

# Supplementing Pine-Wiregrass Range with Improved Pasture in South Georgia<sup>1</sup>

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## Highlight

Native forage on pine-wiregrass ranges is low in quality and poor in palatability most of the year. Management techniques to overcome these problems and to utilize this resource are needed. Acceptable beef production can be achieved with proper combination of burned-unburned range during spring and summer when accompanied by adequate feed during fall and winter. Combining use of improved pasture at the rate of 0.6 acre per cow with native range during the spring-summer grazing period or during only the summer boosts calf weights and maintains cow weights from year to year over weights of cattle grazing range-only during spring and summer.

## La Suplementación en Pastizales de Bosques de Pino en el Estado de Georgia, E.U.A.

### Resumen<sup>2</sup>

El forraje que proporcionan los pastizales nativos en bosques de pino es bajo de calidad y palatabilidad durante la mayor parte del año. La producción de bovino de carne es aceptable con una combinación de pastos quemados y sin quemar durante la primavera y el verano si los animales son suplementados durante el otoño y el invierno. Sin embargo, si se pastorea pastizal nativo y 0.6 acres por vaca diario dallisgrass (*Paspalum dilatatum*) y zacate Bahía (*P. notatum*) durante la época de pastoreo de primavera, verano o un verano solamente, si aumenta el peso de las vacas y el de los becerros al destete.

Several million acres of pine forest in south Georgia produce forage useful to beef cattle even though the area is generally well stocked with timber. Cattle have grazed these forests since colonial days,

but low quality of forage has contributed to limited beef production. Minerals, protein, and other nutrients are deficient much of the year (Biswell et al., 1943; Halls et al., 1957; Hale et al., 1962). Native cattle of mixed breeding that formerly subsisted year-round on this kind of range were small, produced low calf crops with light weaning weights, and suffered high death losses (Farley and Greene, 1921; Biswell et al., 1942; Shepherd et al., 1953).

A series of range grazing studies has shown how to increase productivity of beef herds while utilizing this natural forage. Recognizing the dormant winter season as the most critical period, the earliest studies tested supplemental protein at this season in addition to varied stocking rates and burning treatments at other seasons (Shepherd et al., 1953). These practices failed to increase calving percentage, and indicated need for a higher level of yearlong nutrition. Accordingly, supplementation of range forage with cottonseed meal and with limited improved pasture in spring and summer was tested along with fall and winter feeding of supplemental cottonseed meal (Southwell and Halls, 1955). Beef production increased, and improved pasture was found to be more economical than protein concentrates for supplementing native forage in summer.

Practices representing several levels of summer nutrition were then tested in combination with two levels of supplementation in fall and winter, the latter on hayfield aftermath and coastal bermudagrass hay with no reliance on winter range (Southwell and Hughes, 1965). Most of the spring-summer grazing practices produced high calving percentages and satisfactory weaning weights when ample hay was fed in fall and winter. Overall, these past results suggested that supplementation of native range in spring and summer paid off in increased beef production, but that forage quality in winter was too low for practical use at that season. Supplementing range with improved pasture during spring and summer, grazing hayfields and field gleanings in the fall, and feeding quality hay in winter evolved as a practical scheme for yearlong maintenance of a breeding herd.

Because native forage on burned range is fairly nutritious during the spring but is inadequate during the summer, we investigated summer-only supplementation of range with improved pasture and compared it to supplementation during both spring and summer (season-long) and to no supplementation (range-only).

## Methods

The study was conducted on native forest range at the Alapaha Experimental Range, Berrien County, Georgia, which is in the northern portion of the pine-wiregrass grazing type (Fig. 1). Variable stands of slash pine (*Pinus elliottii* Engelm.) and longleaf pine (*P. palustris* Mill.) form a moderate canopy on uplands. Swampy sites, comprising about 30 percent of the area, support dense stands of trees and shrubs and produce little herbage. Cattle stocking was based on the acreage of upland per range unit, ignoring swamps. The principal native forage plants are pineland threeawn (*Aristida stricta* Michx.), Curtiss dropseed (*Sporobolus curtissii* (Vasey) Small ex Scribn.), blue-stem grasses (*Andropogon* sp.),

<sup>1</sup> Cooperative investigations conducted by the University of Georgia College of Agriculture Experiment Station, Coastal Plain Experiment Station, and the Forest Service, U. S. Department of Agriculture. Coastal Plain Experiment Station Journal Series Paper No. 554. Received September 14, 1970; accepted for publication December 7, 1970.

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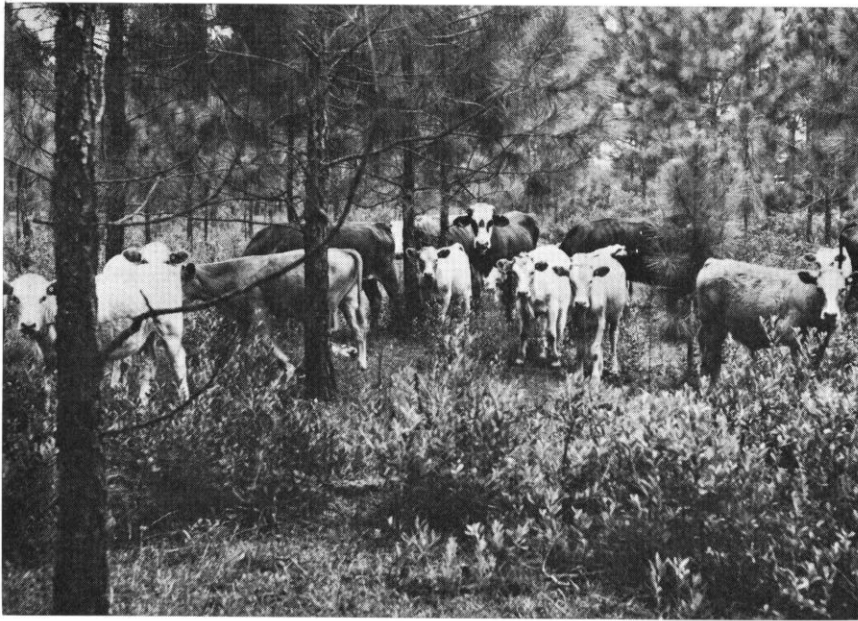


Fig. 1. Cows and calves grazing nonsupplemented native range in August, shortly before weaning. The trees are 9 years old.

panicum grasses (*Panicum* sp.), toothachegrass (*Ctenium aromaticum* (Walt.) Wood), and carpetgrass (*Axonopus affinis* Chase). Predominant shrubs are gallberry (*Ilex glabra* (L.) A. Gray) and sawpalmetto (*Serenoa repens* (Bartr.) Small).

Supplemental improved pastures were mixtures of dallisgrass (*Paspalum dilatatum* Poir.), Pensacola bahiagrass (*P. notatum* Flugge), and carpetgrass. These pastures annually received 400 lb./acre of 0-12-12 fertilizer in the spring and split applications of 100 lb. N/acre, one-half in the spring and one-half in the summer.

Mature cows, raised on the Alapaha range, were divided into three comparable herds with respect to age, previous treatment, sex, and sire of calf. Each herd was assigned to one of three range units and to one of three treatments involving access to improved pasture supplemental to native range or no supplemental pasture (Table 1). For the 3 years of study, a 12-cow herd was assigned to the summer-only treatment, a herd of 14 was assigned to season-long supplementation, and a 13-cow herd was assigned to range-only grazing.

Initially all cows were nursing calves sired by Angus bulls; the second and third calf crops were sired by Charolais bulls. Calves were born during January to March, went on range April 1, and were weaned at the close of the range-grazing season on September 15. After calves were weaned, all cows were maintained as a single herd on coastal bermudagrass hayfields until late December and were then fed coastal bermudagrass hay, free-choice, through March. A mineral mixture was provided year-round.

Cows and calves were weighed every 28 days during the grazing period, and weight changes provided the best measure of treatment effects. Analysis of variance, considering years as replications, was used to aid interpretation. Results discussed were statistically significant at the 5% level.

Two-fifths of each range unit was burned annually in the winter. Herbage yield and utilization were determined every year by the stationary-cage method described by Grelen (1967). A cluster of four quadrats for each 8 acres of burned range was randomly located on fresh burns. One quadrat per cluster was protected from grazing throughout the growing season by a cage; the other three were open to grazing. In September all quadrats were clipped 1 inch above the ground and samples were oven-dried at 70 C for 48 hours.

Cattle diet and grazing habits were determined in 1965 and 1966 by closely observing gentle cattle from sunrise to sunset 2 days per month to record and collect samples of the kind, portion, and relative amounts of plants eaten (Halls, 1954). Proximate chemical analyses were performed on these samples. Observers also recorded the time a herd spent grazing, resting, and traveling.

## Results and Discussion

### Cattle Response

Lactating cows consistently lost weight while grazing native range alone (Fig. 2). Cows in the range-only treatment lost about 100 lb. during the April-June period and continued to lose slightly through the remainder of the range-grazing period. They were able to regain most of this loss during the fall and winter maintenance period on field aftermath and hay, but they suffered a net loss of about 34 lb. annually. While grazing only native range during the spring, cows in the summer-only supplementation treatment also lost weight in a manner similar to the range-only treat-

Table 1. Assignment of native range and supplemental improved pasture (acres per cow) during the range grazing period.

| Treatment   | Supplemental pasture |                 | Native range |          |
|-------------|----------------------|-----------------|--------------|----------|
|             | April 1-June 30      | July 1-Sept. 15 | Burned       | Unburned |
| Summer-only | None                 | 0.6             | 8            | 12       |
| Season-long | 0.6                  | 0.6             | 8            | 12       |
| Range-only  | None                 | None            | 8            | 12       |

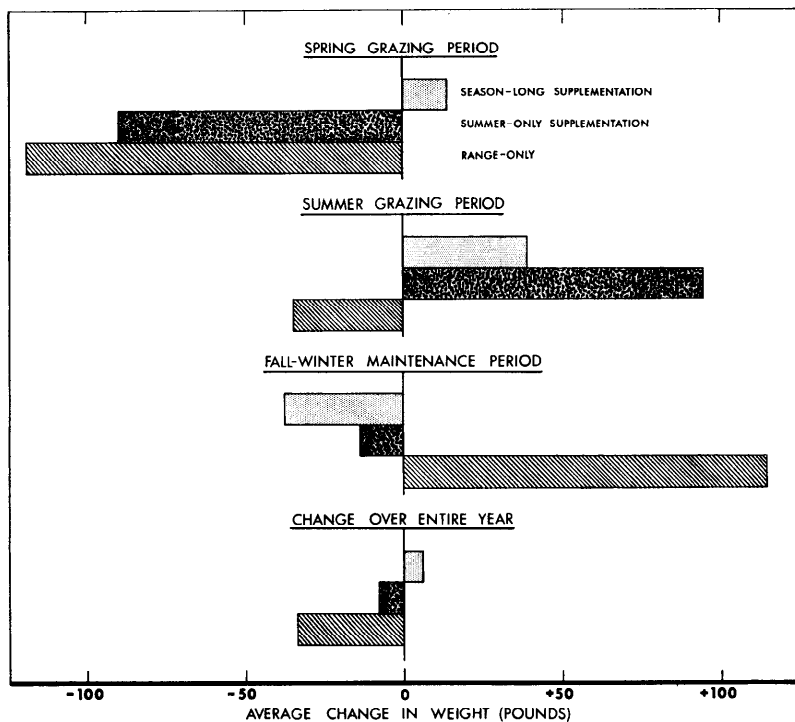


FIG. 2. Average weight changes of cows with and without supplemental improved pasture (0.6 acre/cow) season-long or summer-only.

ment. These herds apparently had insufficient forage available during the spring period.

The amount of burned native range or combination of burned and unburned range required to support a lactating cow adequately has received considerable attention in past research. The first study (Shepherd et al., 1953) indicated that stocking should be based primarily on burned range and that at least 6 acres per cow was required. Later, 7 acres of burned range were found to be inadequate, and the amount was increased to 10 acres (Southwell and Halls, 1955). In a comprehensive study of grazing capacity, maximum weight gains were obtained from the equivalent of 9 acres of burned open range per 500-lb. steer for a 10-month season (Halls et al., 1956). They concluded that mature cows would require 15 acres for the period mid-March to mid-January and that this acreage should be increased about 1½% for each 1% of tree and shrub cover. Subsequently, Southwell and Hughes (1965) reported good weaning

weights when cows were provided 9 acres of burned range in the spring and 26 acres during the summer. In our study, supplying 8 burned and 12 unburned acres for a 6-month season fell short of the optimum, since the degree of forage

utilization on burns tended to exceed levels recommended by Halls et al. (1956). Increasing the burned area to at least 10 acres per cow may have been preferable when supplemental pasture was not available—either in spring or season-long.

Supplemental improved pasture, either season-long or summer-only, permitted the cows to gain weight during the range grazing period and to maintain their weight from year to year (Fig. 2). With summer-only supplementation, weight losses in spring were fully regained during the summer grazing season. Both supplemented herds lost weight during the fall-winter period about equal to gains made during the range grazing period and, thereby, generally maintained their weight from year to year.

Use of improved pasture to supplement native range at various ratios of pasture to combinations of burned and unburned range were tested by Southwell and Halls (1955) and Southwell and Hughes (1965). Figuring that 0.6 acre of improved pasture would supply from ⅓ to ½ the required forage per cow, Southwell and Hughes (1967) added this amount of pasture season-long to 10 burned and 10 unburned acres of native range.

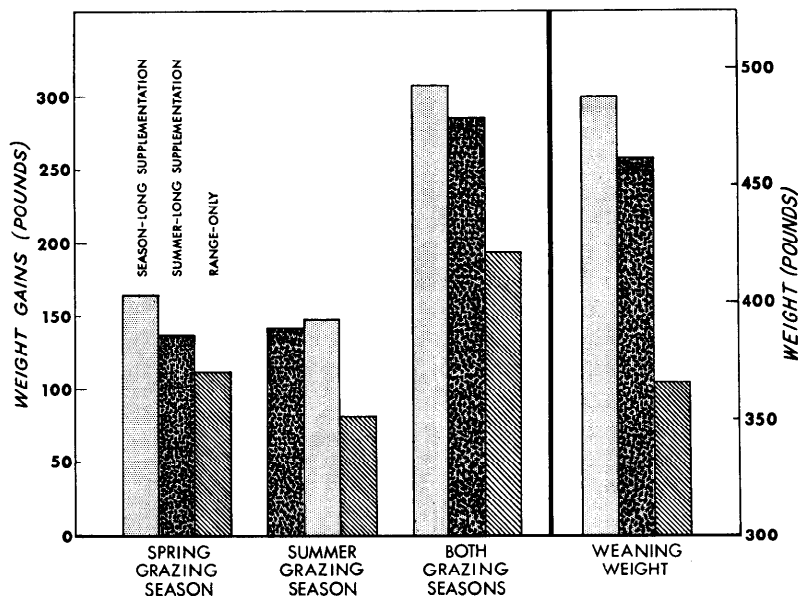


FIG. 3. Average gains of calves by grazing seasons and total weaning weights at 7.75 months with and without supplemental improved pasture.

**Table 2.** Activities of cattle (hours per day) with and without access to improved pasture (0.6 acre/cow) season-long or in summer-only.<sup>1</sup>

| Treatment   | Month | Grazing            |                |              |       | Resting | Travel |
|-------------|-------|--------------------|----------------|--------------|-------|---------|--------|
|             |       | Range <sup>2</sup> | Pasture        | Swamp border | Swamp |         |        |
| Season-long | April | 2.7                | 5.0            | .1           | .1    | 4.8     | .4     |
|             | June  | 3.8                | 6.4            | .5           | .4    | 1.9     | .2     |
|             | Sept. | 2.9                | 5.2            | .4           | .1    | 3.3     | .4     |
| Summer-only | April | 7.8                | — <sup>3</sup> | .4           | .2    | 4.4     | .1     |
|             | June  | 9.0                | —              | .4           | .2    | 3.6     | .1     |
|             | Sept. | 2.7                | 5.1            | .5           | .1    | 3.6     | .2     |
| Range-only  | April | 7.2                | — <sup>4</sup> | .3           | .1    | 5.2     | .1     |
|             | June  | 9.6                | —              | .4           | .1    | 2.9     | .2     |
|             | Sept. | 7.9                | —              | .5           | .4    | 3.5     | .0     |

<sup>1</sup> Cattle activities were measured from sunrise to sunset on two successive days near the middle of the month.

<sup>2</sup> Includes both burned and unburned range.

<sup>3</sup> Improved pasture made available on July 1.

<sup>4</sup> No improved pasture during the spring-summer grazing period.

They obtained excellent cow response and calves that weaned at 470 lb. Also, they found that supplementing 15 to 20 acres of unburned range with 0.6 acre of pasture gave excellent cow response and calf weaning weights of more than 420 lb. These results, along with those in our study, indicate that 0.6 acre/cow of improved pasture is about the right amount to supplement this kind of range.

Percentage calf crop could not be determined precisely with the small number of cows involved, and differences were not statistically significant. Calf crops averaged 90% in the season-long, 92% in the summer-only, and 82% in the range-only treatments. These percentages are based on actual calving in 1966 and 1967 and on palpation in the fall of 1967. Death losses were relatively low—one calf in each herd during the 3 years.

Seasonal gains and weaning weights of calves reflected the beneficial effects of supplemental improved pasture (Fig. 3). Weaning weights of calves in the supplemental treatments were about 100 lb. greater than calves on range-only treatments. These increased gains probably resulted from increased milk production by the cows, particularly in the spring, as

well as from better forage for the calves in summer when a large part of their diet came from grazing. Similar trends were reported by Southwell and Halls (1955) for slightly different management schemes.

It should be emphasized that these results were obtained with a relatively high level of winter feeding. Several methods and levels of supplementing native range during spring and summer failed to give satisfactory calf crops with limited levels of winter feeding in early studies. Southwell and Hughes (1965) concluded that "ample feed during the fall and winter is essential for a good range cattle reproduction program. Most of the spring-summer range treatments

and cattle practices gave satisfactory calving percentages and weaned weights when winter feeding was adequate."

#### Cattle Activities

Cattle spent about 60% of their grazing time on the limited improved pasture when it was available, but this did not appreciably influence total time spent in grazing (Table 2). There was no apparent seasonal trends in time spent grazing range or pasture. Almost all range grazing was on burns, with little use of unburned range, swamp, or swamp border. These observations agree with those reported by Southwell and Hughes (1967).

Cattle on range only grazed and rested about the same amount of time as those on both range and pasture, but the latter spent a little extra time traveling from pasture to burned range. Thus, providing supplemental pasture had little influence on cattle activities other than reducing grazing time on range.

#### Cattle Diet

Supplementing native range with improved pasture had little effect on the relative use of the various native species (Table 3). Pineland threeawn and Curtiss dropseed contributed heavily to the diet in early spring when they were the primary species available. Curtiss dropseed appeared to maintain palatability longer than pineland threeawn because its use declined more slowly.

**Table 3.** Species composition (%) of the diet of cattle grazing native range with access to a limited amount of supplemental improved pasture.

| Species           | Season-long |      |       | Summer-only <sup>1</sup> |      |       | Range-only |      |       |
|-------------------|-------------|------|-------|--------------------------|------|-------|------------|------|-------|
|                   | April       | June | Sept. | April                    | June | Sept. | April      | June | Sept. |
| Pineland threeawn | 31          | 3    | 0     | 32                       | 7    | 1     | 31         | 5    | 2     |
| Curtiss dropseed  | 39          | 16   | 0     | 39                       | 17   | 2     | 38         | 9    | 2     |
| Bluestem grasses  | 11          | 28   | 61    | 11                       | 35   | 40    | 11         | 38   | 37    |
| Other grasses     | 12          | 34   | 27    | 10                       | 23   | 46    | 12         | 38   | 46    |
| Grasslike species | 1           | 2    | 2     | 2                        | 3    | 3     | 2          | 1    | 3     |
| Forbs             | 2           | 6    | 4     | 2                        | 6    | 4     | 2          | 4    | 6     |
| Browse            | 4           | 11   | 6     | 4                        | 9    | 4     | 4          | 6    | 4     |

<sup>1</sup> Given access to improved pasture on July 1.

**Table 4.** Protein, calcium, and phosphorus content (% dry weight) of the diet of cattle grazing native range.

| Month <sup>1</sup> | Crude protein | Calcium | Phosphorus |
|--------------------|---------------|---------|------------|
| April              | 9.9           | 0.13    | 0.13       |
| June               | 7.8           | 0.15    | 0.11       |
| Sept.              | 7.1           | 0.22    | 0.10       |

<sup>1</sup> Diet samples were collected for two consecutive days about the middle of the month while estimating species composition of the diet shown in Table 2.

After these species became unpalatable in late spring, bluestems and other grasses were the major source of native feed. Grasslike species, forbs, and browse apparently contributed very little to cattle diets. The most abundant shrub, gallberry, is unpalatable and was taken only occasionally and in small amounts.

The nutrient content of the diet obtained from range was similar for all treatments, but varied with season (Table 4). As is common in wiregrass forage, crude protein and phosphorus decreased in cattle diets by early summer following winter burning, but calcium levels rose through the grazing season. The cattle's diet of native forage never met the minimum standards for calcium (0.24%) or phosphorus (0.18%) (NAS-NRC, 1963). It would appear to have met the recommended level of crude protein (7 to 8%) for beef cows nursing calves. However, limited digestibility no doubt kept the range diet from being fully adequate, as reflected by lower weight gains of cows and calves on range only (Figs. 2 and 3). Past studies of this kind of wiregrass forage found digestion coefficients for crude protein between 24 and 40%, and total digestible nutrients of 43 to 48%, during the period April through September (Halls et al., 1957; Hale et al., 1962).

#### Forage Yield and Use

Herbage yields, though sampled with limited precision, indicated that lack of forage was not the cause for the poor response of cattle grazing range-only since productivity was highest in this treatment

(Table 5). This can be attributed to an open stand of young pines with limited crown cover; the other range units supported heavier canopies of more mature timber, and herbage yields were lower. Yields of individual species or groups of species reflected a preponderance of pineland threeawn, Curtiss dropseed, and bluestem grasses.

Utilization percentages of individual species and of total herbage apparently were influenced both by range productivity and by pasture supplementation, but the relationships were not precise at the level of sampling employed. Supplemental improved pasture was fully utilized when available and tended to decrease the intensity of use of native range. This was most apparent for pineland threeawn and Curtiss dropseed, the main sources of early spring forage on range. Utilization of these was heavy where supplement was withheld until summer and yield was low. Utilization was relatively light with season-long supplementation, and intermediate without supplementation but with high yield (Table 5).

**Table 5.** Average annual yields (lb./acre, oven dry) of herbage and utilization (%) of burned range grazed April through September in conjunction with supplemental pasture.

| Species           | Season-long            |     | Summer-only |     | Range-only |     |
|-------------------|------------------------|-----|-------------|-----|------------|-----|
|                   | Yield                  | Use | Yield       | Use | Yield      | Use |
| Pineland threeawn | 370 (101) <sup>1</sup> | 25  | 420 (116)   | 75  | 670 (151)  | 45  |
| Curtiss dropseed  | 550 (123)              | 25  | 280 ( 75)   | 60  | 850 (160)  | 35  |
| Bluestem grasses  | 190 ( 56)              | 45  | 200 ( 48)   | 35  | 180 ( 38)  | 25  |
| Other grasses     | 180 ( 68)              | 35  | 170 ( 48)   | 30  | 200 ( 70)  | 25  |
| Other herbage     | 350 ( 82)              | 35  | 330 ( 61)   | 50  | 420 ( 70)  | 50  |
| Total             | 1640 (205)             | 30  | 1400 (192)  | 55  | 2320 (228) | 40  |

<sup>1</sup> Standard error of the mean is shown in parentheses.

#### Summary and Conclusions

Forage from native pine-wiregrass ranges in south Georgia is nutritionally marginal much of the year; in winter, forage quality is too low for practical utilization. Breeding herds can maintain themselves on native forage for up to 6 months during the spring and summer if adequate feed is supplied the remainder of the year. Supplementing range with quality feed or forage will increase calf gains and beef production while utilizing the native forage resource. About 0.6 acre per cow of well-maintained pasture effectively supplements both burned and unburned range.

In our study the use of summer-only supplemental pasture was compared to season-long supplementation. Both increased calf gains about 100 lb. over those from non-supplemented range, but calf gains in spring tended to favor season-long supplementation. Cows with access to improved pasture maintained their weights from year to year; those grazing only native range lost weight over the 3-year period of study.

Eight acres of burned range per cow was adequate while being supplemented with 0.6 acre of pasture, but this allowance was minimal under a moderate stand of timber. About 10 burned acres per cow, if unsupplemented in spring, seems preferable to insure adequate forage by keeping utilization of native herbage below 50%. Utilization of unburned range was negligible.

Cattle spent about 60% of their grazing time on the supplemental pasture. Availability of pasture did not affect the diet obtained from range in regard to species or to chemical composition.

There is no apparent advantage in withholding supplemental pasture until late season when native forage is least nutritious. Consequently, the supplemental improved pasture could be distributed through the forest range to serve also as firebreaks.

Evidently about 20 acres of pine-wiregrass forest range per cow, approximately  $\frac{1}{2}$  of it burned, sustains breeding herds from April to mid-September when the level of maintenance at other times is equivalent to a full feed of high-quality grass hay, thereby producing over 80% calf crops weighing 350–400 lb. at weaning. Cow weights are better maintained and calf weights are increased 100 lb. by supplementing the native range with about 0.6 acre per cow of improved pasture. Although these results apply to south Georgia, comparable responses could reasonably be expected elsewhere from pine-wiregrass

range dominated by forage species of limited quality.

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