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*Frequency of  
Feeding Protein Supplement  
To Range Cattle*

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## Summary

Three groups of wintering Hereford heifers and cows were supplementally fed cottonseed cake on pasture in the Davis Mountain area of Texas during four winters, 1958-62. The accompanying feeding schedules were used.

- Two pounds per head daily the first year and 3 pounds daily the last 3 years.
- Seven pounds per head on Tuesdays and Saturdays during the first year and 10.5 pounds the last 3 years.
- Four and two-thirds pounds per head on Tuesdays, Thursdays and Saturdays the first year and 7 pounds the last 3 years.

The three groups were rotated among the pastures during the winter to minimize pasture differences as much as possible. All cattle were pastured together during the balance of the year.

Although slight but nonsignificant differences in weight changes were observed among the three groups of cows, the difference in frequency of feeding cottonseed cake had no significant effect upon percent calf crop weaned, weaning weight of calves or weaned calf weight produced per cow. At the end of the fourth year the females fed twice weekly showed slight advantage in weight and in percent calf crop weaned. They also tended to graze more widely over the pasture without waiting for supplemental feed than did those fed more frequently.

Feeding twice per week was as satisfactory as more frequent feeding and resulted in savings of approximately 60 percent in labor and travel as compared with daily feeding.

## Contents

## Acknowledgments

The cooperation of the Joe T. Lane Ranch, Marfa, for furnishing labor, cattle and pastures, and the Pecos Cottonoil Co., Pecos, for supplying cottonseed cake is gratefully acknowledged.

COVER: Cows and calves from all groups a few days before the 1962 calf crop was weaned. Photo: courtesy, Texas Hereford Association.

Summary.....	2
Acknowledgments.....	2
Introduction.....	3
Procedure.....	3
Results and Discussion.....	5
Weight Gain or Loss of Cows.....	5
Grazing Habits of Cows.....	6
Savings of Labor and Travel.....	7
Performance of Heifers in Drylot.....	7
Production of Cows.....	7
Literature Cited.....	8

# Frequency of Feeding Protein Supplement to Range Cattle

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THROUGHOUT THE SOUTHWEST, winter roughage for range cattle is cured native grass. In the Trans-Pecos area of Texas this cured grass provides adequate energy but is deficient in protein during winter and spring months (3, 4, 6, 13). Therefore, adequate and proper supplementation of this roughage to correct deficiencies in nutrients is important in successful beef cattle production (7, 8).

Until recent years, range cattle have been fed protein supplements, usually on a daily basis. This daily feeding requires a substantial expenditure for labor and transportation. As labor has become more difficult to obtain and more costly, numerous systems of saving labor in supplemental feeding have been developed and are in use. Some are listed:

- Mixing salt with cottonseed meal or other concentrate feeds to permit self-feeding, yet limit consumption to a desired level (2, 9, 10).
- Blending urea with molasses to permit self-feeding and sometimes adding other ingredients such as phosphoric acid and vitamin A (1, 11, 12).
- Manufacture of protein blocks of specified protein, mineral and vitamin A content but varying in hardness to regulate level of intake.

All of these practices proved satisfactory, but a type of trough must be provided for the first two. For years hand-feeding cottonseed cake on a daily basis was the accepted method of protein supplementation in Texas and most cattlemen were reluctant to change their feeding practices. Little information was available with regard to the influence of less frequent feeding of protein supplement upon the production of range beef cows, although work with sheep in Australia indicated that feeding a maintenance or submaintenance ration once a week was better than daily feeding (5).

This experiment was designed to determine the effect of feeding beef cows under range conditions in the Trans-Pecos area the same total quantity of cottonseed cake per week on a daily, three times weekly and twice weekly schedule. The work was carried out on the Joe Lane Ranch at Marfa and at the Livestock Unit, Trans-Pecos Experiment Station, Balmorhea.

The Trans-Pecos area is the portion of the state west of the Pecos River. It comprises 34,444 square miles, which is larger than several of the Eastern states. Most of the area is mountainous with intervening plateaus,

Figure 1. The elevation varies from 1,200 feet, where the Pecos River empties into the Rio Grande, to 8,751 feet at the peak of the Guadalupe Mountains. The average annual rainfall varies from approximately 8 inches in the extreme west portion of the area to more than 20 inches at some of the higher elevations of the Davis Mountains. However, the rainfall in most of the area ranges from 11 to 16 inches. Approximately 75 percent of the annual rainfall is received from May through October with the larger portion coming in July, August and September.

Because of rainfall distribution, the best grazing season is usually from midsummer until frost in October or November. Therefore, the breeding season is scheduled to produce calves ready to wean at or near the end of the growing season.

At the time of frost there is usually more forage cover than at any other time of the year. About this time rainfall almost ceases, and the cured range grasses stay well preserved. Therefore, supplemental feeding is not necessary until calving begins in January or February. Supplemental feeding usually continues until the summer rains begin about June 1.

The location for this experiment was the Highland area of the Trans-Pecos which has an average elevation of 4,500-5,000 feet. The rainfall average varies from mountains to plateaus. It is about 14 inches annually where this experiment was conducted. The predominant grasses are blue grama, sidecoats grama, black grama, bluestems and tabosa.

## Procedure

Three groups of 50 Hereford heifer calves, averaging 483 pounds, were placed in separate pastures on February 17, 1959. Individual weights were taken at the start and close of this winter feeding period. They were fed 14 pounds of cottonseed cake per head per week from February 17 to May 29, 1959. One group received 2 pounds of cottonseed cake per head daily. A second group received 7 pounds per head on Tuesdays and Saturdays, Figure 2, and the third received  $4\frac{2}{3}$  pounds per head on Tuesdays, Thursdays and Saturdays.

The three groups were rotated among pastures every 2 weeks during the last 7 weeks of the feeding period. After May 29, all groups were pastured together until the original groups were re-formed for the 1959-60 wintering test. Bulls were turned in with the heifers about April 1 each year. All heifers were preg-

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nancy-tested on September 15. Five were open in the groups fed daily and twice a week and six were open in the group fed three times a week. These were removed from the test.

Only 111 heifers, in groups of 37 each, were available for the second winter, 1959-60. It was necessary

to move some of the heifers from the groups fed twice and three times weekly to the group fed daily to have equal numbers per group. This was done after initial weighing on December 9, 1959.

Calving began in January 1960. Supplemental feeding began February 5 to those which had calved. As each

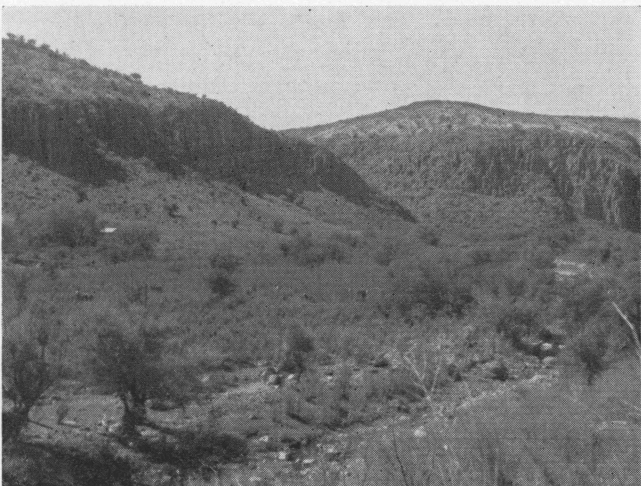
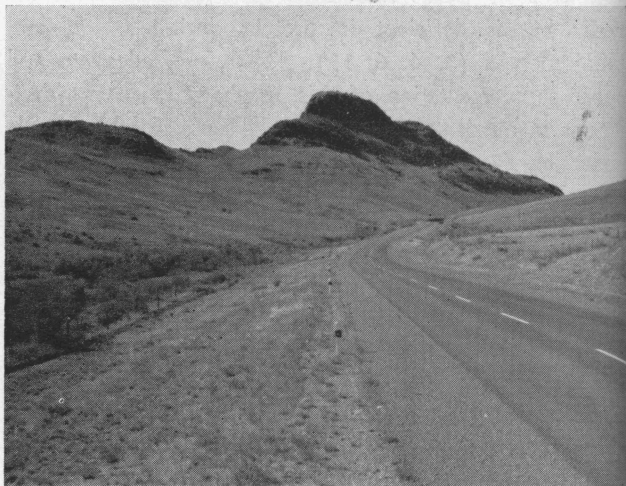
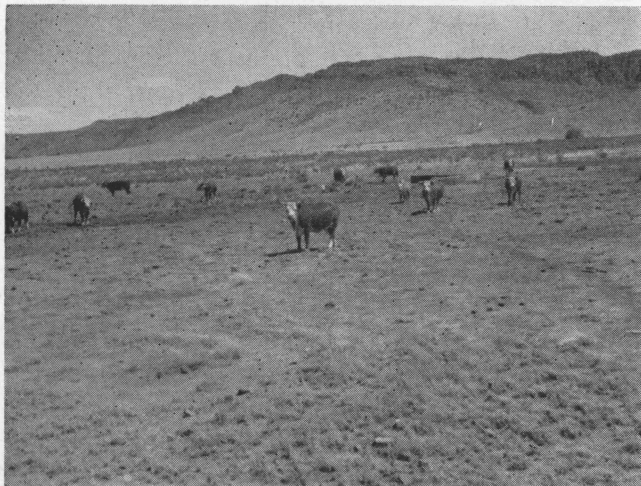


Figure 1. Pictures depicting the topography of the area where this experiment was conducted.



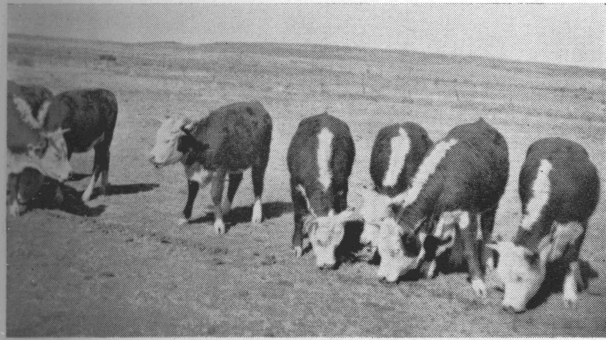


Figure 2. Yearling heifers receiving 7 pounds of cottonseed cake per head twice weekly.

heifer calved, she was placed in her respective feeding group. Each calf was numbered and its birth date was recorded.

The three groups of heifers were continued on the same frequency schedule as in 1959, but were fed a total of 21 pounds of cottonseed cake per head per week. This was the amount fed per head per week each year thereafter. The groups were rotated among the pastures every 2 weeks. Winter feeding was discontinued on May 31 when cow weights were taken as the groups were turned together for summer pasturing. The calves were weighed and weaned and the cows were pregnancy-tested on October 21, 1960. One cow in each group was not pregnant and these were removed from the test.

After the breeding season of 1960, 28 of the 30 heifers used in a winter feedlot test in 1959-60, described later, were added to the three breeding groups on the range. Individual weights were again taken on December 21, 1960, at the end of the summer period and at the beginning of the 1960-61 wintering period.

The second calving season began in January 1961. Calves were numbered and birth dates were recorded as before, and supplemental feeding commenced on February 27. The cows were again fed on the same frequency schedule as in 1959 and 1960. Each group remained in respective pastures 4 to 5 weeks before rotation, rather than 2 weeks as in previous years. Feeding was discontinued June 5, 1961, when weights were taken and the groups were again turned together for summer pasturing. The calves were weighed and weaned and the cows were pregnancy-tested on October 16, 1961. There were no open cows in any of the groups.

The third calving season began in January 1962. The same procedure used in the two previous seasons was followed. Feeding was discontinued May 29, 1962. The calves were weighed and weaned and the cows were pregnancy-tested on October 8, 1962. There were no open females in the group fed daily, but there were two each in the groups fed twice and three times weekly. Birth dates of calves were not available in 1962.

Thirty Hereford heifer calves, averaging 553 pounds, were divided into three groups of 10 each and placed

in the station feedlots on December 23, 1959 to check the pasture feeding test. The frequency of feeding was as previously described for range-fed cattle with an allowance of 14 pounds of cottonseed cake hand-fed per head per week. Once each week, 10 pounds of cottonseed cake were replaced by 10 pounds of cottonseed meal fortified with vitamin A. Each group was self-fed hegari stover for 79 days. During the last 32 days, 25 percent of the hegari stover was replaced by cottonseed hulls.

The feedlot test was repeated in 1960-61 with a fourth group added. The fourth group was fed cottonseed cake every 5 days. The other three groups were fed on the same schedule as during the previous year. The roughage was from a dual-purpose grain sorghum and was self-fed to all groups. The heifers averaged 515 pounds in initial weight and all groups were on test for 111 days.

Since the feedlot results with heifer calves for 2 years showed no practical differences from frequency of feeding, the twice and three times weekly schedules were discontinued in 1961-62. Feeding supplement at daily, 5 and 7 day intervals was tried during the 111-day period. The average beginning weight of the 30 heifers was 516 pounds.

## Results and Discussion

### Weight Gain or Loss of Cows

The results of 4 years of feeding supplement to beef cows on the range are summarized in Table 1 and Figure 3. The average weight gain for the first winter and the average loss during the second winter for the

TABLE 1. WEIGHT CHANGES OF COWS FED COTTONSEED CAKE DAILY, TWICE WEEKLY AND THREE TIMES WEEKLY UNDER RANGE CONDITIONS

	Frequency of feeding supplement		
	Daily	Twice weekly	Three times weekly
	Average gain or loss, pounds		
Winter gain 1958-59—101 days	91	88	38
Number heifers 50-50-50			
Summer gain 1959—194 days	218	240	271
Number heifers 27-42-43			
Total gain 2/17 to 12/9/59	309	328	309
Winter loss 1959-60—174 days	- 60	- 62	- 37
Number cows 37-37-37			
Summer gain 1960—204 days	178	177	151
Number cows 36-36-36			
Total gain 2/17/59 to 12/21/60	409	432	423
Winter loss 1960-61—166 days	- 80	- 121	- 98
Number cows 46-45-44			
Summer gain 1961—198 days	178	206	169
Number cows 45-45-44			
Total gain 2/17/59 to 12/20/61	507	517	494
Winter loss 1961-62—161 days	- 167	- 176	- 170
Number cows 45-45-44			
Summer gain 1962—204 days	206	218	211
Number cows 28-29-31			
Total gain 2/17/59 to 12/19/62	564	570	535



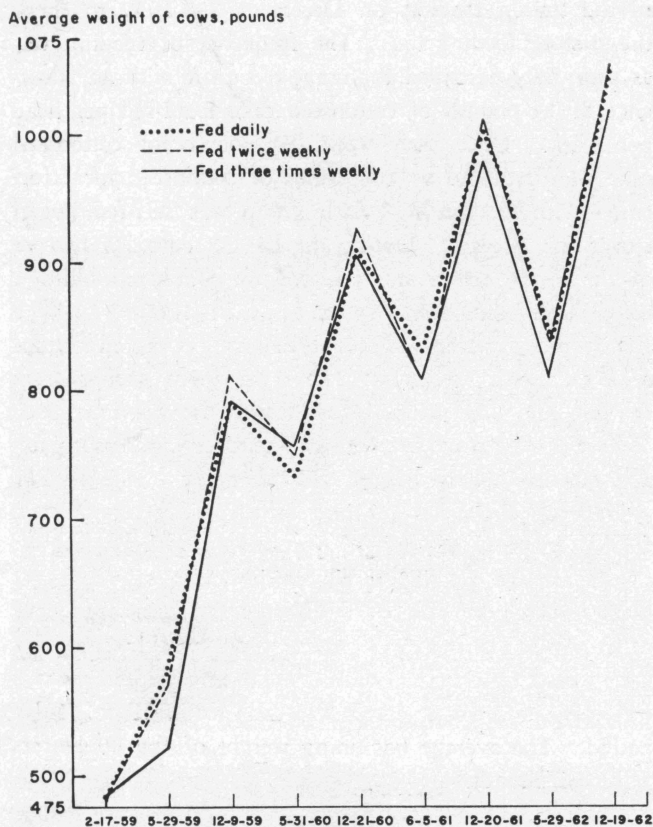


Figure 3. Spring and fall weights of cows fed cottonseed cake daily, twice weekly and three times weekly under range conditions during 4 winter months.

groups fed daily and twice weekly were similar, while those fed three times weekly gained considerably less during the first winter but also lost considerably less during the second winter. Since the calves were not rotated from pasture to pasture until the last half of the first wintering period it is possible that pasture differences accounted for the much lower gain of the group fed three times weekly. Pasture differences could not account for the smaller amount of loss the second winter, since the cattle were rotated in the pastures every 2 weeks.

During the third winter the cows fed twice weekly lost 50 percent more weight than those fed daily, with those fed thrice weekly being intermediate. The losses for each group during the fourth winter were in the same sequence as in the third winter, but there was a dif-

ference of only 9 pounds from the lowest loss of 167 pounds for daily feeding to the highest of 176 pounds for twice weekly feeding.

In general, summer weight gains were inversely related to weight gain or loss during the previous winter. Total weight gain for the 4-year period was slightly in favor of the cows fed twice weekly. The weight loss per cow was less variable for that group than for the cow fed daily. Those fed thrice weekly were intermediate in this respect. It took approximately 2 hours for the cows fed twice weekly to consume their 10½ pound share of cottonseed cake. The timid or slow-eating cows had more opportunity to get their portion of feed which could account for the smaller variation in weight loss observed in this group.

Although Table 1 shows the average gain or loss for all the cows in each group during each summer and winter period, for purposes of statistical analysis only cows in the test from beginning to end were included. This changed slightly the gain or loss figures shown in Table 1, but the differences in gain or loss of the groups were not statistically significant in any period during the test.

### Grazing Habits of Cows

The grazing habits of the cows in all groups were observed the day before feeding and on the day of feeding. On the days prior to feeding the cows in all groups would lie down at approximately 10:00 a.m. About noon, cows in the groups fed twice and three times weekly began grazing again, while the cows fed daily did not begin grazing until about 2:00 p.m. Through the remainder of the day 60-75 percent of the cows in all groups grazed. The grazing habits of the less frequently fed cows differed, depending upon whether or not they had been fed that day.

The grazing habits of the cows fed daily remained constant every day. The cows fed two or three times weekly lay down soon after eating. About 4:00 p.m., on the same day, those fed three times weekly began to graze, but those fed twice weekly did not, although they went to water late in the afternoon.

TABLE 2. WEIGHT GAINS OF HEIFERS FED COTTONSEED CAKE DAILY, TWICE WEEKLY, THREE TIMES WEEKLY, EVERY 5 DAYS AND ONCE WEEKLY IN DRYLOTS

	Frequency of feeding supplement				
	Daily	Twice weekly	Three times weekly	Every five days	Once weekly
Winter gain 1959-60—111 days	164	152	171		
Number heifers 10-10-10					
Winter gain 1960-61—111 days	138	142	122	145	
Number heifers 10-10-10-10					
Average gain for 2 years	151	147	147		
Winter gain 1961-62—111 days	221			166	164
Number heifers 10-10-10					



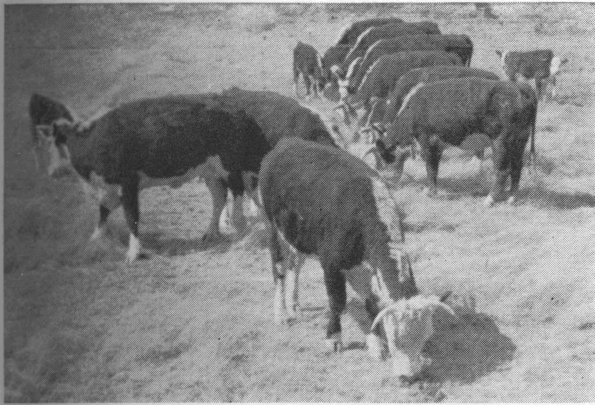


Figure 4. A group of cows fed twice weekly receiving 10½ pounds of cottonseed cake per head.

The cows fed twice weekly grazed more widely over their pasture and did not follow a pickup, but came when the horn was blown for them. The cows fed daily stayed more in a group and followed a pickup whenever it appeared, while those fed three times weekly were intermediate between the other two groups in this respect.

### *Saving of Labor and Travel*

The percent of labor and travel saved in feeding twice and three times weekly, rather than daily, was considerable. Since the cows fed twice and three times weekly were more scattered over the pasture, it took more time to find them than it did those fed daily. In many instances the cows fed twice weekly were so scattered that they could not be gathered into one group for feeding, but had to be fed in small groups where found, Figure 4. However, approximately 60 and 50 percent in labor and travel were saved by feeding twice and three times weekly, respectively.

### *Performance of Heifers in Drylot*

Three year's results of supplementally feeding heifer calves in drylot are shown in Table 2. During the first 2 years the weight gains followed no pattern with regard to frequency of feeding, and the averages for 2 years were similar: 151, 147 and 147 pounds. The group fed every 5 days during 1960-61 gained an average of 145 pounds, which was slightly but not significantly more than the average for the three groups fed more frequently. During the 1961-62 test, the group fed daily gained considerably more than those fed every 5 or 7 days, thus indicating that feeding once a week may be extending the interval between feedings too long for best results.

### *Production of Cows*

Although weight changes are useful aids in evaluating animal response to feed treatments, the calf production of the three groups of cows is more important than the gain or loss of weight. Table 3 and Figures

5, 6 and 7 summarize these results for the 3 years. Each year there were slight differences in average weaning weights and in pounds of calf weaned per cow, but when weights were adjusted to a 205-day steer equivalent basis, these differences were smaller and not significant, indicating that frequency of feeding had no effect. Since 39 head were removed from the test before the beginning of the first calving season, and one cow in the group fed daily became unaccounted for between the second breeding season and calving time, calculations of percent calf crop and pounds of calf weaned per cow are based on the number of cows in the herd at the beginning of the calving season.

The average difference in the ages of calves from the three groups are shown in Table 3. The calves from

TABLE 3. PRODUCTION DATA OF RANGE COWS AS AFFECTED BY FREQUENCY OF FEEDING COTTONSEED CAKE DURING FOUR WINTERING PERIODS

	Frequency of feeding supplement		
	Daily	Twice weekly	Three times weekly
Number heifers	50	50	50
Open-pregnancy test—September 1959	5	5	6
1960			
Number of cows	37	37	37
Number of calves weaned	27	27	25
Age difference of calves, days	0	12	5
Weaning weights			
Steers	401	419	409
Heifers	396	400	381
205-day adjusted steer equivalent	373	378	368
Calf weight weaned per cows			
Steer equivalent	292	306	276
205-day adjusted steer equivalent	272	276	249
Open-pregnancy test, October 1960	1	1	1
Number of cows	37	37	37
1961			
Number of cows	46	45	44
Number calves weaned	41	43	43
Age difference of calves, days	0	13	5
Weaning weights			
Steers	478	476	474
Heifers	440	463	455
205-day adjusted steer equivalent	433	417	429
Calf weight weaned per cow			
Steer equivalent	426	455	463
205-day adjusted steer equivalent	386	398	419
Open-pregnancy test, October 1961	0	0	0
Number of cows	45	45	44
1962			
Number of cows	45	45	44
Number of calves weaned	36	43	39
Weaning weights			
Steers	440	440	413
Heifers	430	431	402
*Steer equivalent	440	440	413
Calf weight weaned per cow			
*Steer equivalent	352	420	366
Open-pregnancy test, October 1962	0	2	2
Number of cows	45	44	44
3-year summary			
Possible number of calves	128	127	125
Number of calves weaned	104	113	107
Percent calf crop weaned	81.3	89	85.6
Calf weight weaned per cow			
Steer equivalent	361	399	374
*205-day adjusted steer equivalent	335	343	341

\*Ages not available in 1962 for 205-day adjustment.



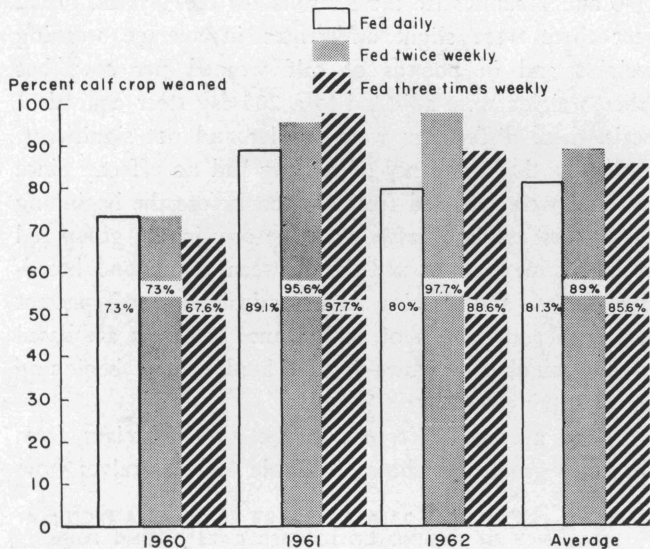


Figure 5. Yearly and 3-year averages of calf crop percentages with three separate treatments.

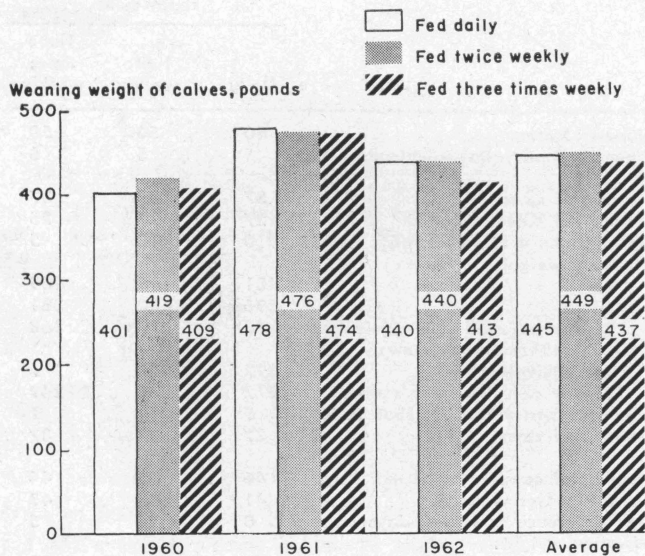


Figure 6. Yearly and 3-year averages of calf weaning weights (steer equivalent) with three separate treatments.

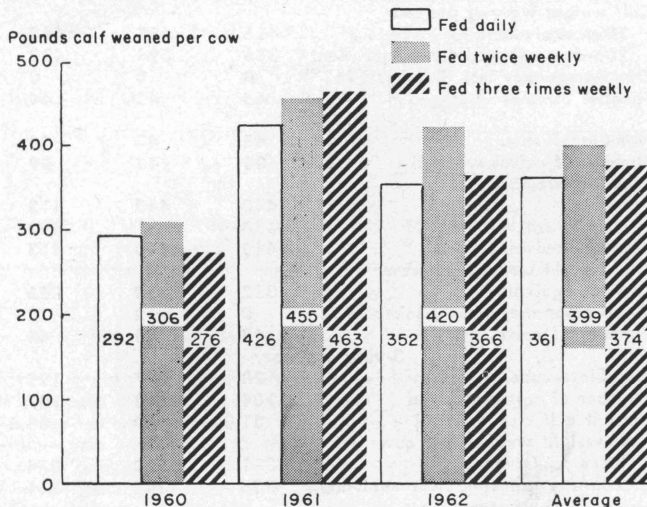


Figure 7. Yearly and 3-year averages of calf pounds per cow (steer equivalent) with three separate treatments.

cows fed thrice weekly averaged 5 days older than those from cows fed daily, in 1960 and 1961. Those from cows fed twice weekly averaged 12 days older in 1960 and 13 days older in 1961. Calving dates were not available for 1962, but at first marking, when all calves on the ground were marked, there were more calves in the group fed twice a week than in either of the other two. Conversely, when the last calves were marked, fewer calves were marked from this group than from the other two. It was evident, therefore, that the calving pattern was about the same in all 3 years and was not materially influenced by frequency of supplemental feeding.

No digestive disturbances were observed when cottonseed cake was fed at levels of 7, 10½ or 14 pounds per animal at one feeding. Since the observed differences in weight loss of cows during the winter and in weaning weights of calves and calf weight weaned per cow were so nearly the same, it is evident that feeding twice per week had no adverse effect but did have marked advantages over daily feeding.

### Literature Cited

- Berry, W. T., H. O. Kunkel and J. K. Riggs, 1958. A liquid supplement for range cattle. *Texas Agricultural Progress*, Jan.-Feb. 1958 4(1)10.
- Cardon, B. P., E. B. Stanley, W. J. Pistor and J. C. Nesbitt, 1951. The use of salt as a regulator of supplemental feed intake and its effect on the health of range livestock. *Arizona Agricultural Experiment Station Bulletin* 239.
- Fraps, G. S. and V. L. Cory, 1940. Composition and utilization of range vegetation in Sutton and Edwards counties. *Texas Agricultural Experiment Station Bulletin* 586.
- Fraps, G. S. and J. F. Fudge, 1945. The chemical composition of grasses of northwest Texas as related to soils and to requirements for range cattle. *Texas Agricultural Experiment Station Bulletin* 669.
- Franklin, M. C., 1952. Maintenance rations for Merino sheep. *Australian Journal of Agricultural Research*, Volume 3, No. 2, April 1952.
- Hart, G. H., H. R. Guilbert, and H. Goss, 1932. Seasonal changes in the chemical composition of range forage and their relations to nutrition of animals. *California Agricultural Experiment Station Bulletin* 543.
- Knox, J. H. and W. E. Watkins, 1958. Supplements for range cows. *New Mexico Agricultural Experiment Station Bulletin* 425.
- Nelson, A. B., R. W. MacVair, W. D. Campbell and O. B. Ross, 1955. Supplements of different protein and vitamin-mineral content for wintering bred yearling heifers. *Oklahoma Agricultural Experiment Station Bulletin* 460.
- Riggs, J. K., J. C. Miller and A. J. Gee, 1950. Self-feeding mixtures of salt and cottonseed meal to beef cows wintering on pasture. *Texas Agricultural Experiment Station Progress Report* 1276.
- Riggs, J. K., R. W. Colby and L. V. Sells, 1953. The effect of self-feeding salt-cottonseed meal mixtures to beef cows. *Journal of Animal Science* 12:379.
- Riggs, J. K. and H. W. Franke, 1955. Urea-molasses vs. sorghum gluten meal as supplements for wintering yearling steers. *Texas Agricultural Experiment Station Progress Report* 1941.
- Riggs, J. K., 1955. Urea-molasses vs. cottonseed meal and molasses as supplements to sorghum silage for wintering two-year-old heifers. *Texas Agricultural Experiment Station Progress Report* 1842.
- Savage, D. A. and V. G. Heller, 1947. Nutritional qualities of range forage plants in relation to grazing with beef cattle on the Southern Plains Experimental Range. *USDA Technical Bulletin* 943.