

Describing cattle grazing distribution in communal rangelands of the Eastern Cape South Africa: towards improving livestock rangeland use.

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Abstract

This study used global positioning systems (GPS) to understand grazing distribution of three cattle in the communal rangeland of Eastern Cape, South Africa. Free ranging cattle were randomly selected from participating households and were fitted with neck GPS collars, which recorded geographic position every five-minute interval during wet and dry season. The study identified three production domains where cattle were reported to be spending most of their time grazing, separated by bound polygons on google earth Pro to further extract MODIS EVI???. The recorded GPS points were loaded into google earth Pro to analyse the distribution of cattle grazing in the rangeland. The results revealed that cattle spent most of their time grazing in areas associated with human features such as areas around homesteads, paths and riparian zones. Furthermore, MODIS EVI showed high production taking place in the concentrated grazed areas, suggesting that cattle may be attracted to those grazing lawns because of high nutrient deposition through to the repeated visitation during grazing. This study will help in providing an informed basis for the development of South African communal rangeland policies for effective livestock management.

Introduction

South African communal rangelands make up only 13% of agricultural land on account of colonialism under which the indigenous people were restricted to small areas, and land rights were delineated along racial lines through the 1913 Native Land Act (Samuels et al., 2007). The Eastern Cape regions have been subjected to traditional herding and ploughing, followed by large-scale abandonment, leading to substantial changes in the species composition of the rangeland, which are now dominated by the more robust, less palatable grasses such as *Eragrostis plana*, *Hyperrenia hirta* and *Sporobolus africanus*. This makes it important to understand livestock grazing distribution in communal rangelands as it affect species composition, vegetation cover and increase erosion. This is equally because livestock make use of a patchy mosaic of available forage in time and space (Scoones, 1992) in order to maximize intake. An understanding of livestock grazing distribution coupled with knowledge of the factors limiting the ability of the farmers to manage the grazing lands effectively, will enable graziers to think about ways to maximise forage utilization and potentially improve livestock production.

This study assessed the grazing distribution of cattle under a continuous grazing system, using Global Positioning Systems (GPS) to identify patterns of rangeland use where interventions would be most beneficial to improving livestock production. This will help in providing an informed basis for the development of South African communal rangeland policies for effective livestock management. An assessment of the areas that provide grazing for livestock and particularly those that provide key resources in maintaining livestock during the wet and dry seasons and when these areas are utilized was determined. These areas such as unimproved grasslands, cultivated lands and areas around the homesteads were determined.

Methods and Study Site

The study was conducted in the northern part of the Eastern Cape Province, South Africa, near Cala town in Mgwalana village (T12A). Livestock herds are mostly dominated by sheep and cattle, with some including a few goats. The study site comprises vegetation of the *Drakensberg foothills moist grassland* (Mucina and Rutherford, 2006) which is a broad arc of Drakensberg mountain and its surroundings. The study site receives 654 mm (2000–2017) of mean annual precipitation during the summer rainfall period (Mucina and Rutherford, 2006). There are 26 frost days, indicative of a sub-montane form of a warm cool temperate climate, and the mean annual temperature is 15 °C. The study site is composed of important taxa of graminoids and geophytic herbs (Mucina and Rutherford, 2006).

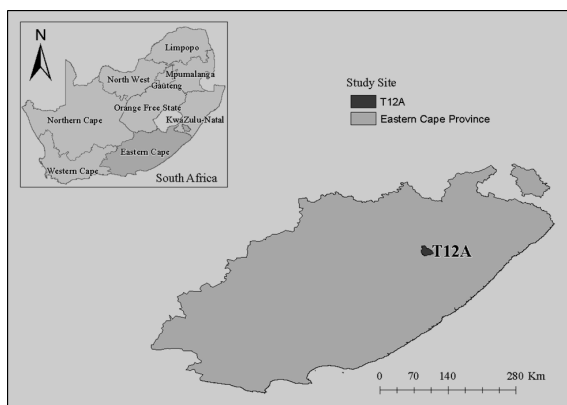


Figure 1. Map of the study site where animal grazing distribution occurred in Mgwalana village (T12A).

Cattle grazing distribution

Three local Zebu-type cattle (*Bos indicus*) were selected as focal animals from herds of collaborating homesteads. Each animal was fitted with a CatLog GPS tracking device inserted in a secure, waterproof pouch sealed with silicon to prevent water damage and attached to a robust neck collar belt, individually adjusted to their neck size. The devices were inserted in collar belts that were placed on the animals for the wet season, in November 2016 and retrieved in February 2017, and then again fitted for the dry season in July 2017 and retrieved in September 2017. [where the cattle herded or allowed to graze freely????]

MODIS Enhanced Vegetation Index (EVI)

The enhanced vegetation index from GEE product based on MODIS Terra surface reflectance for the period of livestock collaring was extracted to determine the active green growth of the areas where most grazing (domain) occurred in both wet and dry seasons.

Results

Google Earth images of cattle grazing during the wet and dry season

Figures 1 and 2 show the grazing distribution of three cattle during the wet and dry season in Mgwalana village. The different colours represent different animals and show that the animals spent most of their time grazing around the homesteads, around the riparian zones and unimproved grasslands. However, other animals did move and graze on unimproved rangelands during the day in both seasons.

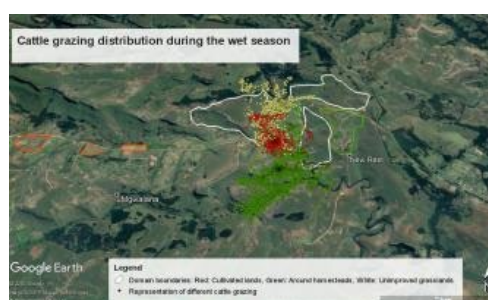


Figure 2. Google Earth plot showing the grazing distribution of three different cattle during the wet season.

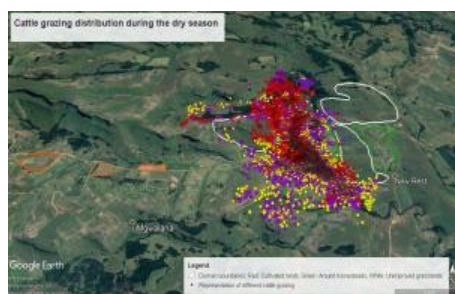


Figure 3. Google Earth plot showing the grazing distribution of three different cattle during the dry season.

MODIS EVI of the areas where livestock grazing occur

The mean EVI for production domains from January 2016 to December 2018 were both 0.27 for cultivated lands and unimproved grasslands and 0.29 for areas that are around homesteads (Figure 3). EVI for the wet and dry seasons were different, with the wet season showing high EVI values of 0.3- 0.4.

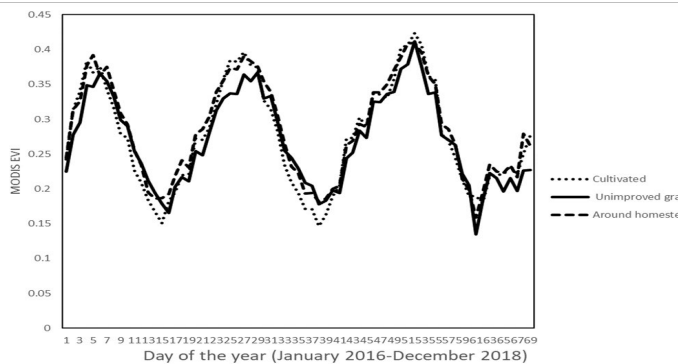


Figure 4. MODIS EVI for three grazing areas used from January 2016–December 2018

Discussion and conclusion

Livestock grazing distribution patterns

The results of livestock distribution patterns for the wet and dry seasons show that, during the daytime grazing periods, livestock spend a great deal of their time strongly associated with human features, for example, homesteads, along roadsides, in abandoned cultivated lands and riparian zones. This strong association is possibly due to the active green growth around these areas; even though the grazing resource is very limited, the grass is generally very short, and is mainly stoloniferous species and does not offer much bulk forage (Palmer and Ainslie, 2009). However, cattle are able to ‘learn the landscape’ (Launchbaugh and Howery, 2005) and know that they have to come home, which may be one of the reasons for the strong association with anthropogenic features. On the other hand, cattle grazing pattern for both seasons were similar, with grazing preference around homesteads. This suggests that, in both seasons forage on unimproved land is not being used as effectively as it might be. These findings provide an important insight into livestock foraging preference on areas that are close to homesteads in the study site. Cattle have demonstrated a strong preference for key resources that are available in these areas where grass in the rangelands is mostly avoided. However, preferred in the dry season by cattle when preferred vegetation in key areas have become depleted. The use of key resource areas by cattle results in exploitation of resources and may later contribute to accelerated degradation of these resources

The findings from this study have an important implication for rangeland management policy in communal areas such as the introduction of committee set by the local people to look at the management of rangeland use. The use of key resource areas by cattle results in exploitation of resources and may later contribute to accelerated degradation of these resources [need for herders???? are sheep herded and cattle roam free???

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References

- Launchbaugh, K.L. and Howery, L.D. 2005. Understanding landscape use patterns of livestock as a consequence of foraging behavior. *Rangeland Ecology and Management.*, 58: 99–108.
- Mucina, L. and Rutherford, M.C. 2006. Vegetation of South Africa, Lesotho and Swaziland. Strelitzia, Pretoria: South African National Biodiversity Institute.
- Palmer, A.R. and Ainslie, A. 2009. Using rain-use efficiency to explore livestock production trends in rangelands in the Transkei, South Africa. *African Journal of Range & Forage Science.*, 24(1): 43–49.
- Samuels, M.I., Allsopp, N. and Knight, R.S. 2007. Patterns of resource use by livestock during and after drought on the commons of Namaqualand, South Africa. *Journal of Arid Environments.*, 70(4): 728–739.
- Scoones, I. 1992. Coping with drought: Responses of herders and livestock in contrasting savanna environments in Southern Zimbabwe. *Human Ecology.*, 20(3): 293–314.