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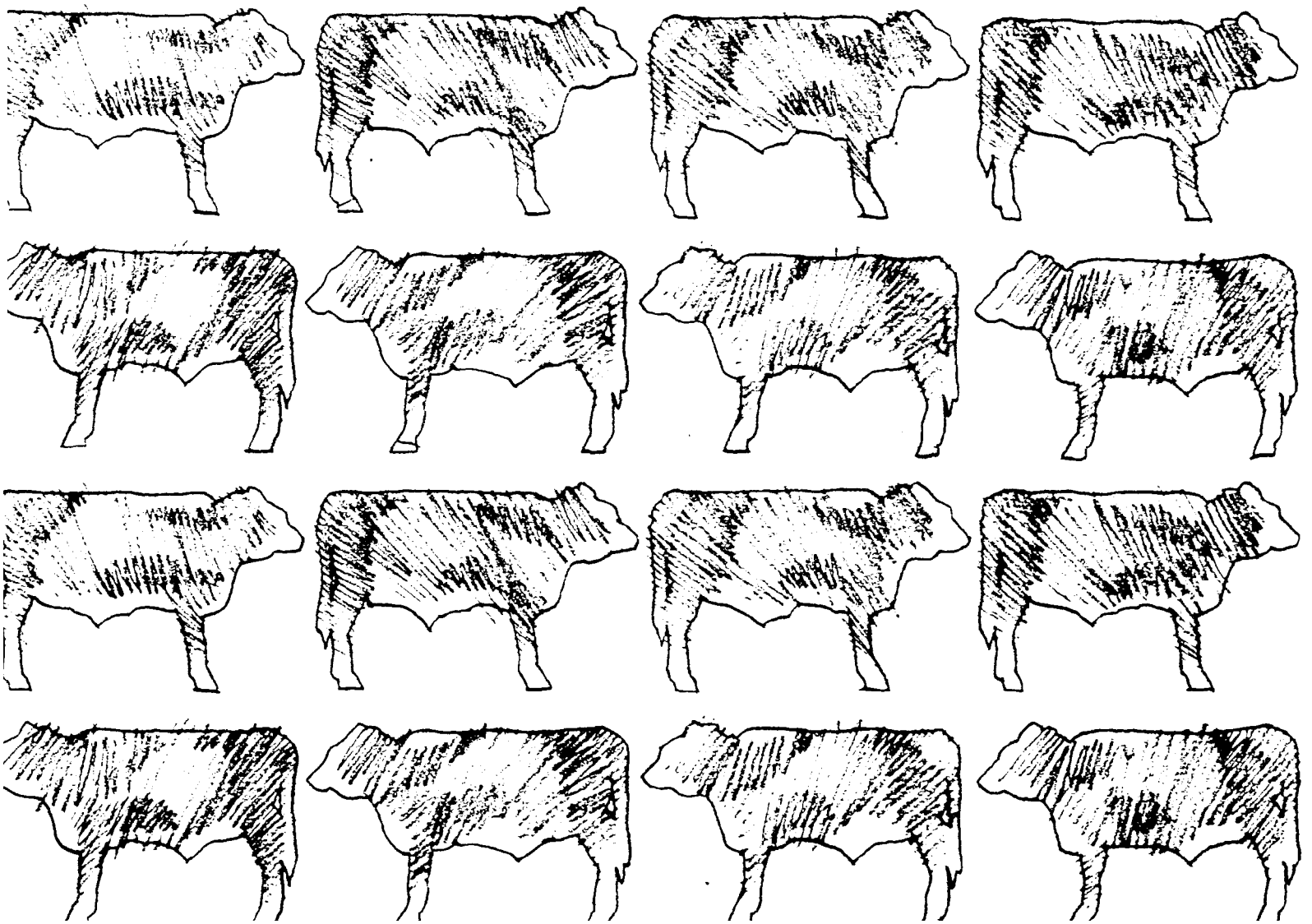

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INTENSIVE - EARLY STOCKING STUDIES ON KANSAS RANGES

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INTRODUCTION

Previous studies on shortgrass range in Colorado (Klipple 1964) and on tallgrass range in Kansas (Smith and Owensby 1978) indicated that yearling cattle could be concentrated at twice normal season-long stocking rates, if grazing were limited to the first half of the summer grazing season. Gains per head were comparable from the start of grazing until the middle of summer at both normal and twice normal stocking rates. Under season-long stocking the cattle made approximately two-thirds of their total summer gain during the first half of the grazing season. Compared with double stocking for the first half of summer, season-long normal stocking resulted in about one-third more individual gain, but only about three-fourths the gain per acre. Plant and grazing animal responses during the trials suggested that twice normal stocking for the first half of the plant growing season may be sustained year after year just as is normal stocking for the entire plant growing season. Also, the United States beef industry is structured to accommodate the movement of growing cattle to feedlots after an abbreviated stay on rangeland.

Although the earlier studies indicated that stocking at twice normal rates with growing cattle the first half of the summer grazing season can be done in greatly different range areas, little is known of maximum sustainable stocking rates, supplemental feeding effects, or related economic considerations. This report summarizes results from season-long versus intensive-early stocking rate and supplementation experiments in Kansas during 1981 and 1982 at Hays and during 1982 at Manhattan.

EXPERIMENTAL AREAS

HAYS - Trials involved typical shortgrass vegetation on a clay upland range site in the Kansas 20- to 24-inch precipitation zone. Major dominant plants included blue grama, buffalograss, and western wheatgrass. Many other species occurred, but most abundant subdominants were Japanese brome and western ragweed. Yearly forage production and species composition depend on site and weather variables, but are modified greatly by intensity of grazing during the summer grazing season (Launchbaugh 1967). Long-term rate-of-stocking studies with yearling cattle showed that 3.5 acres per head was the highest stocking rate that was compatible with season-long forage supplies and would maintain near maximum individual steer gains during a May 1 to October 1 grazing season (Launchbaugh 1957).

MANHATTAN - The study area was located in typical Flint Hills tallgrass prairie where average annual precipitation is 34 inches. Major dominants included big bluestem, indiangrass, and little bluestem with numerous forbs and woody species as minor components of the vegetation. Important range sites in most Flint Hills pastures are loamy upland, shallow limy, clay upland, breaks, and claypan. Annual burning of those sites is recommended in steer grazing operations to increase animal gain and maintain quality vegetation (Launchbaugh and Owensby, 1978). Stocking rate studies have shown the long-term optimum rate to be 3.3 acres per steer from May 1 to October 1.

METHODS

HAYS - A normal stocking rate of 3.52 acres per head from May 1 to October 1 was used for the season-long conventional method of utilizing summer range with yearling cattle. Compared with that were treatments of grazing only from May 1 to July 16 at 2 x normal; 3 x normal; and 3 x normal, plus daily feeding of 200 mg Rumensin mixed with 4 lb ground sorghum grain per head. Test animals were good quality Hereford and Hereford x Angus yearling steers averaging 550-600 lb per head at the start of grazing. Each treatment was replicated twice. Herbage remaining in mid-July and in early October was measured with clipped plots each year.

MANHATTAN - Intensive-early stocking rates used were multiples of the normal rate of 3.5 acres per steer for the grazing season (May 10-October 1). Comparisons were made among normal stocking (May 10-October 1) (burned and unburned) and 2 x, 2.5 x, and 3 x normal stocking rates (May 10-July 15) (all burned). No supplement and supplemental feeding of approximately 1.5 lb ground sorghum grain and 150 mg Rumensin per day were tested for each of the intensive-early stocking treatments. Daily supplement intake was regulated with salt in self feeders. Initial weight of test animals (a combination of breeds and mixed breed animals) was approximately 600 lb. Intensive-early stocking treatments were replicated twice with supplementation treatments superimposed on those replicates. Estimates of herbage remaining were made in mid-July and in early October. Botanical composition was estimated, using the modified-step-point system, in early June.

RESULTS

HAYS - Steer gains under season-long normal stocking averaged 200 lb per head both years (Table 1). An average of 140 lb of that was put on from May 1 to July 16. Two x normal stocking resulted in gains comparable with those from normal stocking during the first half of the grazing season. Three x normal stocking reduced individual steer gains an average of 18 lb per head compared with normal stocking over the same period. Daily feeding of supplemental Rumensin (200 mg/head) and sorghum grain (4 lb/head) more than compensated for reduced animal performance by increasing steer gains 35 lb per head over those from 3 x normal stocking without supplemental feeding. Three x normal stocking and supplemental feeding increased animal gains an average of 17 lb per head over those from normal stocking from May 1 to July 16.

Normal stocking produced a season-long average of 57 lb beef per acre (Table 1). Forty lb of that were produced between May 1 and July 16. Intensive-early stocking resulted in average increases over normal stocking in beef per acre of 37 lb, 64 lb, and 94 lb for 2 x normal, 3 x normal, and 3 x normal plus supplementation, respectively, during the same 76-day period.

Tables 2 and 3 show monetary returns to labor, management, and risk in 1981 and 1982 based on experimental animal gains, opportunity prices, and production costs each year. Although prevailing livestock prices influenced projected returns from year to year, net income per acre from intensive-early stocking was modestly to greatly increased over returns from season-long normal stocking.

Forage left in all treatments, on July 16 and on October 1, 1981, is shown in Table 4 and on the same dates in 1982 in Table 5. Species composition and amounts of dry matter remaining in the fall each year suggest that overall dry matter production was lowered under intensive-early stocking because of reductions in the two cool-season species, western wheatgrass and Japanese brome. Those reductions were not compensated for by corresponding increases in warm-season species, buffalograss, blue grama, and forbs.

MANHATTAN - Steer gains on pastures stocked season-long were 215 lb and 242 lb for unburned and burned treatments, respectively (Table 6). Gains by mid-July were 83 lb and 132 lb, respectively, for those same treatments. Gains from intensive-early stocking at different rates were similar and did not differ from gains to July 15 on season-long stocked burned pastures. Supplemental grain and Rumensin increased steer gains 14-16 lb at the 2 x and 3 x normal stocking rates, but steers at 2.5 x normal with supplement gained 10 lb less than those not supplemented.

Increased numbers of steers on ranges with higher stocking rates resulted in much higher gains per acre (Table 6). Since individual animal gains did not decline as stocking rate increased, that allowed for higher gains per acre. At the 2 x, 2.5 x, and 3 x normal stocking rates, gain per acre was increased by 1%, 28%, and 59%, respectively.

Range burning and intensive-early stocking dramatically increased net profits per acre (Table 7). Percentage increases in return to labor, management, and risk above those from season-long stocking burned range were 49%, 130%, and 235% for 2 x, 2.5 x, and 3 x normal stocking, respectively. Percentage increases were 78%, 26%, and 276% for 2 x, 2.5 x, and 3 x normal stocking plus supplementation, respectively.

Herbage remaining in mid-July was indicative of stocking rate with less than 700 lb of grass per acre left at the highest stocking rate (Table 8). On October 1, however, regrowth equalized all pastures, regardless of stocking rate. Botanical composition was not affected by stocking rate.

DISCUSSION

The brief period of most rapid livestock gain coincides with the time of most rapid plant growth: the time when plants are most palatable, nutritive properties are most favorable, and growing cattle make their most efficient use of range vegetation. In addition to increased yearling cattle gain efficiency, there are certain expected economic advantages from utilizing ranges only during the first half of the summer grazing season. Historically, stocker cattle values per pound have been highest in spring, at the start of the grazing season, and have declined during the summer to seasonal lows in the fall, when such cattle normally are marketed as feeders. Thus, negative margins between stocker and feeder cattle prices tend to be minimized by marketing in mid-season rather than waiting until the end of the summer grazing season. Furthermore, major variable production costs, especially interest on investment in stocker cattle, are reduced about 50 percent per head by holding cattle for only half of the summer grazing season.

When there are negative margins, net returns per acre depend to a high degree on the magnitude of individual animal gains. Returns from intensive-early stocking may become unprofitable by stocking too heavily for growing cattle to make optimum gains per head. Thus the interactions among individual gains, livestock cost-price margins, productions costs, and vegetation should not be ignored in achieving the most lasting and profitable stocking rate.

Preliminary results at Hays indicate that steer gains per head from May 1 to July 16 reached a peak nearer the 2 x normal than the 3 x normal rate without supplemental feeding. Although the 3 x normal stocking rate resulted in greater net-returns per acre than the 2 x normal stocking rate, the possibility of a large negative margin and low gains per head makes higher stocking rates too risky. On the other hand, stocking heavier than 3 x the normal rate may be warranted when supplements are provided. At Manhattan there was no difference among steer gains at 2 x, 2.5 x and 3 x normal stocking rates. Supplementing did not consistently increase profit; either grass quantity and quality were adequate, or supplemental energy was insufficient.

Considering the low rate of gain during the second half of the grazing season under season-long stocking at Hays, the cost of keeping growth animals on range dictated that young cattle should have been taken off grass at mid-season, regardless of stocking rate. Because late-season gains were so high, the opposite was true for both season-long grazing treatments at Manhattan.

SUMMARY

1. Gain per acre was increased by intensive-early stocking compared with season-long stocking at both locations.

2. At Hays, under intensive-early stocking at the 2 x normal rate, gain per head was similar to that from normal stocking during a comparable part of the grazing season, but less at the 3 x normal stocking rate. On burned ranges at Manhattan, individual steer gain was the same under all stocking rates during the first half of the grazing season.

3. At Hays, supplements of sorghum grain and Rumensin and the 3 x normal stocking rate greatly increased livestock gains. At Manhattan, gain responses to supplemental feeding were inconclusive.

4. High individual gains and favorable margins between buying prices of stockers and selling prices of feeders resulted in greatly increased net profits from intensive-early stocking treatments, compared with season-long stocking at normal rates.

5. Determination of stocking rates that optimize livestock gains and maintain adequate forage production requires further study.

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Table 1. Steer gains from season-long versus intensive-early stocking ranges with yearling steers at Hays, 1981 and 1982.

	Stocking System			
	Season-long May 1- Oct 1	Intensive-early May 1-Jul 16		
	Normal rate 3.52 ac/hd	2 x normal 1.77 ac/hd	3 x normal 1.19 ac/hd	3 x normal 1.19 ac/hd
Year	No suppl	No suppl	No suppl	Supplement [1]
	Gain/head, lb			
1981	200 (142) [2]	139	128	160
1982	200 (137)	132	116	153
Average	200 (140)	136	122	157
	Beef/acre, lb			
1981	57 (41)	79	110	137
1982	57 (39)	75	99	131
Average	57 (40)	77	104	134

[1] Supplement was 200 mg Rumensin mixed with 4 lb sorghum grain per head, fed daily in bunks.

[2] May 1-Jul 16 fraction of season-long production shown in parentheses.

Table 2. Cost-return analyses of season-long versus intensive-early stocking ranges with yearling steers at Hays, 1981. The calculations are based on gains, opportunity prices, and projected production costs that year.

Item	Stocking System: Season-long May 1-Oct 1		Intensive-early May 1-Jul 16		
	Normal rate 3.52 ac/hd		2 x normal 1.77 ac/hd	3 x normal 1.19 ac/hd	3 x normal 1.19 ac/hd
	No suppl		No suppl	No suppl	Supplement [1]
Weights, Prices					
1. Initial weight/head-------lb	575		575	575	575
2. Initial value/cwt---------$	73.00		73.00	73.00	73.00
3. Gain/head-----------------lb	200	(142) [2]	139	128	160
4. Gain/acre-----------------lb	57		79	110	137
5. Final weight/head---------lb	775		714	703	735
6. Final value/cwt-----------$	66.00		68.00	68.00	68.00
7. Buy-sell margin/cwt-------$	-7 .00		-5.00	-5.00	-5.00
Income					
8. Final value/head----------$	511.50		485.52	478.04	499.80
9. Less initial value/head---$	419.75		419.75	419.75	419.75
10. Less death loss/head------$	3.52		1.75	1.75	1.75
11. Gross/head----------------$	88.23		64.02	56.54	78.30
12. Gross/acre----------------$	25.07	(18.77)	36.17	47.51	65.80
Cash Costs					
13. Supplement/head-----------$	0.00		0.00	0.00	16.72
14. Health costs/head---------$	4.82		4.18	4.18	4.18
15. Mileage costs/head--------$	3.03		0.76	0.51	0.51
16. Repairs/head--------------$	1.53		0.76	0.76	1.14
17. Salt, misc/head-----------$	4.97		2.47	2.47	2.47
18. Steer buying expense/head-$	8.63		8.63	8.63	8.63
19. Land cost/head, $13.00/ac-$	45.76		23.01	15.47	15.47
20. Subtotal ----------------- $	68.74		39.81	32.02	49.12
21. Interest/head-------------$	34.26		16.48	16.33	16.65
22. Total cash costs/head-----$	103.00		56.29	48.35	65.77
23. Total cash costs/acre-----$	29.26	(22.79)	31.80	40.63	55.27
Return to Labor, Mgmt, Risk					
24. Net return/head-----------$	-14.77		7.73	8.19	12.53
25. Net return/acre-----------$	-4.19	(-4.02)	4.37	6.88	10.53
26. Net profit/l60 acres------$	-670.40	(-643.20)	699.20	1100.80	1684.80

[1] Supplement was 200 mg Rumensin mixed with 4 lb sorghum grain per head, fed daily in bunks.

[2] Shown in parentheses are May 1-Jul 16 fraction of season-long gain per head and cost-return values per acre, if steers from that treatment had been removed July 16 along with the others.

Table 3. Cost-return analyses of season-long versus intensive-early stocking ranges with yearling steers at Hays, 1982. The calculations are based on gains, opportunity prices, and projected production costs that year.

Item	Stocking System: Season-long May 1-Oct 1		Intensive-early May 1-Jul 16		
	Normal rate 3.52 ac/hd		2 x normal 1.77 ac/hd	3 x normal 1.19 ac/hd	3 x normal 1.19 ac/hd
	No suppl		No suppl	No suppl	Supplement [1]
Weights, Prices					
1. Initial weight/head-------lb	600		600	600	600
2. Initial value/cwt---------$	68.00		68.00	68.00	68.00
3. Gain/head-----------------lb	200	(137) [2]	132	116	153
4. Gain/acre-----------------lb	57		75	99	131
5. Final weight/head---------lb	800		732	716	753
6. Final value/cwt-----------$	64.00		67.00	67.00	67.00
7. Buy-sell margin/cwt-------$	-4.00		-1.00	-1.00	-1.00
Income					
8. Final value/head----------$	512.00		490.44	479.72	504.51
9. Less initial value/head---$	408.00		408.00	408.00	408.00
10. Less death loss/head-----$	3.42		1.70	1.70	1.70
11. Gross/head----------------$	100.58		80.74	70.02	94.81
12. Gross/acre----------------$	28.57	(23.89)	45.62	58.84	79.67
Cash Costs					
13. Supplement/head----------$	0.00		0.00	0.00	15.20
14. Health costs/head--------$	5.36		4.64	4.64	4.64
15. Mileage costs/head-------$	3.37		0.84	0.57	0.57
16. Repairs/head-------------$	1.53		0.76	0.76	1.14
17. Salt, misc/head----------$	5.51		2.74	2.74	2.74
18. Steer buying expense/head-$	9.00		9.00	9.00	9.00
19. Land cost/head, $13.00/ac-$	45.76		23.01	15.47	15.47
20. Subtotal-----------------$	70.53		40.99	33.18	48.76
21. Interest/head------------$	31.57		16.06	15.91	16.21
22. Total cash costs/head----$	102.10		57.05	49.09	64.97
23. Total cash costs/acre----$	29.01	(23.03)	32.23	41.25	54.60
Return to Labor, Mgmt, Risk					
24. Net return/head----------$	-1.52		23.69	20.93	29.84
25. Net return/acre----------$	-0.43	(0.86)	13.39	17.59	25.07
26. Net profit/l60 acres-----$	-68.80	(137.60)	2142.40	2814.40	4011.20

[1] Supplement was 200 mg Rumensin mixed with 4 lb sorghum grain per head, fed daily in bunks.

[2] Shown in parentheses are May 1-Jul 16 fraction of season-long gain per head and cost-return values per acre, if steers from that treatment had been removed July 16 along with the others.

Table 4. Forage left per acre at mid-season when steers were taken off intensive-early stocked ranges and at the end of the season when steers were taken off season-long stocked ranges, 1981.

	Stocking System			
	Season-long May 1-Oct 1	Intensive-early May 1-Jul 16		
	Normal rate 3.52 ac/hd	2 x normal 1.77 ac/hd	3 x normal 1.19 ac/hd	3 x normal 1.19 ac/hd
Species	No suppl	No suppl	No suppl	Supplement [1]
	Dry matter left July 16, 1981, lb/acre			
Western wheatgrass	1400	420	230	430
Buffalograss	370	490	410	310
Blue grama	390	650	430	620
Japanese brome	350	90	50	120
Other grasses	180	130	130	110
Forbs	60	130	190	120
Carry-over growth	340	150	80	140
Total	3090	2060	1520	1850
	Dry matter left October 1, 1981, lb/acre			
Western wheatgrass	1110	350	170	340
Buffalograss	200	390	330	250
Blue grama	530	930	680	870
Japanese brome	60	40	30	50
Other grasses	160	100	110	100
Forbs	70	180	230	150
Carry-over growth	0	0	0	0
Total	2130	1990	1550	1760

[1] Supplement was 200 mg Rumensin mixed with 4 lb sorghum grain per head, fed daily in bunks.

Table 5. Forage left per acre at mid-season when steers were taken off intensive-early stocked ranges and at the end of the season when steers were taken off season-long stocked ranges, 1982.

	Stocking System			
	Season-long May 1-Oct 1	Intensive-early May 1-Jul 16		
	Normal rate 3.52 ac/hd	2 x normal 1.77 ac/hd	3 x normal 1.19 ac/hd	3 x normal 1.19 ac/hd
Species	No suppl	No suppl	No suppl	Supplement [1]
	Dry matter left July 16, 1982, lb/acre			
Western wheatgrass	1060	760	530	660
Buffalograss	510	710	530	580
Blue grama	770	770	460	520
Japanese brome	820	240	90	130
Other grasses	120	130	100	110
Forbs	350	520	410	380
Carry-over growth	240	180	110	110
Total	3880	3310	2230	2480
	Dry matter left October 1, 1982, lb/acre			
Western wheatgrass	560	410	290	360
Buffalograss	280	430	320	340
Blue grama	440	470	270	320
Japanese brome	210	30	10	10
Other grasses	90	110	100	100
Forbs	330	510	390	370
Carry-over growth	50	50	30	30
Total	1960	2010	1410	1530

[1] Supplement was 200 mg Rumensin mixed with 4 lb sorghum grain per head, fed daily in bunks.

Table 6. Steer gains from season-long burned and unburned versus intensive-early stocking burned ranges and without supplementation at Manhattan, 1982.

	Stocking System				
	Season-long May 10-Oct 1		Intensive-early May 10-Jul 15		
	Normal rate 3.50 ac/head		2.0 x normal 1.82 ac/hd	2.5 x normal 1.50 ac/hd	3.0 x normal 1.20 ac/hd
Item	Burned	Unburned	Burned	Burned	Burned
	Gain/head, lb				
No supplement [1]	242 (132)	215 (83)	128	132	132
Supplement [2]			144	122	146
	Gain/acre, lb				
No supplement [1]	69 (37)	61 (23)	70	88	110
Supplement [2]			79	81	121

[1] May 10-Jul 15 fraction of season-long production shown in parentheses.

[2] Supplement was an average daily ration of 1.73 lb, 1.91 lb, and 1.41 lb ground sorghum grain and 192 mg, 210 mg, and 156 mg Rumensin per head for the 2.0 x, 2.5 x, and 3.0 x normal stocking rates, respectively.

Table 7. Cost-return analyses of season-long burned and unburned versus intensive-early stocking supplemented and unsupplemented ranges with yearling steers at Manhattan, 1982. The calculations are based on gains, opportunity prices, and projected production costs that year.

Item	Stocking System: Season-long May 10-Oct 1, Normal rate 3.50 ac/hd — Burned		Season-long May 10-Oct 1, Normal rate 3.50 ac/hd — Unburned		Intensive-early May 10-Jul 15, 2.0 x Normal 1.82 ac/hd — No suppl	Intensive-early May 10-Jul 15, 2.0 x Normal 1.82 ac/hd — Suppl [2]	Intensive-early May 10-Jul 15, 2.5 x Normal 1.50 ac/hd — No suppl	Intensive-early May 10-Jul 15, 2.5 x Normal 1.50 ac/hd — Suppl [2]	Intensive-early May 10-Jul 15, 3.0 x Normal 1.20 ac/hd — No suppl	Intensive-early May 10-Jul 15, 3.0 x Normal 1.20 ac/hd — Suppl [2]
Weights, Prices										
1. Initial weight/head-------lb	583		568		597	597	609	609	592	592
2. Initial value/cwt---------$	68.00		68.00		68.00	68.00	68.00	68.00	68.00	68.00
3. Gain/head-----------------lb	242	(132) [3]	215	(83) [3]	128	144	132	122	132	146
4. Gain/acre-----------------lb	69		61		70	79	88	81	110	121
5. Final weight/head---------lb	825		783		725	741	741	731	724	738
6. Final value/cwt-----------$	64.00		64.00		67.00	67.00	67.00	67.00	67.00	67.00
7. Buy-sell margin/cwt-------f	-4.00		-4.00		-1.00	-1.00	-1.00	-1.00	-1.00	-1.00
Income										
8. Final value/head----------$	528.00		501.12		485.75	496.47	496.47	489.77	485.08	494.46
9. Less **initial value/head---$**	396.44		386.84		405.96	405.96	414.12	414.12	402.56	402.56
10. Less death loss/head------$	3.13		3.05		1.47	1.47	1.50	1.50	1.46	1.46
11. Gross/head----------------$	128.43		111.83		78.32	89.04	80.85	74.15	81.06	90.44
12. Gross/acre----------------$	36.69	(23.19)	31.95	(13.87)	43.03	48.92	53.90	49.43	67.55	75.37
Cash Costs										
13. Supplement/head----------$	0.00		0.00		0.00	5.73	0.00	6.32	0.00	4.67
14. Health costs/head----.-----$	5.36		5.36		4.64	4.64	4.64	4.64	4.64	4.64
15. Mlleage costs/head--------$	3.15		3.15		0.75	0.75	0.62	0.62	0.50	0.50
16. Repairs/head-------------$	1.44		1.44		0.66	0.99	0.66	0.99	0.66	0.99
17. Salt, misc/head----------$	5.18		5.18		2.38	2.38	2.38	2.38	2.38	2.38
18. Steer buying expense/head-$	8.75		8.52		8.96	8.96	9.14	9.14	8.88	8.88
19. Land cost/head, $13.00/ac-$	45.50		45.50		23.66	23.66	19.50	19.50	15.60	15.60
20. Subtotal------------------$	69.38		69.15		41.05	47.11	36.94	43.59	32.66	37.66
21. Interest/head------------$	28.77		28.09		13.88	13.98	14.08	14.19	13.64	13.72
22. Total cash costs/head-----$	98.15		97.24		54.93	61.09	51.02	57.78	46.30	51.38
23. Total cash costs/acre-----$	28.04	(22.08)	27.78	(21.93)	30.18	33.56	34.01	38.52	38.58	42.82
Return to Labor, Mgmt, Risk										
24. Net return/head----------$	30.28		14.59		23.39	27.95	29.83	16.37	34.76	39.06
25. Net return/acre----------$	8.65	(1.11)	4.17	(-8.06)	12.85	15.36	19.89	10.91	28.97	32.55
26. Net profit/l60 acres-----$	1384.00	(177.60)	667.20	(-1289.60)	2056.00	2457.60	3182.40	1745.60	4635.20	5280.00

[1] All intensive-early stocked pastures were burned at the same time as the burned, season-long stocked treatment.

[2] Supplement was-an average daily ration of 1.73 lb, 1.91 lb, and 1.41 lb ground sorghum grain and 192 mg, 210 mg, and 156 mg Rumensin per head for the 2.0 x, 2.5 x, and 3.0 x normal stocking rates, respectively.

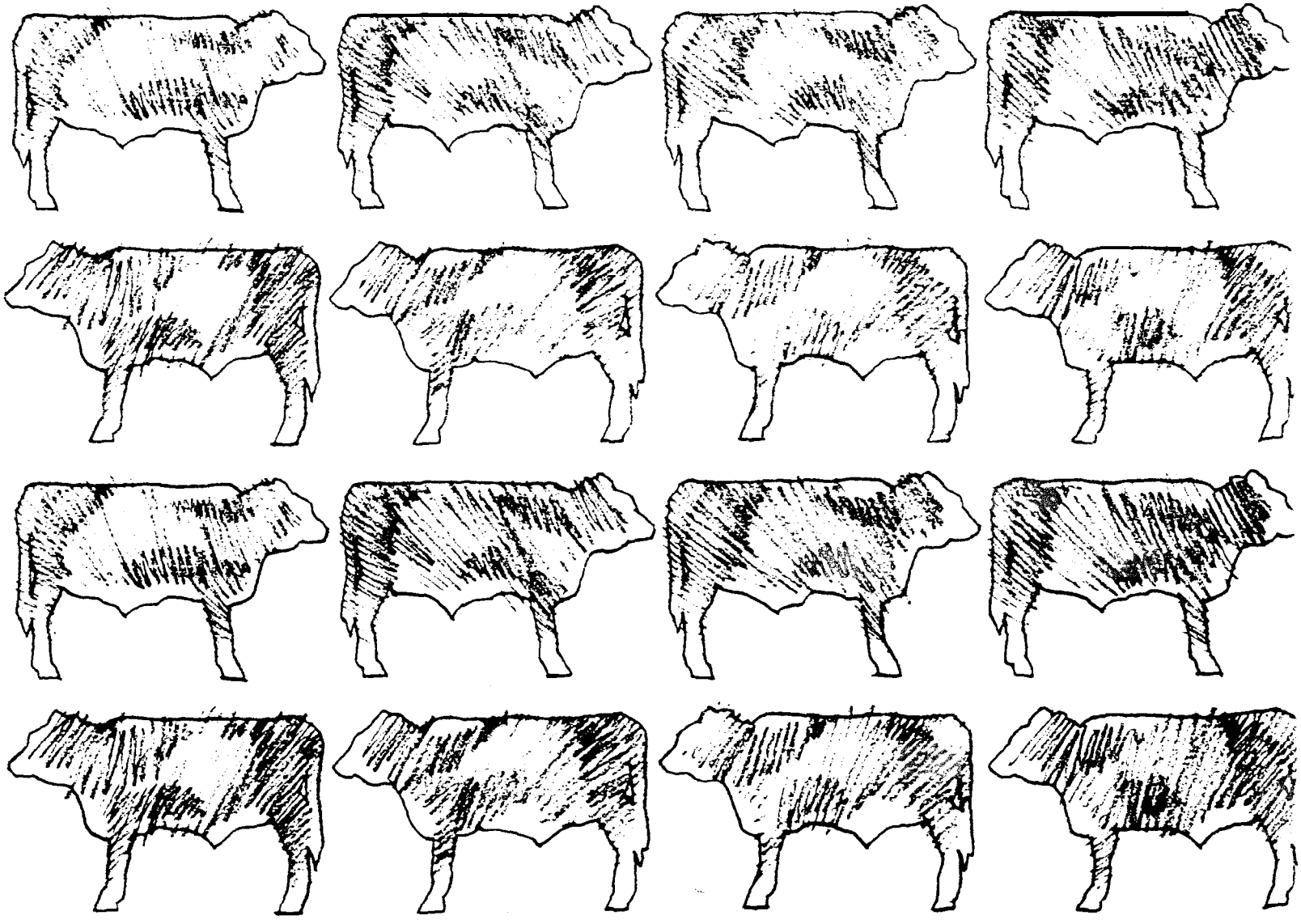
[3] Shown In parentheses are May 10-July 15 fractions of season-long gains per head and cost-return values per acre, if steers from those treatments had been removed July 15 along with the others.

Table 8. Forage left per acre on Loamy Upland and Breaks range sites at mid-season when steers were taken off intensive-early stocked ranges and at the end of the growing season.

Forage Component [1]	Stocking Rate, May 10-Jul 15					
	2.0 x normal 1.82 ac/hd		2.5 x normal 1.50 ac/hd		3.0 x normal 1.20 ac/hd	
	LU [2]	Br	LU	Br	LU	Br
	Dry matter left July 15, lb/acre					
Grass	1780	1260	1090	830	680	640
Forbs	210	120	360	80	180	340
Total	1990	1380	1450	910	860	980
	Dry matter left October 15, lb/acre					
Grass	3610	2360	2690	1850	2900	2260
Forbs	340	190	450	90	540	340
Total	3950	2550	3140	1940	3440	2600

[1] Typical Flint Hills bluestem range vegetation.

[2] LU = Loamy upland; Br = Breaks range sites.



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