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Beef Production from Holstein Steers on No-Till Ryegrass Pastures

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Introduction

Holstein bull calves are normally sold from dairy operations at 1 week of age. The traditional market outlet for Holstein bulls is the livestock auction. The majority of these Holstein bulls are purchased by the veal industry and are fed veal rations until slaughter *(5)*. Recent interest in Holstein bulls used as stocker animals has given rise to the dairy-beef industry in the United States.

Most of the research involving Holstein steers as dairy-beef animals has been done in the northern United States. One study showed that Holstein steers had an average daily gain (ADG) of 2.31 pounds from weaning to 166 days of age when fed a rolled corn based diet and 2.46 pounds of ADG when fed a whole shelled corn based diet *(3)*. A 10-year study showed that Holstein steers averaged 2.70 pounds of ADG on low-protein, corn-silage-based diets and 3.05 pounds of ADG on high-protein, corn-silage-based diets *(5)*. These studies

show that the ADG of Holstein steers is consistently higher than 2 pounds per animal per day.

While there is limited data on Holstein steer performance on ryegrass pastures in the Southeast, a study using Holstein, Jersey, Guernsey, and Ayrshire dairy heifers on oat/ryegrass pastures *(7)* showed that ADG averaged 1.87 pounds over a 3-year period. Another study showed that Hereford, Beefmaster x Hereford, and Angus x Hereford steers had an ADG of 2.57 pounds grazing a ryegrass/crimson clover pasture without supplemental grain *(2)*.

Ryegrass planted in early fall provides up to 200 days of grazing per year*(1)*. Dry matter yields can exceed 10,000 pounds per acre when managed correctly *(6)*. This makes ryegrass the forage of choice for stocker grazing programs in the South.

The dairy industry practice of fall calving puts thousands of Holstein bull calves on the market each fall. This study was initiated to determine how fall-born Holstein steers would perform on ryegrass grazing. In addition to animal production, the economics of grazing fall-born Holstein steers on ryegrass will be useful to producers interested in Holstein steers as an alternative enterprise.

Experimental Procedure

Fall-born (Aug. 1-Nov. 1) Holstein bull calves were assembled from three Mississippi locations: the Coastal Plain Branch Experiment Station in Newton, the North Mississippi Branch Experiment Station in Holly Springs, and the Bearden Dairy Research Center at Mississippi State University. These calves were housed at the Coastal Plain Branch in individual calf hutches and fed a milk-grain diet until weaning.

The milk diet was colostrum for the first 3 days and milk replacer thereafter. The milk replacer, which contained 20 percent crude fat and 20 percent crude protein, was formulated from milk by-products. Calves were fed 1 gallon of milk replacer daily until 2 weeks of age. At 2 weeks, the volume was gradually increased to 5 quarts per calf until weaning. Calves were weaned at 35-40 days or when they were consuming at least 1.5 pounds of calf starter daily. No water was provided to the calves until weaning. At weaning, calves were freely fed calf starter until they were consuming 5 pounds daily.

Two-month-old calves were grouped and fed calf starter at 6 pounds per head per day, plus as much ryegrass hay as they wanted. Also at 2 months, calves were castrated, dehorned, implanted with Ralgro®, vaccinated against clostridial diseases, and dewormed with Ivomec®. Steers were re-implanted at 90-day intervals and were dewormed with Ivomec® in early March. Calves were maintained in groups until ryegrass pasture was available.

Ryegrass pastures used in this trial were established using no-till techniques on Prentiss sandy loam soil. Preparation began in early August when warm-season annual grasses were killed with glyphosate. Thirty days after the summer vegetation was killed, 35 pounds of Marshall ryegrass seed per acre were direct seeded with a Great Plains® no-till grain drill. Seedling ryegrass was monitored closely for cricket and grasshopper infestations. If an insecticide were needed, methyl parathion was applied to reduce the insect population.

All pastures received 68 pounds of N per acre, plus P_20_5 and K_20, according to a soil test at planting. Budgets allowed for 69 pounds of P_20_5 and 60 pounds of K_20 per acre, the average amount of these nutrients needed. Additional N was applied at 68 pounds per acre in December and 34 pounds per acre in March.

Calves were grouped according to weight and placed on the no-till ryegrass pastures when early grazing was available. Eighteen-steer herds were placed on 6-, 5-, and 4-acre pastures, creating stocking rate treatments of 3, 3.6, and 4.5 head per acre, respectively. Steers were assigned to these treatments in a randomized complete block design, with each year of the 6-year study constituting a block. There was no replication between blocks.

While on ryegrass paddocks, calves were fed whole shelled corn at the rate of 1 percent of bodyweight daily. At 28-day intervals throughout the study, calves were re-weighed and the corn feeding rate adjusted. Feeding whole shelled corn tended to reduce the incidence of bloat, a problem that existed to some degree throughout the study. Calves on the lower stocking rates (3 and 3.6 per acre) were fed whole shelled corn until March of each year. In March there was adequate ryegrass grazing to meet their dietary needs without supplementation. Calves on the highest stocking rate (4.5 per acre) were fed whole shelled corn at 1 percent of bodyweight throughout the trial. Weight data were analyzed using the Analysis of Variance (ANOVA) procedure of the Statistical Analysis System (SAS), with each year of the study serving as a replicate.

Results and Discussion

Holstein steer calves began grazing ryegrass pastures as early as Nov. 10 and as late as Dec. 15, depending on rainfall (Table 1). Stocking date was determined when the forage was approximately 8 inches tall. The selling dates during the first 3 years of the trial were when ryegrass grazing was depleted due to hot weather and lack of rainfall. During the last 2 years of the trail, calves were marketed earlier in the spring to take advantage of higher market prices. Fall 1993 and spring 1994 provided the longest grazing period, with 187 days on pasture. The 5-year average was 159 days on pasture.

Mean steer weight at the start of grazing was 180 pounds per head. Mean final weight was 593 pounds per head, for a gain of 413 pounds per head (Table 2). Differences in bodyweight among treatments were not statistically significant ($P<0.05$). Liveweight stocking rates were 540 pounds per acre for the 3-head-per-acre treatment; 651 pounds, 3.6-head; and 809 pounds, 4.5-head. Animal gains were 1,246, 1,474, and 1,861 pounds per acre for the three respective stocking rates.

Whole shelled corn fed was 410, 416, and 594 pounds per steer for the three respective treatments. Feeding whole shelled corn at 1 percent of live bodyweight to steers stocked at 4.5 per acre throughout the trial allowed these steers to gain weight at a comparable rate to the other two treatments. A free-choice mineral was available to steers at all times during the trial. This mineral contained Bovatec® to aid in the prevention of coccidiosis and to promote weight gain. Ryegrass hay was supplemented when ryegrass height was less than 3 inches. The steers stocked at 3 per acre required the least hay, while steers stocked at 3.6 per acre required the most hay supplementation (Table 2). Whole shelled corn supplementation for steers stocked at 4.5 per acre reduced their expected hay intake.

Expenses were generated for each stocking rate using the GRAZER® software program (Table 3). Purchase price used in 1996-97 was based on 80-pound calves valued at $25 per head. No-till ryegrass pasture costs were taken from the "Forage 1996 Planning Budgets" *(4)*. Others prices included $4 per bushel of corn, $75 per ton of hay, and $540 per ton of mineral. Expenses were lowest for steers stocked at 3.6 per acre and highest for steers stocked at 3 per acre. The major cost differences between treatments were costs per head for ryegrass pasture and whole shelled corn. As stocking rates increased, pasture cost decreased and whole shelled corn cost increased.

Holstein steer grazing was profitable in 5 years of this study, with returns above costs reaching $133.52 per head. (Table 4). However, 1 year of the study experienced a loss of $86.12 per head. From the expenses in Table 3, break-even projections were calculated in Tables 5- 7 based on purchase and sale prices. These tables show that purchase price does not have as much impact as sale price on revenues generated from dairy beef production.

Conclusion

The three stocking rates in this study were not significantly different in total gain per steer, and there was no significant difference between years used as replications in this study ($P<0.05$).

Steers on the lowest stocking rate (three per acre) required the least forage management and always had moderate levels of excess forage available. The stocking rate of 3.6 animals per acre, which had the highest return above cost, did not have any excess forage in the spring. Steers on the highest stocking rate (4.5 per acre) rarely had surplus forage available. Differences in hay consumption was negligible between treatments, even when there appeared to be surplus forage in the lowest stocking rates and no surplus in the highest stocking rate. The use of whole shelled corn to supplement pasture allowed higher stocking rates without compromising animal performance. This possibly explains why there was no difference in hay intake between treatments. The use of whole shelled corn rather than a mixed feed greatly reduced the incidence of bloat, a problem that developed early in the study.

The selling price of dairy-beef animals is directly related to the livestock market. These economic conditions determine whether or not there is money to be made in dairy-beef enterprises. The economic data in Table 3 and the returns above costs shown in Tables 5-7 will be helpful in setting up budgets for producers interested in dairy-beef as an alternative enterprise.

References

(1) Brock, W.A., E.J. Murphey, D.K. Hardin, C.E. Powe, and B.L. Clark. 1992. Beef production from Holstein steers. MAFES Bulletin 230.

(2) Burris, W.R., W.E. Brown, R.W. Rogers, W.C. Couvillion, and F.H. Tyner. 1976. Finishing steers on ryegrass-clover pasture with supplemental grain. MAFES Bulletin 839.

(3) Chester-Jones, H., D.M. Ziegler, and J.C. Meiske. 1991. Feeding whole or rolled corn with pelleted supplement to Holstein steers from weaning to 190 kilograms. J. Dairy Sci. 74:1765.

(4) Forage 1996 Planning Budgets. 1996. Agricultural Economics Report 75. Mississippi Agricultural and Forestry Experiment Station and Mississippi Cooperative Extension Service. p 28.

(5) Fox, D.G., and D.J. Ketchen. 1991. Feeding Holstein steers: A summary of ten years of research. Proc. Holstein Beef Production Symposium, Harrisburg, PA. Feb. 13-15, 1991. p 125.

(6) Johnson, B.B., N.C. Edwards, and W.A. Brock. 1993. Ryegrass varieties for forage. MAFES Information Bulletin 252. p 48.

(7) Shumaker, F.D. 1980. A comparison of the performance of unbred dairy heifers grazing cool season grass-legume mixtures versus cool season grasses fertilized with nitrogen. Masters Thesis, Mississippi State University.

TABLES

Table 1. Date stocked, date sold, and days of grazing for Holstein steers grazing no-till ryegrass

pasture.

Year	Stocking date	Selling date	Grazing days
1992	12-13-91	6-01-92	168
1993	12-15-92	5-18-93	152
1994	11-10-93	5-18-94	187
1995	11-18-94	4-13-95	146
1996	11-10-95	4-02-96	144

Table 2. Five-year average of animal performance, pasture performance, and feed requirements for Holstein steers grazing no-till ryegrass pasture.

Variable	Stocking Rate[1]		
	3	3.6	4.5
Animal performance			
Age on ryegrass (days)	86	87	89
Initial weight (lb)	180	181	180
Final weight (lb)	595	590	593
Animal gain (lb)[2]	415	409	414
Average Daily Gain (lb)[2]	2.67	2.73	2.67
Pasture performance			
Initial stocking rate (lb/a)	540	651	809
Final stocking rate (lb/a)	1,786	2,125	2,670
Pasture gain (lb/a)[3]	1,246	1,474	1,861
Feed requirements			
Ryegrass pasture (acres)	.33	.28	.22
Whole shelled corn (lb)	410	416	594
Hay (lb)	73	84	78
Minerals (lb)	36	36	36

[1]Eighteen-steer herds were placed on 6-, 5-, and 4-acre pastures, creating stocking rates of 3, 3.6, and 4.5 steers per acre.
[2]Animal gains not statistically different (P<0.05) for treatment effects in ANOVA.
[3]Means for pasture gain are statistically different (P>0.05).

Table 3. Annual expenses for Holstein steers grazing no-till ryegrass pasture.

Expense	Stocking rate[1]		
	3	3.6	4.5
Ryegrass pasture[2]	$47.86	$39.88	$31.90
Corn on pasture[3]	29.29	29.71	42.43
Hay[3]	2.74	3.15	2.93
Pre-grazing feed[4]	75.34	75.34	75.34
Salt, minerals[3]	9.72	9.72	9.72
Implants	3.00	3.00	3.00
De-wormers	6.00	6.00	6.00
Tagging	3.00	3.00	3.00
Vaccines	8.75	8.75	8.75
Death loss[5]	1.00	1.00	1.00
Marketing[6]	5.02	4.86	4.59
Non-cash expenses[7]	14.61	14.26	13.91
Interest on calf[8]	1.72	1.72	1.72
Interest on operating capital[9]	18.02	18.07	18.82
Total direct expenses[10]	226.07	218.46	223.46
Cost per cwt of steers sold[11]	**37.99**	**37.03**	**37.68**

[1]Eighteen-steer herds were placed on 6-, 5-, and 4-acre pastures, creating stocking rates of 3, 3.6, and 4.5 steers per acre. Expenses are reported in dollars per head.
[2]Ryegrass pasture cost ($143.58/a), excludes $6.33/a fixed expenses and $12.62/a interest on operating capitol. (included below) *(4)*.
[3]November 1996 prices for whole shelled corn = $4/bu; minerals = $540/ton; and

ryegrass hay = $75/ton.

[4]Pre-grazing feed: 52.10 gal milk x $.80/gal = $41.68; 184.25 lb grain x $.175/lb = $32.24; and 139 lb hay x $.03/lb = $4.17. Total = $75.34.

[5]Calculated death loss of 5 percent.

[6]Marketing costs = 2 percent of gross sales.

[7]Depreciation of machinery and equipment: $6.33/a, housing $125/head investment for 10 yr life = $12.50/head. Fencing not included.

[8]Interest on calf = 8.6 percent for calf valued at $25/cwt, weighing 80 lb/head.

[9]Interest on capital at 6 percent.

[10]Labor, debt service, income tax, and overhead are not included.

[11]Cost/cwt = Total Direct expenses ($)/final weight (cwt).

Table 4. Prices and returns above costs for Holstein steers grazing no-till ryegrass pasture.

Year	Sale weight	Purchase price[1]	Sale price[2]	Returns for each stocking rate[3]		
				3	3.6	4.5
	lb/head	*$/head*	*$/cwt*	*$/head*	*$/head*	*$/head*
1991-92	646	108.45	72.70	120.35	127.80	122.88
1992-93	608	94.41	76.00	126.07	133.52	128.60
1993-94	632	82.65	54.10	24.29	32.33	27.41
1994-95	561	67.49	55.90	12.30	19.75	14.83
1995-96	516	29.50	33.10	-86.12	-78.68	-83.60
1996-97[4]	542	25.00	59.75	60.45	67.90	62.98

[1]Average price for 1- to 7-day-old bull calves at local auction. Calves purchased on per head basis. Price based on 80 lb bodyweight.

[2]Actual sale price at local auction.

[3]Returns above costs based on current non-calf expenses Table 3). Cash available would be the sale price per head minus total direct expenses plus noncash expenses. This would be used for labor expenses, debt service, family living expenses, income taxes, and overhead before retained earnings could be calculated.

[4]Returns above costs for 1996-97 based on previous years average inputs. Data from this year not included in other tables for statistical or economic analysis.

Table 5. Return above costs per head for steers stocked at three head per acre.[1]

Sale price ($/cwt)	Purchase price ($/head)					
	0	25	50	75	100	125
30	-55.07	-75.07	-95.07	-115.07	-135.07	-155.07
35	-26.57	-46.57	-66.57	-86.57	-106.57	-126.57
40	1.93	-18.07	-38.07	-58.07	-78.07	-98.07
45	30.43	10.43	-9.57	-29.57	-49.57	-69.57
50	58.93	38.93	18.93	-1.07	-21.07	-41.07
55	87.43	67.43	47.43	27.43	7.43	-13.43
60	115.93	95.93	75.93	55.93	35.93	15.93
65	144.43	124.43	104.43	84.43	64.63	44.43
70	172.93	152.93	132.93	112.93	92.93	72.93
75	201.43	181.43	161.43	141.43	121.43	101.43
Break-even sale price ($/cwt)[2]						
	39.66	43.17	46.68	50.19	53.70	57.21

[1]Based upon current costs (Table 3), 570 lb shrunk sale wt, 80 lb purchase wt.

[2]This section presents the steer sale prices required for a producer to break even at each of the respective calf purchase prices.

Table 6. Return above costs per head for steers stocked at 3.6 head per acre.[1]

Sale price ($/cwt)	Purchase price ($/head)					
	0	25	50	75	100	125
30	-47.46	-67.46	-87.46	-107.46	-127.46	-147.46
35	-18.96	-38.96	-58.96	-78.96	-98.96	-118.96

40	9.54	-10.46	-30.46	-50.46	-70.46	-90.46
45	38.04	18.04	-1.96	-21.96	-41.96	-61.96
50	66.54	46.54	26.54	6.54	-13.46	-33.46
55	95.04	75.04	55.04	35.04	15.04	-4.96
60	123.54	103.54	83.54	63.54	43.54	23.54
65	152.04	132.04	112.04	92.04	72.04	52.04
70	180.54	160.54	140.54	120.54	100.54	80.54
75	209.04	189.04	169.04	149.04	129.04	109.04
Break-even sale price ($/cwt)[2]						
	38.33	41.83	45.34	48.85	52.36	55.87

[1]Based upon current costs (Table 3), 570 lb shrunk sale wt, 80 lb purchase wt.
[2]This section presents the steer sale prices required for a producer to break even at each of the respective calf purchase prices.

Table 7. Return above costs per head for steers stocked at 4.5 head per acre.[1]

Sale price ($/cwt)	Purchase price ($/head)					
	0	25	50	75	100	125
30	-52.46	-72.46	-92.46	-112.46	-132.46	-152.46
35	-23.96	-43.96	-63.96	-83.96	-103.96	-123.96
40	4.54	-15.46	-35.46	-55.46	-75.46	-95.46
45	33.04	13.04	-6.96	-26.96	-46.96	-66.96
50	61.54	41.54	21.54	1.54	-18.46	-38.46
55	90.04	70.04	50.04	30.04	10.04	-9.96
60	118.54	98.54	78.54	58.54	38.54	18.54
65	147.04	127.04	107.04	87.04	67.04	47.04
70	175.54	155.54	135.54	115.54	95.54	75.54
75	204.04	184.04	164.04	144.04	124.04	104.04
Break-even sale price ($/cwt)[2]						
	39.20	42.71	46.22	49.73	53.24	56.75

[1]Based upon current costs (Table 3), 570 lb shrunk sale wt, 80 lb purchase wt.

[2]This section presents the steer sale prices required for a producer to break even at each of the respective calf prices.