Supplemental Feeding of Range Cattle in Longleaf-Slash Pine Forests of Georgia[1]

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For many years cattle grazing has prevailed in the longleaf-slash pine forest ranges of Georgia and contributed greatly to the beef supply of the region. The limiting factor in beef production on these ranges is quality of forage rather than quantity. Except for two or three months during the year, the forage is generally deficient in protein, phosphorus and calcium. Beef cattle can subsist without supplemental feeding but calf crops are very small, death losses high, and replacement requirements large (Biswell, *et al.* 1942; Brasington 1949; Campbell and Rhodes 1944; Shepherd, *et al.* 1953).

Increased cattle production as measured by larger calf crops and reduced death losses of cows is primarily dependent upon better nutrition. It has been customary to get by with as little extra feeding, fencing and general care as possible. Burning is a common method of increasing the value of native herbage for grazing. Winter burning increases the availability, palatability and nutritive value of the native "wiregrass" the next spring, and as a result spring and summer livestock gains are two to three times greater on burned than on unburned areas (Halls, *et al.* 1952). Too often, however, burning has been used to increase grazing values at the expense of potentially greater timber values. Some think grazing should be only one of several factors, such as reduction of fuel and improvement of pine regeneration, in determining when and whether to burn (McCulley 1950).

Even with burning, livestock production is limited unless additional required nutrients and minerals are made available. These may be supplied by improved summer pastures, protein concentrates, annual winter pastures, field gleanings, hay, sugarcane and grain. Mineral mixtures may be self-fed separately the year round.

Experiments were conducted near Alapaha, Georgia, from 1948 through 1952, to investigate the effect of year-round supplemental feeding as compared to fall and winter supplemental feeding of range cattle, and to compare improved pasture with high protein meal as supplements to forest range. Results apply in particular to the Lower Coastal Plain but in general to forest lands characterized by an overstory of longleaf and slash pines and herbaceous understory of "wiregrass."

Description of Area

Approximately 60 percent of the 22.5 million acres in the Coastal Plain of Georgia is classified as forest land. Topography of the Coastal Plain varies from gently rolling to nearly flat. Soils are sandy in texture, mildly to strongly acid and low in fertility. The frost-free period averages 245 days and annual precipitation is about 48 inches. Grazing is most prevalent on upland areas which support variable stands of second growth longleaf (*Pinus palustris*) and slash pine (*Pinus elliottii*). Areas which have light to medium stands of timber produce abundant grazable herbage, whereas it is negligible under dense stands. Major species of grasses on upland which contribute the greater portion of the forage, include pineland threeawn (*Aristida stricta*), Curtiss dropseed (*Sporobolus curtissii*), bluestems (*Andropogon* spp.), carpetgrass (*Axonopus affinis*) and various panicums (*Panicum* spp.). Broad-leaved herbs are relatively unimportant both as to extent and contribution to the forage supply. The two main shrubs, gallberry (*Ilex glabra*) and sawpalmetto (*Serenoa repens*), are relatively unpalatable and undesirable because they increase the fire hazard and reduce herbage production.

FIGURE 1. Abundant herbage is produced on upland portions of longleaf-slash pine forests. Cattle concentrate on such areas when grazing conditions have been improved by winter burning.

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Swamps and lowland areas, periodically under water, are characterized by cypresses (*Taxodium* spp.), various hardwood trees and shrubs which provide only limited herbage. Although quantity of herbage produced is small, this browse herbage may be relatively high in certain minerals which help to balance the animal diet.

Previous Investigations

Previous studies conducted on this area (Shepherd, *et al.* 1953) substantiated two carlier surveys (Biswell, *et al.* 1942 and Brasington 1949) by showing that supplemental feeding was necessary to prevent severe winter death losses of cattle. Shepherd, *et al.* further reported that a minimum acceptable level of supplemental feeding to avoid starvation losses was about 1 pound of protein concentrate per head daily from October 15 to January 31 when cows were on forest range, and a ration equivalent to 20–25 pounds of sugarcane plus 2 pounds of protein concentrate from February 1 to March 15 when cows were off the range and in dry lots. Under this supplemental feeding practice, dry cows gained consistently in the dry lot and on range through spring and summer, and were in good enough condition to breed successfully. Wet cows, however, usually failed to conceive. They generally barely maintained their weight or lost slightly during the breeding period and continued to lose weight during the late summer, fall and winter. The supplemental feeding met the minimum requirements for dry cows but was inadequate for wet cows. A further inference was that additional supplementation at other seasons might raise the wet cows to breeding condition and thereby increase the calf crop.

Experimental Procedures

Year-round and fall and winter feeding of protein concentrates to grade Hereford cows, as supplements to range forage, was studied from 1948 to 1952. Additional comparisons were made from 1950 through 1952 by providing limited amounts of improved pasture in addition to forest range. Grazing schedules and supplemental feeding practices are illustrated in Figure 2.

There were two groups involved in the protein supplement comparisons. Each of these groups was divided into two small herds. The two herds in group 1 were fed 2 pounds of cottonseed meal per head per day from April 10 to June 30, and 1 pound from July 1 to October 15. During these same periods the two herds in group 2 were on the range without supplemental feed. They were allotted 7 acres of burned upland range, 7 acres of unburned upland, and 6 acres of lowland and swamp per cow for the first two years, and 10, 5, and 7 acres, respectively, the last three years.

Three groups of eight cows each, groups 3, 4 and 5, were furnished ½ acre during spring and summer, ½ acre during the summer, and 1½ acres during the summer, respectively, of improved pasture in addition to 10 acres of burned upland range and 3 acres of unburned lowland and swamp per cow.

All five groups were on forest range with one pound of cottonseed meal per cow per day from October 15 through January, then in dry lot with 2 pounds of cottonseed meal and 20–25 pounds of sugar cane per cow per day (Fig. 2).

Improved pasture plants included Louisiana white clover (*Trifolium repens*), Dallisgrass (*Paspalum dilatatum*), and carpetgrass. Annual fertilization was at the per-acre rate of 56 pounds each of phosphate (P_2O_5) and potash (K_2O).

The cottonseed meal which was fed three times per week in open troughs had a protein content of 41 percent. A mineral mixture of two parts steamed bone meal (7 percent crude protein, 33 percent calcium and 15 percent phosphorus) and one of salt, by weight, was available to cows at all times.

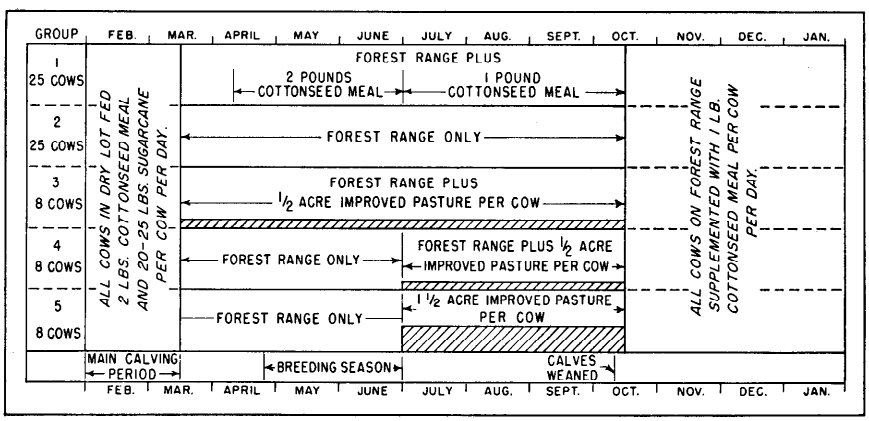

FIGURE 2. Grazing schedule and supplemental feeding practices. Groups 1 and 2 were on test from 1948 through 1952, groups 3, 4 and 5 from 1950 through 1952.

Grade Hereford cows, bred to Brahman bulls during an April 25 to July 1 season, were used in this experiment. Grazing began about March 15 each year when the major grasses, pineland threeawn and Curtiss dropseed, had made approximately 6 and 4 inches growth, respectively. Supplemental feeding stations were located to encourage uniform grazing of the range.

Results

Effects of Feeding Protein Concentrates

On Calf Crop

Feeding cottonseed meal year round tended to increase the calf crop generally over the period of the

Table 1. Calf crops weaned by cows run on native range under two supplemental feeding practices

Year	Cows fed cottonseed meal year-round Group 1	Cows fed cottonseed meal during fall and winter only Group 2
	Percent of cows weaning calves	
1948	96	84
1949	16	16
1950	80	80
1951	68	28
1952	60	68
Average (1949–1952)	56	48

study (Table 1). Good calf crops were obtained in all herds during 1948 because all cows had been dry the previous year. The unusually good 1948 calf crop in group 1 (cows on range with cottonseed meal during spring and summer) does not reflect the effect of increased supplements because supplemental feeding did not start until October 1947, and all cows were treated alike until March 15, 1948. Inability of wet cows to breed on unsupplemented native range is illustrated by the low calf crop in 1949. In group 2 (cows on unsupplemented forest range during spring and summer), the only cows that calved were those which had not produced calves the previous year. The fact that three cows in group 1 calved in both years perhaps indicates a slightly higher level of nutrition for this group. Over the 5-year period, two-thirds of the cows in group 1 produced calves in two successive years and some calved three years in succession. This repeat calving was most prevalent the last two years, probably because of the cumulative effect of better treatment and ability of older cows to make more efficient use of the low quality roughage. Only one-fourth of the cows in group 2 produced calves in two successive years, this occurring mostly during the last two years.

On Calf Weights

The most pronounced effect of extra feeding during the spring and summer was the 65-pound per calf increase in weaned weight (Table 2). Over the period of the test this accounted for a larger portion of the increased beef production than the greater number of weaned calves in the group supplemented year round on the range. Also, the better condition of calves at weaning added to the benefits of supplement feeding.

Cows on year-round supplemented range weaned calves which on the average were five days older than calves on unsupplemented range. However, this had only minor influence on the weaning weights. The greater daily gains of calves during the suckling period were apparently due to increased milk production by cows and direct cottonseed meal consumption.

On Cow Weights

Differences in cow weights that developed during the study were relatively small. The initial weights of 709 and 657 pounds per cow in groups 1 and 2, respectively, had increased to only 774 and 685 pounds five years later. Large individual yearly weight losses occurred when the cows raised calves, and this prevented pronounced increases in weight over the test period. Because cows in group 1 produced more calves, they were subject to more frequent yearly losses in weight. Even so,

Table 2. Average weaning weights and age of range calves in relation to two supplemental feeding practices, 1948 to 1952

Supplemental feeding practice	Weaning weights		Age
	Actual	Adjusted	
	lbs.		*days*
Cows fed cottonseed meal year-round (Group 1)	360	356	229
Cows fed cottonseed meal fall and winter only (Group 2)	295	299	224

they were heavier by nearly 90 pounds than the cows in group 2 at the end of the experiment.

Seasonal changes in weight varied considerably between treatments and according to the numbers of wet cows in each group. On the average, cows with calves lost approximately 130 pounds over a period of a year even though fed supplements during the fall and winter. This yearly loss was reduced to 83 pounds on wet cows by feeding cottonseed meal the year round (Table 3).

During the calving period, February 1–March 15, weight losses averaged from 60 to 70 pounds, the cows in best condition losing slightly more weight. After the cows were put on the range in March, those fed cottonseed meal rapidly regained nearly all of the weight lost in calving. Because of this ability to gain during spring and early summer, wet cows fed cottonseed meal obtained an advantage over those

Table 3. Average seasonal gain or loss in weight for wet and dry cows. Main calving period, February and March; calves weaned October 15

Season	Wet cows		Dry cows	
	Group 1	Group 2	Group 1	Group 2
	pounds per animal			
Feb. 1–Mar. 15	−71	−60	58	77
Mar. 16–Apr. 25	18	−3	42	30
Apr. 26–June 30	50	−3	110	79
July 1–Oct. 15	−9	−33	69	47
Oct. 16–Jan. 31	−71	−31	−95	−53
Average net	−83	−130	184	180

on range without supplemental feed. These, on the average, continued to lose weight. This advantage was mantained through October even though all cows lost some weight during late summer. Weight losses continued during the fall and early winter even though the calves were weaned in October.

FIGURE 3. These cows were fed cottonseed meal year-round (group 1). Cow on left was dry, others had calves. (Photo taken in October).

Dry cows gained 180 pounds through the course of a year on the average (Table 3). These cows gained in the winter dry lot and continued to do so when placed on the range in March. As much as 1½ pounds per cow per day were gained during this spring grazing period. As forage quality and palatability decreased during the late summer, the rate of gain declined. During this range grazing period, dry cows fed cottonseed meal made better gains than dry cows on range without meal and by October they averaged approximately 45 pounds heavier. After October, all cows lost weight. The dry cows that were in the best condition at the beginning of the October-January period lost the most weight; thus the net year-long gains for dry cows were about the same regardless of spring and summer treatment.

Effects of Supplementing Forest Range with Improved Pasture

Free access to forest range supplemented by one-half acre of improved pasture per cow from March to October resulted in extremely heavy use of the pasture. This also favored invasion of the low-producing carpetgrass at the expense of the more desirable Dallisgrass. Unequal use of the native range also resulted because the cattle tended to graze heavily near the improved pasture and lighter as the distance from pasture increased. Increased utilization of native herbage and better maintenance of Dallisgrass and white clover were accomplished when the cattle were excluded from pasture until July. This permitted a considerable buildup of grass herbage in the improved pasture, but with such a schedule most of the white clover grazing was lost.

On Calf Crop

Calf crops, as shown below, were similar for all three groups that had improved pasture as a supplement to native range.

	Calf Crop (Percent)		
	Group 3	Group 4	Group 5
1st year	88	88	88
2nd year	25	25	38
3rd year	86	100	80

These calf crops were slightly higher than those of the protein supplemented groups (Table 1) during the first three years they were on test. In general, however, the performance was similar in that most cows were able to calve the first year of the test, because they had been dry the previous year, but only a few calved the following year. The tendency remained for most wet cows not to breed.

On Calf Weights

Weaned weights of calves were greatly increased by supplementing the range with improved pasture. Weights were in proportion to the amount of pasturage furnished during the summer when calves were old enough to obtain a considerable portion of their feed from grazing. Weaned calf weights averaged 456 pounds when improved pasture was supplied during the summer at the rate of 1½ acres per cow (group 5). Reducing this pasture to ½ acre per cow during the same period also reduced weaning weight to 407 pounds per calf (group 4). Where pasture herbage had largely been removed in early spring and was thus scarce during the summer, calf weaning weights were only 386 pounds.

On Cow Weights

Wet cows lost an average of approximately 64 pounds through the course of a year (Table 4). The net result was approximately the same for all herds although

FIGURE 4. Limited improved pasture during the summer increased cow and calf gains but failed to increase calving percentage when a low level of nutrition was supplied during the fall and winter.

weight changes fluctuated throughout the year according to the amount of improved pasture furnished.

During the dry lot period, February 1–March 15, cows which calved lost from 50 to 65 pounds. Those restricted to forest range from March 15 to July 1 just about maintained their weight. Others provided with ½ acre of improved pasture made gains of 50 pounds per animal. These were comparable to gains made on protein supplements during the same period.

Small allowances of improved pasture provided in this study were closely grazed during the spring. As a result they were very unproductive during the summer, and cattle were forced to obtain the greater portion of their feed from the range. Consequently, cows with calves in this group barely maintained their weight during the summer. When improved pastures were not grazed until July (groups 4 and 5), grass growth was allowed to accumulate; therefore, a large amount of good quality herbage was available. Access to this improved herbage, and the fact that cows had previously been on a near maintenance ration on forest range, enabled them to make very good gains from early July to mid-October. These gains were largely nullified, however, by large losses in weight which occurred when cows were again confined to range from mid-October to late January. These losses occurred even though the calves were weaned and the cows were fed cottonseed meal.

Dry cows gained an average of 130 pounds or better through the course of a year (Table 4). Good performance was noted for all periods except when cows were on range in fall and winter. Gains made during spring and summer were closely related to the amount and time when improved pasturage was supplied.

Discussion

In order to produce a good calf crop, wet cows must be able to maintain or even increase their weight throughout the year. Losses in animal weight may be permissible at certain times of the year, particularly during the calving period, but this weight should be regained at other times, preferably during the spring and summer, when forage quality and grazing conditions are best. Since wet cows do not gain during this period on range without supplements, it appears necessary to provide additional forage or nutrients. Presumably, such cows should breed and conceive when they receive sufficient supplements during the breeding season to make gains of 50 to 70 pounds. Although several of the wet cows in this study did rebreed under such conditions, most of them which made similar gains failed to do so. This indicated the need for a higher year-round level of nutrition. Increasing the rate of supplemental feeding during the spring and summer would help to raise the nutritional level and enable more cows to produce calves, but this extra feeding does not appear justified when excessive weight losses are allowed to take place at other seasons. Also, extra supplements can be used most efficiently when quality of native herbage is lowest, rather than in the spring when it is highest. Presumably, the calving percentages could have been increased most efficiently by preventing large losses in weight during the fall and winter when native forage quality was extremely low.

The failure of cows supplied with limited improved pasture during spring and summer to produce calves each year further indicates that excessive weight losses during fall and winter may be a major factor in restricting the number of calves born. Gains made by cows during and after the breeding season were not sufficient to counteract the effects of weight losses during fall and winter. Thus, little benefit was realized from extra improved pasture during summer as measured by the number of calves weaned.

Table 4. Average seasonal gain or loss in weight for cows with and without calves (1950–1952)

Season	Wet cows			Dry cows		
	Group 3	Group 4	Group 5	Group 3	Group 4	Group 5
	pounds per animal					
Feb. 1–Mar. 15	−52	−53	−65	69	72	79
Mar. 16–June 30	50	10	−5	144	61	89
July 1–Oct. 15	−1	81	135	56	124	137
Oct. 16–Jan. 31	−58	−102	−131	−100	−125	−127
Average net	−61	−64	−66	169	132	178

There is little reason for feeding protein concentrates or furnishing improved pasture during spring and summer to dry cows which are to be kept in the herd. They breed successfully without it. Dry cows, of course, make better gains when furnished with additional feed but this weight advantage is offset by the big losses which take place during the fall and winter. If management facilities are available, wet cows should be separated from replacement heifers and dry cows. Wet cows would make most efficient use of supplemental feeds; whereas the dry cows and heifers would make satisfactory gains and breed successfully on range without supplements during the spring and summer.

The benefits from year-round feeding of cottonseed meal, as

practiced in this study, are small. An extra 1621 pounds of cottonseed meal per cow produced approximately 375 pounds more beef over a 5-year period than when cows were fed meal only during fall and winter; or 4.3 pounds of extra cottonseed meal were required to produce an extra pound of beef. This was primarily a result of the increased 338 pounds of calf weight produced per cow. The 37-pound increased gain in weight of cows fed supplements year round was of minor importance.

Table 5. Net returns per weaned calf are increased by supplementing native range during the spring and summer with improved pasture, as compared to cottonseed meal

Supplement feeding schedule	Cattle group	Calf weaning weight	Value at 20¢/lb.	Cost of extra feed during spring and summer[1]	Return per calf
		pounds	*dollars*	*dollars*	*dollars*
Adequate pasture (July–Oct.)	5	457	91	21	70
Limited pasture (July–Oct.)	4	407	81	7	74
Limited pasture (Mar.–Oct.)	3	386	77	7	70
Cottonseed meal (Apr.–Oct.)	1	360	72	12	60

[1] Cost per cow and calf, March 16–October 15. Based on yearly pasture maintenance of $14.00 per acre (including establishment prorated over 10 years) and cottonseed meal at $70.00 per ton.

The economics of year-round supplemental feeding would, of course, depend upon the relative price of cottonseed meal and beef. During the course of this study, the average selling price of beef was 20 cents per pound, cottonseed meal 3½ cents. At this ratio the practice would apparently be justified. Increased labor costs of getting supplements to cattle would detract from this; but a closer check on animals, better control of insects and disease, and ease of handling and rounding up cattle may partially or even fully compensate for this extra labor.

The limited comparisons of this study indicate that improved pastures may be more economical than protein concentrates for supplementing range during spring and summer (Table 5). Wet cows that had access to limited improved pasture made equal or better gains from March 15 to October 15 than those on protein supplement. Net returns per weaned calf were 17 to 23 percent greater. These increases in weight more than offset the additional cost of providing pasture as compared to protein concentrates. Supplementing the range with improved pasture has one distinct disadvantage in that cows tend to overgraze the improved pasture and nearby range. Moving the feed boxes of protein concentrate helps to overcome this condition by causing cattle to graze farther out.

Summary

In the longleaf-slash pine forests of the Coastal Plain of Georgia, grade Hereford cows were grazed on the native range except for a 6-weeks' period in February and early March. During this off-range period the cows were dry-lot fed a maintenance ration of chopped sugarcane and cottonseed meal. While on the range, some of the cows were fed a supplement in the spring and summer consisting of cottonseed meal (1948–1952) or limited improved pasture (1950–1952). Others were given range only during this period. All animals were treated alike on range from October 15 through January 30.

Cottonseed meal supplement fed during the spring and summer increased weaned calf crop from 55 to 64 percent and the calf weaning weights by 65 pounds. Over a 5-year period, an extra 1621 pounds of cottonseed meal per cow resulted in approximately 375 pounds more beef than when cows were fed meal during the fall and winter only. Dry cows benefited some from supplements fed during the spring and summer, but this advantage was largely lost the following fall and winter when cows lost excessive weight. These losses were apparently a major factor in preventing cows from calving each year.

Cows furnished limited amounts of improved pasture weaned heavier calves but calf crop was similar to that for cows fed cottonseed meal. Indications were that improved pasture was more economical than protein concentrates for supplementing forest range but less flexible in management.

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