A summarization of the results is shown in Table 1. The control obtained was not significantly affected by the age of the animals, calving, location in the State, or the formulation of Dow ET-57 used. Control in individual lots varied from 92 to 50 percent and averaged 76 percent for the 1,498 animals.

Minor toxicity was noted in only one group of 24 feed lot steers where some scouring was evident for several days after treatment. In all other cases no evidence of adverse effects were seen, even though the animals were treated immediately before or after calving.

Dow ET-57 is still an experimental material and is not available for commercial use yet. It should be used on beef cattle only, as small amounts of the insecticide appear in the milk for several days after treatment.

Table 1.—Summarization of cattle grub tests with Dow ET-57

Location	Age of Animals	Formulation	Animals in Test		Ave. No. of Grubs/Animal	
			Treated	Untreated	Treated	Untreated
Fort Supply	Yearlings	Capsules	42	42	2.1	21.9
Fort Supply	Mature Cows	Capsules	44	44	1.3	16.3
Fort Reno	Mature Cows	Drench	76	75	3.4	8.9
Fort Reno	Mature Cows	Drench	49	47	1.3	6.5
Fort Reno	2 yr. Heifers	Drench	16	17	3.6	15.2
Fort Reno	Yearlings	Drench	19	18	3.1	10.8
Fort Reno	Calves	Drench	24	25	2.5	19.5
Coalgate	Yearlings	Drench	10	9	10.5	31.0
Coalgate	Yearlings	Drench	9	10	16.0	34.4
Coalgate	Yearlings	Drench	9	10	8.5	33.9
Coalgate	Yearlings	Drench	10	8	10.5	55.2
Lake Carl Blackwell	3 yr. Cows	Drench	50	50	4.8	9.9
Lake Carl Blackwell	5 yr. Cows	Drench	50	49	.8	3.9
Stillwater	Yearlings	Drench	24	20	1.9	4.3
Stillwater	Yearlings	Capsule	16	20	.6	4.3
Foraker	Mature Cows	Bolus	39	81	4.5	13.5
Foraker	Mature Cows	Bolus	104	23	1.8	6.8
Foraker	Heifers	Bolus	53	104	2.0	18.3
Foraker	Mature Cows	Capsules	43	81	2.5	13.5
Foraker	Heifers	Drench	39	39	1.2	12.8

Protein Supplements for Wintering Fall-Calving Cows.

A. B. NELSON, JAMES MILLER AND GEORGE WALLER

One of the main considerations in any cattle wintering program is the provision of adequate protein. The purchase of protein supplements represents a great portion of the cost of wintering cattle on native grass. Recently completed at this station was a test designed 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 dried native grass during the winter. These data are summarized in Okla. Agr. Exp. Sta. Bulletin B-437.

Results of the study indicated that the supplements were not of equal value when fed at the same level of intake under similar management conditions. However, the test did not provide data on the effect of the various supplements when fed to the same animals for several successive winters. The need for information on these 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 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.
3. To determine the value of a feed supplement containing approximately fifty percent of the total nitrogen as urea for wintering commercial beef cattle grazing native grass.

Procedure

One hundred grade Hereford heifer calves were divided into 5 lots of 20 head each on November 2, 1953. Each of these lots was placed in pastures which provided approximately 5 acres of native grass per heifer. In addition to the dried grass at the Lake Carl Blackwell experimental range area, during the winter months the heifers were fed a protein supplement as follows:

Lot 1. 1 lb. of 40-percent protein pelleted cottonseed meal.
Lot 2. 2 lbs. of 40-percent protein pelleted cottonseed meal.
Lot 3. 2 lbs. of 20-percent protein combination pellet.
Lot 4. 2 lbs. of 20-percent protein pellet (CSM and corn).
Lot 5. 2 lbs. of 40-percent protein pellet containing urea.*

The 40-percent protein pellet was 97.99 percent cottonseed meal and 2.01 percent dicalcium phosphate.

The 20-percent protein combination pellet consisted of several different feed ingredients. Included were different sources of protein, dehydrated alfalfa meal, molasses and minerals which furnish nutrients which might add to the value of a simple mixture of corn and cottonseed meal. The percentages of the various ingredients in this 20-percent protein combination pellet were: cottonseed meal, 12.5; linseed meal, 12.5; soybean oil meal, 12.5; dehydrated alfalfa meal, 5; yellow corn, 41.7; molasses, 10; monosodium phosphate 3.7; ground limestone, 1; salt, 1; and trace mineral mixture**, 0.1. According to the manufacturer's recommendations the additional trace minerals provided were, in mgs

* Urea was supplied by Du Pont Company, Wilmington, Delaware.
**Trace mineral mixture furnished by Calcium Carbonate Company, Chicago, Illinois.

per pound of pelleted supplement: manganese, 55; iodine, 1.76; cobalt, 1.18; iron 36.6; copper, 3.3; and zinc, 3.04.

The simple 20-percent protein pellet was 37 percent cottonseed meal, 58.84 percent yellow corn, 2.36 percent dicalcium phosphate, and 1.80 percent monosodium phosphate.

The 40-percent protein pellet containing urea was the same as the 20-percent protein pellet except that 7.64 percent of the corn was replaced with urea in order to make the nitrogen content of the pellet equivalent to 40 percent protein (N x 6.25). The value of this pellet can be related to the 20-percent protein pellet or the 40-percent protein pelleted cottonseed meal. The amount of urea in this pellet is above the amounts which can be included according to state law in mixed feeds prepared for sale.

Table 1.—Chemical composition of protein supplements (1956-57)

	Percent dry matter	Percentage composition of dry matter						
		Ash	Protein	Fat	Fiber	N.F.E.	Ca	P
40 percent protein pellet	92.29	8.89	43.81	3.69	13.78	29.83	0.73	1.19
20 percent protein combination pellet	91.21	10.38	24.33	3.07	6.01	56.21	0.85	1.55
20 percent protein simple pellet	90.98	7.92	24.80	4.74	6.45	56.09	0.77	1.41
40 percent protein with urea pellet	89.52	6.69	46.70	4.02	6.37	36.22	0.73	1.33

The calcium and phosphorus contents of all pellets were equalized by the addition of ground limestone, dicalcium phosphate, and monosodium phosphate where necessary.

At all times except during the summer of 1955 a mixture of 2 parts salt and 1 part steamed bone meal was available in all lots. During the summer of 1955 the only mineral supplement available was salt because the heifers were used in a test of the value of a salt and phenothiazine mixture in the control of cattle grubs.

The pellets were fed in the kinds and amounts listed during the winter of 1953-54 to heifer calves and during 1954-55 to these same cattle when they were yearlings. All heifers were allowed to graze the native grass pastures yearlong. The heifers were bred to registered Hereford bulls during the period January 3 to March 27, 1955, thus the calves were born in the fall and early winter when the heifers were approximately 2½ years old.

During the winter of 1955-56 the allowance of supplemental feed was increased to 1½ lbs. per head daily in Lot 1 and 3 lbs. per head daily in the other lots.

The cost of the various pellets was calculated from the cost of the several feed ingredients plus a mixing and pelleting charge of $5.00

per ton. On this basis the costs of the pellets fed during the 1955-56 winter feeding season were, per ton: 40-percent protein cottonseed meal pellet, $69.66; 20-percent protein combination pellet, $73.95; 20-percent protein corn and cottonseed meal pellet, $68.26; and 40-percent protein pellet containing urea, $72.54. It should be noted that the many ingredients in the 20-percent protein combination pellet increased its cost considerably above that of the simple 20-percent protein pellet. In this test a phosphorus supplement was mixed with cottonseed meal to make the 40-percent protein cottonseed meal pellet. The mixing increased considerably the cost of the pellet. A cattleman could have purchased cottonseed meal pellets at $65 per ton. Thus, cottonseed meal was given a slight cost disadvantage in the test because of mixing charges.

The rations will be fed to the same cattle for several successive winters in order to study the long-time effect of the winter protein supplement on the reproductive performance of the cattle. The data collected from the beginning of the winter feeding period as calves in 1953 until these cattle weaned their first calves August 8, 1956 are given in Table 2.

Results

The data summarized in Table 2 include only the results with those cattle that weaned a calf in 1956. Originally there were 20 heifers per lot. The reasons for removal of the cattle are listed near the bottom of the table. All live cows have been retained in the herd to determine whether or not they will calve in future years. Because an important economic factor is the number of calves weaned per cow of calving age, rebreeding data for the cows, whether or not they were suckling a calf, were collected in 1956 and used as one of the measures of the value of the various protein supplements.

Gains during the first 29 months of the test were summarized in the 1956 Feeder's Day report (Oklahoma Agricultural Experiment Station MP-45). Gains during the summer of 1956 were related to the gains during the previous winter. Those that lost the most during the winter gained the most during the following summer. The average weight losses during the winter varied from 133 to 227 lbs. Apparently cows have a remarkable ability to recover winter weight losses during the summer and produce satisfactory calves.

The protein supplement, mineral, and pasture cost per cow for the complete test were $81.84, $105.03, $106.58, $102.92, and $105.80 for Lots 1, 2, 3, 4 and 5 respectively. Feeds costs in the latter four lots are nearly the same. The lower feed cost in Lot 1 was due to the fact that these cows were fed one-half as many pounds of protein supplement during the winter.

The average weaning weights of the calves were low in all lots. The weights were 391, 406, 411, 401, and 399 lbs. for Lots 1, 2, 3, 4 and 5, respectively. The differences were so small that the winter ration of the

Table 2.—Protein supplements for wintering fall-calving cows (summary).

	Lot 1 40-CSM	Lot 2 40-CSM	Lot 3 20 Comb.	Lot 4 20-Simple	Lot 5 40-Urea
Number of cows[1]	16	15	15	11	15
Average weight (lbs.)					
Initial 11-2-53	484	474	482	488	470
Spring 4-13-54	485	488	479	480	457
Fall 10-30-54	682	680	683	678	664
Spring 4-19-55	687	674	660	657	660
Fall 10-10-55	983	953	953	955	934
Spring 4-24-56	756	820	772	740	773
Final 8-4-56	980	984	981	987	975
Average gain (lb.)					
Winter of 1955-56	—227	—133	—181	—215	—161
Summer '56	224	164	209	247	202
Total gain in 33 months	496	510	499	499	505
Protein supplement (lbs.)					
Winter 1 and 2	1.0	2	2	2	2
Winter 1955-56	1.5	3	3	3	3
Feed cost ($)					
Winter 1955-56	15.54	25.84	27.10	25.42	26.69
Total to 8-4-56	81.84	105.03	106.58	102.92	105.80
Calf data					
Number of steers	8	6	6	7	7
Number of heifers	8	9	9	4	8
Birth date, November	3	19	3	11	19
Birth weight[2]	73	71	72	75	74
Final Weight 8-4-56[3]	391	406	411	401	399
Daily gain	1.16	1.29	1.24	1.23	1.26
Reason for removal of cows					
From summary of results					
Calved spring of 1954	0	0	0	3	0
Calved spring of 1955	1	4	1	1	0
Open fall of 1955	3	1	4	4	2
Calves born dead or died later	0	0	0	1	3
Open 6-22-56	1	1	1	1	5

[1] Includes only those cows which weaned a calf.
[2] Corrected for sex by the addition of 3 lbs. to the weight of the heifers.
[3] No allowances were made for unequal numbers of steers and heifers within a lot.

cow had little, if any, effect on weaning weights. No allowances for unequal numbers of steers and heifers in each lot were made. The average birth date was not the same; therefore, the average daily gain of the calves was calculated. The highest daily gain was 1.29 lbs. in Lot 2 and the lowest was the daily gain of 1.16 lbs. in Lot 1. It is possible that these gains are a reflection of winter ration of the cow. In this instance the cows of Lot 1 were fed 1.5 lbs. and those in Lot 2 were fed 3 lbs. of 40-percent protein cottonseed meal pellets.

The results of a pregnancy examination on June 6, 1956 may be noted in Table 2. There was one open cow in each of the first four lots and 5 open cows in Lot 5. It will be interesting to note whether or not similar results will be recorded in the future. The cows in Lot 5

have appeared to be very thin during the winter months although the 1955-56 winter loss was greater in several other lots. At the end of the test the lightest cows were those in Lot 5.

Summary

In a comparison of different protein supplements fed to cattle for three successive winters the weight gains of the cows and weaning weights of the calves have been only slightly different. There are differences in winter weight losses of the cows apparently related to winter ration. Apparently cows have remarkable ability to recover from the adverse effects of winter feeding when adequate green feed is available during the summer months. This test is being continued in order that long-time effects may be studied.

1956-57 Preliminary Results

The test is being continued during 1956-57 and the cows were fed as described previously for the 1955-56 winter feeding season. The data collected to April 1, 1957 are summarized in Table 3. The cow weights include only those cows which were suckling a calf on April 1. The reasons for removal of the cows in each lot are listed in a footnote of the table.

Table 3.—Protein supplements for wintering fall-calving cows, 1956-57.

	Lot 1 40-CSM	Lot 2 40-CSM	Lot 3 20 Comb.	Lot 4 20-CSM & corn	Lot 5 40-Urea
Protein supplement (lbs. daily)	1.5	3.0	3.0	3.0	3.0
Number of cows[1]	18	16	19	16	14
Average weight (lbs.)					
Initial 9-26-56	1051	1050	1039	1021	1026
Final 4-1-57	659	719	670	638	655
Winter gain (186 days)	—392	—331	—369	—383	—371
Protein supplement cost[2] ($)	10.11	20.22	21.30	20.22	21.25
Calf data					
Number of steers	8	10	9	6	8
Number of heifers	10	6	10	10	6
Birth date, Oct.	22	11	17	22	15
Birth weight (lbs.)[3]	75	75	76	75	73
Weight 4-1-57 (lbs.)[4]	152	203	170	154	159

[1] Originally there were 20 cows per lot. In Lot 1, 1 cow was open and 1 drowned. In Lot 2, 1 cow was open, 1 died during the winter and 2 calves died shortly after birth. There was 1 open cow in Lot 3. In Lot 4, 1 cow was open and 3 cows had died in previous years (2 from urea toxicity). There were 5 open cows in Lot 5. One of these had cystic ovaries and was sold. In addition, 1 calf was born dead.

[2] Feed costs per ton were: 40-CSM, $72.50; 20 Combination, $76.36; 20 CSM-corn, $72.49; and 40-Urea, $76.16.

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

[4] No corrections were made for age or unequal number of heifers and steers in each lot.

All cows lost considerable weight during the winter feeding period. The greatest loss (392 lbs.) occurred in Lot 1 which was fed 1.5 lbs. of pelleted cottonseed meal. The least loss was 331 lbs. in Lot 2 which was fed 3.0 lbs. of pelleted cottonseed meal. Therefore, the amount of supplemental protein fed was reflected in winter weight gains. The weight

losses were intermediate in the other three lots. The losses were 369, 383, and 371 lbs. for Lots 3, 4, and 5 respectively. The loss in Lot 2 was 31.5 percent of the original weight. The losses in the other lots were within the range of 35.5 to 37.5 percent. These weight changes would indicate that the most satisfactory lot of cattle was those fed 3 lbs. of pelleted cottonseed meal. However, all losses seem excessive and whether or not such losses will affect the production of the cow will be measured as the test is continued. These cows will be examined for pregnancy during the summer and the test will be continued next year.

The average birth date was earlier in all lots during the second calving season. The number of days earlier varied from 11 to 40. These extremes were in Lots 1 and 2, respectively. The average birth weight of all calves was nearly the same; however, the weight in Lot 5 was slightly lower. These weights were corrected for sex by the addition of 3 lbs. to the weight of each heifer calf.

The average weights of all lots of calves was quite low on April 1. No corrections for age and sex have been made in these averages. The calves in Lot 2 (fed 3 lbs. pelleted cottonseed meal) are the heaviest. The lightest calves are in Lot 1. Final weights of these calves will be taken at time of weaning in late July.

Preliminary results of the 1956-57 season indicate that 3 lbs. of pelleted cottonseed meal was the most satisfactory supplement fed in our tests when winter weight changes of the cow and weight of the calves were used as measures.

Effect of Certain Hormones and Feed Additives on the Performance of Steer Calves

L. S. POPE, R. F. HENDRICKSON, GEORGE WALLER and W. D. CAMPBELL

Due to the high costs of cattle and feed, and low returns for finished beef, attempts have been made to increase profits by the use of hormones and complex protein supplements in the fattening ration. Many commercial feeds for fattening cattle are now fortified with stilbestrol (a hormone-like drug), antibiotics, and complex vitamin and mineral additives. Combinations of certain hormone-like drugs may soon appear on the market. These additives invariably increase the cost of the supplement, and therefore the cost per cwt. gain unless additional performance is obtained from their use. Many of the feed additives now used in complex supplements have not been tested under proper experimental conditions.

Recently, stilbestrol implants for beef cattle have become available. Questions have been raised as to their effect on young calves