BULLETIN 493
MAY 7, 1966

Ed Smith

1965-1966 Progress Reports

Charles Peppers.

53rd LIVESTOCK FEEDERS' DAY

KANSAS AGRICULTURAL EXPERIMENT STATION
KANSAS STATE UNIVERSITY
MANHATTAN, KANSAS

Floyd W. Smith, Director

53rd ANNUAL

Livestock Feeders' Day

Saturday, May 7 1966

Animal Husbandry Department

Kansas State University, Manhattan, Kansas

8:00 - 10:00 am - Arena - Experimental Livestock Shown

10:00 am Arena - Presiding - Girdner Crofoot, Cottonwood Falls, Kansas, President, Kansas Livestock Association.

Brief Summaries of:

Varying Percentage Milo and Wheat in Steer Fattening Rations
Soybean Meal vs. Urea in Cattle Wintering Rations
Level of Grain in the Wintering Ration
Amount of Roughage and Added Vit. A in Steer Finishing Rations
Non-protein Nitrogen Substitutes for Protein for Steers
All-concentrate Steer Finishing Rations
Grain as the Only Source of Protein
All-concentrate Rations for Wintering Calves
Hard-surface Pens for Finishing Cattle
Level of Protein for Bred Heifers Wintered on Bludestem Pasture
Ratio of Roughage to Grain Fed at Different Stages of the Feeding Period
Adding Grain to Silage at Time of Ensiling
Value of Dehydrated Alfalfa for Heifers Wintered on Bluestem Gras
Rations for Pigs Weaned at 4 Weeks
Feeding Value of Various Grains for Swine
Reducing Sow Feed-Costs
Methods of Preparing Sorghum Grain for Swine
Influence of Breeding and Feeding on Beef Carcass Characteristics
Factors Affecting Lamb Grade Quality
Heat-treating Sorghum Grain for Fattening Lambs
Ammonium Chloride as a Preventative of Urinary Calculi
Creep Rations for Lambs
Dehydrated Milo Stover in Lamb Fattening Rations
Alfalfa and Wheat Pasture for Fattening Lambs

12:00 Awards to Beef Producers - Lunch - Arena

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*1:30 pm GUEST SPEAKER - Mr. Ted Gouldy, Fort Worth, Texas *
* Editor, Weekly Livestock Reporter *
* (Author of "Stuph and Thangs") *
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2:00 pm Questions

6:30 pm Block & Bridle Banquet for Visiting Stockmen & Parents

FOR THE LADIES

Friday, May 6

6:15 pm Dinner - Kansas State Union. Make Reservations with Mrs. R. F. Cox 421 Edgerton

Saturday, May 7

9:00 am Coffee - Justin Hall - Animal Husbandry Ladies

9:45 am Demonstrations - School of Home Economics

12:00 noon Lunch - Animal Husbandry Arena

6:30 pm Block & Bridle Banquet (See General Program)

C O N T E N T S

SWINE

MEATS

High Protein-Sorghum Grain as the Only Protein Source in an all Concentrate Steer Finishing Ration (Project 253-6) 1965

E. F. Smith, D. Richardson and C. W. Deyoe

The finishing ration for yearling steers should contain a minimum of about 10% protein. Sorghum grain frequently contains 10% protein; this test was to determine if such sorghum grain meets protein requirements.

The sorghum grain was obtained locally and had been tested for protein content at delivery during harvest. Sorghum grain testing 10.0% protein or higher was stored in one bin and that below 10% in another bin. The division was by protein testing the first load of grain delivered by a seller. Subsequent loads were similarly divided. A Udy analyzer (Udy Analyzer Co., Boulder, Colo.) was used to determine protein content of the grain. Only sorghum grain of higher protein content was used.

Three treatments were compared with two lots of steers per treatment and 10 steers per lot. The three treatments were:

Sorghum grain as the only protein source.

Sorghum grain with 1% urea added.

Sorghum grain with 0.75% urea and
5% dehydrated alfalfa added.

Exception for the above variables all rations were as nutritionally adequate and as equal as possible.

A premix and other ration ingredients were mixed with the dry rolled sorghum grain and the complete ration fed in a self-feeder.

The premix supplied per pound of feed consumed: 3.5 mg. of chlorotetracycline (Aureomycin), 0.5 mg. of diethylstilbestrol and 750 I.U. of vitamin A. A trace mineral mixture supplied the following in mg. per pound of feed: manganese, 23; iron, 23; copper, 2.3; zinc, 11.4; iodine, 0.68; cobalt, 0.23. Ground limestone was added to all rations to meet the required calcium level.

No hay or other roughage was fed after the test started.

Prior to the test the steers were started on a self-feeder with a mixture of 45% bran, 5% dehydrated alfalfa and 50% dry rolled sorghum grain with prairie hay fed free-choice. The bran and prairie hay were gradually eliminated. The test being reported was initiated when the steers were receiving nearly an all sorghum grain diet.

The results are reported in table 1. Ration intake varied widely between lots within each treatment but differences between treatments were small.

Daily gain ranged from 2.81 to 3.15 pounds per steer and feed per pound of gain from 6.4 to 8.2 pounds with no apparent difference due to treatments. Variation between lots receiving the same treatment was more than between treatments.

The carcasses graded choice or high good and averaged low choice. No differences were noted in carcasses between treatments; however a complete record was not available because 13 of the 59 carcasses were shipped by the packer who bought the steers before all carcass data were collected.

Table 1

High protein sorghum grain in an all-concentrate steer finishing ration as the only protein source July 2 - October 23, 1965 - 112 days

Protein source	Sorghum grain only		Sorghum grain & Urea		Sorghum grain, urea and dehydrated alfalfa	
Composition of self-fed concentrate mixture, percent:						
Dry rolled sorghum grain	99.00		98.00		93.50	
Urea	---		1.00		0.75	
Dehydrated alfalfa (17% protein)	---		---		5.00	
Ground limestone	0.75		0.75		0.50	
Premix[1] (supplied trace minerals, antibiotics, diethylstilbestrol, and vitamin A, for more details see footnote 1 under table)	0.25		0.25		0.25	
Cost of concentrate mixture per ton[2]	$41.10		$42.04		$42.37	
Percent protein in concentrate mixture (moisture free basis)	12.88		14.20		13.85	
Lot number	18	19	20	21	22	23
No of steers per lot	10	10	10	9[3]	10	10
Av initial weight, lb.	733	731	748	742	722	746
Av daily gain, lb.	3.00	2.81	3.09	2.98	2.90	3.15
Av daily feed intake, lb.	20.9	22.9	23.3	19.0	20.4	22.6
Feed per lb. of gain	7.0	8.2	7.5	6.4	7.0	7.2
Cost per cwt. of gain	$14.30	$16.75	$15.85	$13.41	$14.89	$15.25

1. The premix supplied per pound of feed consumed: 3.5 mg. of chlorotetracycline (aureomycin), 0.5 mg. of diethylstilbestrol and 750 I.U. of vitamin A. One pound of a trace mineral premix (Calcium Carbonate Co., Z5) was added per ton of complete feed which supplied in mg. per pound of feed approximately: manganese, 23; iron, 23; copper, 2.3; zinc, 11.4; iodine, .68; and cobalt, 0.23.

2. Feed prices are on inside back cover.

3. One steer died September 7, 1965.

Hard Surface Pens for Finishing Cattle, 1965 (Project 660)

F. W. Boren, H. B. Perry, G. H. Larson,
R. I. Lipper and E. F. Smith

Each of two lots was 24' x 92', one completely surfaced with concrete; the other, soil except for a 24' x 16' concrete feeding floor where the cattle stood to eat from a fence line feeder.

Results are reported in table 2. Steer performance was slightly better in the nonsurfaced lot. Conditions for feeding were favorable during the summer with normal rainfall and little hot weather. About 22 inches of artificial rain was applied to both lots during the feeding period as a part of an experimental plan to measure run-off and degree of water polution from feedlot wastes. Water applications were timed so that the unsurfaced lot was muddy only a few weeks.

Table 2

Hard surface pens for finishing cattle, May 25 to September 4, 1965 - 101 days.

	Concrete surface	Soil surface
Lot no.	25	26
No. steers per lot	9	9
Av. initial wt., lb.	801	808
Av. final wt., lb.	1075	1101
Av. daily gain, lb.	2.71	2.90
Feed per lb. gain, lb.	8.87	8.36
Feed cost per cwt. gain[1]	$ 17.67	$ 16.95
Daily ration per steer, lb.:		
Sorghum grain	17.95	18.14
Alfalfa hay	4.14	4.14
Supplement[2]	1.94	1.94
Av. feed fed per day, lb.	24.03	24.22
Feed per lb. gain, lb.:		
Sorghum grain	6.62	6.26
Alfalfa hay	1.53	1.43
Supplement	0.72	0.67
Carcass data, av. per animal		
Av. carcass wt., lb.	646.0	658.0
Dressing %	60.0	59.8
Carcass grade[3]	18.7	18.3
Marbling score[4]	6.7	7.4
Rib eye area, sq. in.	11.45	11.40
Fat thickness, 12th rib, in.	0.44	0.55
Yield grade[5]	2.9	2.8

1. For feed prices, see inside of back cover.

2. The protein supplement on a percentage basis consisted of soybean oil meal, 45; molasses, 10; dehydrated alfalfa, 15; urea, 4; ground limestone, 5; sorghum grain, 20; and premix, 1. The premix supplied per head daily, 70 mg. aureomycin, 10 mg. stilbestrol and 10000 I.U. of vitamin A.

3. Carcass grade score: high good, 18; low choice, 19.

4. Marbling score: lower score indicates greater degree of marbling.

5. Yield grade: lower score indicates a higher percentage of trimmed, boned major retail cuts, scored from 1 to 5.

Different Methods of Managing Bluestem Pasture 1965 (Projects 253 3-5).

E. F. Smith, K. L. Anderson and C. V. DeGeer

This experiment was to determine the effect of different stocking rates, of deferred grazing, and of pasture burning on cattle performance, productivity of pastures, and range condition as determined by plant population changes. In addition to the yearly report, a summary of cattle gains for the past 16 years is included.

Experimental Procedure

Yearling Hereford steers with an average U.S.D.A. feeder grade of choice were used in 1965. They were purchased in the spring of 1965 near Larned, Kansas, where they had been grazed on wheat pasture and fed silage and limited grain the previous winter. They were assigned to pastures on a random basis.

The experimental treatment for each pasture was:

Pasture 1 - Moderate stocking rate, 3.3 acres per steer.

Pasture 2 - Overstocked, 2.3 acres per steer.

Pasture 3 - Understocked, 4.6 acres per steer.

Pastures 4, 5, 6 - Deferred grazing and burning, moderate stocking rate, 3.3 acres per steer. The steers were grazed on pastures 5 and 6 from April 29 to July 8. They were then moved to pasture 4 where they remained until September 1, when they grazed all three pastures until September 28, close of the trial. Deferred pasture 4 was burned May 3.

Pasture 9 - Burned April 7, 1965, moderate rate of stocking.

Pasture 10 - Burned April 7, 1965, moderate rate of stocking.

Pasture 11 - Burned May 3, 1965, moderate rate of stocking.

Pasture 9 was to have been burned about two weeks before pasture 10 was, but wet weather and/or high winds precluded burning.

The steers were gathered in the afternoon, held overnight without feed or water and weighed at 8 a.m. Starting and final weights were obtained after putting all steers together and weighing them in random order.

Observations

Results are reported in tables 3, 4, 5; 6. Gain per steer under the various treatments ranged from 178 to 258 pounds. The burning treatments produced the largest gain per steer and deferred grazing, the least gain.

About 75% of pastures 9 and 10 had enough cover to carry a fire when they were burned, with the soil moist and a 10 to 20 mph wind. Most of pastures 4 and 11 burned, with a wind velocity of 5 to 10 mph.

Plant counts made annually during the growing season and clippings were taken after the close of the grazing season to measure plant population and herbage yields. The clippings are taken as paired samples, one of each pair is caged the entire season to measure production and the other is clipped from a nearby grazed area.

Table 3

Grass increasers and grass decreasers shown as percentage of total 1965 vegetation and an estimated range condition based on the percentage of "original" vegetation.[1]

Range Site	Pasture no. 1	2	3	4	5 & 6	9	10	11
	%	%	%	%	%	%	%	%
OU[2]								
Decreasers	38	22	32	45	46	36	54	66
Increasers	45	52	41	33	36	33	29	20
Range condition	58	41	53	67	61	53	72	84
LB[3]								
Decreasers	42	29	43	62	64	49	61	71
Increasers	31	48	41	27	26	25	21	20
Range condition	74	62	70	93	93	77	91	94

1. Forbs limited to 5% in this estimate; all above that considered not original. All values based on plant census data.
2. OU - ordinary upland range site.
3. LB - limestone break range site.

Table 4

Per acre production and disappearance of forage, weeds, and mulch, Donaldson pastures near Manhattan, 1965. Yields obtained from replicated clippings at close of growing season.

Range site		Pasture number							
		1	2	3	4	Average of 5 & 6	9	10	11
		number per acre as indicated							
		Production							
OU[1]	Forage	3053	2489	4136	3507	4496	2841	3562	3744
	Weeds	416	648	410	273	320	496	555	192
	Mulch	1002	469	1385	485	656	---	---	---
LB[2]	Forage	2365	2390	3278	2319	3392	2229	3149	3097
	Weeds	485	454	200	108	252	557	240	73
	Mulch	1291	515	2806	284	433	---	---	---
		Disappearance (Index of amount grazed)							
OU	Forage	773	1692	1066	1604	1436	1040	1231	1597
	Weeds	189	410	137	214	182	297	368	70
	Mulch	---	137	---	2	55	---	---	---
LB	Forage	960	1590	---	498	762	380	1095	985
	Weeds	163	148	81	66	146	300	48	---
	Mulch	161	112	53	---	100	---	---	---
		Remainder (Residue at end of season)							
OU	Forage	2280	797	3070	1903	3060	1801	2331	2147
	Weeds	227	238	273	59	138	199	187	122
	Mulch	1002	332	1385	483	601	---	---	---
LB	Forage	1405	800	3278	1821	2630	1879	2054	2112
	Weeds	322	306	63	42	106	257	192	73
	Mulch	1130	403	2753	284	333	---	---	---

1. OU - ordinary upland range site.
2. LB - limestone breaks range site.

Table 5

A comparison of different methods of managing bluestem pastures, April 29, 1965, to September 28, 1965 - 153 days.

Pasture no.	1	2	3	4,5,6	9	10	11
Management	Moderately stocked	Over-stocked	Under-stocked	Deferred and late apring burned	Early-spring burned	Mid-spring burned	Late-spring burned
Number of steers per pasture	18	26	13	54	13	13	13
Acres per pasture	60	60	60	3-60[1]	44	44	44
Acres per steer	3.3	2.3	4.6	3.3	3.4	3.4	3.4
Initial wt. per steer, lb.	508	509	518	514	504	516	511
Gain per steer, lb.	218	207	204	178	236	231	258
Daily gain per steer, lb.	1.42	1.35	1.33	1.16	1.54	1.51	1.69
Gain per acre, lb.	65.76	90.00	44.34	53.94	69.41	67.94	75.88

1. Three 60 acre pastures.

Table 6

Yearly account of summer gains (pounds per steer) under different methods of grazing pastures; 16-year summary, 1950-1965, the summer season of approximately 150 days.

Pasture no.	1	2	3	4,5,6	9	10	11
Management	Moderately stocked	Over-stocked	Under-stocked	Deferred rotated	Early-spring burned	Mid-spring burned	Late-spring burned
1950	221	210	214	205	216	254	230
1951	242	256	290	234	243	265	254
1952	246	209	228	197	251	278	283
1953	226	194	233	197	205	217	234
1954	261	237	236	214	270	271	306
1955	270	224	253	213	282	305	307
1956	179	184	168	154	212	234	216
1957	243	236	244	209	261	256	279
1958	208	207	207	198	222	270	253
1959	252	241	262	203	254	275	295
1960	267	242	255	235	299	289	314
1961	255	217	227	187	243	245	237
1962	232	177	215	167	201	205	212
1963	202	180	195	170[1]	187	200	233
1964	214	196	196	209[1]	225	231	218
1965	218	207	204	178[1]	236	231	258
Average	234	214	227	198	238	252	258

1. The deferred pasture of these three pastures was burned in late spring in 1963, 1964 and 1965.

Level of Protein for Heifers Wintered on Bluestem Pasture, 1963-1965 (Project 253)

C. V. DeGeer, M. C. Hall and E. F. Smith

The 66 heifers used were good to choice grade Herefords purchased near Fort Davis, Texas, and assigned to treatments on a random weight basis.

They were rotated among pastures to minimize pasture differences during the first winter and summer. Di-calcium phosphate was fed to standardize phosphorus intake among groups during the first winter and each was fed 15,000 I.U. of vitamin A daily. Salt was available to all lots throughout the test. They were fed three times weekly during the winter.

The heifers were bred between July 1 and October 1, 1964; from July 1 to August 15, they were artificially bred; from August 15 to October 1 two Hereford bulls were with the heifers.

All heifers were examined for pregnancy November 20, 1964. All open heifers were culled; the 58 remaining continued on experimental winter rations as outlined in table 7.

The first calf was born April 9, 1965. Calves were weighed at birth; calving difficulty was scored from 1 to 10, with 1 indicating no assistance; 5, some assistance; 10, a caesarean section. Calves were tattoed at birth and sex of calf was recorded. The last calf was born July 4, 1965.

June 18, 1965, two Hereford bulls were turned in with the heifers and remained until September 2, 1965.

Results and Discussion

The weight gain of the heifers fed the combination of soybean oil meal and sorghum grain were equal to those fed only soybean oil meal; both rates were superior to those fed only sorghum grain.

The conception rate for the first breeding season was highest for those receiving the combination of grain and soybean meal while those receiving only sorghum grain ranked second and those receiving soybean meal ranked lowest.

For the second breeding season the heifers fed soybean meal ranked first in numbers bred followed closely by those receiving the combination of grain and soybean meal. Those receiving sorghum grain only ranked lowest with an average pregnancy rate of 69% compared with 95% for those receiving soybean oil meal only.

The soybean oil meal groups produced the most calves. The few calves weaned by lot 5, fed a combination of grain and soybean meal, may have resulted from other management factors.

Weaning weight was lowest for calves produced by heifers on sorghum grain. Calves produced by heifers fed the grain and soybean meal combination were heaviest, followed closely by those receiving only soybean oil meal.

In pounds of calf weaned per heifer bred, soybean oil meal groups were outstanding followed by grain and soybean meal combination groups, while sorghum grain groups only ranked lowest.

The results indicate that the protein received by heifers on bluestem pasture fed 2 pounds of sorghum grain (10% protein) per head daily during the winter was to low for satisfactory performance. Weight gains of heifers and their calves was satisfactory when a combination of grain (10% protein) and soybean oil meal (45% protein) was fed; however calf weight weaned per heifer bred indicates that a higher level of protein (2 pounds of soybean oil meal) may be superior. Too few animals were involved for definite decisions this early.

Table 7

Level of Protein for Heifers Wintered on Bluestem Pasture, December 6, 1963, to November 2, 1965 - 696 days

Treatment	Sorghum grain		Sorghum grain & soybean meal		Soybean meal	
Lot no.	1	3	2	4	5	6
No. of heifers	11	11	11	11	11	11
Av. wt. of heifers that weaned calves:						
December 6, 1963	439	433	441	436	420	443
March 30, 1964	389	399	469	457	472	466
September 26, 1964	645	675	708	722	694	691
April 5, 1965	555	611	717	718	754	740
November 2, 1965	688	704	761	766	781	735
Gain per heifer from December 6, 1963, to November 2, 1965	249	271	320	330	361	292
Supplemental winter feed in lb. per heifer daily:						
Ground sorghum grain	2	2	1	1	----	---
Soybean meal	---	---	1	1	2	2
No. of cows pregnant						
November 20, 1964	8	10	11	11	8	10
Percent	80.0	90.9	100	100	72.7	90.9
October 30, 1965[1]	7	6	9	11	8	9
Percent[1]	87.5	60	82	100	100	90
Calving data 1965:						
Av. calving date	5/5	5/20	5/6	4/30	5/17	4/28
No. of calves born	8	9	11	11	8	10
No. of live births	5	8	9	5	8	9
% of live births	63	89	82	46	100	90
Av. live birth wt., lb.	58	67	63	69	65	65
Av. calving difficulty score[2]	3.1	5.2	3.4	4.2	3.9	2.6
No. of calves weaned	5	7	8	5	8	9
% calf crop weaned	63	78	73	46	100	90
Av. adjusted weaning wt.[3]	232.0	260.0	289.0	331.0	282.0	294.0
Lb. calf weaned per heifer bred	145.0	182.0	210.0	150.0	282.0	265.0

1. For the October 30, 1965, pregnancy examination only the heifers found bred on Nov. 20, 1964, were available to be checked since those not bred Nov. 20 were sold.

2. Calving difficulty was scored on a scale from 1 to 10; 1 indicated no assistance; 5, some assistance; 10, a caesarean section.

3. Weaning weights were adjusted to 180 days and on steer equivalent.

An Evaluation of the Amount of Grain and Roughage to Feed at Different Stages of the Feeding Period, 1964-65 (Project 370)

H. B. Perry and P. W. Boren

The 30 steers used were good to choice Herefords purchased as calves near Sterling, Kansas, and alloted to 3 lots of 10 steers each.

Unlimited roughage was fed where grain was restricted. A ratio of 1 part roughage to 3 parts grain was fed on full feed. Protein supplement (described in footnote 1, table 8) was fed at 2 lb. per head daily to all lots.

Each lot was fed to an average weight per steer of 1000 lb.

All lots were fed the same for the first 100 days of the feeding period, 5 pounds of ground sorghum grain and 2 pounds of protein supplement per head daily with unlimited sorghum silage.

After the first 100 days experimental treatments were as follows:

Lot 14 - From the 100th day on test to the 200 th day, 10 pounds of grain per head daily, from 200 days until slaughter grain was full fed, total days on test 277.

Lot 15 - From the 100 day on test to slaughter grain was full fed, total days 269.

Lot 17 - From the 100th day on test to 200th day grain was full fed, from 200th day to slaughter grain was reduced to 10 lb. per head daily, total days 269.

Results and Discussion

During the second 100 days full feeding grain increased gains over those by steers with grain limited to 10 lbs. per each daily (Lot 14), but steers on limited grain were more efficient.

During the last period, from 200 days on feed to slaughter, steers in lot 14, full fed the last period, gained 0.26 lb. each daily more than those in the other two lots.

For the entire test feed required per pound of gain, daily gain and cost per pound of gain were about the same for all treatments.

The data collected on the carcasses showed only small differences due to treatment, however grades were slightly higher for lot 15 which was full fed grain (169 days) after the first 100 days on test and for lot 17 where grain was full fed the second 100 days on test and then reduced to 10 lb. per steer daily.

Table 8

An evaluation of quantity of grain and roughage to feed at different stages of the feeding period, December 4, 1964, to September, 1965.

	Roughage was fed free choice where grain was restricted, a ratio of 1 part roughage to 3 parts grain was fed where grain was full fed. Protein supplement was fed at the same rate, of 2 lb. per head daily to all lots.		
Experimental treatment			
First 100 days	5 lb. grain	5 lb. grain	5 lb. grain
Second 100 days	10 lb. grain	full fed grain	full fed grain
From 200 days to 1000 lb. body wt.	full fed grain	full fed grain	10 lb. grain
Lot number	14	15	17
Number steers per lot	10	10	10
Initial weight per steer, lb.	444	443	444
Performance first 100 days			
Daily gain, lb.	1.82	1.85	1.90
Feed consumed per head daily			
Grain and protein, lb. supplement	7.0	7.0	7.0
Sorghum silage	19.53	19.53	19.53
Feed per lb. of gain			
Grain and protein supplement[1]	3.84	3.78	3.68
Sorghum silage (30% DM)	3.21	3.17	3.08
Performance second 100 days			
Daily gains, lb.	2.36	2.56	2.64
Feed consumed per head daily			
Grain and protein, lb. supplement[1]	11.63	15.88	16.48
Sorghum silage	20.40	16.60	17.24
Feed per lb. of gain			
Grain and protein supplement	4.93	6.20	6.24
Sorghum silage (30% DM)	2.59	1.95	1.96
Performance from 200 days to 1000 lb. body weight	77 days	69 days	69 days
Daily gains, lb.	1.88	1.62	1.62
Feed consumed per head daily			
Grain and protein, lb. supplement[1]	18.01	16.67	12.56
Sorghum silage first 24 days	16.42	15.22	22.68
Prairie hay rest of period, lb.	6.18	5.50	10.73
Feed per lb. of gain			
Grain and protein supplement, lb.	9.56	10.27	7.74
Sorghum silage (30% DM)	2.62	2.82	4.20
Prairie hay	3.28	3.39	6.61
Performance for entire period			
Final weight per steer, lb.	1007	996	1010
Av. daily gain, lb.	2.06	2.08	2.13
Feed consumed per steer daily			
Grain, lb.	9.87	10.90	10.06
Protein supplement[1], lb.	2.03	2.02	2.00
Sorghum silage, lb.	16.07	14.97	5.86
Prairie hay, lb.	1.20	0.93	1.82
Lb. feed per lb. of gain			
Grain	4.76	5.23	4.73
Protein supplement[1]	0.98	0.97	0.95
Sorghum silage (30% DM)	2.34	2.16	0.83
Prairie hay	0.58	0.45	0.85
Total air dry basis	8.69	8.83	8.77
Feed cost per cwt. gain[2]	$16.65	$17.19	$16.62
Carcass data			
Av. carcass wt.	599	614	603
Av. dressing %	59.5	61.6	59.7
Av. carcass grade[3]	18.4	19.1	18.9
Av. rib eye, sq. inches	10.78	11.18	10.99
Av. fat thickness	0.48	0.38	0.34
Av. yield grade[4]	3.0	3.2	2.7
Av. degree marbling[5]	7.0	6.6	6.9

1. The protein supplement (2 lb. per head daily), on a percentage basis consisted of SBOM 45; molasses 10; dehydrated alfalfa 15; urea 4; ground limestone 5; sorghum grain 20; premix 1. The premix supplied per head daily 70 mg. aureomycin, 10 mg. stilbestrol and 10000 I.U. of vitamin A.
2. Feed costs used are listed on inside back cover.
3. Av. carcass grades; av. choice 20; low choice 19; high good 18; av. good 17.
4. Av. yield grade; 1 indicates highest grade and 5, lowest grade.
5. Av. degree marbling, lower numbers designate more marbling.

The Value of Grain Added to Sorghum Silage at Ensiling, 1965-66 (Project 623)

E. F. Smith, G. M. Ward, D. Richardson and H. B. Perry

This experiment was to determine the value of sorghum grain, whole and ground, added to sorghum silage at 15% of the forage green weight at ensiling. The design was as follows:

Treatment 1 - No grain.

Treatment 2 - Ground sorghum grain fed when silage was fed.

Treatment 3 - Whole sorghum grain added to silage while ensiling, with water added to bring the silage back to original moisture content.

Treatment 4 - Ground sorghum grain added to silage while ensiling and water added to bring silage moisture content to original.

Sorghum silage (Frontier 210) was fed according to appetite. The sterile variety produced only 2 to 3 bushels of grain per acre. An attempt was made to equalize dry matter content of the silage by adding 28% water while ensiling, when sorghum grain was added. Where grain was fed or added to the silage, it was added on the basis of 15% of the silage's weight.

Two trials were conducted. In one the steers were fed in groups of 12, in the other they were fed individually, 3 to a treatment. They were choice Hereford steer calves obtained in Barber county, Kansas.

Added grain increased daily gain and dry matter consumption but dry matter per pound of gain remained about the same.

The steers seemed to perform equally well whether the grain was fed with the silage or added while ensiling as whole or ground grain.

Page 20
title of report
Reversed rations all received
Lot 4 + Lot 6 performance
cattle out
Lot 5 + Lot 3 - Grd. fed

Gains are less with whole grain

Table 9
The value of grain added to sorghum silage ~~while~~ ensiling, December 22, 1965, to March 24, 1966
92 days.

	Steers, group fed				Steers, individually fed			
	Sorghum silage	Ground grain added to feeding	Whole grain added to silage when ensiled	Ground grain added to silage when ensiled	Sorghum silage	Ground grain added at feeding	Whole grain added to silage when ensiled	Ground grain added to silage when ensiled
Lot no	3	4	5	6	1	1A	2	2A
Number of steers	12	12	12	12	3	3	3	3
Initial weight, lb.	429	430	433	433	435	434	439	436
140 day wt	611	675	639	663	582	643	630	667
Average daily gain, lb.	1.62	2.08	1.86	1.95	1.34	1.83	1.83	1.97
140 days	1.32	1.76	1.49	1.66	1.09	1.52	1.41	1.67
Average daily ration, lb.								
Sorghum silage, regular	32	26	--	--	30	24	--	--
Sorghum silage, grain added at 15% of green weight plus water to replace original moisture	--	--	32	32	--	--	29	29
Ground sorghum grain, lb.	--	3.9	--	--	--	3.8	--	--
Soybean oil meal, lb.	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Salt, free choice								
Dry matter in silage, %	27.1	27.1	33.2	32.5	27.1	27.1	33.2	32.5
Dry matter consumed per head, daily lb.	9.8	11.6	11.7	11.5	9.3	11.0	10.7	10.5
Dry matter required per lb. of gain, lb.	6.0	5.6	6.3	5.9	6.9	6.0	5.8	5.3

6#

Comparative Values of Prairie Hay and Sorghum Grain for Calves, 1965-66 (Project 253 4-6)

E. F. Smith, D. Richardson and H. B. Perry

This test was to determine if sorghum grain could completely replace prairie hay in a ration for calves being fed for limited growth. Intake of grain was restricted to supply approximately the same amount of energy consumed by calves fed hay free choice.

The experimental treatments follow:

Lots 18 and 19 - Prairie hay unlimited, supplemented with a soybean oil meal based supplement.

Lots 20 and 21 - 2 lb. per day of prairie, sorghum grain at level to equal total digestible nutrient intake of lots 18 and 19. A soybean oil meal based supplement was fed.

Lots 22 and 23 - Sorghum grain limited to equal intake of total digestible nutrients of lots 18 and 19. A soybean oil meal based supplement was fed.

One of each two lots (19, 21, 23) was supplied top soil, placed in one end of the feed bunk and kept before the steers at all times. Pens were not hard surfaced so all lots had access to soil other than that fed.

The test was designed so all lots would receive approximately the same amount of total digestible nutrients and protein. Estimated TDN content for prairie hay was 45%; for the ground sorghum grain and soybean oil meal, 80%. Protein content of the hay was 5%; the grain, 10%; and the soybean meal, 46%. Other nutrients thought to be lacking in any ration were mixed with the soybean oil meal. Vitamin A was added to supply 10000 I.U. per head daily, a trace mineral mixture was added, see footnote 2, table 10. Monosodium phosphate and ground limestone were used to equalize phosphorus and calcium intake as near that required as possible. Salt was before the steers at all times.

The initial weight December 18 was a full weight taken in the afternoon, the weight January 4 and the final weight were shrunken weights taken after 15 hours without feed or water.

The steers were choice grade Herefords, 12 head to a lot, that originated in Barber county, Kansas.

Observations

For the entire test, including the first two-week adjustment period, the calves receiving prairie hay gained more and required less total digestible nutrients to produce a pound of gain. Steers receiving sorghum grain and the grain and hay combination performed about equally.

After the two week adjustment period, performance (daily gain and TDN per lb. of gain) was about the same under all treatments.

The limited amount of dry matter fed in lots 20 through 23 increased both salt and top soil intakes.

One steer in lot 23 died March 20, from an undetermined cause, a few bloat cases were observed in lots 21 and 23 where top soil was being fed and the intake of dry matter restricted. One steer in lot 21 was treated for bloat twice.

Take cattle out

Table 10
Comparative value of prairie hay and sorghum grain for calves December 18, 1965, to March 25, 1966
97 days.

Experimental treatment	Prairie hay		Prairie hay & sorghum grain		Sorghum grain	
	No soil	Top soil fed	No soil	Top soil fed	No soil	Top soil fed
Lot no.	18	19	20	21	22	23
Initial weight per steer[1]	450	452	451	450	448	447
Final weight per steer[1]	566	561	522	532	538	531
Daily gain per steer	1.19	1.12	0.73	0.84	0.92	0.86
Daily ration per steer:						
Prairie hay	11.9	11.9	2.5	2.4	0.7[3]	0.7[3]
Ground sorghum grain	0	0	5.5	5.5	6.6	6.5
Soybean oil meal (also served as carrier for trace minerals, vitamin A, calcium and phosphorus sources, see footnote 2)	1.3	1.3	1.1	1.1	1.1	1.1
Salt	.09	.13	.23	.23	.25	.22
Top soil	0	0.06	0	0.18	0	0.24
Feed per lb. of gain:						
Concentrates	1.1	1.2	9.0	8.3	8.7	8.8
Prairie hay	9.9	10.8	3.4	3.1	0.8	0.8
Total	11.0	12.0	12.4	11.4	9.5	9.6
Total digestible nutrients per lb. of gain	5.4	5.8	8.7	8.0	7.3	7.4
Performance from January 4 to March 25, 1966, after all lots were receiving their experimental diet.						
Daily gain per steer	0.86	0.94	0.94	0.95	1.00	1.03
Daily ration per steer:						
Prairie hay	12.2	12.2	2.1	2.1	0	0
Ground sorghum grain	0	0	5.9	5.9	7.2	7.2
Soybean oil meal	1.3	1.3	1.1	1.1	1.1	1.1
Salt	0.08	0.10	0.30	0.27	0.26	0.22
Top soil	0	0.06	0	0.22	0	0.27
Feed per lb. of gain:						
Concentrates	1.5	1.4	7.5	7.4	8.3	8.1
Prairie hay	14.2	13.0	2.2	2.2	---	---
Total	15.7	14.4	9.7	9.6	8.3	8.1
Total digestible nutrients per lb. of gain	7.6	6.7	7.0	6.8	6.6	6.5

1. Initial weight per steer December 18 was a full weight taken in the afternoon; all other weights, January 4 and March 25 were taken after 15 hours without feed or water.

2. Added to the soybean oil meal were these nutrients: Vitamin A to supply 10000 I.U. per head daily; a trace mineral mixture supplying in mg. per head daily; manganese, 200; iron, 300; copper, 60; cobalt, 10; iodine, 14; and zinc, 41. Monosodium phosphate and ground limestone were used to equalize phosphorus and calcium intake as near the requirement level as possible for all lots.

3. Prairie hay was fed lots 22 and 23 only the first two weeks while it was gradually being replaced with grain.

The Value of Dehydrated Alfalfa and Delayed Grain Feeding of Heifers on Winter Bluestem Pasture, 1965-66 (Project 253)

M. C. Hall, E. F. Smith and H. G. Spies

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 heifer calves to be bred shortly after the winter feeding period.

(2) Determine merit in feeding grain the last 30-40 days of the winter period compared with feeding the same total amount of grain throughout the winter where heifers are to be bred shortly after the winter feeding period terminates.

Each of three treatment groups contained 27 or 28 Hereford heifer calves, good to choice grade. Initial average weight was 427 pounds.

Each of the three treatments contained two groups of heifers with 13-14 heifers per group. A total of 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 - 1 pound of soybean oil meal and 2 pounds of ground sorghum grain fed per heifer daily during the entire winter feeding period.

Treatment 2 - Soybean oil meal fed at 1.5 lb. per heifer daily until 30 to 40 days before the feeding season ended, then sorghum grain was fed. The same total amount of sorghum grain as fed under treatment 1 throughout the winter was concentrated during the last 30-40 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 lb and ground sorghum grain at 1 lb. per heifer daily during the entire winter feeding period.

The above three rations were formulated to supply approximately the same amount of protein and total digestible nutrients for the total winter feeding period. In addition each heifer received per head daily an average 20,000 I.U. of vitamin A and 0.05 lb. of monosodium phosphate. Salt was fed free choice. Twelve of the heifers from each treatment 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 will enlarge the pelvic open-

ing and permit easier calving by two-year-old heifers and permit observations of its effect on breeding efficiency. Chemical analyses of feeds all shown on the inside back cover of this bulletin.

From December 18, 1965, to March 26, 1966, the daily winter gain per heifer was as follows:

Treatment 1: Soybean oil meal and grain, 0.36 lb.

Treatment 2: Soybean oil meal and delayed grain feeding, 0.31 lb. (represents performance on 1.5 lb. of soybean oil meal per heifer daily since grain feeding began about the date heifers were weighed for this report, March 26, 1966).

Treatment 3: Dehydrated alfalfa and grain, 0.41 lb.

The heifers will be bred starting in mid-May, 1966.

Take these out

Part of each lot implanted with 15 mg of Stilbestrol to see if this will [illegible] the fabric griddle for easier calving. They may not even breed Come back next Feeder's Day & we will let you know what happened

Implants 78#

Non-implants 65#

13#

Thank you

Page 24 & 25 - on page 25 treatments are described

Title

All wintered on Silvaterra pastures & all fed corn TDN & protein

Treatment 1 - describe & results - turn out

Treatment 2 " " " "

Treatment 3 " " " "

Turn Cattle out

Stilbestrol

Influence of Urease Inhibitors on Urea Hydrolysis in Ruminants (Project 596).

D. C. Loper, D. Richardson and L. H. Harbers

The data from the 1965 Livestock Feeders' Day Bulletin indicate that ammonia production from animals fed urea rations was higher than that from nonurea rations. For the bacteria to "capture" more ammonia from urea rations and utilize it, several experiments were designed to test the effect of a variety of chemicals that theoretically would inhibit urea hydrolysis per se. These were initially screened by an artificial rumen technique. The chemicals exhibiting inhibition were then tested inside fistulated steers to simulate practical feeding conditions. At the same time several products were fed to sheep for digestibility data. A preliminary report of the data follows.

Results and Discussion

Sixteen compounds were tested in the artificial rumen at various concentrations from 0.1 to 500 p.p.m. The test lasted 1 hour; criterion of response was ammonia production (table 11). It is evident that the inorganic ions (copper, cobalt) and some antibiotics retard urea hydrolysis. The copper and cobalt compounds are the most potent and least expensive inhibitors. Unfortunately their action is not specific so they will also act on and poison enzymes needed to break down various starches and fibers.

Results from the digestion study with sheep, however, suggest that copper sulfate may improve nitrogen retention (table 12). Data from individual sheep suggest that if the animal had low nitrogen retention, the percentage retained would be improved by copper sulfate. Lambs tested received 16 gm. of urea daily, which is near the recommended level. It thus appears that if animals are fed those levels of urea, the inhibitors tested do not alter the parameters measured. Experiments are now being conducted to determine the effect of increased urea levels on ammonia production in the rumen in the presence of various inhibitors.

Table 11
Effect of urease inhibitors on In Vitro urea hydrolysis.

Chemical	Result[1]	Chemical	Result[1]
Bacitracin - MD	I	Sulfamethazine	NE
Copper Sulfate	I	Alpha - keto - glutarate	S
Neomycin Sulfate	I	Uracil	S
Zinc Bacitracin	NE	Cobalt Chloride	I
Sephadex	NE	Kayexalote	NE
CM - Sephadex - C25	NE	Copper Chloride	I
Methylene Disalysalate	NE	Procaine Penicillin	S
Neomycin Polycarboxylate	NE	Chlortetracycline - HCl	S

1. I = inhibitory; NE = no effect; S = stimulatory.

Table 12
Apparent digestion coefficients of sheep fed rations containing urease inhibitors.

		Apparent Digestion Coefficients					
Treatment	% N Retained	Protein	Dry Matter	Ash	Ether Extract	Crude Fiber	NFE
Control	14.61	53.64	63.49	36.34	81.87	33.70	75.21
Copper Sulfate	15.73	52.37	62.67	35.07	81.31	31.42	74.57
Neomycin Sulfate	14.73	50.05	59.90	45.61	86.49	27.88	71.37
Bacitracin - MD	14.38	50.38	60.36	37.63	82.99	27.55	72.69

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

D. Richardson, E. E. Banbury[1], A. B. Erhart[2], Grady Williams[3], F. W. Boren[3], E. F. Smith, D. C. Loper, Amos Adepoju, L. H. Harbers, and R. F. Cox

This is the third test to measure differences, if any, in performance of cattle in various parts of Kansas due to location, soil, climate, rainfall and/or local feed.

Forty-eight Hereford steer calves from the same herd (Warner's, near Alden and Sterling, Kansas) averaging 475 pounds each were divided as uniformly as possible into four groups of 12 animals. One group was assigned to each of four locations: Colby, Garden City, Manhattan, and Mound Valley. Uniform-size concrete lots with sheds were used at each location. Each group of 12 animals was subdivided into two groups of six. The wintering ration consisted of locally grown sorghum silage (FS1a) fed free choice with 5 pounds of locally grown second-cutting alfalfa hay per head daily. At the end of the wintering phase, silage was gradually decreased and removed from the ration. At the same time, locally grown sorghum grain was introduced and gradually increased until the grain was self-fed. Salt was the only added mineral throughout the test. Analyses of the feeds used are shown in table 13.

Results and Observations

Results of the third test are shown in table 14. Variation in wintering and fattening gains were observed among locations; however, there were no significant differences in carcasses. Rate and feed cost of gain were satisfactory at all locations.

Table 15 gives the results of some crossbreds fed at Colby and Garden City and Holsteins fed at Mound Valley. They were fed in the same manner as reported above.

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1. Colby Station.
2. Garden City Station.
3. Mound Valley Station.

Table 13
Feedstuff analyses.

	Dry matter, %	Moisture, %	Protein, %	Ash, %	Ether extract, %	Crude fiber, %	N.F.E.	Carotene, mgs.per lb.
Colby:								
Sorghum silage	32.09	67.91	1.95	2.01	0.66	6.86	20.61	2.28
Alfalfa hay	94.17	5.83	17.01	9.70	1.84	30.25	35.37	9.23
Sorghum grain	88.54	11.46	10.71	2.86	1.05	1.09	72.83	----
Garden City:								
Sorghum silage	35.77	64.23	1.58	2.57	0.52	5.67	25.43	3.05
Alfalfa hay	90.80	9.20	13.46	8.89	2.57	29.97	35.91	37.69
Sorghum grain	87.28	12.72	9.23	1.06	1.59	1.82	73.58	----
Manhattan:								
Sorghum silage	35.77	64.23	1.84	1.29	0.70	6.87	25.07	1.07
Alfalfa hay	91.73	8.27	22.54	7.48	2.57	26.59	32.55	5.34
Sorghum grain	87.32	12.68	10.19	1.78	2.38	1.84	71.19	----
Mound Valley:								
Sorghum silage	35.77	64.23	2.47	1.90	0.67	7.15	23.58	0.72
Alfalfa hay	94.96	5.04	19.96	5.96	2.75	33.45	32.84	5.11
Sorghum grain	88.34	11.66	9.69	1.55	2.66	1.89	72.48	----

Table 14
Feed lot results for wintering phase, November 13, 1964, to March 5, 1965 - 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.	475	475	475	477	476	476	471.8	479.2
Av. final wt., lb.	615	612	598.2	602.2	620	607.5	662.2	672.2
Av. daily gain, lb.	1.25	1.22	1.10	1.12	1.29	1.18	1.70	1.72
Av. daily ration, lb:								
Sorghum silage	28.9	30.9	23.6	24.2	22.0	22.0	24.6	26.3
Alfalfa hay	4.5	3.7	4.7	4.9	4.9	5.0	4.7	4.2
Feed per cwt. gain, lb.:								
Sorghum silage	2316	2540	2147	2137	1712	1875	1445	1525
Alfalfa hay	363	302	399	429	383	424	276	246
Total dry matter per cwt. gain, lb.	1085	1100	1130	1154	964	1060	779	779
Feed cost per cwt. gain	$ 13.80	$ 13.94	$ 13.58	$ 13.91	$ 11.64	$ 12.80	$ 9.23	$ 9.18
Results for fattening phase, March 5 to September 25, 1965 - 204 days								
No. steers per lot	6	6	6	6	6	6	6	6
Av. initial wt. lb.	615	612	598.2	602.2	620	697.5	662.2	672.2
Av. final wt. lb.	1110	1075	1076.7	1086.6	1064.2	1090	1037.5	1065
Av. daily gain lb.	2.43	2.27	2.35	2.38	2.18	2.37	1.84	1.93
Av. daily ration lb.:								
Alfalfa hay	4.9	4.8	4.3	4.9	4.5	4.6	4.8	4.8
Sorghum grain	16.3	16.0	16.0	16.0	16.0	16.5	15.3	16.3
Feed per cwt. gain lb.:								
Alfalfa hay	202	210	181	208	207	236	261	250
Sorghum grain	671	705	684	672	736	698	833	847
Feed cost per cwt. gain[1]	$ 14.60	$ 15.32	$ 14.58	$ 14.70	$ 15.83	$ 15.51	$ 18.26	$ 18.36
Shrink to market, %	3.53	2.71	3.79	4.22	2.27	3.06	2.33	5.09
Av. hot carcass wt. lb.	654.0	645.2	669.8	663.5	653.8	674.7	619.7	638.7
Dressing %, feedlot wt.	58.92	60.02	62.21	61.06	61.44	61.90	59.73	59.97
Dressing %, market wt.	61.07	61.69	64.67	63.75	62.87	63.84	61.15	63.18
Av. fat thickness 12th rib	.60	.72	.77	.75	.63	.80	.63	.67
Av. size rib eye sq. in.	11.79	11.39	11.76	11.46	11.27	11.53	11.21	11.13
Av. degree marbling[2]	6.67	6.00	4.67	6.00	5.33	5.50	5.83	5.67
Carcass grades:								
Top prime	-	-	1	-	1	-	-	-
Av. prime	-	-	-	-	-	1	-	-
Low prime	-	1	1	-	-	-	-	-
Top choice	-	1	2	4	2	2	4	2
Av. choice	3	2	2	-	1	1	1	3
Low choice	2	1	-	2	2	2	-	1
Top good	1	-	-	-	-	-	-	-
Av. good	-	1	-	-	-	-	1	-

1. Alfalfa hay $25 per ton, sorghum grain $1.80 per cwt., sorghum silage $8 per ton.
2. 4=slightly abundant, 5=moderate, 6=modest, 7=small amount, 8=slight amount 9=trace.

Table 15

Feed Lot Results for Wintering Phase, November 13, 1964, to March 5, 1965 - 112 days.

Location	Colby		Garden City		Mound Valley
Lot no.	3	4	3	4	3
Animals	AngusX Hereford (steers)	AngusX Hereford (heifers)	Charolais X Hereford	Charolais X Angus	Holstein
No. of animals	6	6	6	6	6
Av. initial wt., lb.	487.5	423.3	299	285	410.3
Av. final wt., lb.	598	537	653.5	621.8	589.2
Av. daily gains, lb.	1.2	1.16	1.38	1.22	1.60
Av. daily ration, lb.:					
Sorghum silage	32.0	26.2	29.6	24.7	31.0
Alfalfa hay	3.6	4.2	4.9	4.7	5.0
Feed per cwt. gain lb.:					
Sorghum silage	2848	2264	2136	2006	1940
Alfalfa hay	324	359	346	381	310
Total dry matter per cwt. gain, lb.	1219	1065	1078	1063	988
Feed cost per cwt. gain	$15.44	$13.55	$12.87	$12.78	$11.64
Results for Fattening Phase, March 5 to September 25, 1965 - 204 days.					
No. steers per lot	6	6	5*	6	6
Av. initial wt. lb.	598	537	547.6	621.8	589.2
Av. final wt. lb.	1027.5	935.8	1178	1085.8	1013.3
Av. daily gain lb.	2.11	1.96	2.60	2.27	2.08
Av. daily ration lb.:					
Alfalfa hay	4.9	4.8	4.7	5.0	5.0
Sorghum grain	15.5	16.0	17.9	17.7	17.8
Feed per cwt. gain, lb.					
Alfalfa hay	234	246	179	218	239
Sorghum grain	735	816	687	778	805
Feed cost per cwt. gain[1]	$16.16	$17.75	$14.60	$16.74	$18.38
Shrink to market, %	2.60	3.83	3.90	3.45	2.80*
Av. hot carcass wt. lb.	627.8	581.0	713.6	660.8	616.2
Dressing % feedlot wt.	61.10	62.08	60.58	60.86	59.59
Dressing % market wt.	62.73	64.56	63.04	63.04	61.31
Av. fat thickness 12th rib	.85	.87	.61	.58	.24
Av. size rib eye sq. in.	11.90	10.58	11.73	10.43	11.42
Av. degree marbling[2]	5.50	4.33	5.20	4.67	6.00
Carcass grades:					
Top prime	1	1	-	1	-
Low prime	1	3	1	1	-
Top choice	-	-	2	1	-
Av. choice	1	2	2	2	1
Low choice	3	-	-	1	-
Top good	-	-	-	-	3
Low good	-	-	-	-	1

* Carcass data for five animals presented: One Hostein heifer was not marketed

* Data for five steers presented: One steer died during fattening phase.

1 Alfalfa hay, $25 per ton; Sorghum grain $1.80 per cwt; Sorghum silage $8 per ton.

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

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

D. Richardson, E. E. Banbury[1], A. B. Erhart[2], F. W. Boren[3], E. F. Smith and R. F. Cox

This is a progress report on the fourth test to measure differences in the performance of beef steers in various parts of Kansas due to location, soil climate, rainfall and/or local feed. Forty-eight Hereford steer calves averaging 458 pounds from Warner's Ranch in Barber county were used. The management and feeding were the same as in previous tests. Analyses of the feedstuff are shown in table 16 and the results of the wintering phase in table 17. Results of other steers (purebred and crossbred) being handled in a similar manner at Colby and Garden City are shown in table 18.

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1. Colby
2. Garden City
3. Mound Valley

Table 16
Feedstuff Analyses, 1965-66

	% Moisture	% Dry matter	% Protein	% Ash	% Ether extract	% Crude fiber	% N.F.E.	Carotene mgs.per lb.
Colby:								
Sorghum silage	69.50	30.50	1.43	2.57	0.81	6.97	18.72	1.0
Alfalfa hay	5.59	94.41	12.80	9.04	1.92	34.12	36.53	25.0
Sorghum grain	9.51	90.49	6.68	1.64	2.15	2.05	77.97	----
Garden City:								
Sorghum silage	68.80	31.20	1.23	3.29	0.86	7.39	18.43	1.5
Alfalfa hay	12.13	87.87	14.45	9.92	1.99	29.74	31.77	26.9
Sorghum grain	12.89	87.11	7.13	1.44	3.07	2.33	73.14	----
Manhattan:								
Sorghum silage	62.10	37.90	1.78	2.86	1.02	7.99	24.25	1.8
Alfalfa hay	11.95	88.05	11.61	7.66	1.48	26.37	40.93	21.7
Sorghum grain	14.02	85.98	7.09	1.61	1.93	2.47	72.88	----
Mound Valley:								
Sorghum silage	50.90	49.10	1.60	3.39	0.97	12.30	30.84	2.0
Alfalfa hay	6.79	93.21	16.08	7.43	1.58	32.03	36.09	18.0
Sorghum grain	13.95	86.05	6.03	1.45	2.50	2.48	73.60	----

Table 17

Feedlot results for Wintering Phase. November 19, 1965, to March 11, 1966 - 112 days.

Location	COLBY		GARDEN CITY		MANHATTAN		MOUND VALLEY	
Lot number	1	2	1	2	1	2	1	2
No. steers per lot	6	6	6	6	6	6	6	6
Av. initial wt., lb.	458.3	457.5	458.3	459.2	464.2	452.5	466.7	451.7
Av. final wt., lb.	600.7	606.8	610.5	628.2	595.0	580.8	604.8	581.2
Av. daily gain, lb.	1.27	1.33	1.36	1.51	1.17	1.15	1.23	1.16
Av. daily ration, lb:								
Sorghum silage	27.7	27.1	25.2	26.4	19.2	19.2	16.9	16.6
Alfalfa hay	3.9	4.6	5.0	5.0	4.7	4.6	4.9	4.6
Feed per cwt. gain lb:								
Sorghum silage	2177	2035	1854	1752	1648	1676	1366	1438
Alfalfa hay	308	344	368	331	403	402	396	402
Total dry matter per cwt. gain lb.	955	946	901	838	980	989	1040	1081
Feed cost per cwt. gain[1]	$12.56	$12.52	$12.02	$11.14	$11.63	$11.73	$10.41	$10.78

1. Sorghum silage $8 per ton, Alfalfa hay $25 per ton.

Table 18

Feedlot results for Wintering Phase. November 19, 1965, to March 11, 1966 - 112 days.

Location	COLBY		GARDEN CITY	
Lot number	3	4	3	4
Animals, steers	Shorthorn	Shorthorn X Hereford	Charolais X Hereford	Charolais X Hereford
No. animals per lot	6	6	6	6
Av. initial wt., lb.	478.2	464.3	454.2	458.3
Av. final wt., lb.	614.7	589.8	696.3	689.8
Av. daily gain, lb.	1.22	1.12	2.16	2.07
Av. daily ration, lb:				
Sorghum silage	31.6	29.3	34.7	34.8
Alfalfa hay	4.0	4.3	5.0	5.0
Alfalfa pellets	-----	-----	-----	-----
Feed per cwt. gain, lb:				
Sorghum silage	2596	2616	1607	1684
Alfalfa hay	328	379	231	---
Alfalfa pellets	---	---	---	242
Total dry matter/ cwt. gain, lb.	1102	1156	704	738
Feed cost/cwt. gain[1]	$14.48	$15.20	$ 9.32	$ 9.77

1. Sorghum silage $8 per ton, Alfalfa hay $25 per ton.

Sources of Nonprotein-Nitrogen as a Substitute for Protein in Ruminant Rations[1] (Project 5-804

D. Richardson, E. F. Smith, H. B. Perry, L. L. Dunn and L. H. Harbers

Americans consume large quantities of meat. An increasing population will demand more production to maintain present consumption rates. Protein is an essential nutrient for all animals. The simple-stomached animals (pigs, chickens, dogs, human beings, etc.) can utilize only natural protein, whereas ruminant animals can use nonprotein-nitrogen as a source of ammonia to produce microbial protein in the rumen. This project was to evaluate various ammoniated phosphates in ruminant rations.

Experimental Procedure

Steers and sheep were used in preliminary feeding tests to determine safety and acceptability of mono and diammonium phosphate, a blend of mono and diammonium phosphate, a blend of monoammonium phosphate and urea and urea-dicalcium phosphate. Levels up to 0.45 pound per head daily were fed to steers with no symptoms of harmful effects observed. Lambs consumed .075 pound per day with no observed harmful effects.

Fistulated steers were used to determine rate and amount of ammonia release and amounts of crude and true protein in rumen contents. Ammonia production was greater with all nonprotein-nitrogen sources than with natural protein; however, there were no significant differences between the nonprotein-nitroben sources, nor in true protein of rumen contents.

The feedlot experiment with steers receiving a finishing ration was designed to compare results with the supplemental protein (1) all natural protein (2) part natural protein and part nonprotein-nitrogen and (3) nonprotein-nitrogen supplement without soybean oil meal. The supplements are shown in table 19 and the chemical analyses in table 20. Fifty Hereford steers (purchased from Warners Ranch in Rice county) were divided into five lots of 10 each. They had been used in a wintering test using a ration of sorghum silage, soybean oil meal and limited grain. They were started on a ration of 10 pounds prairie hay, 4 pounds sorghum grain and 2 pounds of their respective supplements. Grain was increased to a full feed and hay reduced to 3 pounds per head daily. Hay was reduced to 2 pounds daily the last 37 days of the test.

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1. This project was partially supported by U. S. Phosphoric Products Division of Tennessee Corporation, Tampa, Florida.

Results and Observations

Results are shown in table 21.

There were no significant differences in rate of gain, feed efficiency, carcass grades or carcass characteristics measured. The steers in lot 6, which did not receive soybean oil meal in the supplement, were very reluctant to eat their supplement at first and to a lesser degree throughout the test. All sources of nonprotein-nitrogen tested were found to be of equal value in this experiment. No symptoms of harmful effect were observed.

Table 19
Percentage of Indicated Ingredients in Supplements[1]

Ingredient	Soybean oil meal	Molasses	Dehy. Alfalfa	DiCal. phosphate	Calcium Carbonate	DiAmmon.[2] phosphate	DAP-[3] Urea	Urea[4]	Sorghum grain
Supplement No.									
79	64	3	20	10	3	---	---	---	---
80	30	5	25	---	10	12	---	---	18
81	30	5	25	5	7	---	7.6	---	20.4
82	30	5	25	12	2	---	---	5.2	20.8
83	---	5	25	---	11	11	---	4.5	43.5

1. Each pound of supplement supplied 10000 I.U. vitamin A, 35 mg. Aureomycin and 5 mg. diethylstilbestrol.
2. Diammonium phosphate = 18% nitrogen (112.5% protein equivalent) and 21% phosphorus.
3. Diammonium phosphate - urea blend = 26% nitrogen (162.5% protein equivalent and 13% phosphorus).
4. Urea = 42% nitrogen (262% protein equivalent).

Table 20
Chemical Analyses of Feedstuffs (%)

	Dry matter	Crude protein	Ether extract	Crude fiber	Nitrogen free extract	Ash	Calcium	Phos-phorus
Prairie hay	92.5	3.9	2.1	29.6	49.1	7.8	---	---
Sorghum grain	87.2	11.3	1.9	1.7	71.2	1.2	---	---
Supplement								
79	89.8	33.7	1.2	7.8	34.4	12.8	4.2	2.2
80	89.9	35.8	1.5	7.9	29.5	15.3	4.2	2.8
81	90.4	35.1	1.5	7.7	33.5	12.7	4.4	2.2
82	89.8	33.5	1.5	7.4	33.6	13.8	4.3	2.5
83	90.0	33.2	1.9	6.9	34.1	14.0	4.5	2.5

Table 21

Results of Finishing Steers with Different Protein Supplements
June 15 - December 9, 1965, 177 days.

Lot no.	2	3	4	5	6
Added protein source, Supplement:	79	80	81	82	83
No. steers per lot	10	10	10	10	10
Av. initial wt., lb.	666	667.5	668	666.5	666
Av. final wt., lb.	1117.5	1140	1136	1139	1115
Av. daily gain, lb.	2.55	2.67	2.64	2.67	2.54
Av. daily ration, lb:					
Sorghum grain	16.7	18.2	17.4	17.2	16.5
Prairie hay	3.7	3.7	3.7	3.7	3.7
Supplement	2.00	2.00	2.00	2.00	2.00
Feed per cwt. gain, lb:					
Sorghum grain	655	683	658	646	650
Prairie hay	143	137	138	137	144
Supplement	77	74	75	74	78
Feed cost per cwt. gain[1]	$18.56	$18.13	$18.28	$17.75	$17.80
Shrink to market, %	1.97	2.68	2.33	2.28	3.32
Av. hot carcass wt., lb.	677.4	681.0	690.6	684.5	661.6
Av. dressing % feedlot wt.	60.6	59.7	60.8	60.1	59.3
Av. fat thickness 12th rib, in.	.86	.89	.81	.72	.76
Av. size rib eye, sq. in.	11.45	11.64	11.60	12.13	11.68
Av. degree marbling[2]	5.0	5.4	5.0	5.0	5.2
Estimated kidney knob %[3]	2.55	2.75	2.55	2.50	2.35
Carcass grades					
Top choice					1
Medium choice	1	4	2	2	3
Low choice	8	6	6	6	4
Top good	1		2	2	2
Av. carcass grade[4]	19	19.4	19	19	19.3

1. Prairie hay, $20 per ton; Sorghum grain $2 per cwt; Lot 2 supplement $104/ton; Lot 3 supplement $84/ton; Lot 4 supplement $100.26/ton; Lot 5 $93.80/ton; Lot 6 supplement $86.15/ton.

2. 4=slight, 5=small, 6=modest.

3. Less kidney fat is desirable.

4. 21=high choice, 20=medium choice, 19=low choice, 18=high good, 17=medium good, 16=low good

Levels of Vitamin A and High and Low Level of Roughage in the Finishing Ration of Beef Steers Previously Wintered on Silage and Limited Grain (Project 567)

D. Richardson, E. F. Smith, L. H. Harbers and R. S. Lebdosoekojo

Sixty Hereford steer calves averaging 440 pounds each from Warner's Ranch in Rice county were wintered on sorghum silage, 1 pound soybean oil meal and sorghum grain. Thirty received 4 pounds grain per head daily and 30 received 8 pounds.

After 112 days on the wintering ration, the steers were re-alloted to six lots of 10 steers each with 5 from each level of grain. The silage was reduced so three lots received 16 pounds per head daily and three lots 8 pounds. Silage was fed 111 days and then replaced by 4 or 2 pounds of prairie hay. Sorghum grain was increased to full feed. Vitamin A was added to one lot on each level of roughage at the intended rates of 0, 15000, 30000 I.U. per head daily. Actual analyses showed added levels of 0, 12750, and 22920 I.U. per head daily.

Feedstuff analyses are shown in table 22. This test was to study: 1. Two levels of grain in wintering rations and their effects on subsequent feedlot performance. 2. Effects of adding 0, 15000, or 30000 I.U. of Vitamin A in the finishing ration. 3. Performance on high and low levels of roughage in the finishing ration.

Results and Observations

A summary of the wintering phase is shown in table 23. Steers receiving the higher level of grain gained more, but not significantly more. Cost per pound of gain was increased with the higher level of grain.

A summary of the fattening phase is shown in table 24. An overall summary of the entire test is shown in table 25. The only significant differences were (1) greater gain at the highest level of vitamin A supplementation ($p = < 0.05$), (2) heavier carcasses for steers finished on low roughage ($p = < 0.05$), (3) highly significant difference in liver storage of vitamin A and carotene due to level of roughage and added vitamin A ($p = < 0.01$).

Table 22
Proximate Analyses of Sorghum Silage, Hay, Sorghum Grain and Supplements.

Feedstuff	Moisture	Protein	Ether extract	Fiber	Ash	N.F.E.	Carotene
	%	%	%	%	%	%	mg/lb.
Silage	66.21	2.26	0.84	8.09	2.42	20.18	1.90
Prairie hay	7.01	6.29	3.13	34.29	6.31	42.97	21.80
Sorghum grain	10.70	8.52	3.93	1.93	0.77	74.15	---
Supplement #66	9.62	33.13	1.71	11.73	8.77	35.04	7.80
Supplement #67	9.83	32.63	1.98	13.05	8.83	33.68	5.50
Supplement #68	9.46	31.37	1.63	13.51	9.40	34.36	6.00

1. All supplements supplied 70 mg. Aureomycin per head daily.

Table 23
Summary of Results Obtained During the Wintering Phase, November 13, 1964, to March 5, 1965 - 112 days.

Lot No.	7	8	9	10	11	12
No. steers per lot	10	10	10	10	10	10
Av. initial wt. lb.	441.0	440.5	440.5	441.5	441.0	441.5
Av. final wt. lb.	620.5	617.5	622.5	633.0	638.5	642.5
Av. daily gain, lb.	1.60	1.58	1.63	1.71	1.76	1.79
Av. daily ration, lb.						
Sorghum silage	23.4	23.2	23.2	17.7	17.7	17.9
Sorghum grain	4.2	4.2	4.2	7.5	7.5	7.5
Soybean oil meal	1.0	1.0	1.0	1.0	1.0	1.0
Feed per cwt. gain, lb.						
Sorghum silage	1461.0	1469.0	1428.6	1035.8	1004.3	990.5
Sorghum grain	263.9	267.8	260.2	440.2	426.8	419.4
Soybean oil meal	67.4	63.3	61.5	58.5	56.7	55.7
Feed cost per cwt. gain	$13.61	$13.78	$13.40	$15.31	$14.84	$14.59

Table 24
Summary of Results of Fattening Phase. March to October 4, 1965 - 213 days

Groups	7	8	9	10	11	12
No. of steers	10	10	10	10	10	9
Av. initial wt. per steer, lb.	626	630	629	628	630	630
Av. final wt. per steer, lb.	1101	1077	1083	1143	1100	1084
Av. daily gain, lb.	2.22	2.10	2.13	2.42	2.21	2.13
Vit. A added daily, I.U.	22920	12570	0	22920	12570	0
Av. daily ration, lb.						
Supplement	1.5	1.5	1.5	1.5	1.5	1.5
Sorghum grain	16.0	14.7	15.9	17.6	17.4	15.3
Silage (Mar 6-June25)	16.3	16.4	16.6	9.5	9.5	9.3
Hay (June 25-Oct 4)	4	4	4	2	2	2.2
Feed per cwt. gain, lb.						
Supplement	67.7	71.5	70.4	62.0	68.0	70.4
Sorghum grain	736.8	701.9	748.1	722.0	787.1	718.5
Silage	381.8	406.9	406.4	205.8	223.5	228.6
Hay	85.6	90.4	89.0	39.2	43.0	49.4
Feed cost per cwt. gain	$19.02	$18.66	$19.36	$17.30	$18.82	$17.72
Shrinkage to market,%	5.1	5.1	5.7	5.5	4.1	3.9
Av. hot carcass wt., less 2%, lb.	640.6	633.1	639.1	627.3	648.3	646.1
Dressing %, market wt.	61.5	62.0	62.3	62.3	61.9	62.0
Av. fat thickness 12th rib, in.	0.66	0.74	0.74	0.74	0.66	0.76
Av. size rib-eye, sq. in.	10.44	10.72	10.50	11.26	10.79	10.97
Carcass grades:						
Prime	-	-	2	-	-	-
Top choice	-	1	1	1	2	1
Av. choice	4	5	-	1	2	6
Low choice	6	4	7	8	4	2
Good	-	-	-	-	2	-
Vit. A per gram liver I.U.	49.87	22.48	9.96	28.56	13.05	3.93
Carotenoids per gram liver, mcg.	2.09	2.73	2.50	1.42	1.39	1.95

Table 25
Overall Summary of Entire Test

	Winter[1] 4 lbs. grain	Winter[1] 8 lbs. grain	30000 added I.U.Vit.A	15000 added I.U.Vit.A	0 added Vit.A	Fattening high roughage	Fattening low roughage
No. animals	30	30	20	20	19	30	29
Av. gain, wintering phase, lb.	179.5	196.5	------	------	------	------	------
Av. daily gain, wintering phase lb.	1.63	1.75	------	------	------	------	------
Av. gain, fattening phase, lb.	472	464	493.5*	458.4	452.5	457	479
Av. daily gain, fattening phase, lb.	2.22	2.18	2.32	2.15	2.13	2.15	2.25
Av. total gain, lb.	652	661	681	645	644	648	665.5
Av. daily gain, lb.	2.01	2.03	2.10	1.98	1.98	1.99	2.05
Av. grain consumption, lb.	------	------	16.95	16.05	15.10	15.60	16.80
Av. hot carcass wt. lb.	657	662	670	654	658	651	669*
Av. dressing percent	62.0	62.0	61.9	61.7	62.3	62.0	61.9
Av. ribeye area, 12th rib, sq.in.	10.91	10.66	10.85	10.75	10.74	10.56	11.01
Av. backfat thickness, 12th rib, in.	0.72	0.71	0.70	0.70	0.75	0.71	0.72
Av. estimated kidney knob, % of carcass	3.0	2.9	3.0	2.9	2.9	3.0	2.9
Av. degree marbling[1]	6.4	6.6	6.7	6.6	6.2	6.5	6.5
Av. grade[2]	4.6	4.5	4.4	4.5	4.9	4.6	4.5
Av. I.U. vit. A, storage/gram, liver	23	19	39**	18**	7**	27**	15**
Av. mg. carotenoids/gram, liver	2.0	2.1	1.7	2.1	2.2	2.4**	1.6**

1. 4=slightly abundant, 5=moderate, 6=modest, 7=small amount
2. 2=average good, 3=top good, 4=low choice, 5=average choice, 6=top choice
* significantly greater $p = <0.05$
** highly significant difference $p = <0.01$

Soybean Oil Meal Compared with Urea and Varying Levels of Grain in a Wintering Ration for Steer Calves (Project 370)

D. Richardson and E. F. Smith

It is generally recognized that a readily available source of energy (preferably grain) must be in the ration for efficient synthesis of protein from nonprotein nitrogen. Therefore, nonprotein nitrogen is used primarily in finishing rations. There is practically no information on the minimum amount of grain needed for efficient utilization. This test was designed to compare soybean oil meal (natural protein) and urea (nonprotein nitrogen) on an equivalent nitrogen basis in wintering rations and at levels of 0, 3 and 6 pounds per head daily of added grain. Sorghum silage was fed in the amount that the animals would clean up. The sorghum produced 85 bushels grain per acre. Two pounds of average quality alfalfa hay was fed per head daily to all animals.

Results and Observations

Results are shown in table 26. Urea was less efficient than soybean oil meal without added grain. With the excellent silage, apparently 3 pounds of grain was sufficient for efficient utilization of the urea.

This test is being continued by adding grain to finish the steers for market.

Table 26
Urea Compared with Soybean Oil Meal and Varying Levels of Grain in Wintering Ration of Steer Calves

Lot	13	14	15	16	17
No. steers per lot	14	14	14	14	14
Av. initial wt., lb.	519	525	520	518	519
Av. final wt., lb.	689	665	703	710	730
Av. daily gain, lb.	1.52	1.24	1.63	1.72	1.88
Av. daily ration, lb.					
Sorghum silage	24.8	24.1	21.1	20.7	17.1
Alfalfa hay	2.0	2.0	2.0	2.0	2.0
Soybean oil meal	1.0	---	1.0	---	---
Grain-Urea supplement[1]	---	1.0	---	1.0	1.0
Sorghum grain	---	---	3.0	3.0	6.0
Feed per cwt. gain, lb.					
Sorghum silage	1634	1939	1291	1205	910
Alfalfa hay	132	161	123	117	106
Soybean oil meal	66	--	61	--	--
Grain-Urea supplement	--	80	--	58	53
Sorghum grain	--	--	184	175	319
Feed cost per cwt. gain	$11.16	$12.17	$13.13	$11.52	$12.94

1. 86% sorghum grain and 14% urea = 44% protein equivalent.

Improvement of Beef Cattle Through Breeding (Project 286).

W. H. Smith, J. D. Wheat and H. G. Spies

The purebred Shorthorn beef cattle breeding experiment was initiated to study inheritance of production traits, to evaluate effects of inbreeding, and to explore the feasibility of using inbred lines for breeding improvement of production traits. The project was initiated in 1949 and was continued during 1965 according to plan.

The Wernacre Premier line is in its fifth generation and the Mercury line in its fourth generation of inbreeding. The inbreeding program has been basically to continue successive generations of half-sibbing. Extensive line crossing has not been attempted because of relatively low levels of inbreeding prevailing in both lines and the limited number of animals. Inbreeding will continue to be increased as the project progresses.

Production data for the 1964 calves are summarized in Table 27. Those for the 1965 calves have not been completed. Thirty-four of the 1965 calves are being fed individually.

Management of the experimental cattle includes weighing each cow and calf immediately following parturition. Calves are born in the spring and early summer each year as the result of summer pasture breeding. Creep feeding is not practiced. The calves are weaned, weighed and scored at approximately 6 months of age for feeder calf grade. Shortly after being weaned, they are placed on individual feeding trials for record-of-performance tests for 182 days. At completion of this feeding phase they are approximately 365 days old. Feed consumption and live weight gain records are maintained while the calves are on test. Final weights and conformation scores are taken at the termination of the feeding period. The primary trait selected for has been high weight per day of age.

Feed consumption and weaning weight data have been summarized and subjected to preliminary statistical analyses, and previously reported.

To date, no hereditary abnormalitites attributable to effects of inbreeding have been observed in either line. Incidence of still born calves has tended to increase with increased inbreeding, especially in the Mercury line.

The full-feed ration for bulls consists of 75% cracked corn and 25% chopped alfalfa hay; that for the heifers, 55% cracked corn and 45% chopped alfalfa hay. No bull calf has been castrated since 1957.

Table 27
Summary of the 1964 Shorthorn Calves

Tag no.	Coefficient of inbreeding	Birth weight	Weaning weight	Weaning score	Days fed	Initial weight	Final weight	Total gain	Av. daily gain	Final Score	T D N cwt. gain
					Mercury Line Bulls						
1	20.30	69	337	2-	182	343	785	442	2.43	2	414
3	15.63	57	400	2+	182	392	810	418	2.30	1-	506
6	16.24	74	450	2	182	466	932	466	2.56	2+	314
10	7.18	66	360	3	182	396	850	454	2.49	3+	484
14	15.50	80	369	2-	182	370	910	540	2.97	2	347
16	7.81	75	298	2	182	315	735	420	2.31	3	401
17	18.75	75	380	2-	182	393	780	387	2.13	3+	508
19	16.24	85	365	2	182	391	980	589	3.24	2-	371
20	17.19	60	365	2	182	395	825	430	2.36	2	451
29	14.69	72	398	2+	182	387	825	438	2.41	2+	489
33	15.92	72	335	2-	182	328	730	402	2.21	3+	502
37	12.50	78	400	2-	182	422	875	453	2.49	2	480
38	13.45	55	315	2-	182	340	710	370	2.03	3+	472
Av.	14.72	71	367	2	---	380	827	447	2.46	2-	441
					Heifers						
2	7.18	80	425	1-	182	443	790	347	1.91	1	568
5	16.75	71	400	2-	182	425	780	355	1.95	3+	545
8	9.38	80	415	2	182	400	750	350	1.92	1	504
11	15.50	56	380	2+	182	378	740	362	1.99	1-	582
12	15.63	67	382	2	182	381	680	299	1.64	2-	620
13	13.45	62	258	2+	182	302	750	448	2.46	1-	421
18	15.92	58	360	2-	182	334	690	356	1.96	2-	538
21	14.69	70	307	2	182	305	640	335	1.84	2	629
22	15.50	89	382	2-	182	386	758	372	2.04	2+	571
23	17.19	67	275	2-	182	276	630	354	1.95	3+	465
25	14.69	72	370	2	182	371	725	354	1.95	2-	574
27	16.25	64	341	2	182	355	641	286	1.57	2+	596

Tag no.	Coefficient of inbreeding	Birth weight	Weaning weight	Weaning score	Days fed	Initial weight	Final weight	Total gain	Av. daily gain	Final score	T D N cwt. gain
Continued											
32	17.19	71	280	2+	182	295	660	365	2.01	2-	587
34	12.93	53	345	2	182	336	650	314	1.73	2-	576
35	18.75	62	300	3	182	311	665	354	1.95	3+	503
Av.	14.73	68	348	2	---	353	703	350	1.92	2	552
				Wernacre Premier Bulls							
7	33.05	61	300	2-	182	309	825	516	2.84	2	464
9	34.05	79	382	2-	182	408	840	432	2.37	3	514
26	29.81	62	298	3	182	329	770	441	2.42	3+	477
30	34.05	72	480	2-	182	495	1030	535	2.94	2+	474
36	28.27	74	446	2	182	475	1005	530	2.91	2-	474
Av.	31.85	70	381	2-	---	403	894	491	2.70	2-	481
				Heifers							
28	30.86	67	331	2-	182	342	730	388	2.13	3+	530
24	34.09	75	400	3-	182	408	780	372	2.04	3+	608
Av	32.48	71	366	3+	---	375	755	380	2.09	3+	569

Effects of Heat Treatment of Proportions of Sorghum Grain in Fattening Lamb Rations (Project 236)

C. S. Menzies, D. Richardson, C. W. Deyoe and H. B. Pfost

Research indicates that treating grains with heat may improve feedlot performance of ruminant animals. Previous work here indicated that treating all grain or roughage with heat resulted in reduced palatability. This test was designed to determine the effect of treating[1] various proportions of the grain in the ration.

Experimental Procedure

The 132 finewool wether lambs used were shorn, drenched with pheno-thiazine-lead arsenate, vaccinated with 5 cc. Clostridium perfringens type D toxoid and implanted with 3 mg. stilbestrol and placed on test November 10, 1965. Lambs were weighed, randomly divided into 12 lots and duplicate lots were self-fed a ration consisting of 55% dehydrated alfalfa (15% protein) and 45% sorghum grain treated as follows:

Lot no.	Lamb ration
5 & 11	Control, ground-mixed.
3 & 9	15% heat treated sorghum grain, ground-mixed.
4 & 10	30% heat treated sorghum grain, ground-mixed.
2 & 8	45% heat treated sorghum grain, ground-mixed.
6 & 12	45% steam rolled sorghum grain, mixed.
1 & 7	Entire ration treated and fed in form of expanded pellet.

Wheat straw was fed free choice to all lambs.

Results and Discussion

Results are reported in table 28. Daily feed consumption decreased as the percentage of heat treated (expanded) sorghum grain increased. Slowest gains and poorest feed efficiency were by lambs in lots 2 and 8 fed a ration with all sorghum grain heat treated. However, most efficient gains were made by lambs in lots 4 and 10 fed a ration containing 30% (two-thirds of the grain portion) heat treated grain. Most rapid gains were made by lambs receiving steam rolled sorghum grain.

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1. Processed through an expansion pelleting machine at the Wenger Mixer Manufacturing Company, Sabetha, Kansas. Treated ingredients were steam heated to 300°F in the process.

Table 28
Performance of Lambs Fed Heat Treated Rations, November 10 to February 14 - 96 days

Treatment	Control		15% Treated Sorghum grain		30% Treated Sorghum grain		45% Treated Sorghum grain		45% Steam Rolled Sorghum grain		Expanded	Pellet
Lot no.	5	11	3	9	4	10	2	8	6	12	1	7
No. lambs	11	10	11	9	11	10	11	9	10	10	11	10
Av. initial wt., lb.	65.6	69.4	70.4	69.1	69.6	70.3	66.2	66.2	70.3	70.5	70.2	70.2
Av. final wt., lb.	108.5	109.1	103.5	107.5	108.9	108.6	92.4	99.6	115.4	111.8	106.6	111.0
Av. total gain, lb.	42.9	39.7	33.1	38.4	39.3	38.3	26.2	33.4	45.1	41.3	36.4	40.8
Av. daily gain, lb.	0.44	0.41	0.35	0.40	0.41	0.40	0.27	0.34	0.47	0.43	0.38	0.42
Daily feed/ lamb, lb.[1]	3.49	4.05	3.12	3.27	3.11	2.97	3.12	2.84	3.56	3.38	3.36	3.50
Feed/cwt. gain, lb.	783.2	978.8	904.1	818.6	761.3	744.9	1139.4	822.8	758.1	786.7	886.0	824.5

Averages for Duplicated Treatments

Av. daily gain, lb.	0.431	0.370	0.404	0.307	0.450	0.401
Daily feed/ lamb, lb.	3.76	3.19	3.05	2.99	3.47	3.43
Feed/cwt. gain, lb.	872.4	862.2	755.0	973.9	771.1	855.4

1. Lambs in Lot 11 wasted considerable feed which accounts for part of the high daily consumption.

Value of Animal Fat and Alfalfa Hay in High-concentrate Lamb Rations

C. S. Menzies

In a previous test (Livestock Feeders' Day Bulletin 473) adding 10% animal fat to a ration containing 45% alfalfa hay did not affect rate of gain but materially improved feed efficiency and lowered cost per unit gain. This test was conducted to determine the value of fat and additional hay in a high concentrate ration for lambs fed during the hot summer.

Experimental Procedure

Thirty early weaned ewe and wether lambs were sheared and divided into three lots June 8 and self-fed these rations:

Lot 1 - 64% ground sorghum grain, 20% dehydrated alfalfa meal, 10% soybean oil meal, 5% molasses, and 1% ground limestone.

Lot 2 - Same ration as fed lot 1 except additional alfalfa hay was fed free choice.

Lot 3 - 59% ground sorghum grain, 20% dehydrated alfalfa meal, 10% soybean oil meal, 5% molasses, 5% stabilized animal fat and 1% ground limestone, no alfalfa hay.

Results and Discussion

Results are presented in Table 29. Lambs in all lots gained rapidly and efficiently during the hot summer. No digestive troubles were noticed in any lots. Adding 5% animal fat did not improve rate or efficiency of gain. Lambs having free access to alfalfa hay consumed only .36 lb. hay per day and made slower, less efficient gains than those receiving no hay.

Table 29
Results From Adding Fat and Alfalfa Hay to High-concentrate Lamb Rations, June 8 to August 13 - 66 days.

Lot no.	1	2	3
Treatment	No hay No fat	Alfalfa hay No fat	No hay 5% fat
No. lambs	9	10	10
Av. initial wt. lb.	51.9	48.4	49.9
Av. final wt. lb.	95.2	88.4	91.4
Av. total gain, lb.	43.3	40.0	41.5
Av. daily gain, lb.	.656	.606	.629
Daily feed per lamb, lb.			
Ground-mixed ration	3.16	3.28	3.32
Alfalfa hay		.36	
Total	3.16	3.64	3.32
Av. feed per cwt. gain, lb.			
Ground-mixed ration	481.7	541.2	527.8
Alfalfa hay		59.4	
Total	481.7	600.6	527.8
Av. feed cost per cwt. gain[1]	$ 9.83	$11.63	$12.30

1. Feed prices used were: alfalfa hay, $20/ton; sorghum grain, $34/cwt.; animal fat 7.5¢/lb.; dehydrated alfalfa, $35/ton; soybean meal, $74/ton; molassed, $30/ton; and ground limestone, $20/cwt. Grinding and mixing cost, $3/ton. With those charges the ration containing 5% fat cost $46.66/ton and that with no fat, $40.86/ton

Table 30
Proximate Analyses of Rations Fed

	No fat	5% fat
Moisture	7.3%	8.8%
Protein	14.5%	14.4%
Fat	3.0%	7.3%
Fiber	6.8%	6.3%
Ash	4.7%	4.8%

Investigations of Milk-fat Lamb Production Practices for Western Kansas, Colby.*

Results for 1964-65 Creep-feeding Tests and 1965 Ewe Preflushing and Flushing Tests.

C. S. Menzies, Animal Husbandry Department, Kansas State University
Evans Banbury, Superintendent, Colby Branch Station
Henry Elliott, Livestock Project Leader, Colby Branch Station

Experimental Sheep

A flock of approximately 450 commercial finewool ewes is maintained at the Colby Branch Experiment Station. Ewes are purchased in southwest Texas as yearlings and replaced after producing their sixth lamb crop. The current flock is made up of ewes that have produced their first, third, and sixth lamb crops. Purebred Hampshire rams were used.

General Procedure

The ewe flock is handled in an early lambing program with the breeding season beginning around June 1 and ending September 1. All lambs are sold as milkfat lambs during the spring and early summer.

Two separate tests were made during 1965-66. (1) a study to determine the value of different rations for creep-feeding lambs and (2) a study determining the various treatments and rations for flushing ewes.

Lamb Feeding Tests, 1964-65

Procedure: To study values of various creep-feeding rations with milk-fat lambs for a spring market, ewes and lambs were divided into 8 test groups. Allottment was based on type of lamb birth (multiple or single) and lamb age. Lambs were docked and castrated during a 7 to 10 day adjustment period before being placed in test groups.

All ewes, except those on rye pasture in lot 2, received a uniform nursing ration until lambs were weaned, then they were fed a standard maintenance ration. Lambs in all lots had access to a self-fed creep ration as soon as assigned to test groups.

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* Contribution No. 345, Department of Animal Husbandry, and No. 27, Colby Branch Station, Kansas Agricultural Experiment Station, Kansas State University. 1M-3-66

Lamb and ewe treatments follow:

Lot No.	Lamb ration and treatment	Ewe treatment
1	Mixture: 10% soybean meal 35% ground sorghum grain 55% ground alfalfa hay weaned 8-10 weeks of age	Standard ration* until lambs were weaned, then maintenance ration**
2	Rye pasture Mixture: 45% ground sorghum grain 55% ground alfalfa hay weaned 8-10 weeks of age	Rye pasture until lambs were weaned, then maintenance ration
3	Mixture: 45% ground sorghum grain 55% ground alfalfa hay weaned 8-10 weeks of age	Standard ration until lambs were weaned, then maintenance ration
4	Mixture: 45% ground sorghum grain 55% ground alfalfa hay	Standard ration
5	Whole sorghum grain Alfalfa hay	Standard ration
6	Whole sorghum grain Alfalfa hay ¼ oz. ammonium chloride	Standard ration
7	Mixture: Changing ration (see Table 33)	Standard ration
8	Mixture: 65% ground sorghum grain 35% ground alfalfa hay	Standard ration

* Standard ewe ration - 1 lb. sorghum grain, 1.25 lb. alfalfa hay, full feed of sorghum silage (av. consumption, approximately 10 lb./day).

** Maintenance ration - 1 lb. alfalfa hay and 6 lb. sorghum silage.

Table 31

Lamb performance and feed cost by treatments, 1964-1965.

Lot No.	1	2	3	4	5	6	7	8
Treatment	Ground Mixture: 10% S.B.M. 35% sorg. gr. 55% alf. hay (weaned 8-10 weeks)	Rye pasture Ground Mixture: 45% sorgh. gr. 55% alf. hay (weaned 8-10 weeks)	Ground Mixture: 45% sorg. gr. 55% alf. hay (weaned 8-10 weeks)	Ground Mixture: 45% sorg. gr. 55% alf. hay	Whole sorg. grain, alf. hay	Whole sorg. grain, alf. hay NH_4Cl[1]	Ground Mixture: Changing ration[2]	Ground Mixture: 65% sorg. gr. 35% alf. hay
No. lambs	65	63	64	67	61	66	68	61
Av. market wt., lb.[3]	109.2	105.7	106.3	105.3	101.3	101.2	106.6	106.7
Av. total gain, lb.[4]	98.4	95.0	95.8	94.5	90.6	90.1	95.9	95.8
Av. daily gain, lb.	.65	.60	.60	.61	.53	.53	.62	.60
Twin lambs, lb.	.60	.56	.57	.55	.48	.47	.54	.55
Av. market age, days	154	159	161	159	177	177	159	163
Av. Daily feed/lamb, lb.								
Mixture	2.51	1.82	2.49	2.02			2.03	1.85
Sorghum grain					1.37	1.36		
Alfalfa hay					.34	.37		
Av. lb. feed/cwt. gain								
Mixture	393.0	304.5	418.6	339.9			336.5	314.8
Sorghum grain					267.7	267.1		
Alfalfa hay					66.4	72.7		
Total	393.0	304.5	418.6	339.9	334.1	339.8	336.5	314.8
Lamb feed cost/cwt. gain[5]	$ 8.65	$ 5.88	$ 8.09	$ 6.56	$ 6.35	$ 6.82	$ 7.67	$ 6.39
Ewe feed cost to 4-5-65 per cwt. gain	$ 5.84	$ 3.09	$ 6.01	$ 8.32	$ 8.67	$ 8.80	$ 8.13	$ 8.27
Total feed cost/cwt. gain[5]	$14.49	$ 8.97	$14.10	$14.88	$15.02	$15.62	$15.80	$14.66

1. Ammonium chloride was fed beginning 12-10-64 at 1/8 oz. per lamb per day for each lamb over 20 days of age; increased to 1/4 oz. on 1-6-65 when youngest lamb became 20 days old.
2. See table 2 for details.
3. Weight at station prior to shipment.
4. Market weight minus birth weight.
5. Based on these prices: sorghum grain, $2.00/cwt., alfalfa hay $30/ton, soybean meal $95/ton, grinding $2/ton, mixing $2/ton and rye pasture at 1½ cents per ewe per day. Ammonium chloride fed lot 6 cost 35¢/lamb.

Table 32
Shrink and Carcass Data By Treatments, 1964-1965.

Lot no.								
% shrink to market[1]	8.6	5.4	3.2	4.2	4.7	5.9	6.8	7.9
Dressing, %[2]	52.0	52.8	50.8	51.5	52.8	54.0	52.8	53.3
U.S.D.A. carcass grade								
% Prime	66	71	51	73	93	87	90	84
% Choice	34	29	49	27	7	13	10	16
No. lambs graded	55	48	45	52	29	31	1	44

1. Based on weight at station and selling weight at Denver, Colorado. Lambs were marketed in 5 shipments. Equal numbers from each lot were not marketed at the same time.
2. Not obtained on all lambs marketed.

Table 33. Rations fed lot 7

Period[1]	1st 60 days	60 to 90 days	90 to 120 days	120 days to market
Ration				
% soybean meal	20	15	10	10
% gr. sorghum grain	70	60	50	35
% gr. alfalfa hay	10	25	40	55
Av. daily feed/lamb, lb.	0.41	1.32	2.31	3.13
Cost of ration/cwt.	$ 2.81	$ 2.49	$ 2.28	$ 2.20

1. Calculated on days from birth of first lamb.

Table 34. Lamb weights at 8 to 10 weeks of age.

Lot no.	1	2	3	4	7
No. lambs	65	63	64	67	68
Av. weaning age, days[1]	66	66	66	66	66
Av. weaning wt., lb.[1]	52.0	55.3	47.8	48.0	52.6
Single wethers	59.5	61.5	57.9	56.3	59.5
Single ewes	54.7	58.9	49.3	52.6	56.2
Twins	44.9	48.2	41.4	39.7	45.5

1. Lambs in lots 1, 2, and 3 were weaned, while those in lots 4 and 7 were weighed at a corresponding age, but were not weaned until later.

Table 35. Number of lambs affected and number lost to indicated disease by lots.

Lot No.	Urinary Calculi	Enterotoxemia	Death Loss	Removed from lot for Other Causes
1	-	-	-	2
2	-	1	1	-
3	-	-	-	1
4	-	-	-	-
5	4	-	1	1
6	-	-	1	1
7	-	-	-	-
8	1	1	1	3

Lambs were marketed in Denver, Colo. when they weighed approximately 105 lb. at the station. Five separate shipments were made.

Results and Discussion: Performance and cost of gain for various rations are reported in table 1. Lambs weaned when 8 to 10 weeks of age (lot 3), gained equally as fast, ate more feed, and reduced ewe feed cost so cost per cwt. of lamb gain was 78 cents less than lambs weaned at a later date (lot 4). Replacing 10% of the sorghum grain with soybean meal for early weaned lambs (lot 1) increased rate of gain and cost of gains. Early weaned lambs on rye pasture (lot 2) ate less creep feed, gained equally as fast, and made considerably cheaper gains than early weaned lambs fed a similar ration in the dry lot (lot 3). Rye pasture stimulated milk production in ewes as lambs in this lot weighed approximately 7.5 lbs. more at weaning than lambs in lots 3 or 4 fed similar creep rations in dry lots (see Table 34).

Lambs in lots 5 and 6 fed whole sorghum grain and alfalfa in separate troughs made slower, more expensive gains than those in lot 4 fed a ground-mixed ration. Adding ammonium chloride (lot 6) did not affect feed consumption or lamb performance while reducing urinary calculi compared with lambs on the control ration (lot 5, Table 35).

Urinary calculi has been a serious problem in previous years with wether lambs fed a ration of grain and hay in separate troughs. Not a single case of calculi has been noticed with lambs fed a mixed ration containing at least 55% alfalfa. Lambs in lots 5 and 6 (table 31) ate only around 1/3 pound of alfalfa per day while those

in lots receiving the mixed rations ate around 1 1/3 pound of hay per day.

Starting young lambs on a high protein-high concentrate ration and periodically reducing the protein and concentrate levels with their age (as they became ruminant animals) was not economical at feed costs used; however, the lambs performed well. Ration composition used at various periods is reported in table 2.

Increasing the grain level to 65% in lot 8 did not improve rate of gain, however, the lambs made slightly more efficient and cheaper gains than those in lot 4 fed a 45% grain ration. Incidence of calculi, enterotoxemia and prolapsed rectums was somewhat higher in the lot fed 65% concentrates.

Table 36. Market information on lambs sold during 1965.

Number of lambs	532
Market dates and number sold:	
April 5, 1965	165
April 26, 1965	201
May 17, 1965	88
June 7, 1965	49
June 28, 1965	29
Av. feedlot wt. at market date	105.1
Av. sale wt.	99.16
Av. shrink to market (feed lot wt. to market wt.)	5.65%
Av. selling price/cwt.	$ 27.19
Trucking cost/cwt.	.62
Other marketing costs/cwt.	.80
Total marketing costs/cwt.	1.42
Av. return/lamb after marketing costs	$ 25.59
Av. gross lamb return/ewe(1)	30.80
Av. gross return/ewe(2)	35.78
Net lamb sales after market expense	$13,612.64
Wool income	1,797.29
Wool and lamb incentive payments (estimated)	405.00
	$15,814.93

(1) Wool and government incentive payments not included.

(2) Includes estimated wool and government incentive payments.

Ewe Flushing Test, Spring 1965.

Procedure: The 421 ewes (128 yearlings and 293 four and seven year old ewes) were weighed and assigned to six groups May 14, 1965. The six groups received the following flushing treatments:

Lot 1 - Cereal crop pasture - 34 days (c.c.p.)

Lot 2 - Cereal crop pasture plus 1 lb. whole sorghum grain per ewe per day - 34 days (c.c.p. + 1# gr.)

Lot 3 - Dry lot ration of 2 lb. whole sorghum grain and 2 lb. alfalfa hay per ewe per day. - 34 days. Sixty mg. of the synthetic progestin hormone Medroxyprogesterone acetate (repromix)[1] was fed per ewe per day from May 17 to May 31 (15 days). One fourth of the grain was ground and mixed with Repromix and fed once daily before ewes were fed remainder of their grain. (repromix)

Lot 4 - Dry lot ration of 2 lb. whole sorghum grain and 2 lb. alfalfa hay plus 1/7 oz. wheat germ oil per ewe per day - 34 days. Wheat germ oil was mixed with the daily grain ration (w.g. oil)

Lot 5 - Dry lot ration of 2 lb. whole sorghum grain and 2 lb. alfalfa hay per ewe per day - 34 days. (control)

Lot 6 - Dry lot ration of 2 lb. whole sorghum grain and 2 lb. alfalfa hay per ewe per day - 34 days. Ewes exposed to 4 vasectomized rams from the beginning of the flushing period, May 14, to the beginning of the breeding period, June 1 (17 days). (teaser rams)

During the breeding season (June 1 - September 1) 18 purebred Hampshire rams were used. Breeding season began 17 days after ewes were placed on flushing treatment and 17 days before flushing rations were stopped. The rams were randomly assigned to six groups of 3 rams and each group was rotated to a different ewe lot twice each week. Rams were placed with ewes at night only and were removed during the day.

At the end of the 34-day flushing period, June 18, ewes were individually weighed and turned together. The 18 rams were turned with the ewes as a group until September 1. After flushing, ewes were grazed on buffalo grass and sudan pasture. In addition to pasture, ewes were fed 3/4 lb. of sorghum grain and 1/4 lb. dehydrated alfalfa pellets during the last 3 to 4 weeks before lambing season started.

1. Donated by Upjohn Company, Kalamazoo, Mich. This orally active synthetic progestin hormone prevents estrus and ovulation. It can, therefore, be used to synchronize estrus in cycling ewes.

Table 37. Gains and lambing performance of ewes alloted to one of the indicated flushing treatments, spring, 1965.

Lot No.	No. of ewes	Total gain	No. ewes lambing	Total No. lambs	% lamb crop[1]	% lamb crop[2]
First lamb crop ewes						
1 (c.c.p.)	22	6.1	21	23	104.6	109.5
2 (c.c.p. + 1# gr.)	22	8.0	19	22	100.0	115.8
3 (Repromix)	21	11.2	18	20	95.2	111.1
4 (w.g. oil)	24	13.6	23	25	104.2	108.7
5 (Control	19	11.8	17	19	100.0	111.8
6 (Teaser rams)	20	13.2	19	19	95.0	100.0
TOTAL	128		117	128	100.0	109.4
Third and sixth lamb crop ewes						
1 (c.c.p.)	50	.9	50	68	136.0	136.0
2 (c.c.p. + 1# gr.)	49	6.6	49	63	128.6	128.6
3 (Repromix)	50	15.7	48	65	130.0	135.4
4 (w.g. oil)	50	15.0	47	65	130.0	138.3
5 (Control)	50	15.2	50	71[3]	142.0	142.0
6 (Teaser rams)	51	14.9	49	73[3]	143.1	149.0
TOTAL	300		293	405	135.0	138.2
GRAND TOTAL	428		410	533	124.5	130.0

1. Includes all ewes exposed to rams and all lambs born.
2. Includes only ewes lambing and all lambs born.
3. Two sets of triplets in each lot.

Table 38. Effect of flushing treatment on cumulative percentage of ewes lambing. Spring, 1965.

Lot No.	Days after first lamb birth: 10	20	30	40	90	Total lambing
	First lamb crop ewes					
1 (c.c.p.)	27.3	36.4	72.7	86.4	95.4	95.4
2 (c.c.p. + 1# gr.)	18.2	36.4	68.2	77.3	86.4	86.4
3 (Repromix)	61.9	71.4	85.7	85.7	85.7	85.7
4 (w.g. oil)	20.8	45.8	91.7	91.7	95.8	95.8
5 (Control)	10.5	31.6	57.9	79.0	89.5	89.5
6 (Teaser rams)	20.0	30.0	75.0	75.0	95.0	95.0
	Third and sixth lamb crop ewes					
1 (c.c.p.)	2.0	12.0	74.0	86.0	98.0	100.0
2 (c.c.p. + 1# gr.)	---	16.3	75.5	91.8	98.0	100.0
3 (Repromix)	42.0	52.0	94.0	96.0	96.0	96.0
4 (w.g. oil)	2.0	16.0	80.0	88.0	94.0	94.0
5 (Control)	8.0	20.0	90.0	92.0	100.0	100.0
6 (Teaser rams)	13.7	23.5	78.4	84.3	96.1	96.1

Table 39. Number of ewes breeding by periods following onset of breeding season as recorded from breeding marks.[1]

Lot No.	No. of ewes	Period 6-1-65 to 6-9-65 (9 days)	6-10-65 to 6-17-65 (8 days)	6-18-65 to 6-25-65 (8 days)
1 (c.c.p.)	72	13	10	34
2 (c.c.p. + 1# gr.)	71	5	15	35
3 (Repromix)	71	49	0	16
4 (w.g. oil)	74	12	15	38
5 (Control)	69	10	16	35
6 (Teaser rams)	71	17	9	35

Results and Discussion: Results of lambing performance and gains of ewes receiving the various flushing treatments are presented in Table 37 and 38. The number of ewes bred by periods following onset of breeding season is reported in Table 39.

Ewes in the four lot (3, 4, 5, 6) receiving the dry lot flushing ration of 2 lb. sorghum grain and 2 lb. alfalfa hay gained considerably more during the 34-day flushing period than those on cereal crop pasture (Lots 1 and 2). Adding 1 lb. of sorghum grain per ewe per day on cereal crop pasture materially increased gains, but failed to improve lambing performance. Similar results were obtained last year. (See Report of Progress 103 for summary of the past 6 years' flushing data).

Yearling ewes produced fewer multiple births and a proportionately larger number failed to lamb compared with older ewes. There appeared to be no material difference due to flushing treatment as measured in percentage lamb crop produced.

Ewes synchronized prior to breeding with Repromix had an earlier average lambing date (Table 38) compared with ewes receiving other treatments. Sixty-two percent and 42 percent of the yearling and older Repromix-fed ewes, respectively, lambed within the first 10 days of lambing season. This accounted for most of the ewes bred during the first estrus after Repromix was removed from the ration: 69% of the ewes in this lot bred during the first 9 days of the breeding season (Table 39). Ewes exposed to teaser rams also tended to lamb somewhat earlier than controls and yearling ewes fed wheat germ oil also lambed earlier than controls.

Lamb Creep Feeding Tests, 1965 - 1966

Procedure: Lambs born during the fall of 1965 were allotted to eight test groups. After lambing, the ewes with their lambs were given a 7 to 10 day adjustment period. Lambs were docked and castrated and assigned, on the basis of type of birth and age, to various test lots. All creep rations were self-fed.

Lamb and ewe treatments for the various lots follow:

Lot No.	Lamb creep ration	Ewe nursing ration
1	Mixture: 55% ground alfalfa hay 40% ground sorghum grain 5% molasses	Standard ration[1]
2	Rye/pasture weaned 8 to 10 wks. of age	Rye/pasture until lambs weaned, then maintenance ration[2]
3	Mixture: 55% ground alfalfa hay 40% ground sorghum grain 5% soybean meal	Standard ration
4	Mixture: 55% ground alfalfa hay 35% ground sorghum grain 10% soybean meal	Standard ration
5	Free Choice: Alfalfa hay Ground sorghum grain	Standard ration
6	Free Choice: Alfalfa hay Ground sorghum grain containing 1½% ammonium chloride until oldest lamb is 80 days - then reduced to 1% ammonium chloride	Standard ration

1. Standard nursing ration: 1 lb. whole sorghum grain, 1.25 lb. alfalfa hay, and sorghum silage fed to limit of appetite (approximately 10 lb.) per ewe daily.
2. Maintenance ration: 1 lb. alfalfa hay, 6 lb. sorghum silage per ewe daily.

7	Mixture: 55% ground alfalfa hay 45% ground sorghum grain	Standard ration
8	Mixture: 55% ground alfalfa hay 45% ground wheat	Standard ration

Results and Discussion: This test will be concluded in 1966 and reported in 1967.

Lamb Feeding Experiments, Garden City, 1965-66[1]

C. S. Menzies, K.S.U., and A. B. Erhart, Garden City

Lambs and Pretest Treatment

Lambs used were finewool wethers purchased from the Zuni Indian Reservation near Gallup, New Mexico. Average purchase weight of 699 head was 63.8 lbs.; cost was $23.50 per cwt. plus 15 cents per head commission. Lambs were trucked to Garden City, arriving October 15. Shrinkage during shipment was 5.8 lbs. (9.10%). Chopped grain sorghum stubble and alfalfa hay were fed until lambs went on test.

Experimental Procedure

November 1, 1965, lambs were randomly divided into 13 lots of 50 lambs each and started on the following rations:

Lot No.	Treatment	How Fed
1	Standard ration of sorghum silage, whole sorghum grain, .75 lb. dehydrated alfalfa pellets, .10 lb. C.S.M. (cottonseed meal)	Hand
2	Sorghum silage in standard ration replaced by corn silage.	Hand
3	Mixture of 35% whole sorghum grain and 65% dehydrated alfalfa pellets.	Self
4	Mixture of 35% whole sorghum grain, 32.5% dehydrated alfalfa pellets and 32.5% dehydrated sorghum stubble pellets.	Self
5	Mixture of 35% whole sorghum grain, 20% dehydrated alfalfa pellets and 45% dehydrated sorghum stubble pellets.	Self
6	Mixture fed to lot 5 ground and made into a 3/16" pellet.	Self
7	Mixture of 35% whole sorghum grain and 65% suncured alfalfa pellets	Self

1. Contribution No. 343, Department of Animal Husbandry, and No. 83, Garden City Branch Station, Kansas Agriculture Experiment Station, Kansas State University.

Lot No.	Treatment	How Fed
8	.10 lb. C.S.M. in standard ration (lot 1) replaced by .10 lb. of mixture of 13% urea and 87% ground sorghum grain (approximately equal to C.S.M. in crude protein).	Hand
9	.05 lb. C.S.M. in standard ration (lot 1) replaced by .05 lb. of mixture of 13% urea and 87% ground sorghum grain.	Hand
10	Ration fed to lot 8 plus 35 mg. copper sulfate per lamb per day.	Hand
11	Volunteer wheat pasture - irrigated.	Pasture
12	Drilled wheat pasture - irrigated.	Pasture
13	Alfalfa pasture - irrigated.	Pasture

All lambs were vaccinated by Dr. J.E. Dale with 5 cc. Clostridium perfringens Type D Bacterin October 28, and were revaccinated December 6, because of death losses from enterotoxemia. Each lamb was implanted in the lower jaw with a 3 mg. stilbestrol implant November 19. Half the lambs in each lot (25 head) were treated with 45 ml. of "Tiguvon" pour-on parasiticide at the start of the test. Internal parasite egg counts were made on fecal samples collected from lambs in lot 1 November 1, and again November 10.

The volunteer wheat pasture consisted of rank growth, irrigated volunteer Scout wheat. Irrigated drilled wheat was Scout seeded August 28 at 68 lbs. per acre. The irrigated alfalfa pasture (14 acres) was regrowth following last cutting September 23. It was estimated that alfalfa pasture that remained was equal to around 17,000 lbs. of hay. Because of snow and limited alfalfa pasture lambs on alfalfa were fed 1 lb. dehydrated alfalfa pellets per day the last 24 days on pasture and on January 11 (71 days after start of test) they were placed in dry lot and self-fed a mixture of approximately 40% whole sorghum grain and 60% dehydrated alfalfa pellets.

Final weights were taken February 11 after 102 days on test.

Table 40

Value of corn silage, sorghum silage, urea, cottonseed meal and copper sulfate in hand fed lamb rations November 1, 1965 to February 11, 1966 -- 102 days

Lot No.	2	1	9	8	10
Treatment	Corn silage C.S.M.	Sorg. silage C.S.M.	Sorg. silage ½ C.S.M. ½ Urea	Sorg. silage Urea	Sorg. silage Urea $CuSO_4$[1]
No. lambs	48	48	42	49	46
Av. initial wt., lbs.	63.4	63.3	62.7	63.0	64.9
Av. final wt., lbs.	110.3	106.1	105.3	104.8	105.8
Av. total gain lbs.	46.9	42.8	42.6	41.8	40.9
Av. daily gain, lbs.	.460	.420	.418	.410	.401
Tiguvon[2]	.474	.432	.452	.383	.396
Control	.443	.408	.387	.438	.404
Daily feed/lamb, lbs.					
Sorghum grain	1.34	1.34	1.34	1.34	1.34
Sorghum silage		3.95	3.95	3.93	3.95
Corn silage	3.95				
Dehy. alf. pel.	.72	.72	.72	.72	.72
41% C.S.M.	.10	.10	.05		
Urea mix			.05	.10	.10
Copper sulfate					35 mg.
Salt	.027	.025	.022	.023	.024
Feed/cwt. gain, lbs.					
Sorghum grain	291.3	319.0	320.6	326.8	334.2
Sorghum silage		940.5	945.0	958.5	985.0
Corn silage	858.7				
Dehy. alf. pel.	156.5	171.4	172.2	175.6	179.6
41% C.S.M.	21.7	23.8	12.0		
Urea mix			12.0	24.4	24.9
Salt	5.9	6.0	5.3	5.6	6.0
Av. feed cost/cwt. gain	$12.21	$12.89	$12.82	$12.93	$13.24
Av. feed cost/lamb	$ 5.73	$ 5.52	$ 5.46	$ 5.40	$ 5.42
Av. cost/lamb on test[3]	$17.02	$17.00	$16.83	$16.91	$17.42
Av. total cost/lamb	$22.75	$22.52	$22.29	$22.31	$22.84
Av. total cost/cwt.	$20.62	$21.22	$21.17	$21.29	$21.59

1. Copper Sulfate
2. 25 lambs in each lot treated with 45 ml. Tiguvon parasiticide poured on.
3. Includes cost of stilbestrol implants at 10 cents and enterotoxemia vaccination at 7 cents.

Table 41

Value of dehydrated alfalfa, suncured alfalfa and sorghum stubble pellets in self-fed rations.
November 1, 1965 to February 11, 1966 -- 102 days

Lot No	7	3	4	5	6
Treatment	Mix: 35% whole sorg. gr. 65% sun-cured alf. pel	Mix: 35% whole sorg. gr. 65% dehy. alf. pel.	Mix: 35% whole sorg. gr. 32.5% dehy. alf. pel. 32.5% milo stub. pel.	Mix: 35% whole sorg. gr. 20% dehy. alf. pel. 45% milo stub. pel.	Pelleted: 35% sorg. gr. 20% dehy. alf. 45% milo stub.
No. lambs	48	47	50	49	45
Av. initial wt., lbs.	64.4	63.7	62.6	64.8	64.4
Av. final wt., lbs.	112.2	109.9	103.2	100.9	94.2
Av. total gain, lbs.	47.8	46.2	40.6	36.1	29.8
Av. daily gain, lbs.	.469	.453	.398	.354	.292
Tiguvon[1]	.470	.450	.401	.368	.279
Control	.465	.456	.394	.341	.302
Daily feed/lamb lbs.					
Mix or pellets	4.06	3.52	3.65	3.42	2.93
Salt	.027	.017	.022	.033	.052
Feed/cwt. gain, lbs.					
Mix or pellets	865.7	777.0	917.1	966.1	1003.4
Salt	5.8	3.8	5.5	9.3	17.8
Av. feed cost/cwt. gain	$15.04	$14.26	$15.65	$16.04	$20.26
Av. feed cost/lamb	$ 7.19	$ 6.59	$ 6.35	$ 5.79	$ 6.04
Av. cost/lamb on test[2]	$17.29	$17.10	$16.81	$17.39	$17.29
Av total cost/lamb	$24.48	$23.69	$23.16	$23.18	$23.33
Av. total cost/cwt.	$21.82	$21.56	$22.44	$22.97	$24.77

1. 25 lambs in each lot treated with 45 ml. Tiguvon parasiticide poured on.
2. Includes cost of stilbestrol implants at 10 cents each and enterotoxemia vaccination at 7 cents.

Table 42

Drilled and volunteer wheat and alfalfa pastures as fattening lamb rations November 1, 1965 to February 11, 1966 -- 102 days[1]

Lot No.	11	12	13
Treatment	Volunteer Wheat Pasture	Drilled Wheat Pasture	Alfalfa Pasture
No. lambs	49	50	46
Av. initial wt., lbs.	62.7	63.5	65.3
Av. final wt., lbs.	93.3	96.0	104.3
Av. total gain, lbs.	30.6	32.5	39.0
Av. daily gain, lbs.	.300	.319	.382
1st 71 days, lbs.[1]	.318	.382	.362
last 31 days, lbs.	.258	.174	.429
Daily feed/lamb lbs.			
Dehy. alf. pellets[2]	.14	.09	.33
Mixed ration[2]			2.98
Salt	.015	.016	.018
Feed/cwt. gain, lbs.			
Dehy. alf. pel.	46.7	28.2	199.3
Sorghum grain			101.7
Salt	5.0	5.0	4.7
Av. feed cost/cwt. gain	$ 4.27	$ 3.72	$ 9.95
Av. feed cost/lamb	$ 1.31	$ 1.21	$ 3.88
Av. cost/lamb on test[3]	$16.84	$17.05	$17.53
Av. total cost/lamb	$18.15	$18.26	$21.41
Av. total cost/cwt.	$19.45	$19.02	$20.53

1. Lambs in lot 13 were placed in drylot after 71 days and self-fed a mixed ration of 40% whole sorghum grain and 60% dehydrated alfalfa pellets.

2. Fed pellets only when snow covered pasture. Daily consumption of mixed ration fed lot 13 is based on 31-day feeding period. Supplemental dehydrated alfalfa pellet consumption based on the 71-day pasture period.

3. Includes cost of stilbestrol implants at 10 cents each and enterotoxemiz vaccination at 7 cents.

Observations

Hand-fed silage rations produced considerably cheaper lamb gains than did self-fed complete pelleted rations or mixtures of whole sorghum grain and pelleted roughages. However, labor costs involved in feeding were omitted.

Corn silage produced both faster and cheaper gains than sorghum silage, even though valued at $1 more per ton.

Lambs fed urea in place of half or all of the cottonseed meal performed equally as well as those fed supplemental cottonseed meal. The .10 lb. of urea mix or cottonseed meal supplied only approximately 10% of the crude protein in the ration. However, the sorghum grain, sorghum silage and dehydrated alfalfa supplied an estimated .32 lb. of crude protein and the National Research Council recommendations for an 80 lb. fattening lamb is only .35 lb. Adding copper sulfate to the urea ration produced no differences at the level fed.

A mixture of whole sorghum grain and suncured alfalfa pellets was more palatable and produced slightly faster gains than a similar mix containing sorghum grain and dehydrated alfalfa pellets. However, lambs fed dehydrated alfalfa pellets made considerably more efficient gains at less cost per unit gain. Replacing 50% or 70% of the dehydrated alfalfa pellets in the mixed ration with dehydrated sorghum stubble pellets (lots 4 and 5) reduced the rate of gain and increased both feed costs and amount of feed required to produce a unit of gain. Replacing 70% of the dehydrated alfalfa with dehydrated sorghum stubble in a complete pelleted ration (lot 6) gave even poorer results. This ration was so unpalatable that lambs ate about one half pound less feed per day. The poor feed efficiency and higher cost of processing resulted in highest feed cost per unit gain of all rations fed in this year's test.

Lambs grazed on wheat pasture gained more slowly than in past years. Results (reported in Table 4 2) indicate that rate of gain declined in the later part of the test, especially for lambs on drilled wheat pasture. Even so, wheat pasture produced cheap gains. Very few wheat pastured lambs were fat enough to market at the end of the test.

Alfalfa pasture produced gains as fast as most drylot rations. Figuring the gain produced on the 14 acres of alfalfa as 1250 lbs. and the value at $27.00 per cwt., the pasture was worth $337.50. The estimated 17,000 lbs. of hay would have been worth $255 minus the cost of harvesting (at $30 per ton). The alfalfa was quite green and had received only a light frost when lambs were first turned in, however, only one lamb died from bloat.

Tiguvon did not improve rate of gain. Considering lambs in all lots, control lambs gained an average of .404 lb. per day and the Tiguvon treated lambs gained .410 lb. per day. Worm egg counts on fecal samples obtained from lambs in lot 1 at the time of treatment and again 10 days later were: treated - 861 and 492, and control - 528 and 392. This compound is reportedly effective against head grubs (larvae of oestrus ovis fly), however, there was no evidence of such infestations in any of the lambs, so the compound could not be evaluated against head grubs.

Thirty-three lambs died during the tests; 16 from enterotoxemia, even though all lambs were vaccinated before being placed on test. Seven died from the disease after receiving a second vaccination. Urinary calculi caused death of 4 lambs. Others died of various causes. Heavy infestations of fringed tapeworms were reported in lambs posted by Dr. Dale.

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Chemagro Corporation, Kansas City, Mo. - Tiguvon.
Corvel Inc., Omaha, Nebr. - enterotoxemia vaccine.
Dr. J.E. Dale, Garden City, Kans. - veterinarian services
Garden City Co-op. Equity Exchange, Garden City, Kans. - feed processing.

Table 43

Feed prices, processing charges, and miscellaneous costs for tests reported here were:

	Per Ton
Dehydrated alfalfa pellets	$38.00
Suncured alfalfa pellets	35.00
Milo stubble pellets	30.00
Sorghum grain	34.00
Sorghum silage	7.00
Corn silage	8.00
Salt	22.00
41% cottonseed meal	72.00
Urea	128.00
Urea (13%) and gr. sorghum grain (87%) supplement	51.22

	Per Lamb
Pelleted ration of 35% sorghum grain, 20% dehy. alfalfa, 45% milo stubble	40.00
Grinding and mixing	5.00
Grinding and pelleting	7.00

	Per Lamb
Enterotoxemia vaccination	.07
3mg. stilbestrol implant	.10
Wheat or alfalfa pasture	.01 per day

Effects of Method of Preparation and Physical Form On Feeding Value of Sorghum Grain to Grow and Finish Swine (Project 110)

Cam-Chuong Ly, Larry Miller, C. W. Deyoe, H. B. Phost and L. F. Tribble

Sorghum grain was prepared in a hammermill with a 1/8-inch screen and by steam rolling through a fine corrugated roller mill. Each preparation was fed in meal, pellet or crumble form. The ration also contained soybean oil meal, vitamins, minerals and antibiotics. The ration contained 16 percent protein until the pigs weighed 100; 12% thereafter.

Two lots of 5 pigs each were self-fed each ration. The pigs were housed in concrete floored pens 6 by 18 feet with half the pen under roof.

Results are shown in table 44. No statistically significant differences were obtained among preparations or physical forms for rate of gain, average daily feed intake or feed required per pound of gain. Pigs fed ground grain gained faster and more efficiently than those fed steam rolled grain. More steam rolled than other grain was wasted, especially in crumbled form. Wasted feed was weighed back and not charged against the pigs.

Pigs fed crumbled ration gained slightly faster than pigs fed either pellets or meal. Average difference between pigs fed meal or pellet rations was slight, but the pelleted ration was more efficient.

No advantage was apparent for steam rolling sorghum grain. Cost of the various forms would determine the ration use. However, pelleted or crumbled forms of sorghum grain-soybean oil meal ration show little advantage.

Table 44
Effect of Method of Preparation and Physical Form of Sorghum Grain to Grow and Finish Swine (50-200 lbs.)

Preparation	Ground			Steam rolled		
Physical form*	M	P	C	M	P	C
No. of pigs	10	10	10	10	9	10
Days on test	105	101	100	105	102	102
Av. daily gain	1.42	1.37	1.54	1.30	1.35	1.42
Daily feed	4.52	4.35	4.91	4.54	4.21	4.73
Feed/lb. gain	3.39	3.19	3.27	3.50	3.44	3.31

* M=Meal, P=Pellet, C=Crumbles.

Effect of Restricted Feeding During Mid-gestation On Sow Performance

L. F. Tribble

A group of 16 sows was divided after all sows were bred. One group was fed 4 pounds per head per day; the other, 4 pounds per head every other day for 60 days, then 4 pounds per head per day until taken to the farrowing house a few days before farrowing.

All sows had access to fair alfalfa brome pasture. The ration fed (sorghum grain, soybean oil meal, dehydrated alfalfa meal, minerals and vitamin) contained about 17 percent protein.

Weight changes of the sows are shown in Table 45. The sows gained about the same during the 60 days. Limited fed sows apparently consumed enough more pasture to gain as much as those fed every day. However, 2 weeks after farrowing, sows fed every day had gained 17 pounds more from the start of the test than those limited fed during mid-gestation.

There was no difference in the performance of the two groups (table 46). Other research has shown that too much feed and over fatness impairs reproduction. The data indicate that feed costs can be reduced considerably and good sow performance can be obtained by limiting the feed intake of sows on pasture during mid-gestation.

Table 45
Weight Changes of Sows as Affected by Level of Feed Intake

Feed level/head	4 lb/day	4 lb. every other day*
Initial weight, lb.	426	397
After 60 days, lb.	461	424
At farrowing, lb.	520	472
2 weeks after farrowing, lb.	450	404
Gain initial to 2 week after farrowing, lb.	24	7

* After 60 days feed increased to 4 lb./day

Table 46
Sow Performance as Affected by Level of Feed Intake during Mid-gestation

Feed level	4 lb/day	4 lb. every other day*
No. of sows	8	8
Pigs farrowed/litter	10.8	10.7
Pigs at 2 weeks/litter	9.2	9.1
Birth weight/pig lb.	2.6	2.9
2 week weight/pig lb.	7.1	7.9

* After 60 days feed increased to 4 lbs./day

Evaluation of Rations for Pigs Weaned at 3 to 4 Weeks (Project 110)

A. H. Jensen, L. F. Tribble and Larry Miller

Wheat and corn-rolled oats in various physical forms compared with pigs weaned at 3 weeks of age.

Rations of corn and rolled oats were compared with rations containing wheat. All rations were supplemented with protein, minerals, vitamins and antibiotics. The rations were fed in meal, pelleted and crumble form. The basal rations are shown in Table 47.

Pigs were weaned at approximately three weeks and fed in 5 x 8-foot farrowing stalls. Two pens of six pigs each were on each treatment. Feed and water were available at all times. The study was conducted 28 days. The results are shown in Table 48.

Pigs fed the wheat rations performed about as well as those fed the corn-rolled oats rations except for the poor performance by those fed the wheat ration in pelleted form. Pigs fed the pelleted wheat ration had the slowest rate of gain and smallest feed intake. That agrees with observations made with older pigs, who ate less pelleted wheat rations than meal or crumbles.

Pigs fed the wheat ration in meal form and those fed the corn-rolled oat ration in crumble form gained most rapidly (.45 pound per head per day). However, those on the wheat ration were the most efficient. Pigs fed the pelleted corn-rolled oats ration were least efficient, probably due to excessive waste.

Various antibiotics compared with pigs weaned at 3 to 4 weeks.

The value of various antibiotics and combinations of antibiotics in starter rations for pigs weaned at 3 to 4 weeks were tested in the summer of 1965. The design of the test was as follows:

1. Tylosin and Neomycin at 20 mg. each per pound.
2. Chlortetracycline and sulfamethazine at 16 mg. each per pound and penicillin at 8 mg. per pound.
3. Tylosin and streptomycin at 20 mg. each per pound.
4. Tylosin at 40 mg. per pound.
5. Neomycin at 40 mg. per pound.
6. Control - no antibiotic.

Two groups of 6 pigs each were fed each ration. One group of 6 pens were on flattened expanded metal floor; the other, a wood slat floor. The pens were 3 x 6 feet located inside a completely enclosed building. All rations were pelleted; feed and water were available at all times.

The control ration used was the same as ration S43M (Table 47) minus the antibiotic. Antibiotic mixtures were added at the expense of the corn in the ration. Average test was 33 days. The results are shown in Table 49. Adding any antibiotic tested improved performance of pigs above that of controls. However, in some cases the increase was rather small. Pigs fed the combination of chlortetracycline, sulfamethazine and penicillin gained fastest and most efficiently.

Rations compared with pigs weaned at 4 weeks.

The pigs were managed nearly as in section B. Pigs in this study were weaned as near 4 weeks of age as possible.

The rations used are shown in Table 50. Pigs were started on rations S82A, B and C. After two weeks in the second trial and after 3 weeks in the first trial, half were switched to ration S82. The first trial was conducted with pigs farrowed in August, 1965; the second with pigs farrowed in November. Each treatment of 6 pigs was replicated in each trial.

The results are shown in Table 51. There was very little difference among pigs fed the different rations. Pigs appeared to gain as well as simpler ration S82A as on the more complex ration S82C. Also very little advantage to leaving pigs on higher protein rations after 2 or 3 weeks was indicated over changing them to a lower protein ration (S82). Ration S82 contained approximately 18% crude protein while other rations contained 20% protein

Table 47
Basal Starter Rations for Baby Pigs

Ration no.	S43M	S43Y
Wheat	----	54.25
Corn	38.25	----
Rolled oats	13.00	----
Soybean oil meal	19.0	16.0
Dried skim milk	10.0	10.0
Fish meal	5.0	5.0
Sugar	10.0	10.0
Animal fat	2.0	2.0
Dicalcium phosphate	1.0	1.0
Livestone	1.0	1.0
Salt	0.5	0.5
Trace mineral mix	0.5	0.5
Vitamin-antibiotic[a]	0.2	0.2

a. Contributes 2.6 riboflavin, 5.2 mg. calcium pantothenate, 7.2 mg. niacin, 24 mg. choline chloride, 6 mcg. B_{12}, 200 I.U. vitamin D, 1500 I.U. vitamin A and 40 mg. antibiotic (Tylosin) per pound of ration.

Table 48
Wheat and Physical Form of Starter Rations Evaluated with Pigs Weaned at 3 Weeks. (June 7 to July 5, 1965)

Ration Grain form*	Corn M	Corn P	Corn C	Wheat M	Wheat P	Wheat C
Initial weight, lb.	12.5	12.7	12.8	12.9	12.7	13.5
Final weight, lb.	23.1	23.3	25.7	25.5	19.7	23.7
Daily gain, lb.	.38	.37	.45	.45	.25	.35
Daily feed, lb.	.68	.86	.83	.68	.50	.62
Feed/lb. gain	1.76	2.29	1.80	1.53	2.00	1.73

* M=Meal, P=Pellet, C=Crumble.

Table 49
Value of Various Antibiotics in Starter Ration of Pigs Weaned at 3 to 4 Weeks.

Antibiotic*	Ty. .20 Neo. 20	Tet. .16 Sul. 16 Pen. 8	Ty. 20 St. 20	Ty. 40	Neo. 40	Control
No. of pigs	12	12	12	12	12	12
Initial weight, lb.	13.3	13.1	13.3	13.3	13.3	13.4
Final weight, lb.	34.2	36.4	35.8	33.2	34.4	32.3
Daily gain, lb.	0.60	0.69	0.66	0.58	0.62	0.55
Daily feed, lb.	1.00	1.05	1.05	0.93	0.96	1.00
Feed/lb. gain, lb.	1.65	1.51	1.59	1.66	1.58	1.84

* All antibiotics were fed to supply a total of 40 mg. of antibiotic per pound of ration. Ty.=Tylosin, Neo.=Neomycin, Tet.=Chlortetracycline, Sul.=Sulfamethazine, Pen.=Penicillin, St.=Streptomycin.

Table 50
Rations for Pigs Weaned at 4 Weeks.

Ration no.	S82C	S82B	S82A	S82
Corn	38.45	45.15	55.15	66.25
SBOM	19.00	17.00	20.00	23.00
Rolled oats	13.00	13.00	-----	-----
Dried skimmilk	10.00	20.00	20.00	5.00
Sugar	10.00	-----	-----	-----
Fish meal	5.00	-----	-----	-----
Animal fat	2.00	2.00	2.00	2.50
Dicalcium phosphate	1.00	1.00	1.00	1.00
Limestone	-----	0.30	0.30	0.70
Salt	0.50	0.50	0.50	0.50
Trace mineral mix	0.05	0.05	0.05	0.05
Vitamin & antibiotics*	1.00	1.00	1.00	1.00

* Supplied 1500 I.U. vitamin A, 300 I.U. vitamin D, 3.5 mg. riboflavin, 7.0 mg. calcium pantothenate, 10.5 mg. niacin, 35 mg. choline, 10 mcg. vitamin B_{12}, 50 mg. chlortetracycline, 50 mg. sulfamethazine, and 25 mg. penicillin per pound of ration.

Table 51
Performance of Pigs Weaned at 4 Weeks of Age and Fed Different Rations. (Initial weight 13-15 pounds-fed for 35 days)

Ration no.	S82A*	S82B*	S82C*	S82A	S82B	S82C
No. pigs	24	24	24	24	24	24
Av. daily gain, lb.	0.83	0.89	0.80	0.81	0.87	0.92
Feed/lb. gain	1.59	1.70	1.72	1.59	1.61	1.60

* Changed to ration S82 after 2 or 3 weeks.

Evaluation of Wheat in Rations for Growing-finishing Swine (Project 110)

L. F. Tribble, A. H. Jensen, C. W. Deyoe and H. B. Pfost

A series of experiments has further evaluated wheat as swine feed. The experiments were conducted in confinement on concrete floored pens. Purebred Duroc, Poland and D x P crossbred pigs were used in all trials. All rations were supplemented with calcium, phosphorus, salt, trace minerals, the following vitamins A, D, riboflavin, pantothenic acid, niacin, choline, B_{12} and antibiotic, chlortetracycline. Soybean oil meal was added to the grain to bring protein content to the desired level.

A. Comparing wheat, sorghum grain and corn to finish swine.

The test was from March 30 to May 6, 1965. Six pigs were fed in each lot with two lots per treatment. Results are shown in Table 52.

Rations were calculated to contain 12% crude protein and so no soybean oil meal was needed. Chemical analysis showed the rations to be higher in protein than calculated. The wheat ration contained 15.7% crude protein, but pigs on it gained significantly more slowly than pigs on either corn or sorghum grain rations, indicating a probable imbalance of amino acids in the protein from wheat. Pigs fed either sorghum grain or corn gained at the same rate, however, those fed sorghum grain were more efficient. Pigs fed wheat had the lowest feed intake and the least efficient gains.

Table 52
Comparison of Wheat, Sorghum Grain and Corn to Finish Swine
March 30 - May 5, 1965.

Ration No.	S73	S76I	S77
Grain	Sorghum	Wheat	Corn
% protein*	13.8	15.7	13.0
No. of pigs	12	12	12
Initial wt.	123	123	123
Final wt.	188	171	189
A.D.G.	1.78**	1.29	1.77**
Feed/hd/day	5.85	5.04	6.47
Feed/lb. gain	3.29	3.99	3.66

* Chemical analysis.
** Statistically significant (P<.01

B. Comparing four cereal grains for growing-finishing swine.

First of three phases of the study was conducted during the growing period; the other two phases, during the finishing period. During the finishing period half the pigs were continued on rations containing the same level of protein. The other half's rations corn was replaced by the other grains pound for pound. During each phase there were two lots per treatment with varying numbers per lot. All rations were pelleted. Sorghum grain, corn, barley and wheat were the cereal grains tested.

Table 53 gives results of growing and finishing phases. Pigs fed sorghum grain or barley gained at the same rate and more rapidly than those fed corn or wheat. Pigs fed corn gained slightly faster than those fed wheat. Amount of feed eaten was closely related to rate of gain, with very little difference in efficiency of gains from various rations. Pigs fed corn ration made the fastest and most efficient gains during the finishing phase. Pigs on wheat gained more slowly and ate less than pigs on other rations. Pigs fed barley gained least efficiently.

The remaining half of the pigs from the growing phase plus additional pigs were used to evaluate grains in rations formulated to contain 12% crude protein from corn and soybean oil meal or with replacing corn and remaining ingredients unchanged. Pigs fed wheat performed much better than they did in the equal-protein comparisons. These results substantiate the previous test that wheat alone has an imbalance of amino acids. Amino acids must be added from other sources, like soybean oil.

Table 53

Four Cereal Grains for Growing-finishing Swine Compared.

Growing phase: April 14 - May 25, 1965 - 16% protein*

Grain	Corn	Sorghum	Wheat	Barley
Ration No.	S78	S78A	S78B	S78C
% protein**	17.0	16.9	19.3	17.8
No. of pigs	16	16	16	16
Initial wt.	47.4	47.8	47.8	47.8
Final wt.	104	110	101	110
A.D.G.	1.38	1.53	1.31	1.53
Av. daily feed	3.34	3.75	3.24	3.68
Feed/lb. gain	2.42	2.44	2.53	2.41

Finish phase May 25-July 13, 1965 - 12% Protein*

Ration No.	S78E	S73	S78F	S78G
% protein**	12.9	13.1	13.3	13.6
No. of pigs	8	8	8	8
Final wt.	196	201	182	195
A.D.G.	1.91	1.78	1.61	1.73
Av. daily feed	6.2	6.1	5.3	6.5
Feed/lb. gain	3.26	3.42	3.3	3.72

Finishing phase: corn-replaced pound for pound

Ration No.	S78E	S78H	S78I	S78J
% protein**	12.9	14.2	16.4	16.2
Final wt.	196	189	180	188
A.D.G.	1.87	1.76	1.72	1.75
Av. daily feed	5.6	5.3	5.2	6.1
Feed/lb. gain	3.00	3.03	3.01	3.51

* Calculated to contain 16 and 12 percent protein for growing and finishing phases.

** By chemical analysis.

C. Wheat and sorghum grain for growing-finishing swine compared.

Sorghum grain was compared with wheat and various combinations of the two grains. Although sorghum grain and wheat generally contain more protein than corn, previous work had indicated more protein was needed with sorghum grain and wheat. For this study, protein values of 9 and 10.5 percent, respectively, were used for the sorghum grain and wheat. Protein level was reduced when the pigs weighed 135 pounds.

Results are shown in Table 54. Pigs fed sorghum grain as the only grain made the fastest and most efficient gains, and those fed wheat made the slowest gains. Gains of pigs fed various proportions of sorghum grain and wheat were between gains from one of the grains. No consistent pattern indicated that as more wheat was added, gains decline. As in earlier trials, pigs fed the all-wheat ration consumed less feed than those on other rations. Apparently that is the main factor that limits performance of pigs on wheat rations. Efficiency of wheat rations has been excellent, not enough wheat is eaten to produce gains like those from corn and grain sorghum.

Table 54
Sorghum Grain, Wheat and Various Combinations of Them for Growing-finishing Swine Compared.

Ration No.*	S83D-I	S83-E	S83A-F	S83B-G	S83C-H
Ratio -- Sorghum:wheat	1:0	2:1	1:1	1:2	0:1
No. pigs	18	18	18	18	18
Initial wt.	71	71	71	70	71
Final wt.	204	201	199	203	198
Av. daily gain	1.71	1.63	1.60	1.68	1.59
Av. daily feed	5.47	5.30	5.27	5.47	5.14
Feed/lb. gain	3.21	3.28	3.31	3.27	3.24

* Protein content was reduced when pigs weighed approximately 135 pounds.

D. Effect of physical form of wheat on performance of growing-finishing swine.

Since feed intake of wheat rations by swine appears to limit maximum gains, two trials were conducted to study the effect the final physical form of a ration might have on growing-finishing swine performance.

Wheat ground through a 1/8-inch screen in a hammer mill was fed as a meal, pellet or crumble (Table 55). Two lots of nine pigs each were fed each ration. Differences in the gains were small. Pigs fed the pelleted ration ate less and gained most efficiently.

Table 55

Effect of Physical Form of Wheat Rations for Growing-finishing Swine.

Form	Meal	Pellet	Crumble
No. of pigs	18	18	17
Initial wt.	34.5	34.7	34.7
Final wt.	167	170	178
A.D.G.	1.27	1.30	1.32
Daily feed	4.08	3.82	4.01
Feed/lb. gain	3.21	2.94	3.07

In the second trial, wheat was prepared by coarsely rolling and finely grinding (1/8-inch screen) in a hammer mill. Finely ground feed was fed in both meal and pellet form. In addition, 5% of wheat bran was added to the finely ground wheat and then pelleted, in an attempt to soften the pellet.

Two lots of six pigs each were fed each ration from 36 to 115 pounds (Table 56). Pigs fed the finely ground wheat in meal form gained faster, consumed more feed and were as efficient as pigs on other rations. Adding 5% bran did not improve palatability, as less of that ration than any other was consumed and pigs on it gained more slowly than pigs on other rations. Pigs fed the coarsely rolled wheat ration gained slightly faster than those fed the ration with the added bran, but they gained less efficiently.

To test palatability, three pens of 11 pigs each were offered a choice between coarsely rolled wheat ration and another ration (Table 57). Pigs chose coarse rolled wheat over finely ground meal, about 2½ to 1, which does not agree with performance of the pigs in the growth study previously discussed. The finely ground wheat ration in pelleted form was preferred by about a 3 to 1 ratio over coarsely rolled wheat. With no choice (previous trial) the two rations were consumed at about the same level. Pigs fed finely ground wheat plus 5% of bran pelleted preferred it about 9 to 1 over coarsely rolled wheat which does not agree with above data, showing that less pelleted ration than any other was consumed when no choice was available. Further work on wheat rations for swine is needed.

Table 56

Effect of Method of Preparation and Physical Form of Wheat Rations on Performance of Growing-finishing Swine

Ration	Rolled	Fine meal	Fine Pelleted	+5% Bran Pellet
No. pigs	10*	12	12	12
Initial wt.	37.8	36.6	36.3	36.8
Final wt.	113	129	119	106
Daily gain	1.07	1.32	1.17	1.00
Daily feed	3.9	4.3	3.85	3.35
Feed/lb. gain	3.6	3.3	3.25	3.4

* Two pigs removed - data not included

Table 57

Preference by Pigs for Wheat Ration in Various Forms. Pounds Consumed by 2-week Intervals.

Pen*	1		2		3	
Ration	Rolled	Fine Meal	Rolled	Pellet	Rolled	5% Bran Pellet
1st 2 weeks	268	75	24	354	17	342
2nd 2 weeks	271	127	39	358	39	359
3rd 2 weeks	479	174	251	295	84	516
Total	1018	376	314	1007	140	1217

* 11 pigs per pen.

Influence of Breeding and Length of Feeding Period on Carcass Characteristics and Palatability of Beef (Project 639)

H. J. Tuma, D. H. Kropf, D. L. Mackintosh, and G. A. Ahlschwede

Carcass measurement, muscle quality, and palatability data have been collected on 88 paternal half-sib Angus steers. At weaning they were subdivided into one of the 11 nutritional and management regimes shown in Table 58. Phase I involved feeding from 0 to 224 days after weaning. Phase II was essentially deferred feeding. The intermittent slaughter of animals from both phases made possible the study of muscle and fat tissue development within as well as between phases. Quantity and quality of muscle are the two factors that determine true beef carcass value.

Results

Superficial linear and circumference carcass measurements proved unreliable in predicting carcass composition, retail yield or quantity of muscle. Quantity of muscle, edible portion, retail yield and cutability are all similar terms and indicate amount of muscle in a carcass. Linear and circumference measurements would be of greater value to estimate muscle quantity or retail cut yield if the amount of subcutaneous (outside) and intermuscular (seam) fat could be controlled or adjusted.

The two nutritional and management regimes were quite different, although the percentage of lean, fat and bone for the last slaughter groups in phase I and II, (groups 8 and 11) were quite similar. Table 59 shows those three composition characteristics varying within 1 percent in the two groups. Average carcass weight of group 11 was 224.7 pounds heavier than for group 8, but quality grades were mostly choice, and muscle quality was quite similar. Even though groups 8 and 11 produced the same percentage of lean and were genetically similar, total pounds of lean was 120.9 greater for group 11. Composition in both phases changed greatly as time progressed from weaning to finishing. In phase I the major change from good to choice grade occurred between 168 and 196 days on feed. The more mature cattle in phase II required slightly less feeding time to achieve similar results.

Shear and taste panel tenderness data indicated that groups 1, 2, 3, 8, and 9 were not as tender or palatable and had less feed, hence less muscle quality, than the other groups.

Table 58
Slaughter Age and Weight, Carcass Weight,[1] and Management Regime for Each Group of Steers Indicated.[2]

Group	Slaughter age (days)	Slaughter weight (lb.)	Carcass weight	Class calf-beef	Carcass grade[2]	Management
			Phase I			Days on feed
1	240	351.3	188.2	8 - 0	7G, 1S	0
2	296	446.9	254.6	7 - 1	8G	56
3	324	492.9	297.7	2 - 6	8G	84
4	352	525.0	327.5	0 - 8	7G, 1C	112
5	380	630.6	391.2	0 - 8	7G, 1C	140
6	408	681.9	430.7	0 - 8	6G, 2C	168
7	436	785.0	487.6	0 - 8	1G, 7C	196
8	464	834.8	521.7	0 - 8	1C, 7C	224
			Phase II			
9	540	496.0	281.2	0 - 8	8S-	Weaned then summer grazed & wintered from June, 1963 to April, 1964
10	660	687.0	374.2	0 - 8	5S+, 1S, 2G-	Summer grazed, wintered and summer grazed from June, 1963 to August, 1964
11	800	1175.0	745.4	0 - 8	2C+, 5C-, 1G+	Summer grazed, wintered and summer grazed from June, 1963 to August, 1964 Full feed 140 days until slaughter.

1. Eight steers per group.
2. C=Choice, G=Good, S=Standard

Table 59
Means of Indicators of Carcass Composition

Group	Fat thickness 12th rib	Ribeye area 12th rib	% kidney & pelvic fat	Weight kidney & pelvic fat	Estimated % bone	Estimated % fat	Estimated % lean	Estimated lbs. of lean
				Phase I				
1	.11	5.44	2.34	2.21	19.7	16.1	64.0	120.4
2	.21	5.97	2.52	3.21	16.2	25.3	58.5	148.9
3	.28	7.87	2.61	3.89	14.0	25.1	60.5	180.1
4	.38	7.68	3.74	6.12	15.5	28.7	57.0	186.7
5	.46	8.33	3.69	7.22	16.0	31.2	53.8	210.5
6	.41	8.84	3.84	8.26	15.5	29.7	56.2	242.1
7	.59	9.31	4.04	9.85	14.6	32.4	51.2	249.7
8	.69	10.16	4.28	11.15	13.1	35.5	53.8	280.67
				Phase II				
9	.03	6.42	1.04	1.46	21.5	6.1	72.2	203.0
10	.20	8.44	2.35	4.39	17.0	22.2	61.7	230.9
11	.57	13.03	3.71	13.85	13.8	35.4	53.8	401.6

The Relation of Lamb Quality Factors to Grade, Marbling, Carcass Value and Sensory Evaluations

D. H. Kropf, D. L. Mackintosh, C. S. Menzies,
Dorothy Harrison and Lois Anderson

This study was to determine quality factors most closely related to carcass grade, marbling in the rib eye muscle, and to tenderness.

A total of 376 crossbred lambs were slaughtered over 4 years at an approximate live weight of 90 lb. after carcasses chilled 48 hours. U.S.D.A. carcass grade and various quality scores were evaluated by a representative of the Federal Meat Grading Service. Carcasses were cut to wholesale cuts and weights obtained. The hotel rack was physically separated into fat, L. dorsi muscle, other lean, intercostal tissue, overflow fat and bone.

Loin roasts were cooked to a specified internal temperature under carefully controlled conditions and cooking and sensory data obtained. Correlation coefficients were calculated between factors studied and 4-year correlations were pooled.

Lamb carcasses used ranged from Low Choice to Average Prime with most grading High Choice or Low Prime.

Conformation score was most closely related to final carcass grade of all factors studied. Many fat factors were significantly related to carcass grade although none of the correlations were higher than .39 ($P < 1\%$). Conformation score was related to many finish factors. As fat increased, conformation score tended to improve. Higher grading carcasses tended to exhibit more marbling with correlations of .26** and .29** respectively, with rib eye marbling score and % fat in the rib eye sample.

Various quality factors were significantly related to marbling: Scores for external finish, feathering, overflow, fat streaking, kidney and pelvic fat, and percentage of separable fat in the hotel rack. Carcasses with a greater percentage of separable lean in the rack tended to exhibit less marbling.

Relationships of various quality factors to tenderness of lamb roasts were disappointingly low. Very few grade factors were significantly correlated. Marbling was highly significantly related to all 4 ways of evaluating tenderness, but even here the highest correlation was .28 which means that only 7.8% of variance in tenderness could be explained by marbling variations. However the quality range of the carcasses was rather small. Had a greater range in carcass grades been sampled, higher correlations may have resulted. Tenderness evaluations were closely related to each other. Juiciness and tenderness correlated positively.

** $P < 1\%$ and years not significantly different.

Table 60
Correlation Coefficients of Carcass Factors to U.S.D.A. Carcass Grade, Conformation Score and Marbling. 4 Years Data

	U.S.D.A. grade	Conformation score	Rib eye marbling score	Rib eye % fat
Conformation score	.57**	---	.14	.10
Amount external finish score	.36	.38**	.12*	.17*
Feathering score	.65	.03	.23**	.22**
Overflow fat score	.23**	.03	.11	.10
Fat streaking flank steak	.39**	.12*	.20**	:19**
Fat streaking, other flank muscle score	.38**	.07	.23**	.19**
Kidney and pelvic fat score	.29	.23**	.23	.30**
Rib eye marbling score	.26**	.14	---	.55**
Rib eye fat %	.29**	.10	.55**	---
Intercostal muscles fat %	.27	.16**	.22	.32
Rib eye area	.11	.14**	-.03	-.10
Fat thickness over rib eye	.27**	.19**	.19**	.30**
Overflow fat, gms.	.33**	.11*	.24**	.23**
% Separable fat, rack	.42	.30**	.32**	.37**
% Separable bone, rack	-.30	-.30	-.09	-.23**
% Separable lean, rack	-.30	-.17*	-.22**	-.28**
Wt. kidney knob	.28**	.22**	.29**	.37**

* P < 5% and years not significantly different.
** P < 1% and years not significantly different.

Table 61
Pooled Correlation Coefficients Between Tenderness and Lamb Quality Factors - 4 years' data

	Initial tenderness	No. of chews	Final tenderness score	W. B. shear value lb.
U.S.D.A. grade	.08	.10	.05	.03
Quantity of finish score	.00	-.01	.02	.02
Color reading flank steak	.07	-.04	.10	-.06
Color reading L. dorsi	.08	-.10	.06	-.12*
Feathering score	.06	-.04	.02	.02
Overflow fat score	.03	.02	.02	.08
Fat streaking flank steak score	.00	-.01	-.04	.11*
Fat streaking other flank muscles score	.03	-.04	.00	.04
Kidney and pelvic fat score	.07	-.06	.06	.04
Marbling score-12th rib rib eye	.28**	-.21**	.24**	-.14*
% fat, rib eye	.25**	-.23**	.22**	-.14*
Fat thickness over L. dorsi, in.	.04	-.04	.07	.07
Overflow fat, gms. in rack	.16**	-.19**	.12*	-.08
% separable fat, rack	.13*	-.10	.14*	.08
Weight, kidney knob, lb.	.15	-.14**	.17**	-.06
Days of age	.13	-.11	.11	-.05
Cooking time, min./lb.	-.20	.20**	-.18**	.11
% volatile cooking loss	-.24	.14*	-.16**	.07
% drip loss	-.06	.02	.02	.11
Shear value, ½ in cooked core, lb.	-.46	.47	-.46	---
Press fluid yield, ml/25 gm.	.18**	-.17**	.15**	-.10
Flavor intensity score	-.20**	.23**	-.23**	.05
Flavor desirability score	.37	-.38	.38	-.14*
Juiciness score	.35**	-.32**	.30**	-.12
Initial tenderness score		-.87	.91	.46
Number of chews			-.89	.47
Final tenderness score				.46

* P < 5% and years not significantly different.
** P < 1% and years not significantly different.

Comparison of Slaughter and Carcass Characteristics of Ram, Wether and Ewe Market Lambs. 2 Year Preliminary Report.

D. H. Kropf, D. L. Mackintosh, L. C. Hinnergardt, C. S. Menzies, Dorothy L. Harrison and Lois Anderson

Lambs sired by Hampshire rams and from western ewes were individually slaughtered as they reached 96 lbs. live weight. Quality and quantity factors were evaluated after carcasses were chilled 48 hours. Carcasses were broken into wholesale cuts and weights obtained. The leg and loin were trimmed of external fat in excess of 3/8 inch and trimmed weights were taken.

Ewe lambs dressed heavier carcasses and a higher dressing %, but the extra carcass weight was due to higher finish. Wether and ewe lamb carcasses showed higher conformation scores and higher U.S.D.A. grades, apparently due to more fat.

Fat and lean from ram carcasses was noticeably less firm than from wethers and ewes. Lowest rib eye marbling scores were noted in ram carcasses, highest scores in ewe carcasses, with intermediate values in wethers.

No sex difference was noted in average weight of shoulder, breast, trimmed loin, untrimmed leg or total trimmed weight of leg plus loin. A heavier hotel rack was noted from ewe carcasses due largely to greater fat deposition in the rack. Rams had lighter untrimmed loins, due to fat as no sex difference was found in trimmed loin. Ewe carcasses exhibited lighter trimmed leg weights and carried more weight in kidney and pelvic fat.

No sex difference was found in total cooking loss, although loin roasts from the ram carcasses exhibited higher volatile, but lower drip cooking loss, probably due to greater trimness and muscling. No sex difference was found in cooking time to a certain degree of doneness, or in flavor or juiciness scores. Ram roasts were not stronger flavored. In all cases, loin roasts from ewe carcasses were most tender, followed by wethers and rams in that order. Tenderness differences were so small that their importance is doubtful.

Table 62

Slaughter and Carcass Characteristics of Ram, Wether and Ewe Market Lambs.

	Group averages[1]		
	Ram	Wether	Ewe
No. of animals	39	34	87
Wt. per day of age, lb.	0.71	0.63	0.59
Empty slaughter wt., lb.	89.4	88.6	88.4
Cold dressed wt., lb.	47.9	49.2	50.0
Cold dressing %	53.5	55.4	56.7
Pelt wt., lb.	10.2	9.1	9.2
Conformation score[2]	7.6	8.1	8.3
Amount external finish score[3]	8.2	8.8	9.2
Fat firmness score[4]	8.2	9.4	9.5
Lean firmness score[4]	9.0	9.5	9.7
Feathering score[5]	5.6	5.6	5.5
Overflow fat score[5]	4.5	4.9	5.3
Rib eye marbling score[5]	4.5	5.5	5.9
Rib eye firmness score[4]	10.1	10.5	10.6
Rib eye color reading[6]	13.2	12.8	12.7
Flank steak color reading[6]	19.3	18.5	18.4
U.S.D.A. carcass grade[7]	8.6	9.2	9.5
Ave. rib eye area, sq. in.	2.34	2.30	2.21
Fat thickness over rib eye, in.	0.16	0.21	0.26
Fat thickness lower rib, in.	0.47	0.57	0.64
Breast wt., lb.	8.4	8.5	8.7
Shoulder wt., lb.	13.0	13.1	13.0
Hotel rack wt., lb.	4.8	5.0	5.3
Loin wt., lb.	5.0	5.4	5.6
Trimmed loin wt., lb.	4.8	5.0	4.9
Leg wt., lb.	15.3	15.6	15.3
Trimmed leg wt., lb.	14.8	15.0	14.5
Trimmed leg + loin, lb.	19.6	19.9	19.3
Kidney and pelvic fat, lb.	0.8	1.1	1.6

1. Lot averages underlined with same line are not significantly different at 5% level of probability.
2. Conformation score: Low Prime=9, High Choice 8, Average Choice=7.
3. Amount external fat score: Moderately Thick=9, Slightly Thick=8.
4. Firmness score: Firm=10, Moderately Firm=9, Slightly Firm=8.
5. Quality scores: Modest=6, Small=5, Slight=4.
6. Color reading on photovolt color difference meter (green filter) Darker color has lower number
7. Carcass grade: Average Prime=10, Low Prime=9, High Choice=8.

Table 63

Cooking Time, Cooking Losses and Taste Panel Evaluations of Loin Roasts From Ram, Wether and Ewe Market Lambs[1]

	Ram	Wether	Ewe
Mean cooking time, min./lb.	39.2	35.9	36.5
Volatile cooking loss, %	8.9	8.3	7.8
Drip cooking loss, %	2.6	3.8	4.1
Total cooking loss, %	11.7	12.3	12.0
Press fluid, ml./25 g.	7.8	8.0	8.2
Shear force (½ inch cooked cores) lb.	8.8	7.8	7.2
Flavor intensity score[2]	4.7	4.5	4.6
Flavor desirability score[2]	5.5	5.6	5.5
Juiciness score[2]	6.0	6.0	6.1
Initial tenderness score[2]	5.4	5.6	5.8
Number of chews	33.6	32.1	29.1
Final tenderness score[2]	5.2	5.5	5.7

1. Lot averages underlined with the same line are not significantly different at 5% level of probability.
2. Higher score is more desirable.

Table 64
Chemical Analyses of Feeds Used In Beef Cattle Experiments

Description	Protein (Nx6.25)	Ether extract	Crude fiber	Mois- ture	Ash	N-free extract
	%	%	%	%	%	%
Sorghum grain (Nov., 1965)	11.69	2.99	2.33	11.22	1.91	69.86
Sorghum grain (Jan., 1966)	9.25	2.81	2.21	11.83	1.64	72.26
Soybean oil meal	46.06	2.03	5.80	8.76	6.48	30.87
Sorghum grain (March, 1966)	10.19	2.38	1.84	12.68	1.78	71.19
Sorghum silage	1.84	0.70	6.87	64.23	1.29	25.07
Alfalfa hay	22.54	2.57	26.59	8.27	7.48	32.55
Prairie hay (Nov., 1965)	3.90	2.10	29.60	7.50	7.80	49.10
Prairie hay (Jan., 1966)	4.88	2.33	32.27	4.85	6.76	48.91

Table 65
Prices of Feeds Used in Beef Cattle Experiments

	Per ton
Sorghum grain	$40
Corn	$46
Soybean oil meal	$90
Protein supplement (AH 75)	$70
Dehydrated alfalfa	$50
Urea, 42% N	$134
Ground limestone	$16
Sorghum silage	$ 8
Alfalfa hay	$25
Prairie hay	$20
	Per lb.
Aurofac 10 (10 grams chlorotetracycline per lb.)	87¢
Stilbosol (1 gram diethylstilbestrol per lb.)	55¢
Vitamin A (10,000 I.U. per gram)	28¢
Trace mineral mixture	10¢

Calvin Drake

831

#22.80

23.25

22.25

500

50

150

1060

600 flesh

#25.11

150

10

#2.00

#2.00