

Why Some Cattlemen Overgraze— and Some Don't¹

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Highlight

Cattle can make high gains on overgrazed range for a few years—if they are fed enough hay, grain, or protein. The supplements mask the low and declining production of overgrazed range. This combination of overgrazing and extra supplements can be profitable until the plant and soil resources are badly damaged, or until a series of drouth years combined with low or dropping cattle prices “terminate” the business or put it on a subsistence level. Over the long term, moderate grazing is more profitable than overgrazing, and in the short term, is much more stable financially.

Por que Algunos Ganaderos Practican el Sobrepastoreo y Otros No

Resumen²

Los bovinos pueden producir mucho en pastizales sobrepastoreados si están suplementados con bastante heno, grano o proteínas. Pero un bajo nivel de producción puede estar escondido por la suplementación. La combinación de sobrepastoreo y suplementación puede ser aprovechable hasta que los recursos naturales tales como las plantas y el suelo están dañados seriamente o cuando hay una sequía combinada con precios bajos y que pueden perjudicar seriamente el negocio de la ganadería. El pastoreo moderado es más aprovechable que el sobrepastoreo si lo consideramos a largo plazo y se refleja en una situación más estable en el corto plazo.

Why do some ranchers continue to overgraze even though the disadvantages of overgrazing have been

well publicized for more than 30 years? We recently found one answer to this perplexing question while conducting an experiment which included overgrazing and moderate grazing with and without extra supplements (Shoop and McIlvain, 1971).

In brief, steers given extra supplements while on a range overgrazed for 3 years gained 60 lb. per head annually more than steers on moderately grazed range that were given only standard supplements—but the overgrazed range was severely damaged! This and the results from our 20-year stocking rate studies brought the answer into clear focus.

We have also observed that many ranchers who overgrazed feed considerably hay, grain, and protein supplements. They do this in spite of the fact that their neighbors who moderately graze produce highly acceptable gains and profits merely by feeding a low level of protein (1 to 2 lb. of high-protein supplement per head/day).

Our purpose in writing this paper is to help cattlemen and range technicians understand how feeding extra hay, grain, and protein masks the harmful effects of overgrazing: low forage production, low “grass gains,” disastrous financial losses during drouths, and excessive erosion. Understanding this relationship will help them to analyze a ranch operation and, where appropriate, to modify it to withstand several successive years of drouth and falling cattle prices.

Area and Cattle

The grazing studies were conducted on the Southern Plains Experimental Range in northwestern Oklahoma near Woodward. The

average annual precipitation over 85 years is 23 inches, varying from 10 to 43 inches. About 1 year in 3 is a drouth year. Temperature extremes have varied from -27 to 113F. Temperatures in January usually range from 10 to 50F, and in July from 65 to 105F.

The predominant soil type on the rolling, stabilized sand dunes is Pratt loamy fine sand. All of the soils have a single-grain structure that makes them highly susceptible to erosion when not protected by vegetation.

The native vegetation is dominated by an overstory of sand sagebrush (*Artemisia filifolia* Torr.) with an average canopy of 40%. The understory vegetation consists of a mixture of short, mid, and tall grasses, and a few forbs (Shoop and McIlvain, 1963). The annual production of forage averages 1,050 lb. of dry matter per acre.

The steers used were high quality Herefords from a single ranch. They were received in October as calves directly off the cows, and were weaned and handled in a single herd until allotment. The cows were also high quality Herefords from a single herd. Their average fall weight was about 1,100 lb. All cattle were allotted to treatments at random within weight classes and within conformation grades and condition scores.

Methods

Partial results of three grazing experiments are discussed in this paper to validate our conclusion on why some ranchers continue to overgraze—and some don't. In each experiment, moderate grazing was the level of grazing that left approximately ⅓ of the average production of forage (about 350 lb./acre) at the end of the grazing year, about April 20. The stocking rate on the moderately grazed pastures was varied seasonally in an effort to balance cattle numbers with forage production. (In this paper, forage is all current-year growth except that produced by shrubs.)

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Overgrazing occurred on the heavily grazed pastures which were always stocked with about 50% more cattle than were the moderately grazed pastures. An average of 225 lb. of forage/acre was left on the heavily grazed pastures about April 20.

No additional roughages were fed during the experiments. All cattle were fed 41% protein cottonseed pellets (cake) during winter at the rate of 1.5 lb./head daily, except to the steers in Study 1 that were fed additional supplements as a treatment. Salt was the only other supplement fed except those listed as treatments.

Prices used in economic analyses were market prices during 1967–69. Profit to labor and management is income left after all costs except labor are paid. Net profit is income left after all costs are paid.

Forage production was measured from 1953 through 1961. Measurements were made at the end of the growing season, about October 15, and at the end of the forage year, about April 20. Production was determined by the micro-unit forage inventory method and included all portions of grasses and forbs above ground level (Shoop and McIlvain, 1963).

Changes in vegetation were determined from forage inventories and from line-intercept measurements of vegetation cover made at the beginning and end of the experiments and periodically during intervening years (Parker and Savage, 1944).

Erosion was determined by critically examining the pastures, and from photographs made periodically on many permanent photo sites.

In the presentation of results, drouth years (1947, 1952–51, and 1956) were those in which precipitation was short enough for 2 or more months to drastically reduce yearly forage production below average. Nondrouth years were those in which forage production was not seriously reduced by lack of rainfall. Some years (1942, 1946, and 1957)

Table 1. Average gain of steers, economics, and range conditions on overgrazed and moderately grazed range with and without extra supplements, 1964–66.

Item	Overgrazed range		Moderately grazed range	
	Standard ² supplement	Extra ² supplements	Standard ² supplement	Extra ² supplements
Experimental procedure				
Acres/steer (no.)	6	6	9	9
Total steers (no.)	72	72	72	72
Steer wt. Nov. 1 (lb.) ¹	456	456	456	456
Gain/steer (lb.) ³				
Winter	43 a	95 c	54 b	106 d
Summer	292 a	314 b	295 a	319 b
Yearlong	335 a	409 b	349 a	425 b
Economics (\$) ⁴				
Selling price (/cwt)	28	27.50	28	27.50
Steer sales value Oct. 1	222	238	225	242
Steer cost Nov. 1 @ \$33/cwt	150	150	150	150
Operating costs/steer ⁵	58	72	67	81
Total costs/steer	208	222	217	231
Profit to labor & management				
Per steer (\$)	13	16	8	11
Per acre (\$)	2.20	2.70	.90	1.20
Range conditions, Oct. 1966				
Plant vigor	Low	Low	Medium	Medium
Death loss of plants	High	High	Low	Low
Soil erosion	Medium	Medium	Low	Low

¹ All weights shrunk 3%.

² Standard supplement was 1.5 lb. cake/steer daily during winter. Extra supplement was 3.0 lb. cake in winter, plus stilbestrol, plus cake in late summer.

³ Means on a line followed by the same letter are not significantly different at 5% level by the Duncan multiple range test.

⁴ Economics based on 1967–69 prices.

⁵ Costs include pasture \$3/acre; drugs & vet. \$1; salt & insecticides \$1; cake \$10; death & injury at 1.5% of sales value \$3; buying, selling, trucking \$6; taxes \$1; interest \$15; and miscellaneous \$3. Labor is not included.

were not classified because they were not clearly drouth years.

Study 1, Extra Supplements

The effect of giving extra supplements to steers on range was studied with three replications for 3 years as part of a larger grazing experiment (Shoop and McIlvain, 1971). Weaner Hereford steers were grazed yearlong on overgrazed and moderately grazed range, with and without extra supplements (four treatments).

Steers given extra supplements received a combination of additional winter cake (3.0 lb./steer daily as compared with 1.5 lb.), plus late-summer cake (1 lb./steer daily from July 20 through September), plus dichlorylstilbestrol (stilbestrol) (one

12-mg pellet per steer on November 1 and another on May 1). In comparison, the steers that did not receive the extra supplements received only the standard supplement of 1.5 lb. of cake/head daily.

All the pastures used were moderately grazed for at least 7 years before the start of the experiment, and were very similar within each replication. The pastures had been sprayed for brush control and were stocked accordingly.

Study 2, Stocking Rates with Steers

A stocking-rate study with steers was conducted on native range with two replications for 20 years, 1942–61. Grazing treatments were heavy, moderate, light and no grazing, but only the first two are discussed here

(McIlvain and Shoop, 1965). The pastures were fenced to be quite uniform in topography, soil, and vegetation. All the pastures were severely depleted when the study started, and were deferred from grazing in 1940-41.

Study 3, Stocking Rates with Cows and Calves

Heavy, moderate, and light year-long grazing of native range with Hereford cows and calves were studied with two replications for 9 years, 1953-61. The pastures used had been grazed with stocker cattle at heavy, moderate, and light intensities for the previous 11 years. Only the first two treatments are discussed here (McIlvain and Shoop, 1962).

The cows were placed on the treatments as weaner calves and were not removed during the experiment. They were bred as yearlings to calve as 2-year-olds in 1953. Average date of calving was March 15.

Results

Study 1, Extra Supplements

Steers given the extra supplements (cake + stilbestrol + late-summer cake) while pastured on overgrazed range made excellent gains. In fact, they gained only 16 lb./head less than similarly treated steers on moderately grazed range. They also gained 74 and 60 lb. more, respectively, than steers on overgrazed and moderately grazed range that received only the standard supplement, 1.5 lb. of cake (Table 1).

Overgrazing combined with extra supplements was the most profitable of the four systems of producing steers during the 3 years of the study. It returned \$.50 per acre more profit than overgrazing with standard supplements, \$1.80 per acre more than moderate grazing without extra supplements, and \$1.50 more than moderate grazing with extra supplements (Table 1).

However, overgrazing both with and without extra supplements greatly reduced the vigor of the range plants and killed many of

Table 2. Average gain of steers, economics, and range conditions during drouth and nondrouth years on overgrazed and moderately grazed range, 1942-1961.¹

Item	Nondrouth years		Drouth years	
	Overgrazed	Moderate	Overgrazed	Moderate
Experimental procedure				
Acres/steer (no.)	6	9	6	9
Years of data (no.)	12	12	5	5
Total steers (no.)	285	285	100	100
Steer wt. Nov. 1 (lb.)	446	446	427	427
Gain/steer (lb.)				
Winter	57	70	46	81
Summer	292	304	212	257
Yearlong	349	374	258	338
Economics (\$) ²				
Selling price/cwt	28	28	25	24.50
Steer sales value Oct. 1	223	230	171	187
Calf buying price/cwt	33	33	30	30
Calf cost Nov. 1	147	147	128	128
Operating costs per steer ³	58	67	58	67
Total costs per steer	205	214	186	195
Profit to labor and management				
Per steer (\$)	18	16	-15	-8
Per acre (\$)	3.00	1.80	-2.50	-.90
Range conditions				
Forage: ⁴				
Production (lb./acre)	1260	1310	530	810
Stubble after grazing (lb./acre)	280	430	90	130
Grazable forage, (lb./acre)	980	880	440	680
Grazable/steer (lb. × acres)	5900	7900	2600	6100
Death loss of plants	Low	Trace	High	Moderate
Soil erosion	High	Trace	High	Low

¹ Drouth years were 1947, 1952-54, and 1956. Data for 1942, 1946, and 1957 excluded. All weights shrunk 3%.

² Economics based on 1967-69 prices, with adjustments in buying and selling prices of steers to reflect prices during drouths.

³ Costs include pasture \$3/acre; drugs & vet. \$1; salt & insecticides \$1; cake \$10; death & injury at 1.5% of sales value \$3; buying, selling, trucking \$6; taxes \$1; interest \$15; and miscellaneous \$3. Labor is not included.

⁴ Data for 1953-61.

those growing on the least favorable sites and many of the taller grasses. Moderate-intensity drouths occurred during the growing seasons of the 3 years in which the study was conducted. Soil disturbance because of grazing, trailing, rubbing, and fighting was much greater on the overgrazed pastures than on the moderately grazed pastures. Also, soil was moved more by wind and water (Table 1).

Study 2, Stocking Rates with Steers

During the 12 nondrouth years of the study, the steers on moderately grazed range made only slightly greater gain than those on overgrazed range; but during the 5 drouth years they made much greater gains. The average gain difference in favor of moderate grazing was 25 lb./steer during nondrouth years (Table 2). However, during

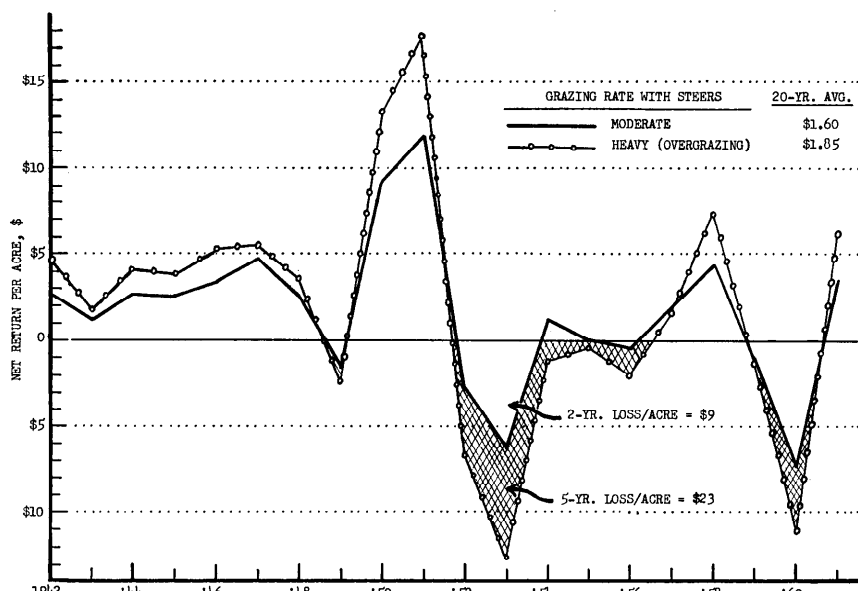


FIG. 1. Net return per acre from yearling steers on overgrazed and moderately grazed range, 1942-61. (Note: Rising cattle prices during 1942-51 abnormally favored profits from overgrazing.)

drouth years the difference in favor of moderate grazing averaged 80 lb.; but in one year it was 100 lb.

During nondrouth years, overgrazing returned \$1.20 per acre more profit to labor and management than did moderate grazing (Table 2). Conversely, during drouth years, overgrazing lost \$1.60 more per acre than moderate grazing.

More significantly, overgrazing lost money for 5 consecutive drouth years for a total of \$23/acre (Fig. 1). In comparison, moderate grazing lost money during only 2 of the 5 drouth years for a total of only \$9/acre.

Less forage was available per steer under overgrazing during both drouth and nondrouth years—but during drouth years the difference was extreme. The overgrazed pastures produced an average of only 530 lb. of forage/acre during drouth years. The moderately grazed pastures produced 810 lb. or 50% more. As a result of the low production and the few acres allowed per head, each steer on the overgrazed pastures had access to only 2,600 lb. of grazable forage. In contrast, each steer on the moderately grazed pastures had access to 6,100 lb. of grazable forage (Table 2).

Just as in the extra-supplement study, more plants died under overgrazing during drouth years than under moderate grazing. The areas of severe death loss during drouths

were large on overgrazed pastures (Fig. 2). Although grasses on the overgrazed pastures made recovery when precipitation was favorable, the recovery was slow and incomplete.

The most lasting difference between moderate and overgrazing was the difference in soil erosion. The shifting of the sandy soils by winds was much greater on the thinly vegetated soils of the overgrazed pastures, and much topsoil was blown from the hillsides to the interspersed swales.

Still more dramatic and damaging was the severe water erosion that occurred when high-intensity rains fell on the sparsely covered dunes of the overgrazed pastures (Fig. 3). When the heavy rains fell in 1957 following 5 years of drouth, the sandy soil literally melted and ran to the swales where it killed the best grass in the pastures. The thicker vegetation on the moderately grazed pastures greatly reduced the extent of this damage.

Table 3. Calf production and economics during drouth and nondrouth years on overgrazed and moderately grazed range, 1953-61.¹

Item	Nondrouth years		Drouth years	
	Overgrazed	Moderate	Overgrazed	Moderate
Experimental procedure				
Acres/cow (no.)	12	17	12	17
Years of data (no.)	5	5	4	4
Total cow-years (no.)	90	90	70	70
Calf production				
Calf weaning weight (lb.)	440	490	340	440
Calf weaning percentage	82	94	78	89
Calf production/cow (lb.)	360	460	265	390
Economics (\$) ²				
Selling price of calf/cwt	33	32.50	31	30
Calf sales value Oct. 15	145	159	105	132
Value of calf/cow	119	150	82	117
Costs per cow ³	86	101	103	112
Profit to labor, management				
Per cow (\$)	33	49	-21	5
Per acre (\$)	2.70	2.90	-1.80	.60

¹ Drouth years were 1953-54 and 1956. Weight is shrunk 4%.

² Economics based on 1967-69 prices, with adjustments in selling prices to reflect prices during drouths.

³ Costs include pasture \$3/acre; drugs & vet. \$2; salt and insecticides \$1; cake \$10; interest on cow \$15; interest on operating costs \$1; taxes \$2; depreciation \$7; death & injury \$4; bull costs \$8; and extra feed during drouth on overgrazed \$17; and on moderate \$11. Labor is not included.

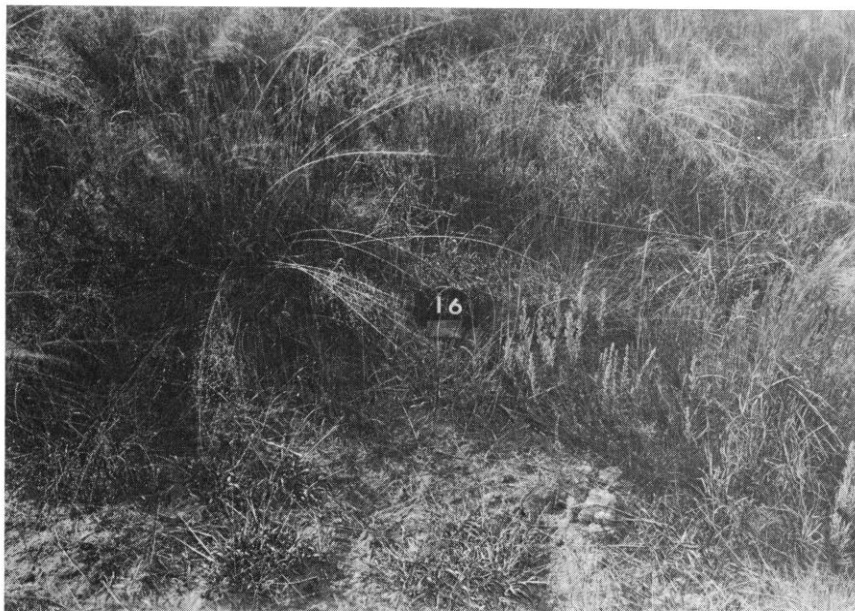


FIG. 2. Grass on overgrazed range after 5 nondrouth years (upper) and on the same site after 4 drouth years (lower). Both pictures were taken in November.

Study 3, Stocking Rates with Cows and Calves

Weaning weight of calves on overgrazed pastures was 50 lb. less than that of calves on moderately grazed pastures during nondrouth years and 100 lb. less during drouth years (Table 3). Cows on the overgrazed pastures weaned about 11 fewer calves per 100 cows during both drouth and nondrouth years than cows on moderately grazed pastures. The reducing weaning weights on

the overgrazed pastures, combined with the lowered weaning percentages, resulted in much lower production per cow.

Unlike the results with steers, moderate grazing with cows and calves was more profitable than overgrazing during all years. Profit/acre to labor and management for moderate grazing was \$2.90 during nondrouth years and \$.60 during drouth years (Table 3). In comparison, profit/acre on overgrazed

ranges was \$2.70 during nondrouth years and the loss during drouth years was \$1.80.

More significantly, overgrazing caused a net loss during 4 consecutive drouth years that totalled \$12/acre (Fig. 4). In contrast, moderate grazing caused a net loss during only 3 years that totalled only \$4/acre.

The effect of stocking rates with cows and calves on plants and soil was essentially the same as with steers. Heavy grazing caused much more death of plants, especially during drouths, and caused much greater erosion.

Discussion

Why Some Cattlemen Overgraze

Satisfactory gains per steer were made on overgrazed range when sufficient supplements were fed. It is reasonable to expect that similar gain results could be obtained with cows and calves. The feeding of hay, grain, and extra protein supplements on overgrazed range masks the low production from the weakened plants and thin stands of grass.

The results reported here show that overgrazing can be profitable during nondrouth years. Combining heavy grazing with extra supplements can make heavy grazing even more profitable during those good years. Apparently, the good profits obtained during nondrouth years make cattlemen who overgraze overlook the heavy losses that they suffer during a drouth. Of course, some cattlemen who overgraze survive drouths because another source of income supports the cattle operation.

The death and greatly reduced vigor and production of overgrazed range plants often go unnoticed or are accepted as natural instead of a result of improper grazing. The decline in forage production is not realized because forage yield is not measured.

A rancher who feeds hay, grain, and extra protein is much less dependent on his grassland than one who feeds a minimum of supplements. Therefore, his natural tend-

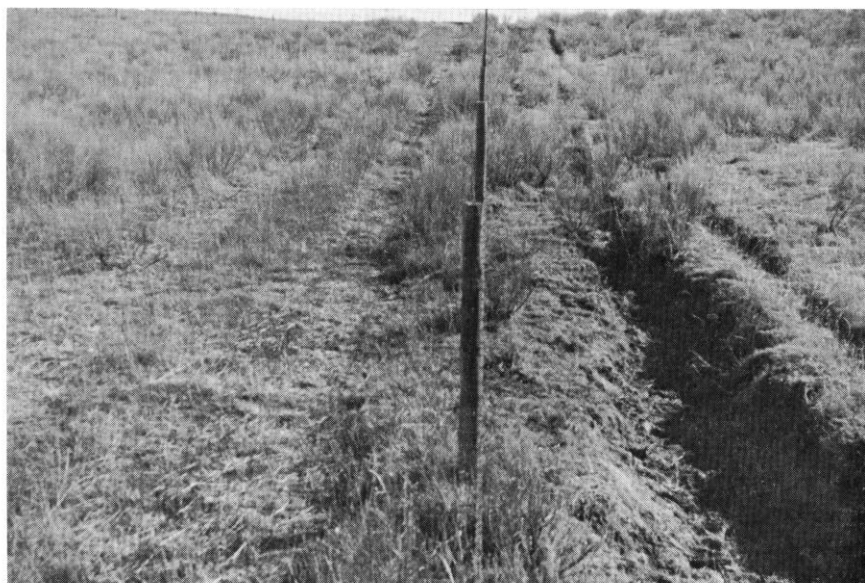


FIG. 3. Severe water and wind erosion on an infrequently used trail in an overgrazed pasture (right) but not in the adjacent moderately grazed pasture.

ency is to not worry greatly about the health of his grasslands. Even the irreparable damage of accelerated erosion is often considered as natural, or is minimized since some types are conspicuous only during and immediately following drouths.

Why Some Don't Overgraze

Most truly successful cattlemen don't overgraze. They realize that it is not a sound practice in the long run.

The drastic reduction in gains from heavy grazing during drouth years are well known to experienced cattlemen. There is a margin of safety with moderate grazing that provides enough forage to produce satisfactory gains during most drouths—but with heavy grazing there is none and cattle production falls abruptly. Most cattlemen in arid and semi-arid regions are sufficiently familiar with the weather of their area to know that drouths

are a rule of the climate and not the exception.

Most cattlemen who use moderate grazing realize that they cannot afford several successive years of high losses that occur under heavy grazing. Five successive years of loss totalling \$23/acre from overgrazing would put many cattlemen out of business, whereas they might survive 2 years of loss totalling \$9 from moderate grazing—even though it would be painful (Fig. 1).

Moderate grazing of range keeps the grass as healthy as possible and allows it to produce the most forage, gains, and profits. Feeding hay, grain, or extra protein supplements to replace grass diverts money, cropland, and labor that could frequently be used more profitably in some other manner.

Overgrazing is brinkmanship with the natural resources. Overgrazing combined with an unexpected drouth can so damage the range that recovery takes years. Even if moderate grazing were slightly less profitable than heavy grazing, most cattlemen wish to leave their ranch to the next generation as healthy and productive as possible. This can't be done by overgrazing.

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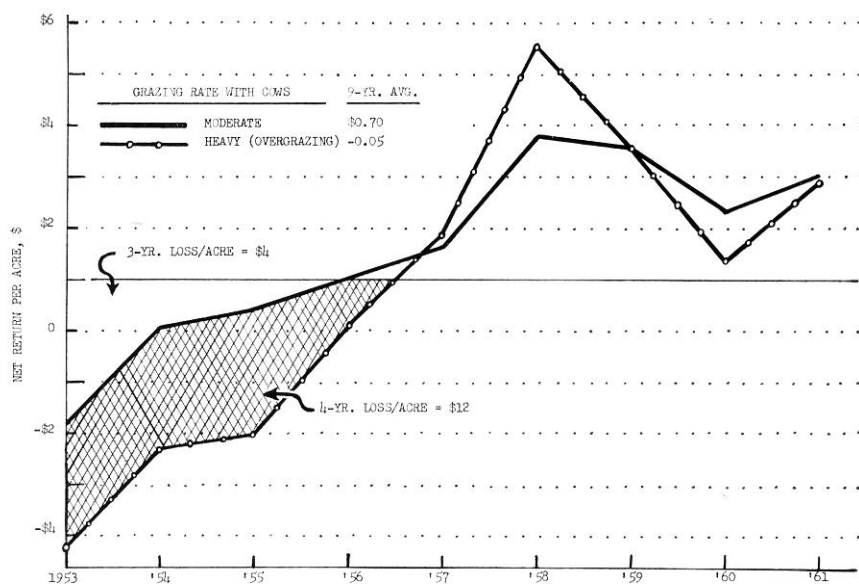


FIG. 4. Net return per acre from Hereford cows on overgrazed and moderately grazed range, 1953-61.