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Yearly Forage Production of Irrigated Pastures Grazed by Cow-Calf Pairs as Affected by the Timing of Sprinkler Irrigation Application

R.D. Wiedmeier, D.R. ZoBell, A.C. Young, and ***P.R. Schmidt***
Department of Animal, Dairy and Veterinary Sciences
Utah State University, Logan

Introduction

In many desert states in the Intermountain West cow-calf operators face two major problems: 1) issues associated with curtailment of public land use and 2) growing human populations. Public land issues are difficult to predict and are often controlled by changing public sentiment and political policy. An alternative that may be considered by some operators currently heavily dependant on the grazing of public lands is intensive cow-calf production on privately owned irrigated pastures. A major problem associated with irrigated pasture production in desert states is competition for water with a growing human population. Research at this station has reported that high carrying capacity on irrigated pastures is imperative for financial success (Meek et al., 2004). Carrying capacity is highly dependant on irrigation practices.

The objective of this study was to determine the importance of the timing of sprinkler irrigation application on the productivity of pastures after being intensively grazed by cow-calf pairs.

Materials and Methods

A well-established (12 yr) 1.64 ha (102m x 163m) cool-season grass pasture was used for the study. The forage composition of the pasture was approximately: 60% tall fescue (*Festuca arundinacea, Alta*), 30% orchardgrass (*Dactylis glomerata, Patomac*), and 10% Kentucky bluegrass (*Poa pratensis*). The longer side of the pasture was oriented east-west. Six cow-calf pairs grazed the pasture for approximately 170 d (May-October) for two consecutive years. The average BW of the cows through the grazing season was 557 kg and that of the calves was 194 kg. The cattle grazed across the pasture from east to west with management intensive grazing and received a new allotment of pasture forage each 24 h. The boundaries of daily pasture allotments were controlled by portable electric polywire fencing. The size of each allotment was adjusted daily to allow ad libitum forage intake, while leaving a 10 cm stubble height. This was accomplished by a visual appraisal of standing forage yield (Stockdale, 1984) that was corrected weekly by determining the forage DM yield of a 0.1 m^2 clip plot. There were four grazing circuits across the pasture each of the two years of the study. The number of days associated with each of these circuits depended on the forage yield during that period. The objective was to have the east end of the pasture prepared for grazing by the time the cattle grazed the

last daily allotment on the west end, and thus fairly continual grazing. Forage DM harvested by the cattle was recorded each day.

Grazing started the first week of May each year.Irrigation water was available the first or second week of June each year. So the first grazing circuit each year was fed by snow melt and rain. Commercial fertilizer application on the pasture did not commence until June to help control rapid forage growth during late spring, which was greatly in excess of that which cows with young calves could consume if fertilizer was applied in April or May. Starting in June N was applied to the pastures at a rate of 44.9 kg/ha before each grazing circuit in the form of ammonium nitrate. The pastures were harrowed shortly after the cattle grazed during each grazing circuit.

The pasture was irrigated with a single hand-changed sprinkler line running in a north-south orientation across the 102 m side of the pasture. Each irrigation set covered about 0.14 ha and delivered 10.16 cm of water. This arrangement allowed irrigation to easily follow the cattle through each grazing circuit. The irrigation management treatments applied to the pastures are described in Table 1. Two irrigation treatments were applied that resulted in the same amount of water being applied after each circuit, but the commencement of irrigation application was delayed either 7 d or 14 d.

Table 1. Post-grazing irrigation management treatments applied to pasture intensively grazed by cow-calf pairs.

	Year	
Grazing Circuit	1	2
	---days post-grazing irrigation when commenced---	
1. (May-June)	natural[a]	natural
2. (June-July)	7[b]	14[c]
3. (August-September)	14	7
4. (September-October)	7	14

[a] Moisture from natural snow melt and rain
[b] Irrigation began 7 d after pasture was grazed by cow-calf pairs
[c] Irrigation began 14 d after pasture was grazed by cow-calf pairs

Data were analyzed using the Proc MIXED procedure in SAS (SAS Institute, Cary, NC) with yearly forage production as the dependant variable and irrigation treatment as the independent variable. Year was used as a repeated measure. Multiple comparisons were made with P-values adjusted using Tukeys procedure. A $P < 0.05$ was considered significant.

Results and Discussion

The effect of irrigation management on the yearly forage DM production of pastures grazed by cow-calf pairs is summarized in Table 2. Although the same resources were expended to the pasture, when irrigation water was applied at either a 7 d or 14 d post-grazing delay, the 7 d delay resulted in a 19.8% increase in yearly forage DM production compared to that of the 14 d delay. The average forage DM consumption of the cow-calf pairs on this study through the grazing period was 18.3 kg DM/pair/d. The grazing season averaged 170 d during each of the two years of the study. Hence, the carrying capacity of the pasture with a 7 d post grazing delay was 3.83 pairs/ha, while that of the 14 d delay was only 3.20 pairs/ha. Thus, carrying capacity of the pasture was substantially increased without adding resources simply by applying irrigation water as soon as possible after the cow-calf pair intensively grazed. Meek et al. (2004) demonstrated the importance of high carrying capacity to the profitability of cow-calf production on improved irrigated pastures. Pastures with carrying capacity of 3.59 pair/ha or less were deemed unprofitable. In this study the 7 d post-grazing irrigation delay would therefore be profitable while 14 d post-grazing irrigation delay would not.

Table 2. Yearly forage dry matter production of pastures grazed by cow-calf pairs when post-grazed irrigation was delayed either 7 or 14 days.

	Days post-grazing when irrigation commenced			
Item	7	14	SEM[a]	P[b]
Yearly forage harvested[c], kg DM/ha^{-1}	9905[d]	8269[e]	36.4	0.0001

[a] Standard error of mean
[b] Probability greater than F score
[c] Includes forage DM production during the first non-irrigated grazing circuit
[d,e] Means in the same row with different superscripts differ, $P < 0.05$

Implications

This study demonstrated that if pastures are irrigated within 7 d after being intensively grazed by cow-calf pairs the yearly forage DM production can be increased by nearly 20% compared to delaying irrigation another seven days to 14 d. This simple irrigation management practice will affect the overall profitability of cow-calf production on irrigated pastures.

Literature Cited

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