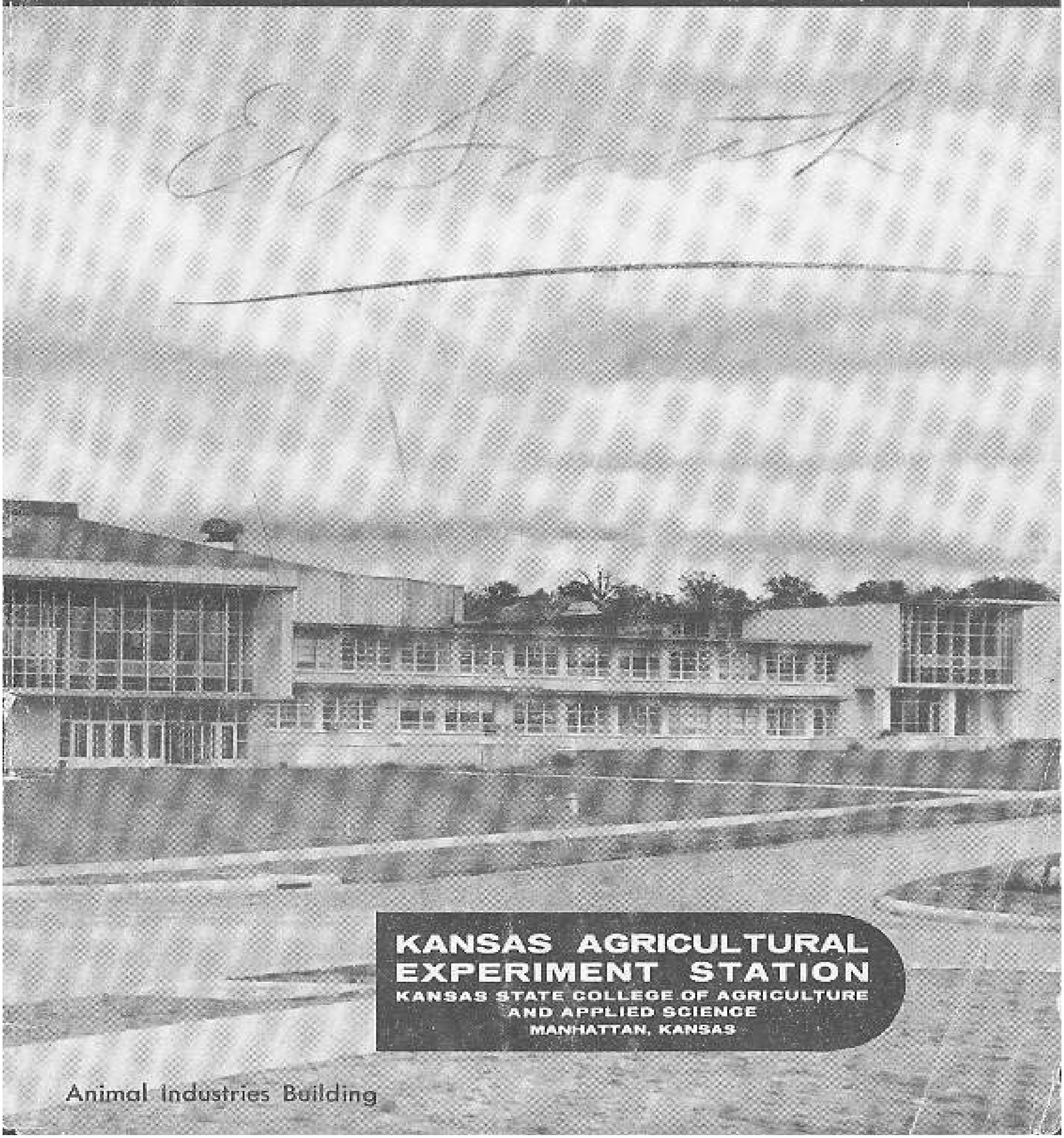
Circular 358
May 3, 1958

45th ANNUAL

LIVESTOCK FEEDERS' DAY

1957-1958 PROGRESS REPORTS



Animal Industries Building

KANSAS AGRICULTURAL EXPERIMENT STATION

KANSAS STATE COLLEGE OF AGRICULTURE AND APPLIED SCIENCE
MANHATTAN, KANSAS

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45th Annual Livestock Feeders' Day

KANSAS STATE COLLEGE

MANHATTAN, KANSAS

MAY 2 AND 3, 1958

Friday, May 2, 1958—Livestock Arena
Animal Industries Building

1:00 p.m.—*Beef Producers Need Meat-Type Cattle? We've Got 'em*—Kenneth R. Fulk, Secretary, American Shorthorn Breeders Association, Chicago, Ill.

We Must Keep Quantity (Weight-for-age, Size, etc.) and Type and Quality in Balance—Paul Swaffar, Secretary, American Hereford Association, Kansas City, Mo.

Too Big! Too Small! Too Much Bone! Too Refined! How Do We Recognize the Optimum?—Frank Richards, Secretary, American Angus Association, St. Joseph, Mo.

Kansas Purebred Sheep Breeders' Association Program

Kansas Swine Improvement Association Program

Why the Meat-Type Hog—Dr. J. C. Hillier, Oklahoma State University, Stillwater, Okla.

Meats Exhibit and Demonstrations—Animal Husbandry Staff

Animal Breeding and Genetics Exhibit—Animal Husbandry Staff

7:30 p.m.—Livestock Arena

Livestock Parade and Exhibits—Animal Husbandry Staff

Quarter Horse Exhibit and Cutting Demonstration—Kansas Quarter Horse Association

Saturday, May 3, 1958

9:30 a.m.—Livestock Arena

Presiding—Orville Burtis, Manhattan, President, Kansas Livestock Association

Experimental lots of livestock studied and compared

11:15 a.m.—*Meat Producers Have Come Through*—Carl Neumann, Secretary-Manager, National Livestock and Meat Board, Chicago, Ill.

12:15 p.m.—Lunch—Animal Industries Building

1:30 p.m.—Livestock Arena

Presiding—Dr. James A. McCain, President, Kansas State College

Invocation—Dr. William Tremmel, Director of Student Religious Activities, K.S.C.

Introduction of Guests—President McCain

Dedication of Animal Industries Building

Presentation—Mr. McDill Boyd, Chairman, Kansas State Board of Regents

Acceptance—President McCain

This circular is composed of reports from three departments of Kansas Agricultural Experiment Station, Manhattan. Many persons have been involved in this research and in preparation of this circular. Names of persons most closely involved with each project are listed with the report of the project. Contribution No. 223, department of Animal Husbandry; No. 573, department of Chemistry; and No. 204, department of Home Economics (Foods and Nutrition), Kansas Agricultural Experiment Station.

A Center for Research and Education in the Animal Industries—Dr. Arthur D. Weber, Dean of Agriculture, Kansas State College

Research and the Livestock Industry—Dr. Oliver S. Willham, President, Oklahoma State University, Stillwater

10-minute recess

2:30 p.m.—Announcement of Beef Production Contest Awards—W. H Atzenweiler, Agriculture Commissioner, Chamber of Commerce, Kansas City, Mo.

Concluding Reports of Livestock Experiments—Animal Husbandry Staff

Question and discussion period for all who wish to stay.

6:30 p.m.—Kansas State Union

Banquet for parents and visiting stockmen and ladies—Block and Bridle Club

FOR THE LADIES

Friday, May 2, 1958

6:30 p.m.—Dinner—Gillett Hotel

Kansas Cow Belles and Visiting Ladies (Make reservations in advance with Mrs. C. G. Elling, 2230 Anderson, Manhattan.)

Saturday, May 3, 1958

9:00 a.m.—Coffee—Room 103, Animal Industries Building, by Animal Husbandry Wives

9:30 a.m.—Auditorium (Room 107), Animal Industries Building

Program sponsored jointly by School of Home Economics and Animal Husbandry Department

Presiding—Mrs. Edwin Brown, Fall River, Kan., President, Kansas Cow Belles

Address—Rita Campbell, National Livestock and Meat Board, Chicago, Ill.

What Makes Beef Good to Eat?—Marilyn McNelis, Ruby Franklin, Grayce Goertz and Dorothy Harrison, School of Home Economics, Kansas State College

12:15 p.m.—Lunch—Animal Industries Building (See General Program.)

1:00 p.m.—Livestock Arena

Dedication of new Animal Industries Building (See General Program.)

6:30 p.m.—Block and Bridle Banquet (See General Program.)

MILO AND SORGHUM GRAIN

Inasmuch as the sorghum varieties and hybrids used for grain at present are largely the result of hybridization between such sorghum types as true milo, kafir, feterita, and others, they do not possess all characteristics common to any one type. Therefore they cannot rightfully be referred to by any single type name. Although the term **milo** is frequently applied to all sorghum used for grain, this use is incorrect and can even be misleading. The preferable terms in this case are **grain sorghum** for the entire plant, **sorghum grain** for the seed of such a plant, and **milo** only when speaking of true milo. Such usage has been followed in this circular.

Swine

The Value of Vigofac and Terramycin B_{12} Supplement Bi-Con TM-10 Antibiotic in the Rations of Fattening Pigs on Alfalfa Pasture (Project 110, Test 2).

C. E. Aubel

Vigofac, put out by Chas. Pfizer & Co., is another additive that has recently come into the pig-feeding arena. It was thought desirable to compare it with antibiotics for fattening pigs on pasture.

In this test four lots of spring pigs were self-fed free choice a basal ration of shelled corn and a mixed protein supplement on alfalfa pasture. The mixed protein supplement was made up of 4 parts tankage, 4 parts soybean meal, 1 part linseed meal, and 1 part alfalfa meal. Lot 1 pigs received no Vigofac or antibiotic. They were self-fed the basal ration of a mixed protein supplement and shelled corn. Lot 2 pigs were self-fed shelled corn and a mixed protein supplement to which had been added Vigofac at the rate of 27 pounds to the ton.

Lot 3 pigs were self-fed shelled corn and a mixed protein supplement to which had been added Vigofac at the rate of 27 pounds to the ton, and Bi-Con TM-10 Terramycin B_{12} antibiotic at the rate of 4½ pounds to the ton. Lot 4 pigs were self-fed shelled corn and a mixed protein supplement to which had been added Bi-Con TM-10 at the rate of 4½ pounds to the ton. Table 1 shows the results of this experiment.

Table 1

The Value of Vigofac and Terramycin B_{12} Supplement Bi-Con TM-10 Antibiotic in the Rations of Fattening Pigs on Alfalfa Pasture.

June 9, 1957, to September 17, 1957—100 days.

Basal ration fed: Shelled corn, mixed protein supplement, in the dry lot	Basal	Basal + 27 lbs. per ton Vigofac	Basal + Vigofac, 27 lbs. per ton + Bi-Con TM-10, 4½ lbs. per ton	Basal + Bi-Con TM-10, 4½ lbs. per ton
Lot number	1	2	3	4
Number pigs in lot	10	10	10	10
Av. initial wt. per pig, lbs.	60.20	59.40	60.30	60.30
Av. final wt. per pig, lbs.	181.00	208.90	192.90	180.50
Av. total gain per pig, lbs.	119.80	149.50	132.60	120.20
Av. daily gain per pig, lbs.	1.19	1.49	1.32	1.20
Av. daily ration per pig, lbs.:				
Shelled corn	3.85	4.35	4.26	3.87
Protein supplement	.37	.37	.32	.30
Lbs. feed per 100 lbs. gain per pig:				
Shelled corn	321.70	291.37	321.71	322.79
Protein supplement	30.96	25.01	24.73	24.45

Observations

In this experiment the pigs that received the Vigofac made the larger gains. They exceeded the gains made by the lot 3 pigs that received Vigofac and the antibiotic Bi-Con TM-10 Terramycin B_{12} supplement. The lot 2 pigs also consumed least total feed per 100 pounds gain of any of the lots in the experiment.

Acknowledgment is made to Chas. Pfizer & Co., Inc., Terre Haute, Ind., for supplying the Terramycin B_{12} supplement, Bi-Con Tm-10, and the Vigofac for this experiment.

The pigs in lot 3 receiving the Vigofac and the terramycin made the next largest gains and likewise made a good showing in total feed consumption, although not quite as efficient as the pigs in lot 2.

In conclusion it may be said that when Vigofac was added to a ration of shelled corn and good mixed protein supplement to pigs on pasture, a good response was achieved. Adding, in addition, terramycin antibiotic did not improve the gains or feed conversion factor. Antibiotic alone in this test of pasture-fed pigs did not improve the gains or feed consumption of the pigs over that where no antibiotic was fed.

The Value of Furazolidone Nf-180 and Terramycin Bi-Con TM 10 Antibiotic in the Rations of Fattening Pigs on Alfalfa Pasture (Project 110, Test 1).

C. E. Aubel

One of the most critical problems of the swine industry is disease. Antibiotics have been demonstrated to be effective in keeping some diseases at a low level. The nitrofurans have shown good results for certain specific diseases in poultry. Their effect in swine feeding is little known, for few experiments have been carried on feeding them to swine.

This experiment was initiated to study the effect of Furazolidone Nf-180 in rations for growing and fattening swine.

In this test four lots of fall pigs were self-fed free choice a basal ration of shelled corn and a mixed protein supplement on alfalfa pasture. The mixed protein supplement was made up of 4 parts tankage, 4 parts soybean meal, 1 part linseed meal, and 1 part alfalfa meal.

Lot 1 pigs received no nitrofuran. They were self-fed the basal ration, a mixed protein supplement, and shelled corn.

Lot 2 pigs received shelled corn and a mixed protein supplement to which had been added Nf-180 at the rate of 2¼ pounds per ton. This supplied it to the pig at the rate of about 25 gms. per ton of total feed.

Lot 3 pigs received the same feed ration as did those in lot 2 except that they also received Bi-Con TM-10 at the rate of 4½ pounds to a ton.

Lot 4 pigs received shelled corn and a mixed protein supplement to which had been added Bi-Con TM-10 at the rate of 4½ pounds to a ton.

Table 2 gives the results of this experiment.

Acknowledgment is made to Hess & Clark, Inc., Ashland, Ohio, for supplying the Furazolidone Nf-180 for this experiment, and to Chas. Pfizer & Co., Terre Haute, Ind., for the Terramycin B_{12} supplement, Bi-Con TM-10.

Table 2

The Value of Furazolidone Nf-180 and Terramycin Bi-Con TM-10 Antibiotic in the Rations of Fattening Pigs on Alfalfa Pasture.

June 9, 1957, to September 17, 1957—100 days.

Basal ration fed: Shelled corn, mixed protein supplement, on pasture	Basal	Basal + Nf-180 at 25 gms. per ton level	Basal + Nf-180 at 25 gms. per ton level; Bi-Con TM-10, 4½ lbs. per ton	Basal + Bi-Con TM-10 at 4½ lbs. per ton
Lot number	1	2	3	4
Number pigs in lot	10	10	10	10
Av. initial wt. per pig, lbs.	60.20	60.30	60.40	60.30
Av. final wt. per pig, lbs.	181.00	188.70	187.20	180.50
Av. total gain per pig, lbs.	119.80	128.40	126.80	120.20
Av. daily gain per pig, lbs.	1.19	1.28	1.26	1.20
Av. daily ration per pig, lbs.:				
Shelled corn	3.85	3.87	4.17	3.87
Protein supplement	.37	.38	.35	.30
Lbs. feed per 100 lbs. gain per pig:				
Shelled corn	321.70	311.79	345.54	322.79
Protein supplement	30.96	30.17	28.22	24.45

Observations

In this experiment the pigs that received the Furazolidone Nf-180 supplement made faster gains than the pigs receiving no drug or those receiving Terramycin B_{12} antibiotic. The lot receiving the drug, and in addition receiving Terramycin as in lot 3, made for practical purposes about the same gain as the pigs that received the drug alone. In feed consumption, the pigs in lot 2 that received the drug alone utilized less corn per 100 pounds gain than the pigs in any of the other lots, but the pigs in lot 3 receiving the drug and the antibiotic for some reason or other utilized more corn per 100 pounds gain, although not quite so much protein supplement. The pigs in lot 4 receiving the antibiotic utilized about the same grain per 100 pounds gain as the pigs in the lot receiving no drug or antibiotic.

In conclusion it may be said that the pigs in lot 2, receiving the Nf-180, made the best showing of all the lots in this test with larger daily gains and less total feed consumption. The pigs in lot 3 receiving the drug and antibiotic required more feed than any of the other pigs in the experiment but made comparable daily gains with lot 2. The reason for this has not been determined, but two pigs in lot 3 did not do well and were scarcely up to the average of the rest in the lot. This may be the reason.

The Comparative Value of Corn, Open-pollinated Grain Sorghum, and Hybrid Grain Sorghum as Fattening Feeds to Fall Pigs in the Dry-Lot (Project 110-4).

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, especially hybrids, have increased in popularity, it was thought advisable to get results from a 1958 experiment that compared corn with both open-pollinated and hybrid sorghum grain, with the sorghum grains prepared for feeding in different ways.

Five lots of pigs were self-fed free-choice 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 open-pollinated sorghum was the Plainsman variety, of excellent quality, being especially high in protein. The hybrid sorghum was Farmer's Union 222 and was somewhat high in moisture.

Table 3 gives the chemical analysis of the feeds used in this experiment.

Table 3

	Protein (Nx6.25)	Ether extract	Crude fiber	Moisture	Ash	N-free extract	Carbohydrates
Sorghums:							
F.U. 222	6.63	2.43	1.63	15.68	1.24	72.39	74.02
Open-pollinated	13.81	2.89	1.52	12.45	1.50	67.83	69.35
Corn (yellow)	9.75	3.51	1.98	14.78	1.35	68.63	70.61
Protein supplement, 4-4-1-1	45.88	4.04	6.33	7.84	11.34	24.57	30.90

In this experiment lot 1 received, with the protein supplement, whole hybrid sorghum grain. Lot 2 received rolled hybrid sorghum grain, lot 3 whole open-pollinated sorghum grain, lot 4 rolled open-pollinated sorghum grain, and lot 5 shelled corn.

Table 4 gives the results of this experiment.

Table 4

The Comparative Value of Corn, Open-pollinated Sorghum, and Hybrid Sorghum as Swine-fattening Feeds.

December 2, 1957, to March 20, 1958—107 days.

Ration fed	Whole hybrid sorghum, protein-mixed supplement	Rolled hybrid sorghum, protein mixed supplement	Whole open-pollinated sorghum, protein-mixed supplement	Rolled open-pollinated sorghum, protein-mixed supplement	Shelled corn, protein-mixed supplement
Lot number	1	2	3	4	5
Number of pigs per lot	8	8	8	8	8
Av. initial wt. per pig, lbs.	52.40	52.60	52.50	52.40	52.80
Av. final wt. per pig, lbs.	176.22	180.41	198.62	199.42	175.43
Av. total gain per pig, lbs.	123.82	127.80	146.12	147.02	122.63
Av. daily gain per pig, lbs.	1.15	1.19	1.36	1.37	1.14
Av. daily ration per pig, lbs.:					
Grain	4.13	4.03	4.71	4.85	4.15
Protein supplement	.54	.54	.56	.53	.55
Av. lbs. feed per cwt. gain per pig:					
Grain	357.37	337.44	345.60	353.69	362.88
Protein supplement	48.05	45.48	41.14	39.19	48.51

Observations

Pigs in lots 3 and 4, those that received the open-pollinated sorghum, made the largest daily gains, 1.36 and 1.37 pounds, respectively. They also ate more feed per day. The amount of feed per 100 pounds gain was low. The sorghum fed in these lots was of excellent quality, clean, high protein and good plump grain, which probably accounts for its superiority in this experiment. The hybrid sorghum fed in lots 1 and 2 made gains a little better than the corn fed in lot 5. The hybrid sorghum was not of very good quality, was somewhat wet, and the grain was not too plump or clean.

All factors considered, the sorghums, both open-pollinated and hybrid, showed up well. This is consistent with other experiments where sorghum has been superior to corn for fattening hogs.

The Value of the Antibiotic B_{12} Supplement Terramycin Bi-Con TM-10 Vitamin B_2 Premix (Fortafeed 2-49-C), and Aureomycin B_{12} Supplement Aurofac 2A in the Protein Supplement for Fattening Spring Pigs in the Dry-Lot in Summer (Project 110, Test 3).

C. E. Aubel

In 1956-57 experiments with swine were designed to secure information on the maximum use of alfalfa meal in protein supplemental mixtures as a dry-lot substitute for pasture, since pastures for swine in Kansas are often poor, inadequate, or unavailable. The pigs in these tests received, with their grain, mixed protein supplements which contained varying quantities of alfalfa meal. The mixed protein supplement that gave best results for the two years tested was one of 4 parts tankage, 4 parts soybean meal, and 3 parts alfalfa meal.

From time to time there come on the market new substances, chemical

Acknowledgment is made to Chas. Pfizer & Co., Inc., Terre Haute, Ind., for supplying the Terramycin B_{12} Supplement, Bi-Con TM-10, for this experiment; and to the American Cyanamid Co., Lederle Laboratories Division, New York, for the Fortafeed 2-49-C and the Aurofac 2A.

and otherwise, that, added to a ration, increase gains and feed efficiency. To the efficient protein supplement of the two years preceding, antibiotics and a vitamin B_2 premix were added to see if the 4 parts tankage, 4 parts soybean meal, and 3 parts alfalfa meal protein mixture would then produce more efficient gains.

In this test four lots of pigs were self-fed shelled corn and a mixed protein supplement. Each lot contained 10 pigs.

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

Lot 2 pigs were treated exactly as those in lot 1, except that 4½ pounds of the antibiotic Terramycin Bi-Con TM-10 was added to each ton of the supplement.

Lot 3 pigs were fed in the dry-lot and received a mixed protein supplement of 4 parts tankage, 4 parts soybean meal, and 3 parts alfalfa meal.

Lot 4 was fed in the dry-lot and received the same protein supplement as lot 3 with 15 pounds of aureomycin B_{12} (Aurofac 2A) and 15 pounds of Fortafeed 2-49-C, a vitamin premix added per ton of protein mixture.

Table 5 gives the results of this experiment.

Table 5

The Value of Antibiotic Terramycin (Bi-Con TM-10), Vitamin B_2 Premix (Fortafeed 2-49-C) and Aureomycin B_{12} Supplement (Aurofac 2A) in the Protein Supplement for Fattening Spring Pigs in the Dry-Lot in Summer.

June 9, 1957, to September 17, 1957—100 days.

	Shelled corn, mixed protein supplement: 4 parts tankage, 4 parts soybean, 1 part cottonseed meal, 1 part alfalfa meal — alfalfa pasture		Shelled corn, mixed protein supplement: 4 parts tankage, 4 parts soybean meal, 3 parts alfalfa meal — in dry-lot	
		4½ lbs. Bi-Con TM-10 Terramycin added per ton		15 lbs. 2-49-C and 15 lbs. Aurofac 2A added per ton
Lot number	1	2	3	4
Number pigs in lot	10	10	8	10
Av. initial wt. per pig, lbs.	60.20	60.30	59.60	59.10
Av. final wt. per pig, lbs.	181.00	180.50	214.80	209.00
Av. total gain per pig, lbs.	119.80	120.20	155.20	149.90
Av. daily gain per pig, lbs.	1.19	1.20	1.55	1.49
Av. daily ration per pig, lbs:				
Shelled corn	3.85	3.87	4.51	4.56
Protein supplement	.37	.30	.54	.59
Lbs. feed per cwt. gain per pig:				
Shelled corn	321.70	322.79	290.35	304.20
Protein supplement	30.96	24.45	44.10	39.75

Observations

In this experiment the pigs in lots 1 and 2 fed on alfalfa pasture made almost exactly the same daily gains, 1.19 and 1.20 pounds each, respectively. The pigs in lot 3 and lot 4 fed in the dry-lot made larger gains and used less feed per 100 pounds gain than the pasture-fed pigs. In lot 3 the pigs were fed only the protein supplement, 4 parts tankage, 4 parts soybean meal, and 3 parts alfalfa meal, yet produced the largest gain of the lots. When supplements of Fortafeed 2-49-C and vitamin B_2 premix and an antibiotic aureomycin were fed in lot 4, the gains were not quite so good and neither was the feed conversion so efficient, yet it was satisfactory.

The pasture for the pigs in this experiment was not too good, which probably explains to some extent the poor showing of the pasture-fed lots 1 and 2.

On the whole, the results of this experiment confirm for the third year that increased alfalfa meal in the protein supplement increases efficiency in dry-lot feeding, and that we may expect the addition of an antibiotic and vitamin B_{12} supplements to make a good showing.

Metabolism of Carotenoid Pigments and Vitamin A by Swine (Project 311).

Provitamin A from Alfalfa and Yellow Corn, and Vitamin A in a Gelatin-Stabilized Product as Sources of Vitamin A for Weanling Pigs.

D. B. Parrish and C. E. Aubel

This test was made to obtain further information on the utilization of Vitamin A from different sources by weanling pigs. Sources of Vitamin A were: (1) a gelatin-stabilized vitamin A product, (2) carotene as supplied by a high-quality dehydrated alfalfa meal, and (3) carotene and cryptoxanthin as supplied by yellow corn. Units of vitamin A were calculated from the carotene and cryptoxanthin analyses by multiplying micrograms of these pigments by 1.6 and 0.8, respectively.

In the 1957 test a purified cryptoxanthin was separated and determined, but in the 1956 test a crude cryptoxanthin, which contained some pigment in addition to cryptoxanthin, was determined. In the 1957 test vitamin A or provitamin A was added to the feed at 500 units per pound, but in 1956 only 400 units per pound were used. Feed was prepared several times during the two months of the study so that no batch was more than 16 days old before it was consumed.

Twenty-seven weanling pigs from gilts fed a vitamin A-restricted diet during gestation and lactation were distributed into three groups of three lots each so that lots among groups were balanced on the basis of litter, sex and weight. Gilts and weanling pigs were in good condition at the time of weaning, but vitamin A reserves were low.

The basal feed was 78 percent white corn, 16 percent soybean oil meal, 2.5 percent non-fat dry milk solids, 1.3 percent brewer's yeast, 0.4 percent iodized salt, 0.4 percent bone meal, and 0.4 percent calcium carbonate, plus vitamins and trace minerals. The feed conversion ratios (Table 6) indicate that this was a good basal ration. When yellow corn or alfalfa was used as a source of vitamin A, it was substituted in the formula for an equal weight of white corn. Each day a quantity of feed was offered to each lot slightly in excess of that which would be consumed. The test was similar to the 1956 test, but modified slightly as noted previously.

Data from the 1957 test are presented in Table 6 and for comparison the 1956 data also are shown.

Observations

1. Growing pigs fed stabilized vitamin A had much higher levels of serum vitamin A than those receiving provitamin A from yellow corn or dehydrated alfalfa. Results in 1957 using 500 units of stabilized vitamin A per pound of feed were similar to those in 1956 when 400 units were used. Vitamin A levels in serum of pigs receiving dehydrated alfalfa were similar both years, but vitamin A levels in serum of pigs fed yellow corn were higher in 1957, indicating that the crude cryptoxanthin fraction of yellow corn contained some vitamin A inactive pigment or pigments of low vitamin A activity.

2. In the 1957 test, pigs getting provitamin A from dehydrated alfalfa gained almost as well as those getting stabilized vitamin A, but they did not do so well in the 1956 test.

3. Gains and feed conversions were somewhat better in the 1957 test than in 1956.

Table 6

Average Body Weights, Feed Conversion Ratios, and Blood Serum Vitamin A Contents of Pigs.

Diet	Lot[4]	Av. wt., lbs. Start	Av. wt., lbs. End 2 mos.	Average gain, lbs. By lot	Average gain, lbs. By diet	Feed conversion ratio By lot	Feed conversion ratio By diet	Vitamin A, mgs. per 100 ml. serum[2] By lot	Vitamin A, mgs. per 100 ml. serum[2] By diet
				1957 Data					
Vitamin A[3]	1[1]	27	96	69		2.6		17.2	
	2	24	98	74		2.4		16.8	
	3	25	93	68	70	2.6	2.5	22.8	18.9
Dehydrated alfalfa	1a	27	94	67		2.6		2.5	
	2a	24	92	68		2.6		3.1	
	3a	24	92	68	68	2.6	2.6	2.9	2.8
Yellow corn	1b	27	91	64		2.8		4.3	
	2b	24	84	60		2.8		3.5	
	3b	25	82	57	60	3.0	2.9	3.2	3.7
				1956 Data					
Vitamin A	1	23	92	69		2.7		21.6	
	2	25	95	70		2.6		22.2	
	3	25	87	62	67	2.9	2.7	17.9	20.6
Dehydrated alfalfa	1a	23	76	53		2.9		4.3	
	2a	25	87	62		2.8		3.1	
	3a	25	65	40	52	3.6	3.1	1.4	3.1
Yellow corn	1b	23	81	58		2.8		1.4	
	2b	25	89	64		2.9		1.3	
	3b	25	59	34	52	3.6	3.1	1.3	1.3

1. Three pigs per lot.
2. At end of test.
3. Gelatin-stabilized vitamin A was Pfizer A-10-P.
4. 1, 1a, 1b, etc., are groups balanced by litter, sex and age at start of test.

Sheep

Feed Lot and Pasture-Fattening Tests with Feeder Lambs, 1957-58. Studies Carried on by the Department of Animal Husbandry and the Garden City Branch Experiment Station (Project 111-GC).

C. S. Menzies and A. B. Erhart

Tests this year include both feed-lot and wheat-pasture studies. Feed-lot tests were designed to determine the value of the following feed additives and hormone treatments: (1) aureomycin, (2) hydroxyzine tranquilizer, (3) 3 mgs. stilbestrol implants, (4) 6 mgs. stilbestrol implants and (5) Synovex implants consisting of 2.5 mgs. estradiol benzoate, 25 mgs. progesterone and 27.5 mgs. inert material. The following roughage combinations were also compared for fattening lambs in the feed lot: (1) sorghum stover, (2) sorghum silage and alfalfa hay, and (3) wheat silage and alfalfa hay. Lambs in one lot fed in the feed lot were shorn at the start of the test on November 7.

Two lots of lambs were grazed on wheat pasture for the entire 123-day experimental period. Lambs in one of these, lot 5, were also shorn at the start of the test on November 7. One-third of the lambs in each lot received a 3-mg. stilbestrol implant, ⅓ received a 6-mg. stilbestrol implant and the remaining ⅓ served as the hormone control.

Two lots of lambs were used in a combination feed-lot and wheat-pasture study. One of these lots was grazed on wheat pasture for 60 days and then was switched to the feed-lot for the remaining 63 days of the test. The second lot was started in the feed-lot and was then switched to wheat pasture. One-third of the lambs in these two lots were implanted with 3 mgs. stilbestrol, ⅓ received a 6-mg. stilbestrol implant and the remaining ⅓ received no hormone.

Irrigated wheat pasture was used until February 21, after which dry-land wheat pasture was used.

All the lambs were shorn during the period January 31 to February 2 with the exception of the lambs that were shorn November 7.

Lambs

Lambs used in these tests were secured from near Bernalillo, N.M., and consisted primarily of whiteface lambs with a small number of blackface crossbreds. These were predominantly wether lambs. They averaged 73.1 pounds at the loading point and 66.6 pounds off the cars at Garden City on October 24. They were started on test November 7.

Feed Prices Used

Sorghum grain	$ 1.70 per cwt.
Sorghum stover	7.50 per ton
Sorghum silage	6.00 per ton
Wheat silage	6.00 per ton
Alfalfa hay	20.00 per ton
Cottonseed meal	70.00 per ton
Pelleted ration	40.00 per ton
Salt	1.00 per cwt.
Limestone	.50 per cwt.
Aurofac 2A	.40 per lb.
Hydroxyzine tranquilizer premix	.80 per lb.
Stilbestrol implants	.09 per implant
Synovex implants	.50 per implant—varies with quantity purchased
Wheat pasture	.30 per head per month

Table 7.—Feed-Lot Tests.

Lot number	1	2	3	4	5	9
Treatment	Sorghum stover ration	Stover ration + aureomycin	Stover ration + hydroxyzine tranq.	Sorghum silage ration	Sorghum silage ration, fall shorn	Wheat silage ration
Number lambs per lot	39	39	39	39	37	39
Days on feed	123	123	123	123	123	123
Av. initial wt. per lamb, lbs.	77.2	77.2	78.1	77.2	72.6[2]	77.3
Av. final wt. per lamb, lbs.	93.3	93.3	92.8	100.4	107.5	93.1
Av. wt. shorn fleece, lbs.	5.2	5.2	5.6	5.3	3.5	5.2
Av. total gain per lamb, lbs.[1]	21.3	21.3	20.4	28.5	34.9	21.0
Av. daily gain per lamb, lb.	.173	.173	.166	.232	.284	.171
Av. daily feed gain per lamb:						
Whole sorghum grain, lbs.	1.21	1.13	1.21	1.21	1.21	1.21
Sorghum silage, lbs.	....	....	....	3.82	4.23	....
Sorghum stover, lbs.	2.49	2.47	2.30	....	....	....
Wheat silage, lbs.	....	....	....	....	....	3.55
Cottonseed meal, lbs.	.21	.19	.21	....	....	....
Alfalfa hay, lbs.	....	....	....	.77	.77	.77
Salt, lbs.	.016	.018	.016	.019	.011	.015
Limestone, lbs.	.015	.015	.015	....	....	....
Aureomycin, mgs.	....	30	....	....	....	....
Hydroxyzine activity, mgs.	....	....	3	....	....	....
Av. lbs. feed per cwt. gain:						
Whole sorghum grain	699.9	652.5	731.6	523.9	427.4	709.9
Sorghum silage	....	....	....	1651.2	1491.9	....
Sorghum stover	1436.1	1431.1	1394.3	....	....	....
Wheat silage	....	....	....	....	....	2074.6
Cottonseed meal	118.4	111.9	123.7	....	....	....
Alfalfa hay	....	....	....	332.2	271.0	449.8
Salt	9.1	10.1	9.4	8.3	3.82	8.9
Limestone	8.8	8.6	9.0	....	....	....
Av. feed cost per cwt. gain,[1] $	21.64	22.20	23.53	17.26	14.50	22.87
Tranquilizer cost per lamb, $	....	....	.30	....	....	....
Aureomycin cost per lamb, $	....	.37	....	....	....	....
Av. feed cost per lamb,[3] $	4.61	4.72	4.80	4.92	5.06	4.81
Initial cost per lamb, $	16.84	16.84	17.03	16.84	16.60	16.86
Number lambs lost	....	....	....	....	2	....
Cost of lamb loss, $	....	....	....	....	1.01	....
Av. total cost per lamb, $	21.45	21.93	22.13	21.76	22.67	21.67
Av. total cost per cwt., $	22.97	23.50	23.85	21.67	21.09	23.28

1. Weight of shorn fleece included in total gain in all cases except in Lot 5.
2. Lambs were shorn before initial weight was taken.
3. Includes cost of tranquilizer and aureomycin in the lots in which these were fed.

Table 8.—Wheat Pasture Tests.

Lot number	13[1]	6[1]	13 & 16[2]	13 & 6[2]	13 & 6[2]
Treatment	Unshorn	Fall shorn	No hormone	3-mg. stilbestrol implant	6-mg. stilbestrol implant
Number lambs per lot	39	39	26	26	26
Days on feed	123	123	123	123	123
Av. initial wt. per lamb, lbs.	77.4	76.5	76.6	78.7	75.5
Av. final wt. per lamb, lbs.	95.8	104.0	96.0	102.2	101.5
Av. wt. shorn fleece, lbs.	6.2	3.5	5.3	5.0	4.9
Av. total gain per lamb, lbs.[3]	24.6	31.0	24.7	28.5	30.9
Av. daily gain per lamb, lb.:	.20	.252	.201	.232	.251
No hormone	.171	.220	....	....	....
3-mg. implant	.20	.264	....	....	....
6-mg. implant	.23	.272	....	....	....
Av. daily feed per lamb, lbs.:					
Wheat pasture	Free choice	Free choice	Free choice	Free choice	Free choice
Salt	.009	.009	.009	.009	.009
Av. feed cost per cwt. gain, $	5.04	4.01	5.03	4.36	4.02
Av. feed cost per lamb, $	1.24	1.24	1.24	1.24	1.24
Hormone cost per lamb, $	.06	.06	.00	.09	.09
Av. initial cost per lamb, $	16.88	16.88	16.70	17.16	16.47
Number of lambs lost	....	....	....	....	....
Av. total cost per lamb, $	18.18	17.98	17.94	18.49	17.80
Av. total cost per cwt., $	18.97	17.29	18.69	18.09	17.54

1. One-third of the lambs received no hormone, ⅓ implanted with 3 mgs. stilbestrol and ⅓ implanted with 6 mgs. stilbestrol.

2. Includes lambs from lots 6 and 13 that received similar hormone treatments.

3. Weight of shorn fleece included in total gain.

Table 9
Combination Wheat Pasture and Feed-Lot Tests.

Lot number	12[1]	14[1]
Treatment	Dry-lot 60 days, then to wheat pasture 63 days	Wheat pasture 60 days, then dry-lot 63 days
Number lambs per lot	39	39
Days on feed	123	123
Wheat pasture	63	60
Feed lot	60	63
Av. initial wt. per lamb, lbs.	75.8	76.3
Av. final wt. per lamb, lbs.	88.3	102.6
Av. wt. shorn fleece, lbs.	5.6	6.4
Av. total gain per lamb, lbs.[2]	18.2	32.6
Av. daily gain per lamb, lb.	.148	.265
No hormone	.127	.238
3 mgs. stilbestrol	.160	.279
6 mgs. stilbestrol	.160	.280
Wheat pasture	.035	.279
Dry-lot	.267	.252

Table 9 (Continued)

Av. daily feed per lamb (dry-lot):		
Whole sorghum grain	1.14	1.28
Sorghum silage	3.48	4.54
Alfalfa hay	.77	.77
Salt	.014	.029
Av. daily feed per lamb (w. pasture)		
Wheat pasture	Free choice	Free choice
Salt	.009	.009
Av. lbs. feed per cwt. gain:		
Whole sorghum grain	376.7	247.5
Sorghum silage	1148.7	876.9
Alfalfa hay	254.0	148.5
Salt	7.8	6.5
Av. feed cost per cwt. gain, $	15.93	10.23
Hormone cost per lamb, $	.06	.06
Av. feed cost per lamb, $	2.90	3.34
Initial cost per lamb, $	16.52	16.64
Number of lambs lost	....	....
Av. total cost per lamb, $	19.48	20.04
Av. total cost per cwt., $	22.06	19.53

1. One-third of the lambs received no hormone, ⅓ implanted with 3 mgs. stilbestrol, ⅓ implanted with 6 mgs. stilbestrol.

2. Weight of shorn fleece included in total gain.

Table 10.—Feed-Lot Hormone Tests.

Lot number	4	7	8	11	10a[2]	10b[2]
Treatment	No hormone	3 mgs. stilbestrol	Synovex implant[1]	6 mgs. stilbestrol	No hormone, pelleted ration[3]	6-mg. stilbestrol implant, pelleted ration[3]
Number lambs per lot	39	39	39	39	20	19
Days on feed	123	123	123	123	123	123
Av. initial wt. per lamb, lbs.	77.2	75.6	77.4	77.2	78.9	74.6
Av. final wt. per lamb, lbs.	100.4	103.9	106.1	104.6	109.7	115.6
Av. shorn fleece wt., lbs.	5.3	5.6	5.8	5.7	5.9	6.3
Av. total gain per lamb, lbs.[4]	28.5	33.9	34.5	33.0	36.8	47.2
Av. daily gain per lamb, lb.	.232	.276	.281	.268	.299	.384
Av. daily feed per lamb, lbs.:						
Whole sorghum grain	1.21	1.21	1.21	1.21	....	....
Sorghum silage	3.82	4.0	4.24	3.91	....	....
Alfalfa hay	.77	.77	.77	.77	....	....
Pellet—free choice	....	....	....	....	4.23	4.23
Wheat straw—free choice	....	....	....	....	.05	.05
Salt	.019	.015	.02	.017	.028	.028
Av. lbs. feed per cwt. gain:						
Whole sorghum grain	523.9	439.5	423.4	452.2	....	....
Sorghum silage	1651.2	1448.0	1511.3	1459.2	....	....
Alfalfa hay	332.2	278.7	274.2	286.8	....	....
Pellet—free choice	....	....	....	....	1415.7	1103.1
Wheat straw	....	....	....	....	16.7	13.0
Salt	8.3	6.4	7.3	6.6	9.4	7.3
Av. feed cost per cwt. gain, $[5]	17.26	14.66	14.70	15.00	28.41	22.13
Hormone cost per lamb, $	....	.09	.50	.09	....	.09
Av. feed cost per lamb, $	4.92	4.98	5.07	4.95	10.45	10.45
Av. initial cost per lamb, $	16.84	16.49	16.88	16.84	17.21	16.27
Number of lambs lost	....	....	....	....	....	....
Av. total cost per lamb, $	21.76	21.56	22.45	21.88	27.66	26.81
Av. final cost per cwt., $	21.67	20.75	21.16	20.92	25.21	23.19

1. 2.5 mgs. estradiol benzoate, 25 mgs. progesterone, and 27.5 mgs. inert material.
2. Lambs in lots 10a and 10b were fed together.
3. Pellet consisted of 28% sorghum grain, 7% molasses, 40% alfalfa hay and 25% sorghum stubble.
4. Wt. of shorn fleece included in total gain.
5. Does not include cost of hormone.

Table 11
Average Gain per Lamb per Day by Periods.

	1st 60 days	Next 24 days	Next 39 days	Entire 123-day period
Lot No.	Nov. 7-Jan. 6	Jan. 6-Jan. 30	Jan. 30-Mar. 10	
1	.218	.271	.044	.173
2	.162	.313	.101	.173
3	.217	.171	.082	.166
4	.242	.275	.190	.232
5	.260	.267	.331	.284
6	.30	.246	.182	.252
7	.305	.429	.136	.276
8	.308	.421	.151	.281
9	.185	.250	.100	.171
10	.412	.321	.245	.341
11	.277	.421	.164	.268
12	.267	.046	.026	.147
13	.278	.250	.049	.200
14	.280	.408	.156	.266

Observations

Gains made by all lambs during the 123-day feeding trial were lower than expected. The chart, above, showing the average daily gain per lamb by periods indicates that the lambs gained fairly well until they were shorn. Lambs in lot 5, the fall-shorn lot, were the only ones that gained an appreciable amount during the last 39 days of the test. The fall-shorn lambs in lot 6, that were on wheat pasture, gained less during the last 39-day period than during the previous period. However, they still gained considerably more than their control lot (13) during the last 39 days.

The addition of 30 mgs. of aureomycin or 3 mgs. of hydroxyzine tranquilizer per lamb per day to a standard sorghum stover, sorghum grain, cottonseed meal and limestone ration failed to increase the rate of gain or feed efficiency under conditions of this test.

Lamb gains were increased by 34 percent or by .06 pound per lamb per day by replacing sorghum stover and cottonseed meal with sorghum silage and alfalfa hay. This increased rate of gain resulted in a considerably cheaper feed cost per cwt. gain. Wheat silage was not eaten as readily as sorghum silage. It was also higher in water content and much lower in percent nitrogen-free extract and therefore produced slower, more expensive gains than sorghum silage. This agrees with results obtained in a previous test. Fall-shorn lambs in lot 5 gained 22 percent faster than the controls in lot 4 and required 13 percent less feed per cwt. gain.

Lambs in lot 7 that were implanted with 3 mgs. stilbestrol gained 19 percent faster than their controls; lambs in lot 8 that received Synovex implants gained 21 percent faster, and lambs in lot 11 that were implanted with 6 mgs. of stilbestrol gained 16 percent faster than the controls. The increased gains were made on 13.5 percent, 11.5 percent and 12 percent less feed per cwt. gain for lots 7, 8 and 11, respectively.

The pelleted ration fed to lot 10 did not have a control and cannot be compared directly with any of the unpelleted rations. The lambs in lot 10 that were implanted with 6 mgs. of stilbestrol gained 28 percent faster than those receiving no hormone in that lot. Since these lambs were fed together, the exact amount of feed required to produce a cwt. of gain is not known for the two treatments. The feed cost per cwt. gain was high for the pelleted lambs.

Lambs implanted with 3 mgs. or 6 mgs. of stilbestrol and grazed on wheat pasture gained 15 percent and 25 percent faster than those not implanted. The fall-shorn wheat pasture lambs gained 26 percent faster than those shorn the last of January. Irrigated wheat pasture produced 191 pounds of gain per acre during the period November 7 to February 21.

Table 12

Chemical Analysis of Feeds Used in Garden City Lamb Feeding Trials, 1957-1958.

	Protein (Nx6.25)	Ether extract	Crude fiber	Moisture	Ash	N-free extract	Carbohydrates
	%	%	%	%	%	%	%
Alfalfa hay	16.81	1.75	26.69	9.76	8.95	36.04	65.73
Pellets	9.50	1.74	19.62	9.06	8.40	51.68	71.30
Sorghum grain No. 1	10.25	3.10	1.66	14.19	1.53	69.27	70.93
Sorghum grain No. 2	10.44	3.19	1.72	11.96	1.52	71.17	72.89
Sorghum grain No. 3	10.38	3.05	1.63	10.54	1.42	72.98	74.61
Green wheat	5.02	0.84	6.42	70.00	4.03	13.69	20.11
Wheat silage	2.40	0.33	8.78	76.36	2.76	9.37	18.15
Sorghum stover	3.39	1.25	18.31	33.33	8.18	35.54	53.85
Sorghum silage	2.84	0.56	8.67	63.63	3.25	21.05	29.72

Lambs in lot 14 that were grazed on wheat pasture for 60 days and then brought into the feed-lot produced faster and cheaper gains than lambs in lot 12 that were switched from the dry-lot to wheat pasture after 60 days. Lambs in these two lots that were implanted with either 3 mgs. or 6 mgs. of stilbestrol gained faster than those not implanted.

Only two lambs were lost during these tests. One lamb died of pneumonia and one died of urinary calculi. Both of the lambs were from lot 5. Although this treatment may not have been responsible, it was charged with the cost of the lambs and the feed they consumed in determining the total cost per lamb and the final cost per cwt. gain.

Assistance from the following firms is gratefully acknowledged: Syntex Animal Products Division of Foundation Laboratories Inc., New York, for Synovex implants; American Cyanamid Co., New York, for the Aurofac 2A; Chas. Pfizer and Co., Inc., Terre Haute, Ind., for the stilbestrol implants and hydroxyzine tranquilizers.

Adaptability of Breeds of Rams and Breed Types of Range Ewes to Market Lamb Production in Kansas (Project 347).

C. S. Menzies, L. A. Holland, and R. E. John

Western ewes of the three predominant types (Texas ewes or finewools, Northwest blackface crossbreds, and Northwest 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 for six seasons. A different set of rams has been used each year, and the ewes are rotated so that no ewes are bred to the same breed of ram each year. Wool and lamb production records have been kept on the different types of ewes, and lamb production figures have been obtained for the four sire groups

Results

Lamb production figures for the 1956-57 lamb crop are presented in Table 14 and the preliminary lambing data and lamb production for 1957-58 are shown in Table 13.

All lambs born on or before January 27 were separated into sire groups and fed separately. Twenty-five lambs born between January 27 and February 10 were added to their respective sire groups February 10. Twice daily each group of lambs was creep fed a concentrate mixture consisting of 5 parts by weight of grain sorghum, 1 part cracked corn, and 1 part wheat bran. The lambs were also fed good, leafy alfalfa hay in the creep. The ewes in the different lots were fed similar rations consisting of 1 pound grain, 2 pounds alfalfa hay, and 6 pounds sorghum silage per ewe per day. Records were kept on the feed consumption of the different groups of lambs and ewes.

Table 15 gives the gains and feed consumption of the different groups of lambs and Table 16 gives the average body weights following lambing in the fall of 1956 and early part of 1957 as well as the grease wool shorn in the spring of 1957.

Discussion and Observations

As in the past years, the Texas finewool ewes bred and lambed earlier this year than the other two types of ewes. The finewool ewes averaged lambing 12 days earlier than the Northwest blackface and 20 days earlier than the Northwest whiteface ewes.

Because of the earlier lambing date, lambs from the Texas finewool ewes usually reach market weights earlier than lambs from the other ewe groups. Lambs from the Blackface crossbred ewes and from the Northwest whiteface ewes usually gain faster than the finewool lambs and are therefore slightly heavier at 100 days of age. So far in this year's test the lambs from the Whiteface crossbred ewes have outgained lambs from the other two ewe groups.

The whiteface crossbred ewes, followed by the finewools, generally have produced the heaviest fleeces. There have been no consistent differences among the three types of ewes in lambing and weaning percentages.

There has been no consistent difference in carcass grade of lambs from different ewe groups.

Lambing and weaning data from the lambs sired by Hampshire, Suffolk, Southdown, and Shropshire rams have not been consistent. The birth weights of lambs sired by the four breeds of rams have been about equal, with the Southdown-sired lambs being slightly lighter. Southdown-sired lambs were not the lightest at birth this year.

The Hampshire- and Suffolk-sired lambs have gained faster in this year's test than lambs from the other two sire groups; however, they were no more efficient in converting feed into gain than the Southdown- or Shropshire-sired lambs. In past years Hampshire- and Suffolk-sired lambs have gained faster and were heavier at weaning time, but this has not been consistent. The Shropshire-sired lambs have not gained as well as lambs from the other sire groups, probably because they are later lambs. Southdown-sired lambs have shown a slight advantage in carcass grade in some years but this superior quality has not been demonstrated consistently.

Table 13

1958 Lambing Data and Lamb Production from Ewes of Different Types and from Sires of Different Breeds.

	No. ewes bred	No. ewes lambing	Av. lambing date	Av. birth wt., lbs. Singles	Av. birth wt., lbs. Twins	% lambs born	No. lambs alive Mar. 22	Av. wt. lambs Mar. 22
Ewe groups:								
Finewools	46	40	Nov. 16	10.9	8.9	120	55	69.3
Northwest whiteface	38	30	Dec. 8	11.1	9.4	108	41	64.7
Northwest blackface	44	36	Nov. 28	9.1	7.6	109	48	67.7
Sire groups:								
Hampshire	32	29	Nov. 27	11.2	9.7	116	37	70.8
Southdown	32	28	Nov. 26	10.2	8.4	116	37	64.5
Suffolk	32	26	Nov. 21	10.1	8.7	109	35	75.2
Shropshire	32	23	Dec. 4	9.8	8.1	109	35	59.3

Table 14

Lamb Production by Ewes of Different Types and from Sires of Different Breeds, 1957.

	No. ewes bred	No. ewes lambing	No. lambs weaned	% lambs weaned	Lamb wt. at 100 days of age	Av. weaning wt., lbs.	Lbs. of lamb weaned per ewe bred
Ewe groups:							
Finewools	48	43	58	121	71.8	98.9	119.5
Northwest whiteface	38	31	44	116	72.2	99.5	115.2
Northwest blackface	47	40	57	121	72.1	96.4	116.9
Total	133	114	159	119.5	72.0	98.1	117.4
Sire groups:							
Hampshire	33	28	35	106	74.6	100.2	106.3
Suffolk	33	33	46	139	78.5	103.2	143.9
Southdown	34	24	32	94	69.4	92.9	87.5
Shropshire	33	29	46	139	65.2	95.2	132.7

Table 15

Feed Consumption and Lamb Production from Four Different Breeds of Rams and Three Types of Ewes.

	No. of lambs	Daily concentrate consumption in creep per lamb	Av. daily gain in lbs. per lamb	Gain per lb. of creep feed consumed
Sire groups:				
Hampshire	37	1.31	.60	.46
Suffolk	35	1.30	.57	.44
Southdown	37	1.22	.54	.44
Shropshire	35	1.13	.49	.44
Ewe groups:				
Finewools	55		.55	
Northwest whiteface	41		.61	
Northwest blackface	48		.55	

Table 16

Body Weights and Wool Production of Ewes of Different Types, 1956-1957.

	Grease wool production	Body wts. following lambing, lbs. per ewe
Finewool	12.3	145.5
Northwest whiteface	14.6	170.0
Northwest blackface	10.6	174.3

The Use of Management Techniques and Hormones to Control the Time, Rate, and Regularity of Lambing (Project BJ-441).

E. A. Nelson, Walter H. Smith and Carl S. Menzies

Fall lambing has been practiced in Kansas commercial ewe flocks for a good many years. Most breeders have reported that commercial ewes do not breed regularly during the summer months and that fall lambing periods tend to be extended with noticeable occasional lapses. In recent years there has been an appreciable amount of research conducted at several experiment stations which has been directed toward the determination of the extent to which each sex is involved in the summer fertility of sheep.

The experimental sheep used in conjunction with studies of summer fertility of sheep at the Kansas Agricultural Experiment Station consist of a commercial flock of approximately 136 head of western ewes of three predominant types (Texas or finewools, northwest blackface crossbreds, and northwest whiteface crossbreds) and four breeds of rams (Hampshire, Suffolk, Shropshire, and Southdown). Observations on the ewe flock during the past five years indicate that most ewes are sexually active during the summer months and that low summer fertility may be associated with the quality of the semen produced by the rams during the breeding season. During the summer of 1956, four of the eight rams used for summer breeding and observed for semen quality were classified as possessing low fertility on the basis of semen motility scores and concentration of spermatozoa. All four breeds of rams were included in the low fertility classifications. It is evident that individual rams tend to vary considerably more in regard to semen quality than do the breeds observed.

During the summer of 1957, 12 rams were observed for semen quality. Eight of these were in active breeding service, four were not. Six were subjected to a cooling treatment during the day by placing them in an air-conditioned room, starting on June 3 and continuing the practice until the end of the breeding season. One-half of the rams subjected to air conditioning were shorn on June 24 and one-half of the rams not subjected to daytime cooling were shorn on the same date.

Weekly semen collections were made during the summer, starting on June 1 and terminating on August 14. Semen collections were observed for motility, ejaculate volume, sperm concentration, and percentage of abnormal spermatozoa.

All of the rams exhibited a definite decline in semen quality immediately after the start of the breeding season as indicated by all semen characteristics. Most of the rams showed progressive improvement during the breeding season, however. This improvement was more pronounced in rams not in active breeding use than in rams in active breeding use. Of the rams in breeding use, those subjected to daytime cooling displayed the most progressive improvement following the initial decline at the start of the summer breeding season. The effects of shearing were questionable. Shearing was apparently followed by a temporary decline in semen quality in most instances. Shearing may be most beneficial if it is done prior to the onset of the breeding season.

The effects of air conditioning or daytime cooling are also questionable in regard to the improvement of ram semen quality during the summer.

The Relationship of Physical Balance to the Utilization of Pelleted and Non-pelleted Rations for Lambs (Project 236). Three-Year Summary, 1955-56, 1956-57, 1957-58, and Results of 1957-58 Test.

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

Physical balance of lamb-fattening rations has been studied in this project for several years. These tests have been designed to study the effect of pelleting rations of varying proportions of roughages and concentrates upon feed-lot performance and feed efficiency compared with similar non-pelleted rations. For the past three years both dehydrated and field-cured alfalfa hay have been used as roughages.

Experimental Procedure

This is the third year that western feeder lambs have been divided into six lots and fed according to the following plan:

Lot 1—Pelleted ration, 60 percent field-cured alfalfa hay and 40 percent corn. In addition approximately .4 pound of chopped alfalfa hay was fed per lamb per day. Total ration was approximately 65 percent alfalfa hay and 35 percent corn.

Lot 2—Pelleted ration, 50 percent field-cured alfalfa hay and 50 percent corn. In addition each lamb received approximately .4 pound of chopped alfalfa hay per day. Total ration was approximately 55 percent alfalfa hay and 45 percent corn.

Lot 3—Non-pelleted ration, 65 percent chopped alfalfa hay and 35 percent ground corn.

Lot 4—Non-pelleted ration, 55 percent chopped alfalfa hay and 45 percent corn.

Lot 5—Pelleted ration, 60 percent dehydrated alfalfa hay and 40 percent corn. In addition each lamb received approximately .4 pound of chopped alfalfa hay per day. Total ration was approximately 65 percent alfalfa hay and 35 percent corn.

Lot 6—Pelleted ration, 50 percent dehydrated alfalfa hay and 50 percent corn. In addition about .4 pound of chopped alfalfa hay was fed per lamb per day. Total ration was approximately 55 percent alfalfa hay and 45 percent corn.

The alfalfa hay and dehydrated alfalfa hay used in these tests came from the same college field. A portion was dehydrated at the time of cutting and was later used with ground corn to make the pellets for lots 5 and 6. The remainder of the hay was baled and stored in the barn until part of it was ground and used with ground corn to make the pellets fed lots 1 and 2. The chopped hay used in all lots came from the baled-hay supply. This was chopped with an ensilage cutter. All the corn used in these tests has been purchased in bulk lots from a Manhattan mill.

The rations were fed twice a day; in addition, all the lambs had access to water and salt at all times. Individual weights were taken at the beginning of the trial and every two weeks thereafter. Carcass grades were obtained on all lambs when slaughtered.

Feed prices and processing charges used in determining the feed cost have varied from year to year. The 1957-58 prices have been used in calculating the feed cost per cwt. gain in both the 1957-58 test and in the summary of the three years' tests. These feed prices and processing charges were as follows: chopped alfalfa hay, $19 per ton ($16 per ton baled plus $3 per ton for chopping); ground corn, $1.88 per cwt.; dehydrated alfalfa hay, $37 per ton ($7 per ton for hay in the field plus $30 per ton for cutting, hauling, and dehydrating); grinding field-cured hay for pellets cost $5 per ton; and mixing, pelleting and sacking cost $7 per ton. With these prices the 60 percent field-cured hay and the 40 percent corn pellets cost $34.64 per ton, the 50 percent field-cured alfalfa hay and 50 percent corn pellets cost $36.30 per ton, the 60 percent dehydrated alfalfa hay and 40 percent corn pellets cost $44.24 per ton, and the 50 percent dehydrated alfalfa hay and 50 percent corn pellets cost $44.30 per ton.

Results and Discussion

The average daily gain, feed intake, feed consumed per cwt. gain, feed cost per cwt. gain and carcass grades for the 1957-58 test are shown in Table 18. This same information, for the three years this test has been conducted, has been summarized in Table 17. Separate results for the 1955-56 and 1956-57 tests have been reported in Kansas Agricultural Experiment Station Circulars 335 and 349, respectively.

Results of 1957-58 Test

During this year's test, lambs in lots 1 and 2, that were fed different ratios of field-cured alfalfa hay and corn in a pelleted form, and the lambs in lot 5 that were fed a 60-percent dehydrated alfalfa hay and 40-percent corn pelleted ration gained faster and more efficiently than did lambs fed non-pelleted rations. The lambs in lot 6, that were fed 50 percent dehydrated alfalfa hay and 50 percent corn pellets, gained only slightly more than lambs fed a similar non-pelleted ration.

Lambs fed a 55-percent alfalfa hay, 45-percent corn non-pelleted ration gained only slightly faster, but did so more efficiently than lambs fed a 65-percent alfalfa hay, 35-percent corn, non-pelleted ration.

The two lots fed field-cured alfalfa hay and corn pelleted rations produced cheaper gains than did any of the other four lots. Because of the cost of dehydrating alfalfa, the lambs in lots 5 and 6 had the highest feed cost per cwt. gain.

Observations from the Three-Year Summary

Lambs fed pelleted rations have consistently gained faster and more efficiently than those fed similar non-pelleted rations.

Pellets containing field-cured alfalfa hay have produced slightly faster and made more efficient gains than lambs fed pellets containing dehydrated alfalfa hay. This trend has not been consistent from year to year but the three-year average indicates a difference.

Slightly larger and cheaper gains have been produced by pellets containing 60 percent roughage and 40 percent corn than by pellets containing 50 percent roughage and 50 percent corn. However, in the non-pelleted form the ration of 55 percent roughage and 45 percent corn was more efficient as well as more economical than a non-pelleted ration of 65 percent roughage and 35 percent corn.

Due to the increased rate of gain and feed efficiency, the two lots fed field-cured alfalfa hay and corn pellets produced cheaper gains than lambs fed similar non-pelleted rations. This is based on the listed feed prices. Gains made by lambs fed dehydrated alfalfa hay and corn pellets cost considerably more than those made when other rations were fed.

There was little difference in the carcass grades of the lambs fed the different rations.

Table 17

Three-Year Summary—Pelleted and Non-pelleted Rations of Varying Concentrations for Fattening Lambs, 1955-56, 1956-57, 1957-58.

Lot number	1	2	3	4	5	6
Ration fed	60% field cured alf. hay, 40% corn, pelleted[1]	50% field cured alf. hay, 50% corn, pelleted[1]	65% chopped alfalfa hay, 35% cracked corn, non-pelleted	55% chopped alfalfa hay, 45% cracked corn, non-pelleted	60% dehydrated alf. hay, 40% corn, pelleted[1]	50% dehydrated alf. hay, 50% corn, pelleted[1]
Number of tests	3	3	3	3	3	3
Average number lambs per lot	21.0	20.7	21.0	20.3	21.0	20.7
Av. days on feed	88.7	88.7	88.7	88.7	88.7	88.7
Av. initial wt. per lamb, lbs.	77.4	77.7	77.2	77.3	77.5	77.3
Av. final wt. per lamb, lbs.	113.2	112.2	105.5	105.8	110.6	107.6
Av. total gain per lamb, lbs.	35.8	34.5	28.3	28.5	33.1	30.3
Av. daily gain per lamb, lbs.	.404	.389	.319	.321	.373	.342
Av. lbs. feed per lamb daily:[2]						
Pellet	2.95	2.75	......	......	2.85	2.65
Cracked corn	......	......	1.18	1.31	......	......
Chopped alfalfa hay	.44	.46	2.21	1.72	.42	.40
Av. lbs. feed per cwt. gain:[2]						
Pellet	730.2	706.9	......	......	764.1	774.9
Cracked corn	......	......	369.9	408.1	......	......
Chopped alfalfa hay	108.9	118.3	692.8	535.8	112.6	117.0
Feed cost per cwt. gain[3]	13.68	13.95	14.90	14.27	17.97	18.27
Number lambs died	0	1	0	2	0	1
Av. carcass grade, USDA[4]	9.32	9.88	9.19	9.25	9.16	9.22

1. Each lamb received, in addition, approximately .4 lb. chopped alfalfa hay daily.
2. Includes any feed that was wasted.
3. Feed cost per cwt. gain is based on feed prices quoted for 1957-58 test.
4. USDA grade was based on prime, 14; choice, 11; good, 8; utility, 5; and cull, 2.

Table 18

Pelleted and Non-pelleted Rations of Varying Concentrations for Fattening Lambs, 1957-58.

Lot number	1	2	3	4	5	6
Ration fed	60% field cured alf. hay, 40% corn, pelleted[1]	50% field cured alf. hay, 50% corn, pelleted[1]	65% chopped alfalfa hay, 35% cracked corn, non-pelleted	55% chopped alfalfa hay, 45% cracked corn, non-pelleted	60% dehydrated alf. hay, 40% corn, pelleted[1]	50% dehydrated alf. hay, 50% corn, pelleted[1]
Number lambs per lot	20	19	20	20	20	20
Days on feed	93	93	93	93	93	93
Initial wt. per lamb, lbs.	77.6	79.7	78.1	79.2	79.6	78.4
Final wt. per lamb, lbs.	111.5	112.1	103.0	106.5	113.9	108.2
Total gain per lamb, lbs.	33.9	32.4	24.9	27.4	34.3	29.8
Av. daily gain per lamb, lbs.	.364	.348	.268	.294	.369	.320
Lbs. feed per lamb daily:[2]						
Pellet	2.99	2.84	......	......	2.95	2.80
Cracked corn	......	......	1.17	1.36	......	......
Chopped alfalfa hay	.413	.415	2.16	1.76	.413	.413
Lbs. feed per cwt. gain:[2]						
Pellet	821.4	816.1	....	....	799.5	875.0
Cracked corn	....	....	436.6	462.6	....	....
Chopped alfalfa hay	113.5	119.3	806.0	598.6	111.9	129.1
Feed cost per cwt. gain, $	15.31	15.94	17.48	16.10	18.74	20.61
Number lambs died	0	1	0	0	0	0
Av. carcass grade, USDA[3]	8.90	9.26	8.00	8.15	8.30	8.60

1. Each lamb received, in addition, approximately .4 lb. chopped alfalfa hay daily.
2. Includes any feed that was wasted.
3. USDA grade was based on prime, 14; choice, 11; good, 8; utility, 5; and cull, 2.

The Effect upon the Quality and Palatability of the Carcass of Implanting Stilbestrol, and Feeding a Premix, to Feeder Lambs (Project—Hatch 423).

Animal Husbandry, Chemistry, and Home Economics (Foods and Nutrition) cooperating.

D. L. Mackintosh, R. A. Merkel, T. D. Bell, C. S. Menzies, D. Harrison, B. Westerman and L. Anderson

Over the past four years 160 lambs have been slaughtered on this experiment. Ten head of lambs from each of four lots of 35 to 50 lambs fed at the Garden City Station have been shipped to Manhattan for slaughter and carcass observations.

The lots have included, in addition to the controls, 2 mgs. stilbestrol in the feed, 6 mgs. implants and a commercial preparation known as Synovex. The components of this premix have been varied from year to year. This year (1958) the lot receiving 2 mgs. stilbestrol per day in the feed was replaced with a lot implanted with 3 mgs. stilbestrol.

Observations on storage and palatability of the meat from the lambs slaughtered in 1957 have just been completed and are now being analyzed. Carcass data from 1955 and 1956 indicate that the control lambs had the highest yield in 1955 and 1956. They also had the lightest livers and the lowest liver glycogen, the highest level of liver fat, and most fat in the rib eye (indicative of marbling). The lots receiving 2 mgs. of stilbestrol in the feed daily had the heaviest livers both years, lowest liver fat levels, and heaviest pelts. The lambs with the implants had the most outside covering and graded slightly higher each year. The lambs receiving the Synovex had the thickest covering over the ribs but the poorest covering otherwise. They also showed the least rib eye fat, smallest volume of press fluid, least press fluid nitrogen and highest percent N.P.N (non-protein nitrogen) of the total nitrogen in the press fluid. In all three lots receiving stilbestrol the pelt was strongly attached to the fell, with the result that these lambs pelted much harder than the controls.

In the second trial no stilbestrol was found in the composite sample of the rib eye, back fat, and liver, either from the fed or the implanted lot. This confirms results of the first trial. Higher calcium nitrogen ratios and calcium phosphorus ratios were found in both fed and implanted lots than in the controls. These observations may have direct bearing on hormone treatment of human pathology related to arthritis.

The strong adherence of the pelt to the fell in the stilbestrol lambs may be associated with the greater calcium deposits in the fell. Collagen fibers (constituents of connective tissues) become more cohesive when calcium is abundant and vice versa.

Average data indicate that the cooking time, total cooking losses and palatability of roasted legs from the 1956 lambs were not affected by the feeding or implanting treatments. Volatile losses accounted for 75 to 80 percent of the losses during cooking, but the dripping losses increased sharply in the first 10 minutes after the roasts were removed from the oven. The flavor of the lean meat was good after 48 weeks of frozen storage, but the flavor of the fat was slightly undesirable after 24 weeks of frozen storage.

The thiamine and riboflavin content of the loins was not affected by the treatment of the lambs or by frozen storage. The loins from lambs on the control diet contained significantly more pantothenic acid and niacin than did the loins from the other groups of lambs. Frozen storage did not affect the amount of these vitamins in the loins.

Beef Cattle

The Value of Stilbestrol Implants for Beef Cattle (Project 253).

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

Experiment 1 (For experimental procedure used, refer to Project 253-1 on page 29 of this circular):

The objective of this test was to determine the value of stilbestrol implants for steer calves wintered and grazed on bluestem pasture. The following daily ration was fed per head on pasture during the winter period:

Pasture 12—Soybean meal, 1.0 lb.; ground sorghum grain, 4.6 lbs.; aureomycin, 45 mgs.

Pasture 12A—Soybean meal, 1.0 lb.; ground sorghum grain, 4.6 lbs.

Pasture 7—Soybean meal, 1.3 lbs.; molasses, 4.0 lbs.

Pasture 15—Ten percent urea molasses, 2.6 lbs.

Molasses in pastures 7 and 15 was fed free choice. During the summer all animals were grazed together and received no supplemental feed.

Five of the animals in each lot were implanted with 24 mgs. of stilbestrol at the beginning of the test. **Increased rate of gain was noted** with treated animals in all pastures except 12A **for both summer and** winter periods. There were no apparent adverse side effects from treatment.

Experiment 2 (For experimental procedure used in this study refer to project 253-6 on page 40 of this circular):

The purpose of this test was to study the value of stilbestrol implants for steer calves on a wintering, grazing and fattening program.

Five animals in lot 1 and five in pasture 12 were implanted with 24 mgs. of stilbestrol at the beginning of the test. Each lot received the following treatment:

Lot 1—Wintered in dry-lot on sorghum silage; 4.8 lbs. of sorghum grain and 1 lb. soybean meal per head daily; summer grazed on bluestem pasture; fattened in dry-lot on soybean meal, ground sorghum grain and alfalfa hay.

Pasture 12—Wintered on bluestem pasture with the remainder of the treatment identical to lot 1.

When the gains for all three phases of the trial are taken into consideration, the steers implanted with stilbestrol in lot 1 show more gain than the controls. **In pasture 12 no increase in gain was obtained with implants; in fact, during the summer period the stilbestrol-implanted steers gained less than the controls.**

Table 19

Phase 1—Wintering—December 11, 1956, to March 30, 1957—109 days. Five steers per treatment.

Lot number	12		12A		7		15	
Treatment	Controls	Implants	Controls	Implants	Controls	Implants	Controls	Implants
Av. initial wt. per steer, lbs.	432	434	431	432	438	431	436	433
Av. final wt. per steer, lbs.	513	514	519	532	529	538	436	456
Av. total gain per steer, lbs.	81	80	88	100	91	107	.....	23
Av. daily gain per steer, lbs.	.74	.73	.81	.92	.83	.98	.....	.21
Phase 2—Grazing—March 30, 1957, to July 27, 1957—119 days.								
Av. initial wt. per steer, lbs.	513	514	519	532	529	538	436	456
Av. final wt. per steer, lbs.	727	722	732	779	722	755	675	713
Av. total gain per steer, lbs.	214	218	213	247	193	217	239	257
Av. daily gain per steer, lbs.	1.80	1.83	1.79	1.97	1.62	1.82	1.98	2.16
Summary—Phases 1 and 2—December 11, 1956, to July 27, 1957—228 days.								
Av. initial wt. per steer, lbs.	432	434	431	432	438	431	436	433
Av. final wt. per steer, lbs.	727	722	732	779	722	755	675	713
Av. total gain per steer, lbs.	295	298	301	347	284	324	239	280
Av. daily gain per steer, lbs.	1.29	1.31	1.32	1.52	1.25	1.42	1.05	1.23

Table 20

The Influence of Stilbestrol Implants on Steer Calves—Wintering, Grazing, Fattening.

Wintering phase—December 4, 1956, to May 11, 1957—158 days.

Lot number	1	1	12	12
Treatment	Controls	Implants	Controls	Implants
Number steers per treatment	5	5	5	5
Av. initial wt. per steer, lbs.	451	438	447	443
Av. final wt. per steer, lbs.	663	670	583	597
Av. total gain per steer, lbs.	212	232	136	154
Av. daily gain per steer, lbs.	1.34	1.47	.86	.97
Grazing phase—May 11 to July 27, 1957—77 days.				
Av. initial wt. per steer, lbs.	663	670	583	597
Av. final wt. per steer, lbs.	746	792	727	722
Av. total gain per steer, lbs.	83	122	144	125
Av. daily gain per steer, lbs.	1.08	1.58	1.87	1.62
Fattening phase—July 27 to December 2, 1957—128 days.				
Av. initial wt. per steer, lbs.	746	792	727	722
Av. final wt. per steer, lbs.	1057	1097	1059	1047
Av. total gain per steer, lbs.	311	305	330	325
Av. daily gain per steer, lbs.	2.43	2.38	2.59	2.54
Complete trial—December 4, 1956, to December 2, 1957—363 days.				
Av. initial wt. per steer, lbs.	451	438	447	443
Av. final wt. per steer, lbs.	1057	1097	1059	1047
Av. total gain per steer, lbs.	606	659	612	604
Av. daily gain per steer, lbs.	1.67	1.82	1.69	1.66

Experiment 3 (The experimental procedure used is described under Project 253-3-5 of this circular):

The purpose of this test was to determine the value of stilbestrol implants for yearling steers grazed on bluestem pasture. Work completed under similar circumstances the previous year indicates that implanting with 24 or 36 mgs. will increase rate of gain. However, there were several treated animals, especially at the higher level, that exhibited undesirable side effects. This year 12 and 24 mgs. were used to see if rate of gain could be increased without the appearance of undesirable side effects. These animals were scored on feeder grade by a panel of judges at the beginning and conclusion of the test; grades were similar for controls and the two treated groups.

In general, it appears that 24 mgs. is the most desirable level to use under the conditions described.

Table 21

Effect of Stilbestrol Implants on Steers Pastured on Bluestem Pasture.

April 27 to October 3, 1957—159 days.

Pasture number	Pasture treatment	Number of steers	Av. daily gain	Av. total gain	Treatment
1	Normally stocked	9	1.46	233	Control
1	Normally stocked	5	1.55	247	12 mgs.
1	Normally stocked	5	1.63	260	24 mgs.
2	Overstocked	13	1.44	230	Controls
2	Overstocked	6	1.38	221	12 mgs.
2	Overstocked	6	1.62	258	24 mgs.
3	Understocked	7	1.47	235	Controls
3	Understocked	3	1.52	242	12 mgs.
3	Understocked	3	1.69	270	24 mgs.
4	Deferred and rotated	29	1.28	205	Controls
4	Deferred and rotated	14	1.37	219	12 mgs.
4	Deferred and rotated	14	1.40	224	24 mgs.

Table 21 (Continued)

9	Early spring burned	6	1.59	253	Controls
9	Early spring burned	4	1.72	274	12 mgs.
9	Early spring burned	4	1.63	260	24 mgs.
10	Mid-spring burned	6	1.48	236	Control
10	Mid-spring burned	4	1.60	255	12 mgs.
10	Mid-spring burned	4	1.79	286	24 mgs.
11	Late spring burned	6	1.60	255	Controls
11	Late spring burned	4	1.80	287	12 mgs.
11	Late spring burned	4	1.90	303	24 mgs.
Total		76	1.41	225	Controls
		40	1.51	241	12 mgs.
		40	1.60	255	24 mgs.

Self-Feeding Urea-Molasses and the Feeding of Aureomycin to Steer Calves Wintered on Bluestem Pasture (Project 253-1).

Trial I, 1956-57

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

The wintering phase of this trial has been reported previously in Circular 349.

A self-fed urea-molasses mixture is being compared to molasses self-fed plus soybean oil meal in an effort to determine if a urea-molasses mixture self-fed on dry grass will serve as an adequate source of protein and energy.

Another phase of the test is to determine if aureomycin will improve the performance of calves wintered on pasture without shelter.

Experimental Procedure

The Hereford steer calves used in this study originated in the vicinity of Santa Rosa and Melrose, New Mexico. They were allotted to their treatments on the basis of weight. The calves in lots 12 and 12A were wintered together in a 190-acre bluestem pasture and separated each morning to be fed. The calves in lot 7 were in a 60-acre pasture during the winter, as were those in lot 15.

Lot 12 should be compared with 12A, which received aureomycin in the form of Aurofac 2A. The Aurofac 2A was mixed with the soybean meal so as to furnish 45 mgs. of aureomycin per head daily.

Lot 7 should be compared with lot 15. The molasses in lots 7 and 15 was self-fed with no attempt to regulate consumption. The urea-molasses mixture fed to lot 15 contained 77 percent molasses, 3 percent phosphoric acid, and a 20 percent urea solution which was one half urea and one half water. The molasses fed to lot 7 contained 3 percent phosphoric acid.

At the close of the wintering period all of the lots were placed in a 190-acre bluestem pasture and grazed together with no supplemental feed until they were weighed off test July 27, 1957.

Observations

Feeding aureomycin during the winter to lot 12A increased the average daily gain per steer by .12 of a pound during the winter and .16 of a pound during the summer as compared to lot 12. Other trials will be necessary to verify these results.

Molasses fed to lot 7 during the winter was more palatable than the urea-molasses fed to lot 15. The soybean meal and extra molasses consumed by lot 7 increased the daily gain per steer of that lot by .8 of a pound during the winter period, and .19 of a pound for the winter and summer period combined over lot 15 self-fed the urea-molasses mixture.

The protein or protein equivalent consumed in the supplemental feed by the two lots was about the same for each lot. Apparently some additional source of protein other than that found in dry bluestem pasture and urea is desirable for calves.

Table 22

Self-Feeding Urea-Molasses and the Feeding of Aureomycin to Steer Calves Wintered on Bluestem Pasture. Compare Lot 12 with 12A and Lot 7 with 15.

Phase 1—Wintering—December 11, 1956, to March 30, 1957—109 days.				
Treatment	No aureomycin	Aureomycin	Molasses and soybean meal	Urea-molasses
Lot number	12	12A	7	15
Number steers per lot	10	10	10	10
Av. initial wt. per steer, lbs.	433	432	435	435
Av. final wt. per steer	514	526	534	447
Av. gain per steer, lbs.	81	94	99	12
Av. daily gain per steer, lbs.	.74	.86	.91	.11
Av. daily ration per steer, lbs.:				
Soybean meal	1.0	1.0	1.3	
Ground sorghum grain	4.6	4.6		
Aureomycin, mgs.		45 mgs.		
Molasses, self-fed			4.0	
10% urea-molasses, self-fed				2.6
Dry bluestem pasture	Free choice		Free choice	
Salt	Free choice		Free choice	
Av. feed cost per steer,* $	23.21	24.03	25.89	18.37
Phase 2—Grazing—March 30 to July 27, 1957—119 days.				
Av. gain per steer, lbs.	211	230	205	247
Av. daily gain per steer, lbs.	1.77	1.93	1.72	2.08
Av. final wt. per steer, lbs.	725	756	739	694
Av. feed cost per steer,* $	16.00	16.00	16.00	16.00
Summary of Phases 1 and 2—December 11, 1956, to July 27, 1957—228 days.				
Av. gain per steer, lbs.	292	324	304	259
Av. daily gain per steer, lbs.	1.28	1.42	1.33	1.14
Av. feed cost per 100 lbs. gain, $	13.42	12.35	13.78	13.27
Av. feed cost per steer,* $	39.21	40.03	41.89	34.37

* Winter rations were continued until April 20, 1957, and cost is included through this date. Feed prices for 1956-57 are inside back cover; $1.00 per steer was charged for salt.

A Comparison of the Amount and Kind of Protein Concentrate for Yearling Steers on Bluestem Pasture, 1957 (Project 253-1).

E. F. Smith, B. A. Koch, F. W. Boren and G. L. Walker

In Circular 349 from this station, it has been reported in a three-year study that 2 pounds of soybean pellets fed per steer daily increased the gain .39 pound per head daily on yearling steers on bluestem pasture in late summer (August, September, and October). Most of this gain increase occurred in September and October. This report is concerned primarily with finding out if the level of supplemental feeding can be profitably lowered and if the kind of protein concentrate has any effect on performance.

Experimental Procedure

Twenty-four head of good to choice quality Hereford yearling steers were used in this test. They had been grazed together on bluestem pasture previous to the test. They were divided into four lots of six steers each in a manner to equalize any differences due to previous winter treatment. The steers had been wintered on grass the previous winter and used in other experimental tests. For this test, they were grazed on bluestem

pasture from August 5, 1957, to October 30, 1957, and received the following protein concentrates in pounds per head daily.

Pasture 1—1.0 pound soybean meal, 44 percent crude protein.
Pasture 2—2.0 pounds soybean meal, 44 percent crude protein.
Pasture 3—1.3 pounds linseed meal, 34 percent crude protein.
Pasture 4—2.6 pounds linseed meal, 34 percent crude protein.
Each pasture covered 60 acres with a good growth of grass.

Observations

By increasing the level of concentrate feeding, the gain was increased in both soybean meal and linseed meal groups. The gain increase occurred in October, with little benefit during August and September. Based on this and previous studies, it appears that in most years no supplemental feed may be necessary in August; approximately 1 pound of protein concentrate would suffice in September, and 2 pounds per head daily in October.

The differences in gain between the animals fed linseed meal and soybean meal were minor.

Table 23

A Comparison of the Amount and Kind of Protein Concentrate for Yearling Steers on Bluestem Pasture in Late Summer.

August 5 to October 30, 1957—86 days.

Pasture number	1	2	3	4
Number steers per pasture	6	6	6	6
Av. initial wt. per steer, lbs.	731	725	731	740
Av. final wt. per steer, lbs.	863	894	867	896
Av. gain per steer, lbs.	132	169	136	156
Av. daily gain per steer, lbs.	1.53	1.97	1.58	1.81
Av. daily ration per steer, lbs.:				
Soybean meal	1.0	2.0		
Linseed oil meal			1.3	2.6
Av. gain per steer by periods:				
August 5 to September 3	50.0	51.0	62.0	69.0
September 3 to October 5	78.0	72.0	53.0	53.0
October 5 to October 30	4.0	46.0	21.0	34.0
Av. total gain	132	169	136	156

A Comparison of Alfalfa and Alfalfa Plus Grain for Wintering Heifer Calves on Bluestem Pasture, 1956-57 (Project 253-2).

E. F. Smith, B. A. Koch and F. W. Boren

This is the second trial of this comparison. The first one was reported in Circular 349 from this station. The objective is to obtain information on the optimum level of alfalfa hay for heifers being wintered on bluestem pasture.

Experimental Procedure

Twenty-two head of good quality Hereford heifer calves purchased from the Harris Ranch at Melrose, New Mexico, were used in the test. They were divided on the basis of weight into two lots of 11 heifers each and wintered on bluestem pasture with the following treatments:

Pasture 8—Fed 4 pounds of alfalfa hay and 2.5 pounds of corn per head daily.

Pasture 13—Fed 8 pounds of alfalfa hay per head daily.

The 2.5 pounds of corn fed to pasture 8 furnished approximately the same amount of total digestible nutrients as the additional 4 pounds of alfalfa hay fed to pasture 13.

Plenty of grass was available in both pastures. The heifers had free access to salt.

Observations

The 2.5 pounds of corn and 4 pounds of alfalfa hay fed per heifer daily in pasture 8 produced .41 pound more gain per heifer daily than the 8 pounds of alfalfa hay fed to pasture 13. This would indicate that the protein and vitamin A requirements are amply met when 4 pounds of alfalfa hay and 2.5 pounds of corn are fed per heifer daily on winter bluestem pasture.

The increased gain resulting from the replacement of a part of the alfalfa with corn indicates some value of the grain beyond the total digestible nutrient value. This could be accounted for by the higher energy value of the grain.

The heifers were grazed together during the summer with no supplemental feed. By July 23, the close of the summer phase, the difference in gain had been reduced to .10 pound per head daily, still in favor of the heifers fed alfalfa and grain.

This is the same trend observed in the previous trial.

Table 24

A Comparison of Alfalfa and Alfalfa Plus Grain for Wintering Heifer Calves on Bluestem Pasture.

Wintering—December 11, 1956, to March 30, 1957—109 days.		
Pasture number	8	13
Number of heifers	11	11
Av. initial wt. per heifer, lbs.	473	469
Av. gain per heifer, lbs.	81	36
Av. daily gain per heifer, lbs.	.74	.33
Av. daily ration per heifer, lbs.:		
Alfalfa hay	4.0	8.0
Ground shelled corn	2.5	....
Bluestem pasture		
Av. feed cost per heifer,* $	18.30	15.50
Grazing—March 30, 1957, to July 23, 1957—115 days.		
Av. initial wt. per heifer, lbs.	554	505
Av. gain per heifer, lbs.	176	200
Av. daily gain per heifer, lbs.	1.53	1.74
Av. feed cost per heifer, $	16.00	16.00
Summary—December 11, 1956, to July 23, 1957—224 days.		
Av. initial wt. per heifer, lbs.	473	469
Av. final wt. per heifer, lbs.	730	705
Av. gain per heifer, lbs.	257	236
Av. daily gain per heifer, lbs.	1.15	1.05
Av. feed cost per heifer, $	34.30	31.50
Av. feed cost per 100 lbs. gain	13.35	13.35

* The supplements were continued until April 20. This figure includes their cost to that date. Feed prices may be found on inside back cover.

The Value of Trace Minerals in a Fattening Ration, 1957 (Project 253-2).

R. R. Oltjen, E. F. Smith and R. F. Cox

This is the fourth in a series of experiments conducted to determine the value of trace minerals in a typical fattening ration. Three previous experiments, similar to this one, were reported in Kansas Agr. Exp. Sta. Cirs. 297, 308 and 335.

Chemical analyses of feeds commonly used in cattle rations in this area show there is no deficiency in any of the trace minerals: cobalt, copper, iodine, iron, manganese and zinc. It is possible the minerals may not be adequately balanced or available to the animal at all times. The objective of this test is to determine if trace minerals, when fed at a commonly used level, will influence rate of gain and feed efficiency.

Experimental Procedure

Twenty head of good quality Hereford heifers, 10 head to a lot, were used in this test. They were part of a shipment of cattle from Melrose,

New Mexico. The heifers were wintered and summer grazed on bluestem pasture and allotted in such a way as to equalize any differences in prior treatment. The full-feeding period started on July 24 and continued until the heifers graded good to choice. The grain was self-fed and hay was fed in amounts readily consumed.

Both lots were handled identically except that one lot received trace minerals during the dry-lot fattening phase. The trace minerals were fed as a trace mineral premix and added to the soybean oil meal to furnish the following amounts in milligrams per head daily: cobalt 1.25; copper 3.65; iodine 1.97; iron 46.13; manganese 56.3; and zinc 3.42.

Observations

The addition of trace minerals to lot 2 increased the gain .37 of a pound daily over lot 1 fed no trace minerals. Lot 2 ate slightly more grain and utilized it more efficiently. Selling price per hundredweight and dressing percentage were the same in both cases, while carcass data varied only a small amount.

Table 25

The Value of Trace Minerals in a Fattening Ration.

July 24, 1957, to November 5, 1957—104 days.

Lot number	1	2
Number of heifers per lot	10	10
Management	Self-fed grain in dry-lot	Self-fed grain in dry-lot plus trace minerals
Av. initial wt. per heifer, lbs.	716	717
Av. final wt. per heifer, lbs.	977	1016
Av. gain per heifer, lbs.	261	299
Av. daily gain per heifer, lbs.	2.51	2.88
Daily ration per heifer, lbs.:		
Soybean oil meal	1.49	1.47
Corn	16.61	17.43
Prairie hay	3.60	3.51
Salt	.02	.02
Ground limestone	.09	.09
Trace minerals	....	yes
Feed per cwt. gain, lbs.:		
Soybean oil meal	59.3	51.2
Corn	661.9	606.4
Prairie hay	143.3	122.2
Ground limestone	3.6	3.0
Salt	1.0	1.0
Cost of feed per cwt. gain, $	22.75	20.64
Total feed cost	59.38	61.71
Selling price per cwt. at market	23.25	23.25
Dressing percent	59.6	59.6
Carcass grades, USDA:		
Choice	..	1
Low choice	4	4
High good	3	3
Good	2	1
Low good	1	1
Av. thickness of finish[1]	4.4	3.8
Av. degree of marbling[2]	6.6	6.5
Av. size of rib eye[3]	3.9	3.7
Av. degree of firmness[4]	3.1	3.1

1. Scores for thickness of finish: moderate 3; modest 4; slightly thin 5.
2. Scores for degree of marbling: moderate 5; modest 6; small amount 7.
3. Scores for size of rib eye: large 2; moderately large 3; modestly large 4.
4. Scores for degree of firmness: firm 2; moderately firm 3; modestly firm 4.

A Comparison of Milo Mill Feed with Ground Sorghum, 1956-57 (Project 253-2).

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

Milo mill feed* is a relatively new feed ingredient that has been made available to livestock producers. This test is being conducted so that the livestock industry may have some knowledge of its comparative feed value. A progress report on this test was presented in Circular 349 from this station.

Experimental Procedure

The milo mill feed used in this test is a by-product obtained in dry milling sorghum grain. The composition expressed as the percent by weight of each of the component milling fractions is: sorghum bran, 30 percent; sorghum germ, 45 percent; sorghum shorts, 25 percent. A chemical analysis is given in the feedstuff analysis table in this circular.

Twenty-one good-quality Hereford heifer calves from near Melrose, New Mexico, were used in the test. The heifers were assigned to their respective treatments on the basis of weight, 11 head to the milo mill feed lot and 10 head to the sorghum grain fed lot. The heifers were fed all the sorghum silage they would eat during the winter phase but each animal received the same amount of concentrate feed and alfalfa hay. The heifers were gradually placed on a full feed of sorghum grain or milo mill feed during April. During the full feeding phase the sorghum grain or milo mill feed was self-fed, as was the alfalfa hay. Soybean meal was fed at the rate of 1 pound per head daily.

Observations

The gain produced under the two treatments was about the same. Due to a lower consumption of milo mill feed than of sorghum grain in the respective lots during the fattening phase, the heifers fed milo mill feed showed an advantage in feed efficiency. They also showed an advantage in dressing percent. The higher financial return to the producer for heifers fed milo mill feed was due to lower feed consumption, higher yield, a few higher grading carcasses, and a 10-cents-per-cwt. advantage in feed price.

Under the conditions of this test, milo mill feed proved fully equal to ground sorghum grain.

Table 26

The Value of Milo Mill Feed as Compared to Ground Sorghum Grain.[1]

Phase 1—Wintering—January 9 to April 3, 1957—84 days.

Treatment	Ground sorghum grain	Milo mill feed
Lot number	13A	17
Number of heifers per lot	10	11
Av. initial wt. per heifer, lbs.	420	422
Av. final wt. per heifer, lbs.	570	571
Av. gain per heifer, lbs.	150	149
Av. daily gain per heifer, lbs.	1.78	1.77
Daily ration per heifer, lbs.:		
Ground sorghum grain	4.98	....
Milo mill feed[1]	....	4.93
Soybean meal	.23	.23
Sorghum silage	18.62	17.1
Alfalfa hay	2.49	2.45
Salt	.07	.08
Lbs. feed per cwt. gain:		
Ground sorghum grain	277	....
Milo mill feed	....	272
Soybean meal	13	13
Sorghum silage	1036	945
Alfalfa hay	138	136
Av. feed cost per cwt. gain,[2] $	13.29	12.71

* The term "milo mill feed" is a trade name and has no definite or specific relation to the sorghum products or by-products contained in the material to which this term is applied.

Table 26 (Continued)

Phase 2—Full feeding—April 3, 1957, to August 8, 1957—127 days.		
Av. initial wt. per heifer, lbs.	570	571
Av. final wt. per heifer, lbs.	796	792
Av. gain per heifer, lbs.	226	221
Av. daily gain per heifer, lbs.	1.78	1.74
Daily ration per heifer, lbs.:		
Ground sorghum grain, self-fed	12.7	....
Milo mill feed, self-fed	....	11.1
Soybean meal	1.0	1.0
Sorghum silage	4.4	3.8
Alfalfa hay	5.3	4.9
Salt	.02	.02
Lbs. feed per cwt. gain:		
Ground sorghum grain	715	....
Milo mill feed	....	636
Soybean meal	55	56
Sorghum silage	248	216
Alfalfa hay	299	279
Av. feed cost per heifer,[2] $	55.44	47.68
Av. feed cost per cwt. gain, $	24.53	21.57
Summary of Phases 1 and 2, January 9, 1956, to August 8, 1957—211 days.		
Av. total gain per heifer, lbs.	376	370
Av. daily gain per heifer, lbs.	1.78	1.75
Av. feed cost per cwt. gain, $	20.07	18.01
Av. total feed cost per heifer, $	75.47	66.62
Av. initial heifer cost at $19.50 per cwt., $	81.90	82.29
Av. selling price per cwt.,[3] $	22.65	23.87
Av. return per heifer above initial cost plus feed cost, $	16.58	33.93
Av. % shrinkage in shipping to market	3.5	3.3
Dressing %, chilled	59.0	61.6
Carcass grades, USDA:		
Low prime	....	1
High choice	....	....
Av. choice	2	4
Low choice	5	4
High good	3	....
Av. good	....	1
Low good	....	1
Av. grade[4]	12.90	13.18
Av. marbling score[5]	7.10	6.81
Av. fat thickness score[6]	3.5	3.81
Av. rib eye size, score[7]	4.6	4.36
Av. firmness score[8]	3.7	3.63

1. The milo mill feed was furnished by Grain Products, Inc., Dodge City.

2. Feed prices per ton: Alfalfa hay, $25.00; sorghum silage, $10.00; soybean meal, $70.00 per cwt.; ground sorghum grain, $2.50; milo mill feed, $2.40.

3. Based on carcass grades with U.S. prime at 40c a pound, choice at 39c and good at 37c.

4. Average grade was based on low prime, 16; high choice, 15; average choice, 14; low choice, 13; high good, 12; average good, 11.

5. Marbling score was based on moderate, 5; modest, 6; small amount, 7; slight amount, 8.

6. Fat thickness score at 12th rib based on moderate, 3; modest, 4; slightly thin, 5.

7. Rib eye score size was based on moderately large, 3; modestly large, 4; slightly small, 5.

8. Firmness of rib eye was based on firm, 2; moderately firm, 3; modestly firm, 4; slightly firm, 5.

Different Methods of Managing Bluestem Pastures, 1957 (Projects 253-3 and 253-5).

E. F. Smith, K. L. Anderson, B. A. Koch, F. W. Boren and G. L. Walker

This experiment is to determine the effects of different stocking rates, deferred grazing, and pasture burning on cattle 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 past eight years of the study is included.

Experimental Procedure

Good quality Hereford yearling steers weighing about 485 pounds were used to stock the pastures. They were purchased as calves near Melrose, New Mexico, in the fall of 1956. They were wintered at Manhattan in the dry-lot on sorghum silage, a limited amount of alfalfa hay, and 1 pound of protein concentrate per head daily. The method of management of each pasture was:

Pasture 1—Normal stocking rate, 3.2 acres per head.
Pasture 2—Overstocked, 2.3 acres per head.
Pasture 3—Understocked, 5.6 acres per head.
Pastures 4, 5, 6—Deferred grazing, 3.2 acres per head.

All steers were held in pastures 4 and 6 until July 1, then placed on deferred pasture 5 until August 5; from August 5 until September 4 they were allowed the run of all three pastures. On September 4 they were put back on pastures 4 and 6 for the remainder of the season.

Pasture 9—Burned March 16, 1957, normal rate of stocking.
Pasture 10—Burned April 10, 1957, normal rate of stocking.
Pasture 11—Burned May 1, 1957, normal rate of stocking.

The steers were weighed off test October 3, 1957, but remained on the pastures until November 1, 1957. Results are presented in Tables 27 and 28.

Observations

1. The steers on the normal, over, and understocked pastures made about the same gain, while the steers on the burned pastures, especially those on the late spring burning, made the greatest gains per head.

2. Deferred and rotation grazing produced 34 pounds less gain per steer than normal, season-long grazing as practiced on pasture 1. This difference occurred primarily during July when all of the deferred and rotated steers, 57 head, were on one 60-acre pasture.

3. Pasture 3, overstocked, and pasture 9, early spring burned, had the least top growth remaining at the close of the season. The other pastures ranked approximately as follows in regard to top growth, from most to least:

Pasture 3—understocked
Pastures 5 and 6—deferred
Pasture 1—normally stocked
Pasture 4—deferred
Pasture 11—late spring burned
Pasture 10—mid-spring burned

4. Taking into consideration the condition of the grass, gain per acre and gain per steer, normal stocking, as practiced on pasture 1, appears to rank near the top in management practices tested.

Table 29 (Continued)

Phase 2—Grazing—May 11, 1957, to July 18, 1957—68 days.		
Av. gain per steer, lbs.	127	151
Av. daily gain per steer, lbs.	1.87	2.22
Av. feed cost per steer, $	20.00	20.00
Phase 3—Fattening—July 18, 1956, to October 26, 1957—100 days.		
Av. initial wt. per steer, lbs.	1017	942
Av. final wt. per steer, lbs.	1225	1157
Av. gain per steer, lbs.	208	215
Av. daily gain per steer, lbs.	2.08	2.15
Daily ration per steer:		
Ground sorghum grain, lbs.	13.5	13.5
Soybean oil meal, lbs.	1.42	1.42
Stilbestrol, mgs.	10	10
Ground limestone, lbs.	.1	.1
Salt	Free choice	
Bluestem pasture	Free choice	
Feed per cwt. gain, lbs.:		
Ground sorghum grain	647	626
Soybean meal	68.0	66.0
Av. feed cost this phase,[1] $	39.41	39.41
Av. feed cost per 100 lbs. gain[1]	18.95	18.33
Summary of Phases 1, 2 and 3—December 11, 1956, to October 26, 1957—319 days.		
Av. total gain per steer, lbs.	450	384
Av. daily gain per steer, lbs.	1.41	1.20
Av. feed cost per cwt. gain, $	21.41	18.09
Av. total feed cost per steer	96.33	69.45
Av. initial steer cost @ $19 per cwt.	147.25	146.87
Av. selling price per cwt.	22.00	21.00
Av. return per steer above initial cost plus feed cost	14.04	15.73
Av. % shrink in shipping to market	4.41	4.49
Av. dressing %, chilled	60.95	58.81
Carcass grades, USDA:[2]		
Low choice	1	....
High good	4	....
Av. good	4	....
Low good	1	3
High standard	....	3
Av. standard	....	1
Av. marbling score[3]	7.1	8.7
Av. fat thickness score[4]	4.0	3.9
Av. rib eye size, score[5]	4.5	4.7
Av. firmness score[6]	4.0	4.4

1. Feed prices may be found inside the back cover.
2. Three carcasses from lot 2 were shipped from the packing plant before carcass data were obtained from them.
3. Marbling score based on: small amount, 7; slight amount, 8; traces, 9.
4. Thickness of outside fat based on: moderate, 3; modest, 4; slightly thin, 5.
5. Rib eye size: modestly large, 4; slightly small, 5.
6. Firmness of rib eye based on: moderately firm, 3; modestly firm, 4; slightly firm, 5.

Winter Management for Steer Calves on a Wintering, Grazing, and Fattening Program, 1956-57 (Project 253-6).

E. F. Smith, B. A. Koch, F. W. Boren and G. L. Walker

A previous test has been reported in Circular 349 from this station. The objective of the study is to determine if winter bluestem pasture can be supplemented in such a manner that calves wintered on it will compare favorably in yearly performance with steer calves wintered on good quality roughage. It was noted in the first test that production costs were cheaper on winter grass and that calves wintered in the dry-lot would have to grade higher as fat cattle and sell for more per cwt. to make as great a return as those wintered on pasture.

Experimental Procedure

Twenty head of good quality Hereford steer calves from near Melrose, New Mexico, were divided on the basis of weight into two lots of 10 steer calves each. The treatment assigned to each lot was as follows:

Lot 1—wintered in dry-lot on sorghum silage, 4.8 pounds of sorghum grain, and 1 pound of soybean meal per head daily; grazed on bluestem pasture from May 11 to July 27; fattened in dry-lot from July 27 to December 2, 1957.

Lot 2—wintered on bluestem pasture, with the remainder of their treatment identical to that of lot 1.

The two lots were grazed together during the summer. Five of the steers in each lot were implanted with 24 mgs. of stilbestrol at the start of the test. Results of this phase of the test are reported elsewhere in this circular.

Observations

1. The steers in lot 1, wintered in dry-lot, gained 77 pounds more per head than those wintered on grass; however, the cost per 100 pounds of gain was about the same due to the low charge made for winter grass.
2. The steers wintered on bluestem pasture, lot 2, gained 32 pounds per head more during the summer than lot 1, wintered in dry-lot, which narrowed the gain advantage for lot 1 considerably.
3. Lot 2 continued to gain at a faster rate when placed on full feed, 26 pounds per head for the period, and therefore had a somewhat lower feed cost per 100 pounds of gain for the fattening phase. Feed consumption was practically the same for both lots. The grain was self-fed; alfalfa hay was limited to amounts readily consumed.
4. In summary of the three phases, the calves in lot 1, wintered on sorghum silage, merit the following statements (averages): gained 19 pounds more per head, returned $7.60 more per head, dressed 1.24 percent higher, and produced slightly superior carcasses. The calves wintered on dry grass excelled only in a lower feed cost per 100 pounds of gain.

Table 30

Winter Management for Steer Calves on a Wintering, Grazing, and Fattening Program, 1956-57.

Phase 1—Wintering—December 4, 1956, to May 11, 1957—158 days.

Lot number	1	2
Number of steers	10	10
Place of wintering	Dry-lot	Bluestem pasture
Av. initial wt. per steer, lbs.	445	445
Av. final wt. per steer, lbs.	667	590
Av. gain per steer in lbs.	222	145
Av. daily gain per steer, lbs.	1.41	.92
Av. daily ration per steer, lbs.:		
Ground sorghum grain	4.8	4.8
Soybean oil meal	1.0	1.0
Sorghum silage	25	
Bluestem pasture		Free choice
Salt	.05	.05
Feed cost per steer,[1] $	40.34	27.04
Feed cost per cwt. gain,[1] $	18.17	18.64

Phase 2—Grazing—May 11, 1957, to July 27, 1957—77 days.

Av. initial wt. per steer, lbs.	667	590
Av. final wt. per steer, lbs.	770	725
Av. gain per steer, lbs.	103	135
Av. daily gain per steer, lbs.	1.33	1.75
Feed cost per steer, $	16.00	16.00

Table 30 (Continued)

Phase 3—Full feeding—July 27, 1957, to December 2, 1957—128 days.

Number of steers per lot	9	10
Av. initial wt. per steer, lbs.	777[2]	725
Av. final wt. per steer, lbs.	1079	1053
Av. gain per steer, lbs.	302	328
Av. daily gain per steer, lbs.	2.36	2.56
Av. daily ration per steer, lbs.:		
Ground sorghum grain	17.4	17.5
Soybean oil meal	1.5	1.5
Alfalfa hay	2.8	2.7
Salt	Free choice	Free choice
Stilbestrol	10 mg.	10 mg.
Av. feed per cwt. gain, lbs.:		
Ground sorghum grain	736	682
Soybean oil meal	64	59
Alfalfa hay	121	106
Feed cost this phase,[1] $	66.82	67.08
Av. feed cost per cwt. gain,[1] $	22.12	20.45

Summary of Phases 1, 2, and 3—December 4, 1956, to December 2, 1957—363 days.

Lot number	1	12
Av. total gain per steer	627[2]	608
Av. daily gain per steer	1.74	1.67
Av. total feed cost per steer,[1] $	123.16	110.12
Av. feed cost per cwt. gain	19.64	18.11
Av. initial steer cost at $23 per cwt. plus feed cost	225.51	212.47
Av. sale price per cwt. based on carcass value,[3] $	24.80	23.39
Av. sale price per steer[4]	259.44	238.80
Av. return per steer	33.93	26.33
Av. dressing percent	61.72	60.48
Carcass grade, USDA:		
High choice	3	
Av. choice	3	3
Low choice	1	1
High good	2	2
Av. good	..	4
Av. USDA grade[5]	13.8	12.3
Av. marbling score[6]	5.7	7.0
Av. fat thickness score[7]	4.0	4.5
Av. rib eye size score[8]	4.0	4.6
Av. firmness score[9]	3.2	4.1

1. Feed prices: Sorghum grain, $2.50 per cwt.; soybean oil meal, $70.00 per ton; sorghum silage, $8.00 per ton; alfalfa hay, $25.00 per ton; salt, $0.75 per cwt.

2. One steer removed from lot 1 during the fattening period because of an injury.

3. Based on carcass weights and grade with U.S. Choice at 41 cents and U.S. Good carcasses at 37 cents per pound.

4. Based on carcass values as stated above.

5. Average grade determined as follows: High choice, 15; average choice, 14; low choice, 13; high good, 12; average good, 11; low good, 10; high standard, 9.

6. Visual marbling score determined as follows: Moderate, 5; modest, 6; small amount, 7; slight amount, 8.

7. Visual fat covering at 12th rib: Moderate, 3; modest, 4; slightly thin, 5.

8. Visual rib eye score: Moderately large, 3; modestly large, 4; slightly small, 5.

9. Firmness of rib eye: Firm, 2; moderately firm, 3; modestly firm, 4; slightly firm, 5.

The Effect of Feeding Stilbestrol[1] to Open and Spayed Heifers, 1956-57 (Project 370).

E. F. Smith, D. Richardson, B. A. Koch, R. A. Merkel and F. W. Boren

This is the second of two trials; the first trial was reported in Circular 349 from this station. Experimental evidence indicates that spaying heifers lowers the rate of gain, whereas stilbestrol has been successfully used to increase rate of gain. This test is to study the effect of (1) spaying; (2) spaying plus stilbestrol; (3) non-spaying, and (4) non-spaying plus stilbestrol on the performance of heifer calves on a high roughage ration, followed by a fattening ration.

Experimental Procedure

Forty-four good-quality Hereford heifer calves from near Melrose, New Mexico, were used in the test. They were divided into four lots of 11 heifers each on the basis of weight, and started on test December 8, 1956. Within the following week two lots were spayed. The four lots of heifers were fed the same feed: 4.7 pounds of ground sorghum grain and 2.6 pounds of alfalfa hay per head daily, all of the sorghum silage they would eat, and free access to salt. A small amount of soybean meal was fed during the last 30 days of the wintering phase. On April 3 the heifers were started on a full feed of grain. During the fattening period the heifers in all lots had free access to ground sorghum grain and alfalfa hay.

The experimental treatment for each lot was as follows:

Lot 13—Non-spayed (control lot).

Lot 14—Non-spayed plus 5 mgs. stilbestrol per head daily the first 56 days and 10 mgs. per head daily during the remainder of the test.

Lot 15—Spayed.

Lot 16—Spayed plus 5 mgs. stilbestrol per head daily the first 56 days and 10 mgs. per head daily during the remainder of the test.

The stilbestrol was fed mixed with the sorghum grain during the wintering phase and with the soybean meal during the fattening phase.

Observations

1. Spaying lowered the gain during the wintering phase and during the fattening period which followed. Feed consumption was slightly lower in the spayed lot (lot 15), and feed efficiency was lowered by spaying during the winter period.
2. Stilbestrol fed to spayed heifers increased their gain up to that of the control lot 13 for both the wintering and fattening periods.
3. For the two phases combined, the performance under all treatments was about the same, with small variations, except for the spayed heifers in lot 15, which were the poorest performers. However, they did compare favorably with the other lots in regard to carcass data.
4. This test demonstrates little merit for spaying, emphasizes the value of stilbestrol for spayed heifers, and shows only a small advantage of stilbestrol for regular non-spayed heifers on this type of program. About the same trends were noted in the first test.

1. The stilbestrol was furnished by Eli Lilly Co., Indianapolis, Ind.

Table 31
The Effect of Feeding Stilbestrol to Open and Spayed Heifers.
Phase 1—Wintering—December 8, 1956, to April 3, 1957—116 days.

Treatment	Non-spayed	Non-spayed plus stilbestrol	Spayed	Spayed plus stilbestrol
Lot number	13	14	15	16
Number of heifers per lot	10[1]	11	11	11
Av. initial wt. per heifer, lbs.	373	370	371	370
Av. final wt. per heifer, lbs.	570	572	534	565
Av. gain per heifer, lbs.	197	202	163	195

1. One heifer was removed from this lot because she failed to recover sufficiently from dehorning.

Table 31 (Continued)

Av. daily gain per heifer, lbs.	1.69	1.74	1.41	1.68
Daily ration per heifer, lbs.:				
Ground sorghum grain	4.66	4.66	4.66	4.63
Soybean meal[2]	.17	.17	.17	.17
Sorghum silage	17.0	17.0	15.3	15.9
Alfalfa hay	2.65	2.70	2.50	2.66
Salt	.07	.03	.06	.03
Stilbestrol, 5 mgs. per head daily the first 56 days of test, 10 mgs. thereafter[3]	no	yes	no	yes
Lbs. feed per cwt. gain:				
Ground sorghum grain	273	266	332	277
Soybean meal	10	10	12	10
Sorghum silage	996	980	1086	953
Alfalfa hay	155	154	190	159
Av. feed cost per cwt. gain,[4] $	13.12	13.32	15.47	13.36
Phase 2—Full feeding—April 3, 1957, to August 8, 1957—127 days.				
Av. initial wt. per heifer, lbs.	570	573	534	565
Av. final wt. per heifer, lbs.	796	810	745	798
Av. gain per heifer, lbs.	226	238	211	233
Av. daily gain per heifer, lbs.	1.78	1.87	1.66	1.83
Daily ration per heifer, lbs.:				
Ground sorghum grain, self-fed	12.7	12.8	11.7	12.7
Soybean meal	1.0	1.0	1.0	1.0
Sorghum silage	4.4	4.0	3.8	3.8
Alfalfa hay	5.3	4.7	4.5	4.6
Salt	.02	.02	.02	.02
Lbs. feed per cwt. gain:				
Ground sorghum grain	715	684	703	691
Soybean meal	55	52	59	53
Sorghum silage	248	214	226	205
Alfalfa hay	299	251	272	248
Av. feed cost per heifer,[4] $	55.44	55.32	50.46	54.49
Av. feed cost per cwt. gain	24.53	23.24	23.91	23.39
Summary of Phases 1 and 2—December 8, 1956, to August 8, 1957—243 days.				
Av. total gain per heifer, lbs.	423	440	374	428
Av. daily gain per heifer, lbs.	1.74	1.81	1.54	1.76
Av. feed cost per cwt. gain, $	19.24	18.55	20.24	18.64
Av. total feed cost per heifer, $	81.38	81.60	75.71	79.77
Av. initial heifer cost at $19.50 per cwt.	72.74	72.15	72.35	72.15
Av. selling price per cwt.[5]	22.65	22.48	22.67	22.32
Av. return per heifer above initial cost plus feed cost	19.83	21.82	14.94	20.61
Av. % shrinkage in shipping to market	3.5	3.6	3.5	3.1
Dressing %, chilled	59.0	58.8	58.4	58.6
Carcass grades, USDA:				
High choice	....	....	1	1
Av. choice	2	2	1	1
Low choice	5	5	8	4
High good	3	3	....	1
Av. good	....	....	....	3

2. Soybean meal was fed at the rate of .5 pound per head daily the last 30 days of test.

3. Stilbestrol was furnished by Eli Lilly and Co., Indianapolis, Ind., as Stilbosol (a diethylstilbestrol premix).

4. Feed prices—per ton: Alfalfa hay, $25.00; sorghum silage, $10.00; soybean meal, $70.00 per cwt.; ground sorghum grain, $2.50.

5. Based on carcass grades with U.S. prime at 40c a pound, choice at 39c and good at 37c.

Table 31 (Continued)

Low good	....	1	1	1
Av. grade[6]	12.90	12.63	13.00	12.36
Av. marbling score[7]	7.10	7.18	6.90	7.27
Av. fat thickness score[8]	3.5	3.81	4.09	4.09
Av. rib eye size, score[9]	4.6	4.54	4.36	4.64
Av. firmness score[10]	3.7	3.45	3.72	3.45

6. Average grade was based on low prime, 16; high choice, 15; average choice, 14; low choice, 13; high good, 12; average good, 11.

7. Marbling score was based on: moderate, 5; modest, 6; small amount, 7; slight amount, 8.

8. Fat thickness score at 12th rib based on: moderate, 3; modest, 4; slightly thin, 5.

9. Rib eye score size was based on: moderately large, 3; modestly large, 4; slightly small, 5.

10. Firmness of rib eye was based on: firm, 2; moderately firm, 3; modestly firm, 4; slightly firm, 5.

Relationship of Summer Gains of Yearling Steers on Bluestem Pastures with Feeder Grade, Shade of Color, Weight at the Start of the Grazing Season and Previous Winter Gain, 1956-57 (Project 253-2-5).

L. A. Holland, J. D. Wheat, E. F. Smith, W. H. Smith, D. L. Good and R. F. Cox

Feeder grade, shade of color, and weight are some factors considered by cattlemen who purchase or produce yearling steers to pasture. The objective of this study is to determine the relationship of summer gains of yearling steers on bluestem pastures with feeder grade, shade of color, weight at the start of the grazing season and previous winter gain.

Experimental Procedure

Data were gathered on Hereford steers which were used in pasture utilization studies. In the fall of 1955, 136 steer calves were purchased and wintered 170 days in dry-lot on sorghum silage, alfalfa hay and two pounds of sorghum grain per head daily. The summer grazing period was from April 25 to October 1, 1956. The 155 steers used in the 1957 grazing season were purchased in the fall of 1956 and wintered in dry-lot on sorghum silage, a limited amount of alfalfa hay and one pound of protein concentrate per head daily. The 1957 summer grazing period was from April 27 to October 3.

In April of each year the steers were individually scored for feeder grade and shade of red by five animal husbandmen working independently. Feeder grades were the USDA grades fancy, choice, good, medium, common. Each grade was further subdivided into high, middle, and low. A numerical grade of 18 was assigned to high fancy, 17 to middle fancy, 16 to low fancy, etc. The average of the five feeder grades for each steer (as scored by the animal husbandmen) was computed for statistical analysis. The average of the five color scores for each steer was computed for statistical analysis. Shade of red scores were dark, medium, and light; each shade of red score was further subdivided into three subdivisions. Very dark was assigned a numerical value of 9, medium dark was assigned a grade of 8, etc.

Results

Since the steers were allotted to several pastures and some received hormone implants, correlations were computed within treatment within pasture. The correlations are listed in Table 32.

The correlation between feeder grade and summer gain was practically zero in both years. This indicates that feeder grade is not a good indicator of summer gain. Therefore, the advantage in purchasing high-grading yearlings to summer graze on bluestem pasture would not be in increased gains but would be in having higher grading steers at the end of the grazing season than if lower grading steers were purchased.

The correlation between color and summer gain was practically zero

Table 32

Correlations of Summer Gains with Feeder Grade, Color Score, Winter Gain and Weight at the Start of the Grazing Season by Years.

	1956	1957
Feeder grade	−.03	.07
Color score	−.05	.06
Winter gain	−.20	....
Weight	−.32	.04

in both years. On the basis of these results one cannot claim an advantage in summer gains for a particular shade of red. The advantage of purchasing cattle of a particular shade of red would lie in the possible increase in sale price of these steers when sold to feed-lot operators who prefer cattle of that shade of red.

The correlation between previous winter gain and summer gains (−.20 in 1956) indicates that the steers making low winter gains tended to compensate with higher summer gains. Previous winter gain of each steer was not obtained for the steers grazed during 1957.

The correlation between beginning weight and summer gain (−.32 in 1956) shows that light-weight steers at the start of the summer grazing period tended to make larger gains than the heavier steers. In 1957, the correlation was .04, which is so nearly zero that there appeared to be no real difference in the gains made by cattle of different weights.

Feedlot Performance of Steers Implanted with Stilbestrol[1] Prior to the Grazing Season (Project 253-4).

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

Experimental evidence indicates that beef steers implanted with low levels of stilbestrol before going to grass will make increased gains during the grazing season. The test reported herein was designed to measure the performance of such implanted steers on a fattening ration in dry-lot after the grazing season.

Experimental Procedure

Animals used in this study were selected from a group of 150 Hereford steers used in grazing studies during the summer of 1957. One group of 10 steers had been implanted with 24 mgs. of stilbestrol in April 1957. The other group of 10 steers was among those serving as controls in the summer grazing studies. Both groups of 10 animals averaged nearly 775 pounds in weight when put on feed. The steers were brought to a full feed of grain during a four-week period of hand feeding. Thereafter, they had sorghum grain before them at all times. The alfalfa hay fed was limited to the amount consumed without waste. Each morning 10 pounds of soybean oil meal containing 10 mgs. of stilbestrol per pound was scattered over the grain bunk in each lot.

Warm water was available to the animals at all times from automatic waterers. Salt was available to the animals at all times. A mixture of bonemeal and salt was also available.

Observations

1. Animals in both groups made excellent gains throughout the 100-day period. The previously implanted animals made somewhat greater gains than the control animals.

2. No feeding problems were encountered with either group. There were no cases of bloat, serious scouring or any other evidence of digestive disturbances.

1. Stilbosol premix containing diethylstilbestrol supplied by Eli Lilly and Co.

3. There were no great differences in the overall appearance of animals in the two groups at the end of the trial.

Table 33

Feedlot Performance of Steers Implanted with Stilbestrol Prior to the Grazing Season.

December 16, 1957, to March 26, 1958—100 days.

Treatment on pasture	Implant	Control
Lot number	5	6
Number steers	10	10
Av. initial wt., lbs.	780	771
Av. final wt., lbs.	1150	1101
Av. total gain, lbs.	370	330
Av. daily gain, lbs.	3.70±0.14[1]	3.30±0.17[1]
Av. daily ration, lbs.:		
Ground sorghum grain	20.7	19.5
Soybean meal + stilbestrol	1.0	1.0
Alfalfa hay	7.7	8.0
Av. lbs. feed per cwt. gain:		
Ground sorghum grain	559.31	590.85
Soybean meal + stilbestrol	27.02	30.30
Alfalfa hay	208.05	242.40
Av. feed cost per cwt. gain, $	13.80	14.82
Selling price per cwt.[2]	26.25	26.25
Av. carcass grade[3]	12.0	11.7

1. Standard error of mean.
2. Sold on Kansas City market.
3. Average grade determined as follows: High choice, 15; average choice, 14; low choice, 13; high good, 12; average good, 11; low good, 10; high standard, 9.

The Use of Stilbestrol[1] and Synovex[2 3] Implants for Steers on a Wintering Ration (Project 253-6).

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

This is the third test designed to study the value of stilbestrol implants for steer calves being fed a wintering-type ration. Synovex implants are being used for the second time. Both products are being used successfully to increase the daily gains of steers on high-energy fattening rations. Information concerning their value for calves being fed high-roughage wintering diets is rather limited, however.

Experimental Procedure

Fifty-eight steer calves from New Mexico, weighing approximately 550 pounds each, were divided into three groups (one group each of 10, 20, and 28) at the beginning of the wintering period. Pre-selected calves will be removed from each of the larger groups at the end of the wintering period and used in a pasture study. Ten calves in each treatment group will be continued through a fattening study.

The group of 20 animals served as a control lot. Each animal in the group of 28 received a 24-mg. implant of stilbestrol in the right ear at the start of the wintering period. Each animal in the group of 10 received a Synovex implant (200 mgs. of progesterone and 20 mgs. of estradiol benzoate) in the right ear at the start of the wintering period.

The daily rations fed per animal were as follows: sorghum grain, 4 pounds; soybean oil meal, 1 pound; sorghum silage, 15 pounds; prairie hay, free-choice.

1. Supplied by Chas. Pfizer and Co., Inc.
2. Supplied by E. R. Squibb and Son.
3. Each implant contained 200 mgs. progoesterone plus 20 mgs. estradiol benzoate.

All of the animals had access to a mixture of bonemeal and salt. They also had access to salt alone. Water was available at all times from heated, automatic waterers. The cattle were in outdoor lots with no access to shelter.

Observations

Undesirable side effects such as high tailheads, elongated teats and sexual stimulation were not apparent in any of the implanted steers. However, some of the implanted steers appeared to show some slight lowering of the pin bones. As a group, the steers implanted with stilbestrol appeared somewhat rougher over the top than control animals at the end of the test.

Both of the implanted groups of animals showed greater daily gains than the control animals. The synovex-implanted animals gained considerably more than the stilbestrol-implanted animals.

Feed cost per cwt. gain was lowest for the implanted animals. The synovex-implanted animals showed the lowest cost of gain. The synovex-implanted animals also apparently utilized their ration somewhat more efficiently than the other two groups.

This is the third wintering trial in which stilbestrol implants were studied. Results can be compared in a general way but certain differences in procedure should be considered. In all three trials the stilbestrol-implanted animals gained faster and more efficiently than control animals. In the first two trials this increase in daily gain was about .25 pound per day. In the third trial it was only .12 pound per day. It should be remembered, however, that the animals used in this third trial were larger than those fed previously, while the diet was somewhat lower in net energy.

Thus, the amount of energy available to the animals was lower than in previous tests. Most tests have shown that stilbestrol gives greatest returns when animals receive ample energy in their diet. Animals in the first two trials were kept on concrete and had access to shelter, while animals in the current trial were in dirt lots and had no access to shelter.

Results of three successive wintering trials indicate that stilbestrol implants at low levels will increase winter gains. The amount of the increase apparently depends upon the energy level of the diet fed. In view of most recent results it appears that the implants may change the appearance of the calves under certain conditions.

Results of two successive wintering trials in which calves were implanted with synovex indicate that the implant will improve gain and increase efficiency when calves are receiving high roughage rations. In both trials cost of gain, including cost of implant, was considerably lower for the implanted animals. No physical changes were apparent in the animals at the conclusion of the test period.

Table 34

The Use of Stilbestrol and Synovex Implants for Steer Calves on a Wintering-Type Ration.

December 5, 1957, to March 25, 1958—110 days.

Treatment	Control	Synovex implant	Stilbestrol implant
Lot number	22	20	21
Number steers	20	10	28
Av. initial wt., lbs.	548	546	551
Av. final wt., lbs.	708	741	725
Av. total gain, lbs.	160	195	174
Av. daily gain, lbs.	1.46±0.07[1]	1.77±0.11[1]	1.58±0.05[1]
Av. daily ration, lbs.:			
Ground sorghum grain	4.0	4.0	4.0
Soybean oil meal	1.0	1.0	1.0
Sorghum silage	13.1	13.1	13.7
Prairie hay	6.9	7.2	6.9

1. Standard error of mean.

Table 34 (Continued)

Av. lbs. feed per cwt. gain:			
Ground sorghum grain	274	226	253.20
Soybean oil meal	68.50	56.50	63.30
Sorghum silage	897.35	740.15	867.21
Prairie hay	472.65	406.80	436.77
Av. feed cost per cwt. gain, $	14.22	11.85	13.28
Implant cost per cwt. gain[2]	....	0.77	0.10
Av. total cost per cwt. gain ..	14.22	12.62	13.38

2. Stilbestrol cost—approximately 18c per steer; Synovex cost—approximately $1.50 per steer (no charge made for actual implanting procedure).

The Use of Stilbestrol[1] and Synovex[2,3] Implants for Steers During the Wintering and Fattening Period (Project 253-6).

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

The steers used in this study were implanted with either stilbestrol or Synovex at the start of the wintering period. The results of the first 112 days of the wintering period were reported in Circular 349.

This report summarizes the results of the entire wintering period and also the results of the fattening period which followed.

Experimental Procedure

Forty steer calves, weighing approximately 440 pounds each, were divided into three groups (one group of 10 and two groups of 15). Five animals were removed from each of the larger groups at the end of the winter period for use in a pasture study. (Animals were randomly selected for future summer pasture and feedlot tests at the beginning of the wintering period.) One group of 15 served as the winter control lot. Each animal in the other group of 15 received a 24-mg. implant of stilbestrol in the right ear. Each animal in the group of 10 received a Synovex implant in the right ear at the start of the winter period.

After 168 days on the wintering ration 10 animals in each lot were started on the fattening phase of the study. At that time 5 animals in the stilbestrol lot were reimplanted with 24 mg. of stilbestrol and 5 animals in the Synovex lot were reimplanted with a Synovex implant.

The steers were brought to a full feed of sorghum grain and alfalfa hay plus one pound of soybean meal per day during a three-week period. After the cattle were on full feed, sorghum grain and alfalfa hay were available to the animals at all times on a free-choice basis. The soybean meal was fed once per day and was scattered over the grain in the feed bunk. A mineral mixture made up of equal parts of salt and bonemeal was available to the animals at all times. Salt alone was also available to the animals at all times.

Observations

1. Undesirable side effects such as high tailheads, elongated teats and sexual stimulation were not readily apparent in any of the implanted animals.
2. Reimplantation did not appear to change the physical activity or the general appearance of those animals that were reimplanted.
3. Implanted steers made an average daily gain of approximately 0.4 pound more than the control animals during the fattening phase of the study. Synovex and stilbestrol gave similar increases in gain.
4. Steers implanted with either Synovex or stilbestrol made more efficient gains than did control animals during the fattening period. Synovex-implanted animals appeared to be more efficient than the stilbestrol-implanted animals.
5. Conclusions must be made with care when studying the reimplant data due to the small numbers involved. The magnitude of the standard errors reported also indicates that there was considerable variation within groups. However, it would appear that the original Synovex implant did not show much effect upon the steers during the fattening period. The Synovex reimplant apparently gave those animals receiving it an added stimulus.

The original stilbestrol implant was apparently still showing some effect in the fattening period. The stilbestrol reimplant apparently had little or no effect upon those animals receiving it.

6. The implants apparently had little or no effect upon carcass grade. It should be noted that both the highest grading and lowest grading carcass were in the stilbestrol reimplanted group of animals.

Detailed results of the study are summarized in Table 35.

Table 35

The Use of Stilbestrol[1] and Synovex[2,3] Implants for Steers During the Wintering and Fattening Periods (Project 253-6).

Phase 1—Wintering—December 4, 1956, to May 21, 1957—168 days.

Treatment	Control	Synovex implant	Stilbestrol implant
Lot number	1	2	3
Number steers per lot	10	10	10
Av. initial wt. per steer, lbs.	444.0	444.5	444.5
Av. final wt. per steer, lbs.	726.5	747.5	752.0
Av. total gain per steer, lbs.	282.5	303.0	307.5
Av. daily gain per steer, lbs.	1.68±0.06[15]	1.80±0.04[15]	1.83±0.09[15]
Daily ration per steer, lbs.:			
Ground milo grain	4.8	4.8	4.8
Soybean oil meal	1.0	1.0	1.0
Sorghum silage[4]	24.9	25.4	27.2
Alfalfa hay[4]	0.7	0.8	0.8
Salt	.05	.05	.04
Feed per cwt. gain, lbs.:			
Ground milo grain	285.7	266.7	262.2
Soybean oil meal	59.5	55.6	54.6
Sorghum silage	1482.1	1411.0	1486.3
Alfalfa hay	41.7	44.4	43.7
Salt	3.0	2.8	2.2
Feed cost per cwt. gain,[5] $	15.69	14.82	14.98
Implant cost per cwt. gain[6]		.61	.06
Total cost per cwt. gain, $	15.69	15.43	15.04
Phase 2—Fattening—May 21, 1957, to August 13, 1957—84 days (by pens).			
Av. initial wt. per steer, lbs.	726.5	747.5	752.0
Av. final wt. per steer, lbs.	891.5	954.5	952.0
Av. total gain per steer, lbs.	165.0	207.0	200.0

1. Supplied by Chas. Pfizer & Co. (24 mg. per steer—implanted in the ear; 24 mg. reimplant also).
2. Supplied by E. R. Squibb & Sons.
3. Each implant contained 1,000 mg. progesterone and 20 mg. estradiol benzoate. Each reimplant contained 200 mg. of progesterone plus 20 mg. of estradiol benzoate.
4. No hay fed before May 6, 1957; no silage fed after May 10, 1957.
5. Feed prices: sorghum grain, $2.50 per cwt.; soybean oil meal, $70.00 per ton; sorghum silage, $8.00 per ton; alfalfa hay, $25.00 per ton; salt, $0.75 per cwt.; bonemeal-salt mixture, $4.00 per cwt.
6. Stilbestrol cost, approximately 18c per steer; Synovex cost, approximately $1.85 per steer. (No charge made for implanting procedure.)
15. Standard error of mean.

Table 35 (Continued)

Av. daily gain per steer, lbs.	1.96±0.08	2.46±0.14	2.38±0.06
Daily ration per steer, lbs.:			
Ground milo grain	15.7	16.7	17.3
Soybean oil meal	1.0	1.0	1.0
Alfalfa hay	5.6	5.8	5.9
Salt	0.06	0.03	0.06
Bonemeal-salt[7]	0.02	0.02	0.02
Feed per cwt. gain, lbs.:			
Ground milo grain	801.0	678.9	726.9
Soybean oil meal	51.0	40.6	42.0
Alfalfa hay	285.7	235.8	247.9
Salt	3.1	1.2	3.1
Bonemeal-salt	1.0	0.8	0.8
Feed cost per cwt. gain, $	25.43	21.38	22.79

Phase 2—Fattening—May 21, 1957, to August 13, 1957—84 days (by treatment).

Treatment	Control	Synovex implant	Synovex reimplant	Stilbestrol implant	Stilbestrol reimplant
Lot number	1	2	2	3	3
Number of steers	10	5	5	5	5
Av. initial wt. per steer, lbs.	726.5	730.0	765.0	755.0	749.0
Av. final wt. per steer, lbs.	891.5	920.0	989.0	952.0	952.0
Av. total gain per steer lbs.	165.0	190.0	224.0	197.0	203.0
Av. daily gain per steer, lbs.	1.96 ±0.08	2.26 ±0.20	2.67 ±0.18	2.34 ±0.10	2.42 ±0.08
Carcass grades, USDA:					
Av. choice					1
Low choice	4	1	1	1	1
High good	1	1	1	2	..
Av. good	2	1	1	2	..
Low good	3	2	2	..	2
High standard	..	..	..	..	1
Av. USDA grade[10]	11.6	11.2	11.2	11.8	11.2
Av. marbling score[11]	7.8	8.0	8.0	7.6	8.0
Av. fat thickness score[12]	3.8	4.2	3.4	3.8	4.6
Av. rib eye size score[13]	4.7	4.6	4.8	4.8	4.2
Av. firmness score[14]	4.9	4.8	4.8	4.2	5.0

Summary of Phases 1 and 2—December 4, 1956, to August 13, 1957—252 days.

Av. total gain per steer, lbs.	447.5	510.0	507.5
Av. daily gain per steer, lbs.	1.78±0.04	2.02±0.06	2.01±0.08

7. Salt fed free choice and a mixture of 2 bonemeal plus 1 salt, also fed free choice in fattening period.

10. Average grade determined as follows: high choice, 15; average choice, 14; low choice, 13; high good, 12; average good, 11; low good, 10; high standard, 9.

11. Visual marbling score determined as follows: moderate, 5; modest, 6; small amount, 7; slight amount, 8.

12. Visual fat covering at 12th rib: moderate, 3; modest, 4; slightly thin, 5.

13. Visual rib eye score: moderately large, 3; modestly large, 4; slightly small, 5.

14. Firmness of rib eye: firm, 2; moderately firm, 3; modestly firm, 4; slightly firm, 5.

Table 35 (Continued)

Av. total feed cost per steer (including implants), $	86.28	91.01	92.39
Av. initial cost per steer[8]	102.12	102.23	102.23
Initial cost plus feed cost	188.40	193.24	194.62
Selling price per cwt.[9]	23.48	23.12	22.76
Av. value per steer	209.32	220.68	216.68
Av. return per steer	20.92	27.44	22.06
Av. dressing percent	59.64	59.70	58.11
Carcass grades, USDA:			
Av. choice	..	..	1
Low choice	4	2	2
High good	1	2	2
Av. good	2	2	2
Low good	3	4	2
High standard	..	..	1
Av. USDA grade[10]	11.6	11.2	11.5
Av. marbling score[11]	7.8	8.0	7.8
Av. fat thickness score[12]	3.8	3.8	4.2
Av. rib eye size score[13]	4.7	4.7	4.5
Av. firmness score[14]	4.9	4.8	4.6

8. Initial cost per steer was $23.00 per cwt.

9. Based on carcass grades and carcass weights with U.S. choice at 40c and U.S. good carcasses at 37c per pound.

10. Average grade determined as follows: high choice, 15; average choice, 14; low choice, 13; high good, 12; average good, 11; low good, 10; high standard, 9.

11. Visual marbling score determined as follows: moderate, 5; modest, 6; small amount, 7; slight amount, 8.

12. Visual fat covering at 12th rib: moderate, 3; modest, 4; slightly thin, 5.

13. Visual rib eye score: moderately large, 3; modestly large, 4; slightly small, 5.

14. Firmness of rib eye: firm, 2; moderately firm, 3; modestly firm, 4; slightly firm, 5.

Nutritive Value of Forages as Affected by Soil and Climatic Differences; Limestone Pasture vs. Sandstone Pasture (Project 430).

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

This report is a summary of the results obtained in the first trial of a study designed to determine differences in the nutritive value, for beef cattle, of forages grown on limestone or sandstone soils. Preliminary results were reported in detail in Kansas Circular 349.

In a study of this sort there are many variables which cannot be completely controlled or eliminated. It is virtually impossible to select pastures and meadows that are alike in every detail. Pastures within a few miles of each other receive differing amounts of moisture in a given period of time. Previous treatment, type of forage, yield of forage; all of these and many other variables affect the results obtained. Therefore, several trials extending over a number of years must be carried out before definite conclusions can be made.

Experimental Procedure

Spayed Hereford heifers were used in this first trial extending over a period of 18 months. Throughout the trial animals in each group received roughage grown either on sandstone or limestone soil. Detailed procedures for the first three phases of the study were reportd in Circular 349 from this station.

During a three-week period beginning on March 9, 1957, the heifers were gradually brought to full feed on a fattening ration. The heifers were hand-fed daily all the feed they would eat throughout the fattening period. Those animals receiving supplemental phosphorus before the fattening period began continued to receive it throughout the fattening period. Rations fed and results obtained are listed in detail in Tables 36 and 37.

Observations

At the end of the overall study those cattle receiving forage grown on limestone soil had made an average total gain that was 53 pounds greater than that made by similar cattle receiving forage grown on sandstone soil. The difference in total gain was 74 pounds at the beginning of the fattening period. All of this extra gain in favor of those cattle consuming forage grown on limestone soil occurred during the two winter phases of the study.

Statistical treatment of the gain data indicated that the difference in the average final weight of the two groups of cattle was a real difference. Likewise the differences in gains made during the two wintering periods and during the fattening period were real differences.

It should be noted that the cattle on sandstone forage actually gained somewhat more than those on limestone forage during the grazing season. And during the fattening period they gained considerably more than those on limestone forage. The addition of 4 gms. per day of supplemental phosphorus to the diet of half the animals in each group during the latter part of the study did not result in any definite change in weight gains.

Blood levels of calcium and phosphorus were followed throughout the study. Average blood calcium levels were similar for both groups throughout the study. However, there was considerable variation within groups. Blood inorganic phosphate levels varied considerably within groups of animals. Also at the end of the second winter period the animals receiving sandstone forage and no supplemental phosphorus showed a reduced amount of inorganic blood phosphates. It should be noted that all groups showed an increase in blood phosphorus content during the fattening period.

At slaughter the right front metacarpal bone (cannon bone) was removed from one half the carcasses in each group and submitted to various tests. Results are reported in Table 38 and indicate no apparent differences in composition, length or breaking strength of bones from animals in the various groups.

Results of the overall study indicate only that those animals receiving forage from limestone soil did gain at a faster rate during the total time involved. All of this increased gain apparently can be credited to the wintering periods. Present data do not indicate the reason for the increased gain of the animals receiving limestone forage. It is possible that a difference in net energy available to the animals during the wintering periods caused the differences in gains. However, all animals consumed about the same average amount of feed, and chemical analyses showed no great chemical differences in feeds fed. Under conditions of the study supplemental phosphorus did not improve the performance of the animals. No other dietary additives were checked in this study.

Table 36

Average Total Weight Gain of Spayed Heifers Eating Forage Grown on Limestone and Sandstone Soils During the Complete Study.

Soil type	Limestone	Sandstone
Number of animals	19	20
Av. initial wt., lbs.	553	558
Phase 1—December 5, 1955, to April 15, 1956—131 days.		
	Pasture	Pasture
Av. total gain, lbs.	63±5.7[1]	6±5.1[1]
Phase 2—April 15, 1956, to October 8, 1956—176 days.		
	Pasture	Pasture
Av. total gain, lbs.	180±5.6	193±6.2
Phase 3—October 8, 1956, to March 8, 1957—151 days.		
	Dry-lot	Dry-lot
(Wintering ration)		
Av. total gain, lbs.	149±8.4	114±8.4

1. Standard error of mean.

Table 36 (Continued)

Phase 4—March 8, 1956, to June 8, 1957—92 days.		
	Dry-lot	Dry-lot
(Fattening ration)		
Av. total gain, lbs.	128±6.1	149±6.9
Summary—December 5, 1955, to June 8, 1957.		
Av. total gain, lbs.	520±13.6	462±17.7
Av. final wt., lbs.	1073	1020

Table 37

Limestone Prairie Hay versus Sandstone Prairie Hay in the Fattening Ration of Spayed Heifers Previously Wintered and Summered on Forage Produced Either on Limestone or Sandstone Soil.

March 8, 1957, to June 8, 1957—92 days.

Soil type	Limestone		Sandstone	
Treatment	Control	+ H_3PO_4	Control	+ H_3PO_4
Number of heifers	9	10	10	10
Av. initial wt., lbs.	935	948	866	875
Av. total gain, lbs.	115	133	160	144
Av. daily gain, lbs.	1.25 ±0.08[4]	1.44 ±0.10[4]	1.74 ±0.08[4]	1.57 ±0.12[4]
Av. final wt., lbs.	1050	1081	1026	1019
Av. daily ration:				
Sorghum grain, lbs.	14.7	15.7	15.7	15.7
Prairie hay, lbs.	9.5	10.0	11.0	11.0
Soybean meal, lbs.	1.5	1.5	1.5	1.5
Added phosphorus, gms.[1]	0	4	0	4
Av. feed per cwt. gain:				
Sorghum grain, lbs.	1176.0	1083.0	910.6	1004.8
Prairie hay, lbs.	760.0	690.0	638.0	704.0
Soybean meal, lbs.	120.0	103.5	87.0	96.0
Phosphorus, gms.	0	276	0	256
Av. carcass wt., lbs.	639	655	588	587
Av. dressing percent[2]	61	60	57	58
Av. carcass grade[3]	13.2	13.0	11.0	11.2

1. Phosphoric acid mixed in the soybean meal.

2. Dressing percent calculated by dividing average hot carcass wt. by average final wt. taken in Manhattan.

3. Carcass grade determined as follows: high choice, 15; average choice, 14; low choice, 13; high good, 12; average good, 11; low good, 10; high standard, 9; average standard, 8; low standard, 7; high commercial, 6.

4. Standard error of mean.

Table 38

Additional Data Collected During the Study of Limestone versus Sandstone Forage for Spayed Beef Heifers.

Soil type	Limestone		Sandstone	
Treatment	Control	+ H_3PO_4	Control	+ H_3PO_4
Bone analyses				
Right front metacarpal (cannon bone)				
Av. percent ash (moisture free, fat free)	68.73	68.99	68.18	68.84
Av. length, cms.	19.68	19.52	19.76	19.69
Av. breaking-strength, lbs.:[1]				
First crack	2264	2192	2754	2168
Shattered	3346	4278	4762	3768

1. Determined in the laboratory of the Department of Applied Mechanics with the assistance of M. E. Raville and M. W. Davis.

Table 38 (Continued)

Blood analyses:				
Inorganic phosphate, mg. %				
3-14-56	7.68	....	8.00	....
	±0.12[2]	....	±0.40[2]	....
11-13-56	7.58	....	6.98	....
	±0.28	....	±0.21	....
3-13-57	7.65	7.82	6.30	7.40
	±0.27	±0.32	±0.42	±0.39
5-29-57	10.30	11.02	9.51	9.26
	±0.80	±0.95	±0.94	±1.50
Calcium, mg. %				
3-14-56	11.44	....	11.26	....
	±0.16	....	±0.10	....
11-13-56	11.31	....	11.37	....
	±0.27	....	±0.20	....
3-13-57	11.77	11.12	11.45	11.33
	±0.19	±0.15	±0.20	±0.16
5-29-57	10.60	10.20	10.66	11.31
	±0.08	±0.25	±0.67	±0.67

2. Standard error of mean.

The Use of Tranquilizer Compounds[1,2] in Wintering Rations for Steers (Project A-597).

B. A. Koch, E. F. Smith, D. Richardson and M. M. McCartor

Recent experimental work with chemical tranquilizers has indicated that these substances may be of value in the fattening ration of beef cattle under certain conditions. Theoretically at least, the chemical tranquilizers should calm the animals and thus reduce the amount of energy lost due to nervousness and unnecessary muscular activity. It is also possible that they have some other effect upon the animal which leads to increased weight gains and improved feed efficiency. The trial reported herein was designed to determine whether or not tranquilizer compounds will improve the performance of beef cattle on a wintering ration.

Experimental Procedure

Forty-eight steer calves weighing approximately 550 pounds each were divided into three groups (one group of 10, one group of 18 and one group of 20) at the beginning of the wintering period. Pre-selected animals will be removed from each of the larger groups after the wintering period for a pasture study. Ten calves in each group will be continued through a fattening study.

Two tranquilizer compounds, Paxital and Tran-Q, are being compared in the study. The compounds are mixed with the soybean oil meal portion of the rations fed.

The daily rations fed per animal were as follows: sorghum grain, 4 pounds; soybean oil meal, 1 pound; sorghum silage, 15 pounds; prairie hay, free-choice. All of the animals had access to a mixture of bonemeal and salt. They also had access to salt alone. Water was available at all times from heated automatic waterers. The cattle were in outdoor lots with no access to shelter.

Observations

1. At no time during the wintering period did any of the animals receiving either tranquilizer show any visible evidence of sedation or calming. This was also true in a very limited test conducted earlier in which animals received much higher levels of tranquilizer in their diet.

1. Paxital is the brand name of a tranquilizer furnished by S. B. Penick and Co. of New York.

2. Tran-Q is the brand name of a tranquilizer furnished by Chas. Pfizer and Co., Inc., Terre Haute, Ind.

2. Feeding the tranquilizers did not increase daily gain or improve feed efficiency significantly under the conditions of this study.

3. No undesirable effects of any kind were noted in any of the animals during the test period.

Table 39

The Use of Tranquilizer Compounds in Wintering-Type Rations for Steer Calves.

December 5, 1957, to March 25, 1958—110 days.

Treatment	Control	Paxital	Tran-Q
Lot number	22	18	19
Number steers	20	10	18
Av. initial wt., lbs.	548	544	559
Av. final wt., lbs.	708	719	718
Av. total gain, lbs.	160	175	159
Av. daily gain, lbs.	1.46±0.07[4]	1.59±0.08[4]	1.45±0.06[4]
Av. daily ration:			
Ground sorghum grain, lbs.	4.0	4.0	4.0
Soybean oil meal, lbs.	1.0	1.0	1.0
Prairie hay, lbs.	6.9	6.8	7.8
Sorghum silage, lbs.	13.1	13.1	12.4
Paxital, mgs.[1,2]		75	
Tran-Q, mgs.[1,3]			1.5
Feed per cwt. gain:			
Ground sorghum grain, lbs.	274.0	251.60	276.00
Soybean oil meal, lbs.	68.50	62.90	69.00
Sorghum silage, lbs.	897.35	823.99	855.60
Prairie hay, lbs.	472.65	427.72	538.20
Feed cost per cwt. gain, $[5]	14.22	13.01	14.59

1. Mixed in the soybean oil meal.
2. Paxital cost estimated to be about .... per gm. by S. B. Penick and Co.
3. Tran-Q cost estimated to be about 8.80c per gm. by Chas. Pfizer and Co.
4. Standard error of mean.
5. Not including tranquilizer cost.

Relationship Among Live and Carcass Characteristics of Slaughter Steers.

John D. Wesell, D. L. Good and L. A. Holland

One of the major tools needed for a more accurate live animal evaluation is an objective method of determining the amount of muscle in a beef steer. We can come close to estimating dressing percentage and grade but these factors are not good indicators of the amount of red meat or "edible portion" that is in the carcass. Many prime cattle have less utility or true value than choice cattle because of excess fat and/or lack of muscle.

From the standpoint of the consumer as well as that of the packer, the most desirable carcass is one that has a large proportion of high-quality lean meat. After a steer is fat enough to attain a desired grade, additional finish is objectionable because the extra fat must be trimmed off. This extra fat is a problem to the processor and it is uneconomical for the feeder to produce overfinished cattle. The important problem is to be able to determine when the animal is correctly finished and to predict how much red meat he has under his hide. An experienced stockman, by handling and careful visual appraisal of an animal, can make a fairly good estimate of muscling. A more objective method, however, is needed to aid in the selection of superior market animals and breeding stock, particularly of herd sires, since the heritability of muscling in beef cattle is high.

This is a report of an exploratory study to find a possible live-animal measurement that would be useful in predicting superior muscling in beef cattle.

Experimental Procedure

The steers used in this study consisted of 73 Angus, 43 Herefords, and 37 Shorthorns, which were exhibited at the 1956 International Livestock Exposition held in Chicago. The group of 153 steers comprised the carcass contest held in conjunction with the International. The age range of the group was from 12 to 18 months and the weight varied from 800 to 1,300 pounds.

These steers were bred and fed by individuals from varied localities with the intent of entering them in the carcass contest. Consequently, this was a highly select group of cattle and the variability was not expected to be as great as if regular market cattle had been used in the study.

On November 22, 1956, four body measurements were taken of these steers immediately after leaving the scales for show-ring classification. A flexible steel tape placed around the forearm on a horizontal plane at the junction of the forearm and the brisket gave the circumference of the forearm in centimeters. The circumference of the left metacarpus was taken mid-way between the knee and pastern joint. At this same position a sliding vernier caliper was used in determining the frontal and lateral measurement of the cannon.

At the time of weighing, a visual estimation of bone size and a visual grade were placed on each steer by a committee of three appraisers. The average score of the committee was used for analyses. The score cards used in recording the visual grades were broken into three divisions for each grade: high prime received a score of 2, medium prime 4, low prime 6, high choice 8, etc. The visual scores on bone started with 2 being very rugged and higher scores indicate a decrease in size of bone.

The steers were classed according to age and breed, making a total of 12 classes. After being placed on foot, they were moved to Armour and Company for slaughter. At slaughter, the left metacarpus was salvaged and transported to Kansas State College for study.

The cannons were freed of all excess tissue. Circumference, lateral and frontal measurements were taken of the clean metacarpus in a fashion similar to that for the live measurement of the same region.

A tracing of the longissimus dorsi (rib eye) muscle of each steer was made at the 12th rib and a planimeter was used to determine the area in square inches. Marbling scores were assigned by meat experts according to Reciprocal Meat Conference Proceedings. The higher numerical scores on marbling are the more desirable. Fat thickness at the 12th rib was determined by an average of three measurements as outlined by the Reciprocal Meat Conference Proceedings.

Results

Averages of live-animal characteristics by breeds and weight groups are shown in Table 40. Differences between breed averages were statistically highly significant for cannon frontal measurement and circumference of cannon, the Herefords having the largest measurements. The differences between breed averages for the other live-animal measurements were not statistically significant. Weight of the animal did influence the magnitude of the live-animal characteristics; differences between weight groups within breeds were statistically significant or statistically highly significant for all the live-animal characteristics.

Averages of carcass characteristics by breeds and weight groups are listed in Table 41. The breeds differed significantly only in marbling score, Shorthorns and Angus having more marbling than Herefords. Differences between weight groups within breeds were statistically highly significant for loin eye area, fat thickness, dressing percentage, cannon frontal measurement, and cannon circumference. Differences between weight groups within breeds for marbling score and cannon lateral measurements were not statistically significant.

Correlations involving characteristics, neither of which differed significantly between breeds, were computed without regard to breed. Correlations involving characteristics which differed significantly between breeds were computed within each of the breeds.

Correlations of live cannon circumference with dressing percent and fat thickness are listed separately for each breed. Other individual breed correlations were judged not to differ significantly. Therefore, they were combined into pooled intrabreed correlation coefficients.

Two sets of correlation coefficients are presented in each of the correlation tables. Those not enclosed by parentheses are simple correlation coefficients which were computed between two variables, disregarding the wide range in live weight of the steers. Those enclosd by parentheses are partial correlation coefficients which indicate the relationship between two characteristics among steers of similar weight.

Correlations between live steer characteristics are listed in Table 42. The partial correlation between circumference of forearm and bone score, —.28, indicated that among steers of similar weight those scored as having more bone tended to have larger circumference of forearm. Steers having large cannon circumference measurements tended to have large circumference of forearm. The simple correlations of live grade with bone score, circumference of forearm, and cannon circumference indicate that steers that were scored more desirable in live grade tended to be those scored as having less bone, larger circumference of forearm, and larger cannon circumference. However, the correlations between live grade and other live measurements among steers of similar weight were small and not statistically significant.

The accuracy of bone score and cannon measurements on the live animal as indicators of carcass cannon measurements is indicated by the correlation coefficients listed in Table 43. The correlations, most of which are statistically significant or statistically highly significant, are small, indicating that the live-animal measurements were not as useful as indicators of the carcass cannon measurements as was expected when the measurements were taken.

Correlations of live steer characteristics with dressing percent, loin eye area, and fat thickness (Table 44) are small. Among steers of similar weight the only statistically significant indicator of dressing percent was bone score. The partial correlation between bone score and dressing percent was .27, indicating that steers scored as having larger bones tended slightly to have lower dressing percents. Loin eye area was not significantly correlated with any of the live characteristics among steers of similar weight.

The sole statistically significant live steer indicator of fat thickness among steers of similar weight was bone score. The partial correlation between bone score and fat thickness, .23, indicated that steers scored as having larger bone tended to have less fat thickness.

Significant differences between the individual breed simple correlations of live cannon circumference with dressing percent and fat thickness (Table 45) were observed. Those correlations within the Shorthorns were markedly different from those observed in the other two breeds and show that, within this set of Shorthorn cattle, larger live cannon circumference was associated with larger dressing percents and deeper fat covering. The partial correlations, though not statistically significant, tend to point to the same association of these characteristics among the Shorthorn cattle of similar weight. This result is quite different from what is believed to be the true association and may be peculiar to this particular sample of cattle and/or due to human error in measuring the live cannon. The individual breed correlations of carcass cannon measurement with dressing percent and fat thickness did not differ markedly.

Correlations between carcass characteristics are listed in Table 46. As fat thickness increased, loin eye area decreased. The partial correlation between fat thickness and loin eye area, —.44, is more than twice as large as the simple correlation (—.21). An explanation for this result is that the ratio of fat to loin eye area may vary considerably more among heavy-weight steers than among lighter-weight steers. This would tend to reduce the magnitude of the simple correlation between fat thickness and loin eye area. As fat thickness increased, dressing percent tended to increase, cannon circumference decreased (among steers of similar weight), and the very slight tendency toward more marbling was not statistically significant among steers of similar weight. Larger carcass cannon measurements tended to be associated with lower dressing percents.

In this study, wherein most of the cattle graded choice and prime, the partial correlation between marbling score and fat thickness was only .14, indicating little or no relationship between covering of fat and marbling; that is, steers with a thick covering of fat did not necessarily have more marbling than cattle with a thinner covering of fat. In a group of cattle which includes a wider range of USDA grades, the relationship between fat thickness at the 12th rib and marbling may be different than that found in this study.

Summary

Under conditions of this study, the live-animal measurements were not correlated closely enough with loin eye area to indicate that they would be useful in selecting superior muscled animals. In this group of steers, most of which graded choice and prime, thickness of fat was not closely related to marbling, indicating that well-marbled steers need not have excessive covering of fat.

The steers with thicker fat covering over the 12th rib tended to have smaller loin eye areas and higher dressing percents.

Similar studies are being conducted at this station and will be reported at a later date.

Table 40
Averages of Live Animal Characteristics by Breeds and Weight Groups.

Breed	No.	Weight group (lbs.)	Live grade	Circum. of fore-arm (cms.)	Bone score	Cannon measurements (cms.) Frontal	Lateral	Circum.
Angus	26	1100-1280	5.85	48.2	6.77	5.09	6.47	19.2
Angus	26	1000-1085	6.56	47.4	7.08	5.08	6.47	18.9
Angus	23	800-990	9.74	45.9	7.87	4.83	6.21	18.5
All Angus	74		7.30	47.2	7.22	5.01	6.39	18.9
Hereford	12	1110-1300	4.00	49.4	5.08	5.57	6.80	21.0
Hereford	16	1000-1090	5.63	49.8	6.06	5.45	6.81	20.6
Hereford	15	855-980	6.80	48.0	6.33	5.29	6.60	20.3
All Herefords	43		5.58	49.0	5.88	5.43	6.73	20.6
Shorthorn	12	1110-1280	4.33	48.1	6.42	5.13	6.56	19.6
Shorthorn	12	1020-1100	5.33	47.1	6.25	5.07	6.40	19.3
Shorthorn	12	815-1000	6.67	42.0	7.75	4.83	6.20	18.1
All Shorthorns	36		5.44	45.1	6.81	5.01	6.39	19.0

Table 41

Averages of Carcass Characteristics by Breeds and Weight Groups.

Breed	No.	Weight group (lbs.)	Loin eye (sq. in.)	Fat thickness (ins.)	Marbling score	Dressing percent	Cannon measurements (cms.) Frontal	Lateral	Circum.
Angus	26	1100-1280	12.17	1.12	8.92	65.1	4.02	2.45	10.8
Angus	25	1000-1085	11.55	1.08	8.52	64.1	3.97	2.43	10.6
Angus	23	800-990	11.40	.88	8.96	64.2	3.90	2.36	10.4
All Angus	74		11.72	1.03	8.80	64.5	3.96	2.42	10.6
Hereford	12	1110-1300	12.07	1.10	8.17	64.7	4.37	2.53	11.4
Hereford	16	1000-1090	11.79	1.00	8.31	64.2	4.13	2.46	11.0
Hereford	15	855-980	11.10	.79	7.73	62.4	4.15	2.47	11.0
All Herefords	43		11.63	.95	8.07	63.7	4.20	2.49	11.2
Shorthorn	12	1110-1280	11.10	1.29	8.75	65.1	4.04	2.51	10.8
Shorthorn	12	1020-1100	10.19	1.09	9.08	64.4	3.99	2.47	10.8
Shorthorn	12	815-1000	9.86	.89	8.67	63.4	3.65	2.38	10.0
All Shorthorns ..	36		10.38	1.09	8.83	64.3	3.89	2.45	10.5

Table 42

Correlations Between Live Steer Characteristics.

	Circum. of forearm	Cannon circum.	Live grade
Bone score	−.38**(−.28**)	−.04(.16)	−.31**(−.16)
Circum. of forearm		.42**(.30**)	−.27**(−.12)
Cannon circum. ..			−.27**(−.06)

** Significant at the .01 level.
( ) = partial correlation coefficients.

Table 43

Correlation of Bone Score and Cannon Measurements on the Live Animal with Carcass Cannon Measurement.

	Carcass cannon measurements Frontal	Lateral	Circumference
Bone score	−.51**(−.43**)	−.20*(−.13)	−.49**(−.33**)
Live cannon measurements			
Frontal	.44**(.32**)		
Lateral		.30**(.22*)	
Circumference			.43**(.31**)

* Significant at the .05 level.
** Significant at the .01 level.
( ) = partial correlation coefficients.

Table 44

Correlations of Live Steer Characteristics with Dressing Percent, Loin Eye Area and Fat Thickness.

Live steer characteristics	Dressing percent	Loin eye area	Fat thickness
Live grade	−.12(.08)	−.05(.12)	−.36**(−.17)
Circum. of forearm	.16*(.02)	.22**(.12)	.06(−.14)
Bone score	.09(.27**)	−.20*(−.10)	.00(.22*)
Cannon circum.	−.01	.30**(.18)	.03

* Significant at the .05 level.
** Significant at the .01 level.
( ) = partial correlation coefficients.

Table 45

Correlations of Live Cannon Circumference with Dressing Percent and Fat Thickness within Each Breed.

	Live cannon circumference Angus	Hereford	Shorthorn
Dressing %	.10(−.01)	−.09(−.37*)	.47**(.13)
Fat thickness	.05(−.11)	.00(−.36)	.51**(.12)

* Significant at the .05 level.
** Significant at the .01 level.
( ) = partial correlation coefficients.

Table 41
Averages of Carcass Characteristics by Breeds and Weight Groups.

Breed	No.	Weight group (lbs.)	Loin eye (sq. in.)	Fat thickness (ins.)	Marbling score	Dressing percent	Cannon measurements (cms.) Frontal	Lateral	Circum.
Angus	26	1100-1280	12.17	1.12	8.92	65.1	4.02	2.45	10.8
Angus	25	1000-1085	11.55	1.08	8.52	64.1	3.97	2.43	10.6
Angus	23	800-990	11.40	.88	8.96	64.2	3.90	2.36	10.4
All Angus	74		11.72	1.03	8.80	64.5	3.96	2.42	10.6
Hereford	12	1110-1300	12.07	1.10	8.17	64.7	4.37	2.53	11.4
Hereford	16	1000-1090	11.79	1.00	8.31	64.2	4.13	2.46	11.0
Hereford	15	855-980	11.10	.79	7.73	62.4	4.15	2.47	11.0
All Herefords	43		11.63	.95	8.07	63.7	4.20	2.49	11.2
Shorthorn	12	1110-1280	11.10	1.29	8.75	65.1	4.04	2.51	10.8
Shorthorn	12	1020-1100	10.19	1.09	9.08	64.4	3.99	2.47	10.8
Shorthorn	12	815-1000	9.86	.89	8.67	63.4	3.65	2.38	10.0
All Shorthorns	36		10.38	1.09	8.33	64.3	3.89	2.45	10.5

Table 42
Correlations Between Live Steer Characteristics.

	Circum. of forearm	Cannon circum.	Live grade
Bone score	−.38**(−.28**)	.04(.16)	−.31**(−.16)
Circum. of forearm		.42**(.30**)	−.27**(−.12)
Cannon circum.			−.27**(−.06)

** Significant at the .01 level.
( ) = partial correlation coefficients.

Table 43
Correlation of Bone Score and Cannon Measurements on the Live Animal with Carcass Cannon Measurement.

	Carcass cannon measurements Frontal	Lateral	Circumference
Bone score	−.51**(−.43**)	−.20*(−.13)	−.49**(−.33**)
Live cannon measurements			
Frontal	.44**(.32**)		
Lateral		.30**(.22*)	
Circumference			.43**(.31**)

* Significant at the .05 level.
** Significant at the .01 level.
( ) = partial correlation coefficients.

Table 44
Correlations of Live Steer Characteristics with Dressing Percent, Loin Eye Area and Fat Thickness.

Live steer characteristics	Dressing percent	Loin eye area	Fat thickness
Live grade	−.12(.08)	−.05(.12)	−.36**(−.17)
Circum. of forearm	.16*(.02)	.22**(.12)	.06(−.14)
Bone score	.09(.27**)	−.20*(−.10)	.00(.22*)
Cannon circum.	−.01	.30**(.18)	.03

* Significant at the .05 level.
** Significant at the .01 level.
( ) = partial correlation coefficients.

Table 45
Correlations of Live Cannon Circumference with Dressing Percent and Fat Thickness within Each Breed.

	Live cannon circumference Angus	Hereford	Shorthorn
Dressing %	.10(−.01)	−.09(−.37*)	.47**(.13)
Fat thickness	.05(−.11)	.00(−.36)	.51**(.12)

* Significant at the .05 level.
** Significant at the .01 level.
( ) = partial correlation coefficients.

Table 46

Correlations Between Carcass Characteristics.

	Fat thickness	Dressing %	Cannon circum.	Marbling score
Loin eye area	−.21**(−.44**)	.08(−.05)	.22**(.11)	.03(.00)
Fat thickness ..		.44**(.31**)	−.03(−.27**)	.17*(.14)
Dressing %			−.34**(−.57**)	.02(−.02)

* Significant at the .05 level.

** Significant at the .01 level.

( ) = partial correlation coefficients.

Fundamental Studies of Sorghum Roughages and Grains. I. A Study of the Value of Pelleting Sorghum Grain. II. A Study of the Value of Levels of Hormone and Synthetic Hormonelike Substances (Project 222).

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

Previous work has shown that rate of gain and carcass quality are essentially the same with sorghum grain and corn when self-fed in a beef fattening ration (Kansas Agricultural Experiment Station Circulars 308, 320, and 335). However, the animals eat more sorghum grain than corn per pound of gain. Because of its relatively small size, uniform preparation of the sorghum grain is more difficult than for the larger corn grain.

This is a preliminary test to evaluate grinding sorghum grain to a meal and then making it into a pellet. Source and level of hormones and synthetic hormonelike substances used as implants are also being studied.

Experimental Procedure

Thirty-six of the heaviest Hereford steer calves purchased for experimental work were assigned to this test. Since lot space was not available, they were fed together in a group until the test started. They were divided on the basis of weight and conformation into three lots of 12 animals each, January 15, 1957. At that time they were consuming 5 pounds of grain per day and their average weight was about 540 pounds.

The daily ration for all animals consisted of grain, 1 pound soybean oil meal, 2 pounds alfalfa hay, and all of the sorghum silage they would clean up. Equal quantities of grain were fed as follows: Lot 1, rolled corn; lot 2, finely ground pelleted sorghum grain; and lot 3, rolled sorghum grain. It should be observed that silage was the only ingredient not kept on an equal weight basis between lots. The calves were hand-fed in the morning and afternoon.

The animals in each lot were assigned to four groups of three animals each on the basis of weight. One group served as the control, one group had 24 mgs. of stilbestrol implanted under the skin of the ear, and another group received 36 mgs. The fourth group received the Synovex implant (1000 mgs. progesterone and 20 mgs. estradiol benzoate). This gave three animals in each lot per treatment or a total of nine on each treatment. The calves were implanted 28 days after starting the test. They had been on a full feed of grain (10 pounds daily) for several days at that time.

Results and Observations

The results of this test are shown in Tables 47 and 48. The calves receiving corn were the first to reach a full feed of grain followed by those receiving pelleted sorghum. Lot 3 calves (rolled sorghum grain) would have consumed more grain than the others; however, grain consumption was kept the same in all lots. Lot 3 calves consumed more silage. After about 60 days on test, the calves on pelleted sorghum grain seemed reluctant to eat for a few days. No apparent reason for this was observed and normal feed consumption was resumed.

Rate of gain, feed efficiency and carcass grade were best for rolled corn followed by pelleted sorghum grain and then rolled sorghum grain. Based upon prevailing feed costs, pelleted sorghum produced gains for the lowest feed cost. The animals fed pelleted sorghum produced larger rib eyes. The reason for this is not apparent. Even though this test indicates beneficial effects from fine grinding and pelleting of sorghum grain, further work must be done to confirm or reject these apparent beneficial results.

Animals receiving implants of hormone or hormonelike substances gained faster than non-implanted animals. The highest rate of gain was produced by animals implanted with 24 mgs. of stilbestrol. Stilbestrol tended to lower the carcass grade, whereas Synovex apparently did not. Size of rib eye tended to increase as size of animals increased. Thus, the ones having gained faster, in general, had larger rib eyes. Side effects such as high tailhead, weak loin and teat development were more pronounced with the 36-mg. level of stilbestrol implantation. These results indicate that 24 mgs. is the desired level of implantation for steers of this weight when being fattened for market.

Table 47

Comparative Results with Rolled Corn, Pelleted Sorghum Grain and Rolled Sorghum Grain in Beef Steer Calf Fattening Rations.

January 15 to July 12, 1957—178 days.

Lot number	1	2	3
Number calves per lot	12	11[1]	12
Av. initial wt., lbs.	541.3	537.3	538.8
Av. final wt., lbs.	968.3	954.1	933.7
Av. daily gain per calf, lbs.	2.40	2.34	2.22
Av. daily ration, lbs.:			
Sorghum silage[2]	9.0	8.6	10.6
Alfalfa hay	2.4	2.3	2.4
Soybean oil meal	1.0	1.0	1.0
Rolled corn	12.0	....	....
Pelleted sorghum grain	....	12.0	....
Rolled sorghum grain	....	....	12.0
Lbs. feed per cwt. gain:			
Sorghum silage	375.6	369.5	478.9
Alfalfa hay	100.6	99.5	107.8
Soybean oil meal	41.7	42.7	45.1
Rolled corn	501.8	....	....
Pelleted sorghum grain	....	511.3	....
Rolled sorghum grain	....	....	542.5
Av. feed cost per cwt. gain,[3] $	18.65	18.15	19.16
Carcass data:			
Av. hot carcass wt.	591.3	571.1	551.7
Av. hot carcass dressing %[4]	63.3	62.6	60.4
Av. hot dressing % based on final feed lot wts.	61.1	59.9	59.1
Av. carcass grade:[5]			
Before ribbing	12.6	12.3	11.5
After ribbing	12.9	12.2	12.0
Av. finish:			
Fat thickness[6]	3.2	4.0	3.8
Fat distribution[7]	1.6	3.0	2.8

1. One animal removed because of urinary calculi.
2. Sorghum silage discontinued May 8.
3. Feed cost per 100 lbs.: Sorghum silage, $0.50; alfalfa hay, $1.00; soybean oil meal, $3.50; rolled corn, $2.85; pelleted sorghum grain, $2.70; rolled sorghum grain, $2.60.
4. Based on selling weight.
5. Based on top choice 15, av. choice 14, low choice 13, top good 12, av. good 11, and low good 10.
6. Based on very thick 1, thick 2, moderate 3, modest 4, slightly thin 5.
7. Based on very uniform 1, uniform 2, moderately uniform 3, modestly uniform 4, slightly uneven 5.

Table 47 (Continued)

Degree of marbling[8]	8.0	7.6	7.9
Size of rib eye (visual est.)[9]	3.7	3.3	4.1
Size of rib eye (sq. in.)	10.29	10.50	9.91
Degree of firmness[10]	2.2	2.5	3.0

8. Based on modest amount 6, small amount 7, slight amount 8, traces 9, practically devoid 10.

9. Based on very large 1, large 2, moderately large 3, modestly large 4, slightly small 5.

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

Table 48

Results of Implanting 24 and 36 Mgs. of Stilbestrol and Synovex Pellets with Beef Steer Calves on Fattening Ration.

February 12 to July 12, 1957—150 days.

Treatment	Control	24 mgs. stilbestrol	36 mgs. stilbestrol	Synovex[1]
Number of calves per treatment	9	9	8	9
Av. initial wt., lbs.	618.9	614.4	611.3	610.0
Av. final wt., lbs.	910.5	995.0	957.5	945.6
Av. daily gain, lbs.	1.94	2.54	2.31	2.22
Carcass data:				
Av. hot carcass wt., lbs.	548.8	592.4	574.7	569.8
Av. hot carcass dressing % based on final feed lot wt.	60.3	59.5	60.0	60.3
Av. carcass grade:[2]				
Before ribbing	12.6	11.8	11.5	12.7
After ribbing	13.1	11.6	11.8	13.0
Av. finish:				
Fat thickness[3]	3.6	3.7	3.9	3.6
Fat distribution[4]	3.0	2.6	2.5	2.8
Degree of marbling[5]	7.0	8.3	7.9	6.9
Size of rib eye (visual est.)[6]	3.8	3.7	3.9	3.4
Size of rib eye (sq. in.)	9.79	10.64	10.26	10.21
Degree of firmness[7]	1.9	3.0	3.1	2.2

1. 1000 mgs. progesterone and 20 mgs. estradiol benzoate.

2. Based on top choice 15, av. choice 14, low choice 13, top good 12, av. good 11, and low good 10.

3. Based on very thick 1, thick 2, moderate 3, modest 4, slightly thin 5.

4. Based on very uniform 1, uniform 2, moderately uniform 3, modestly uniform 4, slightly uneven 5.

5. Based on modest amount 6, small amount 7, slight amount 8, traces 9, practically devoid 10.

6. Based on very large 1, large 2, moderately large 3, modestly large 4, slightly small 5.

Fundamental Studies of Sorghum Roughages and Grains. A Study of the Value of Pelleting Sorghum Grain (Project 222).

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

A preliminary test indicated that the efficiency of utilization of sorghum grain by beef cattle may be increased by grinding the grain very fine and making it into pellets. Digestion, nitrogen balance, digestible energy and feedlot tests are being conducted. This report is on the wintering phase of the feedlot test.

Experimental Procedure

Forty Hereford steer calves from one herd were divided as equally as possible on the basis of weight and conformation into four lots of 10 animals each. Two additional steers became available about 10 days after the test started and they were added to lot 3. The daily ration con-

sisted of 1 pound soybean oil meal, 5 pounds grain, 2 pounds alfalfa hay, and all the sorghum silage they would clean up. Salt and a mineral mixture of two parts steamed bonemeal and 1 part salt were fed free-choice. Water was supplied by electrically heated automatic water fountains. The grain used was as follows: lot 1, rolled sorghum grain; lot 2, cracked corn; lot 3, finely ground and pelleted sorghum grain; lot 4, finely ground sorghum grain.

Results and Observations

Results of the wintering phase of this test are shown in Table 49. Rate of gain and feed efficiency were exceptionally good in all lots. The lower rate of gain in lot 4 was caused primarily by two animals which became lame and had to be treated. They have apparently recovered. These data do not indicate any real differences between corn and sorghum grain or method of preparation of sorghum grain in the wintering ration of beef steer calves. The fattening phase of this test is now in progress.

Table 49

Comparative Results with Cracked Corn, Rolled Sorghum Grain, Finely Ground Sorghum Grain and Finely Ground Pelleted Sorghum Grain in Beef Steer Calf Wintering Rations.

December 7, 1957, to March 17, 1958—100 days.

Lot number	1	2	3	4
Number calves per lot	10	10	12	10
Av. initial wt., lbs.	431	432	426.3	432
Av. final wt., lbs.	636	628	623.3	620
Av. daily gain per calf, lbs.	2.05	1.96	2.00	1.88
Av. daily ration, lbs.:				
Sorghum silage	19.2	17.6	17.7	17.8
Alfalfa hay	2.0	2.0	2.0	2.0
Soybean oil meal	1.0	1.0	1.0	1.0
Rolled sorghum grain	5.0	....	....	....
Corn	....	5.0	....	....
Pelleted sorghum grain	....	....	5.0	....
Finely ground sorghum grain	....	....	....	5.0
Lbs. feed per cwt. gain:				
Sorghum silage	938	897	870	945
Alfalfa hay	97.6	102	100	106.4
Soybean oil meal	48.8	51.0	50.0	53.2
Rolled sorghum grain	243.9	....	....	....
Corn	....	255.1	....	....
Pelleted sorghum grain	....	....	250	....
Finely ground sorghum grain	....	....	....	266
Feed cost per cwt. gain, $[1]	10.57	11.54	10.76	11.26

1. Based on ingredient prices given on inside of back cover.

Self-Feeding Molasses Mixed with Urea, Phosphoric Acid and Water with or without Ethyl Alcohol to Beef Heifers. I. Feedlot and Carcass Study (Project 536).

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

Phosphoric acid has been found to be an excellent source of phosphorus when used in beef cattle rations. Urea, a non-protein-nitrogen compound, has long been recognized as a satisfactory source of protein equivalent for ruminants. Recently, the idea has been advanced that small amounts of ethyl alcohol would be beneficial in ruminant rations. Because of the labor-saving aspect, the practice of self-feeding liquid supplements seems to appeal to many people. All of the above ingredients can be mixed easily and thoroughly with molasses. This test was conducted to study the value of self-feeding a mixture of molasses, urea, phosphoric acid and water with and without ethyl alcohol in the wintering and fattening ration of beef heifers.

Experimental Procedure

Thirty-three Hereford heifer calves from the same herd, averaging about 435 pounds each, were divided as equally as possible on the basis of weight and conformation into three lots of 11 animals each. During the wintering phase, all lots received all the sorghum silage the animals would clean up each day. The remainder of the ration was as follows:

Lot 1—Control, 1 pound soybean oil meal and 2 pounds sorghum grain.

Lot 2—Free-choice mixture, 77 percent blackstrap molasses, 3 percent phosphoric acid, 10 percent urea, and 10 percent water (approximately 30 percent protein equivalent).

Lot 3—Free-choice mixture, 71 percent blackstrap molasses, 3 percent phosphoric acid, 10 percent urea, 10 percent water, and 6 percent ethyl alcohol (approximately 30 percent protein equivalent).

At the end of the 112-day wintering phase, the fattening phase was started by adding sorghum grain to the ration. The animals were worked up to a full feed of grain. It was necessary to change the roughage from silage to prairie hay. After reaching a full feed of grain, hay and grain were self-fed free choice. Lot 1 animals continued to receive 1 pound of soybean oil meal per head daily, and lots 2 and 3 continued to receive their respective molasses mixtures free choice. Lot 1 had salt and a mixture of 2 parts bonemeal and 1 part salt fed free choice. Lots 2 and 3 had salt and a mixture of equal parts salt and limestone fed free choice. Electrically heated automatic water fountains provided drinking water at all times. The calves were started on test without any preliminary feeding of the molasses mixtures. All animals were weighed at 28-day intervals. Carcass data were obtained on each animal at slaughter. Wholesale rib cuts were obtained from five animals in each lot for further study on carcass evaluation.

Results and Observations

Results of this test are shown in Table 50.

Wintering phase. It was the second day before the animals started consuming any of the molasses mixture. There was no noticeable variation in consumption after they started eating it and no unusual behavior or toxic effects were observed. Total feed consumption tended to be about the same in all lots; however, there were small differences. Rate of gain was satisfactory in lots 2 and 3; however, it was considerably better in lot 1. Based upon the cost of feedstuffs at the time of the test, lot 1 produced the most economical gains.

Fattening phase. Grain was added to the ration after conclusion of the wintering phase. An average of 23 pounds per head daily was being consumed in all lots when the animals reached a full feed of grain. This is a tremendous amount of grain for about 600-pound animals. After reaching a full feed of grain, the grain was self-fed, and consumption tended to level out at a normal rate. No ill effects were observed except the foundering of two animals in lot 1 and one in lot 2. The average molasses mixture consumption was slightly less during the fattening phase than in the wintering phase. Total feed consumption tended to be the same in all lots; however, more grain was consumed by animals in lots 2 and 3. A greater rate of gain was produced by animals in lots 2 and 3; however, considering the winter gains and the fact that there were two foundered animals in lot 1, it is doubtful that there were any real differences. There were no significant differences in shrink to market, dressing percent, carcass grade, covering of fat, degree of marbling, size of rib eye or degree of firmness. The use of ethyl alcohol did not produce any significant differences. The cost per pound of gain for the entire test was least for lot 1.

Table 50

Results of Self-Feeding Molasses Mixed with Urea, Phosphoric Acid and Water with or without Ethyl Alcohol to Beef Heifers.

Wintering phase—December 15, 1956, to April 6, 1957—112 days.

Lot number	1	2	3
Number heifers per lot	11	11	11
Av. initial wt., lbs.	435.0	435.5	434.5
Av. final wt., lbs.	601.4	565.0	567.7
Av. daily gain per heifer, lbs.	1.49	1.16	1.19
Av. daily ration, lbs.:			
Sorghum silage	29.4	30.1	30.5
Soybean meal	1.0	....	....
Sorghum grain	2.0	....	....
Urea-blackstrap molasses No. 1[1]	....	2.1	....
Urea-blackstrap molasses No. 2[2]	....	....	2.3
Bonemeal and salt, equal parts	0.10	....	....
Salt	0.05	0.12	0.16
Limestone	....	0.02	0.04
Lbs. feed per 100 lbs. gain:			
Sorghum silage	1978.0	2600.00	2563.00
Soybean meal	67.3	....	....
Sorghum grain	134.6	....	....
Urea-blackstrap molasses No. 1	....	180.6	....
Urea-blackstrap molasses No. 2	....	....	193.3
Bonemeal and salt, equal parts	7.0	....	....
Salt	3.4	10.0	13.2
Limestone	....	1.9	3.4
Feed cost per 100 lbs. gain,[3] $	16.06	21.67	22.12

Fattening phase—April 6, 1957, to August 24, 1957—140 days.

Lot number	1	2	3
Number heifers per lot	11	11	11
Av. initial wt., lbs.	601.4	565.0	567.7
Av. final wt., lbs.	842.3	845.9	860.5
Av. daily gain per heifer, lbs.	1.72	2.01	2.09
Av. daily ration, lbs.:			
Sorghum silage[4]	27.9	27.9	28.3
Prairie hay[5]	4.7	4.1	4.2
Sorghum grain	16.0	17.8	18.1
Soybean oil meal	1.0	....	....
Urea-blackstrap molasses No. 1[1]	....	1.8	....
Urea-blackstrap molasses No. 2[2]	....	....	1.7
Bonemeal and salt, equal parts	0.03	....	....
Salt	0.02	0.02	0.04
Limestone	....	.03	.06
Pounds fed per 100 lbs. gain:			
Sorghum silage	394	338	329
Prairie hay	206	154	151
Sorghum grain	930	885	863
Soybean oil meal	58	....	....
Urea-blackstrap molasses No. 1	....	87	....
Urea-blackstrap molasses No. 2	....	....	82
Bonemeal and salt, equal parts	1.2	....	....

1. Mixture of 77 percent blackstrap molasses, 3 percent phosphoric acid, 10 percent urea and 10 percent water (approximately 30 percent protein equivalent).

2. Mixture of 71 percent blackstrap molasses, 3 percent phosphoric acid, 6 percent ethyl alcohol, 10 percent urea, and 10 percent water (approximately 30 percent protein equivalent).

3. Based on following prices: Silage, $10 per ton; prairie hay, $20 per ton; sorghum grain, $2.80 per cwt.; soybean oil meal, $70 per ton; urea-molasses mixtures, $95 per ton; bonemeal and salt mixture, $80 per ton; salt, $15 per ton; limestone, $15 per ton.

4. Sorghum silage fed only first 34 days.

5. Prairie hay fed last 106 days.

Table 50 (Continued)

Salt	1.6	1.0	2.0
Limestone	....	1.3	2.7
Feed cost per 100 lbs. gain,[3] $	30.28	30.39	29.54
Summary—Wintering and fattening—December 15, 1956, to August 24, 1957—252 days.			
Lot number	1	2	3
Av. total gain, lbs.	407.3	410.4	426.0
Av. daily gain, lbs.	1.62	1.63	1.69
Av. feed cost per 100 lbs. gain,[3] $	24.47	27.64	27.22
Percent shrink to market	2.0	1.6	1.5
Av. dressing percent (includes 2% cooler shrink)	58.9	59.0	58.7
Av. carcass grade, before ribbing[6]	11.7	11.5	11.6
Av. carcass grade, after ribbing[6]	12.9	12.6	12.9
Av. fat thickness at 12th rib, visual est.[7]	3.6	3.4	3.6
Av. uniformity of fat distribution[8]	3.4	3.3	3.1
Av. degree of marbling[9]	6.2	7.2	6.5
Av. size rib eye, visual estimate[10]	3.9	3.8	3.9
Av. size rib eye, sq. in.	9.67	9.54	9.44
Av. degree of firmness[11]	3.3	3.6	3.2

3. Based on following prices: Silage, $10 per ton; prairie hay, $20 per ton; sorghum grain, $2.60 per cwt.; soybean oil meal, $70 per ton; urea-molasses mixtures, $95 per ton; bonemeal and salt mixture, $80 per ton; salt, $15 per ton; limestone, $15 per ton.

6. Based on: top choice 15; av. choice 14; low choice 13; top good 12; av. good 11; low good 10.

7. Based on thick 2; moderate 3; modest 4; slightly thin 5.

8. Based on uniform 2; moderate 3; modest 4; slightly uneven 5.

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

10. Based on large 2; moderately large 3; modestly large 4; slightly small 5.

11. Based on firm 2; moderately firm 3; modestly firm 4; slightly firm 5.

Self-Feeding Molasses Mixed with Urea, Phosphoric Acid and Water with or without Ethyl Alcohol to Beef Heifers. II. Meat Evaluation Study (Project 536).

D. Richardson, D. L. Mackintosh and R. A. Merkel

The details of management and feeding of animals involved in this test are given in part I of this report. Five wholesale rib cuts from each lot were obtained at the time of slaughter for cooking, palatability, mechanical separation and chemical tests. These tests were conducted to determine the effect of the protein supplement upon the meat produced.

Results and Observations

The average results of this test are presented in Tables 51 and 52. These data show that no differences were produced in the meat by the protein supplements used in this test.

Table 51

Results of Cooking, Palatability, and Mechanical Separation Tests with Rib Roasts from Beef Heifers (Project 536, 1957).

Treatment	Control: Soybean oil meal supplement	Urea, phos. acid, molasses supplement	Urea, phos. acid, molasses, alcohol supplement
Lot number	1	2	3
Number of samples	5	5	5
Av. percent total loss	13.5	13.6	12.4
Av. percent volatile loss	10.1	10.2	10.2

Table 50 (Continued)

Av. percent drip loss	3.5	3.4	2.3
Av. cooking time, minutes per lb.	31.3	29.5	30.2
Av internal temp. from oven, degrees F.	140	138	139
Av. max. internal temp.	147	146	146
Av. palatability score[1]			
Aroma	5.9	5.8	5.8
Flavor:			
Lean	5.9	5.9	5.7
Fat	5.9	6.0	5.5
Tenderness	6.0	6.3	6.3
Juiciness	5.6	5.7	5.6
Av. shear value, lbs.	14.5	15.4	14.2
Av. press fluid, yield ml./25 gms.:			
Total	8.7	8.7	8.6
Serum	7.5	7.5	6.9
Fat	1.3	1.2	1.7
Mechanical analysis 9-11 rib (av. % of entire 9-11 rib cut):			
Av. percent eye muscle	18.42	17.84	17.64
Av. percent other lean	30.53	29.15	31.54
Av. percent fat	33.04	35.04	32.43
Av. percent bone	17.80	16.64	18.14

1. Range 1-7, higher figure = higher score.

Table 52

Chemical Analysis of Beef Samples (Project 536, 1957).

Grade	Degree marbling[1]	Shear value, lbs.	Other lean, % fat	Press fluid: Total volume, ml/25g	Press fluid: Fat volume, ml/25g	Press fluid: Total nitrogen, mg/ml	Rib eye: pH	Rib eye: Penetrometer scale[2]	Rib eye: Nitrogen %	Rib eye: Moisture %	Rib eye: Ash %	Rib eye: Fat %
Control:												
C	6	17.2	20.5	8.1	0	17.8	5.30	59	3.40	70.5	1.02	7.0
G−	9	11.6	11.8	9.1	0	15.0	5.41	62	3.40	74.8	1.04	2.2
Urea—Phosphoric Acid—Molasses Supplement												
G	8	18.4	14.6	8.2	0	17.6	5.38	57	3.41	72.3	1.05	5.3
C−	7	15.1	16.4	9.0	0	16.5	5.34	55	3.42	71.6	1.02	4.9
G+	8	13.6	14.0	8.2	0	16.5	5.36	57	3.51	72.2	1.04	3.7
G+	8	11.3	12.8	8.1	0	17.5	5.24	62	3.35	73.5	1.04	3.5
Urea—Phosphoric Acid—Molasses—Alcohol Supplement												
C	6	15.6	19.4	8.3	0	17.8	5.40	53	3.35	71.0	1.01	6.6
C−	7	15.0	17.8	10.8	0	16.1	5.29	57	3.33	72.6	1.03	5.2

1. The smaller the number the greater the degree of marbling.
2. Penetration of standard ASTM quarter scale cone into ground rib eye at 10°C. Average of 7 readings.

Self-Feeding Molasses Mixed with Urea, Phosphoric Acid and Water to Beef Heifers. Wintering Phase 1957-58 (Project 536).

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

This is the second test to study the value of self-feeding a mixture of blackstrap molasses, urea, phosphoric acid and water as the protein supplement to beef cattle. The results of the wintering phase are given in this report.

Experimental Procedure

Thirty Hereford heifer calves from the same herd were divided as equally as possible on the basis of weight and conformation into three lots of 10 animals each. Animals in all lots received all of the sorghum silage they would clean up each day. The remainder of the ration was as follows:

Lot 7—Free-choice mixture, 77 percent blackstrap molasses, 3 percent phosphoric acid, 10 percent urea, and 10 percent water.

Lot 8—Free-choice mixture, 77 percent blackstrap molasses, 3 percent phosphoric acid, 10 percent urea, and 10 percent water plus .5 pound soybean oil meal, and 1.5 pounds sorghum grain.

Lot 9—Control, 1 pound soybean oil meal and 2 pounds sorghum grain.

Salt and a mixture of equal parts salt, steamed bonemeal, and limestone were fed free-choice to all lots. Water was supplied by electrically heated automatic fountains.

Results and Observations

Results of the wintering phase of this test are shown in Table 53. No toxic symptoms were observed from self-feeding the urea, phosphoric acid, water and molasses mixture. Satisfactory gains were obtained on the silage and molasses mixture; however, the rate of gain was increased by adding soybean oil meal and grain to the ration.

Table 53

Results of Self-Feeding a Mixture of Molasses, Urea, Phosphoric Acid and Water to Beef Heifer Calves. Wintering Phase.

December 12, 1957, to March 21, 1958—100 days.

Lot number	7	8	9
Number calves per lot	10	10	10
Av. initial wt., lbs.	441.5	441.5	441.0
Av. final wt., lbs.	560	590	585
Av. daily gain per calf, lbs.	1.18	1.48	1.44
Av. daily ration, lbs.:			
Sorghum silage	27.6	25.9	25.9
Sorghum grain	....	1.5	2.0
Soybean oil meal	....	0.5	1.0
Molasses mixture[1]	2.15	2.39	....
Salt	.07	.04	.09
Mineral mixture[2]	.09	.11	.12
Lbs. feed per cwt. gain:			
Sorghum silage	2333	1747	1799
Sorghum grain	....	101	138.9
Soybean oil meal	....	33.7	69.4
Molasses mixture[1]	181.4	160.7	....
Salt	5.6	2.4	6.1
Mineral mixture	7.8	5.7	8.7
Cost per cwt. gain, $[3]	15.71	15.88	11.71

1. Mixture contained 77 percent blackstrap molasses, 3 percent phosphoric acid, 10 percent urea, and 10 percent water.
2. Equal parts of limestone, steamed bonemeal, and salt.
3. Based on ingredient prices given on inside of back cover.

Self-Feeding Ammoniated Blackstrap Molasses with or without Ethyl Alcohol and Ammoniated Hydrol to Beef Heifers (Project 537).[1]

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

Previous work has shown that ammonia added to hydrol (corn molasses) can serve as a source of non-protein-nitrogen for ruminants (Kansas Agr. Exp. Sta. Cirs. 320, 335 and 349). The practice of self-feeding liquid supplements seems to be increasing in popularity. This test was conducted to study the value of self-feeding ammoniated blackstrap molasses and ammoniated hydrol as a source of protein equivalent in the wintering and fattening ration of beef heifers.

Experimental Procedure

Forty-four Hereford heifer calves from the same herd averaging about 435 pounds were divided as equally as possible on the basis of weight and conformation into four lots of 11 animals each. All lots received all of the sorghum silage that the animals would clean up during the wintering phase. The remainder of the ration was as follows:

Lot 1—Control. 1 pound soybean oil meal and 2 pounds sorghum grain.

Lot 2—Free choice mixture of ammoniated blackstrap molasses (15 percent protein equivalent).

Lot 3—Free choice mixture of ammoniated blackstrap molasses containing 3 percent ethyl alcohol (15 percent protein equivalent).

Lot 4—Free choice mixture of ammoniated hydrol (15 percent protein equivalent) plus 0.5 pound soybean oil meal.

Lot 1 had salt and a mixture of 2 parts steamed bone meal and 1 part salt fed free choice. The other lots had salt and a mixture of equal parts limestone and salt fed free choice. Electrically heated automatic water fountains provided drinking water at all times. The calves were started on test without any preliminary feeding of the molasses mixtures. Weights were obtained on individual animals each 28 days.

At the end of the wintering phase, grain was added to the ration in all lots. An average daily consumption of 22 to 23 pounds of grain was reached before the animals were on full feed. This was an unusually high consumption for this weight animal; however, consumption became normal after self-feeding of grain was started. It was necessary to change the roughage from silage to prairie hay after 34 days of the fattening phase. The source of protein remained the same throughout the test.

Results and Observations

The results of this test are shown in Table 54.

1. This project was in cooperation with Clinton Corn Processing Co., Clinton, Iowa.

Table 54

Results of Self-Feeding Ammoniated Blackstrap Molasses with or without Ethyl Alcohol, and Ammoniated Hydrol to Beef Heifers.

Wintering phase—December 15, 1956, to April 6, 1957—112 days.				
Lot number	1	2	3	4
Number heifers per lot	11	11	11	10[1]
Av. initial wt., lbs.	435.0	433.6	434.0	431.0
Av. final wt., lbs.	601.4	526.4	540.9	579.5
Av. daily gain per heifer, lbs.	1.49	.83	.95	1.33
Av. daily ration, lbs.:				
Sorghum silage	29.4	22.1	23.0	26.7
Soybean meal	1.0	....	....	0.5
Sorghum grain	2.0	....	....	....
Ammoniated blackstrap molasses No. 1[2]	....	5.2	....	....
Ammoniated blackstrap molasses No. 2[3]	....	....	5.6	....
Ammoniated hydrol[4]	....	....	....	3.2
Bonemeal and salt, equal parts	0.10	....	....	....
Salt	0.05	0.15	0.15	0.11
Limestone	....	0.05	0.04	0.02
Lbs. feed per cwt. gain:				
Sorghum silage	1978.0	2666.0	2408.0	2015.0
Soybean meal	67.3	....	....	37.7
Sorghum grain	134.6	....	....	....
Ammoniated blackstrap molasses No. 1	....	633.4	....	....
Ammoniated blackstrap molasses No. 2	....	....	617.5	....
Ammoniated hydrol	....	....	....	241.8
Bonemeal and salt, equal parts	7.0	....	....	....
Salt	3.4	17.5	15.7	8.2
Limestone	....	5.5	4.3	1.8
Av. feed cost per cwt. gain,[5] $	16.06	32.50	30.71	18.71
Fattening phase—April 6, 1957, to August 24, 1957—140 days.				
Lot number	1	2	3	4
Number heifers per lot	11	11	11	10
Av. initial wt., lbs.	601.4	526.4	540.9	579.5
Av. final wt., lbs.	842.3	774.5	796.4	847.0
Av. daily gain per heifer, lbs.	1.72	1.77	1.83	1.91
Av. daily ration, lbs.:				
Sorghum silage[6]	27.9	21.3	21.7	22.9
Prairie hay[7]	4.7	3.5	4.2	3.7
Sorghum grain	16.0	16.8	16.5	16.8
Soybean oil meal	1.0	....	....	.5
Ammoniated blackstrap molasses No. 1	....	1.8	....	....
Ammoniated blackstrap molasses No. 2	....	....	1.8	....
Ammoniated hydrol[4]	....	....	....	1.1
Bonemeal and salt, equal parts	0.03	....	....	....
Salt	0.02	0.08	0.10	0.03
Limestone	....	.05	.04	.02
Lbs. feed per cwt. gain:				
Sorghum silage	394	291	288	292
Prairie hay	206	149	134	147
Sorghum grain	930	949	902	882
Soybean oil meal	58	....	....	....
Ammoniated blackstrap molasses No. 1	....	102	....	....
Ammoniated blackstrap molasses No. 2	....	....	99	....
Ammoniated hydrol	....	....	....	55
Bonemeal and salt, equal parts	1.2	....	....	....
Salt	1.6	4.8	5.3	1.7
Limestone	....	2.9	2.0	1.1
Av. feed cost per cwt. gain,[5] $	30.28	30.74	29.25	28.44

1. One sick heifer removed.
2. Ammoniated blackstrap molasses (15 percent protein equivalent).

3. Ammoniated blackstrap molasses with 3 percent ethyl alcohol (15 percent protein equivalent).
4. Ammoniated hydrol (15 percent protein equivalent).
5. Based on following prices: Silage, $10 per ton; prairie hay, $20 per ton; sorghum grain, $2.60 per cwt.; soybean oil meal, $70 per ton; ammoniated molasses mixtures, $60 per ton; bonemeal and salt mixture, $80 per ton; salt, $15 per ton; limestone, $15 per ton.
6. Sorghum silage fed only first 34 days.
7. Prairie hay fed last 106 days.

Table 54 (Continued)

Summary—Wintering and fattening—December 15, 1956, to August 24, 1957—252 days.

Lot number	1	2	3	4
Av. total gain, lbs.	407.3	340.9	362.4	416.0
Av. daily gain, lbs.	1.62	1.35	1.44	1.65
Av. feed cost per cwt. gain, $	24.47	30.80	29.68	24.97
% shrink to market	2.0	1.7	1.7	1.5
Av. dressing % (includes 2% cooler shrink)	58.9	56.8	56.1	58.0
Av. carcass grade, before ribbing[8]	11.7	10.6	11.1	11.3
Av. carcass grade, after ribbing[8]	12.9	12.5	12.0	13.6
Av. fat thickness at 12th rib, visual estimate[9]	3.6	3.9	3.9	3.4
Av. uniformity of fat distribution[10]	3.4	4.0	4.2	3.4
Av. degree of marbling[11]	6.2	6.9	7.2	5.8
Av. size rib eye, visual estimate[12]	3.9	4.9	4.9	4.1
Av. size rib eye, sq. in.	9.67	8.93	8.81	9.45
Av. degree of firmness[13]	3.3	4.0	3.9	3.6

8. Based on top choice 15, av. choice 14, low choice 13, top good 12, av. good 11, low good 10.
9. Based on thick 2, moderate 3, modest 4, slightly thin 5.
10. Based on uniform 2, moderate 3, modest 4, slightly uneven 5.
11. Based on slightly abundant 4, moderate 5, modest 6, small amount 7, slight amount 8.
12. Based on large 2, moderately large 3, modestly large 4, slightly small 5.
13. Based on firm 2, moderately firm 3, modestly firm 4, slightly firm 5.

Wintering phase. The ammoniated blackstrap molasses mixtures were very palatable. In fact, the large amount consumed by animals in lots 2 and 3 tended to cause looseness or borderline scouring. Rate of gain was very poor for the first 28 days in these lots. It is believed that this was caused by the looseness plus a greater length of time than normal for microorganisms to adapt themselves to utilization of ammonia nitrogen. Satisfactory gains were made after the first 28 days; however, they were not so good as those in lots 1 and 4. The increased rate of gain in lot 4 over lots 2 and 3 illustrates the value of a small amount of natural protein concentrate in the ration when the principal source of protein equivalent is non-protein-nitrogen. A smaller molasses consumption may also have been a factor. A lower rate of gain and high molasses consumption caused lots 2 and 3 to have a high feed cost per cwt. gain. The results indicate that the ethyl alcohol may have been slightly beneficial.

Fattening phase. The high grain consumption at the beginning of the fattening phase was probably responsible for the founder of two animals in lot 1. One animal went off feed in lot 2; however, it recovered without any noticeable effect. There was a substantial drop in rate of molasses consumption after the animals were on a full feed of grain. In fact, the rate of consumption was probably less than 1 pound per head daily for the last 40 to 50 days of the test. Considering the size of animal and extremely hot weather, the rate of gain was satisfactory in all lots.

The rate and efficiency of gain was best in lot 4, which resulted in the lowest cost per cwt. gain. There were no practical differences in dressing percentage, carcass grade, amount of fat, degree of marbling, size of rib eye or degree of firmness between lots 1 and 4. Even though the rate of gain was similar in lots 2 and 3, they were thinner at the beginning of the fattening phase and consequently were not as well finished at the time of slaughter. As a result, the above values were not quite so good for lots 2 and 3 as for lots 1 and 4. Ethyl alcohol was apparently of no value in the fattening phase.

Summary. Ammonia nitrogen, self-fed as ammoniated molasses, can be used as the source of protein equivalent to ruminants when fed a non-legume roughage; however, results are vastly improved when a small amount of natural protein concentrate is added to the ration. These results indicate that ethyl alcohol is of very little, if any, value in the ration of ruminants.

Self-Feeding Ammoniated Blackstrap Molasses to Beef Heifers. Wintering Phase 1957-58 (Project 537).

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

This is the second test to study the value of ammoniated blackstrap molasses in beef cattle rations. This report gives the results of the wintering phase.

Experimental Procedure

Forty Hereford heifer calves from one herd were divided as equally as possible on the basis of weight and conformation into four lots of 10 animals each. The animals received all of the sorghum silage they would clean up in all lots. The remainder of the ration was as follows:

Lot 9—Control, 1 pound soybean oil meal and 2 pounds sorghum grain.

Lot 10—Free-choice ammoniated blackstrap molasses (16 percent protein equivalent) and .5 pound soybean oil meal.

Lot 11—Free-choice ammoniated blackstrap molasses (16 percent protein equivalent), .5 pound soybean oil meal, and 1.5 pounds sorghum grain.

Lot 12—Free-choice ammoniated blackstrap molasses (16 percent protein equivalent) and 2 pounds sorghum grain.

Salt and a mineral mixture of equal parts limestone, steamed bonemeal, and salt were fed free-choice to all animals. Water was provided by electrically heated water fountains.

Results and Observations

The results of the wintering phase of this test are shown in Table 55. No unusual behavior or toxic effects were observed even though the rate of consumption of the ammoniated molasses would be considered high. Rate of gain was satisfactory in all lots. Gains were better than those produced in the wintering phase of the previous test. It is believed that the addition of .5 pound natural protein concentrate to the ration is largely responsible for the improved results. The addition of grain alone seemed to be beneficial but not so much as the protein concentrate.

Table 55

Results of Self-Feeding Ammoniated Blackstrap Molasses to Beef Heifer Calves.

December 12, 1957, to March 21, 1958—100 days.

Lot number	9	10	11	12
Number calves per lot	10	10	10	10
Av. initial wt., lbs.	441	441.5	442.5	440.5
Av. final wt., lbs.	585	574	591	567
Av. daily gain, lbs.	1.44	1.32	1.48	1.26
Av. daily ration, lbs.:				
Sorghum silage	25.9	24.5	23.3	23.2
Sorghum grain	2.0	....	1.5	2.0
Soybean oil meal	1.0	0.5	0.5	....
Amm. blackstrap molasses (16% protein equiv.)	....	4.58	5.11	5.09
Salt	.09	.07	.07	.12
Mineral mixture[1]	.12	.09	.08	.08
Lbs. feed per cwt. gain:				
Sorghum silage	1799	1851	1569	1832
Sorghum grain	138.9	....	101	158.1
Soybean oil meal	69.4	37.7	33.7	....
Amm. blackstrap molasses (16% protein equiv.)	....	345.4	344.1	402.7
Salt	6.1	5.5	4.5	9.2
Mineral mixture	8.7	6.9	4.4	6.6
Cost per cwt. gain, $[2]	11.71	15.77	16.55	18.92

1. Equal parts steamed bonemeal, limestone, and salt.
2. Based on ingredient prices given on inside back cover.

The Effect of Implanting Beef Heifers on a Fattening Ration with Hormones or Hormonelike Substances.[1]

D. Richardson, Ed F. Smith, B. A. Koch and F. W. Boren

The response from feeding stilbestrol to heifers is not so good as that obtained with steers. Implanting heifers with levels of stilbestrol recommended for steers produces many undesirable side effects, including prolapse of the vagina in many instances. This test was designed to study the effect of low level (12 mgs.) implanting of stilbestrol and a combination of testosterone (100 mgs.) and estradiol benzoate (20 mgs.) on heifers being fattened for slaughter.

Experimental Procedure

Sixty-five Hereford heifers averaging slightly over 600 pounds were being fattened in Projects 536 and 537. There were six lots of animals. Three animals in each of the lots were each implanted with one 12-mg. pellet of stilbestrol and three with Synovex-heifer-7 implant. The remaining animals served as controls. Thus, there were 29 control animals and 18 on each of the two kinds of implants. Carcass data were obtained at the time of slaughter.

Results and Observations

Results of this test are shown in Table 56. There were no noticeable side effects from either of the implants. Neither was there any unusual behavior on the part of any of the heifers. Animals receiving the stilbestrol implant gained an average of .27 pound faster than the controls, while the ones receiving Synovex-heifer-7 gained .13 pound faster. There were no significant differences in carcass grade, fat thickness, fat distribution, degree of marbling, or degree of firmness. However, size of rib eye was larger with both implants, and those from heifers receiving stilbestrol were the largest. It should be observed that size of rib eye increased as weight of animal increased.

1. Stilbestrol supplied by Chas. Pfizer & Co., Terre Haute, Ind. Synovex-heifer-7 supplied by E. R. Squibb & Son, New Brunswick, N.J.

Table 56

Results of Implanting Stilbestrol and Synovex-Heifer-7 in Beef Heifers on Fattening Ration.

May 4 to August 24—112 days.

Treatment	Control	12 mgs. stilbestrol Implant	Synovex heifer-7 Implant[1]
Number heifers per treatment	29	18	18
Av. initial wt., lbs.	618.8	618.9	615.3
Av. final wt., lbs.	815.9	846.7	826.9
Av. daily gain per heifer, lbs.	1.76	2.03	1.89
Av. carcass grade before ribbing[2]	11.2	11.6	11.0
Av. carcass grade after ribbing[2]	12.8	12.4	12.8
Av. fat thickness at 12th rib, visual estimate[3]	3.6	3.6	3.3
Av. uniformity of fat distribution[4]	3.4	3.6	3.7
Av. degree of marbling[5]	6.6	7.0	6.4
Av. size rib eye, visual estimate[6]	4.4	4.1	4.3
Av. size rib eye, sq. in.	9.00	9.71	9.39
Av. degree of firmness[7]	3.4	3.7	3.6

1. 100 mgs. testosterone and 20 mgs. estradiol benzoate.
2. Based on top choice 15, av. choice 14, low choice 13, top good 12, av. good 11, low good 10.
3. Based on thick 2, moderate 3, modest 4, slightly thin 5.
4. Based on uniform 2, moderate 3, modest 4, slightly uneven 5.
5. Based on slightly abundant 4, moderate 5, modest 6, small amount 7, slight amount 8.
6. Based on large 2, moderately large 3, modestly large 4, slightly small 5.
7. Based on firm 2, moderately firm 3, modestly firm 4, slightly firm 5.

Improvement of Beef Cattle Through Breeding Methods (Project 286).

W. H. Smith, L. A. Holland and J. D. Wheat

The purebred Shorthorn cattle breeding project was continued during 1957 and thus far in 1958 according to the plans and breeding programs which were established in 1949. Two inbred lines have been established. These are referred to as the Wernacre Premier and the Mercury lines with reference to the foundation sires which were used initially for the development of the two lines. The Wernacre Premier line is entering the fourth generation of inbreeding, while the Mercury line is now in the third. The basic inbreeding plan has been the continued mating of half-brothers to half-sisters during the progress of the study.

The experiment was initiated to study the inheritance of beef cattle production traits and to evaluate the effects of inbreeding upon production. The lines will be crossed at some time in the future to study the feasibility of utilizing inbred lines of beef cattle for the breeding improvement of productivity. To date, no extensive line crossing has been introduced in the breeding program; however, a Mercury line bull was used on some Wernacre Premier line females during the 1956 and 1957 breeding seasons because of the fact that one of the Wernacre Premier bulls possessed low fertility and was necessarily removed from the breeding herd. In view of the fact that the data are limited, no conclusions regarding line crossing can be made at this time. Most of the line-cross calves produced to date have been from two-year-old heifers.

Birth weight of calves and the weight of each cow are taken at the time of calving. The calves are routinely born in the spring as the result of summer pasture breeding. The calves are not creep fed during the suckling period while the cows are on grass. Calves are weaned at approximately 6 months of age at which time they are scored for type and conformation and weighed. After a three-week adjustment period, the calves are placed on individual feeding trials or record-of-performance tests for a 182-day period. Weight gain and feed consumption records are maintained on each calf.

The full feed ration for the steers and bulls 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.

Approximately one-half of the bull calves are castrated each year immediately after the calves are weaned.

Upon the termination of the feeding trials, the calves are weighed and scored individually and a series of body measurements are taken on each. Since the project started, a total of 83 heifers, 36 bulls, and 37 steers have been individually fed. This does not include the 37 calves produced in 1957 which have not completed their individual feeding trials at this date. Thus far in the study the Wernacre Premier calves have been more highly inbred than the Mercury calves. The Wernacre Premier calves have made slightly greater gains but have required more feed per 100 pounds of live body weight gain than have the Mercury calves.

To date no abnormalities which can be attributed to inbreeding have occurred in either of the two inbred lines. Analyses of the data indicate that inbreeding has lowered the weaning weights of the calves. Initial weight and average daily gain have appeared to be related to feed efficiency. The calves possessing lighter initial weights and those making higher average daily gains within each line tend to be more efficient in feed utilization. Inbreeding has not appeared to be related to gaining ability or feed efficiency in either of the two lines.

The data for the 1956 Shorthorn calves are summarizd in Table 57 and a partial summary of the 1957 calves appears in Table 58. The data on the 1957 calves are incomplete because these will not complete their feeding trials until the summer of 1958.

Table 57
Summary of the 1956 Shorthorn Calves of the Wernacre Premier and Mercury Lines.

Tag number	Coefficient of inbreeding[1]	Birth weight	Weaning weight	Weaning score	Days fed	Initial weight	Final weight	Total gain	Average daily gain, lbs.	Final score	Pounds corn per cwt. gain	Pounds alfalfa per cwt. gain
Wernacre Premier Line												
Bulls												
56	32.03	71	406	2−	182	450	917	467	2.56	2	405	202
31	23.74	59	405	3+	182	417	876	459	2.52	3−	406	203
Av.	27.89	65	406	2−	182	434	897	463	2.54	3+	406	203
Steers												
82	32.03	68	380	4	182	360	854	494	2.72	2−	538	238
Heifers												
30	23.56	78	430	2	182	440	795	355	1.95	2	397	349
68	32.03	70	395	2	182	406	650	244	1.34	2	430	393
173	15.36	69	395	2−	182	416	750	334	1.84	2−	407	365
108	30.20	69	340	3+	182	350	667	317	1.74	2+	337	303
38	15.09	74	305	2−	182	350	640	290	1.59	3+	366	334
Av.	23.25	72	373	2−	182	392	700	308	1.69	2	387	349
Mercury Line												
Bulls												
189	14.19	61	365	1−	182	400	835	435	2.39	1−	391	205
105	15.72	56	412	1−	182	455	933	478	2.63	1	350	182
7	25.00	62	409	2	182	427	886	459	2.52	2+	393	189
154	3.37	71	457	2−	182	500	950	450	2.49	3+	422	214
Av.	14.57	63	411	2+	182	446	901	456	2.50	2+	389	198
Steers												
11	13.48	65	312	2+	182	371	795	424	2.33	3	355	191
8	3.61	58	355	3+	182	355	752	397	2.18	2	373	183
36	12.92	65	370	2	182	391	660	269	1.48	3	520	266
Av.	10.00	63	346	2	182	372	736	363	2.00	3+	416	213
Heifers												
13	11.23	54	315	2	182	312	620	308	1.69	1−	383	344
766	3.91	58	360	1−	182	365	590	225	1.24	1−	433	391
12	6.45	66	380	1−	182	405	691	286	1.57	1+	395	364
184	13.48	51	352	2+	182	378	655	277	1.52	1−	406	368
10	14.26	55	345	1	182	350	622	272	1.49	1+	397	360
58	14.46	65	365	1−	182	388	640	252	1.38	1+	474	437
15	8.01	62	372	1−	182	395	705	310	1.70	1	411	368
103	14.31	63	315	3+	182	355	665	310	1.70	2−	401	365
Av.	10.76	59	351	2+	182	369	649	280	1.54	1	413	375

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

Table 58

Partial Summary of the 1957 Shorthorn Calves of the Wernacre Premier and Mercury Lines and Line Crosses.

Tag number	Coefficient of inbreeding[1]	Birth weight	Weaning weight	Weaning score	Initial weight	Weight on 8-20-58	Days on trial	Daily gain during trial
				Wernacre Premier Line				
				Bulls				
56	10.94	69	410	2 —	460	830	142	2.61
				Steers				
105	27.97	55	375	3	390	660	142	1.90
				Heifers				
12	23.47	73	435	3 +	430	700	142	1.90
103	32.03	87	240	3	255	510	142	1.80
52	32.03	58	254	2 —	275	450	87	2.00
Av.	29.18	73	310	3 +	320	......	......	1.90
				Mercury Line				
				Bulls				
189	16.50	70	365	1	380	775	142	2.78
61	13.28	65	420	2 +	495	912	142	2.94
13	11.23	58	360	2 +	415	765	142	2.46
10A	14.46	67	376	1 —	416	630	87	2.46
15	6.44	65	368	2 +	402	577	87	2.01
6	13.48	68	291	1 —	341	525	87	2.11
5	14.18	64	412	1	450	695	87	2.82
1	15.72	67	312	1 —	339	580	87	2.77
Av.	13.16	66	363	1 —	405	......	......	2.54
				Steers				
8	6.25	70	320	2 —	360	715	142	2.50
68	8.01	59	260	3	275	540	142	1.87
36	3.91	81	300	2 —	320	670	142	2.46
7	14.26	69	410	2	472	760	142	2.03
10	3.61	70	410	1 —	540	853	142	2.20
Av.	7.21	70	340	2 —	393	......	......	2.21
				Heifers				
58	13.97	63	305	1 —	335	575	142	1.69
106	9.37	56	435	1	477	720	142	1.71
31	13.48	55	390	1	400	605	142	1.44
11	9.03	56	380	2 +	430	670	142	1.69
82	25.00	57	305	2 +	310	564	142	1.79
173	3.61	57	270	3	300	555	142	1.80
9	6.25	70	228	2 —	252	406	87	1.77
146	12.91	64	325	2 +	330	490	87	1.84
2	15.72	74	305	1 —	323	477	87	1.77
38	7.03	58	271	2	296	430	87	1.54
68A	12.50	61	216	3	220	270	37	1.35
49	6.25	62	282	2	280	315	37	.95
Av.	11.26	61	309	2 +	329	......	......	1.61
				Line Crosses				
				Bulls				
30	....	72	314	2 —	346	575	87	2.63
				Steers				
3	....	65	266	3	307	495	87	2.16
87	....	80	354	3 +	365	400	37	.95
Av.	....	73	310	3 +	336	......	......	1.56
				Heifers				
72	....	80	311	2	334	505	87	1.97
4	....	62	236	2	267	435	87	1.93
120	....	75	320	1 —	330	372	37	1.14
81	....	64	300	2 —	300	370	37	1.89
Av.	....	70	292	2	308	......	......	1.73

1. The coefficient of inbreeding means the percentage of inbreeding. Individuals from brother-sister matings are 25% inbred and individuals from mating half-brother to half-sister are 12.5% inbred. The line cross calves are not inbred.

The Value of Shade for Beef Cattle, 1957 (Project 430 B.J.9, 2).

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

This is the first year of a study designed to investigate the economic value of providing shade for beef cattle kept under Kansas environmental conditions. Because the practice of year-around fattening of cattle in the dry-lot is becoming increasingly popular, it was decided that the beginning phase of this study should be a preliminary dry-lot fattening trial with heifers. This experiment was conducted during the summer of 1957 for a period of 140 days.

Experimental Procedure

Thirty head of Hereford heifers weighing an average of 530 pounds per head were used in this study. They were placed in three lots, 10 head per lot, on the basis of live weight and grade.

The heifers were on test from June 26, 1957, to November 13, 1957, a total of 140 days. At the beginning of the experiment, the heifers were consuming 8 pounds of coarse ground sorghum grain, 1 pound of soybean oil meal, and 6 pounds of alfalfa hay per head daily. They were rapidly brought up to a daily ration composed of all the sorghum grain they would consume plus 1 pound of soybean oil meal and 5 pounds of alfalfa hay. At the termination of the test the heifers were sold on the central market at St. Joseph.

The experimental treatment for each lot was as follows: lot 1, control (sun); lot 2, control (sun); lot 3, shade.

The shade provided the heifers in lot 3 was from two trees located in the experimental pen. These trees supplied approximately 50 square feet of shade per animal. The lot was not completely shaded and the heifers could go into the shade cast by the trees, as they desired. Feed and water were in the sun.

Five heifers in each lot were randomly selected and implanted with Synovex (R) Heifer hormone implant. This implant was composed of 20 mg. of estradiol benzoate and 100 mg. of testosterone.

Results and Observations

Table 59 shows the results of this preliminary test designed to measure the effects of shade upon the feed lot performance and carcass characteristics of yearling heifers.

1. The heifers having access to shade (lot 3) made an average daily gain of .16 pound per head daily more than heifers in lots 1 or 2.
2. Shaded heifers were more efficient in feed utilization, requiring less feed per cwt. gain.
3. The heifers in lot 3 produced higher grading carcasses and sold for more on the market.
4. The percent shrink to market was essentially the same for all lots. However, the heifers from the sun lots had a slightly higher dressing percentage than those which had had access to the shade.
5. During the summer days when the temperature was high, the heifers in the sun lots appeared to be extremely uncomfortable. They were very slow to consume their daily ration and were continually going off feed. In contrast, the shaded heifers appeared comfortable and contented, consumed their daily ration readily, and did not go off feed during the experiment.
6. Based on the results of this preliminary experiment, the shade in lot 3 was worth about $5.00 per animal.

Table 60 illustrates the effect of certain climatic factors on the period average daily gains of yearling heifers. Again, it should be emphasized that this is only a preliminary trial, and the data presented and observations made are not conclusive. Trials will be continued during future summer seasons and more conclusive results presented.

It appears that increased temperature, sunshine, and radiation had a depressing effect upon the period average daily gains regardless of whether or not shade was provided. Also, the heifers responded to a moderation of temperature, sunshine, and radiation as indicated by the daily gains during periods 3 and 4.

Table 59

The Value of Shade for Beef Cattle—Shade versus No Shade—Fattening Yearling Heifers.

June 26, 1957, to November 13, 1957—140 days.

Lot number	1	2	3
Number heifers per lot	10	10	10
Management	No shade	No shade	Shade
Av. initial wt. per heifer, lbs.	530	530	530
Av. final wt. per heifer, lbs.	795	805	822
Av. gain per heifer, lbs.	266	275	292
Av. daily gain per heifer, lbs.	1.90	1.96	2.09
Av. daily ration per heifer, lbs.:			
Ground sorghum grain	12.9	12.8	13.4
Soybean oil meal	1.0	1.0	1.0
Alfalfa hay	6.0	6.3	6.1
Lbs. feed per cwt. gain:			
Ground sorghum grain	676	650	640
Soybean oil meal	53	51	48
Alfalfa hay	323	331	298
Feed cost per cwt. gain,[1] $	18.39	17.94	17.01
Selling price per cwt. at market	22.50	22.80	22.95
Percent shrink to market	3	3	3
Dressing percent	58.4	58.2	58.0
Carcass Data			
Carcass grades, USDA:			
Av. choice	1	..	..
Low choice	..	4	6
High good	1	..	1
Av. good	2	2	..
Low good	6	4	3
Av. carcass grade[2]	16.8	17.4	18.4
Av. size of rib eye[3]	4.2	4.4	4.1
Av. size of rib eye, sq. in.[4]	9.95	9.98	10.27
Av. fat thickness at 12th rib[5]	3.9	4.1	3.4
Av. fat thickness at 12th rib, in.[6]	.45	.55	.56
Av. degree of marbling[7]	8.2	7.5	7.4
Av. degree of firmness[8]	4.2	4.3	3.4

1. Price of feed per cwt.: Ground sorghum grain, $2.50; soybean oil meal, $3.50; alfalfa hay, $1.25.

2. Average choice, 20; low choice, 19; high good, 18; average good, 17; low good, 16.

3. Very large, 1; large, 2; moderately large, 3; modestly large, 4; slightly small, 5. Visual estimate.

4. Planimeter reading of rib eye muscle.

5. Very thick, 1; thick, 2; moderately thick, 3; modestly thick, 4; slightly thin, 5. Visual estimate.

6. Reciprocal Meat Conference Standards—1952.

7. Modest, 6; small amount, 7; slight amount, 8; traces, 9. Visual estimate.

8. Very firm, 1; firm, 2; moderately firm, 3; modestly firm, 4; slightly soft, 5; soft, 6. Visual estimate.

Table 60

Effect of Certain Climatic Factors on the Period Average Daily Gains of Yearling Heifers.

Dry-Lot Fattening Period—June 26, 1957, to November 13, 1957—140 days.

Period	1	2	3	4	5
Date	6/26–7/24	7/25–8/21	8/22–9/18	9/19–10/16	10/17–11/13
Av. maximum temp.[1]	92.8	97.4	84.0	73.3	56.6
Av. minutes of sunshine[2]	599.2	665.8	516.3	397.1	234.1
Av. radiation[3]	526.4	578.3	434.0	318.8	191.7
Av. wind movement[4]	141.0	145.3	131.3	133.4	141.3
Av. relative humidity[5]	47.6	46.3	52.0	56.5	56.5
Av. daily gain:					
Lot 1 (sun)	1.89	1.16	2.79	2.07	1.57
Lot 2 (sun)	1.84	1.11	2.27	2.79	1.82
Lot 3 (shade)	2.29	1.36	2.59	2.31	1.96

1. Reading made daily at 7 p.m.; thus maximum temperature will have occurred. Thermometer in standard thermometer shelter.
2. Number of minutes the sun shone during the day. Period midnight to midnight.
3. Reading in langleys. Langleys × 3.69 = BTU's per square foot.
4. Wind movement is miles past the station.
5. Read from an autographic hygrograph exposed in thermometer shelter.

The Effect of Shade and Hormone Implant on Fattening Yearling Heifers.

June 26, 1957, to November 13, 1957—140 days.

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

Five heifers in lots 1, 2 and 3 of the shade vs. no shade study were randomly selected to receive an implant composed of 20 mg. of estradiol benzoate and 100 mg. of testosterone. Since they were fed along with the non-implanted heifers in each lot, no feed efficiency data is available.

Table 61 shows the results of this phase of the study. Although the numbers are small, some general observations can be made. These are as follows:

1. Shade exerted a definite influence upon the average daily gains. The implanted heifers in the shade gained .12 pound more per head daily than the implanted heifers in the sun. Heifers receiving no hormone implant in the shade gained .16 pound more per head daily than the non-implanted heifers in the sun. Thus shade increased gains an average of .14 pound per head per day regardless of hormone implant.

The hormone implant increased average daily gains .30 pound in the sun lots and .26 pound in the shade. Thus the implant increased average daily gain per head .28 pound.

The combined influence of shade and implant was .42 pound increase in average daily gain per head.

2. The implanted heifers had a slightly higher dressing percentage than did the non-implanted heifers.
3. Shade influenced carcass grade. The average carcass grade of the heifers in the sun lots was just slightly over average good, whereas the shaded lot heifer carcasses graded high good.
4. The average square inches of rib eye muscle were greater in the implanted heifers. Shade apparently had no influence upon the size of rib eye muscle.
5. The implant caused no excessive development of teats and udder, raised tail heads or depressed loins.

Table 61

The Effect of Shade and Hormone Implant[1] on Fattening Yearling Heifers.

June 26, 1957, to November 13, 1957—140 days.

	No shade		Shade	
	No implant	Implant	No implant	Implant
Number of heifers	10	10	5	5
Initial wt. per heifer, lbs.	535	524	532	528
Final wt. per heifer, lbs.	786	816	805	838
Av. gain per heifer, lbs.	251	292	273	310
Av. daily gain per heifer, lbs.	1.79	2.09	1.95	2.21
Dressing percent	58.1	58.5	57.8	58.2
Carcass Data				
Carcass grades, USDA:				
Av. choice	..	1	..	..
Low choice	2	2	4	2
High good	..	1	..	1
Av. good	3	1	..	..
Low good	5	5	1	2
Av. carcass grade[2]	17.2	17.4	18.4	17.6
Av. size of rib eye[3]	4.3	4.3	4.4	3.8
Av. size of rib eye, sq. in.[4]	9.8	10.3	9.8	10.7
Av. thickness of fat at 12th rib[5]	4.1	4.0	3.4	3.8
Av. thickness of fat at 12th rib, in.[6]	.51	.55	.59	.53
Av. degree of marbling[7]	8.0	7.2	7.4	8.0
Av. degree of firmness[8]	4.3	3.7	3.2	3.6

1. 20 mgs. estradiol benzoate plus 100 mgs. testosterone supplied by Squibb and Sons.
2. Av. choice, 20; low choice, 19; high good, 18; av. good, 17; low good, 16.
3. Very large, 1; large, 2; moderately large, 3; modestly large, 4; slightly small, 5. Visual estimate.
4. Planimeter reading of rib eye muscle.
5. Very thick, 1; thick, 2; moderately thick, 3; modestly thick, 4; slightly thin, 5. Visual estimate.
6. Reciprocal Meat Conference Standards—1952.
7. Modest, 6; small amount, 7; slight amount, 8; traces, 9. Visual estimate.
8. Very firm, 1; firm, 2; moderately firm, 3; modestly firm, 4; slightly soft, 5; soft, 6. Visual estimate.

Adapting Roughages Varying in Quality and Curing Processes to the Nutrition of Beef Cattle (Project 370—1957-58).

Combinations of Wheat Straw and Alfalfa Hay in the Winter Ration of Beef Heifers.

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

Previous work at this station (Circular 297, p. 45-47) and at the Fort Hays Branch Experiment Station (Circular 322, p. 1-6) indicates that beef calves wintered on a daily ration of 1.75-2 pounds of ground sorghum grain, 1.25-2 pounds of protein concentrate and wheat straw fed free-choice made average daily gains of only .3 to .6 pound. One pound of molasses substituted for 1 pound of grain and sprinkled on wheat straw increased consumption only .22 pound per head daily but decreased gains .08 pound per head daily. Also 1 pound of molasses had slightly less feeding value than 1 pound of grain in a wintering ration for steer calves with wheat straw roughage. The addition of 1 pound of dehydrated alfalfa pellets increased the rate of gain and feed efficiency. Calves receiving dehydrated alfalfa pellets also consumed more straw.

Although wheat straw is considered a very poor roughage and under normal conditions should not be used as the only roughage for cattle, there are times when it can be used as a major part of the roughage. The purpose of this study is to continue investigation of the use of wheat straw in the winter ration of beef cattle, with particular emphasis upon the effect of various combinations of wheat straw and alfalfa hay upon the performance of beef heifers being wintered in dry-lot.

Experimental Procedure

Fifty Hereford heifers of good to choice quality were allotted into 5 lots of 10 calves each on the basis of live weight and grade. The average daily ration for each heifer in the various lots is shown in Table 62. Each lot received an equal amount of ground sorghum grain and protein from soybean oil meal and/or alfalfa hay. Wheat straw was fed free-choice to lots 1, 3, 4, and 5. The same amount of alfalfa hay was fed to lot 2 as straw fed to lot 1. The soybean oil meal fed was fortified with vitamin A so that each pound of soybean oil meal contained 10,000 IU of the vitamin.

Observations

Table 62 presents the 98-day summary of this test and the following observations can be made:

1. No vitamin A deficiency symptoms were apparent.
2. Alfalfa hay fed at the rate of 5.79 pounds per head daily as the only source of roughage and protein (lot 2) produced the same daily gain per head (.91 pound) as did 1.25 pounds of soybean oil meal and 5.79 pounds of wheat straw (lot 1).
3. The feeding of 1 pound of alfalfa hay plus wheat straw fed free-choice as a source of roughage (lot 3) increased average daily gain only slightly. The calves consumed as much wheat straw as was consumed in lot 1.
4. Although the total wheat straw consumption decreased as the alfalfa allowance increased from 2 pounds to 4 pounds per head daily, total roughage consumption increased.
5. Lot 3, receiving 1 pound alfalfa hay in addition to wheat straw free-choice, made essentially the same average daily gain as was made by lot 4, which received 2 pounds alfalfa hay.
6. Increasing the alfalfa hay from 2 to 4 pounds greatly increased average daily gains.
7. Based on the conditions of this trial, 4 pounds of alfalfa hay were required, in addition to wheat straw fed free-choice, to materially increase the average daily gains.
8. As the alfalfa hay allowance increased, the cost per cwt. gain decreased.

Table 62

The Effect of Various Combinations of Wheat Straw and Alfalfa Hay on the Performance of Beef Heifers Wintered in Dry-Lot.

December 12, 1957, to March 20, 1958—98-day progress report.

Lot number	1	2	3	4	5
Number heifers per lot	10	10	10	10	10
Av. initial wt. per heifer, lbs.	457	455	454	456	455
Av. final wt. per heifer, lbs.	546	544	552	557	577
Av. gain per heifer, lbs.	89	89	98	101	122
Av. daily gain per heifer, lbs.	.91	.91	1.00	1.04	1.24
Av. daily ration per heifer, lbs.:[1]					
Ground sorghum grain	4.00	4.00	4.00	4.00	4.00
Soybean oil meal + Vitamin A[2]	1.25	0	1.00	.75	.25
Alfalfa hay	0	5.79	1.00	2.00	4.00
Wheat straw	5.79	0	5.75	5.05	4.17
Av. lbs. feed per cwt. gain:					
Ground sorghum grain	440	440	400	384	321
Soybean oil meal	137	0	100	72	20
Alfalfa hay	0	637	100	192	321
Wheat straw	637	0	575	485	335
Av. feed cost per cwt. gain,[3] $	17.21	13.90	15.60	14.54	11.67

1. Salt supplied free-choice and a mixture of equal parts salt and steamed bone meal, free-choice.

2. Vitamin A used was Nopcay 30 type V supplied by Nopco Chemical Co., Harrison, N.J. Each pound of soybean oil meal contained 10,000 I.U. of vitamin A.

3. Feed prices for 1957-58 are inside back cover.

Short-Term Feeding of Aureomycin (R) to Suppress the Occurrence of Respiratory Diseases in Cattle (Project 370-2—1957).

F. W. Boren, B. A. Koch, E. F. Smith, D. Richardson, R. F. Cox, W. H. Hay

One of the major problems confronting cattlemen is control of occurrence of respiratory diseases such as the shipping fever complex, colds, nasal congestion, and pneumonia. These respiratory conditions are especially troublesome to the cattle feeder who ships and receives cattle during the fall and winter months when adverse weather conditions create added stress on cattle.

It is the purpose of this study to investigate the value of orally administering antibiotics to weaning calves to control the occurrence of respiratory diseases during the first 28 days they are in the dry-lot.

Experimental Procedure

The 161 heifer and steer calves used in experiment number 1 of this test were purchased from two different ranches in New Mexico. They were loaded into railroad stock cars at Clovis, N.M., October 18, 1957. On October 20, they were unloaded at Emporia, Kan., given hay, water and allowed to rest. Then the calves were loaded into the stock cars and arrived in Manhattan October 21. They were unloaded, weighed and immediately trucked from the railroad stock pens to the experimental beef cattle unit at Kansas State College. The calves were then randomly placed in two lots, 81 head in the control lot, and 80 head in the lot to receive aureomycin. There was approximately the same number of steer and heifer calves in each lot. Each lot was then weighed and an average beginning weight per head determined.

The 223 heifer and steer calves used in experiment number 2 of this test were purchased from one ranch in New Mexico. They were loaded into railroad stock cars at Logan, N.M., October 16, 1957, and shipped to Manhattan. The calves arrived in Manhattan October 18. They received no feed, water and rest stop en route. Upon arrival in Manhattan they were treated exactly as the calves in experiment number 1, except that they were randomly placed in two lots with about the same number of heifers and steers in each lot. One of the lots was fed aureomycin and the other was the control lot.

The daily concentrate ration fed to the control and treatment calves was as follows (pounds):

	1st week	2nd week	3rd week	4th week
Wheat bran	1.50	1.20	....	....
Dehydrated alfalfa meal	.40	.45	.40	....
Molasses	.10	.15	.20	....
Soybean meal	....	....	.40	1.00
Ground sorghum grain	....	1.20	3.00	4.00
Total daily ration	2.00	3.00	4.00	5.00

Aureomycin was added to the concentrate fed the treatment calves at a level to supply 350 mgs. per head daily. The roughage portion of the ration consisted of prairie hay fed free choice plus 2 pounds of atlas sorgo silage daily.

Each day during the study the calves in each pen were observed for respiratory disease symptoms such as an appearance of tiredness, chilling, light cough, heavy breathing, or mucus discharge from the nostrils. Any animal possessing a degree of these symptoms sufficient to warrant treatment was removed from the lot, placed in a treatment pen and treated by Dr. W. H. Hay, Assistant Professor of Surgery and Medicine, Kansas State College. The treatment used varied, depending upon the manifestation of the symptoms. Sulfonamides and antibiotics were used in treating the calves. The calves were returned to their original pens when released by Dr. Hay.

Observations

Both groups of calves used in these two experiments had a transit shrink in live weight of 9 percent. The calves used in experiment 1 appeared to have made the trip in better condition than the calves that were used in experiment 2. This could have been due to the stop-over for feed, water and rest.

Table 63 gives the results of this study. Some of the statements that can be made concerning the data presented are:

1. There was very little difference in the average daily gain of the control and aureomycin fed calves within experiments. The great difference in average daily gains between experiments is difficult to explain and no valid reason has been determined for this difference. Since this test was for only 28 days, average daily gains are of little value in evaluating the results of this study.

2. In experiment 1, only 5 percent of the animals fed aureomycin were treated during the test, whereas 11 percent of the control calves required treatment. In experiment 2, 14 percent of the animals fed aureomycin required treatment and 19 percent of the control calves were treated. Under the conditions of these experiments the feeding of 350 mgs. of aureomycin per head daily suppressed the occurrence of respiratory disease symptoms by approximately 5 percent.

3. There was no difference between experiments 1 and 2 or between controls and aureomycin-fed calves within each experiment in the average number of days each animal was in the sick pen.

4. At the beginning of this experiment the calves being fed aureomycin were slow to consume their concentrate ration. The level of aureomycin fed, 350 mgs. per head daily, decreased palatability of the ration. However, after the third day, the calves became adjusted to the concentrate and readily consumed their daily allowance.

Table 63

Short-Term Feeding of Aureomycin (R) to Suppress the Occurrence of Respiratory Diseases in Weaning Beef Calves.

Experiment number	1		2	
Date	6/21/57-7/18/57		6/18/57-7/15/57	
	28 days			
Lot number	1	2	1	2
Treatment	Control	Aureomycin	Control	Aureomycin
Number calves	81	80	101	122
Av. initial wt.	459	455	400	405
Av. final wt.	504	495	415	419
Av. total gain per head	45	40	15	14
Av. daily gain per head	1.61	1.43	.54	.50
Total animals in sick pen (28-day period)	9	4	19	17
% of total	11	5	19	14
Av. number days each animal was in sick pen	6	5.5	5	5

Aureomycin was furnished by American Cyanamid Co.