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

W. G. KIRK, E. M. HODGES, F. M. PEACOCK, L. L. YARLETT, AND F. G. MARTIN

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. 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-
grasses (Axonopus affinis), common bahia (Paspalum notatum), broom sedge (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 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% bone meal, 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:

<table>
<thead>
<tr>
<th>Lot</th>
<th>Cows/pasture</th>
<th>Hectares/cow</th>
<th>Initial wt (kg)</th>
<th>Final wt (kg)</th>
<th>Weight loss (kg)</th>
<th>Calves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lot 1</td>
<td>8</td>
<td>8.1</td>
<td>372</td>
<td>324</td>
<td>48</td>
<td>Birth wt (kg) 29</td>
</tr>
<tr>
<td>Lot 2</td>
<td>10</td>
<td>8.1</td>
<td>357</td>
<td>336</td>
<td>21</td>
<td>Calf crop (%) 56</td>
</tr>
<tr>
<td>Lot 3</td>
<td>10</td>
<td>10.6</td>
<td>367</td>
<td>346</td>
<td>28</td>
<td>Weaning wt (kg) 150</td>
</tr>
<tr>
<td>Lot 4</td>
<td>10</td>
<td>6.5</td>
<td>364</td>
<td>336</td>
<td>28</td>
<td>Prod./cows (kg) 84</td>
</tr>
<tr>
<td>Lot 5</td>
<td>10</td>
<td>6.5</td>
<td>351</td>
<td>347</td>
<td>28</td>
<td>Prod./ha (kg) 10.4</td>
</tr>
</tbody>
</table>

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. Pasture treatments and supplements

<table>
<thead>
<tr>
<th>Item</th>
<th>No burning</th>
<th>No supplement</th>
<th>Cane molasses</th>
<th>Fresh sugarcane</th>
<th>Cottonseed pellets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow wt (kg)</td>
<td>372</td>
<td>357</td>
<td>367</td>
<td>364</td>
<td>351</td>
</tr>
<tr>
<td>Hectares/cow</td>
<td>8.1</td>
<td>8.1</td>
<td>10.6</td>
<td>10.6</td>
<td>6.6</td>
</tr>
<tr>
<td>Initial wt (kg)</td>
<td>372</td>
<td>357</td>
<td>367</td>
<td>364</td>
<td>351</td>
</tr>
<tr>
<td>Final wt (kg)</td>
<td>324</td>
<td>336</td>
<td>346</td>
<td>336</td>
<td>347</td>
</tr>
<tr>
<td>Weight loss (kg)</td>
<td>48</td>
<td>21</td>
<td>21</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>Calves</td>
<td>Birth wt (kg) 29</td>
<td>Calf crop (%) 56</td>
<td>Weaning wt (kg) 150</td>
<td>Prod./cows (kg) 84</td>
<td>Prod./ha (kg) 10.4</td>
</tr>
<tr>
<td>Mineral/cow (kg)</td>
<td>0.21</td>
<td>0.18</td>
<td>0.16</td>
<td>0.17</td>
<td>0.16</td>
</tr>
</tbody>
</table>

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

Lot 5. Citrus pellets.

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.

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
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.

<table>
<thead>
<tr>
<th>Item</th>
<th>None (Lot 1)</th>
<th>Oranges (Lot 2)</th>
<th>Grapefruit (Lot 3)</th>
<th>Grapefruit + CS pellets (Lot 4)</th>
<th>Citrus pellets (Lot 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplements fed daily (kg/cow)</td>
<td>—</td>
<td>3.2</td>
<td>4.8</td>
<td>4.7 fruit 0.23 pellets</td>
<td>0.91</td>
</tr>
<tr>
<td>Cow/pasture</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Initial wt (kg)</td>
<td>368</td>
<td>368</td>
<td>368</td>
<td>368</td>
<td>368</td>
</tr>
<tr>
<td>Final wt (kg)</td>
<td>445</td>
<td>458</td>
<td>429</td>
<td>427</td>
<td>459</td>
</tr>
<tr>
<td>Weight increase (kg)</td>
<td>77</td>
<td>90</td>
<td>61</td>
<td>59</td>
<td>91</td>
</tr>
<tr>
<td>Calves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calf crop (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weaning wt (kg)</td>
<td>175</td>
<td>177</td>
<td>178</td>
<td>176</td>
<td>179</td>
</tr>
<tr>
<td>205-day wt (kg)</td>
<td>172</td>
<td>175</td>
<td>176</td>
<td>177</td>
<td>176</td>
</tr>
<tr>
<td>Prod./cow (kg)</td>
<td>107</td>
<td>111</td>
<td>128</td>
<td>122</td>
<td>122</td>
</tr>
<tr>
<td>Prod./ha (kg)</td>
<td>19.8</td>
<td>20.6</td>
<td>23.7</td>
<td>22.6</td>
<td>22.5</td>
</tr>
<tr>
<td>Slaughter grade$^3$</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Feed/kg calf gain increase over control (kg)</td>
<td></td>
<td>49</td>
<td>30</td>
<td>41 fruit 2.1 pellets</td>
<td></td>
</tr>
</tbody>
</table>

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.
were observed in temporary distress from which prevented manure contamination aged a 61% weaned calf crop and those weaned calves ranged from two for Lot 2 this reason, oranges were fed in bunks, and lessened bird damage of fruit. Essence-
and 5 in 1951. Fifty-seven of the 60 cows 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 five lots. Yearly calf gain per cow and pel-
tlets. Average daily mineral consump-
tion/cow ranged from 0.05 to 0.06 kg, to present-day conditions. It has been recognized that new wiregrass to present-day conditions. It has long
been recognized that new wiregrass growth after burning was sparse, palatable, and nutritious and cow-calf herds respon-
ding with increased production if the range was not over-stocked. As the wire-
growth matured, cattle response was re-
duced, with loss in weight usually begin-
ing in October. Wiregrass is the most
prevalent forage species on the 2 million
ha of Florida unimproved range, although
improved pastures. Cull oranges and grapefruit have eliminated fresh sugarcane and cot-
tains from citrus canning plants pro-
cessed for cattle feed.

Two of the most important feeds avail-
able to cattlemen are products from the Florida sugar and citrus industries. Large quantities of cane molasses, frequently fortified with urea, minerals, vitamins, and antibodies, are self-fed to grazing herds. Production of citrus feeds in 1971-
72 was 65,843 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.

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

<table>
<thead>
<tr>
<th>Lot number</th>
<th>Avg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial weight</td>
<td>368 368 368 368 368 368</td>
</tr>
<tr>
<td>Final weight</td>
<td>445 458 429 427 459 444</td>
</tr>
<tr>
<td>November</td>
<td>379 390 379 376 383 381</td>
</tr>
<tr>
<td>March</td>
<td>395 373 370 380 379 379</td>
</tr>
<tr>
<td>June</td>
<td>352 370 357 384 371 367</td>
</tr>
<tr>
<td>September</td>
<td>370 405 386 388 404 391</td>
</tr>
</tbody>
</table>

of pastures at a heavier rate in Trial II.
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 re-
responded with increased production if the range was not over-stocked. As the wire-
growth matured, cattle response was re-
duced, with loss in weight usually begin-
ing in October. Wiregrass is the most
prevalent forage species on the 2 million
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