

12 mg. in summer. These groups also had the lowest and highest live values per 100 lbs., respectively.

Differences in carcass grades and dressing percentage were small. There were no noticeable changes in general body conformation due to winter or summer implants. Shortly after all steers were implanted with 24 mg. at the beginning of the feedlot test some of them exhibited elevated tailheads. These differences soon disappeared and there were no noticeable side effects at time of marketing.

### Summary

Stilbrol implants (12 mg.) increased summer gains of yearling steers 11 lbs. The increased gain of certain steers which were selected for a subsequent fattening test was 24 lbs. In the subsequent fattening test in which all steers were implanted with 24 mg. of stilbrol, the average feedlot gain was reduced 22 lbs. due to previous summer implants, although there was considerable variation between lots. Previous summer implants decreased carcass grade but increased dressing percentage. These differences were very small.

Greatest feedlot gain was for those implanted with 12 mg. in the winter and no implant in the summer. Lowest feedlot gains were for those implanted with 12 mg. in both seasons. Greatest total gain (15 months) was for those implanted with 24 mg. in winter and 12 in summer. All steers were implanted with 24 mg. at the beginning of the feedlot test.

On the basis of the average response and considering no difference in feed consumption or efficiency during the feedlot phase, it is estimated that the value of a 700 lb. yearling feeder steer in the fall would be reduced approximately \$.80 per 100 lbs. because of previous summer implants.

## Effect of Level of Wintering Fall-Calving Beef Cows and Replacement Heifers

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In recent years there has been an increased number of cows calving in the fall. This change in calving season has resulted in a need for additional data on feeding and managing such cattle grazing native grass (Bluestem and associated grasses) year-long. Because of the increase in nutritive requirements of a cow suckling calf, it is of primary im-

portance to determine the most satisfactory level of supplemental winter feed.

The cost of supplemental feed constitutes a large portion of the total cost of producing a calf. The amount of supplemental winter feed will vary according to the amount and quality of forage available in a pasture. In some areas of our state the native grasses furnish practically all of the roughage consumed by a cow herd.

The effects of feeding level upon productive life of a cow herd as well as the cost of supplemental winter feed must be considered when determining the optimum level of wintering.

Questions which arise in planning a fall-calving program include: (1) What is the effect of level of winter feeding on weaning weights of calves and rebreeding rate of cows? (2) What percent of her body weight can a cow lose during the winter without affecting percentage calf crop and weaning weights of calves?

The original trial to provide information on the above and other questions was initiated in the fall of 1954 at the Lake Carl Blackwell experimental range area. Mature Hereford cows which had previously produced at least one calf were used in the experiment. The cows remained in the tests until the fourth calf crop was weaned in the summer of 1958. Results obtained during these 4 years have been summarized and reported in Oklahoma Agricultural Experiment Station MP-55. The 4-year summary indicated that under conditions of adequate grass, as was present in these tests, the low level of wintering (1.5 lbs. of C.S.M. per cow daily) was more profitable than the high level of wintering (2.5 lbs. of C.S.M. plus 3 lbs. of grain) when cow feed costs were subtracted from total calf values. Most of the calves were sold as choice feeders at weaning. Creep-feeding was practiced at both levels of wintering. In the four years of test, there were eight possible comparisons of creep-feeding vs. not creep-feeding. Only in one instance was creep-feeding profitable and this was on the low level of wintering. Additional creep-feeding data are presented elsewhere in the publication ("Creep-Feeding Fall Calves").

Although the low level of wintering was more profitable in the 4-year study, it should be emphasized that these cows had completed much of their growth when placed in the test. They had first calved in the spring as two-year-olds and their second calf was born in the fall when they were 3½ years old. They therefore had several additional months of growth between calvings without the added burden of reproduction. The effect of this "rest period" upon subsequent production is not known.

It is possible that younger animals might respond differently when subjected to the same treatment. Therefore, a trial was conducted (1957-58) with heifers calving in the fall at 2½ years of age. In this test, neither the low (1.5 lbs. C.S.M. per cow daily) nor the high (2.5 lbs. C.S.M. plus 3 lbs. ground milo) level of supplemental winter feeding resulted in thrifty and heavy calves. Apparently the amount of nutrients consumed by the cows was not adequate for growth and lactation. A summary of this trial was reported in Oklahoma Agricultural Experiment Station MP-55.

The present article includes (1) the results of the 1958-59 test with three-year-old cows, (2) preliminary results (1959-60) with these same cows as four-year-olds, (3) results of two-year-old heifers producing their first calf (1958-59), (4) preliminary results of these same cows producing their second calf, (5) results with wintering yearling heifers (1958-59), (6) preliminary results with these same heifers as two-year-olds producing their first calf, (7) results with wintering heifer calves (1958-59), (8) preliminary results with wintering these same heifer calves as yearlings, and (9) preliminary results with wintering heifer calves.

## Part 1. Results with Three-Year-Old Cows, 1958-59.

### Procedure

The two-year-old heifers used in the 1957-58 study, described in the introduction, were continued on test in 1958-59 in order that accumulative effects could be studied. The initial weight was taken on September 20, 1958. The intention was to produce a wider difference in winter weight loss than that recorded in previous tests. The cows in Lots 1 and 2 were fed to lose approximately 30 to 20 percent of their body weight, respectively. Both lots of cows were allowed to graze the native grass pastures and during the winter were supplemented as follows: Lot 1, 1.1 pounds of cottonseed meal pellets per head daily; Lot 2, 6.25 pounds of pellets consisting of 40 percent cottonseed meal and 60 percent ground milo. Therefore, the high level cows (Lot 2) received 2.5 pounds of cottonseed meal and 3.75 pounds of milo per head daily. Supplemental winter feeding started October 30, 1958, and was discontinued April 23, 1959 (175 days).

Hereford bulls were placed with the cows in mid-December. Thus, the first calves were born in late September. One cow was found to be open upon pregnancy examination in June and was removed from the experiment. Two additional cows failed to calve in Lot 1; therefore, 13 of the two-year-olds which raised calves in the previous test were

nursing calves. In Lot 2, all 16 cows were suckling calves. None of the calves were creep-fed.

## Results

A summary of the data collected in this test is given in Table 1. The cows in Lot 1 lost an average of 262 pounds or 26 percent of their body weight. The loss in Lot 2 was 209 pounds or 21 percent.

The average birth weights were 4 pounds in favor of Lot 2. The calves in Lot 1 were born an average of 12 days earlier than those in Lot 2. The spring weights of both lots of calves were relatively light. The average spring weights were 197 pounds and 220 pounds for those in Lots 1 and 2, respectively. The difference had increased to 41 pounds

**Table 1.—Levels of Supplemental Winter Feeding of Three-Year-Old Beef Cows, 1958-59.**

Lot Number	1	2
Level of Feeding	Low <sup>1</sup>	High <sup>2</sup>
Number of cows per lot raising calves <sup>3</sup>	13	16
Average weight per cow (lbs.)		
Initial 9-20-58	1005	1017
Spring 4-23-59	743	808
Weaning 7-3-59	928	965
Fall 10-13-59	1086	1103
Winter gain (215 days)	—262	—209
Gain to weaning	— 77	— 52
Yearly gain	81	86
Average weights per calf (lbs.)		
Birth <sup>4</sup>	71	75
Spring <sup>5</sup>	197	220
Weaning <sup>6</sup>	346	387
Average birth date of calves, Oct.	2	14
Supplemental feed per cow (lbs.) <sup>7</sup>		
Cottonseed meal	192	438
Ground milo		656
Total feed cost per cow (\$) <sup>8</sup>	30.95	53.01
Selling value (\$)		
Per 100 lbs.		
Steers	38.50	38.50
Heifers	35.00	35.00
Per head <sup>9</sup>	119.63	134.70
Selling value minus feed cost (\$)	88.68	81.69

<sup>1</sup> Fed 1.1 lbs. pelleted cottonseed meal per head daily.

<sup>2</sup> Fed 6.25 lbs. of pellets consisting of 40% cottonseed meal and 60% ground milo. Daily consumption was 2.5 lbs. cottonseed meal and 3.75 lbs. milo per head.

<sup>3</sup> In Lot 1, one cow was found to be open when examined for pregnancy on 6-28-58 and was therefore removed from the experiment. Two additional cows in this lot failed to calve.

<sup>4</sup> Corrected for sex by the addition of 3 lbs. to the weight of each heifer.

<sup>5</sup> Corrected for sex by the addition of 18 lbs. to the weight of each heifer after a 170-day age correction by interpolation.

<sup>6</sup> Corrected for sex by the addition of 43 lbs. to the weight of each heifer after a 260-day age correction by interpolation.

<sup>7</sup> 175 days of feeding which started 10-30-58.

<sup>8</sup> Includes pasture cost and prices of feeds at the time tests were conducted.

<sup>9</sup> Based on an equal number of steers and heifers in each lot using the age and sex corrected weaning weights as the steer selling weight and this weight minus 43 lbs. (sex correction factor) as the average weight of heifers.

by weaning with an average weight of 346 pounds for Lot 1 and 387 pounds for Lot 2. These weaning weights are relatively light when compared to those of the mature cows previously mentioned. However, the weights were an increase of 29 and 43 pounds for Lots 1 and 2, respectively, when compared to the weaning weights of calves from these same cows as two-year-olds.

Both lots of calves were weaned and sold as feeders in early July at the Oklahoma City livestock market. The steers sold for an average of \$38.50 per 100 pounds and the heifers sold for \$35.00. The cost of the increased feed for Lot 2 was greater than the increased value of the calves sold. The selling value minus feed cost was \$6.99 in favor of the low level (\$88.68 vs. \$81.69).

In the tests with mature cows (4-year-summary reported in 1959), it appeared that their production might not be greatly affected by losses of 25 to 30 percent of their body weight. However, results with three-year-olds indicate that production of younger animals may be reduced unless the weight losses are decreased considerably. In this test, both cows receiving the low and the high level of supplemental feed failed to produce calves with desirable weaning weights.

## **Part 2. Preliminary Results with Four-Year-Old Cows, 1959-60.**

### **Procedure**

It seemed desirable to continue the cows used in the previous study on test for another season in order that accumulative effects of the different levels of supplemental winter feed could be studied. Thus, the cows are presently raising their third calf. The initial weight for this trial was taken October 13, 1959.

The cows receiving the different levels of supplemental feed the previous two seasons remained on their respective levels during this trial. However, the low level of supplemental feed was increased from 1.1 pounds pelleted cottonseed meal as fed in 1958-59 to 2.5 lbs. The high level was 6.58 pounds of pellets consisting of 40 percent cottonseed meal and 60 percent ground milo. Thus, daily consumption per head in Lot 2 (high level) was 2.63 pounds of cottonseed meal and 3.95 pounds of ground milo. These feeds were fed in bunks every other day in amounts to furnish the above pounds per head daily. Supplemental winter feeding started October 13, 1959, and will be discontinued in April when adequate green grass is available.

Hereford bulls were placed with the cows January 8, 1959. Thus, the first calves were born in mid-October. One cow in Lot 1 was found to be open upon pregnancy examination in June and was removed from

the experiment. In Lot 2, 1 cow was open, 1 cow failed to calve, and 1 calf was born dead. Therefore, 12 of the 13 cows in Lot 1 which raised calves in 1958-59 are now raising calves. In Lot 2, 13 of the 16 cows are suckling calves.

### Results

The preliminary results for the past winter season are summarized in Table 2. The cows in Lot 1 lost an average of 374 pounds or 34 percent of their body weight. The loss in Lot 2 was 326 pounds or 29 percent. Adverse weather prevailed for a considerable number of days prior to the last weighing. It is expected that a part of these losses is reduced fill. However, it is also recognized that the dry range grass is of reduced nutritive value this season.

The average birth weights were 3 pounds in favor of Lot 2. The calves in Lot 2 were born an average of 6 days earlier than those in Lot 1. Both lots of calves are relatively light. The average weights on March 12 were 153 pounds and 186 pounds for those in Lots 1 and 2, respectively. The increased level of wintering the cows has increased calf weights 33 pounds. Supplemental feed cost for Lot 1 was \$11.89 as compared to \$22.66 for Lot 2.

Further evaluation of the two levels of wintering will be made when the calves are weaned and sold in mid-summer.

**Table 2.—Levels of Supplemental Winter Feeding of Four-Year-Old Beef Cows (Preliminary Results, 1959-60).**

Lot Number Level of Feeding	1 Low <sup>1</sup>	2 High <sup>2</sup>
Number of cows per lot <sup>3</sup>	12	13
Average weight per cow (lbs.)		
Initial 10-13-59	1089	1116
Spring 3-12-60	715	790
Winter change (151 days)	—374	—326
Average birth weight per calf (lbs.) <sup>4</sup>	73	76
Average calving date, November	13	7
Average weight per calf 3-12-60 <sup>5</sup>	153	186
Supplemental feed per cow (lbs.) <sup>6</sup>		
Cottonseed meal	378	395
Ground milo		537
Supplemental feed cost per cow (\$)	11.89	22.66

<sup>1</sup> Fed 2.5 lbs. pelleted cottonseed meal per head daily.

<sup>2</sup> Fed same as Lot 1 until October 28, at which time the daily feed was increased to 6.58 lbs. of pellets consisting of 40% cottonseed meal and 60% milo. Daily consumption was 2.63 lbs. of cottonseed meal and 3.95 lbs. milo.

<sup>3</sup> Originally there were 13 cows in Lot 1 and 16 cows in Lot 2. One cow was open in Lot 1. In Lot 2, 1 cow was open, 1 cow failed to calve and 1 calf was born dead.

<sup>4</sup> Corrected for sex by the addition of 3 lbs. to the weight of each heifer.

<sup>5</sup> No correction for age or unequal number of steers and heifers within a lot.

<sup>6</sup> Supplemental feeding started 10-13-59.

### Part 3. Results with Two-Year-Old Heifers, 1958-59.

#### Procedure

The first test with two-year-old heifers was conducted in 1957-58. It appeared from these data that in order to obtain desirable results with younger animals, the winter weight losses should be less than that of mature cows. A second test was initiated in the fall of 1958 to study the effect of 20 and 30 percent body weight losses upon production of fall-calving heifers. These heifers were bred to Hereford bulls during the previous winter and were to calve in October when they were approximately 2½ years old. The 53 Hereford heifers used in this test were divided into three lots on September 20, 1958. There were 18, 17, and 18 cows placed in each of Lots 1, 2, and 3, respectively.

The heifers in Lots 1 and 2 were fed to lose approximately 30 percent of their body weight during the winter period. Those in Lot 3 were fed to lose 20 percent. The amount of supplemental feed given to Lots 1 and 2 was 1.39 pounds of pelleted cottonseed meal per head daily. The Lot 3 cows were fed 6.94 pounds per head daily of a pelleted mixture consisting of 35 percent cottonseed meal and 65 percent ground milo from November 4, 1958, until February 13, 1959. At this time the daily feed was increased to 7.81 pounds in order to obtain the desired weight differences between lots.

Supplemental winter feeding was discontinued on April 17, 1959. The winter feed was fed every other day, twice the daily allowance at each feeding. At all times, cattle were in the native grass pastures and had access to a mineral mixture of 2 parts salt and 1 part steamed bone meal. The calves in Lot 1 started receiving creep-feed in mid-January. The calves in Lots 2 and 3 received no supplemental feed.

#### Results

A summary of results may be found in Table 3. The small difference in birth weight of the calves should not be attributed to the level of winter feeding because all heifers were treated alike prior to November 4, 1958. Two heifers in each of Lots 1 and 3 calved very late and their data were not included in the experiment. In Lot 2, one heifer failed to calve and 1 calf died. One calf was removed from the Lot 3 data because he accidentally had access to the creep-ration for a few weeks.

The cows lost an average of 278, 296, and 134 pounds in Lots 1, 2, and 3, respectively. The percentage of body weight loss for the three respective lots was 28, 30, and 14 percent. Since the cows were suckling

Table 3.—Levels of Supplemental Winter Feeding of Two-Year-Old Beef Heifers, 1958-59.

Lot Number	1	2	3
Level of Feeding	Low <sup>1</sup>	Low <sup>2</sup>	High <sup>3</sup>
Number of cows per lot <sup>4</sup>	16	15	15
Average weight per cow (lbs.)			
Initial 9-20-58	979	983	960
Spring 4-17-59	701	687	826
Weaning 7-6-59	931	914	948
Fall 10-8-59	1033	1027	1042
Winter gain (209 days)	—278	—296	—134
Gain to weaning	— 48	— 69	— 12
Yearly gain	54	44	82
Average weight per calf (lbs.)			
Birth <sup>5</sup>	74	74	73
Spring <sup>6</sup>	213	152	201
Weaning <sup>7</sup>	410	299	358
Average birth date of calves, October	23	22	21
Supplemental feed per animal (lbs.) <sup>8</sup>			
Cow			
Cottonseed meal	228	228	418
Ground milo			775
Calf (creep-feed)	847		
Total feed cost per head (\$) <sup>9</sup>			
Cow	32.07	32.07	55.01
Calf	22.70		
Total	54.77	32.07	55.01
Selling value (\$)			
Per 100 lbs.			
Steers	38.50	38.50	38.50
Heifers	35.00	35.00	35.00
Per head <sup>10</sup>	143.15	102.37	124.04
Selling value minus feed cost (\$)	88.38	70.30	69.03

<sup>1</sup> Fed 1.39 lbs. of pelleted cottonseed meal per head daily. Creep-feeding was started in mid-January.

<sup>2</sup> Cows fed same as in Lot 1.

<sup>3</sup> Cows fed 6.94 lbs. of pellets consisting of 35% cottonseed meal and 65% ground milo from 11-4-58 to 2-13-59 at which time the daily feed was increased to 7.81 lbs./head.

<sup>4</sup> Originally there were 18, 17 and 18 cows in Lots 1, 2 and 3, respectively. In Lots 1, 2 and 3, respectively, 2, 1 and 2 cows calved very late and their data were not included in the experiment. One calf died in Lot 2. One calf in Lot 3 accidentally had access to the creep-ration for a few weeks.

<sup>5</sup> Corrected for sex by the addition of 3 lbs. to the birth weight of each heifer.

<sup>6</sup> Corrected for sex by the addition of 18 lbs. to the weight of each heifer after a 170-day age correction.

<sup>7</sup> Corrected for sex by the addition of 43 lbs. to the weight of each heifer after a 260-day age correction by interpolation.

<sup>8</sup> 164 days of feeding which started 11-4-58.

<sup>9</sup> Includes pasture cost and prices of feeds at time tests were conducted.

<sup>10</sup> Based on an equal number of steers and heifers in each lot using the age and sex corrected weaning weights as the steer selling weight minus 43 lbs. (sex correction factor) as the average weight of heifers.



calves during most of the winter feeding period, any effect of the two levels of supplemental feed on calf weights should be apparent in the weights of the calves in mid-April when supplemental feeding was stopped. The increased level of winter feeding of the cows in Lot 3 increased the average calf weight 49 pounds when compared to the other non-creep-fed calves (Lot 2). Therefore, the high level of winter feeding increased spring weights of the calves in addition to decreasing winter weight losses of the cows. Creep-feeding was also reflected in the average spring calf weights. The difference in favor of creep-feeding calves whose mothers were fed at the low level was 61 pounds.

The calves were weaned on July 6 and sold at the Oklahoma City livestock market. All calves were sold as feeders; the steers sold for \$38.50 per 100 lbs. and the heifers for \$35.00. The calves averaged 410, 299, and 358 pounds for Lots 1, 2 and 3, respectively. The high level of winter feeding increased average calf weights 59 pounds over the low level non-creep-fed calves (Lot 2 vs. Lot 3). The increase in value of the calves due to the high level of wintering cows was nearly equal to the increased cost of supplemental feed. The calf value minus feed costs were \$70.30 and \$69.03 for the low (Lot 2) and high (Lot 3) level, respectively.

Creep-feeding resulted in an increased gain of 111 pounds for calves from the low level cows (Lot 1 vs. Lot 2). Also creep-feeding and low level feeding of cows (Lot 1) resulted in calves which weighed 52 pounds more than calves from cows on the high level of feeding (Lot 3). The creep-fed calves consumed an average of 847 pounds of creep feed which cost \$22.70. The cost of feeding the cows in Lots 1 and 2 (low level) was \$32.07. Subtracting both the cow feed cost and the creep-feed cost from the selling value per calf resulted in increased profits of \$18.08 in favor of creep-feeding on the low level of wintering. The average increase in return for calves in Lot 1, after subtracting both the cow and calf feed costs, was \$19.05 greater than the return for calves from Lot 3 cows (high level). Therefore, it was more profitable to offer increased feed to the calves rather than to the cows.

Apparently creep-feeding is a means of profitably increasing the weaning weight of calves from first-calf heifers in a fall-calving system. However, these results are in contrast with results obtained with creep-feeding fall calves from mature cows receiving either a low or high level of supplemental winter feed. This emphasizes the fact that creep-feeding is profitable only under specific conditions. One should consider the many factors affecting the value of creep-feeding before deciding whether or not to follow the practice.

## Part 4. Preliminary Results with Three-Year-Old Beef Cows, 1959-60.

### Procedure

The cattle used in Part 3 are being continued in the test. They are now three years old. The procedure was essentially the same as that outlined in Part 3. However, some changes were made in the supplemental feed allowances. The cows in Lots 1 and 2 were fed an average of 2.5 pounds of cottonseed meal pellets per head daily. Those in Lot 3 were fed 6.25 pounds of a pelleted mixture consisting of 40 percent cottonseed meal and 60 percent ground milo. Thus, each cow received 2.5 pounds of cottonseed meal and 3.75 pounds of ground milo daily. The calves in Lot 1 were offered creep-feed starting December 31, 1959.

### Results

The weight losses of the cows were relatively large. Part of these increased losses are due to the extended period of severe weather just

Table 4.—Levels of Supplemental Winter Feeding of Three-Year-Old Beef Cows (Preliminary Results, 1959-60).

Lot Number Level of Feeding	1 Low <sup>1</sup>	2 Low <sup>2</sup>	3 High <sup>3</sup>
Number of cows per lot <sup>4</sup>	11	11	14
Average weight per cow (lbs.)			
Initial 10-8-59	1088	1041	1019
Spring 3-15-60	742	680	761
Winter change (159 days)	—346	—361	—258
Average birth weight per calf (lbs.) <sup>5</sup>	72	72	73
Average calving date <sup>6</sup>	Oct. 19	Oct. 30	Nov. 17
Average weight per calf (lbs.) 3-15-60 <sup>7</sup>	153	140	149
Average daily gain per calf (lbs.)	1.03	1.02	1.25
Supplemental feed per animal (lbs.)			
Cow <sup>8</sup>			
Cottonseed meal	398	398	398
Ground milo			435
Calf (creep-feed) <sup>9</sup>	100		
Supplemental feed cost per cow (\$)	12.54	12.54	20.80

<sup>1</sup> Fed 2.5 lbs. pelleted cottonseed meal per head daily. Creep-feeding started in December 31, but consumption was negligible prior to mid-February.

<sup>2</sup> Cows fed same as those in Lot 1.

<sup>3</sup> Cows fed same as those in Lots 1 and 2 until November 20, at which time the daily feed was increased to 6.25 lbs. of pellets consisting of 40% cottonseed meal and 60% ground milo.

<sup>4</sup> There were 16, 15 and 15 cows in Lots 1, 2 and 3, respectively, which were included in the data in 1958-59. In Lots 1, 2 and 3, respectively, 3, 2 and 1 cows were found to be open upon pregnancy examination 7-6-59 and were therefore removed from the experiment. In addition, 1, 2 and 1 cows failed to calve in Lots 1, 2 and 3, respectively. One calf was born dead in Lot 1.

<sup>5</sup> Corrected for sex by the addition of 3 lbs. to the weight of each heifer.

<sup>6</sup> The bulls were rotated among the pastures at 2-week intervals during the calving season. One of the bulls was found to be sterile and this is probably responsible for a major portion of the differences in average calving date.

<sup>7</sup> No correction for age or unequal number of steers and heifers within a lot. The age difference should be noted.

<sup>8</sup> Supplemental feeding started 10-8-59.

<sup>9</sup> Creep-feed cost \$2.50 per cwt. Total cost to 3-12-60 was \$2.50 per head.

prior to date of weighing. It is expected that the total winter loss will have decreased considerably by the time of final weighing in late April. The losses of 346 and 361 pounds in Lots 1 and 2 are in excess of 30 percent of the fall weights of the cows. The high level of supplemental feeding decreased losses about 100 pounds. The 258 pounds of loss in Lot 3 was 24 percent of the initial weight. Preliminary weights of the calves indicated little difference due to creep-feeding. However, the consumption of creep-feed to date has been relatively low, and the added gain due to creep-feeding would be expected to increase considerably in later weeks. It should be noted that at weaning in 1958-59 season the increased gain which was due to creep-feeding the first calves from these cows was 111 pounds.

The weights of all groups of calves were nearly the same. However, those in Lot 3 were 18 days younger than those in Lot 2 and 29 days younger than those in Lot 1. Much of these differences in average calving date were due to presence of a sterile bull. Bulls were rotated among the lots at 2-week intervals during the breeding season, therefore the presence of the infertile bull is responsible for at least a portion of the later average calving date in both Lots 2 and 3. Because of these differences in age the average daily gains of the calves have been calculated. The 0.23 pound increase in daily gain of the calves from the high level cows is an increase of 22 percent. This test will be completed when the calves are sold in July.

## Part 5. Levels of Supplemental Winter Feeding of Yearling Beef Heifers, 1958-59.

### Procedure

Thirty-six yearling heifers were divided into 2 lots of 18 on October 29, 1958. They were allowed to graze yearlong in the native grass pastures. During the winter period they were fed different amounts of supplemental feed. Those in Lot 1 were fed a mixture of 0.32 lb. of cottonseed meal and 0.6 lb. of ground milo per head daily in pelleted form until February 14, at which time the feed was changed to 0.92 lbs. of pelleted cottonseed meal. The heifers in Lot 2 were fed 7 lbs. per head daily of pellets consisting of 35 percent cottonseed meal and 65 percent ground milo. This was 2.45 lbs. of cottonseed meal and 4.55 lbs. of ground milo per head daily. Twice the daily allowance was fed every other day.

### Results

Gain and feed data are summarized in Table 5. The heifers in

Table 5.—Levels of Supplemental Winter Feeding of Yearling Beef Heifers, 1958-59.

Lot Number Level of Feeding	<sup>1</sup> Low <sup>1</sup>	<sup>2</sup> High <sup>2</sup>
Number of heifers per lot	18	18
Average weight per heifer (lbs.)		
Initial 10-29-58	696	695
Spring 4-16-59	581	753
Fall 10-8-59	917	980
Winter gain (169 days)	—115	58
Yearly gain	221	285
Supplemental feed per heifer (lbs.) <sup>3</sup>		
Cottonseed meal	91	414
Ground milo	65	769
Supplemental feed cost per head (\$) <sup>4</sup>	22.25	47.75

<sup>1</sup> Fed 0.92 lb. of pellets consisting of 35% cottonseed meal and 65% milo until February 14, 1959 at which time the supplemental feed was changed to 0.92 lb. cottonseed meal per head daily. During the early period the daily feed intake was 0.32 lb. cottonseed meal and 0.6 lb. milo per head.

<sup>2</sup> Fed 7 lbs. of the mixture listed above. Daily intake was 2.45 lbs. cottonseed meal and 4.55 lbs. milo per head.

<sup>3</sup> 169 days of feeding which started 10-29-58.

<sup>4</sup> Includes pasture cost and prices of feeds at time tests were conducted.

Lot 1 lost 115 lbs. in the 169-day winter period. Those in Lot 2 gained 58 lbs. The supplemental feed cost was increased \$25.50 per head by the high level of feeding. The high level heifers gained 227 lbs. during the subsequent summer grazing season resulting in a yearly gain of 285 lbs. The Lot 1 heifers gained 336 lbs. during the summer after the large winter loss. Their yearly gain was 221 lbs. Therefore, the difference which was present in the spring was reduced considerably by the end of the summer.

Bulls were placed with these heifers on January 12, 1959, in order that the calving season would start in late October when the heifers were about 2½ years old.

### Part 6. Preliminary Results with Two-Year-Old Beef Heifers, 1959-60.

#### Procedure

The heifers used in the test reported in Part 5 were continued in the experiment. During the winter as yearlings a certain bull was left in each lot for the entire breeding season. In the 1959-60 season the 28 pregnant heifers were divided into 2 lots on the basis of weight and previous winter treatment (or breeding group). In Lot 1 (low level) there were 7 heifers which were fed on the low level as yearlings and 7 on the high level. In Lot 2 (high level) the numbers were 6 and 8 for the high and low levels, respectively. Because of the low weaning weights of calves from two- and three-year-olds in previous tests, the nutrient intake of the heifers used in the current tests was increased by the feeding of prairie hay rather than allowing the cattle to graze the dry native grass. Prairie hay was fed ad libitum. The supplement in

Lot 1 was 1.43 lbs. of pelleted cottonseed meal per head daily. In Lot 2, 6.25 lbs. of a mixture consisting of 25 percent cottonseed meal and 75 percent ground milo was fed. The intake was 1.56 lbs. cottonseed meal and 4.69 lbs. ground milo.

**Results**

There was only a small difference in the winter weight losses of the two groups of heifers (114 vs. 97 lbs., see Table 6). The reason for the small difference is apparent when one notes the feed intake of the two groups. The cattle in Lot 1 consumed an average of 24.5 lbs. of prairie hay and 1.43 lbs. cottonseed meal. This 25.93 lbs. of feed is estimated to contain 11.7 lbs. total digestible nutrients (TDN). The TDN content of the 17.6 lbs. of prairie hay and 6.25 lbs of supplemental feed (23.85 lbs. total) fed to those in Lot 2 is estimated to be 12.5 lbs. This is a difference of only 0.8 lb. estimated TDN intake. Feed costs to date are \$5.46 per head higher for the high than for the low level of winter feeding.

Four calves in Lot 2 were born dead. The assistance of a veterinarian was required for two of these calves. All four calves were in the high level group for the current winter but had been on the low level as yearlings. Whether or not these losses are related to the feeding practice is not known. Certainly the cause of these losses is not related to the current level of feeding because the calves were born before or shortly after supplemental feeding was started. There were no calving losses in the low level group (Lot 1).

**Table 6.—Levels of Supplemental Winter Feeding of Two-Year-Old Beef Heifers (Preliminary Results, 1959-60).**

Lot Number Level of Feeding	1 Low <sup>1</sup>	2 High <sup>2</sup>
Number of cows per lot <sup>3</sup>	14	10
Average weight per cow (lbs.)		
Initial 10-8-59	964	976
Spring 3-12-60	850	879
Winter change (156 days)	-114	-97
Average birth weight per calf (lbs.) <sup>4</sup>	64	67
Average calving date, November	6	9
Average weight per calf (lbs.) 3-12-60 <sup>5</sup>	152	168
Feed per cow (lbs.) <sup>6</sup>		
Cottonseed meal	223	241
Ground milo		638
Prairie hay <sup>7</sup>	3825	2754
Feed cost per cow (\$)	32.84	38.30

<sup>1</sup> Fed 1.43 lbs. of cottonseed meal pellets per head daily in addition to prairie hay.  
<sup>2</sup> Cows fed same as those in Lot 1 until October 28, at which time the daily feed was increased to 6.25 lbs. of pellets consisting of 25% cottonseed meal and 75% ground milo. All cows received prairie hay in addition to the pellets.  
<sup>3</sup> Originally, there were 14 cows in each of Lots 1 and 2. In Lot 2, 4 calves were born dead.  
<sup>4</sup> Corrected for sex by the addition of 3 lbs. to the weight of each heifer.  
<sup>5</sup> No correction for unequal number of steers and heifers within a lot.  
<sup>6</sup> Supplemental feeding started 10-8-59.  
<sup>7</sup> Total pounds of prairie hay consumed per cow. Average daily consumption was 24.5 and 17.6 lbs. per head in Lots 1 and 2, respectively.

On March 12, 1960, the calves whose mothers are fed the high level of supplemental feed weighed only slightly more than those in Lot 1. Spring weights will be recorded in April and the calves will be weaned in July.

### Part 7. Levels of Supplemental Winter Feeding of Heifer Calves, 1958-59.

#### Procedure

On November 5, 1958, 72 weanling heifers were divided into two lots and were fed prairie hay. In addition, those in Lot 1 were fed 1 lb. of pelleted cottonseed meal until February 13, 1959, at which time the quantity was reduced to 0.5 lb. per head daily. This supplemental feeding was discontinued on March 14. The supplement fed to the Lot 2 calves was 6 lbs. of pellets consisting of 25 percent cottonseed meal and 75 percent ground milo.

One heifer in Lot 2 died of unknown causes in mid-May.

#### Results

The winter weight gains were -2 and 125 lbs. for Lots 1 and 2, respectively. The increase in supplemental feed cost which was resulted in this 127 lbs. of difference in gain was \$22.54. During part of the feeding period the hay consumption in Lot 1 was limited. Accurate data on voluntary consumption are, therefore, not available. It is estimated that hay consumption was nearly equal in the two lots. If the response were similar to that reported in Parts 6, 8 and 9, when hay was offered

Table 7.—Levels of Supplemental Winter Feeding of Heifer Calves, 1958-59.

Lot Number Level of Feeding	1 Low <sup>1</sup>	2 High <sup>2</sup>
Number of heifers on each level <sup>3</sup>	36	35
Average weight per heifer (lbs.)		
Initial 11-5-58	456	455
Spring 5-1-59	454	580
Fall 10-23-59	662	726
Winter gain (177 days)	—2	125
Yearly gain	206	271
Supplemental feed calf (lbs.) <sup>4</sup>		
Cottonseed meal	114	269
Ground milo		806
Supplemental feed cost per head (\$) <sup>5</sup>	21.03	43.57

<sup>1</sup> Fed 1 lb. of pelleted cottonseed meal from 11-5-58 to 2-13-59 at which time the daily feed was reduced to 0.5 lb. per head. Feeding was discontinued on 3-14-59.

<sup>2</sup> Fed an average of approximately 6 lbs. of pellets, consisting of 25% cottonseed meal and 75% milo, daily from 11-5-58 to 5-1-59.

<sup>3</sup> Originally there were 36 heifers in each of Lots 1 and 2. One calf died in mid-May in Lot 2 due to unknown causes.

<sup>4</sup> Pellets were fed as supplements to prairie hay.

<sup>5</sup> Includes pasture cost and prices of feeds at the time tests were conducted.

ad libitum, the high level heifers would have consumed less hay than those on the low level.

Heifers which gained the most during the winter gained the least during the subsequent summer grazing season. The 127 lb. difference in gain by April was reduced 65 lbs. by October.

## Part 8. Preliminary Results with Yearling Heifers, 1959-60.

### Procedure

The heifers fed on the two levels of supplemental winter feed as described in Part 7 were continued on test and fed at the low and high levels during the 1959-60 winter feeding season. Those on the low level in 1958-59 were continued on the low level; however, one-half was fed prairie hay in a trap and one-half was allowed to graze the native grass. Of the 35 head on the high level in 1958-59, 18 were fed prairie hay and the remaining 17 grazed the dry range grass in 1959-60.

The supplemental feed for those on the low level (both in traps and on range) was 1.11 lbs. cottonseed meal. Those on the high level were fed 6.94 lbs. of the 35 percent cottonseed meal and 65 percent ground milo pellet. In addition to a comparison of the two levels of supplementing each roughage, this design will allow a direct comparison of the value of prairie hay vs. dried range grass at two levels of supplemental feeding.

### Results

As was true for the two-year-old heifers, the yearlings fed the lower level of supplement consumed more hay than those fed a high level of supplement (see Table 8). The average daily hay consumption was 18.3 lbs. in Lot 1 and 10.4 lbs. in Lot 2. The total pounds of feed consumed were 19.4 and 16.3 lbs. for the two lots, respectively. The estimated TDN intakes were 8.8 and 9.9 lbs. With this difference in TDN intake, a large difference in weight gain should not be expected. In this test the difference to March 19 was 22 lbs. (39 vs. 61 lbs.).

When dry range grass was the forage available the winter gains on the low and high levels of supplemental feeding were -110 and 17 lbs., respectively. The average supplemental feed cost was increased \$16.54 per head by increasing the level of feeding.

The gain of heifers fed the low level of supplemental feed was 39 lbs. for those fed prairie hay and -110 lbs. for those on dry range. This difference of 149 lbs. is apparently due to the difference in nutritive value of the roughages. The difference in value of the two roughages may be partially masked by the reduction in hay consumption in Lot 3.

Table 8.—Levels of Supplemental Winter Feeding of Yearling Beef Heifers (Preliminary Results, 1959-60).

Location	Trap		Range	
	1 Low <sup>1</sup>	2 High <sup>2</sup>	3 Low <sup>1</sup>	4 High <sup>2</sup>
Lot Number				
Level of Feeding				
Number of heifers per lot	18	18	18	17
Average weight per heifer (lbs.)				
Initial 10-23-59	654	720	669	730
Spring 3-19-60	693	781	559	747
Gain	39	61	-110	17
Avg. feed consumption per heifer (lbs.)				
Cottonseed meal	164	360	144	316
Ground milo	---	667	---	586
Prairie hay <sup>3</sup>	2692	1550	---	---
Range	---	---	ad lib	ad lib
Feed cost per head (\$) <sup>4</sup>	23.34	34.47	8.54	25.08

<sup>1</sup> Both the heifers in the trap and those on the range were fed 1.11 lbs. of pelleted cottonseed meal per head daily. In addition, the heifers in the trap received prairie hay. Supplemental feeding was started 10-23-59 and 11-10-59 for the heifers in the trap and those on the range, respectively.

<sup>2</sup> Heifers on the range fed 6.94 lbs. of pellets consisting of 35% cottonseed meal and 65% ground milo. Those in the trap were fed the same plus prairie hay. Starting dates for winter feeding were the same as those listed above.

<sup>3</sup> Total pounds of prairie hay consumed per heifer. Average daily consumption was 18.3 and 10.4 lbs. in Lots 1 and 2, respectively.

<sup>4</sup> Dry range pasture cost of \$4.00 per head for Lots 3 and 4 is included.

However, we must assume that the dry grass consumption by the cattle on the range was also reduced. These data indicate that when high levels of supplemental feed are offered we are reducing the roughage intake. A sound cow-calf enterprise is usually based on a high intake of roughage because roughage is usually the cheapest source of energy. Only when the cost of grains is relatively low or when additional winter gains are desirable should a very high level of supplemental concentrates be fed to range cattle.

These heifers have been bred to Hereford bulls and will calve in the fall when they are 2½ years old. They will be fed low and high levels of supplemental feed while suckling a calf. These tests will allow a study of the effects of feeding at the different levels for several successive winters during the development of the beef female.

## Part 9. Preliminary Results with Weanling Heifer Calves, 1959-60.

### Procedure

On November 6, 1959, 60 heifers were divided into two groups of 30 head. All heifers were fed prairie hay, ad libitum. In addition, those



in Lot 1 were fed 0.5 lb. of pelleted cottonseed meal per head daily. During the early part of the test those in Lot 2 were fed 5 lbs. of a mixture consisting of 25 percent cottonseed meal and 75 percent ground milo. Although the quantity was increased to 7 lbs. per head daily, the average daily consumption for the 138-day period was 5.75 lbs. During the last 103 days of the test, one-third of the heifers in each group was fed pelleted prairie hay. A summary of this phase may be found in the article "Pelleted Prairie Hay for Wintering Calves."

## Results

The weight gains (Table 9) were 9 and 90 pounds for the low and high level of wintering, respectively. This 81 lbs. of increased gain resulted from feed consumption which cost an additional \$12.44 per head. Average daily hay consumption was 10.72 lbs. in Lot 1 and 7.59 lbs. in Lot 2. The estimated daily TDN intake was 5.04 lbs. for the low level and 7.77 lbs. for the high level of supplemental feeding.

**Table 9.—Levels of Supplemental Winter Feeding of Weanling Heifer Calves (Preliminary Results, 1959-60).**

Lot Number Level of Feeding	1 Low <sup>1</sup>	2 High <sup>2</sup>
Number of heifers per lot	30	29 <sup>3</sup>
Average weight per heifer (lbs.)		
Initial 11-6-59	435	433
Spring 3-23-60	444	523
Gain (138 days)	9	90
Average feed consumption per heifer (lbs.)		
Cottonseed meal	69	198
Milo	---	595
Prairie hay <sup>4</sup>	1480	1047
Feed cost per head (\$)	12.16	24.60

<sup>1</sup> Supplemental feed was 0.5 lb. pelleted cottonseed meal per head daily.

<sup>2</sup> Quantity of concentrates was gradually increased. Average consumption was 5.75 lbs. per head daily of a pellet consisting of 25% cottonseed meal and 75% ground milo. Daily consumption was 1.44 and 4.31 lbs. of these two feeds, respectively.

<sup>3</sup> There were originally 30 heifers per lot; however, one heifer drowned after falling through the ice on the pond which supplies the water for the cattle.

<sup>4</sup> One-third of the heifers in each lot were fed pelleted prairie hay for the last 103 days of the test.

These heifers will be fed on a low and a high level of supplemental feeding for successive winters until they have produced two calves in order that accumulative effects of winter losses may be studied.

## Summary

The winter weight losses of fall-calving cows and weaning weights of their calves is related to the level of winter feeding. However, the

production of these young heifers has not been satisfactory even on the high level of wintering. Increased calf gains on the high level may not increase the value of the calf in an amount equal to the increased feed costs.

Preliminary results with different age groups of cattle indicate that relatively large quantities of supplemental winter feed are necessary to obtain differences in weight gains. The provision of large quantities of supplemental feed decreases considerably the voluntary intake of prairie hay.

### **Effect of Pelleting and Steam Rolling Milo, With and Without Enzymes, For Fattening Steer Calves**

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Previous studies have shown that fine grinding and pelleting milo results in slightly greater gains than feeding dry, rolled milo, and 10 percent less milo is required to produce 100 lbs. gain. In these studies, however, there was a considerable difference in degree of fineness between the dry rolled product and the milo which was finely ground before pelleting. Hence, it is necessary to study the effect of pelleting milo of the same degree of fineness or particle size.

Research at the Maryland Station suggests that steam heating certain grains may alter the proportion of end products from rumen fermentation and thus improve the utilization of the feed for certain body processes. It is possible that this effect may occur to some extent when milo is pelleted. To test this hypothesis, two lots of steer calves received milo which had been pelleted and then reground to approximately the same particle size as was present prior to the pelleting process.

In an additional lot, milo was steam-rolled so that its value could be compared to either the ground or pelleted grain. Little information is available as to the value of steam-rolling vs. grinding or dry-rolling milo.

Recent research at Iowa has suggested that the addition of a starch-splitting enzyme product to rations containing dry corn improves gains and feed efficiency. If this is true, a certain amount of starch may escape breakdown and digestion in the rumen or intestinal tract of cattle. To date, few trials have been reported in which enzymes were added to milo rations. In the trial reported herein, one lot of steers receiving each of three different preparations of milo were fed a small amount (.0075 lb./day) of a commercial enzyme product, mixed with the protein supplement.