University of Florida, IFAS
Range Cattle Research and Education Center
June 2003
Volume 6, Number 2

RANGE CATTLE REC NEWSLETTER

Calendar of Events

Month	Date(s)	Event	Location
June	18-20	FCA Annual Convention	Marco Island, FL
August	7-8	NCBA/CME Cattle Marketing Workshop	Kissimmee, FL

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Effect of Stocking Rate on Measures of Cow-Calf Productivity and Nutrient Loads in Surface Water Runoff

> The presence of beef cattle at three stocking rates had no impact on nutrient load (P and N) of surface runoff water when compared with pastures containing no cattle.

Rationale

The University of Florida-IFAS, formed a partnership with Archbold Biological Station, South Florida Water Management District, USDA-ARS, Florida Department of Agriculture and Consumer Services, and the Florida Cattlemen's Association. The goal of this partnership was to design sustainable, environmentally sensitive management practices for cattle grazing operations. This partnership is currently completing a comprehensive research study investigating, among other things, the interrelationship between beef cow-calf stocking rate and surface water quality.

Study Site and Experimental Methods

This research was conducted at Buck Island Ranch near Lake Placid, Florida over three production cycles from 1999 to 2001. Both summer and winter pastures were used. Summer pastures consisted of eight, 50-acre pastures with established bahiagrass on flatwoods soils with extensive ditching to facilitate drainage. Winter pastures consisted of eight, 80-acre pastures with mixed forages, predominantly bahiagrass, on similar soils with less extensive ditching

Three stocking rate treatments were used which represented 3.7, 6.5, and 8.6 acres per cow over the combined total of 130 acres of the summer (50 acre) and winter (80 acre) pastures. These treatments were chosen to illustrate differing levels of cattle stocking rates common in south Florida (high, medium, and low, respectively). A fourth treatment containing no cows (Control) was also used. Summer, but not winter pastures, received a spring application of ammonium nitrate fertilizer (50 lb N/acre).

Pregnant, Brahman crossbred cows, ranging in age from 4 to 9 years, were used in the stocking rate study. All cows were exposed to bulls for 120 days starting in mid-January. Cow body condition was scored on a 1 to 9 scale when they were moved to winter pastures (start of production cycle), moved to summer pastures, and at weaning (end of production cycle). Calf weight was collected when cows were moved into summer pastures and again at weaning.

The economic impact of reducing stocking rates was developed using SPA (Standardized Performance Analysis). Five years of SPA data were collected from the commercial ranch at Buck Island. These data provided an annual average of itemized production costs, calving percentages, and calf weaning weights. Costs were grouped into two categories – variable and fixed costs.

Experimental pastures were separated by berms and all surface runoff from each pasture collected in ditches and flowed through a separate flume. Each flume was fully instrumented to record the total amount of runoff and to take automatic water samples during periods of flow. Water samples were analyzed for total phosphorus and nitrogen.

Results

Cow and calf performance was similar, irrespective of stocking rate. Production, as measured by pounds of calf weaned per acre of dedicated land was greater for high compared to medium and low stocking rates. Stocking density had no impact on cow pregnancy rate.

Based on SPA data, total operating costs declined from the highest to lowest stocking rate. However, because fixed costs remain constant, the unit cow costs increased from $167 per cow at the highest stocking rate to $255 per cow at the lowest stocking rate. Based on season average Florida calf prices as reported by the Florida Agricultural Statistics Service, a rancher who stocked at the highest rate would have earned positive net returns every year between 1994 and 2000. On the other hand, if a rancher stocked at the lowest rate, positive net returns would have earned in only one year between 1994 and 2000.

Cattle stocking rate did not effect concentrations or loads of total P or N measured in runoff from the plots in 1998 –2001 (Table 1). In fact, control pastures containing no cattle provided similar amounts of total P and N in runoff water compared to pastures containing cattle. Summer pastures consistently delivered greater P loads in runoff than did the winter pastures in all years except the drought year of 2000 (Table 2). Loads of total N was greater from summer than winter pastures in 1999 and 2001 (Table 2).

The greater loads of N and P in the summer pasture runoff than in the winter pasture runoff was likely due to differences in the long term fertilization history of the two pasture sites. The improved summer pastures are fertilized annually with N fertilizer and, although they currently receive no P fertilizer, they were fertilized annually with P fertilizer (30-80 lbs. P_2O_5 per acre) for at least 15-20 years prior to 1987, at which time P fertilizer use was discontinued. The semi-native winter range pastures, by contrast, have never been fertilized.

Implications

In this evaluation, the high stocking density supported similar cow and calf performance as the lower stocking densities. When pasture productivity was considered, the high stocking density provided the most weight of weaned calf per unit of dedicated land. A change in stocking rate has a one-to-one relationship with ranch revenues. At the same time, unit cow costs increase at an increasing rate as fewer brood cows are left to support the ranch's fixed costs. Consequently, ranch profitability decreases as stocking rates decline.

Stocking rate did not affect the total loads of P and N in surface runoff. In fact, a similar amount of total P and N in surface water runoff were found in pastures containing no cattle compared to pastures stocked with cattle over three production cycles. The improved summer pastures provided 5 to 7 times more total P and N in surface water runoff compared to the semi-native winter pastures. This is apparently due to past use of P fertilizer prior to 1987 and does not appear to be dependent upon the current presence of cattle on these pastures.

Additional Information

Expanded information on all phases of this research effort is available in individual discipline manuscripts. Please contact one of the authors for further information. **(JDA, PB, FMR)**

Table 1. Nutrient loads in surface water runoff from summer and winter pastures stocked at different cattle rates (average 1998-2001).

	Summer pastures		Winter pastures	
Stocking rate[1]	Total P	Total N	Total P	Total N
	----------------------- lbs/acre	----------------------		
Control	1.22	5.49	0.21	5.17
Low	1.27	5.23	0.17	4.01
Medium	1.13	6.88	0.14	4.40
High	1.15	5.51	0.22	4.54

[1] Stocking rates of 8.6, 6.5, and 3.7 acres/cow correspond to high, medium, and low rates, respectively.

Table 2. Nutrient loads of surface water runoff from summer and winter pastures (average 1998-2001).

	Mean nutrient load	
Pasture type	Total P [a]	Total N [b]
	---------- lbs/acre	---------
Summer	1.19	5.77
Winter	0.18[b]	4.53
Pooled SEM	0.07	0.59

[a] Significant differences between pasture types for total P were noted in each year except the drought of 2000, $P < 0.05$.
[b] Significant differences between pasture types for total N were noted in 1999 and 2001, $P < 0.05$

Growing Leucaena in south Florida

Bahiagrass is the grass of choice in most ranches in south Florida where more than 80% of the cattle in Florida are raised. The grass provides more than adequate herbage in the summer, but the nutritive value is low. Both available forage and nutritive value are also low in the fall. Animal performance can be improved by having a legume in the pasture at these times. The worldwide importance and contributions of forage tree legumes in areas that have similar soil and climatic conditions as Florida suggest a role for tree legumes in the cow-calf industry.

Leucaena is a tropical forage tree legume that could meet the forage needs of cattle in south Florida. Studies carried out in central and south Florida, have confirmed the outstanding yields and quality of the forage. Clipping studies at Brooksville showed that leucaena produced up to 12, 500 lbs./acre/year of highly digestible dry leaf matter when harvested every 5 to 6 weeks during late spring and summer. The forage contained 22-35% protein. At Ona, heifers and steers grazing leucaena + bahiagrass pastures from June to January gained 75 lbs./head, about three times the weight gained by those grazing bahiagrass alone. When access to leucaena was delayed till July, the animals gained 117 lbs./head, seven times the weight gain of those on bahiagrass alone. Delaying grazing of leucaena till late in summer ensured that the trees accumulated adequate forage and thus contributed the most when the quality of bahiagrass was at the lowest. Thus, leucaena is a dependable perennial legume for south Florida.

The future acceptance or widespread use of leucaena by cattlemen will depend on the identification of suitable selections or varieties, development of cultural practices for uniform field establishment, and demonstration of potential economic contributions of the tree legume to the cow-calf industry. Even in Australia where the use of leucaena is widespread, commercial plantings were slow before the 1980s. However, within the decade about 40, 000 acres was planted to leucaena. Research at Ona is aimed at gathering practical knowledge of suitable selections, and establishment and management requirements that hopefully will spur rapid development of the tree legume-grass pasture concept for sustainable cow-calf production in south Florida.

Leucaena can grow in a wide range of soil and climatic conditions. In south Florida some environmental factors create some problems for growing leucaena. These include the plant's lack of tolerance of frosts, poorly drained or waterlogged soils, soil acidity, and low soil fertility. The plant is best adapted to warm, well-drained deep calcareous soils. Light frosts will cause leaf shedding while heavy frosts will kill above ground, but the crown will survive in the next summer with multiple branches. This eliminates the necessity of cutting to keep the plants within the reach of animals under grazing.

We evaluated the abilities of 8 selections of leucaena to grow and persist in waterlogged soil. The seeds were sown in either well-drained or waterlogged soil. After 15 days, none of the seeds germinated in the waterlogged soil compared with 85-100% germination in well-drained soil. The seedlings in the well-drained pots are being subjected to the waterlogging treatments. After 15 days, no mortality has been recorded and seeds are growing rapidly. Therefore, germination is more sensitive to waterlogging than subsequent seedling growth. Research elsewhere had indicated that leucaena once established is able to persist because the plant transpires water very rapidly as a way of surviving waterlogging.

Another characteristic of the growing conditions in Florida is varying water table. We examined how this would affect leucaena seedlings by growing them in well-drained soil, or where water table was maintained at 15 cm below soil, at soil surface, or 3 cm above soil surface. After 42 days, all the seedlings are persisting; there has been no mortality. This observation confirms that the overriding effect of poor soil drainage is on seed germination and not seedling persistence. Interestingly, seedlings growing where the water level is at soil surface or above soil surface have developed aerenchyma tissues (gas-filled) on the stem bases up to 1 cm above the soil surface or water level. Aerenchyma is a type of "bark" that is induced by lack of oxygen in waterlogged soil. It facilitates movement of oxygen. Aerenchyma can be seen at the base of common aeschynomene and aeschynomene evenia. We have not seen any other report of this observed in leucaena in literature. It would, in addition to rapid loss of water by transpiration, explain the ability of established leucaena plants to persist under waterlogged conditions.

Work will continue on understanding and overcoming the major factors associated with poor establishment of leucaena, and in identifying leucaena selections that are well adapted to the unique growing conditions of south Florida. The overall goal is in testing the potential of tree legume-grass pasture concept for greater sustainability and profitability of the cow-calf industry in Florida. **(IVE)**

Keeping an Eye on Tropical Soda Apple Infestation on Your Pasture

Tropical soda apple (TSA) has invaded pastures in south Florida since 1990. Serious efforts were made to control TSA in Florida in the mid 1990s but the enthusiasm eventually waned. Currently, there are more than 500,000 acres of TSA infestation in Florida.

Tropical soda apple is spread to new locations by cattle movement, wildlife, contaminated hay, grass seed and sod. It is on the list of Florida State's Noxious Weed according to Florida Law (Fla Admin. Code 5B-57-007) and as such it is unlawful to introduce, possess, or move TSA plants deliberately except under permit issued by Florida DACS or the USDA. Recently, some southern states including Georgia, Mississippi, and Alabama have considered passing legislation to regulate the movement of cattle from Florida to their states in order to stop the spread of TSA in southeastern USA. Such legislation, if adopted, would require the quarantine of Florida cattle at specified locations for up to one week during/prior to shipment. The quarantine period allows ingested TSA seed to pass through and out of the gastrointestinal tract. The expense of such confinement will be charged to the cattle owner and will tend to increase cattle production costs in Florida.

Therefore, South Florida cattlemen need to pay greater attention to TSA infestation on their pasture and engage in renewed efforts at preventing, monitoring and controlling TSA as follows:

Sparse Stand:

For sparse stands in south Florida, spot spray individual TSA plants in November with a 0.5% solution of Remedy (tryclopyr) + 0.1% non ionic surfactant. Wet foliage completely to the point of dripping with solution and use a color maker in the spray mix to ensure all plants are treated. Monitor the weed problem through winter and spot-spray new/regrowth of TSA plants on that pasture again in February of the following year. Monitor plants through spring and if there are still some live TSA plants on the pasture, spot-spray a third time in May followed by continued monitoring through summer. Monitoring and repeated spot-spraying at about 60 d intervals over 2 years will prevent TSA fruits form maturing seed and help clean up a sparse stand of TSA on a pasture unless pasture is re-infested with seed introduced from outside.

Dense Stand:

Dense stands of TSA on pasture in south Florida must be mowed repeatedly to a 3-inch stubble in November, February and April to prevent fruit setting/seed maturation. Repeated mowing every 50-60 days can in itself cause 50-60 % mortality in mature TSA plants. After the April mowing, allow the TSA plants to regrow for about 60 days and broadcast spray 1 qt /A of Remedy + 0.1% non-ionic surfactant in June. Next, monitor TSA plants through September and spot-spray remaining plants in October with a 0.5% Remedy solution + the non-ionic surfactant and the color marker. Continue monitoring TSA for at least another year and spot spray emerging plants every 60 days as described for sparse stands until pasture is completely cleaned up.

There are hopeful signs that a variety of biological agents (insects, virus) for TSA control will soon become available to increase our arsenals on this noxious pasture weed. But for the meantime, **prevention, monitoring** and **repeated**

spraying with Remedy provide the key to successful tropical soda apple control in south Florida. **(MBA)**

Where Does Nitrogen Come from in Your Bahiagrass Pasture?

Of course you would say, "from the N in fertilizer for which I paid such a dear price." This is partially correct. Although data are variable, research has shown that bahiagrass will recover 50 to 80% of applied N with little difference between forms of N used. The amount of recovery of applied N varies with the rate (recovery increases with N rate) and age of bahiagrass (recovery increases in older stands due to mature stolons). These data are calculated by subtracting N taken up by grass in unfertilized plots from N taken up by fertilized bahiagrass. Unfertilized bahiagrass will easily take up 100 lb N/acre/year, and bahiagrass fertilized with 50 lb N/acre in March can take up 150 lb N/acre/year. Much of the non-fertilizer N comes from a biological break down of organic matter in a process referred to as mineralization. Research in Florida using isotopes of N, which are labeled forms such as ^{15}N, show that much of the N used for spring bahiagrass growth comes from fertilizer applied in spring, but that almost all of the summer growth comes from non-fertilizer N. In a pasture, the N we add becomes part of the system, and it is recycled through organic matter. Some is lost by leaching and some is lost by denitrification or volitalization. One of the most interesting topics is that of the addition of unaccountable N. Dr. Blue, a UF soil scientist now retired, conducted long-term research with bahiagrass and found that in a period of over 25 years, there had been the addition of about 700 lb/acre of N into the soil-plant system. That is about 28 lb of N/acre/year that came into the system in an unexplainable way. Biological N fixation by bacteria for grasses is possible and has been the focus of research, especially in Brasil. A bacteria (*Azotobacter paspali*) specific for grasses of the genus *Paspalum*, of which bahiagrass is a member, has assimilated about 110 lb N/acre under laboratory conditions. I strongly suspect that we have a small amount of biological N fixation in our bahiagrass pastures in Florida. **(RSK)**

Effectiveness of selected Pasture herbicides on spring broadleaf weed control

There is a continuous need to determine the effectiveness of pasture and hayfield herbicides for weed control and the tolerance of improved pasture grasses to these herbicides. Most herbicides registered for pasture and hayfield weed control are used as post-emergence applications. That is, herbicides are applied after weed emergence and several inches of growth. Herbicides should be applied to small actively growing weed seedlings. This provides good control with minimal herbicide. The application of herbicides on perennial weeds should be withheld until spring regrowth when plants attain adequate surface area for herbicide coverage and translocation into the roots.

Three pasture herbicides were applied in late March of 2002 to determine their effectiveness on broadleaf weed control and herbicide tolerance of improved tropical pasture grasses. Recommended rates of Cimarron® 3/10 oz/A, Redeem R&P® 1 qt/A, and Weedmaster® 1.5qt/A were applied with the surfactant Silkin® at 10 oz/100 gal water. All herbicides were applied at a total volume of 30 gal/A.

Cimarron® provided excellent control of Stiff verbena, dogfennel, thistle, Oldfield toadflax, Broadleaf pink purslane, pokeberry, Carolina geranium, goatweed, Wondering cudweed, Florida pellitory, amaranth (pigweed), and lambsquarters. The activity of this chemical is very slow, requiring 60 days for complete control. Cimarron has no grazing or hay cutting restrictions for either lactating or non-lactating cattle or for horses.

Redeem R&P® provided excellent control of thistle, Oldfield toadflax, Yellow woodsorrel, Carolina geranium, Wandering cudweed, Spreading dayflower, and Black nightshade within 45 days. Redeem R&P® has 0 days restriction for grazing, 7 days for hay cutting and 3 days for cattle slaughter; 14 days for grazing and 1 year hay cutting for lactating cattle and no information for horses.

Weedmaster® provided excellent control of dogfennel, Oldfield toadflax, Primrose willow, Carolina geranium, Wondering cudweed, Spreading dayflower, amaranth, lambsquarters, and Mexican tea within 45 days. Weedmaster® has 0 days restrictions for grazing, no information on hay cutting, and 30 days for slaughter of non-lactating cattle; 7 days for grazing, 37 days for hay cutting for lactating cattle and no information for horses.

The above three herbicides were tested on numerous perennial warm season forages grown in south central Florida. Cimarron® had no effect on stargrass or bermudagrass cultivars tested, however, a slight suppression effect on Floralta limpograss and completely killed Pensacola, Tifton 9, Sand mountain, Tifton 7, and forage cross hybrid bahiagrasses and no effect was found on Argentine bahiagrass, well developed ryegrass, and small grain cultivars.

Redeem R&P® had no effect on any warm season perennial grasses tested, except a slight suppression on Florakirk bermudagrass. Ryegrass and small grain cultivars were unaffected.

Weedmaster® had no effect on any warm season grasses except Floralta limpograss which was severely suppressed, and even death. Weedmaster® had no effect on ryegrass or small grains that had developed tillers.

In conclusion, there are several herbicide options available for pasture broadleaf weed control. The specific herbicide used will depend on the weed needing to be controlled and the specific cultivar of pasture grass. **(PM)**

Yellowing in Bahiagrass Pastures

Yellowing of bahiagrass pasture usually observed in the spring and early summer is a common occurrence in Florida. We know that the yellowing is caused by iron deficiency in the bahiagrass leaf due to inadequate iron uptake in the spring. Several years ago we applied iron sulfate in a liquid fertilizer mixture as a foliar application (broadcast spray) to large areas of bahiagrass pasture. The yellowing condition disappeared within a week

Dr. Jack Rechcigl found that bahiagrass yellowing could be eliminated by applying iron chelate to the soil, but the chelate was cost prohibitive. Application of iron sulfate to the soil was ineffective.

Dr. Martin Adjei conducted experiments that evaluated different fertilizer and lime treatments on bahiagrass plots. One very obvious outcome was that bahiagrass forage responded to nitrogen application where lime was applied to increase pH above 5.0. Where lime was not applied and pH was 4.0 to 4.5, the application of nitrogen fertilizer had a negative effect on bahiagrass yield and the yellowing condition was observed. It was best not to apply nitrogen to bahiagrass plots if lime was not applied to increase pH to 5.0 or higher because bahiagrass stand loss occurred.

We experienced a lot of bahiagrass yellowing at the Ona Research Center in the spring and summer over many years. Pastures had not been limed in more than 10 years and soil pH was around 4.5. In January, 2001 we applied 2 tons of dolomite per acre to 300 acres.

In the spring and early summer of 2001 we still observed extensive yellowing of bahiagrass where dolomite was applied. However, in the spring and summer of 2002 no yellowing of bahiagrass was evident. This shows that time is required for the lime source to be dissolved and washed into the bahiagrass root zone, so a quick response should not be expected. In the spring of 2003 we have not seen yellowing in bahiagrass pastures that received dolomite in January, 2001.

It appears that most of the yellowing observed in bahiagrass pastures is a result of low pH which probably prevents bahiagrass roots from absorbing enough iron. This can be corrected with a good liming program. University of Florida/IFAS recommends that the soil pH in bahiagrass pasture should be 5.0 or better. If you are seeing considerable yellowing in bahiagrass pasture, first test the soil pH. If the pH is below 5.0 apply dolomitic of calcitic lime according to University of Florida/IFAS recommendations. This should cure the yellowing problem over time. **(FMP, MBA)**

RCREC Field Day a Success!

The faculty and staff of the Range Cattle Research and Education Center would like to thank the three hundred plus guests that came out for our field day on May 15th. You made all of our hard work worth the effort. Here are a few photos of the day that we would like to share.


Everyone enjoying the steak lunch.


Dr. Bob Sand brings the line through for the steak lunch.


Dr. John Arthington discusses the woods project.


Drs. Ike Ezenwa and Rob Kalmbacher discuss the silvopasture project.


Dr. Paul Mislevy discusses the search for a Bahiagrass with winter growth characteristics.

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