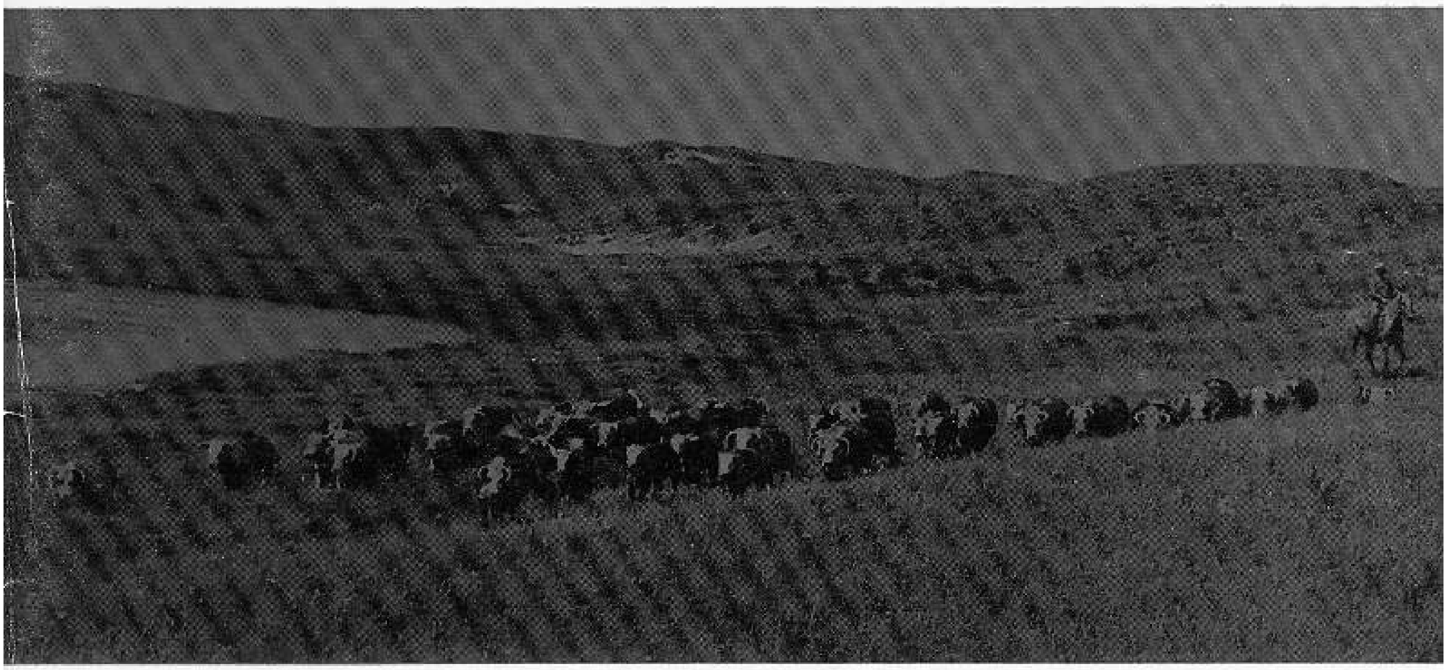
BULLETIN 529 • MAY 2, 1969 • 1968-1969 PROGRESS REPORT • 56TH ANNUAL

CATTLEMEN'S DAY



DEPARTMENT OF ANIMAL SCIENCE & INDUSTRY

KANSAS AGRICULTURAL EXPERIMENT STATION

KANSAS STATE UNIVERSITY, MANHATTAN

FLOYD W. SMITH, DIRECTOR

FOREWORD

"Planning for the Future" is the theme of the 56th Annual Cattlemen's Day. This is a memorable occasion as we are introducing to the public, for the first time, the new Beef Cattle Research Center.

This modern half-million dollar beef unit is unique and one of the most flexible research facilities in the country. It provides a variety of research approaches, such as individual and group feeding, large-lot feeding, confined-cowherds, various environments, and slatted floor building over a pit, which provides an excellent opportunity to study management of animal wastes.

The Beef Cattle Industry is Kansas's largest industry. January 1, 1968, all cattle on farms and ranches totaled 5,564,000 head with a value of $757 million. Economic studies indicate that beef cattle production in the State is expected to increase at least 79% by 1980. Development of hybrid milo and irrigation during the last decade, and a natural climatic advantage for livestock make possible the vast Kansas beef cattle industry that exists today, and provide tremendous possibilities for expansion.

The income multiplier is one measure of the interrelationships of various segments of the Kansas economy. One dollar out-put by the beef sector generates five times as much income in other sectors as it does in the cattle sector itself. The multiplier in the packing and processing industry is 6.9, and the packing and processing of meat in Kansas is expanding at a rapid pace. Truly, the Beef Cattle Industry and industries allied to it have a tremendous impact on the economy of Kansas. It will take cooperation of all people in the State to meet the challenge of fostering, guiding and properly implementing the vast expansion of the Beef Cattle Industry in Kansas. All Kansas citizens have a stake in its future because it permeates nearly all economic segments of the Kansas economy.

We in the Department of Animal Science and Industry pledge our efforts to serve this great industry through research, teaching, and extension. We hope we merit your confidence; we sincerely solicit your cooperation and support. Working together, we can achieve great progress in both the Beef Cattle Industry and the State of Kansas.

56th Annual

CATTLEMEN'S DAY

Friday, May 2, 1969

FRIDAY, MAY 2, 1969

"PLANNING FOR THE FUTURE"

8:00 a.m. Weber Hall Arena

Registration—Exhibits
(Coffee and donuts served)

10:00 a.m. Weber Hall Arena

Dr. Don Good, Head of the Department of Animal Science and Industry, presiding

Research Reports

- Pre-slaughter Feeding and Management of Cattle
  Dr. Dell M. Allen, Department of Animal Science and Industry, KSU
- Receiving and Handling Feeder Cattle
  Dr. Homer K. Caley, Extension Veterinarian, KSU
- Research on Cow-calf Performance
  Dr. Robert R. Schalles, Department of Animal Science and Industry, KSU
- Non-protein Nitrogen in Ruminant Nutrition
  Dr. Ben E. Brent, Department of Animal Science and Industry, KSU
- Future Research to Serve the Kansas Beef Industry
  Dr. Calvin Drake, Department of Animal Science and Industry, KSU

Remarks—Mr. Raymond F. Roemer, President, Kansas Livestock Association, Grainfield, Kansas

12:00 noon Weber Hall Arena

Smoked, Round Roast Lunch

BEEF FURNISHED BY WICHITA, KANSAS CITY, AND ST. JOSEPH LIVESTOCK MARKET FOUNDATIONS

1:00 p.m. Weber Hall Arena

- Presentation of Beef Production Contest Winners
  Mr. George Smith, Kansas Farmer, Topeka, Kansas; Professor Herman W. Westmeyer and Dr. Keith O. Zoellner, Department of Animal Science and Industry, KSU
- "New Horizons in the Beef Cattle Industry"
  Dr. L. S. (Bill) Pope, Associate Dean, College of Agriculture, Texas A & M University, College Station, Texas

Dr. Pope accepted his present position as Associate Dean of Agriculture for Administrative Affairs in 1968. He has vast experience in the field of beef cattle nutrition and is known for his work on winter feed levels and supplements for wintering beef females. He has served as advisor in Argentina and Ethiopia on nutrition and management of beef cattle. He was Head of the Department of Animal Science at Oklahoma State University before accepting his present post.

2:15 p.m. Beef Cattle Research Center

Dedication of the Beef Cattle Research Center (located at north end of College Avenue).

New Facilities for Beef Cattle Research

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

Block and Bridle Banquet for parents and visiting stockmen

FOR THE LADIES

Thursday, May 1, 1969

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

Kansas Cow Belles Dinner
Reservations by April 29 to: Mrs. Don L. Good, 2027 Sunnymeade Road, Manhattan, Kansas 66502

Friday, May 2, 1969

10:00 a.m. Weber Hall, Staff Memorial Library

Coffee for Visiting Ladies

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

Program—"Let's Have a Barbecue," Mrs. Audrey McGinn, Home Economist, State Board of Agriculture, Topeka, Kansas

12:00 noon Weber Hall Arena

Smoked, Round Roast Lunch with the men

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

Block and Bridle Banquet

C O N T E N T S

Cow Weight and Preweaning Performance of Calves

A.R. Singh, R.R. Schalles, W.H. Smith and F.B. Kessler

The influence of cow weight at parturition and during the lactation on preweaning performance of calves was evaluated. Hereford cattle at the Fort Hays Branch Experiment Station were used. Purebred sires had been used many generations in the herd that produced the calves.

The calves were born January through April. Cows and calves grazed native pastures without creep feed. Heifers were bred to produce first calves when about three years old. All male calves were castrated by one month of age. Calves were weighed and identified within 24 hours after birth and were again weighed at weaning. They were weaned between September 15 and November 1, at an average age of 263 days. Cows were weighed immediately following parturition and when the calves were weaned.

Birth weight, preweaning average daily gain (ADG), and weaning weight were available for 619 calves sired by 13 bulls during 6 years.

The data were analyzed by the least squares method, 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 interactions were excluded from the model.

The "t-test" was used to isolate differences among subclasses. Correlations among preweaning traits were obtained from data adjusted for average effects of birth weight, weaning weight, and cow weight at parturition.

Results and Discussion

Average birth weight, preweaning ADG, and weaning weight of 619 calves were 76.0, 1.56, and 483.3 pounds, respectively. Weights of cows at parturition ranged from 850 to 1595 pounds (1149 pounds average). Cows' weights were grouped into 10 classes. Cow weight at parturition significantly influenced birth weight (correlation, 0.26). However, cow weight did not significantly influence preweaning ADG nor weaning weight. The lightest cows produced the lightest calves at birth, but cows weighing 1300 to 1345 pounds at parturition produced the heaviest calves at birth.

Calves from cows weighing 1000 through 1195 pounds at parturition grew faster until weaning than calves from heavier or lighter cows but the difference was not significant. Cow weight did not significantly affect weaning weight of calves, but cows weighing more than 1150 pounds at parturition produced heavier calves at weaning than did lighter cows. Calves from cows weighing 1250 to 1295 pounds at parturition were heaviest at weaning.

Correlations of cow weights with productive years in the herd and with calves produced per year were small and nonsignificant, indicating essentially no relationship between cow size and reproductive performance.

From parturition to weaning cow weight changes varied from 295 pounds lost to 240 pounds gained. Cow weight changes were grouped into 5 classes. Simple means and standard errors, calculated according to years, showed that years of higher cow weight losses tended to be associated with faster calf growth rates and heavier calves at weaning, but not consistently so.

Cow weight change was significantly related to preweaning ADG and weaning weight of calves. Analyses indicated that cows that gain the least weight during lactation produce faster gaining calves. The difference between preweaning ADG of calves whose mothers lost weight and those whose mothers gained during lactation was highly significant.

The regression of preweaning ADG of calves on ratio of cow-weight change to weight at parturition (percent change in body weight) was - 0.007, or a calf gain of 0.07 pound per day faster for every 10 percent its mother lost of her weight. Perhaps cows that produced more milk had faster gaining calves and lost weight while nursing them.

Influence of cow weight changes on weaning weights of calves was highly significant and similar to the effects on ADG. Widest difference in weaning weights of calves (36.0 pounds) was between calves produced by cows that gained and those by cows that lost weight during the preweaning period.

When the means and standard errors of ratio of cow weight changes to cow weights at parturition were calculated according to cow age groups, 3- and 4 year-old cows lost the most weight on a percentage basis, and the losses decreased with cow's age. Ratios of cow-weight-change to weight-at-parturition indicated that for each percent loss in body weight of cows, calves were from 0.31 to 2.40 pounds heavier at weaning, depending on age of the cow. The effect on calves was greatest when their mothers were 5 to 7 years old; least when mothers were 4 years old, supporting the belief that mature cows have better mothering ability than either older or younger cows.

The regression of weaning-weight-of-calves on ratio of cow-weight-change to weight-at-parturition (percentage change in body weight) was 1.98, indicating a 1.98 pounds increase in weaning weight of calves for one percent loss of cow weight during preweaning. Analyses by cow-age groups gave similar results.

This study showed that calves from medium size cows (1150 to 1300 lbs.) tended to grow faster and were heavier at weaning than calves from lighter cows, though not significantly so. Cows that gained the least during the lactation produced heaviest calves at weaning, probably because the cows were producing more milk than those that gained more. Younger cows lost a larger percentage of weight during lactation than older cows.

An Evaluation of Heatmount Detectors in Beef Cattle Under Range Conditions

A.R. Singh, Guy H. Kiracofe and R.R. Schalles

Kamar[a] heatmount detectors were used last spring on 45 Polled Hereford cows 3 to 12 years old. Bulls ran with the cows. Most cows became pregnant, which lessened observations as the breeding season progressed. Detectors were placed on rumps with adhesive according to directions. Generally, the front edge of the detector was farther to the rear on heavier cattle than on lighter cattle.

First observation was May 28, 1968. Observations then were made weekly for 9 weeks, by checking for presence or absence of detectors. All cows that lost detectors or had the detector activated were palpated rectally to determine if ovulation had occurred. If the detector was present and unactivated, it was noted if dye had leaked in the detector.

Results and Discussion

The heatmount detectors were 82.2 percent accurate. Seventy-three observations had activated detectors in which 46 (63.0 percent) had ovulated. Fourteen pregnant cows (19.2 percent) with detectors activated, did not ovulate. Only 29 observations (7.8 percent) had ovulated without showing detector activation, which is normal for beef cattle under range conditions. Twenty-one percent (78 observations) of the detectors leaked some. Sixty observations (19 percent) lost detectors during the observation period, primarily by loss of hair but also affected by amount of rainfall.

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[a] Kamar Inc., Steamboat Springs, Colo.

The results suggest that Kamar heatmount detectors can be used to help detect heat in beef cattle under range conditions.

Table 1

Summary of Data Collected on Heat mount Detectors

Week	No. of observations	No. of detectors lost[c]	No. of cows with activated detectors	No. of cows ovulating	No. of cows that ovulated with activated detectors	No. of cows ovulating with detectors not activated	No. of cows not ovulating with activated detectors	No. of detectors with some dye leakage
1	42[a]	4	11	11	9	2	2	6
2	45	5	15	15	12	3	3	7
3	45	5	10	13	9	4	1	14
4	45	1	6	4	3	1	3	19
5	45	6	15	10	6	4	9	12
6	45	2	9	3	2	1	7	8
7	41[b]	16	4	17	3	14	1	8
8	35[b]	7	2	2	2	0	0	4
9	30[b]	14	1	0	0	0	1	0
Total	373	60	73	75	46	29	27	78

[a] Three cows had not yet calved.

[b] Remaining cows were pregnant.

[c] If detectors were activated before being lost observations were included in ovulation data.

Effects of Winter Nutrition Level on Cow and Calf Performance

R.R. Schalles, C.L. Drake and Guy Kiracofe

Cow and calf performance under four winter nutritional levels was evaluated, using 61 purebred Polled and high grade Hereford cows randomly allotted to obtain approximately equal pregnant and open cows in each group. The cows were 1.0 to 4.5 years old, except for two older ones. Average calving date was mid April. Forty-five live calves were born. They were weighed within 24 hours after birth and at monthly intervals from June to November. One calf was born dead. Cows were weighed each month and rotated among four native bluestem pastures during the entire year. All calves were graded and weaned at the last weighing.

Winter rations were formulated so the one with highest energy and protein would approximately maintain the cows weight from November to May. This ration consisted of 3 lbs. good quality alfalfa hay, 3 lbs. cracked sorghum grain and 1½ lbs. soybean meal daily. A second ration lower in protein consisted of 3 lbs. alfalfa hay and 3 lb. of sorghum grain daily. A third ration was lower in energy but high in protein with 3 lbs. alfalfa hay and 1½ lbs. soybean meal daily. Ration four was low in both energy and protein, containing only 3 lbs. alfalfa hay per day. Each group of cows was wintered and summered in approximately 300 acres native pasture of predominately big and little bluestem.

Results and Discussion

Average initial cow weights by groups ranged from 838 to 945 lbs. The random assignment put both old cows in the third group, which increased initial weight and age of the group. Cow weight in group 1 remained essentially constant from November till May as planned; all other groups lost weight. Cows receiving 3 lbs. alfalfa hay lost an average of 64 lbs. However, approximately 80 percent of the cows in each group calved late in the feeding period. During May, cattle on low protein rations gained less rapidly than other groups (groups 2 and 4 versus 1 and 3). All groups gained rapidly from June to August then changed little. By August average weight of all except those that had received only 3 lbs. alfalfa hay (Group 4) was around 1,000 lbs. Group 4 reached their highest average weight (942 lbs.) in October.

No difficulty was encountered at calving and 45 of the 46 calves born were weaned. Calf birth weights were approximately equal among groups (70 to 73 lbs.). Calf growth patterns were essentially the same in all groups. Calves from cows which received alfalfa hay and soybean meal (group 3) gained slower and were significantly lighter at weaning than calves from the other three groups.

The study is being continued with the same nutritional levels and the same cows in the same groups. One year's data indicate cows receiving low energy and protein (group 4) were stressed enough to prevent their reaching mature size as rapidly as cows on a higher nutritional plan. However, calf performance seemed not to be affected by the cows' low winter nutritional level. There was some indication with these rations that energy was more critical than protein. Refer to tables 7 and 8 page 29 for reproductive performance of a portion of these cows.

Table 2

Average Cow and Calf Performance Under Indicated Nutritional Levels

Group		1	2	3	4
	Alfalfa	3 lb.	3 lb.	3 lb.	3 lb.
Ration	Grain	3 lb.	3 lb.		
	SBM	1½ lb.		1½ lb.	
Data					
No. of cows		15	17	15	14
Avg. cow age		2.0	2.0	3.3	2.1
1967 cow wt.		838.4	880.7	945.0	895.0
1968 cow wt.		990.3	1002.3	1047.3	925.8
Cow wt. change		151.9	121.6	102.3	30.8
No. of calves		12	11	11	11
Calf birth wt.		70.1	76.2	70.3	73.3
205-day calf wt.		447.2	440.8	376.7	429.2
Calf weaning grade		11.5	11.8	11.1	11.7

Protein Synthesis in the Rumen: Ruminal Urease Inhibition by Acetohydroxamic Acid (Project 596)

Amos Adepoju, Fabio Portela and B.E. Brent

When urea is fed to ruminants, it is immediately converted to ammonia by an enzyme, urease. The ammonia usually becomes available faster than rumen bacteria can convert it to protein. Studies were reported last year (Bulletin 518) on attempts to slow down, or inhibit urease with acetohydroxamic acid.

This year effects of acetohydroxamic acid on rumen ammonia, and volatile fatty acid levels in both sheep and cattle have been studied. In both, rumen ammonia was depressed for about 4 hours after feeding, and rumen fluid urea levels were increased, showing that urease was inhibited. Ammonia data for the steers showed no cumulative effect from prolonged use of acetohydroxamic acid, and no residual effect when it was withdrawn from the ration.

Volatile fatty acid concentrations and patterns for steers and lambs indicated the inhibitor had no effect on carbohydrate metabolism in the rumen.

Ration digestibility was studied in sheep, using 0, 120, or 240 mg. acetohydroxamic acid (AHA) per feeding. Ration composition is shown in table 3 . Digestion data, total digestible nutrients (TDN) and nitrogen balance are shown in table 4 .

The data show that AHA had little, if any, effect on ration digestibility.

Nitrogen balance indicates the amount of nitrogen converted to protein and used in body growth. Since AHA depressed nitrogen balance, urea apparently was absorbed unchanged through the rumen wall and excreted in the urine.

Table 3

Ration Composition[1]

Constituent	Percent
Corn	73.13
Prairie hay	25.00
Urea	1.27
Salt	0.37
Ground limestone	0.23

[1] The complete diet was finely ground and pelleted.

Table 4

Mean Digestibility
TDN[1], and Nitrogen Balance

	Control	120 mg. AHA per feeding	240 mg. AHA per feeding
Dry matter	74.66	72.30	73.67
Crude protein	71.21	70.21	71.28
Crude fiber	38.58	30.37	36.85
Ether extract	75.68	78.57	76.58
Nitrogen free extract (NFE)	82.56	80.76	81.71
TDN	76.21	74.28	75.52
N balance, gm/6 days	44.74	25.91	22.71

[1] Digestibilities and TDN values represent an average of 2 observations. Nitrogen balance is an average of 6 observations.

Summary

Acetohydroxamic acid (AHA) inhibits rumen urease but has no effect on ration digestibility. Because unhydrolyzed urea is rapidly absorbed and excreted, it seems unlikely that urea utilization efficiency can be increased by inhibiting urease.

Influence of Feeding Practices and Season of Birth on Calf Performance

A.R. Singh, R.R. Schalles, W.H. Smith and F.B. Kessler

The ability of beef cows to produce heavy, vigorous and good quality calves every year is one of their most important economic traits. Feeding practices have been reported to influence average daily gain (ADG) and weaning weight. We evaluated creep-feeding, noncreep-feeding, season of birth, and other factors that affect preweaning performance of calves.

At the Fort Hays Branch Experiment Station, Hays, Kansas, purebred sires had been used many generations in the grade Hereford herd. Calves, born in both spring and fall, were randomly allotted to creep-fed and noncreep-fed groups every year. Cows and calves grazed native pastures.

All calves were weighed and identified within 24 hours after birth and were again weighed at weaning. Weaning date varied from September 15 to November 1 for spring calves and July 1 to July 15 for fall calves. Their average age at weaning was 232 days. Birth weight, preweaning ADG, and weaning weight were available for 433 calves from 8 sires during 4 years.

The data were analyzed by least squares method, using a multiple classification model with regressions and interactions with unequal subclass numbers. Standard errors were calculated and the "t-test" was used to isolate differences among subclasses.

Results and Discussion

Effects of various factors are shown in Tables 5 and 6 . Average birth weight, preweaning ADG and weaning weight were 74.6, 1.90, and 515.0 pounds, respectively.

Feeding practices (creep-feeding versus noncreep-feeding) did not significantly affect preweaning ADG or weaning weight. Creep-fed calves had 0.03 pound advantage in preweaning ADG and were only 4.38 pounds heavier at weaning than noncreep-fed calves. Perhaps creep-feeding would be justified by cows producing less milk. Here nutrient demands of noncreep-fed calves apparently were met.

Season significantly affected birth weight but not preweaning ADG or weaning weight. Spring-born calves were 2.4 pounds heavier at birth, grew 0.04 pound per day faster and were 12.0 pounds heavier at weaning than calves born during fall. But only birth weights were significantly different.

Interaction between feeding practices and season was highly significant. Contrary to the most previous reports, creep-feeding had greater effect on calves born in spring than those born in fall. Creep-fed calves born in spring weighed 27.6 pounds more at weaning than creep-fed calves born in the fall.

Sires significantly influenced all traits studied. Greatest differences among sire groups in birth weight, preweaning ADG, and weaning weight of calves were 8.5, 0.09, and 22.0 pounds, respectively.

Years did not significantly influence birth weight, but did significantly influence preweaning ADG and weaning weight. The fourth year was best; the first year poorest for preweaning ADG and weaning weight. The preweaning ADG and weaning weight differed 0.22 and 50.5 pound, respectively, between 1st and 4th years.

Sex of calf significantly influenced (P<.01) all performance traits studied. Bulls were 4.64 pounds heavier than heifers at birth. Steers gained 0.11 pound per day faster and were 24.6 pounds heavier at weaning. Male calves were heavier at birth and maintained the advantage to weaning.

Age of dam did not significantly influence any performance trait studied. Birth weight of calves tended to increase with age of dams. Calf preweaning ADG and weaning weight were lowest for 8 to 12-year-old cows and highest for 4-year-old cows. Calves from 4-year-old cows grew 0.04 pound per day faster and were 10.63 pounds heavier at weaning than the average. Variation in calves' growth rate, normally associated with age of dam, could result largely from differences in dams' milk production.

Age of calf had no significant influence on preweaning ADG, but was significantly associated with weaning weight. The regressions of preweaning ADG and weaning weight on age of calf were 0.0001 and 1.91, respectively, indicating that weaning weight of calves increased an average of 1.91 pounds per day.

Birth weight significantly influenced preweaning ADG and weaning weight. Regression coefficients indicated a 0.01 pound per day advantage in preweaning ADG and 3.34 pounds in weaning weight of calves for each 1 pound advantage in birth weight.

Therefore, this study suggests that creep-feeding was probably not an economical feed practice for beef calves. In this study, it was more useful for spring calves than fall calves, which is completely opposite to the results of most of the previous researchers. Spring calves were a non-significant 12 pounds heavier than fall calves.

Table 5

Least Squares Effects of Management, Season of Birth, and Year on Performance of Hereford Calves

Effects studied	No. of calves	Birth weight lbs.	Av. daily gain lbs.	Weaning weight lbs.
General means	433	74.60 ± 0.36	1.90 ± .011	515.0 ± 3.72
Management				
Noncreep fed	228	-	-0.017 ± .001	-2.19 ± 0.13
Creep-fed	205	-	0.017 ± .001	2.19 ± 0.22
Season of birth				
Spring	326	1.20 ± 0.10	0.022 ± .017	5.92 ± 3.98
Fall	107	-1.20 ± 0.39	-0.022 ± .020	-5.92 ± 4.49
Years				
1	117	-0.97 ± 0.66	-0.082 ± .013	-20.93 ± 2.84
2	133	0.70 ± 0.25	-0.20 ± .000	-2.29 ± 0.01
3	129	0.75 ± 0.25	-0.035 ± .001	-6.39 ± 0.04
4	54	-0.48 ± 0.89	0.137 ± .005	29.61 ± 1.13

Table 6

Least Squares Effects of Sex, Age, Birth Weight of Calf and Age of Dam on Performance of Calves

Effects studied	No. of calves	Birth weight lbs.	Av. daily gain lbs.	Weaning weight lbs.
General means	433	74.60 ± 0.36	1.90 ± 0.01	515.0 ± 3.72
Sex				
Heifers	189	-2.32 ± 0.11	-0.055 ± .002	-12.28 ± 0.46
Steers	244	2.32 ± 0.08	0.055 ± .003	12.28 ± 0.58
Age of dam, yrs.				
3	59	-1.40 ± 0.51	-0.003 ± .000	-0.31 ± 0.05
4	78	0.07 ± 0.38	0.041 ± .000	10.63 ± 0.07
5-7	145	0.64 ± 0.26	-0.016 ± .003	-3.77 ± 0.55
8-12	151	0.69 ± 0.28	-0.023 ± .002	-6.55 ± 0.44
Age of calf[a]	433	-	b = 0.0001	b = 1.91
Birth weight[a]	433	-	b = 0.01	b = 3.34

[a] Reported as regression coefficients.

Effect of Wintering Ration on Reproductive Phenomena in Beef Cows on Range

Guy H. Kiracofe, R.R. Schalles and G.B. Marion

Data are available to indicate proper wintering rations for beef cows under dry lot conditions, but few are available under range management for Kansas. This is our first attempt to determine adequate winter rations for reproductive efficiency in Kansas and to notice reproductive inefficiencies for future study.

We used 45 Polled Hereford cows, each with access to a basic ration of Bluestem winter pasture and 3 lbs. of alfalfa hay per day. November 1, 1967, the cows were randomly divided into four groups receiving these supplements:

Group 1 -- 3 lbs. milo and 1.5 lbs. soybean meal (high energy-high protein)

Group 2 -- 3 lbs. milo (high energy-low protein)

Group 3 -- 1.5 lbs. soybean meal (low energy-high protein)

Group 4 -- basic ration (low energy-low protein)

The high energy-high protein ration was slightly higher than National Research Council (NRC) requirements for energy and protein; the low energy-low protein ration was approximately half of NRC recommendations. The rations were calculated to allow the high energy-high protein group to gain weight and the low energy-low protein group to lose weight between November 1, 1967, to May 1, 1968. No attempt was made to estimate the amount of winter pasture consumed.

All cows were corralled and their reproductive tracts palpated via rectum once a week after calving until the second heat or rebreeding. Time of ovulation and size of pregnant and nonpregnant uterine horns were recorded each week. Daily observations were made to detect heat, and heat mount detectors were kept on all cows to help detect heat.

All cows calved between February 14 and May 12, 1968; average calving date was April 15. Bulls were placed with the cows May 8. Data were statistically analyzed. Statistical corrections were used to compensate for cows not exposed to a bull during first heat.

Results

The effect of nutrition on postpartum conception is shown in table 7 , and effects on ovulation, estrus and uterine involution, in table 8 . Conception rate of cows on the low energy-low protein ration was 63%. Rates of the other groups were 90, 100 and 91%. Although not statistically different in all cases, the low energy groups generally rebred later than other groups. Although the low energy-high protein group required longer to rebreed in one analysis, that was not true when all cows were included. They recovered more rapidly and rebred earlier than the low-low group when cows that calved late and had access to succulent grass before first heat were included.

The rations had no statistical significant effect on uterine involution (return of the uterus to a nonpregnant size), although the low energy-low protein group involuted slightly earlier. Rather than meaning that the uteri of those cows were capable of maintaining pregnancy earlier after parturition, they took longer to rebreed. The low energy-high protein group took longer to ovulate and return to heat; however, that effect was not clear cut because neither of the other low energy or high protein groups had so long an interval from calving to ovulation or heat.

Twenty-five of 45 cows ovulated within 20 days after calving but 40% of the 25 had no detectable sign of heat. Ninety-two percent of the 45 cows ovulated on the ovary contralateral to the previously pregnant uterine horn. Averages for ovulating, exhibiting heat and rebreeding were 22.7, 31.4 and 60 days, respectively after calving. Theoretically, we could expect a cow under similar conditions to ovulate without heat approximately 15 days after calving, have short cycles and second ovulations to coincide with their first heat. Conception was only 20% at the first heat. It appeared that approximately 45 days, two heats or three ovulations needed to lapse for an acceptable conception rate. The postpartum period of infertility may be a potential for increasing beef production, particularly in confinement production if the interval can be shortened. Methods of reducing the calving-to-rebreeding interval and to determine best treatment for postpartum uterine dysfunction are being studied.

Milo (energy) appeared to be more advantageous in the winter ration than soybean meal (protein) for efficient future reproductive performance. Cows receiving only winter pasture and 3 lbs. of alfalfa had lower conception rates than cows receiving either milo, soybean meal or both. The data indicate that cows need an energy or protein supplement in addition to Bluestem winter pasture and 3 lbs. of alfalfa in a spring calving program for maximum conception rate. Additional energy is required for a short calving-to-conception interval. If spring calving is late enough so cows have succulent grass, the energy requirement appears to be less critical and protein or energy protein is an adequate winter supplement. However, if calving is earlier, energy appears to be more critical in regard to rebreeding early.

Table 7

Effect of Winter Ration on
Postpartum Conception in Polled Hereford Cows

Treatment group	% Conception	Days from calving to conception +SE*	Days from calving to conception**
High energy -high protein	92	52.0 ± 4.05[a]	47.6 ± 3.69[a]
High energy -low protein	100	58.0 ± 4.25[ab]	40.1 ± 4.62[a]
Low energy -high protein	91	59.2 ± 4.36[ab]	58.1 ± 4.42[b]
Low energy -low protein	73	69.2 ± 4.68	53.4 ± 5.41[ab]

* First analysis includes all cows that rebred.
** Second analysis does not include cows that did not rebreed or cows that had access to succulent grass before first heat.
a,b,ab Means with the same letter superscript do not differ statistically (P>.05).

Table 8

Effect of Winter Ration on
Postpartum Ovulation, Heat and Uterine
Involution

Treatment group	Days postpartum to ovulation ±	Days postpartum to meat	Days to uterine involution*
High energy -high protein	18.6 ± 2.78[a]	27.2 ± 3.84[a]	31.0
High energy -low protein	23.2 ± 3.08[ab]	29.5 ± 3.60[ab]	29.6
Low energy -high protein	30.4 ± 2.73[b]	39.3 ± 3.62[b]	31.5
Low energy -low protein	18.4 ± 3.10[a]	29.6 ± 3.73[ab]	25.5

* Return of pregnant horn to nonpregnant size (approximately 35 mm diameter) or to size of nonpregnant horn.
a,b,ab Means with the same letter superscript do not differ statistically (P>.05).

The Value of Dehydrated Alfalfa and Delayed Grain Fed to Young Cows on Winter Bluestem Pasture, 1965-1968 (Project 253)

R.W. Swanson, E.F. Smith, D. Richardson and C.L. Drake

This test was to compare the following three winter treatments for young cows on bluestem pasture. Treatment 1 -- One pound of soybean oil meal and 2 pounds of ground sorghum grain per head daily during the entire winter feeding period. Treatment 2 -- One and a half pounds of soybean meal fed 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 amount of protein as those on treatment 1 received. Treatment 3 -- Dehydrated alfalfa fed at 3.3 pounds and ground sorghum grain at 1 pound per heifer daily during the entire winter feeding period.

In addition to the above all cows were fed 5 pounds of ground sorghum grain per cow daily from March 1 to April 20, 1968, because they were thin.

The above three rations were formulated to supply approximately 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.

There were three recorded periods of winter supplementation which started in November and closed in April.

(1) Open calves, winter of 1965-66

(2) Bred Yearlings, winter of 1966-67

(3) Bred two year olds, winter of 1967-68

The cows were grazed together on bluestem pasture each summer with no supplementation other than salt and were exposed to the same bulls. They were bred as yearlings in the summer of 1966; the results reported are for the calf crops produced in 1967 and 1968.

Results

Results are reported in table 9. There were no significant differences among treatments. Delayed grain feeding reduced the average weight of the cows which was probably due to the larger number of calves weaned. For the year 1967 pounds of calf weaned per cow was greatest for delayed grain feeding, largely a result of more calves weaned. The cows fed dehydrated alfalfa calved later the first year and weaned fewer pounds of calf per cow.

Table 9

The Value of Dehydrated Alfalfa and Delayed Grain Feeding
of Young Cows on Winter Bluestem
November to April, 1965-66, 66-67, 67-68

	Soybean oil meal and sorghum grain fed at same rate all winter	Soybean oil meal and sorghum grain, grain feeding delayed until spring	Dehydrated alfalfa and sorghum grain
Pasture number	12A & 15	12C & 7B	12B & 7A
Number of cows, Dec. 18, 1965	28	27	27
Av. wt. of cows that raised calves, Sept. 5, 1968	882	826	872
Gain per cow (cows that raised calves) Dec. 18, 1965 to September 5, 1968	417	380	402
1967 calves			
No. of cows in herd at breeding time	28	27	27
Calving date	3/12	3/14	3/21
Birth wt., lbs.	61	59	61
Calves born alive, %	75	81	71
Calves weaned, %	71	74	71
Weaning wt., sex adjusted to steer basis	372	374	348
Weaning wt. adjusted to 210-day steer basis	382	390	367
Pounds of calf weaned per cow in the herd at breeding time (sex and age adjusted)	264	277	247
1968 calves			
No. of cows in herd at breeding time	28	25	27
Calving date	3/5	3/14	3/13
Birth wt., lbs.	60	59	62
Calves born alive, %	89	88	89
Calves weaned, %	86	88	89
Weaning wt., sex adjusted to steer basis	441	430	428
Weaning wt. adjusted to 210-day steer basis	421	424	410
Pounds of calf weaned per cow in the herd at breeding time (sex and age adjusted)	379	378	381

Sorghum Grain, Urea or Soybean Meal as a Protein Source in All-concentrate Cattle Finishing Rations, (Project 253) 1968.

G.A. Greathouse, R.W. Swanson, E.F. Smith, L.I. Smart, and B.E. Brent

Results of previous similar research have been reported in Kansas Agricultural Experiment Station Bulletins 483, 493, 507, and 518.

Trials at several research centers and here have shown that roughage may be satisfactorily omitted from finishing rations for cattle, often reducing feed required per pound of gain. Cattle may be finished on all-grain diets with only mineral and vitamin supplements when the grain has sufficient protein.

Feedlot trials using three different rations (Table 10) were conducted. A premix was added to make the rations as nutritionally adequate as possible. All the sorghum grain used was obtained at a local elevator, dry rolled and mixed with other ration ingredients as needed.

Steers used were started on a mixture of 60% dehydrated alfalfa crumbles and 40% ground grain with prairie hay fed separately. During three weeks the dehydrated alfalfa crumbles and prairie hay were gradually eliminated.

Experiment 1

March 5 to August 7, 1968 - 155 days

Twelve steers purchased near Manhattan, Kansas, were used. They were fed individually, four to each of the three rations shown in table 10.

Each steer was subjected during the feeding trial to an 8- to 11-day digestibility study of rations he consumed.

Results

The results are reported in table 11. Rations containing urea or soybean meal were about equal. The urea ration cost least per pound of gain. Steers fed sorghum grain not supplemented with protein performed below other steers. Since the performance of the steers fed urea was equal to the performance of the steers fed soybean meal, the limiting factor in feeding sorghum grain as the only source of protein would appear to be the quantity of nitrogen in the diet.

Experiment 2

August 7, to November 15, 1968 - 100 days

Thirty-five steers that had been grazed on bluestem pasture were divided into three treatment groups and fed the three rations shown in table 10. Four steers from each group were individually fed; the remainder group fed. Rations were always accessible. The premix was pelleted then crumbled to obtain a better mix with the ground grain.

Results

The results are reported in table 12. Differences among treatments were small. Steers fed soybean oil meal required the least feed per pound of gain (6.1 to 1 for those group fed).

Carcasses graded high good to low choice and there seemed to be no differences by treatments in the carcasses.

Feed cost per cwt. of gain varied little, from $12.60 (group fed steers) to $13.46 (individually fed steers) with both extremes for animals fed soybean oil meal.

All rations were satisfactory. When a protein supplement is needed, either urea or soybean meal could be used, depending on relative costs.

Table 10

Composition of Rations Used,[1] 1968

Ration mix	Sorghum grain	Sorghum grain and 1% Urea	Sorghum grain and Soybean oil meal
	Pounds of 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 11

Experiment 1

Sorghum Grain With No Added Protein in All-concentrate
Cattle Finishing Rations
March 5 - August 7, 1968 - 155 days
Individually-fed Steers

	Sorghum grain	Sorghum grain, 1% Urea	Sorghum grain, Soybean meal
No. of steers per ration	4	4	4
Av. initial wt., lbs.	575	619	568
Av. final wt., lbs.	981	1085	1033
Av. daily gain, lbs.	2.62	3.01	3.01
Av. daily feed intake, lbs.	17.9	19.1	18.6
Feed required per lb. of gain, lbs.	6.82	6.34	6.16
Feed cost per cwt. of gain, $[1]	12.65	12.01	12.67
Percent protein in concentrate mixture (88% dry matter basis)	9.55	11.77	11.91
Cost of concentrate mixture per ton, $	37.09	37.83	41.14
Carcass Data:			
Av. hot carcass wt., lbs.	561	647[2]	614
Av. rib eye area, sq. inches	9.99	11.71	11.28
Av. fat thickness, inches	.43	.57	.55
Av. % kidney knob (estimate)	2.1	2.0	2.25
Av. marbling score	Small	Moderate	Modest
Av. USDA grade	Good+	Choice +	Choice-

[1] Feed costs used are on inside back cover.

[2] One liver abscess detected during slaughter

Table 12

Experiment 2

Sorghum Grain, Urea, or Soybean Meal as Protein Source in All-concentrate Cattle Finishing Rations
August 7 to November 15, 1968 - 100 days

	1 Individually-fed steers			2 Group-fed Steers			3 Summary (1 & 2 combined)		
	Sorghum grain, ground, 1% urea	Sorghum grain, ground, Soybean meal	Sorghum grain, ground	Sorghum grain ground, 1% urea	Sorghum grain, ground Soybean meal	Sorghum grain, ground	Sorghum grain ground, 1% urea	Sorghum grain, ground, Soybean meal	Sorghum grain, ground
Number of steers per treatment	4	4	4	8	8	7	12	12	11
Av. initial wt., lbs.	699	700	660	650	654	694	666	669	681
Av. final wt., lbs.	1022	1055	1001	1019	1014	1057	1020	1027	1037
Av. daily gain, lbs.	3.26	3.59	3.44	3.73	3.64	3.67	3.57	3.62	3.59
Av. daily feed intake, lbs.	21.44	23.0	22.96	24.63	21.85	25.32	23.57	22.23	23.19
Feed required per lb. of gain, lbs.	6.84	6.55	6.83	6.74	6.13	7.07	6.77	6.27	6.92
Feed cost per cwt. of gain,[1] $	12.94	13.46	12.65	12.74	12.60	13.07	12.81	12.89	12.92
Percent protein in concentrate mixture (88% dry matter basis)	10.9	10.7	8.4	10.9	10.7	8.4	10.9	10.7	8.4
Cost of concentrate mixture per ton,[1] $	37.83	41.14	37.09	37.83	41.14	37.09	37.83	41.14	37.09
Carcass data:									
Av. lbs. hot carcass wt.	606	601	587	590	589	605	595	593	598
Av. loin eye area, in.	11.53	11.19	10.63	11.24	10.87	11.26	11.34	10.98	11.03
Av. fat thickness, in.	.53	.55	.70	.60	.53	.56	.58	.54	.58
Av. marbling score	Slight +	Small	Small -	Small -	Slight +	Small	Small -	Small -	Small -
Av. U.S.D.A. grade	Good +	Choice -	Good +	Good +	Good +	Choice -	Good +	Good +	Good +
Av. yield grade[2]	3	3.25	2.75	2.75	2.63	2.85	2.83	2.84	2.81

1 Feed costs are on inside back cover

2 Yield Grade: 1 to 5, with 1 most desirable

Different Methods of Managing Bluestem Pastures (Project 253), 1968

E.F. Smith, C.E. Owensby, R.W. Swanson,
and J.D. McKendrick

This experiment was to determine the effect of increased early summer stocking and burning on cattle performance, productivity of pastures and range condition as determined by plant population changes.

Early stocking at twice the normal rate for the first half the growing season was tried hoping for more gain per acre and cattle ready for dry lot finishing at midsummer. If grass recovers the last half of the season, it could be "mined" the first half when highest in nutritive value.

Previous tests had shown that late spring burning increases summer weight gains and is compatible with good pasture management.

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, as when moisture conditions are good and excessive dry grass has accumulated.

Pastures used in this study were between an old research project and a new one. Since all the pastures were used in previous research, their past history is used to help explain some of the results obtained.

Pasture 1 was continued under its same treatment (moderate stocking), pastures 2 and 9 were not used. Pasture 3 had been lightly stocked previously. Pastures 4, 5, and 6 had been in a deferred rotation grazing scheme. Pasture 10 was previously burned annually at mid-spring. Pasture 11 was continued, as for several years, on annual late spring burning.

The experimental treatment for each pasture in 1968 follows (unless otherwise stated, the grazing season was May 1 to October 4; if a pasture was burned, it was in late spring):

Pasture 1 - Moderate stocking

Pasture 3 - Double early stocking, May 1 to July 16.

Pasture 4 - Moderate stocking

Pasture 5 - Burned periodically, when soil moisture was ample and a residue of old grass accumulated, burned in 1968.

Pasture 6 - Burned every third year, burned in 1967 (not in 1968).

Pasture 10 - Double early stocking, May 1, to July 16.

Pasture 11 - Burned annually

Yearling Hereford steers were purchased as calves in October, 1967, near Medicine Lodge, Kansas, and were fed alfalfa hay during that winter. May 2 they were randomly allotted to treatments and weighed individually after being gathered and held overnight without feed or water. Each steer was implanted with 15 mg of diethlstilbestrol.

Pastures 5 and 11 were burned April 25, 1968, under a 5 to 8 MPH wind. Only about 35 percent of pasture 11 burned and about 50 percent of pasture 5; grass was too sparse to carry the fire.

Results

The results are reported in tables 13, 14 and 15.

Annual and periodic burning improved weight gain over not burning.

Last year the periodically burned pasture was not burned and performance was the same as under not burning.

Pasture 6, which is burned every three years (last burned in 1967), was not burned this year; no improvement over non-burning was obtained. Last year when this pasture was burned, weight gain improved 13%. Although there may be some carryover effect from burning, results to date indicate that the response to burning is greatest the year a pasture is burned.

Double stocking early only produced about the same steer gain per acre and the same daily rate of gain as under moderate stocking for the entire season.

Table 13

Per Acre Production and Disappearance of Forage, Weeds and Mulch (Air-dry). Donaldson Pastures Near Manhattan, 1968 Clippings Taken at Close of Growing Season

Pasture no.	1	3	4	5	6	10	11
Under cages lb/A (air-dry) (Estimated pounds per acre produced)							
Ordinary upland range site							
Forages	3619	5196	5392	4405	4522	4438	4262
Weeds	529	418	247	355	258	520	663
Mulch	1923	2114	1877	392	685	1211	-
Limestone breaks range site							
Forages	2092	2619	5531	2762	3421	3416	2888
Weeds	863	161	883	128	106	266	260
Mulch	1132	1628	2401	176	581	1110	-
Disappearance (Estimated pounds per acre grazed)							
Ordinary upland							
Forages	1877	2048	2828	3238	1854	2249	2381
Weeds	383	269	114	196	158	456	484
Mulch	782	286	454	170	546	390	-
Limestone breaks							
Forages	681	703	2451	892	868	1524	1097
Weeds	542	48	731	33	42	121	205
Mulch	-	-	747	-	-	11	-
Remainder (Estimated pounds per acre remaining at end of season)							
Ordinary upland							
Forages	1742	3147	2564	1174	2667	2189	1881
Weeds	145	150	132	158	99	64	178
Mulch	1141	1828	1423	222	1231	821	-
Limestone breaks							
Forages	1418	1916	3079	1870	2553	1892	1791
Weeds	321	112	152	95	64	145	55
Mulch	1328	1716	1654	242	639	1099	-

Table 14

Grass Increasers and Decreasers As Percentage of Total 1968 Vegetation, and an Estimated Range Condition[1] Based on Percentage of "Original" Vegetation

Pasture no.	1	3	4	5	6	10	11
Ordinary upland, range site							
				Percentages			
Decreasers	37.0	40.7	45.5	46.0	43.9	62.1	60.7
Increasers	43.2	46.2	41.0	35.3	40.1	19.5	27.8
Range condition[1]	56.3	62.2	66.9	65.3	63.9	81.4	78.0
Limestone breaks, range site							
Decreasers	50.8	44.2	65.2	64.2	72.6	57.4	74.7
Increasers	29.2	43.3	24.0	23.2	19.9	31.1	22.7
Range condition[1]	79.0	76.5	93.2	93.1	93.7	85.7	93.0

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

Table 15

Different Methods of Managing Bluestem Pastures
Compared by Weight Gains of Steers 1968.

	Grazed May 1 - Oct. 4, 157 days					Grazed May 1 - July 16, 76 days	
	Moderate Stocking rate					Double early stocking	
	Not burned		Burned			Not burned	
			Periodically[1]	Every 3rd yr.[2]	Annually		
Pasture number	1	4	5	6	11	3	10
Number of steers per pasture	20	20	20	20	15	40	30
Acres per pasture	60	60	60	60	44	60	44
Acres per steer	3	3	3	3	3	1.5	1.5
Initial wt. per steer, lbs.	452	458	460	443	460	456	479
Gain per steer, lbs.	251	252	306	259	308	114	139
Daily gain per steer, lbs.	1.60[3]	1.60[3]	1.95	1.65	1.96	1.50	1.83
Gain per acre, lbs.	84	84	102	86	105	76	95

1 Burned in 1968

2 Burned in 1967

3 Daily gain in pounds to July 16 for pasture 1, 1.50; pasture 4, 1.79.

Identical Twin Cows on Winter Bluestem Pasture Used to Measure the Value of Supplemental Feed and of Vitamin A.

G.A. Greathouse, R.W. Swanson and E.F. Smith

1. Value of Supplemental Feed

Two pairs of identical twin heifer calves were grazed together on bluestem pasture from 1961 until 1968. During the two winters, 1961-63 each ones daily supplement was 1 pound of ground sorghum grain, 1 pound of soybean oil meal, 20,000 I.U. of Vitamin A and 0.05 lb. of dicalcium phosphate. Salt was always available.

The third winter (1963-64), as bred two year olds, one of each pair was randomly selected to continue receiving the winter supplement, the other to receive only salt and bluestem pasture. They were pastured together, and those fed were separated each morning during the winter to receive the supplement.

Results

Results reported here are for calf crops produced from 1964 to 1967, inclusive, table 16. There were no significant differences between treatments. Birth weights and weaning weights were highest for calves from the supplemented cows. They also averaged calving 10 days earlier, but the price of calves and feed should be considered in evaluating the practice. With prices we used, supplemental feeding did not improve calf weights enough to pay for the supplements, not including the extra labor. The numbers involved are small, Table 32.1, p. 409, of Kempthorne et al's Statistics and Methods in Biology shows each identical twin animal may equal 8. A valuable result of the study was that beef cows that calf first as three year olds and late in the spring can reproduce quite well on a diet of only bluestem pasture and salt; however, its effect on the length of productive life is not known.

2. Value of Vitamin A

Six pairs of identical twin heifers were purchased in the fall of 1964, and have been grazed together since then on bluestem pasture with a supplement, from November to April 2 of 1 pound of soybean oil meal, 1 pound of ground sorghum grain and .05 lb. of dicalcium phosphate per head daily. One of each pair was randomly selected to receive also 20,000 I.U. of Vitamin A daily.

The cows were divided each morning during winter to receive different supplements.

First bred as two year olds in the summer of 1966, they have produced two calf crops, 1967 and 1968.

Results

Results are summarized in table 17. No differences have been found between the two treatments. Each year the same cow on the vitamin A treatment has lost her calf at birth, probably not from the treatment. One pair of identical twins did not calve in 1968.

Table 16

Supplemental Feed for Cows Grazing Winter Bluestem Pasture
1963 to 1967

Supplemental winter feed, per head per day[1]	1 lb. sorghum grain 1 lb. soybean meal	None
Number of Identical twin cows per treatment	2	2
Av. beginning weight, lbs.	657	667
Av. summer gain, lbs.	149	179
Av. winter loss, lbs.	119	169
No. of calves produced[2]	7	7
Av. weaning weight of calves, lbs.	396	374
Av. adjusted weaning weight, lbs.[3]	414	391
Av. birth date	April 1	April 10
Av. birth weight, lbs.	69	63
Av. supplementation cost,[4]	$9.90	$0.00
Av. increase in income,[5]	6.16	0.00

1 Supplement-fed cows also received 20,000 IU of vitamin A per cow daily and a source of phosphorus, usually dicalcium phosphate

2 One cow from each treatment group lost a calf at birth.

3 Adjusted to a 205-day steer basis (+ 5% for heifers).

4 Feed costs used are on inside of back cover.

5 Figured on increase in weaning weight @ 28¢/lb.

Table 17

Feeding Vitamin A to Beef Cows on Winter Bluestem Pasture
December 1964 -- October 1968

Treatment	No vitamin A	Vitamin A
Number of identical twin cows per treatment	6	6
Average weight, lbs.		
December 1964 (Initial Weight)	354	364
December 1965	637	647
December 1966[1]	948	963
December 1967[1]	804	814
October 1968[1]	934	954
Average winter loss, lbs.	86	86
Average summer gain, lbs.	215	217
No. of calves produced	11	9[2]
Average calving period, days	21	65
Average calving interval, days	378	372
Average calving date	Feb. 21	Feb. 26
Average birth weight, lbs.[3]	63	61
Average weaning weight, lbs.[4]	453	452

[1] Includes weights of twins when both individuals of each pair weaned calves.

[2] One cow on the vitamin A treatment lost her calf at birth both years.

[3] Sex corrected by adding 5% of birth weight to heifers.

[4] Weights adjusted to a 205-day steer basis (+5% for heifers).

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

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D.W. Arnett[2], F.W. Boren[3], and H.B. Perry[3]

Colby, Garden City, and Mound Valley Branches and
the Kansas Ag. Exp. Sta., Manhattan

Wintering and finishing performances of beef steers have been compared at Colby, Garden City, Manhattan and Mound Valley. When feeds were grown locally, cattle at Garden City and Colby outperformed those at Manhattan and Mound Valley (Bulletin 507, 1967). Since all cattle were of the same origin, differences were credited to the climate and/or feed composition. In 1968-9 (trials 5 and 6), cattle were fed at all locations on feed produced at Garden City. During the wintering phase in trial 5, cattle at Colby and Garden City significantly outgained those at Mound Valley ($P<.01$). Performance at Manhattan was intermediate. In trial 6, table 18, during wintering, steers at Manhattan gained faster ($P<.01$) than those at Colby or Garden City but not those at Mound Valley. Finishing gains did not differ significantly in either trial. Results of the last two tests being more uniform than results of the previous four indicates some of the differences are from the site where the feed is produced.

Steers at the Manhattan station now are being fed a single variety of sorghum grain produced near the four test stations. Data from all tests are being summarized, and feedstuffs from the four location are being analyzed for mineral content.

Table 18

Feedlot Results at Indicated Locations,
Project 430 Wintering Phase
November 17, 1967 - February 9, 1968 - 84 days

Location	Colby		Garden City		Manhattan		Mound Valley	
Lot no.	1	2	1	2	1	2	1	2
No. steers per lot	6	5	6	5	6	6	6	6
Av. initial wt., lb.	455.8	456.0	455.8	454.0	453.3	458.3	456.7	456.7
Av. final wt., lb.	556.0	554.0	556.3	548.8	583.3	601	574.7	572.5
Av. daily gain, lb.	1.20	1.17	1.20	1.13	1.55	1.70	1.40	1.38
Av. daily ration, lb.								
Alfalfa hay	14.06	14.15	12.55	12.04	17.31	17.16	15.05	15.02
Feed per cwt. gain, lb.	1177.1	1213.9	1048.9	1067.1	1118.7	1011.5	1077.4	1092.2
Feed cost per cwt. gain[1] $	14.71	15.17	13.11	13.34	13.98	12.64	13.47	13.65
Finishing phase, February 10 -- August 9, 1968 - 182 days								
No. steers per lot	6	4	6	5	6	5	6	6
Av. final wt., lb.	950.3	968.1	1011.0	990.6	1012.5	1065.0	1016.0	996.0
Av. daily gain, lb.	2.17	2.26	2.50	2.43	2.36	2.55	2.43	2.33
Av. daily ration, lb.								
Alfalfa hay	5.09	5.40	4.16	4.71	3.83	4.76	5.22	4.21
Sorghum grain	14.46	14.55	16.50	14.50	16.85	16.99	16.38	16.32
Feed per cwt. gain:								
Alfalfa hay	235.09	239.91	166.72	194.16	162.52	186.19	215.08	180.77
Sorghum grain	667.53	644.36	660.6	597.64	714.56	665.16	674.51	700.63
Feed cost per cwt. gain, $	14.96	14.60	13.97	13.19	14.89	14.30	14.83	14.87
Av. daily gain, 266 days	1.86	1.93	2.09	2.02	2.10	2.28	2.10	2.03
Shrink to market, %	2.66	3.40	2.73	3.08	2.88	1.69	1.82	3.02
Av. hot carcass wt., lb.	572.8	583.3	604.3	590.8	616.3	645.6	626.0	598.8
Dressing %, feedlot wt.	60.3	60.3	59.8	59.7	60.9	60.6	61.6	60.2
Dressing %, market wt.	61.9	62.4	61.5	61.5	62.7	61.7	62.8	62.0
Av. fat thickness, 12th rib	.47	.46	.67	.44	.61	.57	.61	.53
Est. % kidney knob	2.50	2.63	2.92	3.10	2.90	2.80	3.00	2.80
Av. size rib eye, sq. in.	10.70	10.98	10.45	10.98	10.82	11.37	11.27	11.21
Av. degree marbling[2]	7.2	7.3	7.3	6.8	6.2	6.2	7.2	7.5
Av. yield grade	2.9	2.8	3.7	3.0	3.5	3.3	3.4	3.1
Carcass grades:								
Top choice					1			
Av. choice		1	2	1	2	1	1	
Low choice	3	1	1	3	3	3	2	2
Top good	2	1	3			1	2	3
Av. good	1	1		1			1	1

[1] Alfalfa hay, $25 per ton; Sorghum grain $1.80 per cwt.

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

Effect of Pre-slaughter Withdrawal from Feed on Cattle Fasted for Varying Lengths of Time

Tom Carr, Dell Allen, Philip Phar and Rufus Cox

Introduction

Feedstuffs pass through cattle in approximately four days; however, steam-flaked rations may have a faster rate of passage. How much value do cattle derive from feed fed the last few days prior to slaughter, particularly cattle taken directly from feedlot to slaughter plant? Cattle that have been shrunk kill more easily than those with full intestinal tracts. Perhaps withdrawing cattle from feed 1, 2, or 3 days before they are slaughtered would economically benefit both feeder and slaughterer.

To find out, we needed to determine:

1. Differences, if any, in tissue yield between cattle withdrawn and those continued on feed.
2. Differences, if any, in carcass grade between fasted and fed cattle.
3. If fasting increases the incidence of dark-cutters.
4. Percentages of live weight lost during pre-slaughter fasting.

Procedure and Experimental Design

To test previously mentioned factors, we fed or fasted 175 steers for 0 to 3 days before slaughter as follows:

Treatment	0	Days 1	2	3
	Number of Steers			
Fed	25	25	25	25
Fasted	--	25	25	25

We completed one trial last summer, another in April, 1969. In the first trial, 175 steers at the Circle E Ranch, Potwin, Kansas, were used; in the second, 125 steers, from the same feedlot. All were individually identified and all had water available free-choice. Those fed were handled and fed routinely; fasted steers were simply removed from feed. The fasting steers were closely observed by several persons.

Results

1. Steers fasted 1 or 2 days were much quieter in temperment and easier to handle than those which were continued on feed or those fasted 3 days.
2. Steers fasted 1 or 2 days showed little or no evident discomfort from fasting.
3. Solid contents in rumens of fasted cattle were markedly reduced, especially contents of those fasted 3 days.
4. Color of muscle tissue was definitely more desirable in steers fasted 1 or 2 days than in those fed or fasted 3 days.

Weights when fasting started and when steers were slaughtered are given in table 19, for the first trial. Original live weights varied widely.

Table 19

Mean Weights of Steers Fasted or Fed for Days Indicated Before Slaughter

	Day							
	0		1		2		3	
Treatment	Int.*	Sl.**	Int.*	Sl.**	Int.*	Sl.**	Int.*	Sl.**
	Pounds							
Fed	1228	1228	1172	1179	1179	1183	1192	1199
Fasted	--	--	1125	1097	1168	1125	1198	1141

* = Initial weight
** = Slaughter weight

Persons who sell with a "pencil shrink" instead of on a grade and yield basis will be interested in the percentage of live shrink in fasted cattle.

Table 20

Percentage of Weight (unadjusted) Gained or Lost by Steers in First Trial

	Day			
Treatment	0	1	2	3
Fed	-	+0.72	+0.34	+0.88
Fasted	-	-2.44	-3.62	-4.74

The percentage shrink of lighter cattle exceeded that of heavier cattle because both had approximately the same amount of rumen contents. That was expected because approximately the same weight loss occurs in both light and heavy animals.

For fasting to be successful, chilled carcass weights or carcass yield must be essentially the same in fasted as with fed cattle. To remove the effect of wide variation in live weight of the steers, linear effects of live weight were removed from the analysis.

Both hot and chilled carcass weights were analyzed to determine if fasting affected carcass cooler shrink.

Table 21

Hot Carcass Weight Difference Between Fed and Fasted Steers as Affected by Breed, Treatment and Days Treated*

Breed	Day 1	Day 2	Day 3
	Pounds per carcass		
Hereford	-0.3	-5.1	-27.9
Angus	-8.2	-12.9	-35.7
Hereford-Angus Cross Hereford-Shorthorn Cross	+5.0	+0.3	-22.5
All others	+13.5	+8.8	-13.9

* Negative (-) signs indicate carcasses of fed cattle had a weight advantage; positive (+) signs indicate fasted cattle had a weight advantage.

Data from 1968 indicate that fasting cattle of predominantly British breeding (especially Angus) is questionable (table 21). On the other hand, crossbred cattle fasted 1 or 2 days had heavier hot carcass weights than those not fasted. Crossbred cattle apparently withstand fasting stress up to 2 days with economic gains rather than losses.

Differences were not statistically significant on a chilled weight basis, but breed differences of chilled carcasses approached significance.

Considering only breed effects, omitting treatment, day and interaction effects, British crossbred cattle had significant ($P<.05$) hot or cold carcass weight advantage (11.40 or 10.40 lb.). Carcasses from crossbred cattle shrank slightly more under cooling than did straight bred cattle.

The standard error for chilled carcass weight was so large that differences between fasted and fed steers were not statistically different thus we cannot definitely state that fasting decreased carcass weight.

Statistically the day-fast interaction showed an F value for fasting higher than for any effect other than breed (table 21). The loss from fasting on day 3 was disproportionately large.

Table 22

Pounds of Chilled Carcass Yield for Steers Fasted or Fed 0, 1, 2, or 3 Days, as Indicated

Treatment	Day 0	Day 1	Day 2	Day 3	S^e
Fed	707.7	711.6	707.4	721.0	±25.3
Fasted	--	713.7	703.6	694.8	±24.6

S^e = Standard error

Differences in chilled carcasses among steers fasted or fed 0, 1, or 2 days before slaughter were slight; those fasted 1 day yielded the most. However, the third day of fasting seemed to lower chilled carcass weight, though not significantly.

Table 23 gives effects of fasting and feeding on muscle tissue color. The primary concern was that fasting would result in dark colored muscle. The reverse was true.

Table 23

Muscle Tissue Color Scores for all Indicated Groups

Treatment	Day 0	1	2	3
Fed	4.33*	3.84	4.20	4.26
Fasted	--	3.04	2.96	3.63

* Lower numbers indicate lighter color

Table 24 shows results of 0, 1, 2, and 3 day fasting or feeding on final carcass grade, which was essentially the same for all slaughter groups.

Table 24

Final Carcass Grades for All Groups

Treatment	0	1	2	3
Fed	19.09[1]	19.52	18.84	18.57
Fasted	--	19.22	19.10	18.57

1 - 20 - Av. Choice; 19 - Choice; 18 - Good+

Chemical analyses for glycogen content of the liver, water-holding capacity of muscle tissue, and pH of muscle tissue showed essentially no differences, except that fasting markedly decreased glycogen content of the liver.

The liver is the major source of energy reserve for the body and glycogen is the major energy source stored, so fasting should rapidly deplete it. Probably glycogen in livers was mobilized during fasting.

Summary

Fasting crossbred steers one or two days before slaughter had little, if any, detrimental effect on carcass traits, and it may have improved color of muscle tissue. It appears that Hereford steers may be fasted one day with little effect on their carcasses. Fasting Angus steers appeared unwise. Differences in chilled carcass weights between steers fasted 3 days and those fed 3 days, though not statistically significant, were large enough to suggest that no breed be fasted that long. Fasting had no detrimental effect on carcass grade or any factor used to determine grade. Chemical analyses showed no differences in carcasses except for reduced glycogen, which was expected.

All-in-one High Energy Sorghum Silage Compared With and Without Antibiotic and Conventional High Energy Sorghum Silage for Feedlot Steers

L.I. Smart and C.L. Drake

Research done here in 1967 and 1968 indicated that adding a complete supplement to forage as it was ensiled gave results equal to using soybean meal at the time of feeding. The research continued to improve the complete silage. Previous work indicated that low levels of antibiotics increased bacterial growth and improved cellulose digestion *in vitro*. Therefore, two levels of antibiotics were tested in all-in-one silage ensiled and fed during 1968 and 1969.

Materials and Method

Forty Hereford steers averaging 676 pounds were randomly divided into 4 lots of 10 each and twelve (3 on each treatment) were fed individually. All steers were full fed sorghum silage as shown in table 25, for 100 days. Sorghum forage[1] used is being studied for improved digestibility of grain and forage. It is a high-grain, combine-type sorghum with less stalk and more leaves than many varieties.

Four silos were filled simultaneously to reduce field and day variation. All forage came from one field and was transferred to the silos in rotation to insure uniformity among

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1 Sorghum grain supplied by Funk Bros., Lubbock, Texas.

silos. Sorghum forage was field chopped into self-unloading wagons, weighed and supplements were placed on top of the forage. The forage and supplement were then reground[2] to crack the grain and to further reduce forage particle size. The fine ground and mixed silage was then blown into the silo and packed. Experimental treatments and ration analysis are shown in tables 26 and 27, respectively.

Results and Discussion

Data for group and individually fed steers are shown in tables 28 and 29, respectively; carcass data, in table 30.

Cost per pound of gain was greatest and fed efficiency lowest for both group and individually fed steers receiving sorghum silage with soybean meal added at feeding. Response of steers receiving all-in-one sorghum silage was equal to those on silage and soybean meal. Adding antibiotic to all-in-one sorghum silage increased gain, improved feed efficiency and reduced feed cost per pound gain. Both group and individually fed steers receiving the silage with low level antibiotic showed faster gains, greater feed efficiency and lower cost per pound of gain than those getting more antibiotic. Carcass weights were heaviest of the four groups. Steers receiving the lowest antibiotic level gained significantly faster than steers receiving sorghum silage with soybean meal added at feeding time.

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[2] Wetmore "385" Grinder Blower to regrind sorghum forage was furnished by Wetmore Inc., Tonkawa, Oklahoma.

The data indicate that all-in-one alone and with antibiotic were comparable or superior to sorghum silage ensiled conventionally and fed with soybean meal. Performance of cattle on extremely low levels of antibiotics merits further investigation. Rate of gain shown is somewhat high because the cattle were thin when the experiment started, and end-of-test weights include some mud on the cattle.

One steer receiving all-in-one silage with low antibiotic and one receiving soybean meal were removed for reasons not related to treatments.

Table 25

Indicated Details on Composition of Experimental Silages

Experimental Silages	Treatment
All-in-one silage, low antibiotic	Sorghum silage + 100 lbs. supplement[1] and 0.2 gm. Chlortetracycline (Aureomycin) per ton added to the forage prior to being reground and blown into the silo.
All-in-one silage, high antibiotic	Sorghum silage + 100 lbs. supplement[1] and 2.0 gm. Chlortetracycline (Aureomycin) per ton added to the forage prior to being reground and blown into the silo.
All-in-one silage	Sorghum silage + 100 lbs. supplement[1] per ton added to the forage prior to being reground and blown into the silo.
Conventional silage	Sorghum silage; no supplement added

[1] Supplement composition, lbs.: Urea, 10; limestone, 10; powdered molasses, 10; trace minerals, 1*; vitamin A, 1 (10,000 IU per gm); soybean meal, 40; grain sorghum, 28.

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

Table 26

Experimental Treatments of Group and Individually Fed Steers

	Number Group fed	Number Individually fed	
Lots	10	2	All-in-one sorghum silage-low antibiotic[1]
Lots	10	3	All-in-one sorghum silage-high antibiotic[2]
Lots	10	3	All-in-one sorghum silage
Lots	9	3	Conventional sorghum silage plus 2# SBM[3] per head per day

1 0.2 gm chlortetracycline (aureomycin) per ton sorghum silage.

2 2.0 gm chlortetracycline (aureomycin) per ton sorghum silage.

3 Soybean meal

Table 27

Indicated Contents of Experimental Silages, Based on Partial Sampling, on Three Bases: as Fed, 100% Dry Matter, and Air Dry, Shown Respectively From Top to Bottom

Experimental silages	Dry matter	Crude protein	Ether extract	Ash	Crude fiber	NFE
Conventional	43.94	4.60	1.38	3.57	7.55	26.84
	100	10.47	3.13	7.60	17.19	61.61
	90	9.42	2.82	6.16	15.47	55.40
All-in-one	44.46	6.13	1.22	3.34	7.08	26.69
	100	13.80	2.75	7.52	15.93	60.01
	90	12.42	2.47	6.77	14.34	54.00
All-in-one + high antibiotic	45.08	6.15	1.16	3.39	7.50	26.88
	100	13.64	2.55	7.53	16.63	59.47
	90	12.28	2.30	6.78	14.97	53.67
All-in-one + low antibiotic	45.70	6.09	1.20	3.32	7.28	27.81
	100	13.31	2.62	7.26	15.93	60.88
	90	11.98	2.36	6.53	14.34	54.79

Table 28

Response of Steers Group Fed Sorghum Silage and Soybean Meal or All-in-one Sorghum Silage With and Without Antibiotic[1]

	All-in-one sorghum silage Low antibiotic[2]	All-in-one sorghum silage High antibiotic[3]	All-in-one sorghum silage	Sorghum silage + 2 lb. SBM[4] per head per day
No. steers	10	10	10	9
Av. initial wt., lbs	683	670	680	680
Av. final wt. lbs.	994	976	955	956
Total gain, lbs.	311	306	275	276
Av. daily gain, lbs	3.11	3.06	2.75	2.76
Feed per gain (Wet Basis)	15.23	15.44	17.22	17.83
(Air dry basis)	7.73	7.73	8.51	9.08
Feed cost per cwt. gain, $	11.48	11.72	12.97	13.61
Daily ration per steer, lb.				
All-in-one sorghum silage	47.4	47.2	47.4	--
Sorghum silage	--	--	--	47.2
Soybean meal	--	--	--	2.0
Av. feed consumed per day, lb. (Wet basis)	47.4	47.2	47.4	49.2
Feed per gain				
All-in-one sorghum silage	15.23	15.44	17.22	--
Sorghum silage	--	--	--	17.10
Soybean meal	--	--	--	.73
Total feed per lb. gain	15.23	15.44	17.22	17.83

1 Chlortetracycline (Aureomycin)
2 0.2 gm chlortetracycline (aureomycin) per ton sorghum silage.
3 2.0 gm chlortetracycline (aureomycin) per ton sorghum silage.
4 Soybean meal

Table 29

Response of Steers Individually Fed Sorghum Silage and Soybean Meal or All-in-one Sorghum Silage With or Without Antibiotic[1]

Ration	All-in-one sorghum silage Low antibiotic[2]	All-in-one sorghum silage High antibiotic[3]	All-in-one sorghum silage	Sorghum Silage + 2 lb. SBM[4] per head per day
No. steers	2	3	3	3
Av. initial wt., lbs.	666	670	669	671
Av. final wt., lbs.	1017	964	964	931
Total gain, lbs.	351	294	295	260
Av. daily gain, lbs.	3.51	2.94	2.95	2.60
Feed per gain (Wet basis)	12.28	13.33	14.13	15.27
(Air dry basis)	6.24	6.68	6.98	7.85
Feed cost per cwt. gain, $	9.26	10.11	10.64	12.24
Daily ration per steer, lb.				
All-in-one sorghum silage	43.1	39.2	41.7	--
Sorghum silage	--	--	--	37.7
Soybean meal	--	--	--	2.0
Av. feed consumed per day, lb.	43.1	39.2	41.7	39.7
Feed per lb. gain, lb.				
All-in-one sorghum silage	12.28	13.33	14.13	--
Sorghum silage	--	--	--	14.50
Soybean meal	--	--	--	.77
Total feed per lb. gain	12.28	13.33	14.13	15.27

1 Chlortetracycline (Aureomycin)
2 0.2 gm chlortetracycline (aureomycin) per ton sorghum silage.
3 2.0 gm chlortetracycline (aureomycin) per ton sorghum silage.
4 Soybean meal

Table 30

Carcass Data of Steers Group or Individually Fed Sorghum Silage and Soybean Meal or All-in-one Sorghum Silage With and/or Without Antibiotic[1]

Ration	All-in-one sorghum silage Low antibiotic[2]	All-in-one sorghum silage High antibiotic[3]	All-in-one sorghum silage	Sorghum silage + 2 lb. SBM[4] per head per day
Group Fed:				
Av. hot carcass wt., lb.	540	537	528	531
Estimated kidney knob, heart, and pelvic fat, lbs.	10.3	11.5	10.3	11.1
Av. fat thickness 12th rib, in.	.39	.35	.38	.33
Av. degree marbling[5]	5.9	6.9	4.4	7.3
U.S.D.A. grade[6]	9.9	9.5	10.7	9.9
Av. ribeye area, sq. in.	10.90	10.55	10.76	10.03
Estimated yield grade	2.7	2.7	2.7	2.8
Individually Fed:				
Av. hot carcass wt., lb.	562	517	517	519
Estimated kidney knob, lbs.	9.50	10.3	10.0	10.3
Av. fat thickness 12th rib, in.	.30	.33	.27	.30
Av. degree marbling	7.5	6.6	3.3	8.3
U.S.D.A. grade	9.0	9.7	11.0	9.0
Av. ribeye area, sq. in.	11.20	10.80	11.23	10.90
Estimated yield grade	2.5	2.6	2.4	2.2

1 Chlortetracycline (Aureomycin)

2 0.2 gm chlortetracycline (aureomycin) per ton sorghum silage.

3 2.0 gm chlortetracycline (aureomycin) per ton sorghum silage.

4 Soybean meal

5 Marbling

Small +	1	Trace +	7	Practically Devoid +	10
Small o	2	Trace o	8	Practically Devoid o	11
Small -	3	Trace -	9	Practically Devoid -	12
Slight +	4				
Slight o	5				
Slight -	6				

6 Grade

High Choice	14
Average choice	13
Low choice	12
High good	11
Average good	10
Low good	9

Table 31

Prices Used In Computing Costs of Rations, 1968-69

	Per ton
Dry rolled sorghum grain	$ 36.00
Sorghum silage	12.00
All-in-one silage	15.06
All-in-one low antibiotic silage	15.07
All-in-one high antibiotic silage	15.18
Alfalfa hay	25.00
Prairie hay	20.00
Dry rolled shelled corn	46.00
Dry rolled wheat	50.00
Salt	20.00
Supplement, all-in-one silage	73.20
Urea	110.00
Ground limestone	22.00
Dehydrated alfalfa	64.00
Soybean oil meal	92.00
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

Second Annual Kansas Swine Producers' Day
Thursday, 25 September, 1969

The second annual Swine Producers' Day is planned for Thursday, 25 September, 1969. The new swine facilities will be 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 1970 Sheep Day will be April 6.

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 Science and Industry Department