Production of Cow-Calf Herds: Effect of Burning Native Range and Supplemental Feeding

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Highlight: *Two grazing trials of 4 and 6 years' duration were conducted to determine the effect of burning unimproved range and limited supplemental feed during the fall and winter on productivity of cow-calf herds. In a 4-year trial, burning one-fourth of the range in November and an additional fourth in January increased weaned calf production from 56% to 75% and calf gain per cow from 84 kg to 106 kg over cows on unburned range. Burning one-half the range plus supplemental feeding of either cane molasses, fresh sugarcane, or cottonseed pellets resulted in a weaned calf crop of 67%, 72%, and 77%, respectively, and yearly calf production of 102 kg, 111 kg, and 117 kg/cow. In another trial of 6 years' duration, one-half of each 64.8 ha experimental range was burned each fall and winter. Supplemental feeds given the five lots were: none, oranges, grapefruit, grapefruit plus cottonseed pellets, and citrus pellets. The average weaned calf crop for the five lots was 61% (unsupplemented), 62%, 72%, 69%, and 68%. The yearly calf production/cow was 107 kg, 111 kg, 128 kg, 122 kg, and 122 kg, respectively. Supplemental feeding increased calf production, but differences were not statistically significant because of too few animals. Supplemental feeding did not offer a reasonable return over burning alone when cost of feed and labor involved were considered.*

Native forage has been important to the beef cattle industry of Florida since Ponce de Leon brought the first cattle from Cuba 450 years ago. Univ. of Fla. Dare Report (1965) stated that in 1963 over 2.24 million ha of unimproved land was grazed by beef cattle and that in addition there was limited grazing on over 2 million ha of timber land. Native grasses contribute to the total 12-month forage program in many cow-calf operations. The most common vegetation on cut-over land of south and central Florida is pineland threeawn (*Aristida stricta*), more commonly known as wiregrass, and saw palmetto (*Serenoa repens*). According to Hilmon and Hughes (1965) wiregrass is not the most productive or palatable species on flatwood ranges. Yarlett (1965) found that wiregrass, even when burned and grazed, is not readily replaced by creeping bluestem (*Andropogon stolonifer*) until saw palmetto is controlled. The most successful way to replace wiregrass is reducing the stand of saw palmetto by chopping followed by good grazing management. Lewis (1970) states that wiregrass is less responsive to fertilization than creeping bluestem.

Becker et al. (1933) found that the new growth after burning wiregrass from a "healthy" range (one where cattle do not develop phosphorus or other mineral deficiency diseases) contained an average of 0.18% calcium and 0.13% phosphorus. Blaser et al. (1945) showed that the seasonal average composition of unburned native range grass was 0.12% calcium, 0.04% phosphorus and 2.8% crude protein on a dry basis. They reported the seasonal average of grass from a burned range to contain 0.18% calcium, 0.06% phosphorus and 3.9% protein. Similarly, unpublished data from the Ona Agricultural Research Center showed that 39 samples of wiregrass collected from 1945 to 1950 from unburned range averaged 3.7% protein; 39 samples from an area burned every year yielded 4.6% protein. Phosphorus content of the wiregrass from the two areas averaged 0.08% and 0.09%, respectively. These data show that wiregrass from an apparently healthy range did not contain the minimum quantity of crude protein and phosphorus required to meet the nutritional needs of producing beef cows.

Hughes (1972) reported that wiregrass growth on a fine sand, imperfectly drained, low fertility south Florida soil site, 1964-1968, was less than 561 kg/ha 4 months and about 786 kg/ha 7 months after burning. Wiregrass utilization was 63%, 52%, and 46% with a stocking rate of one cow per 6.1 ha, 8.9 ha, and 14.6 ha, respectively, 7 months after burning.

Wiregrass ranges are seldom if ever fertilized. Unpublished data show that fertilized wiregrass was replaced by carpet-

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grass (*Axonopus affinis*), common bahia (*Paspalum notatum*), broomsedge (*Andropogon virginicus*) and creeping bluestem during a 3-year trial, with lower cattle response compared to improved pasture species. Wiregrass is the most prevalent grass species on most native ranges in Florida in 1970.

Methods

Forage from unimproved Florida ranges is an important source of nutrients for beef cattle. The purpose of two grazing trials was to determine the effect of burning the native range each year and winter supplemental feed on productivity of cow-calf herds.

Three hundred and twenty-four ha of Florida unimproved flatwoods range were used in two consecutive year-round cow-calf grazing trials of 4 and 6 years duration. The area consisted mainly of Immokalee and Myakka fine sand soil types with numerous small ponds, typical of large areas of cut-over land in central and south Florida. Wiregrass predominated on the flatwoods, with several other grasses present on the higher and lower areas. Saw palmetto and scattered longleaf pine (*Pinus palustris*) characterized the experimental range area. The higher land provided the most forage in wet weather; pond areas were the most productive in dry seasons.

The area was divided into five units of 64.8 ha each to accommodate the five lots of cows used in each of the two trials. The same cows were kept on one range division during the supplemental period from November to March. All lots were put in one herd and rotated from range unit to range unit for the remainder of each year. The cows obtained all their roughage by grazing, except Lot 4 in Trial I, which were fed limited fresh sugarcane from November to March each year. The cows had free access to a mineral mixture (Becker et al., 1958) composed of 29% bonemeal, 29% defluorinated phosphate, 33.89% common salt, 3.39% red oxide of iron, 0.68% copper sulfate, 0.04% cobalt chloride, 2% cane molasses, and 2% cottonseed meal. Cow and calf weights were obtained at 28-day intervals.

Fire guards divided each 64.8 ha unit into four equal areas, and 16.2 ha in each was burned in late November and 16.2 ha in late January of each season in all areas except that occupied by Lot 1, control, in Trial I.

Trial I

Forty-six native and grade Brahman, Devon, and Hereford cows, 7 to 14 years old, were divided according to breeding, age, and weight in November 1943, into two uniform lots of 8 cows and three lots of 10 cows. There was a preliminary year, 1943-44, to accustom cows to the range treatment and supplemental feeding and a 4-year experimental period. The same cows remained on a specified winter range and feed supplement treatment throughout the 4 years of trial. Number of cows, treatment of range, and supplemental feed were as follows:

Lot 1. Eight cows on 64.8 ha unburned range, no supplemental feed.

Lot 2. Eight cows on 64.8 ha range, ¼ burned in November and ¼ burned in late January, no supplemental feed.

Lot 3. Ten cows on 64.8 ha range treated as for Lot 2 and fed limited cane molasses[1] for 135 days beginning in November.

Lot 4. Ten cows on 64.8 ha range treated as for Lot 2 and fed fresh sugarcane.

Lot 5. Ten cows on 64.8 ha range treated as for Lot 2 and fed limited cottonseed pellets.

Calves were weighed at birth. Herds 3, 4, and 5 were fed three times each week.

Trial II

Stocking rate was increased to 12 cows/64.8 ha of native range. Burning of half the range each year was practiced with all treatments, 16.2 ha in November and 16.2 ha in January of each year, the entire range area being burned each 2 years. Supplemental feeds provided from November to March for the 6 years were as follows:

Lot 1. No supplement.

Lot 2. Fresh oranges.

Lot 3. Fresh grapefruit.

Lot 4. Fresh grapefruit and cottonseed pellets.

Lot 5. Citrus pellets.[2]

Cull oranges, grapefruit, and citrus by-product feeds were selected as they were available and low priced, although considerable labor was involved in feeding the fresh fruit. Citrus pellets consisted of 40 parts citrus meal, 35 parts citrus molasses, and 25 parts cottonseed meal. Lot 4 was fed 0.23 kg cottonseed pellets daily/cow and Lot 5, 0.91 kg citrus pellets, both receiving the same amount of high protein feed. The cows in Lots 2, 3, 4, and 5 were fed three times a week in the 142-day supplemental period.

Sixty grade Brahman and Shorthorn cows varying from 2 to 6 years of age were divided into five uniform lots of 12 cows each on November 8, 1948, and removed from the experiment on November 8, 1954. The feed supplement given the 1948-49 fall and winter had no effect on number of calves born in 1949 but would influence their growth. Cows were in a single sire herd for the 120-day breeding season. Calves were graded as slaughter animals when weaned.

Statistical analyses of calf production among the five lots and sex ratio for each year were made by using the x^2 goodness-of-fit-test. Analysis of variance was used to evaluate 205-day calf weight differences among lots.

Table 1. Average production of cow-calf herds grazing burned and unburned native range, without supplements and when supplemented with cane molasses, fresh sugarcane, and cottonseed pellets.

Item	Pasture treatments and supplements				
		½ pasture burned each fall and winter			
	No burning and no supplement (Lot 1)[1]	No supplement (Lot 2)[1]	Cane molasses (Lot 3)	Fresh sugarcane (Lot 4)	Cottonseed pellets (Lot 5)
Supplements fed daily (kg/cow)[2]	–	–	3.0	3.3	0.6
Cows/pasture	8	8	10	10	10
Hectares/cow	8.1	8.1	6.5	6.5	6.5
Initial wt (kg)	372	357	367	364	351
Final wt (kg)	324	336	346	336	347
Weight loss (kg)	48	21	21	28	4
Calves					
Birth wt (kg)	29	28	30	29	29
Calf crop (%)	56	75	67	72	77
Weaning wt (kg)	150	142	151	153	150
Prod./cow (kg)	84	106	102	111	117
Prod./ha (kg)	10.4	13.1	15.7	17.1	18.0
Mineral/cow (kg)[3]	0.21	0.18	0.16	0.17	0.16

[1] Reported by Kirk and Hodges (1970).
[2] Fed for average of 135 days annually.
[3] Daily for entire year.

Results and Discussion

Trial I

The effect of experimental treatment on herd performance is summarized in Table 1. Fig. 1 shows Lot 3 cows eating cane molasses. The cows on unburned

[1] Furnished by United States Sugar Corporation, Clewiston, Florida.

[2] Furnished by Jackson Grain Company, Tampa, Florida.

Fig. 1. *Lot 3 cows, Trial I, eating cane molasses; unburned wiregrass in the background.*

Fig. 2. *Typical summer range showing cattle, wiregrass, and saw palmetto, Trial II.*

range lost the most weight in the four winter periods, those fed 0.6 kg cottonseed pellets daily lost the least.

Burning half the native range increased the average yearly calf crop percentage from 56 to 75. Lot 2 had higher quality forage during the winter from new grass growth after burning and the cattle responded with increases of 19% weaned calf crop, 2.7 kg calf weight/ha of range and 22 kg calf weight/cow compared to the control.

Feeding cane molasses or sugarcane at the higher stocking rate of 6.5 ha/cow on burned range yielded calf crops 8 and 3 percentage points lower than for the no supplemental treatment stocked at 8.1 ha/cow while cows fed cottonseed pellets had a weaned calf crop two percentage points higher. Supplemental feeding combined with burning did not significantly change the percentage of weaned calves over that of burning pasture alone.

Yearly calf production/cow was lowest on unburned range and highest on burned range supplemented with cottonseed pellets. The increase in production/ha over the control group was 26%, 51%, 64%, and 73% for Lots 2, 3, 4, and 5, respectively. The 25% heavier stocking rate, supplemental feeding, plus burning compared with burning alone increased calf gain/ha 20% for those fed molasses, 31% for cows fed sugarcane, and 37% for cows fed cottonseed pellets.

There was no indication of mineral deficiency diseases in the herd. It is calculated that the average mineral mixture (Becker et al., 1958) eaten yearly by cows in Lot 1 supplied 5.4 kg calcium, 2.4 kg phosphorus, 11.6 kg common salt, 1.2 kg red oxide of iron, 0.23 kg copper sulfate, and 0.014 kg cobalt chloride. These amounts plus the minerals in forage appeared to meet the needs of cows for these essential elements. Kirk and Davis (1970) showed that burning of pasture and supplemental feeding did not affect blood phosphorus, calcium, hemoglobin, and hematocrit values for these cows.

New growth of wiregrass after burning in March was sparse but it was not mixed with mature forage. Cows grazing unburned range were unable to separate the new spring growth of wiregrass from the mature forage, resulting in a lower nutrient intake. This occurred during the breeding season, and fewer cows grazing unburned wiregrass came into estrus. The result was a reduced weaned calf crop the next season.

Trial II

There were no cow death losses during the experiment, but two cows had to be replaced due to injury. Calf losses were 1.7%. Six-year production results are summarized in Table 2. A typical summer range is shown in Figure 2.

Cows did not consume the offered daily ration of 4.5 kg of oranges after the first few days of feeding in 1948. For

Table 2. Average production data for cow-calf herds grazing native range one-half burned each fall and winter when supplemented with oranges, grapefruit, grapefruit plus cottonseed pellets, and citrus pellets.

Item	Supplements fed[1] None (Lot 1)	Oranges (Lot 2)	Grapefruit (Lot 3)	Grapefruit + CS pellets (Lot 4)	Citrus pellets (Lot 5)
Supplements fed daily (kg/cow)[1]	–	3.2	4.8	4.7 fruit 0.23 pellets	0.91
Cow/pasture	12	12	12	12	12
Initial wt (kg)	368	368	368	368	368
Final wt (kg)	445	458	429	427	459
Weight increase (kg)	77	90	61	59	91
Calves					
Calf crop (%)[2]	61	62	72	69	68
Weaning wt (kg)	175	177	178	176	179
205-day wt (kg)	172	175	176	177	176
Prod./cow (kg)	107	111	128	122	122
Prod./ha (kg)	19.8	20.6	23.7	22.6	22.5
Slaughter grade[3]	9	8	8	9	8
Mineral/cow (kg)[4]	0.06	0.06	0.06	0.05	0.05
Feed/kg calf gain increase over control (kg)	–	49	30	41 fruit 2.1 pellets	7.9

[1] Fed for an average of 142 days annually.
[2] Differences are not statistically significant.
[3] Slaughter grades: 8, High Standard; 9, Low Good.
[4] Daily for entire year.

this reason, oranges were fed in bunks, which prevented manure contamination and lessened bird damage of fruit. Essential oil in peel lowered palatability of oranges and reduced average daily consumption per cow to 3.2 kg. Two cows were observed in temporary distress from a small orange lodging in their gullet, but they swallowed the fruit within a few minutes. Grapefruit was eaten in less than two hours after feeding, even when a 3-day supply was given at one feeding.

In the 6 years the control cows averaged a 61% weaned calf crop and those fed fresh grapefruit 72%. The number of weaned calves ranged from two for Lot 2 in 1954 to 12 calves for each of Lots 2, 3, and 5 in 1951. Fifty-seven of the 60 cows weaned calves in 1951, which is unusually high for cows on native range. McCaleb and Hodges (1960) showed that moisture conditions were favorable for growth of native range species in the breeding season preceding the high calf crop.

There were no significant differences in weaning and 205-day weights in the five lots. Yearly calf gain per cow and per ha were positively correlated with number of calves weaned. Supplemental feeding of Lots 2, 3, 4, and 5 for 6 years increased calf gain per cow and per ha of range 4%, 20%, 14%, and 14%, respectively, over Lot 1 on pasture alone; a nonsignificant response because of the limited number of cows. Grapefruit supplemented fall and winter forage more adequately than either oranges, combination of grapefruit and cottonseed pellets, or citrus pellets. Average daily mineral consumption/cow ranged from 0.05 to 0.06 kg, one-third the amount eaten by the cows in Trial I.

In a later study Kirk et al. (1963) reported that 60 Shorthorn and Brahman cows were kept on this same native range, with half burned each year from 1955 to 1958. They were given winter feed of pangolagrass hay and cottonseed pellets. These cows had a 62% weaned calf crop with the calves averaging 151.4 kg at 205-days of age, equivalent to 17.4 kg yearly calf production/ha of native range and 94 kg/cow. These production results were 14% lower than for the control cows in this experiment.

The greater response of the cow herds in Trial II over Trial I, as shown by percentage weaned calf crop and production per cow and per ha of range, was due to the native and grade cows being less productive stock in Trial I and stocking of pastures at a heavier rate in Trial II.

Table 3. Average initial, final, and monthly weight (kg) of cows for 6 years (Trial II).

	Lot number					
	1	2	3	4	5	Avg
Initial weight	368	368	368	368	368	368
Final weight	445	458	429	427	459	444
November	379	390	379	376	383	381
March	395	373	370	380	379	379
June	352	370	357	384	371	367
September	370	405	386	388	404	391

The average initial, final, and seasonal weights for the 6 years are shown in Table 3. The important factors in weight change were the number of cows which nursed calves and cows pregnant in November. Average gain/cow in the 6 years was 76 kg, ranging from 59 kg for Lot 4 to 92 kg for Lot 5. Only 19 of the 60 cows nursed calves in 1954, and close observation showed that most of the cows were pregnant (no record of the 1955 calf crop), a reason for the heavier final weight. The cows were from 2 to 6 years old initially and many of them grew and matured while on experiment, another reason for the greater final weight. Each year it was apparent that the cows given feed were more thrifty than those on native pasture alone.

Conclusions

The results of the two completed cow-calf wiregrass grazing trials (1944 to 1954) have either positive or negative application to present-day conditions. It has long been recognized that new wiregrass growth after burning was sparse, palatable, and nutritious and cow-calf herds responded with increased production if the range was not over-stocked. As the wiregrass matured, cattle response was reduced, with loss in weight usually beginning in October. Wiregrass is the most prevalent forage species on the 2 million ha of Florida unimproved range, although there has been some invasion by carpetgrass, creeping bluestem, and Bahia varieties on the more fertile upland soil areas.

There is less burning of wiregrass in the present decade than 25 years earlier. On many well managed ranches wiregrass forage supplements improved pastures by providing low quality forage for cows after their calves are weaned.

High production costs and feed prices have eliminated fresh sugarcane and cottonseed pellets as supplemental feeds for range herds. Cull oranges and grapefruit were frequently fed to cattle when citrus prices were low. They are now processed for juice with bruised fruit and skins, rag, and seeds from citrus canning plants processed for cattle feed.

Two of the most important feeds available to cattlemen are products from the Florida sugar and citrus industries. Large quantities of cane molasses, frequently fortified with urea, minerals, vitamins, and antibiotics, are self-fed to grazing herds. Production of citrus feeds in 1971-72[3] was 657,843 tons of dried pulp and 47,478 tons of molasses. These energy-rich citrus products, whether fortified with either natural protein or urea, are available as winter supplemental feeds for cow-calf herds grazing wiregrass ranges or improved pastures.

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[3] Furnished by Florida Canners Association, Winter Haven, Florida.