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Heavy vs Light Weight Steers Grazing Old World Bluestem at Three Stocking Rates: I. Steer Weight Gain and Economic Analysis

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Authors:

C. J. Ackerman, S. I. Paisley, G. W. Horn, H. T. Purvis II, T. N. Bodine and B. R. Karges

Story in Brief

Two-hundred fourteen mixed breed light weight steers (average initial wt: 311 ± 37 lb) and 115 mixed breed heavier weight steers (average initial weight: 584 ± 37 lb) were used to evaluate the effects of stocking rate on weight gain of steers grazing Plains old world bluestem (OWB) from May 29, 1997 through August 5, 1997. Additionally, the income of the two sizes of steers was analyzed. Three stocking rates were used; 1.5, 1.1, and .7 acres/500 lb of initial steer live weight for light, moderate, and heavy stocking rates. As stocking rates (lb/acre) increased, daily gains decreased by .0003 and .009 lb/steer for light and heavy steers, respectively. Additionally, increasing stocking rate (lb/acre) resulted in increased gains per acre of .46 lb/acre for light and .25 lb/acre for heavy steers. Daily gains were greater for heavy (2.67 lb/d) than light (2.22 lb/d) steers, however, light steers gained more BW/acre (252 vs 158 lb/acre for light and heavy steers, respectively). Steers in the heavy stocked pastures had lower ADG (2.27 lb) than steers associated with moderate (2.49 lb) or light (2.57 lb) stocking rates. Net income for light steers was $34.87/steer and $58.57/acre while net income for heavy steers was $9.98/steer and $8.43/acre. Light weight calves had a higher net income per pound of gain, thus, even though ADG was lower and total initial investment was greater for these steers, greater net income would have been realized for LHT calves.

(Key Words: Growing Cattle, Stocking Rate, Old World Bluestem.)

Introduction

Old world bluestem is one of the main grasses which has been planted on marginal farmland in Oklahoma (Berg and Sims, 1995). The nutritive value of old world bluestems declines rapidly as they mature. Therefore, forage must be kept in a vegetative and actively growing stage in order to achieve optimal performance of growing livestock (Dewald et al., 1985). One method of maintaining this growing stage may be manipulation of stocking rate. Establishing which stocking rates achieve optimal use of forage while maximizing cattle performance would aid in making production decisions. Sims (1988) proposed that old world bluestem pastures could be stocked at a rate of 1 acre per steer in eastern and 3 acres per steer in central Oklahoma during the summer grazing period.

Body weight of stocker cattle may be important when considering stocking rates and net income. If stocking rates are based on pounds of liveweight per acre, light weight calves may offer the opportunity to stock more steers per acre. Additionally, the value of body weight gain is often higher for light calves than for heavy calves.

The objectives of this study were to determine the effects of three different stocking rates on the live weight gain of light and heavy steers. Forage intake, diet quality, and grazing time of these cattle are reported in a companion paper in this report.

Materials and Methods

Study Site. The study site was located at the Bluestem Research Range 7 miles southwest of Stillwater, OK. Cattle were allowed to graze Plains old world bluestem (*Bothriochloa ischaemum* var. Plains: OWB) from May 29, 1997 through August 5, 1997. One hundred lb of N/acre and a herbicide treatment were applied to the pastures early in the growing season.

Cattle and Stocking Rate. Two-hundred fourteen mixed breed light weight steers (average initial wt: 311 ± 37 lb: LHT) and 115 mixed breed heavier weight steers (average initial weight: 584 ± 37 lb: HWT) were used in this study. Steers were weaned and vaccinated prior to their arrival in Stillwater. All steers received a Synovex-Câ implant prior to initiation of the trial.

Stocking rates were: light stocking; 1.5 (LS), moderate stocking; 1.1 (MS), and heavy stocking; .7 (HS) acres/500 lb of initial steer live weight. When expressed as lb/live weight/acre, calculated stocking rates would have been 333, 455, and 714 lb/live weight/acre for LS, MS, and HS, respectively. However, due to variance in steer live weight, actual stocking rates were approximately 350, 450, and 750 lb live weight/acre for LS, MS, and HS, respectively. All stocking rate by cattle type combinations were replicated twice resulting in a total of 12 pastures. Cattle were weighed May 28, 1997 and August 8, 1997. In an attempt to equalize fill across treatments, all cattle were placed in the same tallgrass prairie pasture 3 to 4 d prior to both weigh dates. Approximately 12 to 16 h prior to weighing, cattle were moved to a small holding area devoid of grass, and water was withheld until weighing.

Economic Analysis. Gross returns to summer grazing were calculated by multiplying the weight gain of steers by the value of weight gain for each size of steer. For comparison of returns to grazing, gains of LHT and HWT steers were averaged across stocking rates. The value of gain was calculated using the 10-yr, seasonally adjusted Oklahoma City National Stockyards purchase and selling prices for medium-frame, No. 1 steers (Trapp, 1997). The April purchase price of steers was $107.56/cwt for 300 to 400 lb steers and $91.08/cwt for 500 to 600 lb steers. The August selling price was $96.01/cwt for 400 to 500 lb steers and $80.56/cwt for 700 to 800 lb steers. Net income was calculated for both HWT and LHT steers to compare relative profitablity of the two groups. Health and implant costs were estimated to be $18.00/steer for LHT and $9.00/steer for HWT steers, season-long pasture costs were estimated to be $.28/lb of gain. Average death losses were assumed to be 2% for LHT and 1% for HWT steers. Variable costs without interest were $67.33 and $65.03/steer for LHT and HWT steers, respectively. Initial purchase price for LHT steers was $334.52/steer while initial purchase price for HWT steers was $531.91/steer. Thus, total dollars invested were $401.84/steer for LHT and $596.94/steer for HWT steers. Assuming 10% initial equity, the amount of money borrowed would have been $361.66/steer for LHT and $537.24/steer for HWT steers resulting in interest costs (10% rate; 2% above the prime interest rate) of $6.83/steer for LHT and $10.15/steer for HWT steers for the trial period. Thus, total costs, including interest, were $74.16/steer for LHT and $75.18/steer for HWT steers. Net income was calculated by subtracting total costs from gross income.

Statistical Analysis. Steer performance data were analyzed using the GLM procedure of SAS (1992) as a replicated 2 x 3 factorial. Treatment means were separated using Fishers protected LSD. Due to significant (P<.10) interaction, gain/acre data were analyzed using MIXED of SAS (1992), and SLICE was used to analyze simple effects. Regression analysis was conducted using SAS (1992).

Results and Discussion

Daily gains were greater (P<.01; Table 1) for HWT (2.67 lb/d) cattle than LHT (2.22 lb/d) cattle. As stocking rate (lb/acre) increased, daily gains decreased by .0003 and .009 lb/steer for LHT and HWT (Figure 1) steers, respectively. Steers in LS and MS pastures gained (P<.10) more (2.57 and 2.49 lb/day, respectively; Table 2) than steers HS pastures (2.27 lb/d). The higher rates of gain for lighter stocking rates may be expected due to possible differences in forage availability, quantity, and(or) quality factors as a result of increasing stocking rate.

There was a significant (P<.10) cattle size x stocking rate interaction for gain/acre, however, when simple effects were analyzed, LHT cattle gained more (P<.01; Table 3) BW/acre than HWT cattle at all stocking rates. Additionally, there was an increase (P<.01) in gain/acre as stocking rate increased for both types of cattle as would be expected. Gain per acre increased by .46 lb/acre for LHT cattle and .25 lb/acre for HWT cattle (Figure 2) as stocking rates (lb/acre) increased. Light weight cattle gained more per acre despite having more animals per acre in all stocking rates than HWT cattle, thus, the larger number of animals/acre did not decrease gain/acre. Gain per acre continued to increase as stocking rate increased. Therefore, it appears that standing crop, or pounds of forage available to the steers, was not limiting to overall gain/acre at any stocking rate, even though individual animal performance was decreased slightly.

The calculated value of weight gain (Table 4) was $72.00/cwt for LHT steers and $47.00/cwt for HWT steers. Due to increased weight of steers and seasonality of prices, both groups of steers decreased in terms of value per pound of live weight from April to August. However, the

value of LHT steers per pound of live weight was greater than the value of live weight for HWT calves both at the beginning and at the end of the trial, thus, gain was worth more per pound for LHT than HWT steers. After variable costs were calculated, net income for light steers was $34.87/steer and $58.57/acre while net income for heavy steers was $9.98/steer and $8.43/acre. Light weight calves had a higher net income per pound of gain, thus, even though ADG was lower and total initial investment was greater for these steers, greater net income would have been realized for LHT calves.

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Table 1. Weights, ADG, and gain per acre of light vs heavy steers.

	Cattle type		
	Light	Heavy	SE
No of steers	214	115	---
Starting wt, lb	311[b]	584[c]	3.3
Final wt, lb	462[b]	766[c]	5.7
ADG, lb	2.22[b]	2.67[c]	.060
Total gain, lb/acre[a]	252	158	5.3

[a] Significance levels not reported due to interaction (P<.05).
[b,c] Means within a row without common superscripts differ (P<.05).

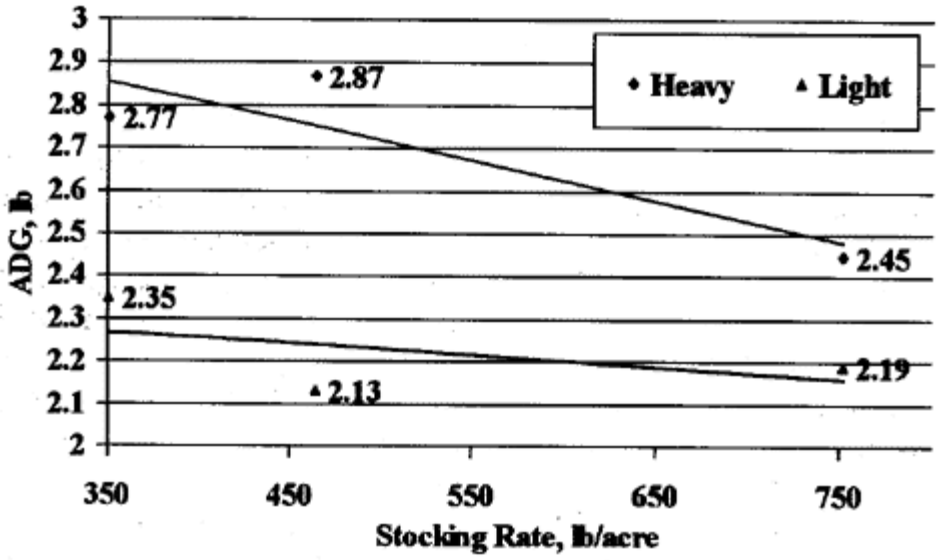
Table 2. Effect of stocking rate on average daily gain and gain per acre of light and heavy steers.

	Stocking rate			
	Light	Moderate	Heavy	SE
Stocking rate, acres/steer[a]	1.5	1.1	.7	
Stocking rate, lb LW/acre[b]	350	450	750	
ADG, lb	2.57[d]	2.49[d]	2.27[e]	.073
Gain, lb/acre[c]	148	184	282	6.5

[a] Acres per 500 lb of initial steer live weight.
[b] Actual stocking rates.
[c] Significance levels not reported due to interaction (P<.05).
[d,e] Means within a row without common superscripts differ (P<.10).

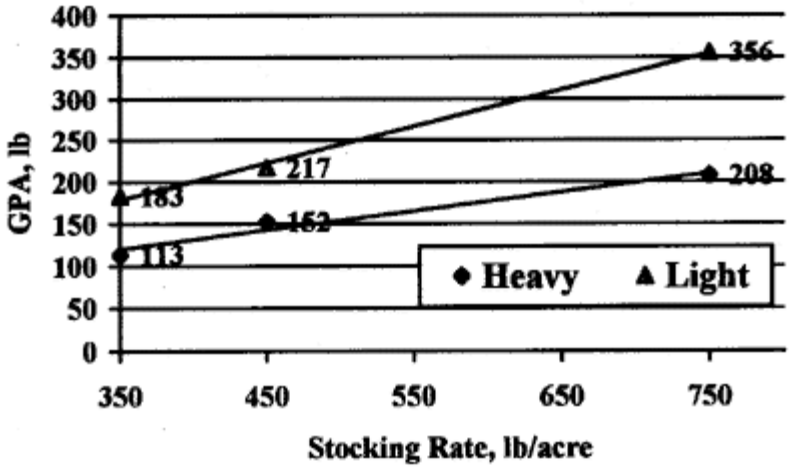
Table 3. Weight gain of light vs heavy steers as influenced by stocking rate.			
	Cattle type		
Stocking Rate	Light	Heavy	SE
Light	183[b]	113[a]	9.1
Moderate	217[b]	152[a]	9.1
Heavy	356[b]	208[a]	9.1
[a,b] Means within a row without common superscripts differ (P<.01).			

Table 4. Net income of light vs heavy steers grazing old world bluestem averaged across all stocking rates.		
	Cattle Type	
Item	Light	Heavy
Acres	125	135
Initial number of steers	214	115
Initial weight, lb	311	584
Purchase price (April), $/cwt	107.56	91.08
Purchase cost, $/steer	334.52	531.91
Final weight, lb	462	766
Selling price (August), $/cwt	96.01	80.56
Final value $/steer	443.55	617.06
Total weight gain, lb	150	181
Gross income, $/steer	109.03	85.16
Value of gain, $/cwt	72.00	47.00
Variable costs:		
Health, $/steer	18.00	9.00
Pasture, ($.28/lb gain)	42.14	50.56
Death loss, $/steer	7.20	5.46
Variable costs, $/steer: (not including interest)	67.33	65.03
Total cost, $/steer: (not including interest)	401.84	596.94
Equity (10%), $/steer	40.18	59.69
Borrowed capital, $/steer	361.66	537.24
Interest (10% Rate, 68 days), $/steer	6.83	10.15
Total variable costs, $/steer (including interest)	74.16	75.18
Net income, $/steer	34.87	9.98
Net income, $/acre[a]	58.57	8.43
[a] Net income per acre = $/steer x number of steers remaining at the end of the trial/acres.		



Y = 3.18 + -.009x (HWT Steers); Y = 2.37 + -.0003x (LHT Steers)

Figure 1. Relationship between average daily gain and stocking rate for both light and heavy steers.



Y = 38.87 + .23x (HWT Steers); Y = 22.14 + .44x (LHT Steers)

Figure 2. Relationship between gain per acre and stocking rate for both light and heavy steers.

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