UNIVERSITY OF FLORIDA

Agricultural Experiment Station
Institute of Food and Agricultural Sciences

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Range Cattle REC, Research Report RC-2004-3

Cattle and Forage Field Day

October 14, 2004
Ona, Florida

Range Cattle REC Field Day 2004

The University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS) extends a cordial welcome to all ranchers, forage producers and industry representatives attending the 2004 Range Cattle Research and Education Center Field Day.

The importance of research and the extension of information is never more evident than what has occurred during the five week period in August and September 2004 in which three major hurricanes made landfall on Florida shores. UF/IFAS has evaluated and released grasses that perform well in wet areas. The importance of animal identification and record keeping becomes most helpful in sorting out animal ownership and herd make-up. The importance of developing and evaluating breeding seasons such that calves are born, raised, weaned and marketed during periods least impacted by summer and early fall hurricanes, and torrential rains common to south Florida.

It is the purpose of UF/IFAS to help Florida expand domestic and international business, enhance natural resources, provide consumers with a wide variety of safe and affordable food, support community development, maintain a sustainable food and fiber system, conserve and improve environmental quality, and improve the quality of life.

It is the purpose of UF/IFAS to develop and distribute research information that will keep Florida agriculture profitable and sustainable. The information presented at this field day emphasizes this commitment.

Findlay Pate
Center Director

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10:00	**UF / IFAS, Range Cattle REC Importance to Florida's Cattle Industry** *Mike Milicevic*
10:20	**Cow and Calf Gains on Creeping Signalgrass and Bahiagrass** *Rob Kalmbacher*
10:40	**Effects of Liming and Nitrogen Fertilization on Bahiagrass Decline** *Martin Adjei*
11:00	**Forage / Cow-Calf Production in Slash Pine – Bahiagrass Silvopasture** *Ike Ezenwa*
11:20	**Limpograss Options for South Florida Cattlemen: Stockpiled Forage, Hay, and Round-Bale Silage** *John Arthington*
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P.M.	
12:00	**Steak Lunch**
1:00	**Field Tour**
3:00	**Adjourn**

COW AND CALF GAINS ON CREEPING SIGNALGRASS AND BAHIAGRASS

R.S. Kalmbacher, J.D. Arthington, and F.M. Pate

The Florida cow-calf industry has historically been based on relatively large pastures with minimal input. While several perennial grasses are commonly grown in pasture, bahiagrass fits well in a system of extensive management and is the major perennial pasture grass with 2.5 million acres state-wide. However, the loss of almost 100,000 acres of bahiagrass in the mid-1990s to tawny mole cricket highlighted the need to identify other grasses with qualities similar to bahiagrass.

Brachiaria grasses have greatly increased the productivity of grazing lands on the infertile, acid soils that cover up to 170 million acres in Brazil. They are high-yielding grasses with reasonable nutritive value. Creeping signalgrass (*Urochloa humidicola*, syn. *Brachiaria humidicola*), a highly stoloniferous species, is sown on about 3% of that area where low soil fertility, imperfect drainage, and extensive management predominate. It shares many of the desirable characteristics of bahiagrass: produces moderate yield with low soil fertility, establishes from seed, and persists with frequent, close grazing. Although creeping signalgrass does not tolerate the wide range of soil conditions and temperatures that bahiagrass does, it is adapted to the wet, infertile soils of the warmer central and south Florida, where the majority of the state's cattle are produced.

Creeping signalgrass was tested in clipping and mob-grazing trials at the Range Cattle Research and Education Center (REC) and further south at the Immokalee REC. However, there has been no measurement of livestock production on creeping signalgrass.

METHODS AND MATERIALS

In June 1998, three of six, 5-acre pastures were randomly selected and sown to either creeping signalgrass (Naterra Seed Co., Brazil) or Pensacola bahiagrass at 10 and 20 lb seed/acre, respectively. During the trial, grasses were fertilized once annually with 50 lb N/acre in the spring. Beginning in May 2000 to May 2003, each pasture was stocked with five, pregnant Brangus cows and their calves (1 cow-calf pair/acre). Cattle were rotated weekly among four, 1.25 acre paddocks in each of the six, 5-acre pastures from May to October.

Cows and calves were weighed the first week of August when calves were weaned and removed. Each group of five cows returned to their previously assigned pastures where they remained until the end of October when they were weighed again.

Calf weights were adjusted for sex and mean age at the respective weigh dates. At May, August, and October weigh dates, cows received a body condition score (BCS).

Scores were visual evaluations based on a range of 1 to 9 with 1 = very thin cows and 9 = very fat cows.

Forage production was determined every 28 d from May to October and available forage was measured weekly from May to October on the day cattle were rotated into successive 1.25 acre paddocks. Hand-plucked samples of grass, which simulated what cattle were eating, were taken for crude protein and in vitro dry matter digestion (IVOMD) determination.

RESULTS

Climatological

Rainfall during the grazing season and temperature in the winter preceding each grazing season varied widely over the 4 yr (Table 1). The driest year on record (62 yr) at the Range Cattle REC was 2000, which was preceded by a relatively warm winter. In contrast, May to October 2001 was the wettest of the 4 yr, and it was preceded by a very cold winter. There were 17 instances of frost from 22 Nov. 2000 to 19 Apr. 2001 with a minimum 23^{O} F, and signalgrass was severely injured. The remaining 2002 and 2003 had more rainfall than that of the 62-yr mean with winter temperatures similar to the norm.

Table 1. Rainfall in the May to October grazing periods, and number of incidences of frost and minimum temperatures in the November-April period before each grazing season.

	Rainfall							Temperature	
Year	May	June	July	Aug.	Sept.	Oct.	Total	Frost†	Minimum‡
	inches							-- no.--	--°F--
2000	0.05	3.78	4.50	5.25	8.03	2.23	23.84	3	30
2001	1.30	10.58	14.26	10.11	17.76	2.38	56.39	17	23
2002	1.28	13.85	11.05	12.25	5.46	3.14	47.03	7	28
2003	5.36	15.80	4.51	10.09	11.04	1.14	47.94	6	28
62-yr	3.71	8.58	8.51	8.10	7.34	3.10	39.34	8.9	27

† Number of instances.

‡ Minimum temperature recorded in each of 4 yr compared with the mean annual minimum temperature over 62 yr.

Cattle

Cows

At weaning in August, cow weight and BCS tended to be greater on creeping signalgrass compared with bahiagrass pastures (Table 2). At the end of grazing in October, cow weight depended on both grass and year (Table 2). For creeping signalgrass, cow weight in October was affected by year while there were no year effects for final cow weights on bahiagrass. With the exception of 2001 when the grazing season was shortened to allow creeping signalgrass recovery after the freeze, cows from signalgrass pastures weighed more than cows from bahiagrass. Cows grazing creeping signalgrass had higher BCS in October compared with cows grazing bahiagrass (Table 2).

Calves

At weaning in August, calf weights and average daily gain (ADG) tended to be greater on signalgrass than bahiagrass (Table 2). Mean age of calves at weaning was 261, 262, 267, and 273 days for 2000 to 2003, respectively. Average daily gain from May to August was affected by year with the ranking: 2000 = 2002 > 2001 = 2003. Note that 2000 was the driest year (Table 1).

Table 2. Effect of grass pasture on various cow and calf responses. 4-year means.

	Grass		
Response	Signalgrass	Bahiagrass	P[†]
Cow weight, May (lb)	1136	1132	0.82
Body condition[‡], May	4.8	4.9	0.52
Cow weight, August (weaning) (lb)	1139	1085	0.07
Body condition[‡], August	5.3	4.7	0.06
Cow weight[§], October (lb)			
2000	1309 a	1140 a	0.0001
2001	1179 b	1151 a	0.37
2002	1310 a	1173 a	0.0006
2003	1165 b	1079 a	0.01
Body condition[‡], October	5.7	4.7	0.01
Calf weight[#], May (lb)	433	434	0.94
Calf weight[#], August (weaning) (lb)	549	519	0.13
Calf average daily gain (lb/day)	0.66	0.48	0.07

[†] Probability of a difference between grasses.
[‡] Body condition score 1= very thin cows, 9= very fat cows.
[§] Grass x year interaction (P=0.01). Within grasses, means over years followed by the same letter are not different (P>0.05, LSD).
[#] Adjusted for sex and mean age.

Forage Production and Available Forage

Bahiagrass forage production exceeded that of signalgrass from May to June, but the reverse was true for July to October (Fig. 1a). The greatest incremental increase in production for creeping signalgrass was 2700 lb DM/acre which occurred between June (1220 lb DM/acre) and July (3920 lb DM/acre). Much of this was from stems and seed heads. The comparable increase in accumulation for bahiagrass was 1100 lb DM/acre. Between August and October, month to month production was similar between grasses. Annual production was greater for creeping signalgrass (8740 lb DM/acre) than bahiagrass (7520 lb DM/acre).

Available forage was similar for grasses in May and June, but for July through October, there was more available forage in creeping signalgrass than bahiagrass pastures (Fig. 1b). After July, much of the forage from creeping signalgrass was stem which formed a residual stubble layer. During the 1-wk grazing periods, cattle ate mostly leaves that had regrown on the stubble layer during the 21-d rest periods.

Nutritive Value

Crude protein in bahiagrass was 11% in May, and it increased above 12% in June followed by a decline to < 10% in September (Fig. 2a). There was a trend for crude protein in bahiagrass to increase in October. Crude protein in creeping signalgrass was always significantly lower than that in bahiagrass. Crude protein in creeping signalgrass was highest in June (11%) and lowest in September (< 8%).

Creeping signalgrass IVOMD was always greater than that of bahiagrass (Fig. 2b). Greatest IVOMD for creeping signalgrass was 57% in June and lowest IVOMD was to 53% in October. Bahiagrass IVOMD reached a maximum of 50% in July, then declined to 45% in October.

Ground Cover and Insects

Following the 2001winter freeze, signalgrass live-plant cover in April averaged 52%. By late-June 2001, creeping signalgrass ground cover had increased to 85%. Except for the freeze, signalgrass maintained relatively good ground cover throughout the trial. Bahiagrass was the major weed in creeping signalgrass pastures followed by common bermudagrass. Weed presence was more obvious in dry spring months, but following rain in June and the resumption of creeping signalgrass growth, weeds contributed essentially nothing to available forage.

Spittlebug larvae and their spittle masses were found from June to October on creeping signalgrass. Their occurrence was patchy, and populations varied with year. No insects pests were noted above ground on bahiagrass, but mole crickets were found in traps in pastures of both grasses.

PRACTICAL APPLICATION

Cattle

The comparatively good weight gains of cows grazing signalgrass in the 3-month period after weaning is important because of the need for cows to regain body condition prior to calving, which can be difficult to achieve on bahiagrass in late summer. Body condition at calving is the determining factor influencing return to estrus and pregnancy in beef cows. Abundant rain coupled with mature bahiagrass tend to lower cow-weight gain in late summer and early fall. Creeping signalgrass, a low-input grass on a par with bahiagrass, may have an advantage over the less nutritious bahiagrass and the more nutritious grasses requiring costly management.

Mean calf weaning weights from creeping signalgrass were not substantially greater than bahiagrass. The difference between grasses was minimized because of the relatively short time calves were on trial. Also, a nursing calf is buffered by milk from the cow, so nutritional aspects of pasture prior to weaning may affect cows more than calves.

The difference in calf ADG between grasses for the period these calves were on trial favors creeping signalgrass. Provided cows are in good body condition (BCS > 5), which signalgrass cows were in August, fall-calving cows could nurse calves for an additional 2 months beyond the standard weaning age of 7 to 8 months. In years when calf prices are high, keeping cows and calves on creeping signalgrass for an additional 60 days could be profitable. This assumes calf ADG would continue at the same rate after early August, however the decline in protein in creeping signalgrass could limit calf growth in August to September. Also, calf ADG may be lower in years with high rainfall.

Forage Production

Annual production on both grasses was abundant, but there were problems with rate and time of growth and the composition of grass growth. In one of the early publications from the Range Cattle Station, Dr. Elver Hodges declared that the major problem with bahiagrass as 'inefficient use of the rapidly-maturing forage'. In this regard, creeping signalgrass intensifies the rate and timing problem because 30% of annual growth came in a 30-day period beginning with the start of summer rain. Much of this is low-quality reproductive growth that is difficult to utilize under grazing. A stiff, residual, straw-like stubble-layer formed by August, and remained for the duration of the grazing season.

To utilize the flush of growth, stocking density on creeping signalgrass should be temporarily increased at the start of the rainy season. Bahiagrass also has a variable growth rate that creates a problem with proper grazing management, but cattlemen can overlook it. However, it is not likely that creeping signalgrass will meet rancher expectations with set-stocked pastures. Where signalgrass is in commercial use, such as at Deseret Cattle & Citrus, underutilization of early summer growth is a major problem.

While neither grass is really productive in April and May, bahiagrass has an advantage with about 12-18% of annual production in these months. Bahiagrass will respond to a little rain, but signalgrass is essentially nonproductive in April and early May.

Persistence and Adaptability

The greatest impediment to signalgrass persistence will be cold. Based on 62-yr means at the Range Cattle REC, the 23^{o} F freeze we experienced in 2001 has occurred in 1of 6 yr. While a winter freeze may not eliminate creeping signalgrass due to the strong stoloniferous habit of growth, cold will render a pasture unproductive and open to weed growth until mid-summer. The first pasture sown to signalgrass was 300 acres at Deseret in 1996, and that pasture has persisted for 8 yr. We suggest that planting of creeping signalgrass pasture be restricted to the Florida peninsula south of Orlando.

While signalgrass is noted to be tolerant of intermittent flooding, we found it had little more tolerance of flooding than bahiagrass. Signalgrass did not grow in ditches and depressions where water (2 inches) remained for several weeks. Signalgrass is not adapted to dry sites.

Spittlebugs could almost always be found somewhere in signalgrass pastures throughout the rainy season. While signalgrass is tolerant, it is not resistant to spittlebugs. The possibility remains that spittlebug could weaken signalgrass pasture just as it does for limpograss pasture in central Florida.

CONCLUSIONS

Although creeping signalgrass has nutritional advantages over bahiagrass, lack of cold tolerance, limited growth prior to June, and excessive growth in July are the main problems that render signalgrass inferior to bahiagrass. Creeping signalgrass could be a valuable part of a bahiagrass-based pasture program on ranches south of Orlando because signalgrass can provide for greater cow weight gain between weaning and calving. It offers the possibility of providing good grazing for fall-calving cows nursing calves for up to 2 months beyond the standard weaning age of 7 to 8 months of age.

Fig. 1. (a) Cumulative forage production of creeping signalgrass and bahiagrass and (b) Available forage. Means of 2000-2003.

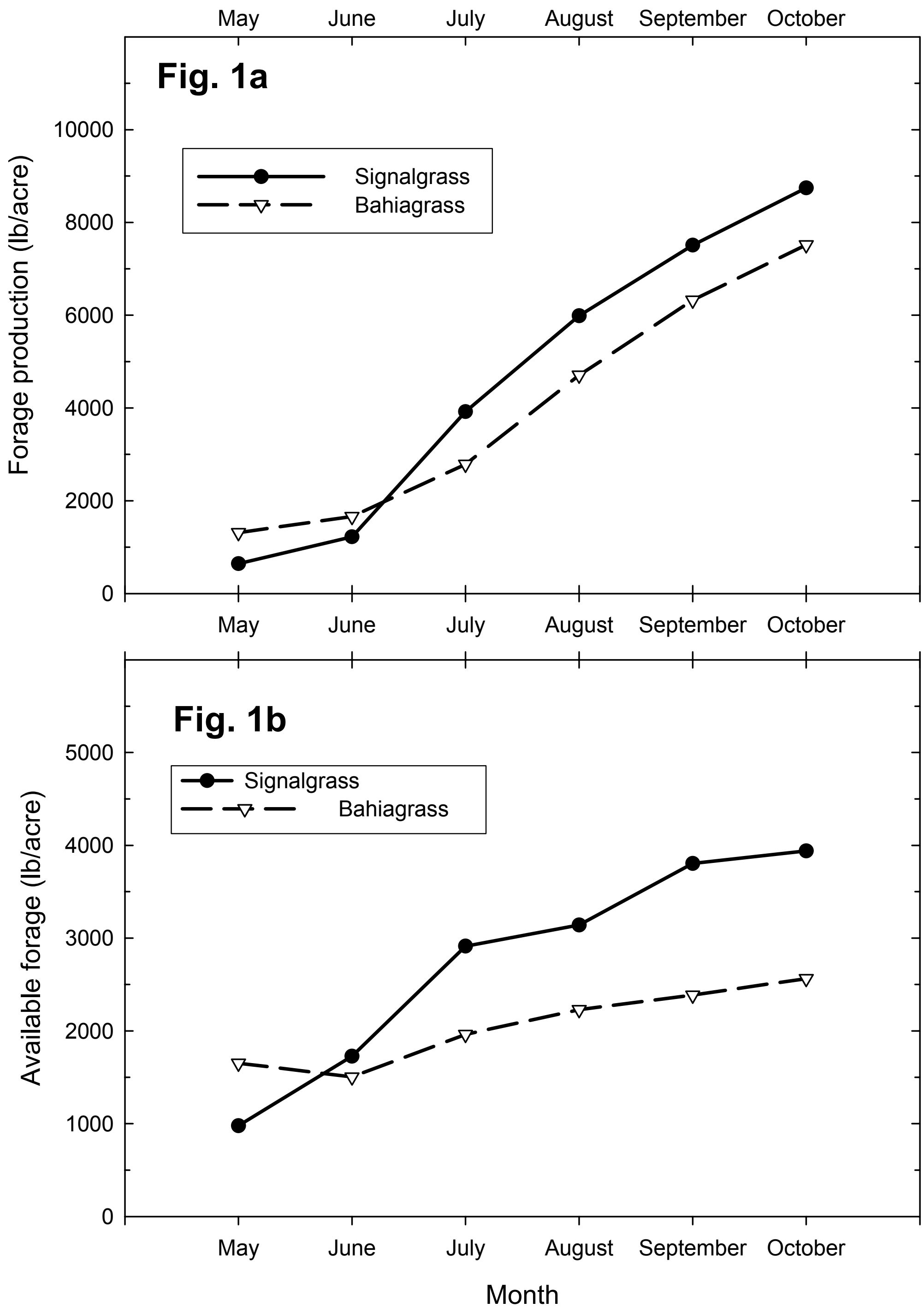
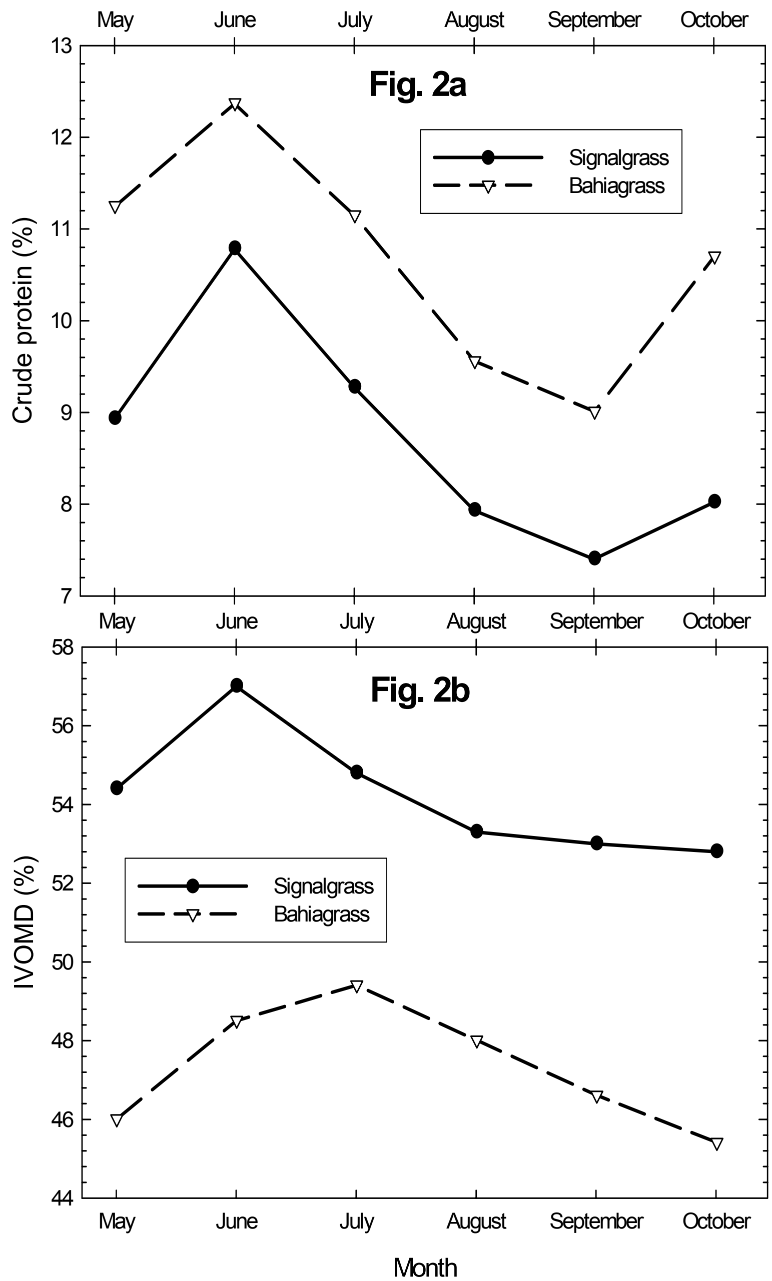


Fig. 2. Nutritive value of creeping signalgrass and bahiagrass (a) Crude protein and (b) In vitro organic matter digestibility (IVOMD). Means of 2000-2003.



NOTES:

EFFECTS OF LIMING AND NITROGEN FERTILIZATION ON BAHIAGRASS DECLINE

Martin B. Adjei

Bahiagrass decline, a major problem with our premier pasture grass, usually begins with yellowing of pasture in small or big patches. Later, affected areas turn brown and die and are normally associated with the borrowing and tunneling activity of mole crickets. On damaged areas with high mole cricket population, the surface 6 to 10 inches of soil layer is honeycombed with numerous mole cricket galleries and the ground feels spongy when stepped on. Severely damaged pasture has virtually no root system and is easily pulled from the soil by cattle or foot traffic in a pasture. Research and surveys conducted throughout south central Florida implicate pasture and grazing management factors in mole cricket induced bahiagrass decline.

Nutritional Factors

<u>Soil acidity (pH):</u> Soil acidity refers to the concentration of active hydrogen ions (H^+) in the soil. It is measured by an index called pH. The lower the pH, the more active hydrogen ions are present and the more acid the system. A pH of 7 (as is the case for distilled water) is neutral ($H^+ = OH^-$), and for soil, a pH of 7 is too high for most forages grown in Florida. A pH of 5 to 6 is slightly acidic and satisfactory for most Florida forages to grow. A pH of 4 is too low or very acid and will result in poor root growth or function of most Florida forages.

<u>Nitrogen (N) Fertilization:</u> Soil acidity tends to increase with repeated use of N fertilization, and liming with calcium or calcium/magnesium compounds capable of reducing soil acidity becomes necessary. For example, it requires 60 pounds (lb) of lime to neutralize the acidity from 100 lb of ammonium nitrate and 110 lb of lime to neutralize the acidity from 100 lb of ammonium sulfate. Increasing soil acidity to pH less than 5 can reduce the availability of boron, molybdenum and sulfur in the soil, reduce pasture production by more than a third, regardless of N fertilization, and predispose grass to yellowing and damage by soil-born insects.

Experiment

In one of our multi-county trials, the Range Cattle Research and Education Center decided to evaluate the long-term combined effect of liming and N-fertilization on bahiagrass pasture performance. We applied three types of fertilizer and a control (no fertilizer) annually to portions of bahiagrass pasture that were either limed to maintain a pH of 5.0 or not limed at a pH of about 4.3. The four fertilizer treatments applied every spring from 1998 to present were: 1) 60 lb/A of N from ammonium sulfate (N), 2) 60-25-60 lb/A of N-P_2O_5-K_2O from ammonium sulfate, triple super phosphate and muriate of potash (NPK), 3) 60-25-60 lb/A of N-P_2O_5-K_2O plus 20 lb/A of a Frit Industries Inc. micro-nutrients mix which contained B, Cu, Mo, Fe, Mn, Mo and Zn (NPKM), 4) no fertilizer control (Cont.). About a ton of lime was applied every two to three years to maintain a pH of 5 on limed areas. Bahiagrass performance was measured by dry matter yield, crude protein content, forage digestibility, and condition of bahiagrass ground cover in spring.

Dry Matter Yield

Effect of Lime

On one of the pastures at Ona (pasture 71A) and in Pasco and Manatee sites, forage yield was not affected by liming to a pH of 5 throughout the 3-5 years (Fig. 1). The no-lime plots at these sites retained a pH of about 4.5 for the entire period. However, lime treatment increased bahiagrass forage yield by 24% across all fertilizer treatments on pasture 87 at Ona where the no-lime, fertilized plots showed a pH decline to about 4.3 (Fig. 1).

Effect of fertilizer

Yield increase from fertilizer application compared with non-fertilized control ranged from 18% on the Manatee site to 31% on the Pasco site with the Ona (Hardee) sites in the middle. However, we hardly noticed any clear differences in forage yield among the N, NPK and NPKM fertilizer treatments on the two Hardee pastures and on the Manatee pasture (Fig. 1). On the other hand, forage DM yield increased by 10% when the NPK and NPKM treatments were applied compared with the N only treatment on the deep sandy soil at the Pasco site.

Nutritive Value

Lime application had little to no effect on seasonal average crude protein content or digestibility (IVOMD) of bahiagrass forage but seasonal crude protein content increased by about 2% units (12% vs. 10%) with the application of any fertilizer containing N. This protein enhancement attribute of N was greater immediately after N application in spring and diminished with time through the season. Forage IVOMD for the no-fertilizer control was always among the lowest (47%) although improvement with N application varied from site to site.

Spring Vegetative Ground Cover

Effect of lime and Fertilizer

At the beginning of grazing in spring of 1998, all the newly established bahiagrass plots at Ona had an excellent stand of nearly 100% green ground cover (Fig. 2). Two years later (2000), color of bahiagrass ground cover on plots started to sort out into lime vs. no-lime sections, where all limed plots were completely green in the spring but the color of no-lime plots depended on fertilizer treatment. This interaction between lime and fertilizer treatment became even more pronounced with passage of time. In 2002, five years into the experiment, minimum spring color change or damage to bahiagrass sward (1-4% ground cover) was noticed for plots limed to pH 5 whether or not they received fertilizer or for no-lime plots that were not fertilized on both Hardee sites (Fig 2). Damage was most severe (20-69% of ground cover) when bahiagrass was not limed but received yearly application of any N-containing fertilizer. The combination of acid soil conditions (pH less than 4.5) and repeated N fertilization seemed to weaken bahiagrass root-stolon system, cause severe yellowing in the early spring growth and made it easier for mole cricket damage to occur.

Effect of Sludge:

Some livestock producers apply lime-stabilized sludge to pastures to reduce the cost of fertilizer and lime. Lime is added in the processing of sludge primarily to control pathogens, insect vectors and odor which makes limed-sludge an excellent source of slow-release plant nutrients (especially N and P), organic matter and lime. During application, the pH of limed-sludge could range between 7 and 11, N content between 3% and 5% of dry sludge , and P content between 2% and 4% of dry sludge. Four years repeated application of limed-sludge at the Range Cattle REC, Ona has shown that, when used at recommended agronomic rate (200 lb N/A), bahiagrass forage production responds well to sludge organic fertilizer and there is no damage to the sward. In those studies, we applied sludge up to 160 lb N yearly and improved annual dry matter yield from 2 T/A where no sludge was applied to 5 T/A. **There was no excessive build up of plant nutrients or trace metals in the soil from sludge application and soil pH only increased from 5.0 to 5.3 in 4 years.** However, bahiagrass roots cannot function properly to absorb sufficient iron, manganese and other micronutrients when the soil pH approaches 7. Several bahiagrass pastures in Polk, Pasco and Hardee counties where excessive amounts of sludge were applied repeatedly attained a soil pH of about 7 and lost substantial portions of the grass stand to weeds similar to symptoms of bahiagrass decline. It was easy to identify the strips on those pastures where sludge was dumped.

Conclusions

Under grazing conditions in **south-central Florida**, bahiagrass forage DM yield and crude protein content on typical flatwoods soils improve substantially with N but not with P or K fertilizer application. The situation may be different on the deep sandy soils where the addition of some P and K to N fertilizer could make a difference. Repeated N fertilization without adequate lime application to bahiagrass pastures induces widespread early spring yellowing and eventual stand loss to weeds. In acid soil situations, you are better off first liming to raise the soil pH to 5 or greater before applying N fertilizer. As precautions to using limed-sludge, apply material uniformly over pasture at recommended agronomic rate, **monitor the soil pH every 2-3 years,** and alternate limed-sludge use with inorganic N-fertilizer such as ammonium sulfate or nitrate in order to stay within the optimum pH range of **5.0 to 6.0**.

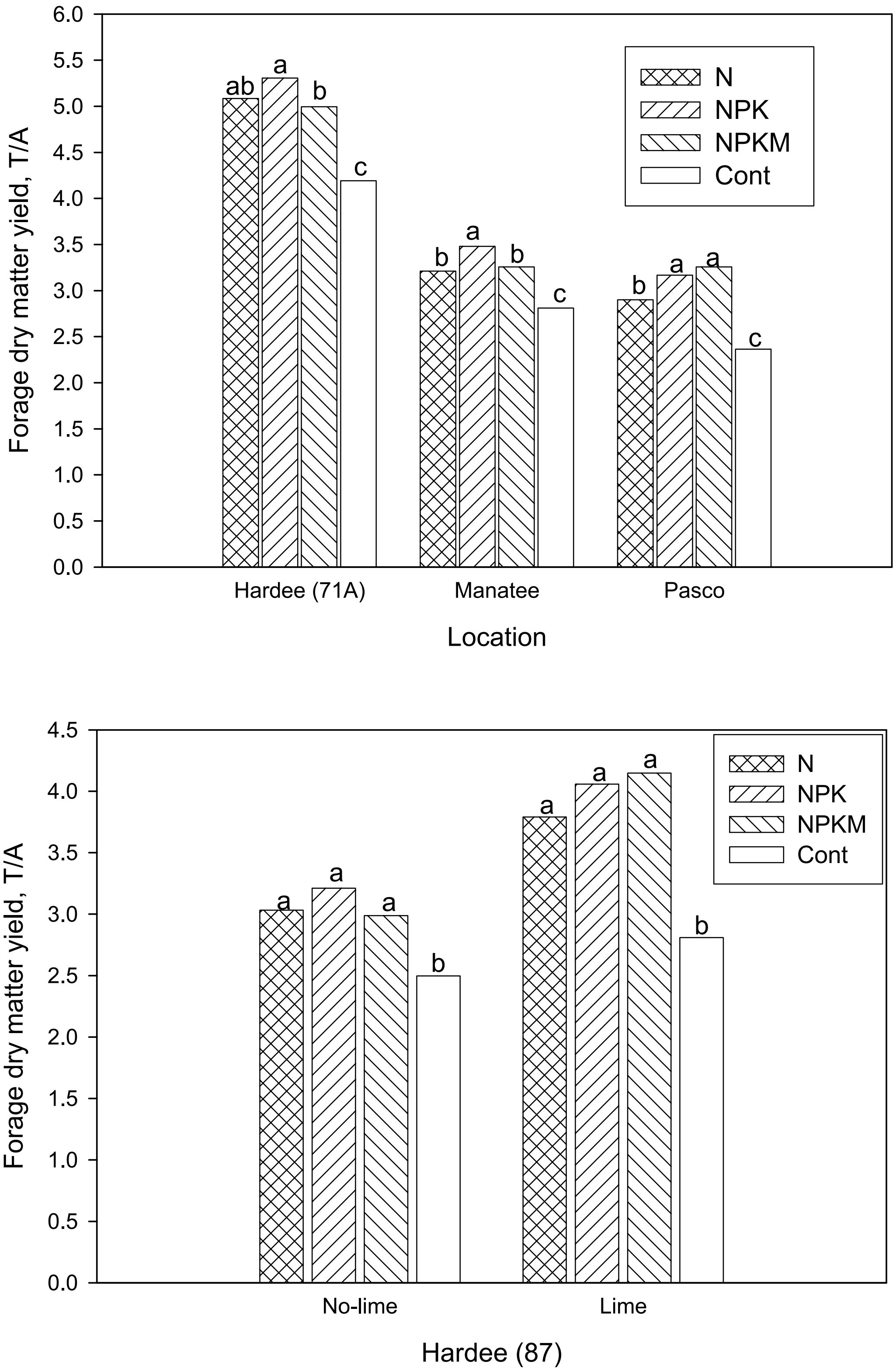
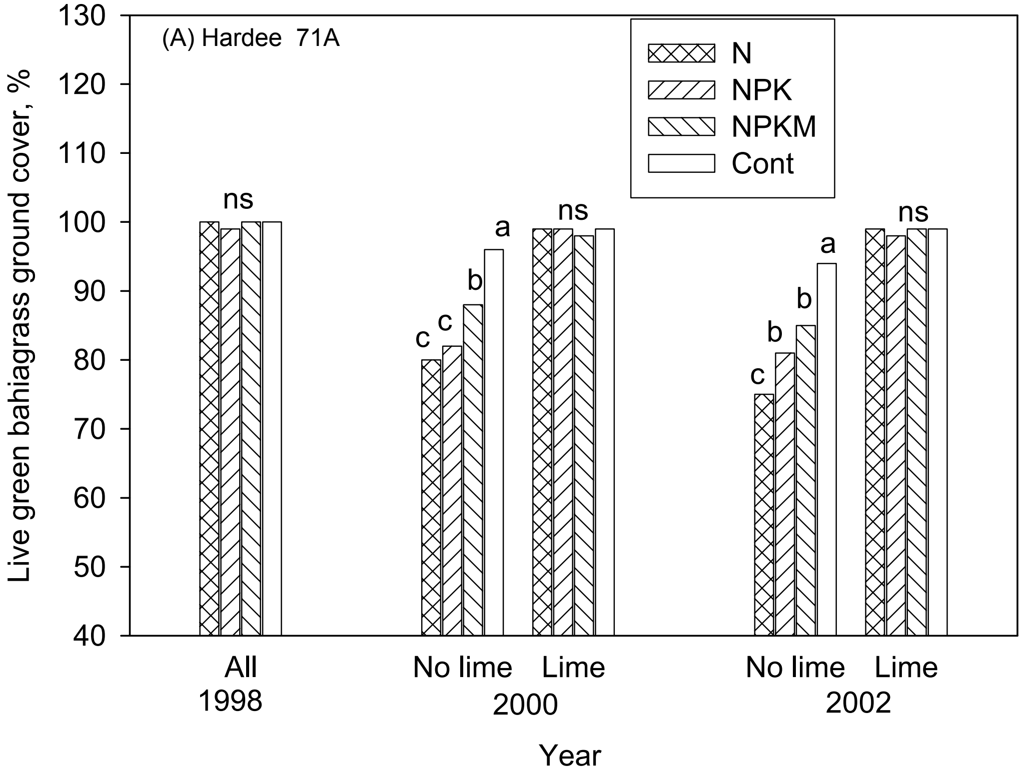


Figure 1. The effect of fertilizer and lime application on bahiagrass forage production in south central Florida. Bars represent 3-yr means for Manatee and Pasco sites and 5-yr means for Hardee sites.



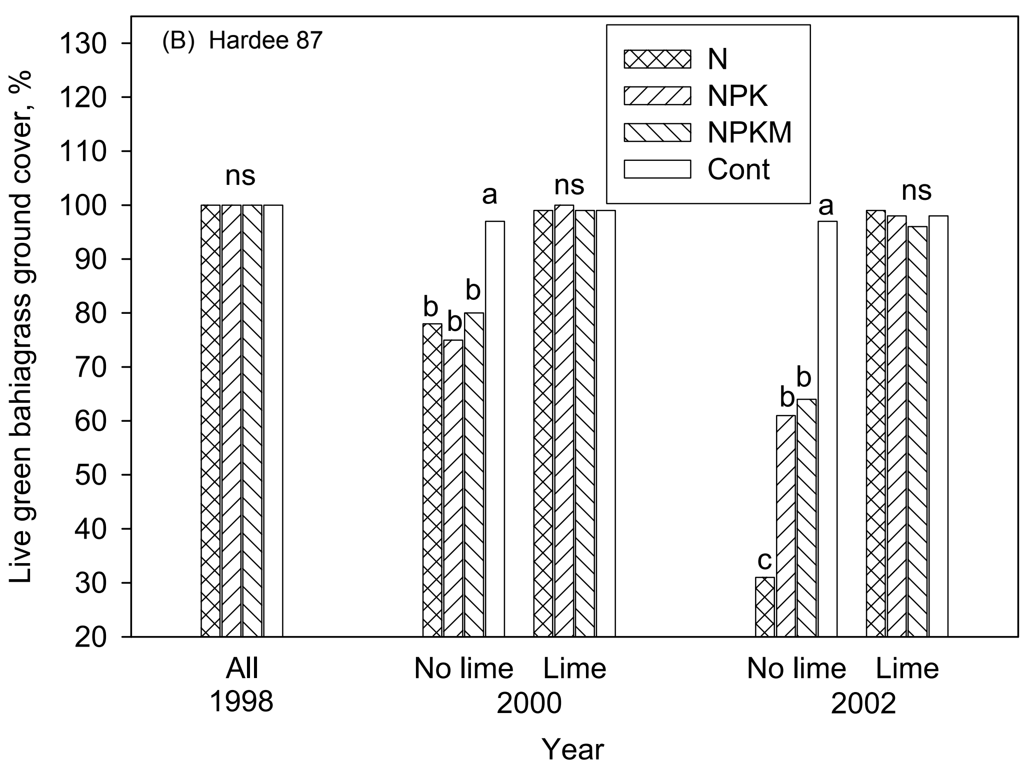


Figure 2. The interaction between fertilizer, lime and year on percentage spring live, green bahiagrass ground cover (damage consisted of yellow, brown and weedy cover).

NOTES:

FORAGE/COW-CALF PRODUCTION IN SLASH PINE-BAHIAGRASS SILVOPASTURE

Ike Ezenwa

Grazing of cattle under pines is an age-long tradition in Florida. Under the old practice of forest grazing, cattle ate native grasses, forbs, shrubs and other vegetation. With high cost of land, taxes, and increased production costs, cattlemen are forced to consider new ways of increasing returns from their ranches. In this regard, silvopasture is promising. Silvopasture is a form of agroforestry in which cattle graze sown pastures under planted trees. Greater return from silvopasture could result from diversification as well as intensification of operations on the land. In addition to beef and forage, silvopasture will also yield timber, pine straw, and hunting leases. Thus, overall profitability of silvopasture may be superior to open pasture. There are also environmental benefits of improvement of water quality, soil conservation, and wildlife habitat that are more difficult to quantify in economic terms.

Silvopasture is more complex than open pasture. Successful management demands a good understanding of the interacting components. Forage yields are not significantly depressed by trees the first 10 years after tree planting or in areas that are more than 7 ft from the nearest tree row. Ten to 15 years after planting the tree crowns close and forage yields decline. During this period, tree thinning is desirable, depending on site productivity, target product, and landowner objectives. The double-row configuration in which trees are planted in double rows spaced 8 ft apart with 4 ft within the rows, and 40 ft between double-rows addresses deficiencies of square and rectangular planting patterns in traditional forestry. The double-row configuration maintains the same tree density and timber volume as traditional configurations, but the wider alley between the tree rows maintains open areas for grazing and easier access for application of management practices.

Many silvopasture studies in the Southeast were conducted on soils with better production potentials than the sandy acid soils of south and central Florida. Whereas some locations in the southeast produce better quality timber, and are closer to the mills and timber markets, south and central Florida are in a unique circumstance as cattle are a more important component of silvopasture than timber. There is a lack of information on cattle productivity in silvopasture, and the dynamics of forage production in the system under grazing. The objectives of our study were to determine cattle and forage production in a pine-bahiagrass silvopasture at a critical stage of tree growth (10 to 15 years after tree establishment) and the beneficial effects of thinning tree stands when herbage yields are expected to begin to decline due to tree canopy closure.

Experimental Procedure

The study was conducted on a 40-acre pine-bahiagrass silvopasture (pasture 48) at Ona. The trees were established in December 1991 on an 11–year-old ‘Pensacola’ bahiagrass pasture at the density of 454 trees/acre in the 4 ft x 8 ft x 40 ft, double-row configuration. The silvopasture was sown to 'Florida' carpon desmodium (*Desmodium heterocarpon*) in 1994 and 'Shaw' vigna (*Vigna parkeri*) in 2001. By 2002, tree survival was 44% or 200 trees/acre after 9 years of grazing. To quantify cow-calf production and the effect of thinning of tree stands, we cross-fenced the 40-acre pine-bahiagrass silvopasture into two 20-acre blocks. In the winter of 2002-2003, about 75 inferior trees/acre were cut and removed from one 20-acre block (thinned) leaving about 125 merchantable trees/acre. The remaining 20-acre block (unthinned) contained an average of 200 trees/acre. A 20-acre open pasture (pasture 53 W), also of Pensacola bahiagrass (> 20-year-old) with Florida carpon desmodium and Shaw vigna served as a control. All pastures were fertilized in March with 300 lb/acre of a 16-4-16 fertilizer. All pastures were grazed similarly from March to May 2003.

On 1 June 2003, Braford cows (4-12 years of age) and calves (avg. 112 days of age) were assigned at 1 cow-calf pair/acre to each of the three pastures. Before the cows and calves were placed on the pastures, they were weighed and given a body condition score (BCS). Weights and cow BCS were again obtained in September when cows were removed from pasture and calves were weaned. Calf weights were adjusted for sex and mean age at weaning. Cows had free-choice access to a loose mineral mixture year-round.

Forage production was measured every 42 days during the grazing period. Available forage was determined every 28 days by harvesting forage from a strip of grass from center of alleys to between double-tree rows in each silvopasture and at random in open pasture.

Forage Production and Available Forage

Forage production was greater in open pasture (9090 lb dry matter (DM)/acre) than in the two silvopastures which were not different (avg. = 6685 lb DM/acre) (Table 1). The trends in forage production during the grazing period differed among the pastures. In the two silvopastures, production declined linearly, while in open pasture forage production increased from 27 May to 21 July, then declined through 29 September. On average, more forage was available in the open pasture (2000 lb DM/acre) than in silvopastures (avg. 1220 lb DM/acre) (Table 1).

Table 1. Total forage dry matter production and average available forage (28-days) on bahiagrass-slash pine silvopasture and open bahiagrass pasture (no pines). Pastures were stocked with 1 cow-calf pair/acre from 1 June to 15 September.

Pasture	Production§	Available‡
	------------ lb (DM)/acre	-----------
Thinned (125 trees/acre)	6270 b†	1230 b
Unthinned (200 trees/acre)	7100 b	1210 b
Open (no trees)	9090 a	2000 a

† Means in columns followed by the same letter are not different ($P > 0.05$).
§ For the period 27 May to 29 Sept. 2003.
‡ Means of four, 28-day periods from 27 May to 15 Sept. 2003.

Cow weights and BCS

There were no differences among pastures for cow weights and BCS at the start of the grazing period on 1 June, but at the end, on 15 September all pastures were different from each other for both responses (Table 2). On average, cow weight in the thinned silvopasture decreased from 1096 to 884 lb, from 1150 to 975 lb in unthinned silvopasture, and from 1120 to 1074 lb in open pasture. Body condition scores of the cows decreased 0.3, 1.2, and 1.5 units for cows in open, unthinned, and thinned pastures, respectively. More rainfall was received over the 1 June to 15 September period (36 in) than the 62-year mean (28 in) for this period. In June, pastures were saturated with frequent periods (1-2 week) of standing water (~ 1 in).

Table 2. Cow and calf weights and cow body condition scores (BCS) on bahiagrass-slash pine silvopasture and open bahiagrass pasture (no pines) from 1 June (start) to 15 Sept. (end) 2003.

	Silvopasture		
	Thinned†	Unthinned‡	Open pasture
Cow weight at start (lb)	1096 a§	1150 a	1120 a
Cow weight at end (lb)	884 c	975 b	1074 a
Cow BCS at start	5.0 a	5.2 a	5.2 a
Cow BCS at end	3.5 c	4.0 b	4.9 a
Calf weight at start (lb)	315 a	317 a	326 a
Calf weight at end, weaning (lb)	392 b	396 b	466 a
Avg. daily gain (lb/day)	1.6 b	1.6 b	2.9 a

† 125 trees/acre.
‡ 200 trees/acre.
§ Means in a row followed by the same letter are not different ($P > 0.05$).

Calf weights and daily gains

Pastures were not different for calf weight at the start (1 June, 2003), but at weaning (15 Sept. 2003), calf weight was greater on open pasture (466 lb) than that of calves on thinned (392 lb) and not-thinned (396 lb) silvopastures, which were not different. Calf average daily gain was also greater on open pasture with 2.9 lb/day than on the silvopastures with an average of 1.6 lb/day.

Discussion

Calf weaning weight on the 12-year old silvopasture was 15% lower and cow weight loss was 4 times more than that on open pasture. These represented drastic reductions in livestock production compared with production when the trees were younger. Between March and October 1994 to 1997, when pines were 3 to 7- years old, Drs. Findlay Pate and Rob Kalmbacher measured calf weaning weights on this silvopasture. Stocked at 1 cow-calf pair/acre, the 4-year average weaning weight of calves was 451 lb, which is similar to that of open pasture in the present study. The marked reduction in cattle performance in the silvopasture over the years can be attributed to reduced forage production due to increasing tree growth so that animal demand exceeded the ability of the silvopasture to supply forage. In general, lower forage yields of bahiagrass are obtained under pines than when bahiagrass is grown in open areas.

Thinning pines did not increase forage production or animal output. It is possible that more thinning is required at this stage to further reduce the impact of the trees on forage production. Perhaps, in our region, it may be best to target production of fence posts or pulpwood, which would mean shorter rotations of 10-15 years, coinciding with the period when trees reduce forage production the most. In this way, trees are harvested for target products and reduction in livestock production is curtailed. The rotation may then be repeated.

Conclusion

If silvopasture is to be an economically viable management option for land owners in central Florida, then increasing value of timber beyond 12 year of age and income from other sources, such as sale of hunting leases, must offset declining returns from cattle.

NOTES:

LIMPOGRASS OPTIONS FOR SOUTH FLORIDA CATTLEMEN: STOCKPILED FORAGE, HAY, AND ROUND-BALE SILAGE

John Arthington and Findlay Pate

Introduction

Limpograss (*Hemarthria altissima*) is the second most utilized pasture forage in south Florida. Over the past 30 years, south Florida Cattlemen have benefited from the high dry matter yields, appreciable digestibility, and persistence of limpograss. One important production characteristic of limpograss relates to its superior winter yield, compared to other warm-season perennial grasses. In south Florida, limpograss can be expected to produce as much as 30 to 40 % of its annual growth in the winter months. This unique quality differs from most all other sub-tropical, perennial forages.

At the Range Cattle Research and Education Center (RCREC), we have completed three complete production years investigating the performance of cow-calf pairs grazing winter stockpiled limpograss. Two treatments were compared; 1) 0.75 acres of limpograss and 1.50 acres of bahiagrass per cow-calf pair, or 2) 1.80 acres of bahiagrass per cow-calf pair with supplemental winter hay. All pastures were spring fertilized with 60 pounds N per acre. Limpograss pastures received an additional fall application of fertilizer (60 pounds N per acre). During September, October, and November, cows assigned to the bahiagrass/limpograss combination treatment were grazed primarily on bahiagrass alone allowing the limpograss to stockpile for winter utilization. Cows assigned to the bahiagrass only treatment were provided adequate winter hay to support an average body condition score of 5.0 (moderate condition). Cows assigned to the winter stockpiled limpograss received no supplemental winter hay. All cows were provided five pounds of supplemental molasses (16% crude protein) daily from November 1 to mid-April. A 90-day breeding season was initiated on January 1.

In this study, cows grazing winter limpograss pastures were provided with no winter hay; however, cows grazing the bahiagrass pastures consumed an average of 1400 pounds of hay per cow during each winter season (January to late March). Cows assigned to the stockpiled limpograss pastures experienced a slightly greater loss of body weight during the winter months, but a greater gain in body weight during the summer months, compared to cows grazing bahiagrass pastures and winter hay (Table 1).

Grazing treatment had no effect on calf weaning weight (average weaning weight = 547 pounds; SEM = 8.2). Pregnancy rates were also not affected by grazing treatment (average over all three years = 92.2 and 91.6 % for cows grazing bahiagrass and bahiagrass/limpograss pastures, respectively).

Table 1. Effect of pasture forage treatment on cow body weight change during the winter and summer seasons.

Season[a]	Bahiagrass + Hay	Stockpiled Limpograss	SEM
	--------------------------- pounds ---------------------------		
Winter	-88	-115	14.7
Summer	47	65	12.7

[a]Seasons extend from October to April and April to August for winter and summer, respectively.

This initial 3-year study suggests that 0.75 acres of stockpiled limpograss can be substituted for approximately 1400 pounds of stored hay for wintering lactating beef cows. Considering an average hay cost of $70 per ton along with a standard wastage of 15%, the value of this stockpiled limpograss would be approximately $110 per acre. Considering these values, stockpiled limpograss may or may not be economically advantageous for south Florida cattlemen. An economic analysis of both pasture systems is appropriate for each individual ranch. Calving seasons that differ from those used in this study may have a significant impact on the value achieved from the limpograss. As well, persistence of stand will greatly impact economic return, as the high-cost of establishment is spread over greater or fewer production seasons.

The current study only investigated the use of limpograss as a winter stockpiled forage source. Although 30 to 40% of the annual growth of limpograss occurs during the winter months, the remainder is realized during the summer. The greatest portion of this summer growth occurs at a time when producers have adequate available forage on bahiagrass pastures. Realizing opportunities for further utilization of limpograss during the late spring and summer may increase the overall value of this forage resource.

Current Limpograss Evaluations for Cow-Calf Production in South Florida

Using the same limpograss establishment utilized in the 3-year study described above, we are now investigating the value of harvesting late spring hay followed by mid-summer round-bale silage. In this system, we will continue to allow for fall accumulation for winter stockpiled grazing.

Hay

In the first year (spring 2004), we fertilized 60 acres of limpograss on March 23 (20-5-10; 400 pounds per acre). Eight weeks later, the pastures were cut and hay harvested. A total of 97 tons of hay dry matter was harvested (1.6 tons dry matter per acre). The average total digestible nutrients (TDN) and crude protein of this hay was 51 and 9%, respectively, on a dry matter basis.

Round-Bale Silage

Limpograss contains long thick stems, requiring as many as 5 to 7 days of drying to achieve > 85% dry matter for hay harvest. Once the rainy season begins, we have less than a 20% probability of obtaining 3 consecutive drying days (mid-June through August) for hay making. This is an unfortunate situation for our limpograss grazing program, as substantial dry matter yield can be expected during these summer months. This excess summer forage accumulation must be utilized prior to preparation for fall stockpiling. Production of round-bale silage may be an interesting alternative to summer grazing of this material. There are multiple systems available for harvesting and storing forage silages. Dr. Bill Kunkle prepared a review of these systems. This paper is available in the Proceedings of the 12th Annual Florida Ruminant Nutrition Symposium (www.animal.ufl.edu).

In our system, we fertilized the limpograss pastures on May 25 for production of summer round-bale silage (20-5-10; 400 pounds per acre). Coordination of custom harvest and the summer hurricanes kept us from harvesting during this current summer; however, adequate dry mater yield was achieved by eight weeks following fertilization. Clipping estimates suggest that we would achieve six to seven tons of round-bale silage per acre (65% moisture). This would equate to a total of about 2.4 tons of dry matter per acre. Our estimate for custom harvesting this material was $135 per acre or $57 per ton of dry matter harvested. Re-fertilization of this crop immediately after round-bale silage harvest will allow plenty of time for fall forage stockpiling prior to winter grazing, which should begin in late December or early January.

Table 2. Estimated annual harvest of limpograss forage[a]

Item	Production, tons per acre	Cost, $ per ton
Spring hay[b]	1.6	$92
Summer round-bale silage[b]	2.4	$72
Winter stockpiling and re-growth[b,c]	3.0	$12

[a]Fertilizer applied prior to hay harvest, round-bale silage harvest and winter stockpiling; (400 pounds per acre of 20-5-10; $184 per ton; includes custom application).
[b]Custom hay harvest includes $15 per 900 pound bale (85% dry matter) and a single application of fertilizer. Custom round-bale silage harvest includes $15 per 1500 pound bale (35% dry matter) and a single application of fertilizer.
[c]Estimated for a 1000 pound cow provided 0.75 acres for 90 days of grazing (25 pounds of dry matter intake per day).

This limpograss management system allows for the potential production of 7 tons of dry matter per acre (Table 2). The majority of this is harvested during the summer months, when continued accumulation of limpograss is often difficult to utilize. The most efficient use of this forage base occurs over the 90 d of stockpiled winter forage harvest by the cow. This estimated 3 tons of dry matter harvested per acre is realized with only the input of fertilizer. Since the cow is harvesting the material through grazing, the cost of custom harvest is saved. In comparison, the costs for producing spring hay and summer silage depend predominantly on the dry matter yield of this material. Considering approximately 51% TDN, these forage products provide us with a cost of $0.09 and $0.07 per pound of TDN. Using these figures, each are reasonable-cost feed sources for cows.

In the hierarchy of use, we would first utilize all the fall stock-piled forage, followed by the round-bale silage and lastly the hay. The stockpiled forage has no sale value. Similarly, the round-bale silage has little sale value due to the difficulty of transporting this high-moisture material. Alternatively, the hay does provide an opportunity for the producer to market excess material not needed to feed the cowherd.

Summary

This production system is currently being evaluated at the Range Cattle REC. This evaluation will continue over the next three production cycles. The value of this system may be realized by both large extensive ranches and smaller intensive production operations. In the scenario described above, it may be possible to produce as much as 7 tons of usable forage dry matter per acre annually. Using a 1000 pound cow at 2.5% annual forage dry matter intake (% body weight) as an example, this forage system may support as much as 1.3 cows per acre. This is a clear advantage in terms of stocking rate; however, intensive management is required. At a minimum, three management inputs are needed, 1) three annual applications of a complete fertilizer, 2) hay and round-bale silage storage, and 3) equipment for handling and feeding the stored forage. In addition, producers that do not own their own hay and silage harvesting equipment are very dependent upon scheduling of custom harvesters. Considerable planning and coordination will be required for the successful implementation of this management system.

NOTES:

INFLUENCE OF MANAGEMENT ON YIELD AND PERSISTENCE OF RHIZOMA PEANUT ON FLATWOOD SOILS

Paul Mislevy, A.R. Blount, K.H. Quesenberry, and M.J. Williams

There is a need in peninsular Florida for a long lived, persistent, warm season perennial legume that will tolerate somewhat poorly drained soils. In central Florida consistent establishment of warm season annual legumes has been difficult due to inconsistent moisture at seeding. In addition, establishment and persistence of many perennial legumes have not been satisfactory due to climatic extrems. Dr. Buddy Pitman tested hundreds of legumes over a 12 yr period at Ona and found one legume [*Vigna parkeri* (Shaw vigna)] that would persist under grazing in a bahiagrass sward. Growers are reluctant to buy seed of Shaw Vigna because seed costs are about $13/lb and must be imported from Australia. Legume research has been conducted at Ft. Pierce for over 30 years and more than 1000 entries were tested with only one long term persistent cultivar (Florida carpon desmodium) in use today. These examples indicate the difficulty in developing a legume that will persist in central Florida with or without a grass. Rhizoma peanut (Arachis), currently being tested at Ona is a long-lived, warm season, persistent perennial legume, adapted to well drained soils.

Studies were conducted over a 4-year period at Ona to determine the influence of rhizoma peanut entries and stubble height (SH) on forage yield, nutritive value, and persistence on a poorly drained soil. Peanut entries consisted of Arbrook, Arbrook Select, Florigraze, Ecoturf, PI 262826, PI 262833, and PI 262839. Peanuts were clipped at 1 and 4 inch SH. Annual fertilization consisted of 300 lb/A 0-10-20 + 0.5% Zn, Cu, Mn, Fe (sulfate form), 0.05% B and 1% S.

Results

Higher dry matter yields were obtained when peanuts were harvested at a 1 inch SH (5.1 ton/acre) compared with the 4 inch (SH 3.4 ton/acre). However differences between SH disappeared after 3 years of clipping resulting in similar dry matter yields between both SH. Yield decreased an average of 68% for Arbrook and Arbrook Select between the initial and 3rd year of clipping and increased 36% for PI 262833 during the same time period (Table 1).

Table 1. Influence of perennial peanut entry on total dry yield over years.

Peanut entry	Year 1	Year 2	Year 3	Change
	-------- Ton/acre	--------		%
Arbrook Select	8.3	3.8	2.6	-69
Arbrook	8.3	3.5	2.8	-67
PI 262839	6.3	3.3	3.4	-45
PI 262826	6.2	3.3	4.5	-28
Florigraze	5.4	3.5	3.6	-34
Ecoturf	4.1	3.2	4.0	-1
PI 262833	3.2	2.8	4.4	+36

Forage Nutritive Value

Generally no difference was found in crude protein and in vitro organic matter digestion between the 1 and 4 inch SH. Crude protein averaged 18% and digestibility 69% over two SH and a 3 year clipping period.

Persistence

Perennial peanut is more persistent when plants are clipped back to a 4 inch SH compared with a 1 inch stubble. Average peanut ground cover after 4 years of clipping was 91% for the 4 inch stubble and 66% for the 1 inch SH. These data suggest taller stubble have better persistence. Plants clipped at the tall stubble were always above the water level regardless of the rain event. Some peanut entries were more water tolerant regardless of SH. PI 262833 averaged 96 and 100% ground cover and Ecoturf averaged 76 and 100% ground cover for the 1 and 4 inch SH, respectively.

Root mass was measured at the end of the study to determine if the 4 inch SH had a greater root/rhizome density than the 1 inch stubble. Data indicate harvesting perennial peanut over a 4-year period, at a 1 inch SH decreased root mass by 44% when compared with the 4-inch SH. This would indicate clipping peanut plants at a 4-inch SH allows plants to continue top and root growth even under poorly drained soil conditions.

In summary harvesting rhizoma peanut at a 4-inch SH will generally produce lower forage yields for about 2 years after establishment. However, after 2 years of clipping above ground yields were similar for both the 1 and the 4 inch SH. Forage quality is generally similar for both SH, however, persistence and root mass are always in favor of the taller SH.

NOTES: