

(vitamin A) produced about .14 pound more grain per day on about 10 percent less feed per unit of gain than Rations 3 and 4 (alfalfa meal). Again in this trial, rations containing fish meal produced only slightly faster gains than those not containing this ingredient.

In general, the results of these trials indicate that:

The advantage of feeding a mixed ration over the free-choice feeding of milo and supplement is small from the standpoint of both rate and economy of gain.

The supplement must be compounded specifically to meet the deficiencies of the grain with which it is to be fed. The relative palatability of the grain and supplement is an important factor to consider.

The addition of fish meal to a milo-soy meal type of basal ration did not improve the rate or economy of gain to any appreciable extent and proved to be uneconomical.

Replacing alfalfa meal in the supplement with vitamin A acetate, as a source of this vitamin, improved the gain slightly and reduced the feed required per unit of gain by 7 to 10 percent.

## Levels of Supplemental Winter Feeding of Beef Cows and Creep-Feeding Fall Calves

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In recent years there has been an increase in number of cows calving in the fall in our area. 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) yearlong. The cow's requirements for nutrients are markedly increased while she is suckling a calf and supplemental winter feed represents a large portion of the total cost of producing a calf. The amount and kind of supplemental feed needed is determined by the amount and quality of forage available in a pasture. In parts of our state the native grasses furnish practically all of the roughage consumed by a cow herd.

Questions to be considered in planning a winter feeding program include: What is the effect of level of winter feeding on weaning weights of calves and rebreeding rate of the cows? Should creep-feeding be recommended for fall-dropped calves which are to be marketed as feeders in mid-summer? Basically our problem concerning level of wintering is the fact that we do not know what percent of her body weight a cow can lose during the winter and still produce a heavy calf at weaning and rebreed so that another calf is produced the next year.

In order to provide information on the above and other questions, an experiment having the following objectives, was initiated in the fall of 1954.

1. To compare two levels of supplemental winter feeding of beef cows suckling calves.

2. To study the value of creep-feeding suckling calves born in the fall and sold as feeder calves.
3. To study the relationship between the level of winter feeding of cows and creep-feeding of their calves.

The results obtained during the 1954-55 and 1955-56 seasons have been summarized and reported in Okla. Agr. Exp. Sta. MP-45 and 48, respectively. Reported in this article are the results of the 1956-57 test, a 3-year summary, preliminary results for 1957-58 with the same cows, and preliminary results for two-year-old heifers producing their first calf.

### Part 1. 1956-57 Experiment

#### Procedure

All except one of the 80, grade, Hereford cows used in this trial had been used in a similar trial during 1955-56. One cow died during the previous trial and was replaced with one of similar breeding. The 4 lots of 20 head each were weighed on September 29, 1956, and were allowed to graze the native grass pastures at the Lake Carl Blackwell experimental range area and during the winter were fed the following amounts of supplemental feed and their calves were fed as follows:

- Lot 1. 1.5 lb. pelleted cottonseed meal; calves not creep-fed.
- Lot 2. 1.5 lb. pelleted cottonseed meal; calves creep-fed.
- Lot 3. 2.5 lb. cottonseed meal; 3 lb. ground milo; calves not creep-fed.

Lot 4. 2.5 lb. cottonseed meal; 3 lb. ground milo; calves creep-fed.

Supplemental feeding was started on October 25 and continued until April 19. The mixture of cottonseed meal and milo was pelleted for convenience in feeding. The pellets were fed in bunks every other day in amounts to furnish the above-listed pounds per head daily. A mineral mixture of 2 parts salt and 1 part steamed bone meal was available at all times. The creep-feed was a mixture containing 55 percent rolled milo, 30 percent whole oats, 10 percent cottonseed and 5 percent cane molasses. The mixture was available in mid-December but only small quantities were consumed until late January.

Purebred Hereford bulls had been placed with the cows on December 15, 1955; therefore, the first calves were born in late September, 1956. Cows were rebred starting December 19, 1956, for calving in the fall of 1957.

#### Results

A summary of the data collected in the 1956-57 season is given in Table 1.

The cows on the low level of wintering, Lots 1 and 2, lost 295 and 313 lb., respectively, during the winter period. These losses were only slightly different from the losses of 264 and 309 lb. for Lots 3 and 4, respectively. The average difference was only 18 lb. This difference has been considerably greater in previous tests. The cows in Lot 4 lost more

Table 1.—Creep-feeding fall calves and levels of wintering cows suckling calves (1956-57)

Lot number Level of feeding cow	1 1½ lb. CSM	2 1½ lb. CSM	3 2½ lbs. CSM 5 lb. milo	4 2½ lbs. CSM 5 lb. milo
Calf feeding	None	Creep-fed	None	Creep-fed
Number of cows raising calves <sup>1</sup>	19	14	18	17
Average weight per cow (lb.)				
Initial 9-29-56	1099	1129	1096	1153
Spring 4-19-57	804	816	832	844
Weaning 7-29-57	1026	1089	1002	1119
Fall 9-21-57	1086	1105	1104	1146
Winter gain	-295	-313	-264	-309
Gain to weaning	-73	-40	-94	-34
Yearly gain	-13	-24	8	-7
Average weight per calf (lb.)				
Birth <sup>2</sup>	80	78	78	79
Weaning 7-29-57 <sup>3</sup>	474	539	487	575
Average birth date of calves, Oct.	14	28	18	9
Supplemental feed per animal (lb.)				
Cow <sup>4</sup>				
Cottonseed meal	266	266	442	442
Milo	—	—	531	531
Calf (creep-feed)	—	1051	—	975
Total feed cost per head (\$)				
Cow	34.04	34.04	53.30	53.30
Calf <sup>5</sup>	—	32.37	—	30.06
Total	34.04	66.41	53.30	83.36
Selling value (\$)				
Per 100 lb.				
Steers	24.50	24.50	24.50	24.50
Heifers	21.00	21.00	21.00	21.00
Per head	104.68	119.48	107.64	127.66
Selling value minus feed cost (\$)	70.64	53.07	54.34	44.30

1 There were originally 20 cows per lot. One cow in Lot 1 died of unknown causes. In Lot 2 there were 3 open cows. In addition, 1 calf was born dead and 2 cows died from accidental urea poisoning. Two calves died in Lot 3. In Lot 4 one cow was open, 1 cow drowned and 1 calf died following castration and dehorning.

2 Corrected for sex by the addition of 3 lbs. to the weight of each heifer calf.

3 Corrected for sex by the addition of 30 lb. to the weaning weight of each heifer after correction to 280 days of age.

4 177 days of feeding.

5 Creep-feed cost \$3.08 per 100 lb.

weight than those in Lot 3 even though both were fed the same amount of supplemental feed. The cow gains from late September until late July (weaning) were quite variable with slightly greater losses on the high level. However, when the 2-month period following weaning is included, the gains are slightly in favor of the high level. The gains of the cows from September to weaning were in favor of creep-feeding. However, the winter gains and yearly gains were not in favor of creep-feeding. Most

of the differences in gain were small and probably are not of practical importance.

The calves were weaned on July 29 and sold at the Oklahoma City livestock market. The weaning weight of the calves in Lot 1 was 474 lb. The creep-fed calves of Lot 2 weighed 539 lb. The calf weights in Lots 3 and 4 were 487 and 575 lb., respectively. The increased gain resulting from creep-feeding was 65 lb. for calves from the low-level cows and 88 lb. for those from the high-level cows. This was the opposite of results obtained in the two previous tests in which creep-feeding resulted in greater increases in gain for calves from the low-level cows.

The steers were sold as feeders at \$24.50 per 100 lb. The heifers sold as feeders for \$21.00 per 100 lb. The fatter heifers of the creep-fed lots were appraised for slaughter at \$20.50. The other heifers would have sold for approximately \$19.50 per 100 lb. for slaughter. The slaughter value of the steers was estimated to be \$19.50 per 100 lb. As has been noted in previous tests the value per calf was greater as feeders than as slaughter calves.

The calves in Lot 2 consumed an average of 1051 lb. of creep-feed per head which cost \$32.37 in this test. In Lot 4 the 976 lb. of creep-feed cost \$30.06 per calf. The cost of feed for the cows in Lots 1 and 2 (low level) was \$34.04. When this cow-feed cost and creep-feed cost were subtracted from the selling value per calf, the "net return" was more than \$17 per head in favor of not creep-feeding (\$70.64 vs. \$53.07). In Lots 3 and 4 (high level) the difference was approximately \$10 per head in favor of not creep-feeding (\$54.34 vs. \$44.30).

The cost of the increased feed for Lots 3 and 4 as compared to Lots 1 and 2 was considerably greater than the increased value of the calves sold. The 25 lb. average increase in weaning weight was not equal in value to the \$18.11 average increase in feed costs. Not included in these measures is any difference in rebreeding rate. This will be discussed in Part 2 of this report.

Apparently either increased level of winter feeding or creep-feeding will increase gain of the calves and the calves will probably be slightly fatter at weaning. However, when costs of feed and selling prices of calves prevailing when these tests were conducted are considered, both practices decreased profits.

## Part 2. Three-Year Summary

There are many factors which can influence the gains of cows and calves in an individual year. It is usually advisable, therefore, to conduct a test in several years and make recommendations on the basis of the average results. Such has been done and a summary of the data collected in 1954-55, 1955-56 and 1956-57 is reported in this part of the article.

## Procedure

The procedure was the same as that outlined in Part 1. The results given in Part 1 are included in this 3-year summary. In all three years of the study the cows in Lots 1 and 2 were fed an average of 1.5 lb. of pelleted cottonseed meal per head daily during the winter feeding period. In Lots 3 and 4, 2.5 lb. cottonseed meal and 3 lb. ground yellow corn were fed during the first two years. In the third year ground milo replaced the corn, and the mixture of cottonseed meal and milo was pelleted for convenience in feeding. The calves in Lots 2 and 4 were creep-fed. Each lot of cows was moved to a different pasture each year.

The number of cows per lot varied from 17 to 20 in each of the years. The number of cows weaning calves does not indicate the relative value of the treatments concerning reproductive rate because all open cows were removed from the experiment in the first trial. Since that time open cows have been left in the experiment in order that accumulative effects could be noted.

## Results

A summary of results obtained during the first three years (1954-55, 1955-56, 1956-57) of this test is given in Table 2. There were small differences in average winter weight losses of the different lots of cows. None of these differences was statistically significant. The average loss for those fed the higher amounts of supplement (Lot 3 and 4) was 232 lb., which was 39 lb. less than those fed on the lower level. Also, the average winter loss was greatest for those cows whose calves were creep-fed. This difference was 25 lb. in favor of not creep-feeding. The average percentage of initial weight lost in the different lots varied from 21 to 26.5 percent. The greatest loss in any one lot within a year was 28 percent. At the present time we do not know the effect of such losses. Because of the great variation among the cow weights, additional tests are necessary before recommendations relating to the practical importance of any of these differences can be made.

There are definite differences in weaning weights of the calves. The high level of feeding cows increased calf weights an average of 29 lb. This difference was statistically significant at the 5 percent level of probability. The difference with non-creep-fed calves was 39 lb. and the difference with creep-fed calves was 19 lb. in favor of the high level of feeding. Creep-feeding increased gains an average of 58 lb. Statistical significance was at the 1 percent level in this case. On the low level of cow feeding, the difference was 68 lb. and on the high level the difference was 48 lb.

The average amount of creep-feed consumed was approximately 850 lb. With a cost of \$2.88 per 100 lb., the creep-feed cost an average of \$25.08 per head in Lot 2 and \$23.79 in Lot 4. Increasing the amount of supplemental feed to the cows increased feed costs approximately \$22 per head.

All lots of calves were sold at approximately the same price per

Table 2.—Levels of supplemental winter feeding of beef cows and creep-feeding fall calves (three-year average)

Lot number Level of feeding cow	1 1½ lbs. CSM	2 1½ lbs. CSM	3 2½ lbs. CSM 3 lbs. grain	4 2½ lbs. CSM 3 lbs. grain
Calf feeding (supplemental)	None	Creep-fed	None	Creep-fed
Total No. of cows raising calves <sup>1</sup>	53	48	52	53
Average weight per cow (lb.)				
Initial	1071	1105	1088	1106
Spring	822	812	859	871
Winter change (196 days)	-249	-293	-229	-235
Weaning	1042	1064	1064	1095
Change to weaning	-29	-41	-24	-11
Fall	1078	1110	1101	1143
Yearly change	7	5	13	37
Average weight per calf (lb.)				
Birth <sup>2</sup>	75	75	77	75
Weaning <sup>3</sup>	451	519	490	538
Average birth date of calves	Oct.31	Nov. 12	Nov. 2	Nov. 1
Supplemental feed per head (lb.)				
Cow				
Cottonseed meal	281	281	467	467
Grain <sup>4</sup>	—	—	547	547
Mineral <sup>5</sup>	47	48	48	47
Calf (creep-fed) <sup>6</sup>	—	871	—	826
Total feed cost per head (\$)				
Cow <sup>7</sup>	33.96	33.98	55.90	55.88
Calf <sup>8</sup>	—	25.08	—	23.79
Total	33.96	59.06	55.90	79.67
Selling value (\$)				
Per 100 pounds <sup>9</sup>				
Steers	21.60	21.93	21.93	21.93
Heifers	18.25	18.83	18.83	19.00
Per head <sup>10</sup>	87.12	102.95	96.99	107.25
Selling value minus feed cost (\$)	53.16	43.89	41.09	27.58

1 Pregnancy examination in the summer of 1955 indicated 5 open cows in Lot 1 and 1 cow in each of the other lots. These cows were removed from the experiment and replaced with cows of similar age and breeding. In 1956 there were 3 open cows in Lot 2 and 2 in Lot 4. These cows were left in the experiment in order that accumulative effects could be noted. In 1957 there were several open cows as follows: Lot 1, 2; Lot 2, 4; Lot 3, 1; and Lot 4, 2.

2 Corrected for sex by the addition of 3 lbs. to the birth weight of each heifer.

3 Corrected for sex by the addition of 30 lbs. to the weaning weight of each heifer after correction for age by interpolation.

4 Corn was fed during the 1954-55 and 1955-56 seasons and milo during the 1956-57 season.

5 Mineral mixture was 2 parts salt and 1 part steamed bone meal.

6 Creep-feed mixture during the first season was 60 percent coarsely cracked corn, 30 percent whole oats, 10 percent cottonseed meal and 10 percent cane molasses. In later seasons the corn was changed to 55 percent rolled milo and the molasses reduced to 5 percent.

7 Includes pasture cost and prices of feeds at the time tests were conducted.

8 Based on prevailing feed prices which was an average of \$2.88 per 100 lbs. of creep-feed.

9 Based on actual selling prices. Prices as feeders were as high or higher (usually) than prices for slaughter.

10 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 30 lbs. (sex correction factor) as the average weight of heifers.

100 lb. Exceptions were in the first year when there were lower values for both steers and heifers in Lot 1 and a higher value for heifers in Lot 4. The steer prices listed are as feeder steers. In most cases the feeder price for heifers was considerably higher than the price for slaughter. However, in some instances the slaughter price of creep-fed heifers was higher than the feeder price. The selling prices for heifers listed in the table are the averages of the highest selling value whether they sold as feeders or for slaughter. All lots of cattle would have sold as choice feeder calves. Creep-feeding resulted in the production of fatter calves. However, no live slaughter or carcass grades were obtained since most were sold as feeders.

When creep-fed calves do not sell at a higher price per 100 lb. than non-creep-fed calves, the value of the increased gain must be greater than the cost of the creep-feed in order for creep-feeding to increase profits. In these tests creep-feeding decreased profits. The difference between Lots 1 and 2 was \$9.27 and the difference between Lots 3 and 4 was \$13.51. Under the conditions of our tests creep-feeding should not be recommended.

The high level of winter feeding of the cows decreased profits \$12.07 for non-creep-fed calves and \$16.31 for creep-fed calves. The increased selling value of the calf was considerably less than the increased cost of winter feed.

In different years there has been considerable variation in the number of open cows in each lot. This number has varied from 0 to 5. The three-year totals are 7, 7, 2 and 5 for Lots 1, 2, 3, and 4, respectively. This information may be noted in a footnote on Table 2. When the total number of open cows in the three years is considered, there is a tendency for more open cows on the low level. This phase of the test requires further study before conclusions can be made.

### Part 3. Preliminary Results, 1957-58

The cows used in the test during 1956-57 were continued on test and the preliminary results for the past winter season are summarized in Table 3.

There were only small differences in weight losses between lots of cows fed 1.5 lb. of supplemental feed and those fed 5.5 lb. The average difference between the high and low levels was only 8 lb. In this test cows whose calves were creep-fed lost considerably more weight during the winter.

Average calf weights on March 31 were 222, 291, 247 and 314 lb. for Lots 1, 2, 3 and 4, respectively. Increased level of wintering cows has increased calf weight 24 lb. However, when corrections are made for the greater number of steers in Lots 3 and 4 this difference will be lessened. Creep-feeding increased gains 68 lb. (69 in Lot 1 vs. 2, and 67 in Lot 3 vs. 4). Average consumption of creep-feed since December 19 was 350 lb. per head in Lot 1 and 331 lb. in Lot 4. The average

Table 3.—Levels of supplemental winter feeding of beef cows and creep-feeding fall calves (Preliminary results, 1957-58)

Lot number	1	2	3	4
Level of feeding cow	1½ lb. CSM	1½ lb. CSM	2½ lb. CSM 3 lb. milo	2½ lb. CSM 3 lb. milo
Calf feeding (Supplemental)	None	Creep-fed	None	Creep-fed
Number of cows per lot <sup>1</sup>	16	14	17	16
Average weight per cow (lb.)				
Initial 9-21-57	1105	1160	1129	1179
Spring 3-31-58	868	865	895	896
Winter change (191 days)	-237	-295	-234	-283
Ave. birth weight per calf (lb.) <sup>2</sup>	80	79	78	80
Ave. calving date, October	16	18	24	23
Ave. wt. per calf, 3-31-58 (lb.) <sup>3</sup>	222	291	247	314
Total feed per animal (lb.)				
Cow <sup>4</sup>				
Cottonseed meal	228	228	380	380
Milo	---	---	456	456
Calf (creep-feed) <sup>5</sup>	---	350	---	331
Supplemental feed cost per head (\$)				
Cow	7.30	7.30	22.42	22.42
Calf	---	9.28	---	8.77
Total	7.30	16.58	22.42	31.19

<sup>1</sup> Originally there were 18 cows in each of Lots 1 and 2 and 19 in each of Lots 3 and 4. Two cows failed to calve in Lot 1, 4 in Lot 2 did not calve, 1 cow failed to calve and 1 calf died in Lot 3, and in Lot 4, 2 cows did not calve and 1 calf died.

<sup>2</sup> Corrected for sex by the addition of 3 lb. to the weight of each heifer.

<sup>3</sup> No corrections for age or unequal number of steers and heifers within a lot. There are 8, 7, 11 and 11 steers in Lots 1, 2, 3, and 4, respectively.

<sup>4</sup> Supplemental feeding started 10-30-57.

<sup>5</sup> Creep-feed cost \$2.65 per 100 lb.

cost of creep-feed consumed was approximately \$9. Final data will be recorded when the calves are sold in July.

#### Part 4. Preliminary Results with Two-Year-Old Heifers, 1957-58

All of the cows used in the tests reported thus far in this article had produced at least one calf before being placed in the test. The response of a younger animal to the two levels of wintering feeding may be considerably different from the results obtained with older cows. Therefore, 48 yearling heifers were bred to Hereford bulls during the 1956-57 winter season. They were to calve in the fall of 1957 when they were approximately 2.5 years old.

The heifers were weighed on September 28, 1957. Division of cattle into 2 lots was made on October 31 at which time winter feeding was started. On this date 34 heifers were suckling calves and 17 were placed in Lot 1 and 17 in Lot 2. Only 8 pregnant heifers remained and 4 were placed in each lot. Of the 6 remaining heifers which were in the test



during the breeding season, 2 died while calving (one drowned), 1 aborted and 3 calves were born dead. After the allotment of 21 head per lot, 1 failed to calve in Lot 1 and 1 calf in each of Lots 1 and 2 became very thin and weak and was removed from the experiment in December.

All heifers were allowed to graze the native grass pastures. Those in Lot 1 were fed an average of 1.5 lb. of pelleted cottonseed meal per head daily. Those in Lot 2 were fed 5.5 lb. of a pelleted mixture made up of 2.5 lb. cottonseed meal and 3 lb. ground milo. None of the calves were creep-fed.

A summary of the production data is given in Table 4. The heifers fed 1.5 lb. of cottonseed meal pellets lost an average of 281 lb. in 181 days. This was a loss of 29 percent of their body weight in the fall. The loss in Lot 2 was 233 lb. or 24 percent.

The small difference in calving date was not due to the level of feeding because the feeding levels were the same during the breeding season. Of the 4 heifers in each lot which had not calved when supplemental feeding was started on October 31, 1 in Lot 1 calved relatively early and 1 failed to calve and her weights were removed from the data. All of the 4 in Lot 2 calved relatively late.

Both groups of calves are very light with growth apparently retarded. There are 3 calves in Lot 1 which have gained only 5 lb. in 3 months. The average weights on March 28 were 161 and 177 lb. for those in Lots 1 and 2, respectively. These weights may be compared to weights

Table 4.—Levels of supplemental winter feeding of beef cows.  
Preliminary results with two-year-old heifers, 1957-58.

	Lot 1 1½ lb. CSM	Lot 2 2¼ lb. CSM 3 lb. milo
Number of cows per lot	19	20
Average weight per cow (lb.)		
Initial 9-28-57	964	962
Spring 3-28-58	683	729
Winter change (181 days)	-281	-233
Average birth weight per calf (lb.) <sup>1</sup>	76	76
Average calving date, October	9	15
Average wt. per calf, 3-28-58 (lb.) <sup>2</sup>	161	177
Total feed per animal (lb.) <sup>3</sup>		
Cottonseed meal	222	370
Milo	---	444
Supplemental feed cost per head (\$)	7.10	21.83

<sup>1</sup> Corrected for sex by the addition of 3 lb. to the weight of each heifer.

<sup>2</sup> No corrections for age or unequal number of steers and heifers within a lot. There are 11 steers and 8 heifers in Lot 1 and 9 steers and 11 heifers in Lot 2.

<sup>3</sup> Supplemental feeding started 10-31-57.

of 222 and 247 lb. in Lots 1 and 3, respectively, from older cows fed similarly as reported in Part 3 of this article. The two-year-old heifers are not producing satisfactory calves with either level of winter feeding. The calves will be sold in mid-summer and the cows will be continued on the experiment next year.

### Summary

Cows which had previously produced at least one calf before being placed in the experiment have been fed 1.5 lb. of pelleted cottonseed meal or 5.5 lb. of a pelleted mixture of 2.5 lb. cottonseed meal and 3 lb. ground milo. The calves produced by one group of cows within each level of wintering have been creep-fed. The 3-year average increase in gain from creep-feeding was 58 lb. Also, the high level of winter feeding of the cow increased calf gains 29 lb. Neither practice was profitable when costs prevailing during the time of the tests were considered. Preliminary results obtained during the fourth test and with 2.5-year-old heifers are presented.

## Protein Supplements for Wintering Fall-Calving Cows

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One of the main considerations in any cattle wintering program is the provision of adequate protein. The purchase of protein supplement represents a great portion of the cost of wintering cattle on native grass. Several experiments have been conducted at this station to study the relative value of supplements containing 20, 30 and 40 percent protein when fed to heifer calves wintered on prairie hay or allowed to graze native grass during the winter. Results of these experiments have been summarized in Okla. Agr. Exp. Sta. Bulletin B-437.

Results of these studies indicated that the supplements were not of equal value when fed at the same level of intake under similar management conditions. However, these tests did not provide data concerning the effect of the various supplements when fed to the same animals for several successive winters. The need for information on this and related problems led to the present study which has the following objectives:

1. To determine the relative value of supplements containing 20 and 40 percent crude protein when fed for several successive winters to commercial beef cattle grazing native grass.
2. To compare a 20 percent protein supplement composed of corn and cottonseed meal to one composed of several feed ingredients for wintering commercial cattle grazing native grass pasture.
3. To determine the value of a feed supplement containing approximately 50 percent of the total nitrogen as urea for wintering commercial beef cattle grazing native grass.