Influence of Communal Area Grazing System on Cattle Performance and Vegetation Parameters in a Semi-arid Area of Zimbabwe

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A study was conducted to determine the impact of grazing management system on cattle performance and vegetation parameters in a semi-arid area of Zimbabwe. Two areas, where traditional grazing management and grazing schemes were practised, were selected for the study. The performance of cattle was determined through body condition scoring of the animals. The assessments were done at the end of the rainy season, after the cattle had spent five months under either traditional grazing system or grazing scheme. Body condition scores were higher (P<0.05) for cattle under the traditional system than those from grazing schemes. Vegetation parameters analysed in the grazing areas included basal cover, species composition, plant vigour and the overall veld score. Under both grazing management systems, overall veld ratings were poor. Grazing schemes have not resulted in improved basal cover, plant vigour and species richness. These findings suggest that grazing schemes tended to compromise performance under poor range conditions, possibly due to limited range resources. The ability of cattle under traditional grazing management system to switch effectively among the different range resources might have enhanced their body condition going into the dry season.

Keywords: body condition, range resources, grazing scheme, vegetation parameters, grazing management
INTRODUCTION

Communal area livestock production systems are inherently inefficient and productivity is low due to poor management of both stock and rangelands (Cousins, 1987; 1988). Due to these problems, grazing schemes have been promoted as an attempt to improve livestock production in communal areas. In Masvingo Province, grazing schemes were in existence since the 1970s (Cousins, 1988). Short duration rotational grazing, a one-herd grazing system (Gillen et al., 1991), is implemented as a veld management practice in grazing scheme. If properly implemented, short duration grazing results in reduced percentages of ungrazed plants and improved livestock distribution in the grazing area (Savory, 1978). The effect on animal performance and vegetation parameters needs to be determined. Some direct effects of livestock and the environment include plant biomass reduction and trampling of the plants (Jones et al., 2010).

In semi-arid regions of communal areas of Zimbabwe, the basis of animal production is natural grazing from rangelands. Feed resource availability in these areas also determines herd dynamics (Scoones, 1995). Therefore, an assessment of vegetation parameters and animal performance is important in evaluating grazing systems.

A number of studies have been carried out on the influence of grazing schemes covering their impact on socio-economic effects (Cousins, 1987), forage nutritional quality (Hungwe et al., 2013a) and cattle foraging behaviour (Hungwe et al., 2013b). The adoption of grazing schemes in some areas had been poor due to farmers’ view that the schemes were a tool to impose de-stocking (Scoones, 1990). Furthermore, some farmers were unwilling to relocate out of designated grazing areas (Kundhlande and Mutandi, 1989), resulting in them being viewed negatively. While grazing schemes tended to compromise forage nutritional quality (Hungwe et al., 2013a) and suppress some foraging behavioural patterns (Hungwe et al., 2013b), their effect on animal performance and vegetation parameters is largely unknown.

The objectives of this study were to 1) assess whether animals from grazing schemes were in better body condition than those under traditional management, going into the dry season, and 2) determine the vegetation parameters under the two grazing systems. It is hypothesised that traditional grazing management system results in poor cattle performance and negatively impacts on vegetation parameters.

MATERIALS AND METHODS

Study site

The study was carried out in Gutu district of Masvingo Province. Two areas with contrasting rainfall patterns were selected for the study (Hungwe et al., 2013a). Each area had a functional grazing scheme and an adjoining area where traditional grazing was practiced.

Vuzhe falls under natural region III and the grazing scheme consists of eleven paddocks covering about 500 hectares. Segande is located in region IV and the grazing scheme is divided into four paddocks, which together cover about 160 hectares.

In both areas, grazing scheme committees are entrusted to determine the rotation of animals through specific paddocks and the grazing duration in each paddock. The grazing period depended on the size of the paddock and the condition of vegetation. Under the traditional grazing system, in both areas, the grazing areas consisted of any open spaces where cattle are herded during the day in the rainy season. These spaces included fallow fields and ridges bordering crop fields.

DATA COLLECTION

Body condition assessment

Body condition scoring was done at the end of the grazing period (June), six months after the animals were confined to specific grazing systems. Body condition scoring was done by visual appraisal of the animals according to the methods of Edmondson et al. (1989). Body conditions at the beginning of the rainy season, when animals went into their respective grazing systems, could not be determined because dipping services were suspended when the study commenced. However, body condition at the end of the wet season could reflect on past nutrient intake and subsequent performance of the animals (DeRouen et al., 1994; Morrison et al., 1999).

A body condition score chart was used and the cattle were scored by visual appraisal to the nearest 0.25 points. A scale of 1 to 5 was used, with scores 1 and 5 indicating severe emaciation and over-fatness, respectively. Only one assessor evaluated all the animals (Table 1) without prior knowledge of the management system of the animals.

Vegetation parameters

The overall veld condition of the grazing areas was assessed using the Ivy (1969) method. Within each grazing management system, sample sites of 1m² were systematically laid along transects selected with the grazing areas. The quadrats were laid starting from the centre traversing towards the edge of the grazing area. Measurements were done at least 20m from roads to minimise border effects. The selection of sites took into consideration the different vegetation communities such as vleis, woodlands, hilly areas and open grass lands. The number of sites for each community depended on the size and diversity of the vegetation. Stratified random sampling with proportional allocation of sites gives an excellent description of the range (Bonham, 1984). The vegetation variables recorded from each quadrat...
included species composition, basal cover, litter cover, plant vigour and forage production.

**Data analyses**

The data for body condition scores and vegetation parameters were transformed by square root transformation (Gomez and Gomez, 1984). Analysis of variance was done (SAS, 2003). Transformed body condition scores were analysed for the effect of grazing management system, class of livestock and the interaction between grazing management and class of livestock. When F-tests were significant, Least Squares procedures were used for mean separation.

**RESULTS AND DISCUSSION**

The body condition scores for the animals assessed (Table 1) were significantly (P<0.05) affected by the interaction of grazing management system and class of livestock.

In Vuzhe, the body condition scores for all the classes of cattle, except bulls, were lower for animals from the grazing schemes (Figure 1). The lack of significant effect for bulls could be due to the limited number of bulls assessed (Table 1). The higher condition of animals from traditional management system was in accordance with the findings from other studies (Anderson, 1988; O’Reagain and Turner, 1992; McCollum et al., 1999). These authors reported that short duration grazing lowered animal performance. The higher body conditions for cattle under the traditional grazing management compared to those from the grazing scheme could partly be explained by the availability of a range of grazing resources under the traditional system. The herders’ inclination was more flexible in determining where the animals would be grazed each day. That allowed the animals to switch to a variety of grazing resources such as contour ridges, roadsides and fallow fields. The different grazing resources could complement poor veld conditions (Table 2).

![Table 1: The numbers of cattle which were assessed under the two grazing systems in Vuzhe and Segande](image)

<table>
<thead>
<tr>
<th></th>
<th>Vuzhe Grazing scheme</th>
<th>Segande Grazing scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional</td>
<td>Traditional</td>
</tr>
<tr>
<td>Heifers</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Cows</td>
<td>64</td>
<td>90</td>
</tr>
<tr>
<td>Steers</td>
<td>78</td>
<td>90</td>
</tr>
<tr>
<td>Bulls</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>180</strong></td>
<td><strong>214</strong></td>
</tr>
</tbody>
</table>

![Figure 1: Body condition scores for cattle under the two grazing systems in Vuzhe. Within a class, bars with the same letter are not different (P>0.05)](image)
Table 2: LS means (SE) of each measured parameter for the two grazing management systems in Vuzhe

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Grazing scheme</th>
<th>Traditional system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basal cover</td>
<td>1.56a(0.29)*</td>
<td>2.42b(1.68)</td>
</tr>
<tr>
<td>Litter cover</td>
<td>1.37a(0.32)</td>
<td>2.27a(1.15)</td>
</tr>
<tr>
<td>Plant vigour</td>
<td>1.58a(0.68)</td>
<td>5.75b(0.23)</td>
</tr>
<tr>
<td>Erosion</td>
<td>4.78a(2.04)</td>
<td>6.29a(2.95)</td>
</tr>
<tr>
<td>Top hamper</td>
<td>1.78a(0.26)</td>
<td>1.60b(0.12)</td>
</tr>
<tr>
<td>Species richness</td>
<td>4.09a(0.31)</td>
<td>7.13a(0.21)</td>
</tr>
<tr>
<td>Overall veld rating/50</td>
<td>16.51a(5.28)</td>
<td>17.63a(5.13)</td>
</tr>
</tbody>
</table>

Notes:
- Means in rows with different superscripts are significantly different (P<0.05).
- *Standard error of mean shown in brackets at the end of each value.

Grazing scheme committees had little authority to impose the recommended grazing practices, although they were empowered (Cousins, 1987). Management of grazing areas is a complex process as other policies give rights to all citizens to use the common resource (Campbell and Shackleton, 2002). Individual farmer preferences on such issues as location of the paddock came too precedence when deciding the grazing paddock. This was more pronounced in Vuzhe where the grazing scheme was viewed as too large.

In Segande, only cows from traditional management were in better condition going into the dry season (Figure 2). Body condition scores for all the classes were not significantly different (P>0.05). Abel and Blaikie (1989) reported similar findings for cattle in grazing schemes 'with known and relatively long histories of good management'. Similar performance of animals under different grazing systems was also reported elsewhere (Manley et al., 1997; Pitts and Bryant, 1987). At Segande, similar cattle performance suggests that where the grazing scheme is smaller, grazing rotation is efficient. Body condition scores showed large variations within the different classes. Where range conditions are excellent, rotational grazing produce the highest weight gains (Lewis et al., 1977).

Overall veld conditions (Table 2) of the grazing areas under the two systems were similar (P>0.05). However, under traditional grazing system there were high variations on vegetation parameters, an indication of heterogeneity among sites. Other studies have shown that there is little difference between short duration grazing and continuous grazing if stocking rates were similar (Anderson, 1988; Thurrow et al., 1988). Poor states of rangelands under both grazing systems are attributed to high stocking rates which exceed recommended carrying capacities. Cousins (1996) found that grazing schemes resulted in very little impact on controlling stocking rates. On the contrary, Abel and Blaikie (1989) observed that veld deterioration within grazing schemes was slow. In communal areas there is little effort paid towards sticking to recommended carrying capacity. The view that grazing schemes were a tool to impose de-
stocking resulted in poor adoption by farmers (Scoones, 1990).

In Vuzhe, parameters such as basal cover, plant vigour and species richness were higher (P<0.05) for sites under traditional management than those within the grazing scheme (Table 2). Of the three parameters above, only basal cover was higher within the grazing scheme in Segande (Table 3). Morris and Tainton (1996) also reported similar species composition between rotational and continuous grazing. The presence of unpalatable bushy shrubs Lopholaena coriifolia and Helichrysum kraussii under both grazing systems further pointed to poor states. The heavy presence of Sporobolus pyramidalis and Aristida junciformis, grass species of poor grazing value, also indicated over-grazing under both grazing systems.

### Table 3: LS means of each measured parameter for the two grazing management systems in Segande.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Grazing scheme</th>
<th>Traditional system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basal cover</td>
<td>4.41(0.29)*</td>
<td>3.63(2.17)</td>
</tr>
<tr>
<td>Litter cover</td>
<td>2.47(0.32)</td>
<td>2.38(0.15)</td>
</tr>
<tr>
<td>Plant vigour</td>
<td>4.79(0.68)</td>
<td>5.75(1.23)</td>
</tr>
<tr>
<td>Erosion</td>
<td>6.28(0.22)</td>
<td>6.75(1.28)</td>
</tr>
<tr>
<td>Top hamper</td>
<td>1.78(0.26)</td>
<td>1.60(0.12)</td>
</tr>
<tr>
<td>Species richness</td>
<td>5.43(0.31)</td>
<td>9.90(0.21)</td>
</tr>
<tr>
<td>Overall veld rating/50</td>
<td>18.42(2.81)</td>
<td>18.88(4.02)</td>
</tr>
</tbody>
</table>

* Means in rows with different superscripts are significantly different (P<0.05)
* Standard error of mean shown in brackets at the end of each value

There was a large variation in scores for parameters that were evaluated, this was expected since sites were selected from different plant communities. Foraging animals select preferred sites (McFarland et al., 1992) and this area selective grazing is partly due to variation in forage quality and productivity with regard to catena position (Danckwerts and Tainton, 1993). Heterogeneity of the veld condition could be further enhanced by proximity to key resources such as water points and homesteads. Spatial and temporal variation in vegetation is the key to livestock survival during drought periods in communal areas (Scoones, 1995).

**ACKNOWLEDGEMENTS**

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