Spatial and Temporal Variation of Stocking Rate in a Rotational Grazing System on a Namibian Cattle and Sheep Farm from 2006 to 2017

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INTRODUCTION

Data required to calculate productivity or resource use efficiency of extensive rangeland-grazing systems are difficult to obtain and observations/studies are laborious and costly. Existing farm records might contribute long-term information of high spatial and temporal resolution.

We explored farm records on grazing rotation between paddocks to calculate stocking rates (SR) as applied by the farm management for 50 paddocks in 11 years.

METHOD

- Handwritten farm records on herd movements between paddocks revealed a total of 2,146 grazing events (i.e. time span from a herd entering a paddock until leaving it again).
- LW was estimated constant at 290 kg (cattle) and 35 kg (sheep) - neglecting intra- and inter-annual variation.
- Year = 1st June - 31 May (start of dry season - end of rainy season).
- Stocking rate (SR) per grazing event = no. of animals × average LW × grazing days / paddock size.
- Cumulated SR of all grazing events per paddock in a year divided by 365 is the average daily SR [kg LW ha⁻¹ d⁻¹].
- Coefficient of variation (CV in %) indicates spatial heterogeneity between the 50 paddocks’ SR within a year.

STUDY SITE

Geography & Climate:
- Central-east Namibia, semi-arid Kalahari savannah
- Sandy soils with calcareous or loamy patches
- Annual rainfall 1960-2017: 272 mm ± 48%
- Annual rainfall 2006-2017: 327 mm ± 53% (53 - 703 mm)
- Growing period: January to March

The Farm:
- 9,500 ha, 50 of 60 paddocks evaluated (avg. size 162 ha)
- 900 Nguni cattle and 3,500 Damara sheep (in 2017)

The Grazing Scheme:
- Until 2013: Rotation of 4 mixed herds across paddocks of 4 separate farm sections (Haus, Sand, Achab, Kalk) resp.
- Since 2014: Rotation of 3 herds (cows, sheep, mixed) over each paddock of the whole farm. I.e. each herd grazes each paddock about once every year.
- Farm manager adjusts grazing days per paddock to perceived (available) forage (visual assessment) at the beginning of the dry season, thus setting the SR (according to Holistic Grazing Planning).

RESULTS

- Avg. annual stocking rate shows an upward trend (from 29-43 kg LW ha⁻¹ d⁻¹) over the study period.
- Stocking was maintained at the upper end or above regional carrying capacity recommendations.
- The cattle herd grew constantly, the sheep flock size was more flexible.
- However, avg. annual stocking rates of individual paddocks and their variation around the mean show high spatial heterogeneity (avg. CV 35 %) and temporal variability (avg. CV 37 %).

CONCLUSION

Analysis of existing farm records on grazing rotation yielded long-term information on applied stocking rates of high temporal and spatial resolution.

Coupled with data from global observatories (e.g. satellite imagery, NDVI) or overlaid on resource maps they could yield valuable information on a) farm or system productivity and b) resource use efficiency.

Such information can be of high utility for practical grazing management and for scientific purposes alike.

OPEN QUESTIONS & OUTLOOK

- Farm records exist in different detail and precision.
- Surveys should be undertaken to explore availability and willingness of farmers to cooperate.
- Written farm records exist mostly for stationary and market-oriented systems.
- Survey methods should be devised to extract such records from pastoral systems where livestock data is orally traded through generations.
- Farm managers and pastoralists should be given the opportunity to analyse their own data overlaid with maps and observatory information.
- From this may emerge farmer led development of decision-making tools?
- We invite potential collaborators to team up.

SAMPLE IMAGES (APRIL 2016)

1. Unfavorable perrenial grasses, standing dead
2. Annual grasses

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