SALLnet – South African Limpopo Landscapes Network

SALLnet Policy Brief

September 2022

Feed gaps and rangeland degradation

Managing smallholder farming systems to reduce feed gaps

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Executive Summary

- Smallholder farmers in the Limpopo province use natural savanna rangelands for forage production.
- Most farmers experience feed gaps at the end of the winter, when feed demand exceeds feed supply, resulting in undernourished livestock, shrub encroachment, and soil erosion.
- Feed gaps will become more pronounced in the future due to overgrazing and more severe drought under conditions of climate change.
- We investigated how drought and grazing influence rangeland condition, and assessed whether sustainable intensification can reduce feed gaps.
- Our research shows that drought effects on rangelands increase with drought duration. However, recovery is possible given sufficient resting times. Sustainable intensification can reduce but not always close feed gaps.
- We propose to apply rotational grazing systems and grazing exclosures to ensure the recovery of overgrazed rangeland after drought.
- Forage subsidies can close feed gaps and should be provided not only during a drought but also after drought to ensure rangeland recovery.

What is the issue?

Smallholder farmers in South Africa's Limpopo province rely on ecosystem services provided by arable land and rangeland. While arable land is used to grow various crops, natural savanna rangelands provide forage for livestock. In mixed-farming systems, livestock feeds on rangeland during the cropping period and on crop residues after harvest.

Yet, most farmers in the Limpopo province experience feed gaps during late winter and early spring, where feed demand exceeds feed supply. An immediate consequence of feed gaps is undernourished livestock. Long-term consequences are bush encroachment and soil erosion, which in turn may further amplify feed gaps.

In addition to intense land-use, the frequency and intensity of drought are predicted to increase during the next decades due to climate change. Such extreme events are expected to reduce rangeland productivity.

Here we asked: How do drought and grazing interact to influence feed provision and feed gaps? Does mixed farming and sustainable intensification reduce these feed gaps?

What did we do?

- We run a large field experiment ('DroughtAct') from 2014 to 2022, where we combined grazing, resting and 2 or 6 year drought treatments. The experiment was established at the University of Limpopo's experimental farm.
- We replicated the DroughtAct experiment in a rangeland model to study rangeland recovery after drought until the year 2030.
- In 2019 we linked livestock-household surveys and analyses of feed resources during a potential feed gap period.
- We combined different modeling approaches for rangeland and cropland to test if mixed cropland-rangeland farming and sustainable intensification can reduce feed gaps.

What did we find?

- Drought strongly reduces rangeland productivity (Fig. 1a) and shifts vegetation composition towards less palatable annual grasses and forbs.
- Recovery of rangeland is possible after drought. However, the duration required for recovery increases with drought duration.
- Resting facilitates rangeland recovery, but long resting leads to a pile-up of dead grass biomass and hampers recovery. Optimal resting times depend on land-use history, and need to be attuned based on monitoring accumulated dead grass biomass.
- Feed gaps are not only linked to the quantity of rangeland biomass, but also the poor quality of the feed resources.
- Feeding crop residues serves to bridge the gap but is often of poorer quality than rangeland biomass, and may not meet livestock demands.
- Yet, model results indicated smaller feed gaps under mixed cropland-rangeland farming, that remained in the mixed cropland-rangeland and the sustainable intensification scenarios (Fig. 1b).

Recommendations

(1) Facilitate knowledge transfer. Knowledge transfer between farmers, extension service and science, but also between farmers is essential. More training on cattle and rangeland management and mixed rangeland-cropland farming is required.

(2) Manage livestock and breeding. Establish schemes that motivate farmers to sell cattle during feed gaps and buy young cattle when forage is sufficient. This reduces cattle mortality and the risk of financial loss. Manage fertility actively by ensuring that calving coincides with forage availability, or by insemination.

(3) Close feed gaps by additional forage sources. Mixed cropland-rangeland farming provides access to crop residues and cover crops as forage. Storage of forage ensures availability during feed gaps. Chopped shrubs are an additional forage source and reduce shrub encroachment.

(4) Improve rangeland recovery and health. After drought and in the early wet season, grass recovery is essential to ensure forage production. Rotational grazing, resting and exclosures ensure recovery, particularly during the early growing season where grasses regrow. Branches of spiny shrubs can be used as fences, thereby reducing shrub encroachment and creating small 'safe sites' for the recovery and seed production of palatable grasses. To avoid accumulation of dead grass biomass, resting times should be limited.

(5) Supply additional forage to farmers on time. Forage subsidies should exceed the drought time for one year. Such extended forage supply facilitates rangeland recovery. Where resources permit, planted pastures can provide additional supply.

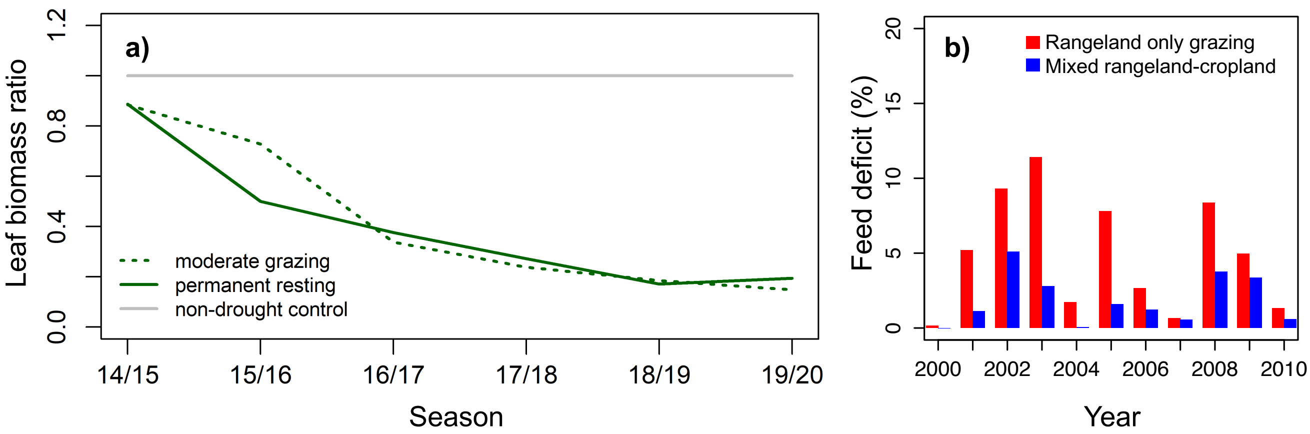

Figure 1: (a) Impact of drought (green) on productivity in the DroughtAct experiment, in comparison to no-drought conditions (grey) for moderate and permanent resting. (b) Annual feed deficit of cattle (i.e., feed gap) at Selwana in model simulations for a scenario where cattle feeds on rangelands only (red) and where cattle feeds on rangelands during the cropping period and on crop residues after harvest (blue).

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GEFÖRDERT VOM

Bundesministerium für Bildung und Forschung

DLR Projektträger

The SALLnet project is one of nine German-South African research collaborations within the framework of the SPACES II programme, funded by the Federal Ministry of Education and Research (BMBF) and managed by Project Management Agency DLR. Any opinions stated in this publication are those of the authors and are not necessarily representative of or endorsed by the SALLnet.

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