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Animal and Forage Response to Short-Duration Rotational Grazing

Hans-Joachim G. Jung, Richard W. Rice, and Ling-Jung Koong

Introduction

It has recently been suggested that the use of a short-duration rotational grazing (SDG) system can significantly increase total beef production on rangelands. The periodic intense grazing pressure of the SDG system is assumed to retard maturation of the forage and stimulate forage growth. This combination of immature, high quality forage and greater total forage production should allow higher stocking rates and/or improved animal performance. Such a system may be of greater utility with improved pastures planted to forages possessing a greater genetic potential for growth. This study was designed to determine the animal and forage responses to SDG on a cool-season improved pasture compared with a traditional continuous grazing management system.

Procedure

Replicated continuous and SDG systems were developed by dividing a 160-acre smooth bromegrass pasture into four 40-acre cells. Two of these cells were further subdivided into eight 5-acre paddocks, each with electric fencing. The SDG cells were arranged in a radial design with a central work and watering area. All cells were mowed in early spring, prior to initiation of active growth of the grass, and fertilized in April with 60 lb nitrogen/acre each year. Water and a mineral supplement were available to the cattle at all times. Angus, Hereford, Charolais, and Angus x Hereford heifer calves born in February were used in the study. Breeds were allocated equally between grazing systems and cells, and mean initial weights were equalized among cells (488 Ib in 1982; 508 lb in 1983).

In 1982, the continuous and SDG treatments were stocked with 47 animals/40-acre cell. Heifers assigned to the SDG system were rotated on a predetermined schedule averaging 2.5 days of grazing per rotational paddock (range 2-4 days). Rotational order through the paddocks remained constant, with 18.5 days of rest (range 17-19 days) after each grazing bout. In 1982, grazing was initiated May 12 and terminated August 20 after 5 complete cycles through the rotational paddocks. During the second year of the study, the continuously grazed system was increased to 62 heifers/40-acre cell. Grazing was initiated May 11, 1983, and terminated August 19, 1983. The grazing interval per paddock and number of cycles was the same as the previous year. Cattle were weighed after each rotational cycle was completed.

The available forage in each cell was sampled on the initiation date of the experiment each year and after completing each rotational cycle. Standing forage was clipped with hand shears from 42 quadrats (1 ft²) in each continuously grazed cell, and 6 quadrats were clipped in each of the eight paddocks from the rotationally grazed cells. Total available forage, crude protein, and in vitro digestibility were determined from these clipping samples.

Results

Animal Response. Average daily gain (ADG) of heifers in 1982 is shown in Figure 1. Cattle grazing the continuous and SDG systems did not differ significantly in season-long ADG (1.06 vs 1.03 lb/day), but there was a decline (P<.05) in ADG as the grazing season progressed. When the SDG system was stocked more heavily in 1983 (131 pct of the continuous system), results (Fig. 2) were similar to the previous year. Animal gain averaged 1.23 and 1.14 lb/day over the entire grazing season for the continuous and SDG systems, respectively (P>.05). While productivity remained the same per animal between grazing systems, total productivity per acre increased 24.2 percent on the SDG system (147.4 vs 183.1 lb of gain/acre, P = .05) due to the increased stocking rate.

Forage Response. In 1982, available forage did not differ significantly between grazing systems, although there appeared to be about 36 percent more forage present under the SDG system on June 21, and available forage tended to remain greater throughout the rest of the summer (Fig. 3). During 1983, when the SDG system was stocked more heavily than the continuous system, available forage (Fig. 4) was the same for both systems except on the August 1 sampling date, when the continuous system had a greater (P<.05) amount of forage (1.22 vs .61 tons/acre). Forage quality in both 1982 and 1983 did not differ significantly for either in vitro digestibility or crude protein content between the grazing systems. As expected, forage quality declined (P<.05) dramatically as the season progressed (Table 1).

The study suggests that, when continuous and SDG systems are stocked equally, the pasture responds with increased forage production under the SDG management system. When the stocking rate was increased for the SDG system to utilize this extra forage, the total animal productivity per acre was increased. Individual animal performance was not improved by the SDG system at either stocking rate, presumably because forage quality was not improved by the SDG system as is usually assumed.

Table 1.—In vitro digestibility (IVD) and crude protein (CP) content of forage sampled after each rotational cycle. The values are averaged across both continuous and SDG system samples

<table>
<thead>
<tr>
<th>Sample</th>
<th>IVD (pet) 1982</th>
<th>IVD (pet) 1983</th>
<th>CP (pet) 1982</th>
<th>CP (pet) 1983</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>65.6*</td>
<td>73.6*</td>
<td>21.2*</td>
<td>17.1*</td>
</tr>
<tr>
<td>Cycle 1</td>
<td>66.2*</td>
<td>77.9*</td>
<td>13.1*</td>
<td>11.1*</td>
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<td>Cycle 2</td>
<td>57.7*</td>
<td>66.4*</td>
<td>8.8*</td>
<td>7.1*</td>
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<tr>
<td>Cycle 3</td>
<td>50.9*</td>
<td>58.7*</td>
<td>7.4*</td>
<td>6.2*</td>
</tr>
<tr>
<td>Cycle 4</td>
<td>44.7*</td>
<td>53.8*</td>
<td>6.5*</td>
<td>4.0*</td>
</tr>
<tr>
<td>Cycle 5</td>
<td>34.9*</td>
<td>48.9*</td>
<td>5.5*</td>
<td>3.6*</td>
</tr>
<tr>
<td>SE*</td>
<td>.8</td>
<td>.8</td>
<td>.3</td>
<td>.1</td>
</tr>
</tbody>
</table>

*SE (standard error of the mean).

Note: Means in the same column not sharing a common superscript differ (P<.05).

1Jung is a research animal scientist, Production Systems Unit, MARC; Rice is a professor of animal biology, University of Arizona; and Koong is the associate director, College of Agriculture, University of Nevada (formerly the research leader, Production Systems Unit, MARC).
Figure 1—Average daily gain of heifers on smooth bromegrass pasture for continuous and short-duration grazing (SDG) systems through five rotational cycles in 1982. Grazing systems did not differ (P>.05) in gain.

Figure 2—Average daily gain of heifers on smooth bromegrass pasture for continuous and short-duration grazing (SDG) systems through five rotational cycles in 1983. Grazing systems did not differ (P>.05) in gain.

Figure 3—Available standing forage in the continuous and short-duration grazing (SDG) systems during 1982. Grazing systems did not differ (P>.05) in available forage.

Figure 4—Available standing forage in the continuous and short-duration grazing (SDG) systems during 1983. Grazing systems were different (P<.05) in available forage on August 1.