Results

The average daily gains of the lambs of the first six lots were the lowest experienced in self-feeding lambs on wheat at the Ft. Reno Station. The death loss (approximately 12 percent) for these lots was also the highest recorded in fattening lambs at the station. The low rate of gain can be partly attributed to the severe winter. The high death loss was probably due to both the severe cold weather and the high energy rations being tested. The death loss was considerably lower in the lambs fed the control ration.

The average daily gain and feed efficiency of the lambs of Lots 7 and 8 were considerably better than those of the first six groups. Also, the death loss was quite low in both groups. These lambs were started on pasture after the Lot 5 and 6 lambs were sold and the weather was considerably warmer. The performance of the Lot 8 lambs on the high energy ration was quite satisfactory. They required less feed and gained more rapidly than Lot 7 lambs. However, considering the overall death loss of the lambs on the high energy rations, it would appear that they may be unsafe to self-feed to lambs grazing wheat.

Although 400 lambs were carried on 30 acres of wheat, the overall return was quite small due to the high death loss and low margin.

Effect of Winter Plane of Nutrition on the Performance of Three- and Four-Year-Old Beef Cows

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Due to the low nutrient value of forage during the period from November to the following April, at a time in which the beef cow is developing a fetus or nursing her calf, it is obvious that the wintering period is the most critical time in the nutrition of the beef female. The proper amount of winter supplement to feed is of great economic importance, not only because of its cost, but also in terms of its effect on overall reproductive performance.

In addition to seven other experiments, either completed or now in progress, two additional trials were recently initiated to determine the effects of four widely different wintering regimes upon growth, milk

production, and reproductive processes in the beef female. Early results from these trials through the fall of 1960 have been reported.[1] Summarized in this report are the results obtained during the 1960-61 period, constituting the second or third calf crops from three- and four-year-old cows, respectively.

Experimental Procedure

Sixty, weaner, Hereford heifer calves were selected each fall in 1957 and 1958 from the Ft. Reno experimental herd and allotted to four groups of 15 each on the basis of sire, dam's productivity, age, grade, and shrunk weight. The heifers were started on winter feed in early November of each year and fed each winter (approximately 160 days to mid-April) according to the following program:

Lot 1 (Low)—No gain during the first winter as weaner calves, with a loss of at least 20% of fall weight during subsequent winters as bred females.

Lot 2 (Moderate)—Gains of 0.5 lb. per head daily the first winter as weanling calves, with a loss of nearly 10% of fall weight during subsequent winters as bred females.

Lot 3 (High)—Gains of approximately 1 lb. per head daily during the first winter, with no loss in weight during subsequent winters.

Lot 4 (Very High)—Self-fed a 50% concentrate mixture to gain as rapidly as possible, both as weanling calves and in subsequent winters.

During their fourth wintering period, Lot 4 (Very High) females of the first trial were reverted to the Moderate treatment; thus, in one trial, the effects of three successive winters on a Very High feed level followed by a drastic decrease to the Medium level could be observed. Females of Lot 4 in Trial II have been continued on the Very High regime each winter in order to study the long-term effects of overfeeding.

In both years the heifers were started on test between seven and nine months of age at an initial weight of about 460 lbs. The daily amount of winter supplement (cottonseed cake and ground milo) was adjusted frequently within each group during the winter to produce, as nearly as possible, the gains or losses outlined above. In each trial, Low level females were confined to dry lot and fed wheat straw during several weeks at the start of the wintering period to initiate the desired weight loss. The wintering period generally extended from early November to mid-April. All females were given approximately seven acres of native pasture per head, year-long, and have had free access to a mineral mixture of two parts salt and one part steamed bone meal throughout the year.

[1]See Okla. Agr. Exp. Stat. Misc. Pub. MP-64

All heifers were exposed to bulls as yearlings and bred to calve first at two years of age. Each year they were placed with various purebred bulls to obtain progeny test data according to level of wintering and previous productivity. Most females calved in February, March, and early April. Thus winter weight losses from November to mid-April reported herein, include the loss in weight due to calving. Detailed records have been maintained on body weight changes, skeletal development and reproductive performance.

Results

Since the results of the two trials have been summarized through the fall of 1960 and published in last year's report, this discussion will be confined to the results obtained from the fall of 1960 to October, 1961 which includes the second and third calf crops of the three-year-old cows in Trial I and four-year-olds in Trial III, respectively.

Body measurements for both trials made in the Fall of 1961 are given in Table 1. It can be seen that treatment had a definite effect on the measurements in Trial II, but of lesser magnitude than one would expect. It is interesting that in Trial I, in which the Very High group had been reverted to the Medium treatment, body measurements are in no case as large as those of Lot 3, the High group. In both width of hooks and length measurements, they are smaller than the Medium fed group. This would suggest that the extremely large measurements of Lot 4 in Trial II are largely a reflection of body fat rather than true skeletal growth. Also, it is clearly apparent that the Low regime definitely delays growth and possibly even stunts the beef cattle.

Table 1.—Effects of Four Widely Different Winter Feed Levels on Body Growth Measurement of Three- and Four-Year-Old Beef Cows.

Lot Number Wintering Level	1 Low	2 Medium	3 High	4 Very High
Trial II				
Three and one-half-year-olds (Fall, 1961)				
Height of withers (inches)	46.38	46.29	46.62	47.04
Width of hooks (inches)	20.02	20.88	20.81	21.96
Length of body (inches)	54.27	55.82	56.42	57.62
Trial I				
Four and one-half-year-olds (Fall, 1961)				
Height of withers (inches)	46.37	46.67	47.11	47.00[1]
Width of hooks (inches)	20.97	21.53	21.61	21.36[1]
Length of body (inches)	53.87	54.70	54.79	54.11[1]

[1]Lot 4 of Trial I was reverted to the Medium level the previous winter after three successive winters on the Very High regime.

Affect of Feed Level on Productivity

Summarized in Table 2 are results obtained in Trial II during the period November, 1960, to November, 1961, which represents their second calf crop. Originally 15 cows were started on test in each treatment group. Two cows were removed from Lot 1 (Low level) and one cow from Lot 2 (Moderate). The only two cows culled for failure to raise a calf two years in succession were in Lot 3 (Highs). Two cows died in Lot 4, the full-fed group, as a result of calving difficulty.

Differences in body weight in the fall of 1960 reflected the accumulative effects of the different winter feed levels. Weight gains to calving and winter weight losses were related directly to the amount of supplement fed. As has been confirmed in many previous studies, there was an inverse relationship between winter and summer weight gains with cows wintered on the Low level showing remarkable recuperative ability during the summer when on lush pasture. It is interesting that the

Table 2.—Effects of Four Widely Different Winter Feed Levels on Performance of Three-Year-Old Beef Cows.

Lot Number Wintering Level	1 Low	2 Medium	3 High	4 Very High
Number of cows started on test	15	15	15	15
Number remaining	13	14	13	13
Avg. body wt. changes, lbs.				
Fall wt., 10-26-60	863	931	986	1084
Gain to calving to 2-1-61	—82	—3	34	108
Total winter wt. gain to 4-13-61	—139	—74	—67	98
Summer gain to 10-27-61	254	184	144	15
Fall wt., 10-27-61	978	1041	1063	1197
Net yearly change	115	110	77	113
Supplemental winter feed per/head, lbs.				
Cottonseed cake	32	202	206	
Ground milo		88	815	
50 percent concentrate mixture				4660
Supplemental winter feed cost per cow since 1958, ($)	74.62	107.29	147.87	281.71
Reproductive performance				
Avg. calving date	4/4	3/16	3/1	3/9
Percent calf crop weaned[1]	71.4	85.7	92.9	84.6
Avg. birth wt., lb.[2]	69.5	73.8	75.3	77.0
Avg. weaning wt., lb.[2]	361	455	512	455
Total lbs. calf weaned per lot through two calf crops	7,142	9,504	10,940	8,940

[1]Based on number of females exposed the previous summer.
[2]Sex corrected to steer equivalent by adding 5 lbs. to birth wt. and 24 lbs. to weaning wt. of heifers.

cows wintered at the Very High level gained only 15 lbs. during the summer, following the full-feeding regime the previous winter. At 3.5 years of age (fall, 1961) there were still large differences in body weight between the Very High and other levels. Most probably, this large advantage in body weight is due to fat rather than skeletal size. This is further suggested by the results of body measurements and weights obtained in the second trial in which Very High females were reverted to the Medium level. Net yearly change in body weight favored the Low level group due to extremely rapid summer gains. This illustrates the tremendous ability of the beef cow to resume growth at a rapid rate following restriction. Also these cows, because of the treatment imposed, may have been in an earlier physiological stage of growth where the potential is greater.

Lot 1 females calved over a month later than the High level cows of Lot 3, which is consistent with previous observations. Evidently, the treatment imposed on Low level females results in such poor condition that estrus is inhibited until the cows can recover on lush spring grass. Medium and Very High level cows of Lots 2 and 4 calved at intermediate dates on the average. Birth weights were related directly to previous winter feeding level, although this was not the case with weaning weights. Weaning weights improved with increasing feed levels up to Very High treatment, which showed a marked depression in weaning weight when compared to the High level (Lots 4 vs. 3). Surprisingly, the Very High's weaned calves no larger than the Medium's although they received over two tons more feed per head the previous winter.

This depression is explained by the reduced milk yield from the Very High group as shown in Figure 1. Other research with dairy cattle and laboratory animals has demonstrated the adverse effect of very high planes of nutrition on mammary development and milk yield. Thus, in addition to increased calving difficulty and drastically increased feed costs, excessively high amounts of feed resulted in decreased milk production. On the other hand, it is obviously seen that severe body weight losses during the winter as great as those observed on the Low level (Lot 1) also result in delayed calving, lower birth weights, lower calf crop percent, less milk production (See Figure 1), and, also, greatly decreased weaning weights.

In these trials and other previous tests, percent calf crop weaned has been depressed by this extremely low level of supplementation. When one compares the productivity of the Medium and High groups, less difference is seen. Total pounds of calf produced through two calf crops is seen to favor the High level females as does average weaning weight. These advantages are easily offset, however, by the increased feed costs associated with the High level treatment. In economic terms, the Medium level in this study usually has been most advantageous even though weaning weights may be slightly depressed during the first two or three calf crops as compared to the High level. There has been a tendency for these differences to become smaller as the cow reaches maturity (See Table 2.).

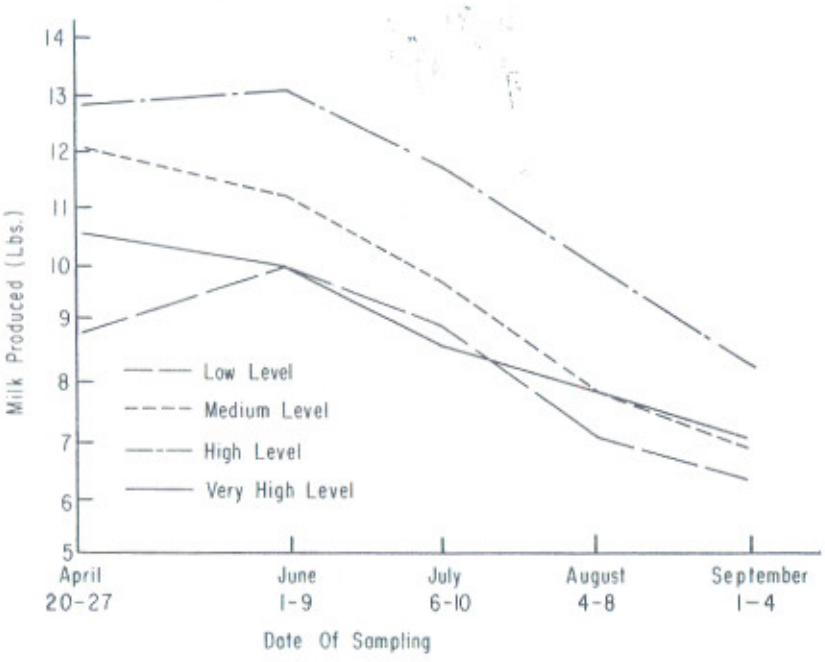

Figure 1. Milk Production (Five Daily Estimates) of Three-Year-Old Cows During the Summer of 1961. (Trial II).

The accumulative effects of similar feed levels in Trial I are presented in Table 3, summarizing the data accumulated from the fall of 1960 to 1961, during which time the cows weaned their third calves. The cattle in this trial were fed and managed as described for Trial II, with the exception of Lot 4. Of primary interest in this trial is Lot 4, which after three successive winters on the Very High regime, was reverted to the Medium level of wintering.

Body weight changes were comparable to the results discussed for Trial II, with the exception of Lot 4, which lost excessively when reverted to the Medium treatment. In fact at 4.5 years of age (fall, 1961), these cows were lighter than those in the Low level. This indicates that the differences in body weight seen between feeding levels may be more of an indication of fatness, rather than true size or skeletal development. It is of interest that the cows in this group presently appear to have aged to a much greater extent than the other groups.

Table 3.—Effects of Four Widely Different Winter Feed Levels on Performance of Four-Year-Old Beef Cows.

Lot Number Wintering Level	1 Low	2 Medium	3 High	4 Very High[1]
Number of cows started on test	15	15	15	15
Number remaining	15	15	14	14
Avg. body wt. and changes, lbs.				
Fall wt., 10-26-60	958	1033	1069	1171
Gain to calving to 2-1-61	—68	4	33	—75
Winter wt. gain to 4-13-61	—159	—88	—85	—246
Summer gain to 10-27-61	282	177	144	154
Fall wt., 10-27-61	1081	1122	1128	1079
Net yearly change	123	89	59	—92
Supplemental winter feed per/head, lbs.				
Cottonseed cake	32	202	258	202
Ground milo		56	623	56
Supplemental winter feed cost per cow since 1957, ($)	100.71	140.06	191.61	314.48
Reproductive performance				
Avg. calving date	3/19	3/9	3/4	3/3
Percent calf crop weaned	80.0	86.7	100.0	100.0
Avg. birth wt., lbs.	75.7	79.1	81.7	79.7
Avg. weaning wt., lbs.	429	470	485	463
Total lbs. calf weaned per lot through three calf crops	14,263	17,107	17,397	16,047

[1]This lot was full-fed a 50 percent concentrate mix during their first three wintering periods and reverted to the Medium level during their fourth winter.

Reproductive performance follows the same trend as indicated in Trial I, but with smaller differences in calving dates, birth weights, and weaning weights. This has been frequently observed in other tests, in that as the cow approaches maturity and no longer needs nutrients for growth, reproductive performance is less affected by winter feeding levels. Small differences in weaning weights between the Medium and High treatments are almost entirely due to younger calves in the Medium level lot. As in the previous trial, little difference exists between High and Medium lots in total pounds of calf produced over the first three calf crops. Under the conditions of this experiment the economic advantage for the Medium level is obvious. Reverting the Very High level cows back to the Medium level seemed to have had no marked effect of their reproductive performance during the subsequent year.

All cows in both trials will be continued on their respective treatments for lifetime performance data. The effects on longevity will be most interesting to follow.

Summary

As a part of a series of studies on the effect of winter feed levels on the growth and productivity of beef females, results of two trials with young cows carried to 3.5 and 4.5 years of age are reported. The results to date clearly point out the danger of underfeeding which results in delayed skeletal growth, body weight, and late calving, with smaller calves at birth and weaning, and depressed milk production. Conversely, overfeeding may result in more calving difficulty, depressed milk production, and a tremendous increase in feed cost. Although feeding regimes similar to the Very High level, as practiced in this study are rarely encountered in the field, the possibility of damaging the young growing beef female by overfeeding, as in fitting show animals, should be guarded against.

A Medium to High level appears to be most desirable in this study in terms of growth of the dam, weaning weight, and number of offspring produced. When considered from the economic standpoint, the Medium level appears most desirable, wherein heifer calves are wintered to gain approximately 0.5 lb. daily throughout the first wintering period, and fed so as to lose less than 10 percent of their fall body weight each winter thereafter to maturity. It should be pointed out that these studies involve only spring-calving cows, and that this loss in body weight during the winter includes the loss due to calving in February and March.

The Inheritance of Two Different Types of Dwarfism in Beef Cattle

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Few, if any, hereditary defects in farm animals have received the attention that was focused on dwarfism. Certainly the present optimism on the part of cattlemen that dwarfism is under control is in sharp contrast to the fear, doubt, and confusion that accompanied the onset and early history of this defect.