Utilization Workgroup

ENHANCING STOCKER GAINS FROM BERMUDAGRASS PASTURES

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Forage and animal scientists as well as commercial livestock managers have sought management opportunities - techniques to improve animal performance, ADG, of stocker cattle grazing bermudagrass. For a season-long, 120 to 150-day period, many have discovered that "a pound-a-day" syndrome often controlled stocker ADG. To move past these "ceiling gains", an array of management approaches have been used and has included primarily stocking rate, stocking method, animal genotype-class attributes, supplementation, and bermudagrass cultivar. A comprehensive review of the literature will not be presented; however, selected citations will be made to provide additional references on topic areas.

Stocking Rate. In general, ADG declines with increasing stocking rates and concomittant reduced forage mass in the pasture. Beef cattle are "leaf selectors" at any stocking rate (Roth *et al.*, 1990); hence, as leaf availability diminishes, diet selection, intake, and ADG are affected. Incremental increases in stocking rate have slight effects initially on ADG but profound effects on gain per acre (Conrad *et al.*, 1981; Rouquette *et al.*, 1984). Actual stocking rates of bermudagrass pastures are dependent upon an array of factors including cultivar, soil fertility status, fertilization, and climatic conditions. Throughout many parts of the southeastern US, Coastal bermudagrass pastures receiving a modest rate of 200 lbs N/acre split-applied during the growing season can accommodate about 2500 lbs BW/ac at "medium" stocking rates. At this stocking rate, ADG would be expected to be at 0.75 to 1.5 lbs/da with season-long gain per acre at 450 to 900 lbs/acre. Post-grazing ownership and economic objectives should dictate the stocking rate of choice.

Stocking Method. Perhaps one of the management decisions most used to enhance stocker performance involves that of changing from continuous stocked to some type of rotational stocked system. One of the first decisions that has to be made is that of establishing the number of pastures in a rotational stocked system. The other decision is that of setting a residence time or graze-defer method. Conrad *et al.* (1981) compared 'Coastal' and 'Callie' bermudagrasses at four stocking rates under continuous and rotational stocked management for a 3-year period. A 7-day graze and 21-day deferment was used for the rotational scheme, and stocking rates for both continuous and rotational stocked was fixed at 2.7, 3.2, 3.8 and 4.9 500-lb steers per acre. Although stocking rate negatively affected ADG on both grazing systems, there was no difference in steer ADG for continuous *vs* rotational stocked pastures. They concluded that the biomass and nutritive advantages of the rotationally stocked pastures on Day 1of the grazing cycle did not compensate for the reduced biomass available on Day 7. They further concluded from this experiment that this 7-day graze:21-day deferment system for bermudagrass had no biological nor economic advantage over a similar continuous stocked system. Bransby (1983) summarized a 4-year study with 'Coastcross-2' bermudagrass that was continuously stocked at eight levels of biomass and rotationally stocked at four levels of biomass. In the 6-paddock system that had a 7-day graze : 35-day deferment, ADG was higher on continuous *vs* rotational stocked pastures when comparing the same level of forage biomass. Maximum gain per acre, however, occurred at 3.2 animals per acre under continuous stocked and 5.8 head per acre under rotational stocked pastures. Reduced or diminished ADG on rotationally stocked pastures resulted from the forced consumption of 5-week old forage which had lower nutritive value than that of the more immature forage in the continuously stocked pastures. In many of the "conventional", one-herd, multi-paddock rotational stocked systems, the desire to achieve some high degree of forage utilization in each grazed paddock has defeated the objective of having optimum ADG per animal.

An alternative rotational stocking management strategy for bermudagrass that partially eliminates the forced utilization of reduced nutritive value and biomass during the final day(s) of residence involves the use of multiple herds or the "leader-follower" concept. In two 2-year grazing experiments on bermudagrass, a 2-herd (Table 1; Rouquette *et al.*, 1992) and a 3-herd (Table 2; Rouquette *et al.*, 1994) rotational stocked approach was used to enhance ADG. The primary objective was to allow the first herd the opportunity to remain on any one pasture long enough to consume primarily leaves. Subsequent herds would then be forced to defoliate bermudagrass to a shorter stubble height, and therefore, consume more of the low nutritive value stem components. Maximum ADG always occurred with stockers assigned to the first herd. In the "following herds", forced consumption of the lower strata of bermudagrass stubble, which is composed primarily of stems, has the same impact on ADG as reduced forage mass and/or nutritive value. Multi-herd, rotational stocking offers an opportunity to maximize ADG for selected cattle and increase forage utilization of the pasture. However, the class of cattle in each herd should be carefully considered so that weight gain or loss scenarios can be accommodated without significant negative impacts on biological or economic returns. A "best-case" management scenario would include allotting stocker steers and/or replacement heifers to the first herd, cows and calves to the second herd, and mature, dry cows to the third or last herd.

Table 1. Two-year average daily gain from Simmental x [Hereford x Brahman] (SIMX) and Brahman (BRM) steers grazing bermudagrass and stocked continuous, rotational-one herd, or rotational-two herds[1].

Grazing Method	Average Daily Gain (lbs/da)		
	SIMX	BRM	AVG
Continuous stocked	0.65 b[2]	1.22 a	0.94
Rotational stocked, 1-herd	0.56 b	1.51 a	1.04
Rotational stocked, 2-herds			
First Grazers	1.35 b	1.91 a	1.63
Second Grazers	0.48 b	1.04 a	0.76

[1] Rouquette *et al.*, 1992.
[2]Numbers in a row followed by a different letter, differ @ P < .05.

Table 2. Two-year gain summaries of cattle grazed in a three-herd rotational stocked bermudagrass pasture using Simmental x [Hereford x Brahman] (SIMX) and Brahman (BRM) steers[1].

Grazing Sequence	Average Daily Gain, lbs/da			
	Pairs		Weaned steers	
	Cow	SIMX Calf	SIMX	BRM
First grazers	0.70	2.23 a[2]	.91 c	1.48 b
Second grazers	-0.06	1.76 a	.43 c	.81 b
Last grazers	-0.26	1.49 a	.04 c	.51 b

[1]Rouquette *et al.*, 1992.
[2]Numbers in a row followed by a different letter, differ at P < .05.

Animal Genotype-Class. Reports, information, and connotations which have led to negative statements concerning animal performance from bermudagrass has been largely due to a "mis-match" of animal genotype and class with bermudagrass pastures. Bermudagrass thrives in hot, humid environmental conditions. The least or worst animal performance has generally occurred with lightweight (400 lbs ±), young (less than 6 months of age), and non-Brahman-influenced genotype cattle. From 1969 to 1976, Oliver (1972, 1978) documented the ADG advantage of yearling steers (15-18 mos) *vs* fall-born, spring weaned calves (6-9 mos) grazing Coastal bermudagrass. At similar stocking densities (lbs BW/ac), yearling steers made compensating gains and had final ADG of about 1.8 lbs/da, which was nearly double the ADG of younger, spring-weaned calves. Additionally, Oliver also reported increased gains on bermudagrass from F-1 (Brahman x Hereford) steers over those with a small to no Brahman-influence. Tables 1 and 2 show the increased ADG from long-yearling Brahman steers *vs* fall-born, summer-weaned 25% Brahman, 50% Simmental stockers. In grazing experiments that contrasted Coastal *vs* Tifton 85 bermudagrass at TAMU-Overton (Rouquette *et al.*, 2003), F-1 (Hereford x Brahman) steers gained an additional .75 to 1 lb/da compared to the same age-group of 25% Brahman, 50% Simmental stockers (Table 3).

Table 3. Average daily gain comparisons for two experiments (EXP) during the grazing-backgrounding summer period on Coastal and Tifton 85 bermudagrass pastures (PAS)[1].

Pasture	Average Daily Gain				
	EXP 1[2] HHAB[4]	EXP 1 HxB[4]	EXP 2[3] SIM X[4]	EXP2 HxB[4]	EXP 2 All Cattle
	--(lbs/da)--				
Coastal PAS			.91 d	1.64 c	1.01 d
Coastal + SUPL[6]	1.54 a[5]	2.03 b	1.18 c	2.04 b	1.30 c
Tifton 85 + PAS	1.61 a	2.30 a	1.58 b	2.33 b	1.69 b
Tifton 85 + SUPL			1.86 a	2.89 a	2.02 a

[1] Rouquette *et al.*, 2003.
[2]EXP 1 grazing from 6-16 to 8-31.
[3]EXP 2 grazing from 6-25 to 9-25.
[4]Breed types included Hereford x (Angus x Brahman) [HHAB], Simmental x (AxB) [SIMX] and F_1 (Hereford x Brahman) [HxB].
[5]Means in a column followed by a different letter differ ($P < .05$).
[6]SUPL = 2 lbs/hd/da of a 1:1 (Corn:soybean meal), 28% protein ration containing minerals and Rumensin, and hand fed daily.

Supplementation. The "need" to supplement grazing cattle with additional protein and/or energy sources ranges from those who provide a supplement 365 days a year to those who provide seasonal supplements in the most "delivery-friendly" method to those who supplement because "all my neighbors are doing it" syndrome. Clearly, one of the most complete assessments of supplementation to non-lactating cattle was a review by Moore *et al.* (1999). Moore also summarized associate and substitution effects of supplementation in a TAES Research monograph by Hutson *et al.* (2002). Aiken (2002) used 585 lb steers grazing bermudagrass stocked at 2 hd/ac and supplemented with ground corn at 0, 1, 3, and 5 lbs/hd/da. These supplement levels of 0, 0.17, 0.5, and 0.85% BW had respective ADG of 1.87, 2.15, 2.61, and 2.58 lbs/da 9 (Table 4). In this 2-year experiment, steer ADG at 1.87 lbs/da was excellent on the non-supplemented pasture. The supplement:extra gain ratios ranged from 3.6:1, 4.1:1, and 7:1, respectively for the 1, 3, and 5 lb/hd/da corn levels. Exclusive of costs associated with management, labor, and method of delivery, the supplement costs per pound of extra gain would be about $.22, $.25, and $.42/lb based on ground corn at $120/ton. Even at double the corn price, the cost per pound of extra gain would still be at $.44, $.50, and $.84/lb. Thus, these supplementation strategies were cost-effective even at the 7:1 conversion rate.

Table 4. Two-year average daily gain (ADG) and supplement to gain ratios for stocker steers grazing bermudagrass and receiving various levels of ground corn.[1]

Corn Level		ADG	SUPPL: EXTRA GAIN
lbs/hd/da	% BW[2]	lbs/da	lb:lb
0	0	1.87	--
1	.17	2.15	3.6:1
3	.50	2.61	4.1:1
5	.85	2.58	7.1:1

[1]Aiken (2002).
[2]Based on initial 585-pound steers.

Alternative supplement sources of protein with an ionophore such as Rumensin, have enhanced stocker ADG when fed daily at quantities of 0.2 to 0.4% BW per head (Ellis *et al.*, 1999; Grigsby *et al.*, 1989). Self- limiting rations that were either fishmeal or feathermeal-based produced an additional 0.5 lb ADG with supplement:extra gain ratios that ranged from 2.1 to 3:1 (Rouquette *et al.*, 1993) (Table 5). In more recent grazing experiments with Coastal and Tifton 85 bermudagrass and supplemented with a soybean meal-ground corn ration plus Rumensin (28% protein ration), stockers gained an additional 0.3 lb/da with conversion ratios of 6:1 to 7:1 (Rouquette *et al.*, 2004). With increased daily protein supplement (36% protein) of 0, .2, .4, and .8% BW, stockers grazing Tifton 85 had respective ADG of 1.6, 1.8, 2.0, and 2.4 lbs/da (Woods *et al.*, 2004) (Table 6). Although all treatment ADGs differed, the supplement:extra gain ratios were similar at 6.8:1 to 7.2:1. Supplement costs per pound of gain with $250/ton ration, or $0.125 per pound, ranged from about $0.75 per extra pound of gain (6:1) to $0.90 per extra pound of gain (7.2:1). Major concerns with supplementation should be targeted at supplement:extra gain ratio, ration cost, and method of delivery. Hence, at the commercial level, there are numerous choices for supplementation which are most often based exclusively on method of delivery. Comparative information among supplement formulations and daily intake are necessary to advise grazing management.

Cultivar. Previous bermudagrass research databases that compared biomass potential, nutritive value, animal ADG, and gain per acre have been developed in numerous southern states. Utley *et al.* (1974) reported that 'Coastcross-1' produced higher ADG than Coastal bermudagras (1.5 *vs* 1.1 lbs/da), and greater gains per acre (594 *vs* 414 lbs/ac). 'Tifton 44' bermudagrass was released based on increased nutritive value (Burton and Monson, 1978) and increased ADG compared to Coastal bermudagrass (Utley *et al.*, 1978). Conrad *et al.* (1981) compared Coastal to Coastcross 1, Callie, and 'Brazos' under various grazing management systems and demonstrated advantages as well as disadvantages. Greene *et al.* (1990) reported 4-year animal gains of 1.6 lbs/da and 1316 lbs/ac from four bermudagrasses with 'Grazer' producing 1.8 lbs/da ADG and 1484 lbs/acre. Hill *et al.* (1993) reported similar 3-year ADG for 'Tifton 78' and 'Tifton 85' at about 1.5 lbs/da; however, gain per acre from Tifton 85 was 1300 lbs/ac compared to 885 lbs/ac for Tifton 78. Rouquette *et al.* (2003) compared Coastal to Tifton 85 bermudagrass using fall-born, 25% Brahman, 50% Simmental stocker cattle grazing pasture only or pasture plus a daily ration of 2 lbs/hd/da of a corn:soybean meal (28% protein) containing minerals and Rumensin (Table 3). The ADG from Coastal was .9 lbs/da and from Tifton 85 was 1.6 lbs/da. For cattle receiving protein supplementation, ADG from Coastal was 1.2 lbs/da and from Tifton 85 was 1.9 lbs/da. When F-1 (Hereford x Brahman) steers were used, ADG from Coastal, Coastal plus supplement, Tifton 85, and Tifton 85 plus supplement was 1.6, 2.0, 2.3, and 2.9 lbs/da, respectively. Woods *et al.* (2004) showed that stocker ADG on Tifton 85 bermudagrass ranged from about 1.6 to 2.4 lbs per day when supplemented with different daily rations of a 2:1 soybean meal:corn ration (36% protein) (Table 6).

Table 5. Performance of crossbred (x-bred) and Brahman steers grazing Coastal bermudagrass (PAS) and

receiving supplemental protein ration as fishmeal or feathermeal[1].

Treatment	Average Daily Gain (lbs/da)	
	x-bred	Brahman
Pasture Only	1.02 ± .06	1.61 ± .03
PAS + Fishmeal[2]	1.44 ± .07	1.97 ± .10
PAS + Feathermeal[3]	1.61 ± .06	2.28 ± .11
Additional Gain		
PAS + Fishmeal	.42	.36
PAS + Feathermeal	.59	.67
Supplement:Extra Gain		
PAS + Fishmeal	3:1	3.5:1
PAS + Feathermeal	2.1:1	1.9:1

[1]Rouquette *et al.*, 1993.
[2]Menhaden fishmeal mixed with corn at 1:1 ratio for 34.5% protein; hand-fed daily at 1.25 lbs/hd/da.
[3]Feathermeal mixed with corn at 64:36 corn:feathermeal ratio for 34.5% protein; hand-fed at 1.25 lbs/hd/da.

Table 6. Average daily gain (ADG) and efficiency of supplementation for stockers grazing Tifton 85 bermudagrass and receiving various levels of protein supplementation.[1]

Supplement Level		ADG lbs/da	Supplement: Extra Gain
% BW/hd/da	lbs/hd/da		
0	0	1.55 a[3]	--
.2	1.7	1.79 b	6.8:1
.4	3.4	2.02 c	6.9:1
.8	6.8	2.44 d	7.2:1

[1]Woods *et al.*, 2004.
[2]Supplement was a 2:1 soybean meal:ground corn ration, 36% protein, with salt, minerals and Rumensin 80.
[3]Means followed by a different letter differ @ $P < .07$.

In a cow-calf stocking rate experiment, Rouquette *et al.* (2002) reported that maximum ADG for steers and heifers occurred on the low stocked pastures each of common (2.5 lbs/da), Coastal (2.8 lbs/da), and Tifton 85 (3.2 lbs/da) when grazed from June through September. The increased nutritive value and fiber digestibility of Tifton 85 (Mandebvu *et al.*, 1999) along with its biomass production potential has altered the backgrounding management strategies for environmentally-adapted genotypes.

With the stocker gain potentials from Tifton 85 bermudagrass, $125/ton corn, and stockers valued at more than $1 per pound, numerous opportunities exist for managers to retain ownership and/or purchase-contract graze stocker cattle in the southeastern US during the summer months. Stocker ADG that approach and exceed 2 lbs/da when stocked at 4 to 5 hd per acre can produce 1000 lbs liveweight gain per acre. There are numerous associated positive economic and biological impacts of renewed stocker operations on pasture and this includes a major reduction in animal waste at the feedlot site due to reduced time on feed.

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