilbestrol in the feed (2 mg. daily)	10	14.4	24.0	52.4	33.4	6.0	17.7	15.9

Table 50

Average Endocrine Gland Weights and Teat Length Measurements (Ten Wether Lambs per Lot).

Lot number	1[1]	2[1]	3[1]	4[1]
1955				
Both adrenals, g.	2.6	2.9	3.1	2.8
Both thyroids, g.	2.6	2.9	3.2	3.1
Pituitary, g.	0.68	0.66	0.90	0.74
Teat length, mm.	15.2	20.4	24.6	35.4
1956				
Both adrenals, g.	2.5	3.0	3.8	2.7
Both thyroids, g.	2.2	2.9	2.7	2.9
Pituitary, g.	0.48	0.75	0.68	0.65
Teat length, mm.	20.5	23.0	27.2	27.2

1. Lot 1—Controls. Lot 2—6 mg. implants of stilbestrol. Lot 3—Implants of 3.5 mg. estradiol and 200 mg. progesterone (Synovex).

Observations

The control lambs usually shrank less in transit than the lambs that were given hormone implants or hormone in their feed, but differences were not consistent between the different hormone groups.

The control lambs consistently yielded more than the hormone-treated lambs. The lambs receiving the 6 mg. stilbestrol implants ranked next to the control lambs in yield, while the Synovex-pellet-treated lambs and those receiving stilbestrol in their feed alternated between the lowest and next to the lowest yield.

The lambs receiving the 6 mg. pellets of stilbestrol ranked nearly as high in carcass grade as the control or untreated lambs, while the lambs receiving the estradiol-progesterone implants consistently produced the poorest carcasses. All of the hormone treatments tended to mature the lambs and produced a larger number of yearling carcasses. The hormones caused the pelt to adhere more firmly to the carcass, causing some difficulty in the slaughtering operation.

The hormones caused an increase in the size of the urogenital system and organs of wether lambs. The greatest increase in size was produced the past two years by the Synovex implants and by stilbestrol. No death losses occurred that could be attributed to the hormone treatment in the 1955-56 trials, but the increase in prostate gland tissue tended to occlude the opening of the urethral passage in some of the lambs examined. While the hormones significantly increased the size of the bulbo-urethral glands, the swellings in the rectal region were not so evident as in past years.

The adrenals, thyroids, and pituitary glands were larger and the teats longer in the hormone-treated lambs than in control lambs.

The Effects of Implanting Stilbestrol in Feeder Lambs and Feeding a Stilbestrol Premix to Feeder Lambs upon the Quality and Palatability of the Carcass.

PROJECT 434

David L. Mackintosh, Ralph P. Soule, Jr., T. D. Bell, J. L. Hall, Dorothy Harrison, and Beulah Westerman

Diethylstilbestrol when implanted in growing fattening lambs increases the rate of gain and feeding efficiency, but lowers the yield and the carcass grade. These observations are accepted as a result of work done by several researchers at different experiment stations. None of these investigations made a complete analysis of the carcass; therefore this project was designed to procure additional information regarding the influence of stilbestrol upon the quality and palatability of the carcass.

Ten lambs were selected from each of three lots of 50 head at the Garden City Branch Station and transported to Manhattan where they were slaughtered and carcass observations made. These observations included dressing percentage, cooler shrinkage, content of the alimentary canal, liver weight, kidney weight, total killing fat, pelt weight, carcass grade, mechanical separation of the hotel rack into fat, lean, and bone, area of the eye muscle, thickness of fat over the 12th rib, blood phosphorus, liver glycogen, liver fat, pressed fluid from the eye muscle, total nitrogen, and nonprotein nitrogen of the pressed fluid, palatability tests, and vitamin content of the muscle.

Laboratory observations are not yet complete and four more groups of lambs have been slaughtered recently. Statistical analyses of available data indicate that the rations fed during 1955 did not significantly affect the slaughter weight, dressing percentage, cooler shrinkage, total killing fat, area of the eye muscle, or the nonprotein nitrogen of the pressed fluid.

Liver weight was significantly increased by the addition of 2 milligrams of stilbestrol per day, but not from 6 milligrams implanted at the beginning of the test. The pelt weight was significantly increased in both stilbestrol lots. The carcass grade was significantly lowered in the lot receiving stilbestrol in a premix, while the grade of the implanted lambs was higher than that of the controls. The fat over the 12th rib was definitely thicker in the case of the implants and lower with the premix than in the controls.

Blood phosphorus was definitely lowered in the premix lot, while the liver glycogen in both lots receiving stilbestrol was lower than in the controls. Stilbestrol treatment also reduced the percentage of liver fat significantly. The percentage of moisture in the rib eye was higher in the premix lambs than in either the control or the implanted lambs.

The first year's work on vitamin content of lamb muscle is summarized below:

Vitamin Content of Lamb Muscle

Vitamin	Implants	Premix	Controls
Thiamine	11.6 ug./g.	14.1 ug./g.	10.5 ug./g.
Riboflavin	12.7 ug./g.	13.2 ug./g.	13.7 ug./g.
Pantothenic acid	19.8 ug./g.	22.7 ug./g.	30.3 ug./g.
Niacin	266.6 ug./g.	292.5 ug./g.	328.0 ug./g.

Data from cooking and palatability tests indicate little difference in the quality of the meat on legs of lamb from animals fed a control ration, a control ration plus diethylstilbestrol, and animals implanted with diethylstilbestrol. Legs of lamb from the three treatments lost about 25 percent of their weight during roasting. Meat from all roasts received a high flavor score through 24 weeks of frozen storage, but the flavor of both fat and lean meat deteriorated noticeably after 36 and 48 weeks of frozen storage.

Roasts from animals fed diethylstilbestrol rated slightly more tender, as measured by both judges' scores and shear force values, and yielded a little more press fluid than roasts from other animals. The palatability panel did not score these roasts juicier than the others.

The Relationship of Physical Balance in the Utilization of Pelleted and Nonpelleted Rations for Lambs.

PROJECT 236

T. Donald Bell, Draytford Richardson, R. F. Cox, and J. W. Needham[1]

Lamb-fattening rations varying in proportions of roughages to concentrate have been studied in this project several years. In recent years much interest has been shown by commercial lamb feeders in completely pelleted rations, and for the past three years this project has

1. Grateful acknowledgment is given to Leonard Hays, graduate student in animal husbandry, for help with the feed-lot trials reported in this study.

Table 51

Feed Lot Performance of Lambs Fed Pelleted and Nonpelleted Rations of Varying Concentration.

Lot number	1	2	3	4	5	6
Ration	60% field-cured alfalfa hay, 40% corn pellets[1]	60% dehydrated alfalfa hay, 40% corn pellets[1]	65% chopped alfalfa hay, 35% ground corn, unpelleted	55% chopped alfalfa hay, 45% ground corn, unpelleted	50% field-cured alfalfa hay, 50% corn pellets	50% dehydrated alfalfa hay, 50% corn pellets
Number lambs per lot	22	22	22	21	22	21
Days on feed	79	79	79	79	79	79
Initial wt. per lamb, lbs., av.	77.54	77.32	78.14	77.43	77.96	78.47
Final wt. per lamb, lbs., av.	110.45	107.40	104.68	105.47	109.41	108.28
Total gain per lamb, lbs., av.	32.91	30.08	26.54	28.04	31.45	29.81
Daily gain per lamb, lbs., av.	.416	.381	.336	.355	.398	.377
Lbs. feed per lamb daily:						
Pellet	2.70	2.65			2.48	2.52
Cracked corn			1.21	1.24		
Chopped hay	.48	.44	2.28	1.70	.55	.38
Lbs. feed per cwt. gain:						
Pellet	649.0	697.0			623.3	668.9
Cracked corn			360.1	349.1		
Chopped hay	116.0	114.8	677.7	478.2	138.1	101.6
Feed cost per cwt.	$14.89	$18.50	$17.62	$14.85	$15.32	$18.13
Feed cost per lamb	$4.90	$5.59	$4.68	$4.16	$4.82	$5.40
Number lambs died				1		1

1. .4 lb. chopped hay fed daily after lambs were on full feed.

been designed to study the effect of pelleted and nonpelleted rations of varying proportions of roughages and concentrates upon feed-lot performance and feed efficiency.

Experimental Procedure

The lambs used in the tests were purchased on the Kansas City market in late October and included blackface and whiteface ewe and wether lambs from Colorado. After a short preliminary feeding period, the lambs, weighing approximately 78 pounds, were started on feed.

Six lots of 22 lambs each were fed according to the following plan:

Lot 1—Pelleted ration—60 percent field-cured alfalfa hay, 40 percent corn pellets, plus .4 pound of chopped field-cured alfalfa hay per head daily (total ration approximately 65 percent alfalfa hay, 35 percent corn).

Lot 2—Pellet ration—60 percent dehydrated alfalfa meal, 40 percent corn pellets, plus .4 pound of chopped field-cured alfalfa hay per head daily (total ration approximately 65 per cent alfalfa hay and 35 percent corn).

Lot 3—Nonpelleted ration—65 percent chopped alfalfa hay and 35 percent ground corn.

Lot 4—Nonpelleted ration—55 percent chopped alfalfa hay, 45 percent ground corn.

Lot 5—Pelleted ration—50 percent field-cured alfalfa hay, 50 percent corn pellets, plus .4 pound of chopped field-cured alfalfa hay per head daily (total ration approximately 55 percent alfalfa hay and 45 percent corn).

Lot 6—Pelleted ration—50 percent dehydrated alfalfa hay, 50 percent corn pellets, plus .4 pound of chopped field-cured alfalfa hay per head daily (total ration approximately 55 percent alfalfa hay and 45 percent corn).

All the hay used in this test was second-cutting alfalfa taken from the same college field. A portion was dehydrated at the time of cutting and later used in the dehydrated pellets. The remainder was sun cured, baled, and stored in the barn until September, when a portion of it was ground and made into pellets with corn. The chopped hay fed in the test came from the field- and barn-cured supply and was chopped with an ensilage cutter. The corn for all the lots came from the same bulk lot at a Manhattan mill.

The prices charged for the various feeds were as follows: Chopped alfalfa hay, $25 per ton; ground corn, $1.42 per bushel; dehydrated alfalfa meal, $38 per ton; mixing and pelleting, $4 per ton; sacks, $0.10 each; 50 percent sun-cured hay, 50 percent corn pellets, $44 per ton; 50 percent dehydrated hay, 50 percent corn pellets, $50.40 per ton; 60 percent sun-cured hay, 40 percent corn pellets, $41.40 per ton; and 60 percent dehydrated hay, 40 percent corn pellets, $49.08 per ton.

Results and Discussion

Lambs gained faster when fed the pelleted rations than when fed similar, unpelleted feeds in similar proportions. This agrees with results of previous years' tests. The increased rates of gain apparently resulted from greater efficiency of feed utilization rather than increased feed consumption, since the quantity of the pelleted rations consumed was similar to or smaller than that of the nonpelleted rations.

The pellets made of sun-cured hay with corn produced larger and more efficient gains than the pellets made of dehydrated meal and corn. Using the prices indicated, the gains made by the lambs fed dehydrated pellets cost nearly $3 per 100 pounds more than when the sun-cured hay was used.

Slightly larger gains were produced by the pellets containing the higher proportion of roughage, but the advantage in efficiency and economy was not consistent.

As in previous years the ration of 55 percent roughage and 45 percent concentrates was most efficient as well as most economical when nonpelleted rations were fed.

Despite larger gains and greater feed efficiency on pelleted rations

containing 55 percent roughage and 45 percent concentrates, the cost of gain was higher than on the nonpelleted rations. When the rations contained 65 percent roughage and 35 percent concentrates, the pelleted ration containing sun-cured hay and corn produced the cheapest gains, followed by the nonpelleted ration. In this year's tests it should be noted that $4 per ton for mixing and pelleting and $2 per ton for sacks was charged above the cost of nonpelleted rations. This contrasts with charges in previous years when $5 to $8 was charged for grinding and transporting the pelleted feeds. All the lots sold for the same price, and there was little difference in carcass grades of the lambs fed the different rations.

Digestion trials were conducted with lambs, using rations similar to those used in the feed-lot tests, but the chemical analyses are not yet available. Results of these digestion trials will be reported later.

Adaptability of Breeds of Rams and Breed-Types of Range Ewes to Market Lamb Production in Kansas.

PROJECT 347

T. Donald Bell, Lewis A. Holland, and A. W. Gardner

Western ewes of the three predominant types (Texas ewes or fine-wools, Northwest Blackface Crossbreds, and Northwestern Whiteface Crossbreds) commonly found in Kansas were obtained as ewe lambs in the fall of 1951 and bred to Hampshire, Suffolk, Shropshire, and Southdown rams four seasons. A different set of rams has been used each year, and the ewes are being rotated so that no ewes are bred to the same breed of ram each year. Lamb-production and wool-production records are being obtained from the different types of ewes, and lamb-production figures are being obtained for the four sire groups.

Results

Lamb-production figures for the 1954-55 lamb crop are presented in Table 52 and the preliminary lambing data and lamb production for 1955-56 are shown in Table 53.

All of the lambs born on or before December 20, 1955, were separated with their mothers by sire groups and fed separately. The lambs born after December 20 could not be identified into sire groups and were fed as a single group. The ewes in all of the four sire groups were fed similar rations consisting of approximately 4 pounds of alfalfa hay, 4 ¾ pounds of silage, and 1 ¼ pounds of grain.

The lambs in each group were creep fed and a record was kept of the concentrate eaten. The creep concentrate mixture was made up of 2 parts oats, 1 part corn, 4 parts milo, 1 part alfalfa meal-corn pellets, 1 part bran, ½ part corn and molasses pellets, and ½ part soybean oil meal. Approximately 3 percent salt was added to this mixture during the later part of the feeding period. The gains and feed consumption of the different groups of lambs are shown in Table 54.

Table 55 gives the average body weights following lambing in the fall of 1955 and early part of 1956 as well as the grease wool shorn the spring of 1956.

Discussion and Observations

The Texas ewes have consistently bred and lambed earlier than the other two types of ewes in the four years that the tests have been conducted. This difference ranged from more than 30 days in the 1954-55 lambing season to an average of 10 days earlier than the Northwest Blackface ewes and 20 days earlier than the Northwest Whiteface ewes in the 1955-56 season. Contrary to popular opinion, the Northwest Blackface ewes have consistently averaged earlier lambing than the Northwest Whiteface ewes. Because of the earlier lambing date, lambs from these Texas fine-wool ewes usually reach market weights earlier than lambs from the other groups. The lambs from the other

Table 52

Lamb Production by Ewes of Different Types from Sires of Different Breeds in 1955.

Breed or breed-type	Number ewes bred	Number lambs weaned	% lambs weaned	Weight 100 days of age	Average weaning weight	Pounds lamb weaned per ewe bred
Ewe types:						
Finewools	50	50	100	68.1	95.4	95.4
Northwest Whiteface	41	34	82.9	79.2	89.8	74.5
Northwest Blackface	50	57	114	76.3	90.6	103.3
Sire groups:						
Hampshire	34	46	135.3	74.3	88.95	120.4
Suffolk	36	43	129.4	80.7	101.34	121.0
Southdown	35	10	28.6	70.8	89.4	25.5
Shropshire	36	42	116.7	67.8	86.71	110.4
Total	141	141	100			

Table 53

1956 Lambing Data and Lamb Production from Ewes of Different Types and from Sires of Different Breeds.

	Ewe types			Sire groups[1]			
	Finewools	Northwest Whiteface	Northwest Blackface	Hampshire	Suffolk	Southdown	Shropshire
Number ewes bred	47	40	49	34	34	33	35
Number ewes lambing before December 20	42	28	35	26	27	25	22
Number ewes lambing after December 20	3	12	6	6	2	8	7
Av. lambing date	11-10	12-5	11-20	11-10	11-7	11-11	11-8
Birth wt., lbs.:							
Singles	9.9	10.1	8.8	9.6	9.5	8.3	9.6
Twins	7.9	9.4	7.0	7.3	7.6	8.3	7.6
% lambs born	127.6	110.0	116.3	105.9	105.9	87.9	85.1
Number lambs alive March 13	54	40	50	32	32	28	25
Av. wt. of lambs March 13	89.2	91.2	91.8	90.0	93.2	88.6	90.1
Number lambs sold March 13	22	14	23	14	20	13	12
Number lambs alive April 9	32	26	27	18	12	15	13
Av. wt. lambs April 6[1]	90.0	90.2	91.9	92.3	91.1	89.1	90.1

1. Lambs born after December 20 not included.

Table 54

Feed Consumption and Lamb Production from Four Different Breeds of Rams and Three Ewe Breed-Types.

	Number of lambs	Daily concentrate consumption in creep	Av. daily gain in lbs.	Gain per lb. of creep feed consumed
Sire groups:				
Hampshire	33	1.57	.64	.41
Suffolk	33	1.58	.69	.44
Southdown	28	1.44	.66	.46
Shropshire	25	1.62	.68	.42
Ewe groups:				
Finewools	51		.67	
Northwest Whiteface	25		.66	
Northwest Blackface	41		.67	

Table 55

Body Weights and Wool Production from Ewes of Different Breed Types.

	Type of ewes 1956 grease wool production lbs. per ewe	Body wts. 1955-56 following lambing lbs. per ewe
Finewools	12.21	141.46
Northwest Whiteface	13.85	167.42
Northwest Blackface	10.46	167.29

groups, however, gain faster than the fine-wool lambs and are heavier at 100 days of age.

The Whiteface Crossbred ewes have generally produced the heaviest fleeces, followed by the finewools. There have been no consistent differences among the three types of ewes in lambing or weaning percentages. In two years of the test, lambs from the Blackface Crossbreds have graded a little higher when slaughtered than lambs from the other ewe groups.

Lambing and weaning data for the lambs sired by Hampshire, Suffolk, Southdown, and Shropshire rams have not been consistent. The Southdown lambs have usually averaged lighter weight at birth but the comparative rank in birth weights of the lambs from the other sires has varied from year to year. The Hampshire- and Suffolk-sired lambs have usually gained faster and have been heavier at weaning than the Southdown- and Shropshire-sired lambs. These differences are not so apparent this year, however, and there has been little difference in the rate of gain of lambs from the different sires. In 1954 and in 1955 lambs sired by Shropshire rams made larger gains per pound of feed consumed than lambs sired by the other breeds, but in 1956 the Shropshire-sired lambs ranked next to last in comparative feed efficiency. The Southdown-sired lambs have shown a slight advantage in carcass grade in some years but this superior quality has not been demonstrated consistently.

Breeding difficulties have been experienced with the experimental rams of all four breeds during the hot summer months. Yearling rams were used in 1952, 1953, and 1954. Because of the difficulty in securing conception during the hot summer months, both a yearling and an older ram were used in each of the breeding groups during the summer of 1955. This practice improved the lambing performance of the ewes, but did not entirely solve the problem. One hundred ewes lambed by December 20; there was a period of about 45 days during which no lambs were born; and then 21 more ewes lambed beginning about January 5, 1956. These later lambs were conceived after the ewes had been turned together with the four breeds of rams July 25, 1955. The sires of these lambs could not be determined and are not included in the lamb figures for the sire group in the 1956 tests.

The Use of Management Techniques and Hormones with Ewes for Controlling the Time, Rate, and Regularity of Lambing.

PROJECT B.J. 441

T. Donald Bell, Walter Smith, John Wheat, Wendel Gardner, V. E. McAdams, and Edward Nelson

One of the major factors in determining the economic success of a sheep enterprise is securing an optimum number of lambs born within a short interval, and at a time most advantageous to the producer. A majority of the commercial lamb producers in Kansas are following a fall lambing program, and one of their biggest problems is the failure of a varying number of ewes to lamb during the desired period. Extensive work at this station, (reported in Circulars 283, 1952; and 308, 1954) and at other experiment stations, has been conducted on the effects various hormones have upon the reproductive activity of ewes. Unfortunately, no hormone therapy has been found that will consistently cause ewes to lamb earlier or more uniformly. Additional information concerning the effects of hormones, singly and in combination, upon the physiological function and breeding behavior of ewes and rams should aid in a better understanding of the problems involved and might possibly lead to the successful use of hormones in improving the breeding performance of ewes and rams.

Limited studies in England and in the U.S. have shown that the breeding pattern of ewes may be altered by varying the proportions of light and darkness to which the ewes are exposed. Modification of experimental procedures, however, would be needed before this practice could be used under practical farm conditions.

Observations during the past three breeding seasons of the experimental flock at Kansas State College have shown that even though ewes may be sexually active, semen quality of rams may be so adversely affected by high temperatures that conception does not take place and lambing failures result. Studies at the Missouri and Kentucky Agricultural Experiment Stations have shown that possibly the semen quality of rams may be improved by providing artificially cooled quarters. Studies at Kansas State College have shown that there is considerable variation in reproductive activity of ewes and rams of different breeding, indicating the possibility of genetic selection for better breeding performance.

It is expected that the following lines of investigation may be continued or initiated as a part of this project.

1. The College purebred and experimental flocks will be used primarily for this study. Cooperators' flocks will be used if and when the experimental procedure can be facilitated by their use.
2. Lactating and non-lactating ewes will be observed for the occurrence of estrus throughout the year to determine the normal pattern of estrus in ewes of different breeding.
3. Rams of different breeds and ages will be checked for semen quality throughout the year to determine normal fluctuations in semen quality and to determine if differences exist in the semen quality of different breeds and ages of rams, particularly during the hotter summer months.
4. A group of ewes will be kept in an artificially cooled room during the hot summer months and their breeding performance compared with similar ewes handled under normal conditions.
5. The semen quality of rams kept in an artificially cooled room during the hot summer months will be compared with that of rams handled under normal conditions.
6. The effects of light upon the breeding activity of ewes and rams will be studied by providing exposure of ewes to varying periods of light and darkness.
7. Hormone treatment will be used if new developments warrant.
8. The lambing records of the College flocks and other flocks will be studied to determine the heritability of twinning, the early lambing trait, and regularity of lambing.

9. Other factors, such as plane of nutrition, will be studied if a need is indicated for this supplemental information.

Studies of the breeding behavior of ewes and rams in the College flock for the past three years have revealed facts that may be of value in better understanding the basic problems involved. These facts, which follow, may also suggest new possibilities for experimental work that could be of value in helping solve the problems.

1. Rambouillet or fine-wool ewes are sexually active during most months of the year. The period of least activity appears to be during February, March, and April. Blackface and whiteface crossbred ewes tend to follow the same pattern in breeding activity, but become sexually active later in the spring and may remain active for a shorter time.

2. Temperatures may play a smaller role in affecting the breeding behavior of ewes than many have thought. Observations made at Kansas State College during the extremely warm summers of 1953 and 1954 show that 60 to 80 percent of the fine-wool ewes came into heat during each of three months: June, July, and August. The accumulative total for the three months would have included between 90 and 95 percent of the ewes. The figures were somewhat lower for the cross breed.

3. Temperatures apparently affect breeding behavior and ability in rams more than in ewes. The semen quality of all the rams used in the experimental flock during the summers of 1953 and 1954 deteriorated to the point that they were virtually sterile during late July and early August.

4. While there may be some variation in temperature tolerance among rams of different breeds and ages, so far the differences have been largely individual, in Kansas studies.

The Effect of Stilbestrol Implants on Fertility in Adult Male Guinea Pigs.

PROJECT 93

J. D. Wheat, C. S. Menzies, and L. A. Holland

July 6, 1955, two adult guinea pig males each was implanted with 24 milligrams of stilbestrol. A young female that previously had given birth to a litter was placed in the cage with these males, but for some time they showed no interest in the female. One male died during the latter part of the summer but the other male remained in the colony until February 29, 1956. The female was kept in the cage with the implanted male and she gave birth to a litter about February 1, 1956. The average gestation length in the guinea pig is 68 days so the implanted male must have recovered from the effect of the stilbestrol and sired this litter by about November 24, 1955, approximately 4½ months after the implant was administered.

This indicates that adult guinea pig males can recover sufficiently from large dosages of stilbestrol to sire progeny.

Stilbestrol in a Guinea Pig Ration.

PROJECT 92

J. D. Wheat, C. S. Menzies, and L. A. Holland

This study was to determine the response of young guinea pigs to stilbestrol added to the basic ration of ground oats, tankage, bonemeal, ground alfalfa hay, and freshly-cut, green alfalfa. Eight litters of guinea pigs, each consisting of two pigs of the same sex, were used. These pigs ranged from 3 to 5 weeks of age and the initial weights ranged from 220.7 to 368.6 grams. Four of the litters were males and four were females. One male from each of the male litters was placed

in the control cage and the other pig from each litter was placed in the treatment cage. The female litters were divided in a similar manner and an effort was made to equalize the initial weights in the control and treatment cages for each sex.

The four animals in each treatment cage received 80 milligrams of stilbestrol-fortified premix daily in addition to the same amount of the basic ration received by the animals in the control cages. Each pig in the treatment cages received approximately 9 micrograms of stilbestrol, mixed with its feed, per day. The experiment began June 7, 1955, and ended August 9, 1955 (9 weeks). The gains, in grams, made by litter mates and the differences in gains made by these litter mates are shown in Table 56.

Table 56

Gains Made by Guinea Pig Litter Mates with and without Stilbestrol in the Ration (in Grams).

Litter number	Initial av. wt. for litter mates	Control ration	Control plus stilbestrol	Difference between gains
		Males		
1	286.5	308.3	155.2	153.1
2	260.3	321.8	256.0	65.8
3	267.2	274.2	197.5	76.7
4	304.0	268.8	260.0	8.8
Total		1173.1	868.7	304.4
Av.		293.3	217.2	76.1
		Females		
5	242.0	268.4	220.9	47.5
6	288.2	202.8	155.1	47.7
7	300.5	149.3	87.6	61.7
8	345.2	227.8	135.7	92.1
Total		848.3	599.3	249.0
Av.		212.1	149.8	62.2

The gains were analyzed statistically and those made by the pigs receiving no stilbestrol in the ration were significantly higher than those made by pigs receiving stilbestrol. The males made significantly higher gains than the females but the addition of stilbestrol to the ration affected the two sexes similarly, as there was no statistical evidence of a different response caused by sex. Among the animals receiving stilbestrol an increase in teat length and size was observed in both sexes as early as the end of the fifth week of the experiment.

Swine

Swine Feeding Investigations

Chemical Analysis of Feeds Used in Swine Feeding Trials, 1955-56.

	Protein, %	Ether extract, %	Crude fiber, %	Moisture, %	Ash, %	N-Free extract, %	Carbohydrates, %
Protein supplement, 4-4-1-1 ..	49.06	3.40	6.98	5.71	11.73	23.12	30.11
Whole milo grain	13.75	3.10	1.97	8.71	1.95	70.52	72.49
Ground dry milo ..	14.00	3.40	2.54	8.19	2.21	69.66	72.20
Wet rolled milo ..	14.19	4.09	2.50	8.45	3.25	67.52	70.02
Molasses-milo mix	13.38	2.78	1.79	8.77	1.98	71.30	73.09
Whole corn (yellow)	10.50	3.94	1.98	10.35	1.33	71.90	73.88
Hog pellets, 3½ to 5	19.06	3.83	2.90	11.31	3.76	59.14	62.04
Hog pellets, 6 to 1	16.94	4.08	3.33	8.08	3.30	64.27	67.60
Hog pellets, 9 to 1	14.31	3.59	2.81	9.26	2.52	67.51	70.32

The Comparative Value of Greenleaf Sudangrass and Common Sudangrass as Pasture for Fattening Spring Pigs.

PROJECT 110, Test 1

C. E. Aubel

This experiment was conducted in the summer of 1955 with spring pigs on pasture. Its object was to compare the quality of the two varieties of sudangrass.

Two lots were fed shelled corn and a mixed animal and plant protein supplement made of 4 parts tankage, 4 parts soybean meal, 1 part cottonseed meal, and 1 part alfalfa meal. Both were self-fed, free choice. Lot 1 was pastured on Greenleaf sudangrass; Lot 2 on Common sudangrass.

The pastures were the same quality and stand. Both furnished ample green forage throughout the test. It was necessary to clip the pastures during the summer to get rid of headed-out stalks and provide good, leafy forage. Both stood the dry weather equally well and were relished equally by the pigs, as well as could be determined by observations.

Table 57 gives the results of this experiment.

Table 57

Comparative Value of Greenleaf Sudangrass and Common Sudangrass as Forage for Fattening Spring Pigs.

June 11, 1955, to September 20, 1955—101 days.

	Shelled corn and protein mixed suppl.	
Ration fed	Greenleaf sudangrass pasture	Common sudangrass pasture
Lot number	1	2
Number pigs in lot	9	9
Av. initial wt. per pig	56.70	57.40
Av. final wt. per pig	183.80	191.44
Av. total gain per pig	127.10	134.04
Av. daily gain per pig	1.26	1.32

Table 57 (Continued).

Av. daily ration per pig:		
Shelled corn, lbs.	3.98	4.20
Protein supplement, lbs.	.67	.67
Feed per 100 lbs. gain per pig:		
Shelled corn, lbs.	316.46	308.19
Protein supplement, lbs.	53.93	50.81

Observations

1. The pigs foraging on the Greenleaf sudangrass made smaller daily gain than those running on the Common sudangrass.

2. The pigs on the Common sudangrass required 8 pounds of corn less per 100 pounds gain than those receiving the Greenleaf sudangrass. They likewise consumed 3 pounds less protein supplement per 100 pounds gain than the pigs pasturing on Greenleaf sudangrass.

3. This experiment indicates that either variety of sudangrass is a satisfactory forage for fattening spring pigs.

The Value of Trimethylalkylammonium Stearate RQ-20 in the Rations of Fattening Pigs on Sudangrass Pasture.

PROJECT 110, Test 2

C. E. Aubel

A new chemical made from beef tallow, RQ-20, recently has come on the market and has been claimed to be beneficial for young pigs being fed for market. Its benefit arises from its anti-scouring action and it is said to be effective as a growth promoter. The substance is a white powder with a special trimethylalkylammonium stearate as the active ingredient to control scours. Steamed bonemeal is the carrier and supplies minerals in proper ratio. The two are mixed at the rate of 1 part RQ-20 to 4 parts steamed bonemeal.

Two lots of pigs were fed in this experiment on sudangrass pasture in the summer of 1955 to test the effectiveness of this compound.

The RQ-20 was mixed in the protein supplement at the rate of 3 pounds to 600 pounds and self-fed. The protein supplement was made of 4 parts tankage, 4 parts soybean meal, 1 part cottonseed meal, and 1 part alfalfa meal. The supplement was fed free choice with shelled corn.

Table 58 gives the results of this experiment.

Table 58

Value of RQ-20 in the Ration of Fattening Pigs on Sudangrass Pasture.

June 11, 1955, to September 20, 1955—101 days.

Basal ration fed: Shelled corn, mixed protein supplement, sudangrass pasture	Basal	Basal + RQ-20
Lot number	1	2
Number pigs in lot	9	10
Av. initial wt. per pig, lbs.	57.40	57.10
Av. final wt. per pig, lbs.	191.44	187.00
Av. total gain per pig, lbs.	134.04	128.90
Av. daily gain per pig, lbs.	1.32	1.27
Av. daily ration per pig, lbs.:		
Shelled corn	4.20	3.73
Protein supplement	.67	.73
Lbs. feed per 100 lbs. gain per pig:		
Shelled corn	308.19	292.70
Protein supplement	50.81	57.64

Observations

The pigs receiving the RQ-20 gained a little more slowly than the pigs that did not receive RQ-20. However, they were slightly more efficient in use of feed, consuming 16 pounds less corn per 100 pounds gain, but 7 pounds more protein supplement.

For practical purposes the RQ-20 was of no benefit to the pigs receiving it in this experiment.

PROJECT 110, Test 3

C. E. Aubel

A second experiment was conducted with fall pigs in the dry lot. Two lots of pigs were used. One lot received the RQ-20 in the protein mixture at the rate of 3 pounds to 600 pounds of supplement. The mixture was self-fed with the shelled corn and was composed of 4 parts tankage, 4 parts soybean meal, 1 part alfalfa meal, and 1 part linseed meal in the dry lot.

Table 59 gives the results of this experiment.

Table 59

Value of RQ-20 in the Ration of Fattening Pigs in the Dry Lot.

December 6, 1955, to March 12, 1956—97 days.

Basal ration fed: Shelled corn, mixed protein supplement in dry lot	Basal	Basal + RQ-20
Lot number	1	2
Number pigs in lot	9	10
Av. initial wt. per pig, lbs.	50.70	52.10
Av. final wt. per pig, lbs.	221.11	217.30
Av. total gain per pig, lbs.	169.11	165.20
Av. daily gain per pig, lbs.	1.74	1.70
Av. daily ration per pig, lbs.:		
Shelled corn	5.16	5.46
Protein supplement	.82	.81
Lbs. feed per 100 lbs. gain per pig:		
Shelled corn	329.04	320.82
Protein supplement	52.36	47.82

Observations

The pigs receiving the RQ-20 gained a little less per day than those not receiving it. They produced their gains a little more efficiently than those not receiving the RQ-20. The differences were small, about 3.5 percent.

The Maximum Value of Alfalfa Meal in Protein Supplements for Pigs on Pasture.

PROJECT 110, Test 4

C. E. Aubel

Since pastures for swine are often poor, inadequate, or unavailable in Kansas, there is a growing appreciation of the value of alfalfa hay or meal in the rations of all swine brood sows (and pigs being fed for market). This experiment was designed to secure information on the maximum use of alfalfa meal in protein supplemental mixtures as a substitute for pasture, tested with pigs on summer pasture and in dry lot.

In the test two lots of pigs were fed shelled corn and a mixed protein supplement, with varying quantities of alfalfa meal on sudangrass pas-

ture, and one lot was fed in the dry lot, with a large quantity of alfalfa meal in the protein supplement to ascertain whether alfalfa meal thus fed could replace the green pasture. All feeds were self-fed.

Lot 1 on pasture received 4 parts tankage, 4 parts soybean meal, 1 part cottonseed meal, and 1 part alfalfa meal.

Lot 2 on pasture received 4 parts tankage, 4 parts soybean meal, and 2 parts alfalfa meal.

Lot 3 in the dry lot received 4 parts tankage, 4 parts soybean meal, and 3 parts alfalfa meal.

Table 60 gives the results of this experiment.

Table 60

The Maximum Value of Alfalfa Meal in Protein Supplements for Pigs on Pasture.

June 11, 1955, to September 20, 1955—101 days.

	Shelled corn, sudangrass pasture, mixed protein supplement		Shelled corn, mixed protein supplement in dry lot
Ration fed	4 parts tankage 4 parts S.B.M. 1 part alf. meal 1 part C.S.M.	4 parts tankage 4 parts S.B.M. 2 parts alf. meal	4 parts tankage 4 parts S.B.M. 3 parts alf. meal
Lot number	1	2	3
Number pigs in lot	9	9	10
Av. initial wt. per pig, lbs.	57.40	57.80	58.80
Av. final wt. per pig, lbs.	191.44	197.88	192.20
Av. total gain per pig, lbs.	134.04	140.08	133.40
Av. daily gain per pig, lbs.	1.32	1.38	1.33
Av. daily ration per pig, lbs.:			
Shelled corn	4.20	4.12	4.30
Protein supplement	.67	.69	.77
Lbs. feed per 100 lbs. gain per pig:			
Shelled corn	308.19	289.12	325.71
Protein supplement	50.81	55.52	58.62

Observations

1. Gains made by the pigs in all three lots were about the same, with a little advantage in the lot receiving 2 parts of alfalfa meal on pasture. Daily corn consumption varied little. The dry-lot pigs consumed about .1 pound per day more protein supplement than the pasture-grazing pigs.

The feed consumption per 100 pounds gain was greatest by the dry-lot-fed pigs, as expected. On pasture the requirements were within experimental expectation; a slight advantage was found in Lot 2 that received the most alfalfa meal.

2. These results confirm last year's and indicate a little preference for more alfalfa meal in the ration.

Varying Quantities of Alfalfa Meal in the Rations of Spring Pigs and in the Dry Lot.

PROJECT 110, Test 5

C. E. Aubel

This experiment was conducted the summer of 1955 with spring pigs to obtain information on maximum use of alfalfa meal in protein supplemental mixtures for pigs in the dry lot.

Four lots of pigs were self-fed shelled corn and a mixed protein supplement. Lot 1 pigs were placed on sudangrass pasture and self-fed protein supplement made up of 4 parts tankage, 4 parts soybean meal, 1 part cottonseed meal, and 1 part alfalfa meal.

Lot 2 received the same protein supplement as Lot 1 for 38 days or until they weighed 100 pounds. They were then removed from the

Table 61

Varying Amounts of Alfalfa Meal in the Rations of Spring Pigs in the Dry Lot.

June 11, 1955, to September 20, 1955—101 days.

	Shelled corn, sudangrass pasture, mixed protein supplement		Shelled corn, mixed protein supplement in dry lot		
	4 parts tankage 4 parts S.B.M. 1 part C.S.M. 1 part alf. meal	4 parts tankage 4 parts S.B.M. 1 part C.S.M. 1 part alf. meal	5 parts tankage 5 parts alf. meal	4 parts tankage 4 parts S.B.M. 3 parts alf. meal	5 parts tankage 5 parts alf. meal
Lot number	1	2	2	3	4
		(June 11-July 19—39 days)	(July 19-Sept. 20—62 days)		
Number pigs in lot	9	10	10	10	10
Av. initial wt. per pig, lbs.	57.40	58.90	100.10	58.80	58.05
Av. final wt. per pig, lbs.	191.44	100.10	177.80	192.20	169.80
Av. total gain per pig, lbs.	134.04	41.20	77.70	133.40	111.30
Total gain—Lot 2—entire period, lbs.		118.90			
Av. daily gain per pig, lbs.	1.32	1.05	1.25	1.33	1.10
Av. daily gain per pig—Lot 2—entire period, lbs.		1.17			
Av. daily ration per pig, lbs.:					
Shelled corn	4.20	4.68	4.14	4.30	3.89
Protein supplement	.67	.25	.58	.77	.55
Lbs. feed per 100 lbs. gain per pig:					
Shelled corn	308.19	442.96	330.63	325.71	353.54
Protein supplement	50.81	24.27	54.82	58.62	52.92
Lbs. feed per 100 lbs. gain per pig: (Lot 2) for entire period—					
Shelled corn		352.73			
Protein supplement		44.23			

pasture and put into a dry lot and fed a protein supplement of equal parts tankage and alfalfa meal until the close of the experiment, when they weighed 178 pounds.

Lot 3 was fed in the dry lot the entire feeding period on a protein mixture of 4 parts tankage, 4 parts soybean meal, and 3 parts alfalfa meal.

Lot 4 was fed in the dry lot the entire feeding period with an increased alfalfa meal allowance, a protein supplement mixture of 5 parts tankage and 5 parts alfalfa meal.

Table 61 gives the results of this experiment.

Observations

In this experiment Lot 1 pigs on pasture the entire feeding period and the pigs in Lot 3 in the dry lot the entire period on 3 parts of alfalfa meal made about the same daily gains. They gained 1.32 and 1.33 pounds daily, respectively, for the period. A little less feed (both corn and supplement) per 100 pounds gain was consumed by pigs on pasture.

The Lot 2 pigs finished in dry lot after reaching 100 pounds on pasture, and the Lot 4 pigs in the dry lot the entire period made the poorest gains, 1.17 and 1.10 pounds daily, respectively. They also had higher feed requirements per 100 pounds gain.

The results of this experiment indicate that when the allowance of alfalfa meal in a ration is too high, efficiency decreases, but that a ration containing the right quantity of alfalfa meal and fed in dry lot will be as efficient as pasture-fed pigs that receive less alfalfa meal.

This experiment should be repeated to verify these observations.

Free-Choice Feeding of Shelled Corn and a Protein Mixed Supplement Compared with Feeding Pigs Completely Mixed Rations in Pellet Form.

PROJECT 110, Test 6

C. E. Aubel

What is the best way to feed corn to growing-fattening pigs? Should it be shelled and fed free choice with a good mixed protein supplement, or should the hogs be fed completely mixed rations as meal or in pellet form? For years growing-fattening pigs have been considered capable of balancing their own rations when fed free choice. Recently experiments have shown it better practice to give pigs their feed as completely mixed rations.

This experiment consisted of two lots of nine pigs each. Lot 1 pigs were fed free-choice shelled corn and a mixed protein supplement made up of 4 parts tankage, 4 parts soybean meal, 1 part linseed meal, and 1 part alfalfa meal. The supplement had a crude protein percentage of 49. Lot 2 pigs were fed pellets of corn ground and mixed with the same protein supplement at the ratio of 3½ parts corn to 1 part supplement. This was fed from 50 pounds, their starting weight, to 75 pounds. The 3½-to-1 pellet had a protein percentage of 19.06. At 75 pounds the ratio of corn to protein supplement was changed to 6 to 1 and fed until the pigs reached 125 pounds. This pellet tested 16.9 percent protein. From 125 pounds to finish the pigs received a pellet with corn to supplement ratio of 9 to 1, which had a protein percentage of 14.3. No antibiotic was fed to either lot.

Table 62 gives the results.

Table 62

Free-Choice Feeding Compared with Completely Mixed Rations in Pellets.

December 6, 1955, to March 12, 1956—97 days.

Ration fed	Shelled corn, Protein-mixed supplement, free choice	Pellets (complete mixture corn and protein supplements)
Lot number	1	2
Number pigs in lot	9	9
Av. initial wt. per pig, lbs.	50.70	51.90
Av. final wt. per pig, lbs.	221.11	203.33
Av. total gain per pig, lbs.	169.11	151.43
Av. daily gain per pig, lbs.	1.74	1.56
Av. daily ration per pig, lbs.:		
Shelled corn	5.16	
Protein supplement	.82	
Pellets		5.47
Lbs. feed per 100 lbs. gain per pig:		
Shelled corn	329.04	
Protein supplement	52.36	
Pellets		350.87

Observations

1. The daily feed consumption of the pigs fed free choice was .51 pound greater than that of those fed pellets.
2. The pigs fed free choice gained .18 pound more each day than the pellet-fed pigs.
3. The pellet-fed pigs required 30.5 pounds less total feed than the pigs fed free choice.
4. In this experiment complete mixtures of corn and protein supplements slowed the daily rate of gain but reduced the feed consumed per 100 pounds gain. If the costs of grinding, mixing, and pelleting were considered, their expense probably would offset the cost of the 30.5 pounds of feed saved.

Comparative Value of Corn and Whole and Ground Milo as Swine-Fattening Feeds.

PROJECT 110, Test 7

C. E. Aubel

In many parts of Kansas sorghum grains are grown extensively. In previous feeding tests with hogs at this station, some sorghum grains gave excellent results compared with corn. In 1950 Westland milo and Midland milo gave 12 percent greater daily gains than did corn. The economy in feed per 100 pounds gain was about 5 percent better from sorghum grain than from corn. Because corn has been more difficult to produce in Kansas while sorghum grains have increased in popularity, it was thought advisable to get results from a 1956 experiment that compared corn with sorghum grain, with the sorghum grain prepared for feeding in different ways.

Five lots of pigs were self-fed in dry lot. All lots received a mixed animal and plant protein supplement of 4 parts tankage, 4 parts soybean meal, 1 part linseed meal, and 1 part alfalfa meal. The milo was an unidentified variety, straight elevator run. Lot 1 received shelled corn; Lot 2, whole milo; Lot 3, dry rolled milo; Lot 4, wet rolled milo; and Lot 5, rolled milo with 5 percent cane molasses added.

Table 63 gives the results.

Table 68

Comparative Value of Corn and Milo as Swine-Fattening Feeds.

December 6, 1955, to March 12, 1956—97 days.

Ration fed	Shelled corn, Protein mixed supplt.	Whole milo, Protein mixed supplt.	Dry-rolled milo, Protein mixed supplt.	Wet-rolled milo, Protein mixed supplt.	Rolled milo, 5 percent molasses-mixed protein supplt.
Lot number	1	2	3	4	5
Number pigs in lot	9	9	9	10	9
Av. initial wt. per pig, lbs.	50.70	52.77	52.40	51.50	50.30
Av. final wt. per pig, lbs.	221.11	216.66	214.77	198.50	219.44
Av. total gain per pig, lbs.	169.11	163.89	162.37	147.00	169.14
Av. daily gain per pig, lbs.	1.74	1.68	1.67	1.51	1.74
Av. daily ration per pig, lbs.:					
Grain	5.16	6.28	6.68	5.96	6.47
Protein mix	.82	.79	.88	.91	.86
Lbs. feed per 100 lbs. gain per pig:					
Grain	329.04	372.06	399.36	354.08	371.15
Protein mix	52.36	46.98	52.62	54.14	49.40

Observations

1. The daily gains of the pigs receiving corn were slightly greater than for the pigs receiving whole or dry-rolled milo. With the wet-rolled milo daily gains of pigs were .23 pound less. The pigs getting rolled milo with molasses made the same daily gains as the corn-fed pigs.

Thus the whole- or dry-rolled milo on a pound-for-pound basis was about 3 percent less efficient than corn. The wet-rolled milo was about 13 percent less efficient.

2. The quantity of grain consumed per 100 pounds gain was greater in all the milo-fed lots than in the corn-fed lots, running from a little less than 1 percent with wet-rolled milo to 21 percent with the dry-rolled milo; however, cost of corn usually is at least 20 percent more than milo per pound.

3. The protein supplement requirements per 100 pounds gain varied from a little less in Lots 2 and 5 to a little more in Lots 3 and 4 than required by pigs fed corn. The protein requirements for all varied only slightly.

4. The milo was palatable. Each lot fed milo consumed more grain daily than the lot fed corn.

5. Milo was a satisfactory, though not outstanding, grain for feeding in this experiment.

Metabolism of Carotenoid Pigments and Vitamin A by Swine.

PROJECT 311, Test 8

Relative Value of Carotenoid Pigments of New-Crop (1954) Yellow Corn and Old-Crop (1948-49 government stored) Yellow Corn and of Dehydrated Alfalfa for Supplying the Vitamin A Requirements of Weanling Pigs.

D. B. Parrish and C. E. Aubel

Question has been raised concerning the vitamin A potency of stored yellow corn. Samples of 1954 corn and 1948-49 stored corn were analyzed for provitamin A content by a separation and chemical determination of the carotene and crude cryptoxanthin contents. The 1948-

49 sample was found to have a vitamin A activity of about 800 units per pound, slightly less than one-third of that of 1954 corn. In this work 1 mg. of carotene was given a vitamin A value of 1.6 units and cryptoxanthin one-half that value, which are the vitamin A activities previously determined by bioassay with rats. Although much vitamin A activity apparently had been lost during storage of yellow corn, there was still the problem of the availability of the remaining vitamin A for animals. This was studied, using weanling pigs as the experimental animal.

Twenty-seven weanling pigs of both sexes were distributed on the basis of weight and sex into nine lots. These pigs were from gilts fed a vitamin A restricted diet during the gestation and nursing periods.

Pigs in three lots were given ration 1, containing old-crop yellow corn as the sole source of vitamin A. Three lots were given ration 2, containing only sufficient new-crop yellow corn to supply the same vitamin A activity as ration 1. The rest of the corn of this ration was white. Three lots were given ration 3 containing white corn plus sufficient high-quality dehydrated alfalfa so that the ration had the same vitamin A activity as ration 1. Rations are shown in Table 64.

These rations contained about 610 units of vitamin A activity per pound, based on chemical analysis. Based on available information, the pigs should have obtained sufficient vitamin A from this ration for growth when fed according to accepted feeding standards, provided the analytically determined vitamin A was available to the pigs. There would not, however, be much excess vitamin A activity, so any marked differences found in utilization should affect growth and vitamin A storage.

For the first week after weaning the pigs were fed rations containing all white corn and no supplemental source of vitamin A. The three experimental rations were fed for nine weeks. Pigs in each lot were group fed. The pigs did not eat the experimental feeds readily for a few days, and for a short time feed intake, as well as vitamin A intake, was less than expected.

Blood serum was analyzed for vitamin A content at the end of the experiment. Average body weights and vitamin A content of serums are shown in Table 65.

Observations

By analytical chemical determinations a sample of old-crop yellow corn (1948-49) had a vitamin A potency of about 800 units per pound and a sample of new-crop yellow corn (1954) had a vitamin A potency of 2700 units per pound. Carotene and cryptoxanthin, two yellow pigments, supply the vitamin A activity of corn.

Gains of pigs fed the old-crop yellow corn ration were a little less than those of the pigs fed new-crop yellow corn or alfalfa, but vitamin A content of blood serums was a little more in pigs fed the old corn. In view of the small differences observed and small variations within ration groups, it appears that results were essentially the same, regardless of the source of vitamin A in the ration. The provitamin A of old-crop yellow corn, as determined by analytical chemical methods, appeared to be as available to weanling pigs in this experiment as provitamin A from new-crop yellow corn or alfalfa meal.

Table 64
Composition of Rations Fed Weanling Pigs.[1]

Ration	1	2	3
	%	%	%
Yellow corn	76[2]	22.3[3]	
White corn		53.7	73.5
Soybean oil meal	17	17	17
Non-fat dry milk	2.5	2.5	2.5
Brewer's yeast	1.5	1.5	1.5
Limestone, Bonemeal, Salt	1	1	1
Vitamin premix[4]	1	1	1
Trace mineral premix[4]	1	1	1
Dehydrated alfalfa			2.5[5]

1. Ration mixed three times. Composition adjusted slightly each time based on vitamin A potency values obtained on corn and alfalfa just previous to ration mixing.
2. Old-crop stored corn (1948-49).
3. New-crop corn (1954).
4. Premix carriers were shorts.
5. 1128 grams.

Table 65
Average Body Weights and Vitamin A Content of Blood Serum of Pigs.

Rations	Lot[1]	Average wt 5/9/55	Average wt 7/2/55	Average gain By lot	Average gain By ration	Vitamin A, mg./100 ml serum[2] By lot	Vitamin A, mg./100 ml serum[2] By ration
Old-crop corn	1	19.8	51.0	31.2		7.0	
	2	19.7	51.5	31.8		7.6	
	3	19.2	53.4	34.2		6.4	
					32.4		7.0
New-crop corn	4	20.0	53.4	33.4		8.1	
	5	19.7	53.4	33.7		5.4	
	6	19.3	54.7	35.4		4.5	
					34.2		6.0
Alfalfa meal	7	20.0	52.7	32.7		5.8	
	8	19.0	53.5	34.5		6.7	
	9	19.8	55.3	35.5		3.8	
					34.2		5.4

1. Three pigs per lot.
2. At termination of experiment.

Feed Prices Used in Beef Cattle Tests, 1955-56.

Milo	$ 2.35 per cwt.
Corn	1.60 per bu.
Corn and alfalfa pellets	62.00 per ton
Cottonseed oil meal pellets	70.00 per ton
Soybean oil meal pellets	70.00 per ton
Sorghum silage	6.50 per ton
Alfalfa hay	20.00 per ton
Prairie hay	20.00 per ton
Molasses	2.20 per cwt.
Bluestem pasture, summer, yearling	16.00 per head
two-year-old	20.00 per head
Bluestem pasture, winter, calf	.50 per head per month
yearling	.75 per head per month
Bonemeal and salt mixture	80.00 per ton
Salt	15.00 per ton
Ground limestone	15.00 per ton

1. The prices reported here were used in calculating beef cattle feed costs, unless otherwise stated.