E. Smith

BULLETIN 518
MAY 3, 1968

1967-1968 Progress Report

55th Annual CATTLEMEN'S DAY

DEPARTMENT OF ANIMAL HUSBANDRY
KANSAS AGRICULTURAL EXPERIMENT STATION
KANSAS STATE UNIVERSITY
MANHATTAN
Floyd W. Smith, director

55th Annual
CATTLEMEN'S DAY

Friday, May 3, 1968

FRIDAY, MAY 3

8:00 a.m. Weber Hall Arena

Registration—Experimental livestock and exhibits. (Coffee and donuts served)

10:00 a.m. Weber Hall Arena

Dr. Don Good, Head of the Department of Animal Husbandry, presiding

Welcome—Dr. Floyd Smith, Director Kansas Agricultural Experiment Station

Remarks—Mr. Ward B. Warren, President, Kansas Livestock Association, Silverdale, Kansas

Research Reports

- Beef Carcass Evaluation
  Dr. Harold J. Tuma, Animal Husbandry Department, KSU
- A. Conditioning Cattle for the Feedlot
  B. M.G.A. for Heifers in Feedlot
  Dr. Calvin Drake, Animal Husbandry Department, KSU
- Heat Synchronization in Beef Cattle
  Dr. Guy Kiracofe, Animal Husbandry Department, KSU
- A. Grass in Beef Production
  B. High Protein Milo for Finishing Cattle
  Dr. Ed F. Smith, Animal Husbandry Department, KSU
- Urea, Liquid and Dry, in Growing and Finishing Rations
  Dr. Draytford Richardson, Animal Husbandry Department, KSU
- Cross Breeding Beef Cattle
  Prof. Walter Smith, Animal Husbandry Department, KSU

12:15 p.m. Weber Hall Arena

Roast Beef Lunch for men and women

1:00 p.m. Weber Hall Arena

- Presentation of Beef Production Contest Winners
  George Smith, Kansas Farmer, Topeka, Kansas; Herman Westmeyer and Dr. Keith Zoellner, Animal Husbandry Department, KSU
- Remarks and Introduction of Guest Speaker
  Dr. James A. McCain, President of KSU
- "Possible Impacts of International Conditions on the Beef Cattle Industry in the United States"
  Dr. George L. Mehren, Assistant Secretary of Agriculture, in charge of Education and Science, Washington, D.C.

Dr. Mehren, a native of California, took his present post in 1963 and has directed science and education emphasis since 1965. He has vast experience in foreign agriculture and works with several USDA agencies including Commodity Credit Corporation, President's Committee on Consumer Interests, and National Advisory Council on Extension and Continuing Education.

2:10 p.m. Weber Hall Arena

Question and Answer Period

6:30 p.m. Kansas State Union Main Ballroom

Block and Bridle Banquet for visiting stockmen and parents

FOR THE LADIES

Thursday, May 2

6:30 p.m. Kansas State Union Bluemont Room

Kansas Cow Belles Dinner

Reservations by April 30 to: Mrs. Don Good, 2027 Sunnymeade Road, Manhattan, Kansas 66502

Friday, May 3

10:00 a.m. Weber Hall, Room 107

Coffee for Visiting Ladies

11:00 a.m. Weber Hall, Room 107

Program—Beef Cutting Demonstration
Dr. Dell Allen, Animal Husbandry Department, KSU

12:10 p.m. Weber Hall Arena

Roast Beef Lunch for men and women

6:30 p.m. Kansas State Union Main Ballroom

Block and Bridle Banquet

C O N T E N T S

Project 286: Improvement of Beef Cattle Through Breeding Methods

Walter H. Smith, Jesse Akinokun and Robert Schalles

Two inbred lines of purebred Shorthorn cattle were established and progressively developed, to study production traits and effects of inbreeding. Inbreeding was initiated in the Wernace Premier Line in 1949 and in the Mercury line in 1952. Both lines have remained closed to outside breeding since. Inbreeding has progressively increased as the result of successive generations of half sibbing.

All cows in the study were pasture bred for spring and early summer calving. Birth weights, birth dates, sires and dams for all calves were recorded. Calves were not creep-fed. All calves were weaned at approximately 180 days of age and weaning weights and conformation scores were taken. Approximately three weeks after weaning, the calves were weighed and placed on individual feeding trials for 182 days (196 in 1950). Individual feed consumption data were taken. Until 1957 about half the bull calves were castrated at weaning and fed as steers. All male calves were left as bulls thereafter. The full-feed ration for heifers was 55 percent cracked corn and 45 percent chopped alfalfa hay; for the bulls and steers, 75 percent cracked corn and 25 percent chopped alfalfa hay. Final weights and conformation scores were recorded for all animals at the termination of the feeding period.

Post weaning data for all cattle produced during the first 16 years were summarized and analyzed during 1967. Seven sires used in the Weracre Premier line had sired 126 calves. Coefficients of inbreeding for these sires varied from 0 to 32 percent. The calves were produced by 49 cows with an average coefficient of inbreeding of 10 percent. The Wernacre Premier calves had an average coefficient of inbreeding of 20.4 percent, an average birth weight of 71 pounds, average starting weight of 401 pounds, average weaning score of low choice and average weight of 783 pounds at the end of the feeding period.

Nine sires used in the Mercury line sired 300 calves. The coefficients of inbreeding for these sires varied from 0 to 14 percent. The calves were produced by cows with an average coefficient of inbreeding of 7 per cent. The Mercury calves had an average coefficient of inbreeding of 14 percent, an average birth weight of 65 pounds, average starting weight of 360 pounds, average weaning score of choice, and average weight of 729 pounds at the end of the feeding period.

Feed efficiency was determined by computing pounds of total digestible nutrients required per pound of live body weight gained during the feeding period. Average daily gain was the average increase per day in body weight

from beginning to end of the feeding period. Gain on test was the difference between initial and final feed-lot weight. In data analyses, the performance traits considered as dependent variables were feed efficiency, gain on test, average daily gain, and final type score. The factors considered independent variables were age of dam, inbred line, weaning type score, sex of calf, initial weight, birth weight and age at start of the feeding period.

The data were analyzed by the fitting of least squares analysis, using a multiple classification model with regressions and unequal subclass numbers. It was assumed on the basis of previous analyses that none of the main effects would interact significantly, so interaction terms were excluded from the model. The normal least squares equations were solved to obtain estimates of constants and regression coefficients by inversion of matrix on IBM 360. Standard errors were calculated and LSD tests performed.

The effect of age of dam was significant on calf average daily gain on feed but not significant with regard to other production traits. Calf average daily gains were lowest for 2-year-old cows; highest for 3-year old cows. Gains of calves from cows 4 to 10 years old were similar but were lower for cows 11 years or older.

Weaning type score was significantly related to average daily gain on test and to final type score. Calves with higher type scores at weaning tended to be scored higher at the end of the feeding period. Calves scored higher at weaning also tended to make higher average daily gains on feed.

Sex of calf had a highly significant effect on all performance traits studied. Bulls gained 45 pounds more on test than steers and steers gained 87 pounds more than heifers. Bulls and steers did not differ significantly in rate of gain but gained significantly faster than heifers. Steers required significantly less total digestible nutrients per pound of gain than bulls and bulls significantly less than heifers. Heifers were scored highest at the end of the feeding period and steers lowest.

The effect of year (weather and environment) was significant on all performance traits.

Inbreeding significantly affected average daily gain and final type score but not feed efficiency. Average daily gain and type score tended to decline as inbreeding increased. No physical abnormalities attributable to inbreeding have been observed.

Calves heavier at birth tended to gain significantly faster after weaning and required less total digestible nutrients per pound of gain than calves lighter at birth.

Initial weight of calf significantly affected feed efficiency and final type score, but not average daily gain. Calves higher initial weights tended to require more total digestible nutrients per pound of gain and to have high final type scores.

Initial age at the start of feeding was significantly related to average daily gain on test and to feed efficiency. The older calves tended to gain more rapidly and make more efficient gains on test.

Environmental effect appeared to be the major component of year-to-year changes in calf performance traits. There has been essentially no detectable genetic change in any of the production traits during the 16 years of the study. It is speculated that selection has offset effects of inbreeding.

The study will be continued according to the general project plan.

Comparison of Time and Method in Freeze-marking Cattle

R.R. Schalles, C.L. Drake and D.M. Allen

Freeze marking for within-herd identification was used on 65 Hereford females. The cattle were 18 months to nearly three years old. Three numerals were placed on the right rump of each animal in the fall of 1967. The "branding irons" used were four-inch brass numerals with a half inch face. Dry ice and ethyl alcohol were used as the coolant with 40, 50 or 60 seconds of contact time as well as liquid nitrogen with 30, 35 or 40 seconds of contact. Three men each applied one of the three numerals using dry ice and alcohol coolant with 60 seconds contact time on 14 head. The remaining 51 head were marked by one man.

The area to be freeze marked was clipped as close as possible with large animal clippers equipped with a 83 AU Stewart blade and 84 AU comb. That left hair about 1/8 inch long. Immediately before the "branding iron" was applied, the area was thoroughly wet with ethyl alcohol.

Five months after marking, freeze marks were evaluated before and after clipping. After clipping each numeral was scored on a scale of 1 to 10. An ideal freeze mark was scored five, under frozen marks (normal color hair present) less than five, and over frozen marks (loss of hair and skin scaring) more than five. A five mark indi-

cated the normal amount of hair in the marked area, all of which was white. A ten score indicated heavy scaring and no hair, similar to a hot iron brand. The scoring system permitted analysis of variance to determine significance of various marking factors. Duncan's Multiple Range test was used to determine significance among contact times within treatments.

Results and Discussion

All times used with the liquid nitrogen method resulted in considerably over frozen marks (Table 1) and especially so at 35 or 40 seconds, both of which scored higher than the 30-second time. This was also indicated by less variation among numerals at the 40-second time.

The most desirable results were obtained with dry ice and alcohol. Differences due to time were not significant; however, the 60-second time produced slightly more readable freeze marks. Differences among animals and among personnel doing the marking were significant and accounted for 76% of the variance. The greatest variation was due to differences among animals.

In this study dry ice and alcohol produced the best freeze marks, however, it was concluded that the contact time was much too long when liquid nitrogen was used as the coolant. It also appeared that the length of contact time was much more sensitive when liquid nitrogen was used. Good results were produced using dry ice and ethyl alcohol as the coolant with 50 or 60 seconds contact time.

Table 1

Means for Time Within Freeze Marking Method

Method	Time	Numerals Evaluated	Mean score and std. errors[a]
Liquid nitrogen			
	30	30	7.90±.20
	35	24	9.08±.20
	40	24	8.29±.19
Dry ice and alcohol			
	40	21	4.71±.30
	50	27	4.85±.26
	60	27	5.04±.28

[a] Five represents an ideal score, higher numbers over freezing and lower numbers under freezing.

Table 2

Analysis of Variance for Method and Time of Freeze Marking Within Method

Source of Variation	d.f.	S.S.	M.S.	F-ratio
Method	1	469.4	469.4	282.4**
Time/method	4	20.2	5.1	3.0*
Error	147	244.3	1.7	
Total	152	734.0		

* $P < .05$
** $P < .01$

Table 3

Analysis of Variance for Personnel and Animals Using Dry Ice and Ethyl Alcohol With 60 Seconds Contact Time

Source of variation	d.f.	S.S.	M.S.	F-ratio
Persons	2	9	4.50	8.3**
Animal	13	64	4.92	9.1**
Error	26	14	0.54	
Total	41	87		

** $P < .01$

Different Methods of Managing Bluestem Pastures

E.F. Smith, C.E. Owensby and S.P. Kolstad

Studied were the effects of early season heavy stocking and burning on cattle performance, productivity of pastures and range condition as determined by plant population changes.

The objective of early season heavy stocking at twice the normal rate for the first half the growing season is to obtain more gain per acre, have cattle available for dry lot finishing at mid summer and determine if the grass will recover the last half of the season. Forage quality is best early in the growing season.

Previous tests have shown late spring burning will increase summer weight gains and is compatible with good management of bluestem pasture. Present burning treatments are to determine how often a pasture must be burned to achieve good results; annually, every third year or only when conditions favor burning, usually when moisture conditions are good and excessive dry grass has accumulated.

This is the first report since the study was redesigned. Some of the information may not bear directly on the research reported. It is recorded as knowledge in the transition from an old research project to a new one. Since all of the pastures were used in previous research, understanding their past history may help explain some of the results obtained initially in this study.

The yearling Hereford heifers grazed were purchased in April, 1967, near Maple Hill, Kansas, where they had been fed sorghum silage and limited grain during the winter. They were randomly allotted to treatments and weighed individually after being gathered and held overnight without feed or water.

The experimental treatment for each pasture starting in 1967 was as follows (unless otherwise stated the grazing season was May 2 to October 3 and if a pasture was burned, it was in late spring):

Pasture 1 - Moderate stocking rate

Pasture 3 - Heavy stocking rate, May 2 to July 15.

Pasture 4 - Moderate stocking rate

Pasture 5 - Burned periodically, when soil moisture was ample and a residue of old grass had accumulated, not burned in 1967.

Pasture 6 - Burned every third year, burned in 1967

Pasture 10 - Heavy stocking rate, May 2, to July 15.

Pasture 11 - Burned annually

Pasture 1 was continued under the same treatment as in the old project, pasture 2 and 9 were not grazed in 1967 nor used in this study because their previous treatment made them differ from other pastures. Pasture 3 had been lightly stocked in previous years. Pasture 4, 5, and 6 had been in a deferred rotation grazing scheme. Pas-

ture 10 was previously burned annually at mid-spring. Pasture 11 was continued on its treatment of annual late spring burning, which had been its treatment for several years.

Results

On pastures 1, 4 and 5, which were not burned in 1967, the daily gain per head ranged from 1.07 to 1.22 lbs. compared with 1.32 and 1.39 for the heifers on the burned pastures 6 and 11. Late spring burning, as in the past enhanced cattle performance.

Pasture 10, grazed heavily early in the season produced more gain per acre than pastures 1 or 4, which were moderately grazed the entire summer season. That pasture 10 had been mid spring burned several years may have contributed to the cattle's good performance.

A heavy cover of old grass from previous understocking was probably largely responsible for the low gain of heifers on early-season, heavily stocked pasture 3.

The heifers on pasture 3 and 10 were put through a squeeze chute for a health check the morning before their last weighing. That likely reduced their gain. Due to variables mentioned, weight gains for heifers on pastures 3 and 10 probably do not reflect fully the 1967 treatments given the pastures.

Table 4
A Comparison of Different Methods of Managing Bluestem Pastures, 1967

Management	Grazed from May 2 to Oct 2, 152 days					Grazed from May 2 to July 15; 73 days	
	Not burned		Burned			Not burned	
			Burned periodically[1]	Burned every 3rd year	Burned annually		
Pasture number	1	4	5	6	11	3	10
Number of heifers per pasture	18	18	18	18	13	36	26
Acres per pasture	60	60	60	60	44	60	44
Acres per heifer	3.33	3.33	3.33	3.33	3.38	1.67	1.69
Initial wt. per heifer lb.	548	557	544	546	558	559	545
Final wt. per heifer lb.	733	720	722	746	770	614	647
Gain per heifer lbs.	185	163	178	200	212	55	102
Daily gain per heifer lbs.	1.22[3]	1.07[3]	1.17	1.32	1.39	.75	1.40
Gain per acre lbs.	55.50	48.90	53.40	60.00	62.63	33.00	60.27

1. Not burned in 1967

2. Burned in 1967

3. Daily gain in pounds to July 15 for pasture 1, 1.13; pasture 4, 1.21

Table 5

Per Acre Production and Disappearance of Forage Weeds, and Mulch (Air-dry). Donaldson Pastures Near Manhattan, 1967
Clippings Were Taken at the Close of the Growing Season

Pasture no.	1	3	4	5	6	10	11
			Under cages lb/A (air-dry)				
Ordinary upland range site							
Forages	2575	3407	4128	2958	2819	2797	2163
Weeds	355	562	106	295	264	383	253
Mulch	1740	1885	808	610	128	826	-
Limestone breaks range site							
Forages	1475	1991	3062	2892	2170	2388	2055
Weeds	777	233	70	286	152	181	42
Mulch	1610	1744	1112	839	220	826	-
			Disappearance (Index of grazing use)				
Ordinary upland							
Forages	1356	1544	2086	1396	1568	1663	240
Weeds	59	159	20	134	216	200	99
Mulch	-	137	-	-	-	-	-
Limestone breaks							
Forages	485	1042	1218	1240	965	764	921
Weeds	337	141	-	211	55	51	-
Mulch	346	-	-	170	-	-	-
			Remainder (Residue at end of season)				
Ordinary upland							
Forages	1218	1863	2042	1562	1251	1134	1922
Weeds	295	403	86	160	48	183	154
Mulch	2004	1749	837	956	247	883	-
Limestone breaks							
Forages	941	949	1844	1652	1205	1623	1134
Weeds	441	93	77	75	97	130	97
Mulch	1264	1952	2066	670	361	874	-

Table 6

Grass Increasers and Grass Decreasers Shown As Percentage of Total 1967 Vegetation and an Estimated Range Condition[1] Based on the Percentage of "Original" Vegetation

Pasture no.	1	3	4	5	6	10	11
Ordinary upland, range site							
Decreasers	48.5	34.8	41.5	49.0	55.3	57.2	61.2
Increasers	29.0	42.4	42.8	28.7	29.9	17.8	23.8
Range condition[1]	65.5	54.2	65.4	68.4	73.0	75.2	77.4
Limestone breaks, range site							
Decreasers	47.1	42.9	58.8	56.1	61.5	58.0	32.6
Increasers	25.0	40.7	27.4	31.3	23.8	27.5	44.4
Range condition[1]	73.2	74.6	88.4	88.4	89.4	86.5	68.0

[1] 0-25% indicates poor condition; 25-50%, fair; 50-75%, good; 75-100%, excellent.

The Value of Dehydrated Alfalfa and Delayed Grain Feeding Young Cows on Winter Bluestem Pasture, 1965 - 67 (Project 253)

E.F. Smith, D. Richardson, C.L. Drake and M.C. Hall

Two primary objectives of this test were to:
(1) Compare dehydrated alfalfa with soybean oil meal as a winter supplemental feed on bluestem pasture for young cows to be bred shortly after the winter feeding period.
(2) Determine any merit in feeding grain the last 50 days of the winter period compared with feeding the same total amount of grain throughout the winter when heifers are to be bred shortly after the winter feeding period.

Each of three treatment groups contained 27 or 28 Hereford heifers, good to choice grade. Their initial average weight was 427 pounds each.

Each of the three treatments contained two groups of 13 or 14 heifers. Three groups, one from each of the three treatments, were pastured together and redivided each day to receive experimental rations. Each of the three remaining groups was pastured separately. The heifers pastured together came from near Paxico, Kansas; the others, maintained in separate pastures, came from near Beaumont, Kansas.

The experimental plan follows:
Treatment 1 -One pound of soybean oil meal and 2 pounds of ground sorghum grain per heifer daily during the entire winter feeding period.

Treatment 2--Soybean oil meal fed at 1.5 pounds per heifer daily until 50 days before the feeding season ended, then ground sorghum grain was fed. The same total amount of sorghum grain as fed under treatment 1 throughout the winter was concentrated during the last 50 days with the soybean oil meal discontinued when grain feeding reached the quantity to supply the same protein in the soybean oil meal. Treatment 3--Dehydrated alfalfa fed at 3.3 pounds and ground sorghum grain at 1 pound per heifer daily during the entire wintering feeding period.

The above three rations were formulated to supply approxiamately the same amount of protein and total digestible nutrients for the total winter period. In addition each heifer received daily an average of 20,000 I.U. of vitamin A, and 0.05 lb. of monosodium phosphate. Salt was fed free choice. Twelve heifers from each group were implanted with 15 mg. of diethylstilbestrol December 18, 1965, and 6 of the same heifers were reimplanted with 15 mg. diethylstilbestrol March 26, 1966. The treatment was to determine if diethylstilbestrol enlarges the pelvic opening and permits easier calving by two-year-old heifers and to permit observations of its effect on breeding efficiency. That phase will be reported later.

Results

Delaying grain feeding until spring reduced both gain of heifers over the two-year period, and birth weight of the

calves. The average calving date was a few days later for those fed dehydrated alfalfa and a few more heifers fed dehydrated alfalfa had calves that required pulling.

The results to date show no particular merit in delaying grain feeding until spring or of feeding dehydrated alfalfa to young developing heifers on grass.

Table 7
The Value of Dehydrated Alfalfa and Delayed Grain Feeding
Heifers on Winter Bluestem Pasture, Dec. 18, 1965 to Sept. 30, 1967

	Soybean meal and sorghum grain, fed at same rate all winter		Soybean meal and sorghum grain, the grain feeding delayed until spring		Dehydrated alfalfa and sorghum grain	
Pasture number	12A	15	12C	7B	12B	7A
No. of heifers	14	14	14	13	14	13
No. of heifers that weaned calves as two yr. olds	10	10	10	10	8	11
Av. wt. of heifers that weaned calves						
December 18, 1965	421	429	415	442	425	433
May 2, 1966	501	489	476	518	487	503
September 30, 1966	741	714	707	734	735	725
May 3, 1967	654	608	607	600	638	599
September 30, 1967	772	743	727	724	768	735
Gain per heifer from Dec. 18, 1965 to Sept.30, 1967	351	314	312	282	343	302
Av. supplemental winter feed received per heifer daily lbs.[1]						
Ground sorghum grain	2.0	2.0	2.0	2.0	1.0	1.0
Soybean oil meal	1.0	1.0	1.0	1.0		
Dehydrated alfalfa pellets					3.3	3.3
No. of cows pregnant						
October 1966	12	13	12	12	12	11
Percent	85.7	92.8	85.7	92.3	85.7	84.6
October 1967	13	12	12	11	12	13
Percent	92.8	92.3	92.3	91.6	85.7	100.0

Table 7 Cont.

	12A	15	12C	7B	12B	7A
Calving data 1967:						
Av. calving date	3/12	3/12	3/19	3/8	3/26	3/15
No. of calves born	11	13	12	12	10	11
No. of live births	11	10	11	11	8	11
Percent of calves born alive	100%	76.9	91.6	91.6	80	100%
Av. wt. calves born alive	61	60	59	58	62	60
Percent calves pulled	20.0	7.69	25.00	8.33	30.0	9.09
Percent calves dead at birth	0	23.07	8.3	8.3	20	0
Calving difficulty score[2]	1.20	1.25	1.66	1.08	1.50	1.18
No. of calves weaned	10	10	10	10	8	11
Percent calf crop weaned	71.4	71.4	71.4	76.9	57.1	84.6
Actual weaning weight	376	348	363	363	341	348
Adjusted weaning weight	403	361	392	389	371	364
Pounds of calf weaned per heifer bred	269	249	260	279	195	294

1 In addition to the feed shown each heifer received an average of 20,000 IU of vitamin A per head daily and 0.05 lbs. of monosodium phosphate.

2 Calving difficulty scores: 1, no assistance rendered; 2, assistance required; 3, pullers or additional assistance required; 4, veterinarian or caesarean required.

High Protein Sorghum Grain With No Added Protein in all Concentrate Cattle Finishing Rations; Urea and Soybean Oil Meal in all Concentrate Rations, (Project 253-6), 1967.

E. F. Smith, D. Richardson, C. L. Drake and B. E. Brent

Trials at several research centers as well as in Kansas (Bulletin 483, page 32) have shown roughage may be satisfactorily omitted from finishing rations for cattle and doing so, often reduces feed required per pound of gain. That has made it feasible to try to finish cattle on all grain diets, when the grain has sufficient protein, and to omit other protein sources as well as roughage. Other research on this subject is reported in Kansas Bulletins 493 and 507 and on page in this bulletin.

To further evaluate sorghum grain as the only source these rations were compared: sorghum grain with no added protein, sorghum grain and 1 percent urea; and sorghum grain and soybean oil meal. Sufficient soybean oil meal was added to equal the protein equivalent supplied by 1 percent urea.

The rations were made as nutritionally adequate as possible by using calcium, trace minerals, stilbestrol, antibiotic and vitamin A in a 50 lb. premix which was added to all rations, as shown in table 8. The premix was added at the mixer as were urea or soybean oil meal. Feed was delivered from the mixer to a self-feeder about once weekly.

Hereford steer calves in this study weighed about 400 lbs. each when received from New Mexico in November, 1966. They were fed alfalfa hay and sorghum silage from November until December 16. On December 16 the alfalfa hay was discontinued (silage continued to be fed in a separate bunk) and the steers were started on a self-feeder containing 40% dehydrated alfalfa crumbles and 60% ground sorghum grain. The proportion of grain in the mixture was gradually increased until by Jan. 3 the steers were receiving only ground sorghum grain in the self-feeder with sorghum silage which was fed in a separate bunk. The silage was gradually reduced until January 9 when the steers were on an all grain diet and this test began.

The sorghum grain came from several fields and varied from 10.4 to 11.2% protein on an air dry basis. Only that from higher protein fields was used.

Results

Differences among the treatments (table 9) were small. Steers receiving urea required least feed per lb. of gain (5.9 to 1); those receiving soybean oil meal required slightly above 6 lbs. and the two lots getting no added protein averaged 6.5 to 1. Feed cost per 100 lbs. of gain was also lowest for steers receiving urea.

Two steers, one with urinary calculi and one that foundered, were removed from the test. No other health problems were observed.

The carcasses graded high good and low choice, however, 16 of the 58 were shipped by the packer before complete carcass data were obtained.

This test indicates that sorghum grain as the only protein source does as surprisingly good job in an all concentrate ration. The addition of urea or soybean oil meal improved feed efficiency slightly. If analysis indicates or if there is any reason to believe grain may be borderline in protein value urea makes a low cost addition for insurance.

Table 8

Composition of Rations[1], 1967

	Sorghum grain	Sorghum grain and 1% urea	Sorghum grain and soybean oil meal
	Ingredients per ton		
Ground sorghum grain	1950	1930	1815
Premix	50	50	50
Urea	0	20	0
Soybean oil meal	0	0	135
Total, lb.:	2000	2000	2000
	Ingredients in 50 lbs. of premix		
Ground limestone	20.0		
Trace mineral premix[2]	1.0		
Stilbestrol premix (1 gram stilbestrol per lb.)	1.0		
Vitamin A. premix (10,000 IU per gram)	0.3 (140 grams)		
Chlortetracycline premix (10 grams per lb.)	0.8 (380 grams)		
Fine ground sorghum grain (enough to make the premix up to 50 lbs.)	26.9		
Total, lbs.:	50.0		

1 Salt, free choice

2 Percentages of indicated elements in trace mineral premix: manganese, 4.4; iron, 6.6; copper, 1.32; cobalt, 0.23; iodine, 0.30; zinc, 5; magnesium, 20; sulfur, 2.70.

Table 9

High Protein Sorghum Grain With No Protein Added
In All Concentrate Cattle Finishing
Rations, Jan. 9, 1967, to June 30, 1967, - 112 days

	Sorghum grain, ground		Sorghum grain, ground and 1% urea		Sorghum grain, ground, and soybean oil meal	
Lot number	18	19	20	21	22	23
Number of steers per lot	10	10	10	9*	10	9**
Av. initial wt. lbs.	494	498	498	500	510	520
Av. final wt. lbs.	939	960	991	944	983	956
Av. daily gain lbs.	2.59	2.69	2.87	2.58	2.75	2.53
Av. daily feed intake, lbs.	16.7	17.6	17.0	15.2	17.0	15.7
Feed required per lb. of gain, lbs.	6.5	6.5	5.9	5.9	6.2	6.2
Feed cost per cwt. of gain,[1] $	11.96	12.11	11.20	11.14	12.71	12.79
Percent protein in concentrate mixture (88% dry matter basis)	10.06	10.07	12.11	12.66	12.12	12.27
Cost of concentrate mixture per ton[1] $	37.09	37.09	37.83	37.83	41.14	41.14

* Foundered steer removed April 20.

** Steer with urinary calculi removed April 28.

1 Feed costs used are on inside back cover.

Sorghum Grain As the Only Protein Source In All-Concentrate Heifer Finishing Rations: Two Levels of Urea In An All-Concentrate Ration, (Project 253-6) 1968

E. F. Smith, D. Richardson, C. L. Drake and B. E. Brent.

Tests reporting on sorghum grain as the only protein source in a diet for finishing cattle are reported in Kansas Agr. Expt. Station Bulletins 493 and 507 and on page 24 in this bulletin.

The three rations fed are shown in table 10. The sorghum grain was obtained as needed at a local elevator, mixed with other ration ingredients at the Animal Husbandry elevator and delivered, usually in 2000 lb. loads to the self feeders when needed.

The heifers were purchased by an order buyer through sale barns and were mostly Angus and Angus-Hereford crossbreds. They were started on feed with a mixture of 60% dehydrated alfalfa crumbles and 40% ground sorghum grain fed in a self-feeder with prairie hay free choice. During two weeks the alfalfa crumbles were gradually reduced. A premix was included when alfalfa crumbles were less than 25 percent of the ration. After the heifers were on all concentrate, the prairie hay was gradually removed from the ration during one week. At the end of three weeks the heifers were on all concentrate ration. Then the following three rations were compared:

1. All sorghum grain without added protein, 2. Sorghum grain plus one percent urea, and 3. Sorghum grain plus 2 percent urea.

Results

The diet containing 2% urea reduced rate of gain and increased costs. It seemed to reduce feed intake in one of the two lots, table 11. Least feed per pound of gain was from the ration containing 1% urea. The heifers fed sorghum grain as the only protein source required about a half pound more feed to produce a pound of gain than those fed 1% urea.

No differences in carcasses could be explained by ration treatments. The reason for the low dressing percentage (58) for lot 1 is unknown. Carcass grades averaged low choice to choice for the different lots.

This test substantiates previous tests that excellent results may be obtained with all concentrate rations where the source of protein is sorghum grain with 1 percent urea added. Nearly as good results may be obtained by omitting the urea.

Table 10

Composition of Rations, 1968

	Sorghum grain	Sorghum grain and 1% urea	Sorghum grain and 2% urea
	Ingredients per ton		
Ground sorghum grain	1945	1925	1905
Premix	50	50	50
Salt	5	5	5
Urea (45% nitrogen)	0	20	40
Total, lb.:	2000	2000	2000
	Ingredients in 50 lbs. of premix		
Ground limestone	20		
Trace mineral premix[1]	1.0		
Stilbestrol premix (2 grams stilbestrol per lb.)	0.5		
Vitamin A premix (10,000 IU per gram)	0.3 (140 gms.)		
Chlortetracycline premix (10 grams per lb.)	0.8 (380 gms.)		
Ground sorghum grain (enough to make the premix up to 50 lbs.)	27.4		
Total, lb.:	50.0		

1 Percentages of indicated elements in trace mineral premix: Manganese, 4.4; iron, 6.6; copper, 1.32; cobalt, 0.23; iodine, 0.30; zinc, 5; Magnesium, 20; sulfur, 2.70.

Table 11

Sorghum Grain With No Added Protein In a Cattle Finishing Ration; Two Levels of Urea In An All Concentrate Ration, October 23, 1967, to January 25, 1968 - 94 days

	Sorghum grain		Sorghum grain and 1% urea		Sorghum grain and 2% urea	
Lot number	1	2	3	4	5	6
No. of heifers per lot	11	11	11	11	11	11
Av. initial wt. lbs.	632	628	628	625	629	620
Av. daily gain lbs.	2.60	2.61	2.62	2.66	2.36	2.08
Av. daily feed intake, lbs.	21.0	20.4	19.6	19.6	19.6	17.6
Feed required per lb. of gain, lbs.	8.1	8.0	7.5	7.4	8.3	8.5
Feed cost per cwt. of gain,[1] $	14.84	14.33	14.11	13.79	15.86	16.22
Carcass data:						
Av. Carcass wt.	508	518	524	519	507	503
Dressing Percent	58.0	59.3	59.9	59.3	59.5	59.7
Carcass grade[2]	19.5	19.6	19.6	19.6	20.0	19.5
Rib eye area, sq. in.	10.3	10.4	10.3	10.2	10.7	9.73
Fat thickness inches	.43	.45	.47	.49	.53	.48
Yield grade[3]	2.8	3.1	3.0	2.7	3.0	3.1
Percent protein in concentrate mixture (88% dry matter basis).	9.74	9.95	12.60	12.54	14.82	14.99
Cost of concentrate mixture/ton[1]	$36.79	$36.79	$37.53	$37.53	$38.27	$38.27

1 Feed prices are on inside back cover.
2 Carcass grade score: Low choice, 19; Average choice, 20.
3 Yield grade: Ranges from 1 to 5, 1 is most desirable.

Nutritive Value of Forages as Affected by Soil and Climatic Differences (Project 430)

D. Richardson, F.G. Clary, E.E. Banbury[1], C.W. Spaeth[1], A.B. Erhart[2], D.W. Arnett[2], F.W. Boren[3], & H.B. Perry[3].

1 Colby Station
2 Garden City Station
3 Mound Valley Station

Four previous tests (Kans. Agri. Expt. Sta. Bull. 507:7, 1967) at Colby, Garden City, Manhattan, and Mound Valley, using beef steers from the same herd and feeding the same feedstuffs, grown locally, produced differences in performance. What is the cause(s) of the differences?

This test was designed as previous ones, except that all locations used the same feed, which was produced at Garden City. Sorghum silage was dehydrated and pelleted for easier transportation. The calves were wintered on the silage pellets and alfalfa hay. Silage pellets were gradually removed from the ration and sorghum grain added for finishing. Analyses of the feedstuffs are shown in table 12. Feedlot performance and carcass data are shown in table 13. Results were more nearly uniform than for any previous year. The test is being repeated. An Atomic Absorption Spectrometer has been obtained and a complete mineral analysis of feedstuffs and water from each location is planned.

Table 12

Feedstuff Analyses, 1966-67

	% Moisture	% Dry matter	% Protein	% Ash	% Ether extract	% Crude fiber	% N.F.E.
Garden City							
Sorghum silage pellets	5.16	94.84	4.52	12.95	1.18	24.11	52.08
Alfalfa hay	6.99	93.01	20.63	9.79	1.29	29.64	31.66
Sorghum grain	11.84	88.16	9.48	1.50	1.98	1.85	73.35
Colby							
Sorghum silage pellets	6.28	93.72	7.36	9.51	1.45	23.99	51.41

Table 13
Feedlot results
Wintering Phase
November 9, 1966 to March 1, 1967 - 112 days

Location	COLBY		GARDEN CITY		MANHATTAN		MOUND VALLEY	
Lot No.	1	2	1	2	1	2	1	2
No. steers per lot	6	6	6	6	6	6	6	6
Av. initial wt., lb.	436.3	433.8	443.0	425.7	436.3	444.2	436.3	436.3
Av. final wt., lb.	576.7	586.3	580.2	563.2	533.3	555.8	530.3	523.0
Av. daily gain, lb.	1.25	1.36	1.23	1.24	.87	1.0	.84	.77
Av. daily ration, lb:								
Sorghum silage Pell.	12.30	12.62	11.73	10.95	11.57	11.68	9.30	9.31
Alfalfa hay	4.67	4.63	4.96	4.96	4.77	5.00	4.72	4.72
Feed per cwt. gain, lb:								
Sorghum silage Pell.	981	927	958	892	1336	1172	1108	1203
Alfalfa hay	373	340	405	404	551	502	562	610
Total dry matter per cwt. gain, lb.	1277	1195	1285	1221	1779	1578	1574	1708
Feed cost per cwt.[1] gain, $	19.38	18.16	19.43	18.43	26.93	23.86	23.65	25.67
Finishing Phase, March 2 to September 16, 1967 - 199 days								
Av. final wt., lb.	972.3	1042.5	1030.7	1023.2	1058.8	988.5	990.2	1000.0
Av. daily gain, lb.	1.99	2.29	2.26	2.31	2.64	2.16	2.31	2.40
Av. daily ration, lb.:								
Alfalfa hay	4.97	4.98	4.97	4.97	3.75	4.23	4.90	4.89
Sorghum grain	14.66	14.94	15.76	14.99	16.60	14.84	14.64	14.72
Feed per cwt. gain:								
Alfalfa hay	250	217	220	215	142	196	212	204
Sorghum grain	737	652	696	648	629	688	634	614
Feed cost per cwt. gain,[1] $	16.39	14.45	15.28	14.35	13.10	14.83	14.06	13.60
Av. daily gain, 311 days	1.72	1.96	1.89	1.92	2.00	1.75	1.78	1.81
Shrink to market, %	2.47	2.96	4.03	3.90	2.96	2.64	2.13	3.50
Av. hot carcass wt., lb.	584.3	632.7	640.6	619.7	656.8	602.0	613.5	607.5
Dressing %, feedlot wt.	60.0	60.7	62.2	60.6	59.4	60.9	62.0	60.8
Dressing %, market wt.	61.6	62.5	64.8	63.0	63.9	62.5	63.3	63.0
Av. fat thickness 12 th rib	.55	.58	.78	.67	.63	.62	.60	.53
Estimate % kidney knob	3.50	3.50	3.54	3.53	3.50	3.53	3.47	3.50
Av. size rib eye, sq.in	9.82	11.12	10.78	10.67	11.43	10.53	10.51	10.44
Av. degree. marbling[2]	8.0	6.5	6.2	6.2	6.2	7.2	6.7	7.3
Av. yield grade	3.0	3.0	3.4	3.2	3.3	3.0	3.0	3.0
Carcass grades:								
Prime		1						
Low prime					1			
Top choice	1	1	3	4	1		3	
Av. choice	1	3	2	2	3	5	2	2
Low choice		1						1
Top good					1	1	1	3
Av. good	2							
high standard	2							

[1] Sorghum silage pellets, $30 per ton; alfalfa hay, $25 per ton; sorghum grain, $1.80 per cwt.

[2] 4 = abundant, 5 = moderate, 6 = modest, 7 = small, 8 = slight, 9 = trace.

Table 14
Feedlot results
Wintering Phase
November 9, 1966 to March 1, 1967 - 112 days
except lot 4, 5, & 6 - 109 days

Location	COLBY		GARDEN CITY			
Lot No.	3	4	3	4	5	6
	Colby pelleted silage	Colby loose silage	Brown Swiss	Hereford	Charolais X Hereford	Charolais X Hereford
No. Animals per lot	6	6	6	6	6	6
Av. initial wt., lb.	434.7	435.5	440.5	432.0	501.0	501.5
Av. final wt., lb.	619.2	548.3	593.0	564.3	616.2	662.3
Av. daily gain, lb.	1.65	1.01	1.36	1.27	1.06	1.48
Av. daily ration, lb:						
sorghum silage	-	21.61	-	-	-	28.28
sorg. silage pell.	12.49	-	15.11	12.31	13.15	-
alfalfa hay	4.70	4.73	5.00	5.00	5.00	5.00
Feed pr. cwt. gain, lb:						
sorghum silage	-	21.55	-	-	-	19.17
sorg. silage pell.	758	-	1110	1014	1243	-
alfalfa hay	285	472	367	423	486	339
Total dry matter/cwt. gain, lb.	975.3	-	1043.5	1343.5	1616.7	-
Feed cost/cwt. gain[1],$	14.93	14.52	21.24	20.50	24.72	11.90
Finishing phase, March 2 to September 16, 1967 - 199 days						
No. Animals per lot	6	5	6	6	6	6
Av. final wt. lb.	1102.0	1024.2	1053.5	1034.3	1150.0	1154.7
Av. daily gain, lb.	2.43	2.36	2.31	2.36	2.68	2.47
Av. daily ration, lb.						
Alfalfa hay	4.98	4.75	5.00	4.98	5.00	5.00
Sorghum grain	16.08	16.70	16.10	15.03	17.47	16.89
Feed per cwt. gn., lb:						
Alfalfa hay	205	201	216	211	186	202
sorghum grain	663	706	696	636	651	683
Feed cost pr. cwt. gn.[1]$	14.50	15.24	15.23	14.08	14.04	14.82
Shrink to market, %	3.66	3.54	3.82	4.77	4.72	4.16
Av. hot carcass wt., lb.	674.5	628.6	609.2	601.6	691.6	679.6
Dressing %, feedlot wt.	61.21	61.37	57.82	58.16	60.13	58.85
Dressing %, market wt.	63.53	63.62	60.12	61.07	63.11	61.40
Av. fat thickness 12th rib,in.	0.65	0.70	0.12	0.43	0.42	0.35
Estimate % kidney knob	3.5	3.5	3.32	3.5	3.5	3.5
Av. size rib eye, sq.in.	11.74	9.73	12.23	10.14	11.72	11.33
Av. degree marbling[2]	6.2	6.2	7.8	6.5	7.0	6.7
Av. yield grade	3	3	1.3	3	3	3
Carcass grade:						
Prime	1					
Top choice	4	2			2	2
Av. choice		3		4	2	2
Low choice						2
High good	1			2	1	
Av. good			2		1	
Low good			2			
Av. Standard			2			

[1], [2] See Table

Urea vs. Soybean Meal in Wintering and Finishing Rations for Beef Steers (Project 370)

D. Richardson, E.F. Smith and B.E. Brent

A previous test using sorghum silage (Kans. Agri. Expt. Sta. Bull. 507:5, 1967) indicated that 3 pounds of grain per day in silage would supply enough available energy for reasonably good utilization of nonprotein nitrogen (urea). However, additional grain apparently increased the utilization of urea. This is the second test to obtain information on the minimum amount of readily available energy as grain necessary for efficient utilization of nonprotein nitrogen as a substitute for natural protein. During the wintering phase, the roughage was corn silage with an average of 38.5% dry matter. Grain made up 27% of the dry matter. Prairie hay replaced the silage in the finishing phase. Supplemental treatments are shown in the tables giving the results.

Results and Observations

Table 15 gives the results of the wintering phase. Urea supplement alone (lot 13) produced significantly lower gains then any other lot. Adding alfalfa hay, soybean meal or grain significantly increased gains. Results of the finishing phase are given in table 16. There were no significant differences in rate of gain or carcass data.

Table 15

Average Daily Gain and Feed Efficiency of Steers Fed
Corn Silage with Different Protein Supplements, Dec. 16, 1966 - April 7, 1967, 112 days

Lot. no.	Pounds	Initial wt.	Final wt.	Av. da. gain[3]	Av. da. silage cons'd	Av. da. feed cons'd (90% D.M.)	Prot. equiv. intake	Av. feed efficiency (90% D.M.)
		Pounds						
13	1.25 urea suppl.[1]	436.5	574.0	1.23[a]	25.05	12.2	1.53	9.91
14	1.25 urea suppl. 2.00 alf. hay	437.5	631.0	1.73[b]	25.44	14.3	1.87	8.26
15	1.25 SBM[2] 2.00 alf. hay	438.5	653.0	1.92[b]	25.53	14.4	1.88	7.51
16	1.25 urea suppl. 3.00 milo	436.5	654.0	1.94[b]	25.07	15.3	1.86	7.89
17	1.25 urea suppl. 3.00 milo 2.00 alf. hay	437.5	637.5	1.78[b]	18.40	14.2	1.90	7.98

1 83% sorghum grain, 14% urea and 3% dicalcium phosphate
2 97% soybean meal and 3% dicalcium phosphate
3 Any two means not bearing a common superscript letter differ significantly ($P < 0.05$)

Table 16
Results of Finishing Phase
Apr. 8 - Aug. 25, 1967, 172 days

Lot	13	14	15	16	17
Av. final wt. lb.	984	1026.5	1060.0	1066.5	1071.5
Av. daily gain, lb.	2.38	2.30	2.43	2.40	2.52
Av. daily ration, lb.					
Prairie hay	1.67	1.53	1.51	1.69	1.70
alfalfa hay	-	1.80	1.80	-	1.80
sorghum grain	14.8	14.4	13.8	14.9	13.7
urea suppl.[1]	1.0	1.0	-	1.0	1.0
soybean meal[2]	-	-	1.0	-	-
Feed percent gain lb.					
Prairie hay	70	65	62	71	68
alfalfa hay	-	77	74	-	71
sorghum grain	623	606	583	623	545
urea supplement	41	41	-	41	39
soybean meal	-	-	41	-	-
Shrink to market %	3.76	1.95	4.35	4.97	4.06
Av. hot carcass wt. lb.	580	627	578	631	643
Av. dressing % feedlot wt.	58.7	61.1	60.5	59.2	60.0
Av. dressing % market wt.	61.2	62.3	63.3	62.3	62.5
Av. fat thick, 12th rib, in.	0.51	0.54	0.60	0.71	0.61
Av. size ribeye, sq. in.	11.82	12.16	12.61	11.28	13.05
Carcass grades:					
Choice	6	9	9	10	6
Good	4	1	0	0	4
ADG, Wintering & Finishing 284 days	1.93	2.11	2.23	2.22	2.23

1 80% sorghum grain, 13% urea, 4% calcium carbonate, 3% dicalcium phosphate

2 94% soybean meal, 3% dicalcium phosphate, 3% calcium carbonate.

NOTE: Each animal received daily 30,000 I.U. vit. A, 75 mg. Aureomycin and 10 mg. diethylstilbestrol

Inhibition of Ruminal Urease
(Project 596)

1. The Intracellar Nature of Urease:

B.E. Brent, Amos Adepoju, Fabio Portela,
and D. Richardson

Rumen bacteria elaborate an enzyme, urease. Urease is capable of breaking down urea to ammonia and carbon dioxide. Rumen bacteria then incorporate the ammonia into new amino acids and bacterial protein. Thus, urea can be used as a non-nitrogen source for ruminants.

Unfortunately, urease often makes ammonia available faster than it can be used by rumen bacteria. That leads to poor utilization of urea or, in extreme cases, to toxicity.

Recent studies at Kansas State have been aimed at increasing the efficiency of urea utilization by slowing down, or inhibiting ruminal urease. Studies by Loper et al. reported in Bulletin 493, showed that urease could be inhibited by certain minerals and several antibiotics. The inhibitors were, however, not specific. That is, they inhibited other necessary enzymes in addition to urease.

To more clearly define urease inhibition, it was necessary to find if urease was located inside or outside the microbial cells.

Experimental Procedure

A known inhibitor of jackbean meal urease, [(S-2-carboxyethel 3-thiosulfopropionate (3,3-dithiodipropionic acid S,S-dioxide)] (CTDD) did not inhibit urease in *in vitro* (artificial rumen) fermentations.

Cells were removed from rumen fluid by high speed centrifugation. Urease activity was determined in the cell-free fluid and in the resuspended cells. Rumen bacteria were disrupted using either high speed homogenization with glass beads, or with ultrasonic sound. After removing debris by centrifugation, we determined urease activity on the cell-free fluid, which contained soluble material from inside ruptured cells. CTDD was added to each preparation to see if it inhibited urease.

Results and Discussion

No urease activity was found in the cell-free rumen fluid. But whole rumen fluid and resuspended rumen bacteria showed urease activity, which could not be inhibited by CTDD. After bacteria were disrupted and cell contents were released into the surrounding fluid, urease activity, which could be inhibited by CTDD, was present in the cell-free fluid.

The results indicate that (1) rumen urease is inside microbial cells, and (2) since CTDD did not inhibit urease in intact cells, but did once urease was freed from the cells, it appears that an inhibitor to operate in the rumen, must have a molecular weight and configuration that will allow it to enter intact cells.

2. Effect of Acetohydroxamic Acid on Rumen Urease.

Acetohydroxamic acid (AHA) (molecular weight 75) has been proposed as the kind of inhibitor needed. It has been studied both in vito and in intact fistulated animals. So we added acetohydroxamic acid at various levels to rumen fluid in in vitro fermentation systems to observe its effect on urease inhibition in intact bacterial cells. Results are shown in table 17. Decrease ammonia levels indicate urease was inhibited.

Table 17

Effect of Acetohydroxamic Acid On (AHA) Ruminal Urease in Intact Cells, In Vitro (mcg. NH_3-N/ml.)

AHA, mcg.ml.	0	Hours ½	1	2
0 (control)	8.4	102	166	232
5	6.7	67	111	170
10	6.7	53	84	149
20	6.7	32	54	104
50	7.8	18	39	71
100	8.8	15	25	46
200	7.4	12	23	34

Since Acetohydroxamic acid was effective *in vitro* on intact rumen microbes, it was studied in intact twin fistulated Hereford steers. AHA was administered directly into the rumen, 3gm. per feeding. Reduction of ammonia levels below control values is shown in table 18.

Table 18

Rumen Ammonia Levels (mcg. NH_3-N/ml.)
At Various Times After Feeding A Urea Containing Diet, With and Without 3 gm. AHA

	0	½	1	2	3	4	6	8
Control	29	196	304	192	141	65	24	12
3 gm. AHA	35	95	180	201	129	86	34	25

Table 18 shows that rumen ammonia was depressed during the first 2 hours, when urea and AHA were both at high concentrations in the rumen. AHA apparently disappears from the rumen rapidly, perhaps via simple transfer through the rumen wall.

AHA appears to be a promising urease inhibitor. However, it is unavailable commercially, and must be synthesized in the laboratory. Our laboratory is preparing the product and the studies are being continued.

Acknowledgment

Sterling - Winthrop Research Institute, Renssilaer,N.Y. furnished part of the urease inhibitors and financial support for the above two projects.

Effects of Supplementing Corn Silage with MGA[1] and Feeding Varying Levels of Sorghum Grain to Feed-lot Heifers

L.I. Smart and C.L. Drake

Melengestrol acetate (MGA) is a new drug recently approved for use in the supplement portion of rations of feed-lot heifers. The recommended level is from 0.25 to 0.50 mg. per head per day. A 48-hour withdrawal period is required before slaughter. Several experiment stations have shown improved rate of gain, feed utilization and suppressed estrus in feed-lot heifers on high concentrate rations plus MGA.

Recently there has been much interest in feeding more silage to feed-lot cattle. Since more pounds of beef can be produced per acre farmed with silage than with grain, it seems reasonable that more silage should be fed. The amount of grain needed to supplement silage for best results has not been determined.

Primary purposes of this study were to:

1. Evaluate effects of MGA with high corn silage rations.
2. To study the effects of adding varying amounts of sorghum grain to corn silage.
3. Try to determine the best time during the feeding period to add grain.
4. To determine the effects of MGA and grain on carcasses of silage-fed heifers.

---

[1] MGA furnished by Upjohn Company, Kalamazoo, Mich.

Materials and Methods

Eighty Hereford heifers averaging 678 pounds each were divided into 8 lots of 10 each. All were full fed corn silage plus the amount of grain for 112 days as indicated in table 19. Carcass data were obtained after the heifers were slaughtered.

Protein supplements were adjusted to keep the protein level approximately the same among all rations. The chemical analyses of the corn silage are presented in table 20.

Results and Discussion

Feed-lot results are presented in table 21. All MGA lots gained faster than the corresponding lots without MGA. The addition of grain increased the cost of gain. There were no real differences in carcass data as presented in table 22.

Table 19

Daily Treatment Per Head

Lot No.	Treatment
3	Corn silage ad libitum Rolled sorghum grain fed at 0.75% of average body weight adjusted every 28 days. 2 lbs. of protein supplement
4	Same as lot 3 except supplmment contained 0.35 mg. MGA
5	Corn silage ad libitum Rolled sorghum grain fed at 1.5% of average body weight adjusted every 28 days. 2 lbs. of protein supplement
6	Same as lot 5 except supplement contained 0.35 mg. MGA
9	Corn silage ad libitum Rolled sorghum grain fed the last 56 days at 1% of average body weight the first 28 days and 2% the last 28 days. 2 lbs. of protein supplement
10	Same as lot 9 except supplement contained MGA
11	Corn silage ad libitum until last 28 days then reduced to 6 pounds. Rolled sorghum grain fed to consumption last 28 days. 2 lbs. of protein supplement.
12	Same as lot 11 except supplement contained MGA

Table 20

Chemical Analyses of Corn Silage

Protein (N X 6.25)	2.98%
Ether extract	0.73
Crude fiber	6.65
Moisture	68.59
Ash	2.17
Nitrogen-free extract	18.88
Carbohydrates	25.53%

Table 21

Feed-lot Data of Heifers Full Fed Corn Silage Supplemented With MGA and Varying Levels of Sorghum Grain

Ration per day	Corn silage Sorghum grain fed at .75% of av. body wt. Protein supplement		Corn silage Sorghum grain fed at 1.5% of av. body wt. Protein supplement		Corn silage Sorghum grain fed last 56 days; 1% first 28 days, 2% last 28 days Protein supplement		Corn silage Sorghum grain fed to Consumption last 28 days Protein supplement	
Hormone	Control	MGA[1]	Control	MGA	Control	MGA	Control	MGA
Lot No.	3	4	5	6	9	10	11	12
No. heifers	10	10	10	10	10	10	10	10
Av. initial wt., lbs.	683	682	677	673	675	675	678	678
Av. final wt., lbs.	888	930	926	930	898	936	915	921
Total gain, lbs.	205	248	249	257	223	261	237	243
Av. daily gain, lbs.	1.81	2.20	2.20	2.27	1.97	2.31	2.10	2.15
Feed per lb. gain, lbs.	25.9	23.1	20.7	20.8	24.7	21.8	21.9	22.9
Feed cost per cwt. gain $	$19.62	$17.27	$20.15	$20.35	$18.90	$16.48	$16.15	$16.55
Daily ration per heifer, lb.								
Corn silage	39.5	43.1	32.6	33.6	38.4	42.3	39.5	42.6
Sorghum grain	5.6	5.7	11.0	11.6	6.3	6.2	4.6	4.7
Supplement	1.8	2.0	2.0	2.0	2.0	1.9	1.9	1.9
Av. feed consumed per day, lbs.	46.9	50.8	45.6	47.2	46.7	50.4	46.0	49.2
Feed per lb. gain, lb.								
Corn silage	21.8	19.6	14.8	14.8	19.5	18.3	18.8	19.8
Sorghum grain	3.1	2.6	5.0	5.1	3.2	2.7	2.2	2.2
Supplement	1.0	.9	.9	.9	1.0	.8	.9	.9
Total feed per lb. gain	25.9	23.1	20.7	20.8	24.7	21.8	21.9	22.9

[1] Assay limits say samples must be within 70 to 120% of amount indicated to be "in compliance."

Table 22

Carcass Data of Heifers Full Fed Corn Silage Supplemented With MGA and Varying Levels of Sorghum Grain

Ration per day	Corn silage Sorghum grain fed at .75% of av. body wt. Protein supplement		Corn silage Sorghum grain fed at 1.5% of av. body wt. Protein supplement		Corn silage Sorghum grain fed last 56 days; 1% first 28 days, 2% last 28 days Protein supplement		Corn silage Sorghum grain fed to consumption last 28 days Protein supplement	
Hormone	Control	MGA	Control	MGA	Control	MGA	Control	MGA
Lot no.	3	4	5	6	9	10	11	12
Av. hot carcass wt., lb.	513	520	537	551	519	538	521	537
Maturity	A	A	A	A	A	A	A	A
Estimated kidney knob %	2.75	2.65	2.6	2.7	2.6	2.6	2.7	2.5
Av. fat thickness 12th rib, in.	.36	.36	.41	.47	.35	.39	.36	.38
Av. degree marbling	Trace +	Trace	Trace	Trace -	Trace	Trace	Trace	Trace -
U.S.D.A. grade	good	good	good	good	good	good	good	good
Av. ribeye area, sq. in.	11.5	11.5	12.1	11.8	12.2	11.7	12.1	12.0

A Comparison of All-in-one and Conventional Sorghum Silage With and Without MGA[1] for Feedlot Heifers

L.I. Smart and C.L. Drake

Silage is being utilized in larger quantities in beef cattle growing and fattening rations. Hammes et al. (1964) showed that higher levels of corn silage can be used because gains from high silage and high grain rations are similar. However, more total digestible nutrients may be harvested per acre and the cost of gain is usually less with silage. Several investigators have shown advantages to certain additives with silage.

The primary purposes of this study were to:

1. Evaluate effects of adding a combination of additives to sorghum silage to make an all-in-one silage.
2. To compare the all-in-one silage with conventional methods of feeding sorghum silage with soybean meal as a source of protein.
3. To feed melengestrol acetate, a hormone to prevent estrus, increase rate of gain and improve feed utilization in heifers.

[1] Melengestrol acetate (MGA) furnished by Upjohn Company, Kalamazoo, Mich.

Materials and Method

Fifty-two Hereford heifers averaging 757 pounds each were divided into 4 lots of 10 each and 12 were fed individually. For 90 days all heifers were full fed sorghum silage, which had been ensiled as shown in table 23. The experimental treatment for the group and individually fed heifers is shown in table 24 and the chemical analysis of the silage is in table 25. Carcass data were obtained following slaughter.

Results and Discussion

Group fed heifers receiving MGA had a higher daily gain and consumed more feed than heifers not receiving MGA, as shown in table 26.

Feed-lot data concerning individually fed heifers are presented in table 27. Individually fed heifers receiving MGA gained fastest, consumed more feed and were more efficient.

Carcass data are presented in table 28. Little difference was observed among treatments.

Signs of heat were observed in only 3 heifers of 26 receiving MGA during the trial.

The data indicate that all-in-one sorghum silage was comparable to sorghum silage ensiled in the conventional manner and fed with soybean meal. Less time and labor were required to feed all-in-one silage

Table 23

Treatment of Experimental Silage

	Treatment
All-in-one silage	Sorghum silage + 100 lbs. of supplement[1] per ton added to the silage at the blower when the silo was filled
Conventional silage	Sorghum silage; No supplements added

[1] Supplement composition, lbs.: Urea, 10; limestone, 5; powdered molasses, 10; trace minerals, 1*; vitamin A, 1 (10,000 IU per gm); soybean meal, 40; grain sorghum, 33.

* Trace minerals in % were: manganese, 10; iron, 10; calcium, 14; copper, 1; zinc, 5; iodine, 0.3; cobalt, 0.1.

Table 24

Experimental Treatments of Group and Individually Fed Heifers

	Group fed	Individually fed	
Lots	3	1, 5, 9	All-in-one sorghum silage
Lots	4	2, 6, 10	Conventional sorghum silage plus 2# of SBM per head per day
Lots	5	3, 7, 11	All-in-one sorghum silage plus .35 mg. MGA[1] per head per day
Lots	6	4, 8, 12	Conventional sorghum silage plus 2# of SBM per head per day plus .35 mg. MGA per head per day

[1] Assay limits call for samples to fall within 70 to 120% of theory to be "in compliance."

Table 25

Silage Analyses
As Fed Basis

	Dry matter	Crude protein	Ether extract	Ash	Crude fiber
All-in-one sorghum silage	37.12	4.32	0.84	2.60	8.36
Conventional sorghum silage	36.88	2.84	0.82	2.39	7.80

Table 26

Feed-lot Response from Heifers Group Fed All-in-one Silage and Conventionally Fed on Silage With and Without MGA

Ration	All-in-one sorghum silage	Sorghum silage + 2# SBM per head per day	All-in-one sorghum silage	Sorghum silage + 2# SBM per head per day
Hormone	None	None	MGA	MGA
Lot no.	3	4	5	6
No. heifers	10	10	10	10
Av. initial wt., lbs.	757	757	760	759
Av. final wt., lbs.	972	955	977	984
Total gain, lbs.	215	198	217	225
Av. daily gain, lbs.	2.39	2.20	2.41	2.50
Feed per lb. gain, lbs.	24.4	26.2	24.5	24.3
Feed cost per cwt. gain $	14.51	14.35	14.58	13.48
Daily ration per heifer, lb.				
All-in-one sorghum silage	58.4		58.5	
Sorghum silage		55.6		58.4
Soybean meal		2.0		2.0
MGA (in sorghum grain carrier)			.5	.5
Av. feed consumed per day, lb.	58.4	57.6	59.0	60.9
Feed per lb. gain, lb.				
All-in-one sorghum silage	24.4		24.3	
Sorghum silage		25.3		23.3
Soybean meal		.9		.8
MGA (in sorghum grain carrier)			.2	.2
Total feed per lb. gain	24.4	26.2	24.5	24.3

Table 27

Feed-lot Response From Heifers Individually Fed All-in-one Silage And Conventionally Fed on Silage With and Without MGA

Ration	All-in-one sorghum silage	Sorghum silage + 2# SBM per head per day	All-in-one sorghum silage	Sorghum silage + 2# SBM per head per day
Hormone	None	None	MGA	MGA
Lot no.	1,5,9	2,6,10	3,7,11	4,8,12
No. heifers	3	3	3	3
Av. initial wt., lbs.	751	747	753	751
Av. final wt., lbs.	902	926	971	968
Total gain, lbs.	151	179	218	217
Av. daily gain, lbs.	1.68	1.99	2.42	2.41
Feed per lb. gain, lbs.	26.3	22.8	20.9	20.6
Feed cost per cwt. gain $	15.78	13.49	13.67	12.57
Daily ration per heifer, lb.				
All-in-one sorghum silage	44.2		50.2	
Sorghum silage		43.5		49.8
Soybean meal		2.0		2.0
MGA (in sorghum grain carrier)			.5	.5
Av. feed consumed per day, lb.	44.2	45.5	50.7	52.3
Feed per lb. gain, lb.				
All-in-one sorghum silage	26.3		20.7	
Sorghum silage		21.8		19.6
Soybean meal		1.0		.8
MGA (in sorghum grain carrier)			.2	.2
Total feed per lb. gain	26.3	22.8	20.9	20.6

Table 28

Carcass Evaluation of Heifers Group and Individually Fed All-in-one Silage and Conventionally Fed on Silage With and Without MGA

Ration	All-in-one sorghum silage	Sorghum silage + 2# SBM per head per day	All-in-one sorghum silage	Sorghum silage + 2# SBM per head per day
Hormone	None	None	MGA	MGA
Group Fed:				
Lot no.	3	4	5	6
Av. hot carcass wt., lb.	517	530	542	540
Maturity	A	A	A	A
Estimated kidney knob %	3.2	3.3	3.2	3.3
Av. fat thickness 12th rib, in.	.3	.3	.3	.3
Av. degree marbling	Slight	Slight	Slight +	Slight
U.S.D.A. grade	Good -	Good	Good	Good
Av. ribeye area, sq. in.	12.5	12.1	11.7	11.9
Individually Fed:				
Lot no.	1,5,9	2,6,10	3,7,11	4,8,12
Av. hot carcass wt., lb.	502	502	531	498
Maturity	A	A	A	A
Estimated kidney knob %	3.1	3.3	3.4	3.4
Av. fat thickness 12th rib, in.	.3	.3	.2	.3
Av. degree marbling	Slight -	Slight -	Slight -	Slight
U.S.D.A. grade	Good -	Good	Good -	Good
Av. ribeye area, sq. in.	12.1	12.5	13.4	11.5

The Effects of Feeding a High Concentrate Ration Containing 25% Ground Beef Manure to Fattening Heifers in Concrete and Soil-surfaced Lots (Project 660)

C.L. Drake, L.I. Smart, E.F. Smith and R.I. Lipper[1]

This is a cooperative project with the Department of Agricultural Engineering to study surface runoff, in addition to animal performance.

Purpose

A. To compare a ration containing 25% ground beef manure with a conventional ration.

B. Study the influence of concrete or soil surfacing on animal performance.

Procedure

Twenty Hereford heifers were randomly allotted to four equal sized lots: 2 surfaced with concrete and 2 with soil. Self-feeders in soil-surfaced lots have concrete aprons.

Manure was collected from pens of cattle receiving a high energy ration, dried and processed through a hammer mill with the screen removed. It was fed mixed with other ingredients in the self-feeders. The ration containing manure consisted of 25% manure, 67.5% ground sorghum grain and 7.5% soybean meal. The control ration con-

[1] Department of Agricultural Engineering

tained 33.5% alfalfa crumbles and 66.5% ground sorghum grain. Chemical analyses of feed ingredients are in table 29 and feedlot and carcass data, in table 30.

Results

Although differences were small, heifers on concrete-surfaced lots gained slightly more and were more efficient. Concrete-surfaced lots are faster and easier to clean than unsurfaced lots, especially during wet weather.

Feed efficiency was the same for control heifers in both concrete- and soil-surfaced lots; however, heifers receiving 25% beef manure required more feed per pound of gain. Differences in feed costs per hundred weight gain were small in all cases.

Heifers receiving manure tried to separate it. A lower percentage of manure and pelleting the entire ration might have increased gains and reduced waste in the manure ration.

Samples of manure were analyzed in the veterinary diagnostic laboratory and found free of Salmonella organisms.

Table 29

Chemical Analyses of Feed Ingredients

	Feed ingredient		
	Sorghum grain	Beef manure	Dehydrated[1] alfalfa crumbles
Analysis,%:			
Protein (nitrogen x 6.25)	10.19	18.69	20.19
Ether extract (fat)	2.87	2.74	3.72
Crude fiber	1.87	13.79	20.68
Moisture	11.96	12.01	7.32
Ash	1.56	26.96	11.22
Nitrogen-free extract	71.55	25.81	36.87

[1] Dehydrated alfalfa crumbles were analyzed for protein only.

Table 30

The Influence of 25% Ground Beef Manure
In Rations of Heifers on
Concrete or Soil-surfaced Lots

	Type of surface			
	Concrete		Soil	
Ration	Manure	Control	Manure	Control
Initial wt., lbs. July 18, 1967	713	724	721	716
Final wt., lbs. Oct. 5, 1967	877	944	876	925
Total gain, lbs.	164	220	155	209
Av. daily gain, lbs.	2.08	2.78	1.96	2.65
Lbs. feed per lb. gain	11.95	9.09	12.64	9.09
Cost per cwt.#[1]	20.53	20.63	21.72	20.63
Carcass Data:				
Hot carcass wt., lbs.	546	577	545	558
Dressing, %[2]	62.3	61.1	62.2	60.3
Fat thickness, 12th rib, in.	0.33	0.34	0.39	0.35
Loin eye area, sq.in.	11.70	11.57	10.10	10.67
U.S.D.A. grade[3]	17	17	17	18

1 Manure valued at $5 per ton.

2 Based on hot carcass weight

3 Carcass grade score: Average good, 17; High good, 18.

The Value of Chlortetracycline (Aureomycin) and Sulfamethazine Fed Independently and in Combination to Weanling Beef Calves Following Shipment

C. L. Drake, L. I. Smart and E. F. Smith

Experimental Procedure

Two hundred weaning calves were received in two shipments and placed on experiment. The calves were weighed, ear tagged and tattooed as rapidly as possible after being received, and were treated as follows:

Treatment A - No oral medication (Control)

Treatment B - Fed 350 mg. sulfamethazine[1] per head daily

Treatment C - Fed 350 mg. chlortetracycline per head daily

Treatment D - Fed 350 mg. sulfamethazine and 350 mg. chlortetracycline per head daily

The cattle were fed sorghum silage to consumption and 3 lbs. sorghum grain (containing the medication) per head daily. They were injected with 10cc Combiotic (penicillin and streptomycin) when fever or respiratory difficulty occurred. Two replications of 100 calves each were used for this trial.

Results and Discussion

Data concerning this trial are in table 31. The calves receiving oral medication required fewer Combiotic injections resulting in a definite saving of time and labor.

[1] Sulfamethazine, chlorotetracycline, chlortetrocycline-sulfamethazine and partial financial support furnished by American Cyanamid Company, Princeton, N.J.

Calves used for experimental purposes are subjected to more stress than those handled in a conventional manner. They are tattooed, ear tagged, divided into smaller groups and weighed frequently. This may explain the large number of injections required. Except for a positive saving in time and labor due to oral medication, no definite trends can be established from this trial.

Table 31

The Effect of Chlortetracycline or Sulfamethazine Supplements for Weaned and Shipped Steer Calves

	Treatment			
Replication[1]	Control	Sulfamethzaine[1]	Chlorotetracycline[1]	Chlortetracycline Sulfamethazine[1]
No. calves	24[2]	25	25	25
Initial wt., lbs. Nov. 4, 1967	363	395	392	375
Final wt., lbs. Dec. 2, 1967	418	434	437	424
Total gain, lbs.	55	39	45	49
Av. daily gain lbs.	1.96	1.39	1.60	1.79
No. times treated[3]	36	11	5	2
Replication[2]				
No. calves	25	24[4]	25	25
Initial wt. lbs. Nov. 6, 1967	364	384	396	395
Final wt. lbs. Dec. 4, 1967	404	427	426	426
Total gain, lbs.	40	43	30	31
Av. daily gain lbs.	1.43	1.54	1.07	1.11
No. times treated[3]	35	3	12	17

1 350 mg. of each medication was fed per head daily

2 One calf died from respiratory infection

3 Injected with 10cc Combiotic

4 One calf developed muscular disorder and was removed from test

The Value of An Artery Clamp To Dehorn Cattle

C.L. Drake, R.R. Schalles and C.W. Smith[1]

A preliminary trail involving use of an artery clamp and a drawing and description of the clamp are reported in Bulletin 507.

This trial involved 42 horned heifers owned and fed by a cooperating feedlot operator. The heifers were individually weighed and placed on these experimental treatments:

1. Control - not dehorned
2. Dehorned using clamp; arteries pulled
3. Dehorned not using clamp; arteries pulled

All heifers were placed in one large lot and fed the same ration for 30 days after being dehorned.

Results

Weight gain results are in table 32. Heifers not dehorned gained the most which agrees with last year's trial. Heifers dehorned using the clamp gained slightly more than those dehorned not using the clamp; however, none of the differences in weight gain were significant, which is in agreement with last year's experiment. Differences this year were much smaller, which indicates that weight gain differences probably disappear as feeding pro-

[1] County Agricultural Agent, Winfield, Kansas

gresses (22 days in 1966 and 30 in 1967). The major arteries were pulled from each heifer that was dehorned.

Arteries were pulled about 10 seconds faster using the clamp. The clamp also made it easier to find the arteries so blood spurting was completely eliminated.

Best results are obtained on thin yearling cattle and close dehorning is necessary to sufficiently expose the arteries to be pulled.

The greatest advantage of a clamp appears to be reduced stress on animals and operators. The pressure of the clamp seems to reduce an animal's pain and prevents an operator from being covered with blood. When a bleeder is found, the clamp can be left on until the bleeding stops.

During the trial the heifers received 8 pounds of rolled sorghum grain, 25 pounds corn silage, 1.5 pounds of 42% protein supplement and 15 mg. stilbestrol per head daily.

Table 32

Weight Gain and Time Required to Pull Arteries From Yearling Heifers as Influenced by Use of an Artery Clamp When Dehorning

	Treatment		
	Control, not dehorned	Dehorned using clamp; arteries pulled	Dehorned not using clamp; arteries pulled
No. heifers	14	14	12[1]
Initial wt., lbs. Dec. 27, 1967	490	483	487
Final wt., lbs. Jan. 26, 1968	572	561	563
Av. total gn. lbs.	82	78	76
Av. daily gn. lbs.	2.73	2.60	2.52
Time required to pull arteries, seconds, average		30.3	41.2

[1] Two animals removed due to injury

The Influence of Marbling and Maturity on Beef Tenderness

H.J. Tuma, Darroll Grant, Richard Covington & D.H. Kropf

The beef carcass quality grading system currently used has been challenged by many who say current standards are too high and that the amount of marbling to attain a given grade should be decreased.

This study attempted to determine the importance of marbling and maturity on beef tenderness; those two major factors in determining quality grades. Current grade standards state that "to stay within a given grade, marbling must increase as maturity advances." For example, a small amount of marbling is necessary for A carcasses (young) to grade choice, a modest amount of marbling is nesessary for B (older than A) carcasses to grade choice.

The longissimus (ribeye) muscle from both wholesale rib cuts of 60 steer carcasses was used to study tissues and chemical and tenderness traits. Three maturity groups (A=youngest; A-B=intermediate; B=most mature for choice grade) and two marbling levels (small and moderate) were used.

Steaks from moderately marbled carcasses (upper half of choice grade) were more tender than steaks from the small marbled carcasses (high good - low choice grade). Tenderness

is only one of three eating characteristics important to the consumer. The flavor and juiciness, the other two, were not considered; however, others have shown that higher marbling (for example moderate) produces juicier and more flavorful steaks and roasts than lower levels and lower quality grades. That is why many chain stores and others use average choice or better as their minimum quality standard.

Our results indicated that maturity may not be as important as once thought. No tenderness differences were noted between most youthful, (A) and most mature, (B) steaks from carcasses within the choice grade. This is contrary to Federal Grade Standards and early research; but it has been substantiated by others (Field et al, Wyoming, Romans et al, South Dakota and McBee et al, West Virginia). That maturity differences may not be so great as once thought is reasonable because nutrition and management systems have changed and younger animals now are marketed at weights similar to those of older animals in the past.

Persons in industry have thought that there may be differences in marbling between the right and left sides of an animal. However, we found no side differences for ether extract content, which is an indication of marbling.

Muscle fiber diameter was greater for moderate than for small marbled steaks and increased with maturity. Despite those differences, fiber diameter was not related to tenderness. Waviness of muscle fibers has been used as an indicator of muscle contraction and tenderness. Wavy fibers are more contracted so muscles with more wavy fibers are less tender. The correlation between shear values and waviness was 0.45, which indicates that 20% of the variation in tenderness can be accounted for by fiber waviness.

Summary

Marbling influenced tenderness more than did maturity and there was no indication that marbling requirements for "choice" beef should be lowered. There are some indications that some of the histological traits of beef muscle might be useful to predict eating characteristics in carcasses and eventually in animal on-hoof.

Influence of Marbling and
Maturity on Shear Force Values*

Maturity	A (Youthful)	AB (Intermediate)	B (More Mature)
	18.08	18.32	17.79

Marbling	Small	Moderate
	18.45	17.66

* The lower the value, the more tender.

The Effect of Aureomycin and Sulmet Combinations in Feed On the Performance of Cattle

P.A. Phar and P. R. Zimmer[1]

Two feedlot trials were conducted during the summer of 1967 at the Morris Feed Yards, Morris, Kansas, to study effects of aureomycin (chlortetracycline) and sulfamethazine fed alone or in combination on weight gain, feed efficiency and general health of newly arrived feeder calves.

The calves originated in the Fort Worth, Texas, area and were trucked to the Morris Feed Yards, where they were individually identified and weighed before being fed and watered. Vaccinations with Leptospira pomona bacterin and infectious bovine rhinotracheitis vaccine preceded random allotment to pens of five head each.

Shrunk body weights were recorded at the beginning and end of the 28-day experiments. Cattle were held off feed and water approximately 18 hours before recording final weights. The cattle were checked daily for health status. A licensed veterinarian also observed the cattle frequently and recorded his observations and treatments.

Feed consumption records were maintained throughout each trial.

[1] Field Investigator, American Cyanamid Company, Princeton, N.J.

Results and Discussion

Composition of the basal ration and protein supplement is shown in tables 33 and 34. Results of these trials are shown in tables 35,36,37. Incidence of sickness was low and no death losses occurred. The cattle receiving treatment D (350 mg. aureomycin and 350 mg. sulmet/head/day) had highest daily gains and lowest feed requirements in both trials. The control cattle, treatment A, had higher daily gains and lower feed requirements than treatments B (350 mg. sulmet/head/day) or C (350 mg. aureomycin/head/day) in one trial (3). Trials 1 and 2 show control cattle with highest feed requirements. In trial 2 controls made the lowest average daily gain. The sulmet cattle (treatment B) gained consistently more and consumed more feed than did cattle receiving 350 mg./head/day of aureomycin (treatment C).

Under the conditions of these trials the combination of 350 mg./head/day of aureomycin and 350 mg./head/day of sulmet resulted in faster, more economical gains and consequently a shorter interval in recovering weight loss due to shipment.

Table 33

Composition of Basal Ration

Ingredient	Percent
Dehydrated alfalfa pellets	35
Cottonseed hulls	35
Sorghum grain	25
Molasses	5
	100

Table 34

Composition of Protein Supplement[1]

Ingredient	Percent
Soybean meal (44%)	65.0
Molasses (dried)	14.0
Dehydrated alfalfa meal	14.0
Dicalcium phosphate	5.2
Iodized salt	1.8
	100.0

Miconutrients/1000 lb.	
Cobalt carbonate	2.0 gm.
Zinc oxide	625.0 gm.
Vitamin A	10,000,000.0 I.U.
Vitamin D	1,500,000.0 I.U.

[1] Supplement was fed at the rate of two pounds per head daily.

Table 35

Summary of Trials

Treatment groups	A	B	C	D
Aureomycin mg/head/day	0	0	350	350
Sulmet mg/head/day	0	350	0	350
No. of steers	40	40	40	40
No. days on test	28	28	28	28
Av. initial wt. (lb.)	371.5	368.3	370.7	366.5
Av. final wt. (lb.)	438.1	437.7	435.5	442.6
Av. total gain	66.6	69.4	64.8	76.1
Av. daily gain	2.38	2.48	2.31	2.72
Av. daily ration	15.64	16.10	14.65	15.34
Feed/lb. gain	6.57	6.49	6.34	5.64
Cattle req. treatment	1	3	0	1
Cattle req. retreat.	1	1	0	0
Total treatments	2	4	0	1
Death loss	0	0	0	0

Table 36

Trial 2

Treatment groups	A	B	C	D
Aureomycin mg/head/day	0	0	350	350
Sulmet mg/head/day	0	350	0	350
No. of steers	20	20	20	20
No. days on test	28	28	28	28
Av. initial wt. (lb.)	337.0	337.7	335.7	332.3
Av. final wt. (lb.)	401.0	408.0	403.0	409.3
Av. total gain	64.0	70.3	67.3	77.0
Av. daily gain	2.29	2.51	2.40	2.75
Av. daily ration	14.22	14.78	12.98	14.08
Feed/lb. gain	6.21	5.89	5.41	5.12
Cattle req. treatment	1	3	0	0
Cattle req. retreat.	1	1	0	0
Total treatments	2	4	0	0
Death loss	0	0	0	0

Table 37

Trial 3

Treatment groups	A	B	C	D
Aureomycin mg/head/day	0	0	350	350
Sulmet mg/head/day	0	350	0	350
No. of steers	20	20	20	20
No. days on test	28	28	28	28
Av. initial wt. (lb.)	406.0	399.0	405.5	400.7
Av. final wt. (lb.)	475.3	467.5	468.0	476.0
Av. total gain	69.3	68.5	62.5	75.3
Av. daily gain	2.47	2.45	2.23	2.69
Av. daily ration	17.09	17.39	16.21	16.57
Feed/lb. gain	6.92	7.10	7.27	6.16
Cattle req. treatment	0	0	0	1
Cattle req. retreat.	0	0	0	0
Total treatments	0	0	0	1
Death loss	0	0	0	0

The Cattle Feeding Industry of Kansas

Philip Phar, Beef Cattle Nutrition
And Management Specialist

The Kansas cattle feeding industry has grown tremendously since 1956. The 1968 January Cattle on Feed Report shows more than ten times as many cattle in commercial feedlots as in 1956. Farm feedlots have also increased, but since 1966 over 50 percent of our cattle have been fed in lots with at least 1,000 head capacity.

Cattle feeding will continue to expand in Kansas because of our abundant feed grain, favorable climate, accessibility to markets, and replacement cattle and, most important, the skill, intelligence and attitude of Kansas feeders.

*Cattle and Calves on Grain Feed, Kansas

Date Jan. 1	Commercial lots	Farm lots	Total	Commercial lots
1956	30,000	152,000	182,000	16%
1957	38,000	115,000	153,000	25%
1958	44,000	127,000	171,000	26%
1959	49,000	166,000	215,000	23%
1960	58,000	217,000	275,000	21%
1961	88,000	249,000	337,000	26%
1962	99,000	284,000	383,000	26%
1963	150,000	293,000	443,000	34%
1964	183,000	264,000	447,000	41%
1965	200,000	251,000	451,000	44%
1966	260,000	220,000	480,000	54%
1967	311,000	275,000	586,000	53%
1968	338,000	272,000	610,000	55%

* Kansas Crop and Livestock Reporting Service

In 1966, 1,351,000 grain-fed cattle and 2,077,000 grass-fed cattle were marketed from Kansas. Grass-fed cattle and calves included those pastured on bluestem and other tall grasses, short grass ranges and wheat pasture and some that were wintered mainly on roughages and limited grain. Total Kansas cattle marketed in 1966 numbered 3,428,000 head.

The success of any feeding operation, commercial or farm feedlot, depends on many factors, but the most important is the ability of the feeder or feedlot to produce cheap, efficient feedlot gains. Improved nutrition and new methods of feed processing have played major roles in improving efficiency.

Commercial size feedlots have certainly been justified in their use of steam-processing equipment for milo and corn. Initial cost of the equipment is high but feed requirements can be reduced five to ten percent, or even more, when the grain is properly steam-processed.

Ensiled, high-moisture corn and milo is also being used by feeders of all sizes to increase efficiency. Upright silos both concrete stave and air-tight, and concrete lined trench silos are being successfully used to store grain at moisture levels of about 30 percent. The improved digestibility of grain ensiled at 30 percent moisture has resulted in increased feed efficiencies of up to 15 percent

More research is needed to refine these two methods of feed processing if we are to continue to improve feedlot efficiency. This research will have to be done in the feedlot and in the laboratory.

Kansas feeders have increased their use of the "futures" market the past year. As more people become acquainted with "futures contracts," more cattle will be "hedged" in feeding operations. Any feeder considering the use of the "hedge" must know the costs involved in feeding cattle. If a feeder does not know his costs and doesn't intend to learn, he can never successfully use the "futures" market. Furthermore he will probably not be a cattle feeder for too many more years.

There is a trend in Kansas for smaller feeders to consider shifting their operations to growing instead of fattening programs. This will allow a feeder to increase his capacity without increasing his feed storage, crop land, equipment, etc., and take advantage of the high efficiency of commercial feedlots during the final phase of fattening. The commercial feedlots have thus created a new market for smaller feedlot operators.

There is a little doubt that cattle feeding will continue to expand in Kansas. It is more important than ever before that the cattle feeding industry, the University and all allied industries work together to maintain and improve Kansas's position as a major cattle feeding state.

The Kansas Beef Cattle Improvement Program

H. W. Westmeyer and K. O. Zoellner

The Kansas Beef Cattle Improvement Program is to help improve beef cow herds in Kansas and to provide information that will be valuable to producers in selecting breeding animals and making management decisions. The program is not to encourage competition among herds. Environmenal conditions very from herd to herd so competition among herds cannot be "under the same rules".

Performance testing is simply a systematic method of recording differences in certain economical traits among animals. Traits important in producing beef cattle as related to carcass desirability and structural soundness, mothering ability, and rate of growth.

Performance Testing Objectives

1. To improve over-all management.
2. To improve growth rate and quality of calves.
3. To select bulls and heifers with desirable conformation, superior growth rates, that produce cattle with a high proportion of quality lean to fat.
4. To cull poor producing cows and bulls.

Kansas Beef Cattle Improvement Program forms, records and assistance also are available to those who do not desire to participate in breed programs.

How do you get started?

See your County Extension Agricultural Agent. He will help. He has complete information and can help you enroll in your breed program or in the Kansas Beef Cattle Improvement Program.

How does the program work?

Calf Program:

1. Identify each cow and herd sire with a number. The identifying number of the animal should not be changed or duplicated in the herd. It may be by hot iron, freeze brand, horn brand, neck chain, brisket tag, or ear tag and tattoo.
2. Identify each calf at birth with tattoo, ear tag or other positive means. Record calf identification, birth date, sex, dam's mother, and sire's number if known.
3. At weaning (between 160-250 days of age), weigh each calf and record the weight. In most herds weighing twice a year takes care of all calves born during a 12-month period.

4. Give each calf a conformation score when weighed. When possible, use a three-man grading committee. Average and record the committee grades.
5. Fill out necessary columns on the calf work sheet and it is ready to be processed.

Yearling Program:

1. Group-feed the calves at least 140 days. The ration should be a good growing ration so the animals amy express ability to gain. The ration should not be a finishing ration that likely would over condition the animals for breeding.
2. Weigh each animal if possible between 350 and 400 days of age. Record weight on Yearling work-sheet.
3. Grade and give conformation score to each animal as it is weighed. Record the score on the Yearling worksheet and complete information in appropriate columns. The Yearling worksheet then is ready to be processed.

Progeny Testing Program:

1. Select 8-10 calves sired by one bull for slaughter. At least half of the them should be steers. If the necessary number is not available from the

first calf crop, slaughter others from the next calf crop.

2. Full feed until steers weigh 975 to 1,025 pounds, and heifers 800 to 850 pounds. Cattle should have enough finish to grade choice and normally would have been fed 200 to 250 days.
3. Record initial weight and final weight.
4. Arrange for slaughter of cattle in packing plant with a U.S.D.A. meat grader.

How do you use the records?

1. To select herd sires.
2. To select replacement heifers.
3. To cull poor producers.
4. To improve gaining ability and to get more muscular carcasses.
5. To improve your management of the cow herd.

Table 38

Prices Used In Computing Costs of Rations, 1967-68

	Per ton
Dry rolled sorghum grain	$ 36.00
Sorghum silage	8.00
Alfalfa hay	25.00
Prairie hay	20.00
Dry rolled shelled corn	46.00
Dry rolled wheat	50.00
Salt	20.00
Urea	110.00
Ground limestone	22.00
Dehydrated alfalfa	64.00
Soybean oilmeal	96.00
Dicalcium phosphate	110.00
	Per lb.
Stilbestrol premix (1 gram per lb.)	$ .55
Aurofac 10 (10 grams chlortetracycline per lb.)	.65
Vitamin A. premix (10,000 I.U. per gram)	.28
Trace mineral premix	.10

First Annual Kansas Swine Producer's Day

Thursday, 26 Sept. 1968

The first annual Swine Producer's Day is planned for Thursday, 26 September, 1968. The new swine facilities will be completed, in operation, and open for inspection.

Research in progress will be discussed.

All persons involved in all areas of swine work in Kansas will be present to discuss your problems. An excellent pork lunch will be served at noon.

We are looking forward to meeting you and any of your friends who are interested in any phase of pork production.

Annual Sheep Day

Annual Sheep Day Programs have been conducted at Kansas State University since 1963. The first Monday in April is reserved for the program. The 1969 Sheep Day will be April 7.

Research and current topics of interest to sheep producers and people connected with the wool and lamb industry will be discussed. A program will be released in early 1969. We extend a sincere welcome to each of you to attend.

The Animal Husbandry Department