Forage Biomass Production under Different Stocking Rates and Stocking Densities on a Namibian Livestock Farm

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Introduction

- **Forage biomass production** in Namibian savanna rangelands is low and varies in space and time, which calls for flexible, adaptive and responsive grazing strategies.
- Current **rangeland management** often relies on setting annual **stocking rates (SR)** to match rangeland carrying capacity (CC).
- More recent reportedly successful grazing strategies relying on flexible adjustment of **stocking density (SD)** often lack scientific endorsement.
- We therefore studied ***responses of forage biomass production to increased SR or increased SD***

Conclusions

- Forage Biomass Production mainly reflected annual precipitation.
- **Increased SD appears to increase forage biomass production** and reduce accumulation of standing dead biomass.
- **Increased SR can also increase forage biomass production** but may reduce the share of perennial grasses.
- Biomass yield and output varied highly between replications, treatments and years, hence further data analysis is necessary at higher spatial resolution.
- Further continued data collection should be at higher temporal resolution and include animal feed intake and feed quality parameters.

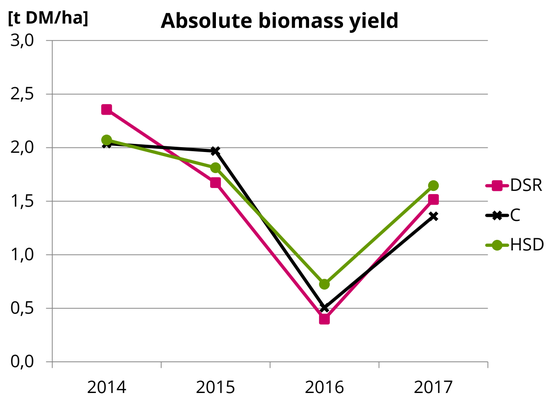
Results:

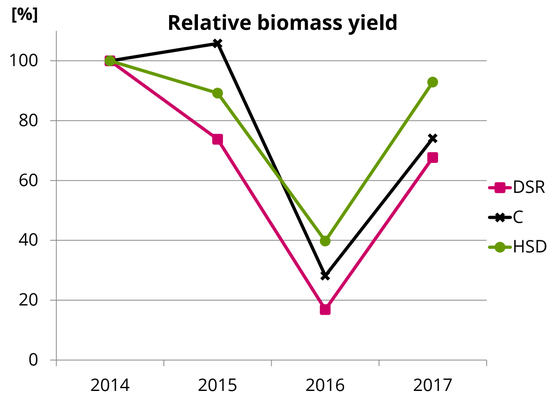
Terms

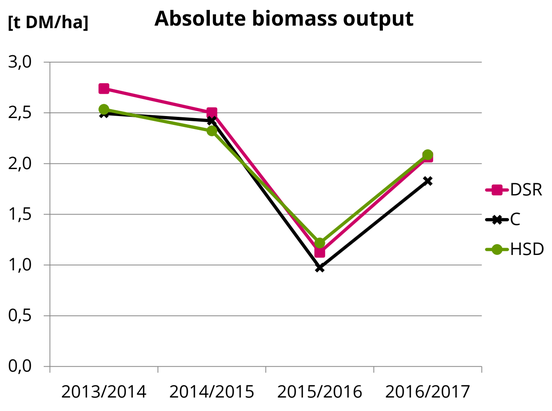
Forage biomass = annual and perennial grasses, legumes, forbs
Yield = forage biomass as measured each year in May [t DM/ha]
Output = yield + hypothetically consumed biomass for each year [t DM/ha]
Hypothetically consumed biomass = estimated forage intake in kg DM (3% of LW / d) x avg. stocking rate [kg LW / ha and year] x 365.

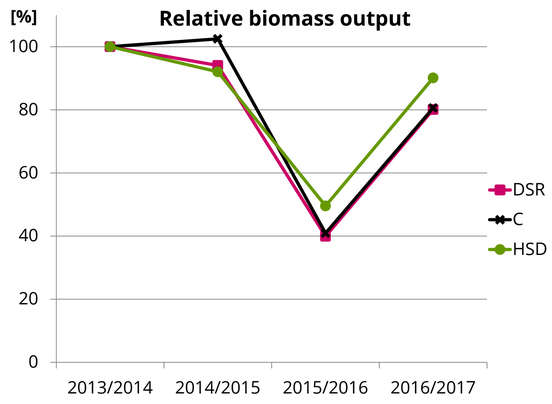
1) Forage yield and output

- Changes in biomass production reflected varying precipitation
- Absolute yield was highest following increased SD
- Output following increased SD or SR was higher than in Control (C)
- Relative yield and output shows advantages of increased SD over both, increased SR and C after 3 years of treatment

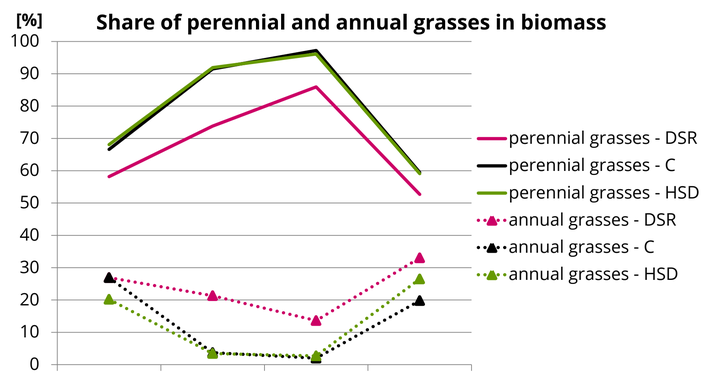






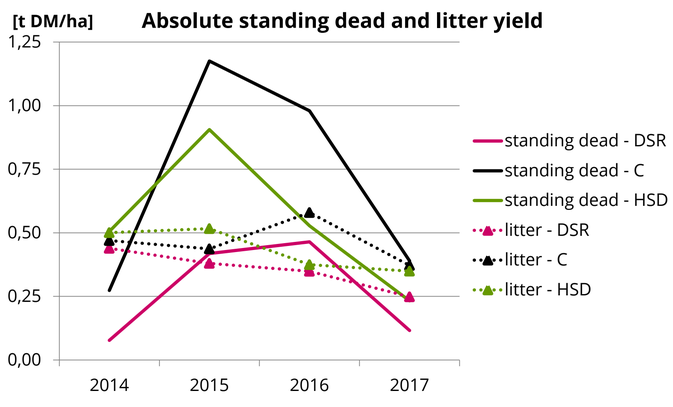


2) Forage composition



- Under increased SR, the share of perennial grasses was lower while the share of annual grasses was higher
- Increased SD was similar to C
- The share of legumes and forbs was <21%

3) Standing dead and litter accumulation



- Increased SR or SD showed lower absolute accumulation than C
- Relative accumulation of standing dead biomass was lower under increased SD (46%) than under increased SR (150%) and C (143%; 2014 = 100%)

Applied SRs [kg LW/ha/a] and SDs [kg LW/ha]

Double**SR**	SR: Ø 64 (26 – 105) SD: Ø 1018 (781 – 1559)	grazing duration twice as long as routinely scheduled
Control	SR: Ø 42 (20 – 67) SD: Ø 1011 (759 – 1841)	grazing duration as scheduled routinely for the respective paddock and herd by Holistic Grazing Planning (factors: e.g. paddock and herd size, forage reserve, season)
Higher**SD**	SR: Ø 44 (22 – 64) SD: Ø 2659 (1756– 3543)	strip grazing (approx. 2-day-moving frequency) within the routinely scheduled grazing duration

Study location

- Farm Springbockvley: 9,500 ha Namibian *Acacia*-savanna, Ø 260 mm annual rainfall (peak Dec – Apr)
- About 890 Nguni cattle (Ø 290 kg per head) and 3,700 Damara sheep (Ø 35 kg per head) split into 3 herds
- Organic Standards and Holistic Management

Rainfall

2012/13: **117 mm**
2013/14: **427 mm**
2014/15: **316 mm**
2015 /16: **132 mm**
2016 /17: **336 mm**

Study design

- 3 treatments were studied at 4 locations (replications)
- 3 herds (cattle and/or sheep) grazed each paddock about once per year with at least 80 days resting between grazing events
- Destructive biomass sampling and then sorting by species, drying and weighing was done each year in May from 2014 (reference) to 2017

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In cooperation with: