Forage-Livestock Research Progress Report

Texas A&M AgriLife Research and Extension Center at Overton

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Pasture and Beef Cattle Research:
Stocking Rates with Cows and Calves on Bermudagrass
with Ryegrass + N vs Clover + no N Fertilizer

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Forage and Pastures

Forage cultivar evaluations and pasture systems for cow-calf and stockers were initiated at the Texas AgriLife Research & Extension Center in 1968. Small plot forage varieties, defoliation regimens, fertilization sources and rates, sod-seeding, and various management practices have been used to assess production, persistence, and nutritive value of warm-season and cool-season perennial and annual grasses and legumes. The initial forage-beef cattle research objectives included 2 to 3 stocking rates each of Coastal bermudagrass, common bermudagrass, Pensacola bahiagrass, and common weeping lovegrass. Other bermudagrasses that were added later included Tifton 44 and Tifton 85. From 1969 through 1984, both Coastal and common bermudagrasses received annual, split applications of 200-100-100 lbs/ac N-P_2O_5-K_2O, and were each stocked at three levels of forage availability for grazing intensities (stocking rates) using F-1 (Brahman x Hereford) cows and their calves. Starting in fall 1974, all bermudagrass pastures were overseeded in October with mixtures of annual ryegrass and a clover which included crimson, arrowleaf, or subterranean during a 10-year period. Fall-born calvers were stocked on pastures from February to June-July, and then winter calvers were stocked from June-July to October. Pastures were not stocked from October to February to allow for establishment and growth of cool-season annual forages.

Nutrient Cycling

From 1985 through 2012, a nutrient cycling, fertility regimen experiment has been targeted for the common and Coastal bermudagrass pastures. Each initial stocking rate pasture was sub-divided into two experiment pastures to be evaluated for: 1) overseeded with annual ryegrass + inorganic N fertilizer; and 2) overseeded with a clover + no N fertilizer. From 1985 through 1997, the ryegrass + N pastures received a season-long average of 320-0-0 lbs/ac N-P_2O_5-K_2O, and the clover pastures received a season-long average of 0-0-115 lbs/ac N-P_2O_5-K_2O. During 1998 through 2012, all pastures received P and K fertilization, and the resultant fertilizer applied to ryegrass pastures was 250-50-100 lbs/ac N-P_2O_5-K_2O and clover pastures received 0-50-100 lbs/ac N-P_2O_5-K_2O. On average, stocking rates to achieve graded levels of forage availability have been 0.8, 1.4, and 2 pair/ac (1500 lb BW) for common bermudagrass pastures, and 1.0, 1.8, and 3 pair/ac for Coastal bermudagrass, respectively, for low, medium, and high grazing intensities. Targeted forage mass (availability) ranged from 500 to 1000 lbs/ac for high grazing intensities, 1250 to 2000 lbs/ac for medium, and greater than 2500 lbs/ac for low grazing intensities. During the summer period, stocking rates are 25% to 35% higher for N-fertilized vs no N-fertilized pastures. An example of suckling calf performance during a 12-year period for the fertility regimens on both common and Coastal bermudagrass are shown in Tables 1 and 2. Using variable stocking to adjust forage mass to targeted levels, resultant stocking rates affected ADG and calf gains per acre. As anticipated, Coastal bermudagrass pastures were more productive than common bermudagrass. And, ryegrass + N pastures were more productive than clover without N. However, cost estimates showed that pasture costs per pound of calf gain were optimum with clover without N. Using 2012 prices for seed, fertilizer, and cattle, all of the stocking x fertility regimen treatments could be considered "acceptable". An intensive soil-depth sampling and analyses for pH, N, P, K, etc. was initiated in 1969 and continues to date with a 5 to 7-year duration between sampling periods. The assessment of soil nutrient status provides documentation of efficiency of fertilizer use.

Stocker Studies
Fall-born calves weaned in June/July are stocked on bermudagrass pastures in which stocking rate, stocking method (continuous vs rotational), and/or supplementation sources-levels are treatments used to assess pasture-animal performance. Winter-born calves weaned in October are stocked on rye + ryegrass pastures and exposed to similar stocking treatment combination as listed for bermudagrass. At termination of the stocker periods (October for fall calves and May for winter calves), all calves are transported to a commercial feedlot to extend the data-collection period from birth-to-harvest. Since 1974, the calf breedtypes have been uniform in that Simmental bulls have been used to breed to F-1 (Hereford x Brahman and Angus x Brahman) cows. Numerous experiments have been conducted to assess animal performance and carcass traits from non-fed (grass-finished), at weaning, or direct from either bermudagrass or rye + ryegrass pastures.

Efficiency of Production
From 2007 to date, the resident Brahman cow herd at the Overton Center have been part of a residual feed intake (RFI) experimentation under the direction of Dr. R. D. Randel. One of the primary objectives of these RFI evaluations were to assess the efficiency of both heifers and bulls based on their intake. Brahman bulls have been used in pasture experiments incorporating alkanes to estimate forage intake and the relationships to RFI. In cooperation with scientists at the University of Missouri who were using Hereford cattle to assess RFI, matings were made between "efficient" Hereford bull and Brahman cows and between "inefficient" Hereford bull and Brahman cows. The resultant F-1 heifers have also been phenotyped for RFI and these cattle will be used in future pasture experiments to determine production-efficiency parameters for the F-1 (HxB) heifer-cow.

BeefSys
All forage and animal data are loaded into an archival-current database, BeefSys, to allow for assessments of birth-to-harvest parameters for cow-calf, stocker, feeder, and carcass data. These data are used for biological and economic modeling as well as an information-base for future experimentation.

Table 1. Twelve-year average stocking for comparison of calf performance on common bermudagrass pastures overseeded with either ryegrass + N or arrowleaf clover + K_2O.

Annual Forage & Fertilizer	Stocking Rate Level	Stocking Rate Pair/ac[1]	Calf ADG	Calf Gain/ac	Calf PAS Cost[2]
		(lbs/da)	(lbs/ac)	(lbs/ac)	per lb gain
Clover + K_2O	High	1.95	0.76	250	$0.50
Ryegrass + N	High	2.17	1.44	588	0.52
Clover + K_2O	Medium	1.30	2.14	497	0.25
Ryegrass + N	Medium	1.37	2.27	606	0.50
Clover + K_2O	Low	0.75	2.53	332	0.38
Ryegrass + N	Low	0.83	2.61	428	0.71

[1] One pair = 1500 lbs body weight
[2] Assumed N costs of $0.90/lb, and K_2O at $0.70/lb; Ryegrass + N = $305/ac; Clover + K_2O = $125/ac

Table 2. Twelve-year average stocking for comparison of calf performance on Coastal bermudagrass pastures overseeded with either ryegrass + N or arrowleaf clover + K_2O.

Annual Forage & Fertilizer	Stocking Rate Level	Stocking Rate Pair/ac[1]	Calf ADG	Calf Gain/ac	Calf PAS Cost[2]
		(lbs/da)	(lbs/ac)	(lbs/ac)	per lb gain
Clover + K_2O	High	2.55	1.32	595	$0.21
Ryegrass + N	High	2.95	1.49	798	0.38
Clover + K_2O	Medium	1.34	2.31	558	0.22
Ryegrass + N	Medium	1.76	2.36	791	0.39
Clover + K_2O	Low	0.84	2.72	413	0.30
Ryegrass + N	Low	1.07	2.71	551	0.55

[1] One pair = 1500 lbs body weight
[2] Assumed N costs of $0.90/lb, and K_2O at $0.70/lb; Ryegrass + N = $305/ac; Clover + K_2O = $125/ac