METHODS OF MANAGING YEARLING STEERS ON BLUESTEM PASTURE

by

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INTRODUCTION

Beef cattle lead all classes of American livestock in the consumption of grass and grassland crops. They utilize one-third of the permanent pastures, three-fourths of the range areas, and a high percentage of the harvested crops. Grass usually represents the principal and cheapest feed for beef cattle.

Certain short grass areas have long been known for their ability to maintain cattle throughout the year with only limited amounts of feed supplied during extremely bad weather. The bluestem area in the Flint Hills of Kansas extending south into Oklahoma has, until recently, been used almost entirely as a fattening area and grazed only during the summer months. The use of protein supplements during the winter months when the grass is known to be low in protein, has greatly expanded the use of bluestem pasture. Yearlong grazing of many classes of cattle such as steers, heifers, and cow herds has become an economical means of utilizing the dry winter grass as well as the highly palatable forage produced during the spring and summer months.

Cattlemen need to know how much protein to feed, what kind of protein to feed, and the best method to feed protein, in order to get the most economical production from the various classes of livestock.

Kansas State College decided to sponsor research work to determine the method best suited for feeding supplement to yearling steers wintered on dry bluestem grass. The material for this thesis was taken from the work started in December of 1949. Since

the gains made during the wintering period have an effect on the gains made during the subsequent summer grazing period, both phases will be included in this paper.

REVIEW OF LITERATURE

Grasses furnish almost the entire feed supply for beef cattle for at least half the year in most areas, and for the entire year in other areas (9). It is common in a few areas to carry breeding herds the year around with limited quantities of protein rich supplements fed only during periods of drought or snow.

Native bluestem pastures in the Flint Hills of Kansas and the Osage area of Oklahoma are well known for their fattening qualities (9). The Sand Hills of Nebraska, the Mineral Point section of southwestern Wisconsin, and the Appalachian region have long had similar reputations. The latter two, however, have more recently been converted into crop lands for the most part (9).

Blue grama is the most valuable and widely distributed native grass in the Great Plains. It grows from Canada to Mexico and represents about a 50-50 mixture with buffalo grass from Montana southward. These two short grasses have a comparatively high feed value at all stages of growth, and therefore have an enviable reputation as the home of feeder cattle - the nation's leading area for the yearlong grazing of beef cattle (9).

Another grass frequently mixed with blue grama and buffalo grass to add to their value for yearlong grazing is western wheatgrass.

Digestion trials were conducted on a 13-acre bluestem pasture containing 52 per cent little bluestem, 11 per cent big bluestem, two per cent side-oats grama, one per cent blue grama, 27 per cent other less common grasses, and seven per cent weeds at the Oklahoma station (10). The objects of the trials were to determine the digestible nutrient content of typical native grass throughout the year.

According to chemical analysis, from late May to the middle of September, the dry matter of the grass varied from 32.7 per cent to 39.0 per cent. The composition of the dry matter varied from 6.77 per cent to 8.97 per cent in protein, and from 28.46 per cent to 32.32 per cent in crude fiber. After September protein decreased to 4.31 per cent and crude fiber increased to about 34.0 per cent. Protein content decreased to a low of 2.56 per cent with no change in crude fiber during the winter. Variations in the amount of nitrogen-free extract present were small and irregular throughout the summer and winter.

The apparent digestibility of dry matter, protein, and crude fiber of the grass was lower in June than in July, August, and September. There was little change during the three latter months in digestibility of nutrients with the exception of protein and ether extract. The apparent digestibility of dry matter, protein, crude fiber, and nitrogen-free extract decreased from 58, 54, 69, and 61 per cent, respectively in September, to about 41, -16, 62, and 41 per cent respectively in November.

The digestibility of dry winter grass was somewhat higher in December than in January and February. Cottonseed cake improved

the digestibility of both winter grass and prairie hay rations. The dry matter of the late winter grass was less digestible than that of the cured hay (10).

Ross and Van Arsdell (14) at the Oklahoma Agricultural Experiment Station compared alfalfa hay and cottonseed cake as a winter supplement for cows grazed year-long on native bluestem pasture. Three years of work indicate that eight pounds of alfalfa hay will satisfactorily replace two and one-half pounds of cottonseed cake for cows being wintered on bluestem pastures in that area.

At the New Mexico Station, Lantow (11) found that cottonseed cake showed an advantage over yellow corn when fed as a winter supplement to cows on the range. Cows gained more weight, the cake was more palatable, and it was easier to get uniform consumption by the animals.

Five years' work at the United States Range Livestock Experiment Station, Miles City, Montana (5), in which beef cows were wintered on the range with and without a supplement of cottonseed cake, showed that weight losses of cows that did not receive the supplement were significantly greater, but that the increased weight of calves at weaning time from the supplement-fed cows did not compensate for the increased winter feed costs. It was found that for greatest economy the use of cottonseed cake should be limited to seasons in which winter range conditions are severe.

Ross and Van Arsdell (14), at the Oklahoma Station, fed replacement heifers to compare 20 per cent protein pellets with 40 per cent protein pellets on native pasture during the winter.

Heifers fed two pounds per head daily of 20 per cent protein gained three pounds more during the winter and 27 pounds more during the summer grazing period per head than did the heifers fed two pounds of 40 per cent protein.

In other tests at the same station heifer calves fed two pounds of 20 per cent protein pellets per head daily were compared with heifers fed the same amount of 40 per cent protein pellets on dry native grass. One year the two lots of heifers made approximately the same winter gains, but tests repeated the next year show that the 40 per cent protein fed heifers outgained the 20 per cent protein fed heifers by 21 pounds per heifer.

In experiments with steer calves Ross (14) found that range supplemented with 2.25 pounds of cottonseed cake per head daily during the winter months produced cheaper gains and greater profits than when calves were wintered on prairie hay plus 1.25 pounds of cottonseed cake per head daily. These calves were sold off grass as two-year-olds. Tests indicated that it was not as profitable to feed grain on grass during the summer before the steers were marketed as it was to allow grazing only.

In one trial Ross and Van Arsdell (14) found that it was not profitable to feed a limited amount (three pounds) of oats per head daily to steer calves wintered on prairie hay and two pounds of cottonseed cake, or to calves wintered on the range and fed two pounds of cottonseed cake.

Steer calves on wheat pasture at the Spur, Texas Station (1) make an average daily gain of two pounds per head during favorable winters. Calves at the same station wintered in drylot on sorghum

silage with one to two pounds of cottonseed meal per head daily make gains of one to one and one-half pounds per day. Calves fed one pound of cottonseed cake per head daily on dry native grass gained .89 pound per head daily, while those fed two pounds of cake averaged 1.15 pounds per head daily gain. The latter group of calves gained more rapidly on summer pasture and produced almost as much net gain as those fed in dry lot.

Savage and Heller (16) at the Southern Great Plains Field Station, Woodward, Oklahoma, found that it was more economical to feed one pound of 40 per cent protein supplement per head daily to steer calves wintered on dry grass and grazed yearlong than it was to feed either two pounds of 40 per cent protein per head daily or a mixture of one pound of the same cake and one pound of rolled milo.

Savage and Heller (16) at the Southern Great Plains Field Station compared hand feeding 41 per cent protein cottonseed meal with self-feeding a cottonseed meal and salt mixture to steer calves. In three years' work the average winter gain of steers self fed the salt meal mixtures during the winter feeding periods was 13 pounds per head less than the comparable steers which were hand fed. At the end of the grazing year the hand caked steers gained 16 pounds per head more than the salt-meal calves. This, however, was not found to be statistically significant.

Black and Mathews (4) at the Northern Great Plains Station, Ardmore, South Dakota, after five years' work found that wintering yearling steers on native range supplemented with cottonseed

cake was more satisfactory than either alfalfa hay and straw, or corn silage and straw. Observations indicate that maximum summer gains were obtained by wintering yearlings slightly above maintenance for an average winter gain of approximately 35 pounds.

Further studies at the Ardmore Station (3) with yearling steers show that supplemental feed was necessary only during severe weather or when the range was snow covered, when steers were pastured yearlong on 20 acres of native range per steer. There was no advantage in alternate grazing over continuous grazing as measured by steer gains in the four years' results at the rate of 20 acres per steer.

Other tests at the Ardmore Station (4) indicate that it is much more economical to winter steers on the range and supplement the range with protein concentrates and feed dry roughage in extremely bad weather or when vegetation is covered with snow, than it is to carry them through in the feed lot.

Black and Clark (2) found little difference between the effects of a high protein and low carbohydrate concentrate (cottonseed cake) and a low protein and high carbohydrate concentrate (beet pulp-molasses pellets) when fed as supplements to the native range for wintering yearlings and two-year-old cattle.

Three years' work at the United States Range Livestock Experiment Station, Miles City, Montana (6), in which calves from weaning to two and one-half years of age were wintered at different levels of nutrition and grazed on native pasture during the grazing season, showed that it was more economical to winter calves and yearlings on a low plain of nutrition than on a high

plain. The lowered feed costs for steers on the low plain more than offset the increased gains made by the steers on the high plain. They concluded that calves should gain 25 to 30 pounds per head during winter and that yearlings should be kept in a thrifty condition on a plain slightly above maintenance.

Tests at the Southern Great Plains Field Station, Woodward, Oklahoma (16), have shown that beef calves and yearlings wintered on dry grass must be supplemented for economical returns from yearlong grazing with from one to two pounds of 40 per cent protein concentrate or its equivalent.

Savage and Heller (16) at the Woodward Station have found that most range grasses are too low in protein content during July, August, and September, in many years for the most rapid growth and fattening of beef cattle. Results show profitable increases in summer gains were obtained in four of the six years by feeding a protein supplement in late summer. No advantages were obtained in 1948 and 1950 when grass was green all summer. In these tests feeding two pounds of cake in late summer was compared with the one pound rate and with no caking during 1945 and 1946. The heavy feeding rate was profitable in 1945 but not in 1946.

The cottonseed pellets not only provided additional protein required for rapid growth and fattening, but according to Hobbs et al.(10) this concentrate also increased the apparent digestibility of all nutrients contained in dry grass. It also stimulates the appetite and increases the consumption of dry roughage.

Morrison (12) states that the benefit from the addition of a protein supplement will be much greater in midsummer and later, because the supply of grass is often scanty and the protein content

is lower than in spring and early summer. He points out that there is more advantage in feeding a protein supplement to cattle of high grade, that will sell near the top of the market when well finished, than to low-grade animals which will not bring the best price, no matter how they are fed.

Some attention should be given to the supply of minerals to cattle wintered on dry grasses. Salt should be provided at all times. In addition, a phosphorus supplement is most likely to be needed. This is especially true when no protein supplement or soybean oil meal as a supplement is fed. One part salt mixed with two parts steamed bone meal in addition to salt alone will usually prevent mineral deficiencies. Boron and iodine will need to be supplied in areas known to be deficient in these minerals (12).

EXPERIMENTAL PROCEDURE

The purpose of this experiment was to compare the following three methods of feeding a protein supplement to yearling steers wintered on bluestem pasture: (1) Feeding protein every day, (2) Feeding protein every other day, and (3) The use of salt mixed with protein to limit consumption and thus make it possible to self-feed the protein. In all cases it was attempted to limit the consumption so that each group would receive an average of two pounds of 40 per cent protein per head per day.

The experiment was repeated three times. The 30 steers in each test were weighed and divided into three lots according to weight so that each lot contained steers of approximately the

same weight. The steers were numbered individually with hot iron brands.

The steers were sprayed twice each winter with Benzene Hexachloride (B.H.C.) to control lice, and twice during each summer grazing with Dichlorodiphenyltrichloroethane (DDT) to control flies.

The steers in lot 3 were self-fed salt and meal in a covered self-feeder to protect the mixture from the weather. Pellets fed to lots 1 and 2 were fed in bunks in the first two experiments, but scattered on the ground in the third experiment.

Salt was provided free choice to all three lots during each experiment. A mixture of two parts (by weight) steamed bone meal to one part (by weight) salt was provided free choice to all lots of steers in the second and third experiments, but not in the first experiment.

Species population of pastures similar to those grazed in these experiments are given in Table 1.

Experiment I

Thirty head of good quality Hereford yearling steers were used in this test. They were divided into three lots and fed the following supplements in addition to bluestem grass from December 11, 1948, to May 1, 1950.

Lot 1 - Two pounds of soybean oil meal pellets per steer daily.

Lot 2 - Four pounds of soybean oil meal pellets per steer fed every other day (average of two pounds per steer

Table 1. Adjoining pastures, similar to the ones used in this experiment, were found to contain the following vegetative populations (17).

Species	Per cent of total population
Big bluestem	17.6
Little bluestem	24.1
Indian grass	7.7
Sideoats grama	8.1
Blue grama	3.5
Hairy grama	2.7
Buffalograss	4.5
Kentucky bluegrass	8.3
All other perennial grasses	7.8
Total perennial grasses	84.3
Sedges and rushes	6.0
Annual grasses	1.7
Total grass and grasslike species	92.0
Perennial broad-leaf plants	5.5
Annual broad-leaf plants	2.2
Shrubs	.3

daily).

Lot 3 - Soybean oil meal and salt self-fed . The proportions of soybean oil meal and salt were 100 pounds soybean oil meal and about 35 pounds salt.

From six to 19 acres of pasture were allowed each steer. All the pastures in which the steers were wintered had been grazed the previous summer, but a plentiful supply of grass remained.

Observations. The weather was very mild, extremely dry, and favorable for wintering cattle during this experiment. This test indicates that daily feeding results in greater gains than feeding every other day and both methods were superior to the self-fed lot in terms of average daily gains. Lot 3 gained only half as well as lot 1.

No ill effects were noted from feeding the meal-salt mixture to the steers in lot 3, although they did present a somewhat rougher appearance than the other lots at the close of the wintering period. All lots were appraised at the same value at the close of the wintering period. Table 2 summarizes the results obtained in the winter feeding tests.

All lots lost weight during the month of March. Lot 1 lost six pounds per steer, lot 2 lost 7 pounds per steer, and lot 3 lost 43 pounds per steer. All lots made large gains during April.

After the wintering period, all the steers were grazed together on bluestem pasture until July 15, 1950. This was necessary in order to determine the effect of the winter treatment upon the following summer gains. Table 3 shows the results obtained during the summer grazing period, and summarizes the winter and summer phases.

Table 2. Wintering yearling steers on bluestem pasture (December 11, 1949, to May 1, 1950 - 141 days).

Method of feeding	Lot 1	Lot 2	Lot 3
	Number of steers per lot		
	10	10	10
	Soybean oil meal pellets: fed daily	Soybean oil meal pellets: fed every other day	Soybean oil meal and salt mixed together & self-fed
Average daily winter ration (lbs.):			
Soybean oil meal pellets	2.00	2.01	-
Soybean oil meal	-	-	1.84
Prairie hay*	.34	.34	.81
Salt	.10	.10	.58
Bluestem pasture	ad lib.	ad lib.	ad lib.
Average initial weight	624	622	623
Average final weight	723	701	669
Average gain	99	79	46
Average daily gain	.70	.56	.33

* Prairie hay was fed only when snow covered the grass except lot 3 was fed some hay at the start of the test to get them started on the salt-meal mixture.

Table 3. Grazing yearling steers on bluestem pasture, summer phase (May 1, 1950, to July 15, 1950 - 75 days)

Method of feeding	Lot 1	Lot 2	Lot 3
	Number of steers per lot		
	10	9*	10
	Soybean oil meal pellets fed daily	Soybean oil meal pellets fed every other day	Soybean oil meal and salt mixed together & self-fed
Average initial weight	723	701	669
Average final weight	879	861	834
Average gain	156	160	165
Average daily gain	2.08	2.13	2.20
Summary - winter and summer phases (216 days)			
Average initial weight	624	622	623
Average final weight	879	861	834
Average gain	255	239	211
Average daily gain	1.18	1.11	.98

* One steer in lot 2 developed an infected foot shortly after the winter period and was removed from the test.

Results indicate that the lots that made the lowest winter gain made the largest summer gain. At the close of the summer period, however, the group fed each day held a total gain of 16 and 44 pounds, respectively over lot 2, fed every other day, and lot 3, self-fed meal and salt.

All steers were appraised at the same value at the end of the summer grazing period.

Table 4 shows the chemical analysis of feeds used in this experiment.

Experiment II

Thirty head of good quality Hereford yearling steers were used in this test. All lots were wintered on dry bluestem pasture, which had been normally stocked the previous grazing season, but contained sufficient grass for the steers to winter on. The pastures were the same as those used in Experiment I.

Each lot received a supplement during the winter period December 13, 1950, to April 18, 1951 (126 days), in addition to dry bluestem pasture as follows:

Lot 1 - Two pounds of soybean oil meal pellets per steer daily.

Lot 2 - Four pounds of soybean oil meal pellets per steer fed every other day (average of two pounds per steer daily).

Lot 3 - Soybean oil meal and salt self-fed. The proportions of soybean oil meal and salt varied from 100 pounds of

Table 4. Chemical analysis of feeds used in Experiment I.

Feeds	Moisture	Protein	Fat	Fiber	N-free extract	Mineral matter	Calcium	Phosphorus
	Per cent							
Soybean oil meal	7.64	43.56	5.71	5.65	31.68	5.76	.10	.78
Prairie hay	4.70	5.56	1.87	33.43	47.20	7.24	.22	.18
Bluestem pasture grasses 1950 (dry basis)								
January 1	0	2.75	2.04	34.94	50.93	9.31	.39	-
February 1	0	3.10	1.92	34.58	51.12	9.25	.46	.08
March 1	0	3.03	1.61	35.85	49.79	9.69	.44	.03
April 1	0	2.98	1.64	33.60	50.00	11.77	.51	.07
May 10	0	13.56	-	-	-	-	-	-
May 20	0	12.10	-	-	-	-	-	-
June 10	0	10.25	2.36	39.21	41.03	7.12	.32	.13
June 20	0	8.43	-	-	-	-	-	-
July 1	0	8.58	3.10	29.36	51.53	7.40	.48	.15
July 10	0	9.33	-	-	-	-	-	-
July 20	0	8.97	-	-	-	-	-	-
August 1	0	8.90	3.48	31.02	48.00	8.60	.40	.10
August 10	0	9.55	-	-	-	-	-	-
August 20	0	7.76	-	-	-	-	-	-
September 1	0	8.54	2.10	31.70	49.03	8.63	.22	.07
September 10	0	7.62	-	-	-	-	-	-
October 1	0	5.27	-	-	-	-	-	-
October 10	0	4.30	2.17	32.62	51.99	8.92	.53	.06
December 15	0	4.04	1.89	37.03	47.72	9.32	.50	.05

meal and 35 pounds of salt up to 45 pounds of salt per 100 pounds of meal. This amount of salt held the consumption of meal to approximately two pounds per head daily.

The winter was very mild and favorable for wintering cattle on dry grass. All three lots wintered satisfactorily. The steers fed every other day made the largest winter gain. This was not true in the previous test. Steers self-fed meal and salt compared very favorably in gain with the steers hand-fed pellets each day.

Table 5 summarizes the results obtained in the winter feeding tests.

Following the wintering period, all steers in the three lots were grazed together on bluestem pasture until July 18, 1951, to determine the effect of the winter treatment upon the summer gains. Table 6 shows the results obtained during the summer grazing period, and summarizes the winter and summer phases.

At the close of the summer grazing period lot 2, fed every second day, was still the largest gaining lot. Lot 1, fed soybean oil meal pellets every day, gained about the same as lot 3, self-fed the salt and soybean oil meal mixture. All were appraised at the same value at the end of the summer grazing period.

Table 7 shows the chemical analysis of feeds used in Experiment II.

Experiment III

Thirty head of good quality Hereford yearling steers were used in this test. These steers were purchased in the spring

Table 5. Wintering yearling steers on bluestem pasture (December 13, 1950 to April 18, 1951 - 126 days)

Method of feeding	Lot 1	Lot 2	Lot 3
	Number of steers per lot		
	10	10	10
	Soybean oil meal pellets fed daily	Soybean oil meal pellets fed every other day	Soybean oil meal and salt mixed together & self-fed
Average daily winter ration (lbs.):			
Soybean oil meal pellets	2.02	2.03	-
Soybean oil meal	-	-	1.97
Prairie hay*	.76	.75	.58
Salt	.19	.13	.69
Mineral mixture**	.02	.03	.05
Bluestem pasture	ad lib.	ad lib.	ad lib.
Average initial weight	683	684	685
Average final weight	745	759	739
Average gain	62	75	54
Average daily gain	.49	.60	.43

* Prairie hay was fed only when snow covered the grass.
** Mineral mixture consisted of 2 parts steamed bone meal to 1 part salt.

Table 6. Grazing yearling steers on bluestem pasture, summer phase (April 18, 1951 to July 18, 1951 - 91 days).

Method of feeding	Lot 1	Lot 2	Lot 3
	Number of steers per lot		
	10	9*	10
	Soybean oil meal pellets fed daily	Soybean oil meal pellets fed every other day	Soybean oil meal and salt mixed together & self-fed
Average initial weight (lbs.)	745	757**	739
Average final weight	906	934	916
Average gain	161	177	177
Average daily gain	1.77	1.95	1.95
Summary - winter and summer phases (217 days)			
Average initial weight	683	684	685
Average final weight	906	934	916
Average gain	223	250	231
Average daily gain	1.03	1.15	1.06

* One steer in lot 2 broke a leg and was butchered May 6, 1951.
**Difference between final weight for winter phase and initial weight for grazing phase of lot 2 is due to removal of one steer from this lot.

Table 7. Chemical analysis of feeds used in Experiment II.

Feeds	Moisture	Protein	Fat	Fiber	N-free extract	Mineral matter	Calcium	Phosphorus
	Per cent							
Soybean oil meal	9.38	43.00	5.00	5.65	31.47	5.50	-	-
Prairie hay	8.67	4.63	1.87	33.34	45.59	6.74	.32	.09
Bluestem pasture grasses 1951 (dry basis):								
January 1	0	3.44	1.99	36.76	48.22	9.59	.47	.10
March 6	0	3.22	1.95	35.34	51.00	8.49	.38	.03
July 5	0	7.60	-	-	-	-	-	-
July 20	0	8.43	-	-	-	-	-	-
August 6	0	6.39	-	-	-	-	-	-
August 11	0	6.65	-	-	-	-	-	-
August 17	0	7.24	-	-	-	-	-	-
August 20	0	8.43	-	-	-	-	-	-
August 31	0	7.32	-	-	-	-	-	-
September 10	0	7.89	-	-	-	-	-	-
September 21	0	5.93	-	-	-	-	-	-
October 15	0	4.44	-	-	-	-	-	-
November 1	0	4.20	2.12	33.98	49.87	9.50	-	-
December 29	0	4.16	1.90	34.31	51.52	8.11	-	-

Analyses are reported on an as-fed basis except where noted.

prior to the experiment, and had been grazed on bluestem pasture during the summer and fall. They carried a moderate amount of flesh, even though they lost some weight during October and November when they were on grass alone prior to the start of this experiment.

The three lots of steers were wintered on dry bluestem pasture, which had been normally stocked the previous grazing season, but contained adequate grass for the steers during the winter. From six to 13 acres of pasture were allowed each steer, and in contrast to Experiments I and II they were rotated among pastures every 30 days. This tended to equalize any variation that might exist between pastures.

In addition to the dry grass, the following supplements were fed during the wintering period:

Lot 1 - Two pounds of cottonseed oil meal pellets per steer daily.

Lot 2 - Four pounds of cottonseed oil meal pellets per steer fed every other day (average of two pounds per steer daily).

Lot 3 - Cottonseed oil meal and salt self-fed. The proportions of cottonseed oil meal and salt were 100 pounds cottonseed oil meal and about 35 pounds salt.

Weather conditions were favorable for wintering on dry grass with the exception of the month of December and the first week in March. All lots lost weight during the wintering period; however, the wintering period stopped on April 1, in this experiment. This is 30 days shorter than Experiment I and 18 days shorter than

Experiment II. All lots made good gains during April in the two previous tests.*

Lot 1, fed every day, wintered slightly better than lot 2, fed every second day, and lot 3, self-fed salt and cottonseed oil meal, lost considerable weight, an average of 55 pounds per head for the winter.

Table 8 summarizes the results obtained in the winter grazing tests.

Table 9 shows the chemical analysis of feeds used in Experiment III.

Summary of Experiments I, II, and III

Weather conditions were favorable for wintering yearling steers on bluestem pasture during each of the three years. All steers wintered satisfactorily in every experiment.

These experiments show that steers wintered on the self-fed meal and salt gained an average of 15 pounds per head for the winter compared with an average gain of 51 and 47 pounds respectively, for steers fed cake daily and every other day. The self-fed salt and meal steers outgained the steers fed cake daily and the steers fed cake every other day during the summer grazing seasons by 13 and three pounds, respectively.

When considering both winter and summer phases, lot 2, fed every other day, gained an average of five pounds more than lot 1,

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* The summer grazing period was not included in this experiment.

Table 8. Wintering yearling steers on bluestem pasture (December 7, 1951 to April 1, 1952 - 116 days).

	Lot 1	Lot 2	Lot 3
	Number of steers per lot		
	10	10	10
Method of feeding	Cottonseed oil meal pellets fed daily	Cottonseed oil meal pellets fed every other day	Cottonseed oil meal and salt self-fed
Average daily winter ration (lbs.):			
Cottonseed oil meal pellets	2.00	2.00	-
Cottonseed oil meal	-	-	2.05
Salt	.09	.07	.65
Mineral mixture*	.14	.12	.09
Prairie hay**	1.52	1.47	1.42
Bluestem pasture	ad lib.	ad lib.	ad lib.
Average initial weight	745	741	746
Average final weight	737	726	691
Average gain	-8.00	-15.00	-55.00
Average daily gain	- .06	- .15	- .47

* Mineral mixture composed of 2 parts steamed bonemeal to 1 part salt, fed free choice.
**Prairie hay was fed only during unfavorable weather.

Table 9. Chemical analysis of feeds used in Experiment III.

Feeds	Moisture	Protein	Fat	Fiber	N-free extract	Mineral matter	Calcium	Phosphorus
	Per cent							
Cottonseed meal*	5.67	40.88	5.36	12.15	29.30	6.64	-	-
Cottonseed cake	6.04	42.13	5.67	12.03	27.84	6.29	-	-
Prairie hay	4.55	6.31	2.37	32.60	47.39	6.78	-	-
Bluestem pasture grasses 1952 (dry basis): February 9	0	3.96	-	-	-	-	-	-

* Analyses are reported on an as-fed basis except where noted.

fed every day, and 23 pounds more than lot 3, self-fed meal and salt.

Table 10 summarizes the results of the three wintering phases, and Experiments I and II with regard to summer grazing and year-long grazing.

Plate I shows the yearling steers being wintered out on dry bluestem pasture in Experiment II. The picture was taken in March, 1951.

Plate II shows the steers being grazed on bluestem pasture during the summer period. The picture was taken after they were taken off Experiment II. The picture was taken in August, 1951.

Table 10. Summary of Experiments I, II, and III.

Method of feeding	Lot 1: Fed protein supplement daily	Lot 2: Fed protein supplement every other day	Lot 3: Self-fed protein supplement with salt
	Av. number of steers per lot		
	10	10#	10
Wintering - average 128 days (Experiments I, II, & III)			
Average daily winter ration (lbs.):			
Protein pellets	2.01	2.01	-
Protein meal	-	-	1.95
Salt	.13	.10	.64
Mineral mixture*	.05	.05	.05
Prairie hay**	.87	.85	.94
Bluestem pasture	ad lib.	ad lib.	ad lib.
Average initial weight	684	682	685
Average final weight	735	729	700
Average gain	51	47	15
Average daily gain	.38	.34	.10
Summer grazing - average 83 days (Experiments I and II)			
Average initial weight	734	729	704
Average final weight	892	898	875
Average gain	158	168	171
Average daily gain	1.92	2.04	2.08
Summary - winter and summer phases (Experiments I and II)			
Average initial weight	654	653	654
Average final weight	892	898	875
Average gain	239	244	221
Average daily gain	1.10	1.13	1.02

* The mineral mixture was fed only the last two years.
**Prairie hay was fed only during unfavorable weather.
Lot 2 contained only 9 steers during the summer grazing period, and only 9 steers were used in summarizing the two phases.

EXPLANATION OF PLATE I

Pictured in this plate are representative yearling steers used in Experiment II being grazed during the winter on dry bluestem grass. The picture was taken in March, 1951.

PLATE I

EXPLANATION OF PLATE II

Pictured in this plate are representative yearling steers used in Experiment II being grazed during the summer on bluestem grass. The picture was taken in August following the summer grazing phase of the experiment.

PLATE II

SUMMARY AND RESULTS

Three experiments were conducted in order to test different methods of feeding protein supplements to yearling steers wintered on dry bluestem pasture. The first two included both the winter grazing and the summer grazing phases, while the third test included the winter grazing phase only.

In each of the experiments good quality yearling steers were divided into three lots of 10 steers each, and allowed to graze bluestem pastures, which contained an adequate amount of dry grass for wintering. In addition, during the winter period lot 1 was hand-fed two pounds of 40 per cent protein pellets daily, lot 2 was hand-fed four pounds of 40 per cent protein pellets every other day (average of two pounds per steer daily), and lot 3 was self-fed a 40 per cent protein meal mixed with salt (the salt was mixed with the meal to limit consumption to two pounds per steer daily). Prairie hay was fed when the grass was covered with snow. A mineral mixture of two parts steamed bone meal to one part salt was provided for all lots during Experiments II and III, but not Experiment I. Salt was available for all lots during each experiment.

1. All three lots wintered satisfactorily in each of the experiments.

2. Steers fed pellets every day and those fed every other day made better winter gains than steers self-fed oil meal and salt. The reverse was true for summer gains.

3. Total average yearlong gain (winter and summer for the first two experiments) was 239 pounds for steers hand-fed protein daily, 244 pounds for steers hand-fed protein every other day,

and 221 pounds for the steers self-fed meal and salt.

4. In each experiment all lots of steers were appraised at the same value at the end of the winter grazing period and at the end of the summer grazing period.

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METHODS OF MANAGING YEARLING STEERS ON BLUESTEM PASTURE

by

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of Agriculture and Applied Science, 1949

ABSTRACT OF A MASTER'S THESIS

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MASTER OF SCIENCE

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The bluestem area, long known for its value in fattening cattle during the summer grazing period, has increased in its popularity for yearlong grazing.

The bluestem grass may vary from an average of 9.0 per cent protein (dry basis) during the summer months to less than 4.5 per cent protein in October. During the winter months the protein content may drop even lower. Since dry bluestem grass contains a low percentage of protein during the winter months, it is necessary to supplement the dry grass with some type of protein during this period when cattle are grazed yearlong. More economical gains also have been obtained from cattle fed protein supplement in addition to bluestem grass during the latter part of the summer grazing period.

Experiments in other grazing areas have shown the value of various protein supplements fed to cattle grazed yearlong on different types of grass.

Since a protein supplement is necessary for cattle wintered on dry bluestem grass in order to get desirable gains, it is then necessary to determine the best method to feed this supplement.

The purpose of this experiment was to compare the following methods of feeding a protein supplement to yearling steers wintered on bluestem pasture: (1) Feeding protein every day, (2) Feeding protein every other day, and (3) The use of salt mixed with protein to limit consumption and thus make it possible to self-feed the protein. With each method it was attempted to

limit the consumption so that each group would receive an average of two pounds of 40 per cent protein per head daily.

The experiment was conducted three different years. In each of the experiments good quality yearling steers were divided into three lots of 10 steers each, and allowed to graze bluestem pastures, which contained an adequate amount of dry grass for wintering. Prairie hay was fed when the grass was covered with snow. A mineral mixture of two parts steamed bone meal to one part salt was provided for all lots during the last two experiments, but not the first experiment. Salt was available for all lots during each experiment.

The results indicate that all three methods were satisfactory in supplying protein. Steers fed protein every day and those fed every other day made better winter gains than steers self-fed protein and salt. The reverse was true for summer gains. The total average yearlong gain (winter and summer for the first two experiments) was 239 pounds for steers hand-fed protein daily, 244 pounds for steers hand-fed protein every other day, and 221 pounds for the steers self-fed meal and salt. The last experiment did not include the summer grazing phase.

In each experiment all lots of steers were appraised at the same value at the end of the winter grazing period and at the end of the summer grazing period.