An Efficient Stocking Strategy for Grazing Replacement Heifers

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Introduction

Even though Kansas native rangelands often have steep slopes or shallow soils not conducive to many other uses other than livestock grazing, native rangeland and perennial grassland acres in Kansas have been declining. Cropland acreage over this same time frame has increased, and rangelands have also become more fragmented by small ranchettes and urbanization. Producers may be looking to increase production efficiency on a shrinking forage land base. The use of intensive early stocking (IES) is one of the most efficient stocking strategies to produce beef on rangeland acres. The IES strategy has been widely used in eastern Kansas and is capable of increasing beef production by 30–40% compared to continuous season long stocking (SLS). In western Kansas, IES and continuous SLS have resulted in similar beef production. However, a modified IES (MIES) system, which combines greater early season animal density on high-quality forage of IES and late season individual animal selectivity for a high-quality diet of SLS, has increased beef production by 26% compared to continuous SLS alone on western Kansas rangelands. Even with this significant increase in production efficiency, stocker production is largely overshadowed by cow/calf production in terms of acres grazed in western Kansas. The question then arises, can the efficiencies of greater beef stocker production from modified IES be utilized with reproductive animals of the cow/calf production system? The purpose of this study was to compare the use of continuous SLS and MIES in a replacement heifer system for western Kansas.

Experimental Procedures

A high percentage of Angus and Angus crossbred replacement heifers were either stocked at 1.6× the typical stocking density May through July and at 1× for the rest of the season in a modified IES system, or at 1× for the entire season in a continuous SLS system. Pastures averaged 35 acres in size and consisted mostly of limy upland ecological sites. Stocking consisted of 8 heifers or 13 heifers per pasture in the SLS and MIES pastures, respectively. Heifers were checked by transrectal ultrasonography between 30 and 35 days after fixed time artificial insemination (AI) to determine pregnancy and were checked again at the end of the grazing season to determine final pregnancy. One bull was placed in each pasture 10 days after timed AI and remained on pasture for 35 days. Heifers determined not pregnant by artificial insemination in the 1.6× IES system were removed in mid-July while all heifers, regardless of pregnancy status, remained on pasture in the 1× continuous system. In cases when not enough AI pregnant heifers in the 1.6× IES system could be retained to meet the late 1× stocking density, the oldest non-AI pregnant heifers remained on pasture while the youngest were removed. Heifer body weight and body condition scores (BCS) were collected each year in May at the start of the grazing season, in mid-July at mid-season, and again in October at the end of the grazing season. Standing available herbage biomass was also collected from pastures each year from 2015–2019 at the grazing season midpoint in July, and again at the end of the grazing season in October by sample measurements from a falling plate meter calibrated to clipped sample plots at each harvest. At midseason, a modified step-point sampling method was also used to estimate ground cover and vegetative species composition in 2014 prior to grazing treatments, in 2017 at mid-experiment, and in 2019 the last year of the experiment.

Results and Discussion

Heifer body weight and body condition scores were not different between the two stocking treatments at the beginning and the end of the grazing season (Table 1). However, heifers were slightly heavier in the continuously grazed pasture at midseason (Table 1), and early individual average daily gain (ADG) from May to July was slightly greater (1.63 vs. 1.49 lb/day) for the continuous SLS group compared to the MIES group (Table 2). This difference disappeared during the last half of the grazing season, and animals had similar ADG for the last half of the grazing season and the combined whole grazing season. Because animals were stocked at a greater density in the MIES pastures early in the season, the MIES treatment had greater total beef production during the first half of the growing season, and subsequently had 33% greater beef production per acre for the whole grazing season (Table 2). First service conception rate (FSCR) was not different between stocking treatments. Because heifers not pregnant to AI were removed from MIES pastures at mid-season, the MIES pastures had a higher percentage of AI-bred heifers remaining on pasture at the end of grazing (72% vs. 52% for the MIES and continuous heifers, respectively), forming a more uniform and synchronized group.

Available herbage dry matter at mid-season in July was greater for the continuous SLS pastures by 163 lb/acre, but available herbage dry matter was not statistically different between stocking systems in October at the end of the growing season (Table 3). Both stocking systems averaged just fewer or greater than 1900 lb/acre of residual available herbage at the end of five growing seasons. Litter cover (Table 4) and species composition of most dominant and subdominant grasses and forbs were not different between stocking systems before or after the initiation of experiment. However, buffalograss (*Bouteloua dactyloides*), sand dropseed (*Sporobolus cryptandrus*), and sedges (*Carex* sp.) did have significant composition changes after stocking treatments were imposed (Table 4). Composition of buffalograss increased to a greater extent in the MIES pastures, while sand dropseed and sedges decreased to a greater extent in the continuous SLS pastures and ended 2019 being equal to the MIES pastures (Table 4). Increased buffalograss composition in the MIES pastures could signal a future downward trend in yield at the end of the season that was not yet detected after 5 years. Dropseed and sedges comprise only a small percentage of total vegetative composition, so these differences may have only small or minimal biological impacts on a pasture system in western Kansas.

Implications

The MIES system appears to be ideally suited for the production of replacement heifers. The use of a synchronization protocol and early pregnancy detection with ultrasonography enables the removal of non-AI pregnant heifers at the grazing season mid-point. This creates a uniform group of heifers remaining on pasture at the end of the grazing season. Individual weight gain trends and gains per acre of the MIES system with replacement heifers closely resembles the improved production efficiency of MIES observed in long-term stocker steer grazing research. End of season pasture available dry matter has not been affected by increased early stocking rate of MIES, but increased buffalograss composition with MIES indicates that yields may eventually decline.

Table 1. Heifer body weights and condition scores (BCS) in early May at the start of the grazing season, at mid-July at mid-grazing season, and at the end of the grazing season in early October, averaged over 2015–2019

Heifer stocking treatment	May weight	May BCS	July weight	July BCS	October weight	October BCS	Heifer FSCR	Pasture AI remain
	lb		lb		lb		%	%
Continuous SLS	777	5.4	907*	5.5	968	5.3	53	52*
Modified IES	782	5.4	896*	5.5	970	5.4	47	72*

Heifer first service conception rate (FSCR) to timed AI and percent of heifers pregnant to AI left on pasture at the end of season is also included. *Indicates statistically different values at the $P \leq 0.05$ level.

Table 2. Early grazing season, late grazing season, and total season individual ADG and total beef produced per acre for replacement heifers stocked with a continuous SLS system or a 1.6×+1 modified IES system averaged over three years, 2015–2019

Heifer stocking treatment	May-July ADG	July-October ADG	Total ADG	May-July beef	July-October beef	Total beef
	lb/hd	lb/hd	lb/hd	lb/acre	lb/acre	lb/acre
Continuous SLS	1.63*	0.72	1.20	32*	14	49*
Modified IES	1.49*	0.82	1.14	47*	16	65*

*Indicates statistically different values at the $P \leq 0.05$ level.
ADG = average daily gain. SLS = season long stocking. IES = intensive early stocking.

Table 3. Pasture available herbage dry matter (DM) yield determined by falling plate meter readings correlated with clipped frame samples in July and October of 2014 prior to grazing treatments and in 2015–2019 at mid-season and after grazing

	Heifer stocking treatment			
	July		October	
	Continuous SLS	Modified IES	Continuous SLS	Modified IES
	Available DM (lb/acre)			
2014 pretrial	1310	1428	1568	1754
2015	1866	1909	1571	1559
2016	2482	2195	2429	2332
2017	2112	1919	1856	1710
2018	1703	1561	2025	1855
2019	2145	1910	1998	1893
Average 2015–2019	2062*	1899*	1976	1870

*Indicates statistically different values at the $P \leq 0.05$ level.
SLS = season long stocking. IES = intensive early stocking.

Table 4. Pasture ground cover and species composition in 2019. Significant changes in composition occurred for buffalograss (BUDA), sand dropseed (SPCR), and sedges (CARX) from 2014, prior to grazing treatments, to 2019 after grazing treatments

	Litter cover 2019	2014–2019 Change	BUDA 2019	2014–2019 Change	SPCR 2019	2014–2019 Change	CARX 2019	2014–2019 Change
	%							
Continuous SLS	87	18	27	8*	1	-4*	5	-5*
Modified IES	83	17	29	15*	1	-1*	5	-1*

*Indicates statistically different values between stocking treatments at the $P \leq 0.10$ level.
SLS = season long stocking. IES = intensive early stocking.