INTRODUCTION
Dryland ecosystems are facing a severe threat from climate change (Maestre et al. 2012), often combined with heavy grazing pressure. Transitions from “good” to “poor” rangeland condition may pose catastrophic and possibly permanent consequences for rangeland productivity, when the system reaches a threshold beyond which it becomes impossible to recover (desertification tipping point). The ability to predict desertification tipping points with the aid of suitable ecological indicators is critical (Esilmi Andergoli el. al. 2015). However, the underlying mechanisms and the sensitivity of plant species to desertification are rarely tested.

Research design

4 communal areas
2 transects per site
9 (10m x 10m plots)

4 commercial farms
16 transects in total
144 plots in total

Species selection
4 perennial grasses
Aristida stipitata
Aristida congetesta
Stipagrostis uniplumis
Eragrostis rigidor

Ecological status
- Poor forage value, often occur in degraded rangelands
- Better grazing value, often occur on healthier semi-arid rangelands

Sampling
- Two basal diameters (semi-minor and semi-major axes) of a minimum of 25 individual tufts of each species were measured at 5 out of 9 plots.
- Individual adults and seedlings were counted in 9 plots to determine population densities and seedling abundance.

Species basal sizes and densities

Stipagrostis uniplumis
Eragrostis rigidor

ECological status
- Poor forage value, often occur in degraded rangelands
- Better grazing value, often occur on healthier semi-arid rangelands

Overall densities and recruitment

DISCUSSION
- Sub-climax species such as A. stipitata tend to be relatively larger in size on highly grazed plots.
- S. uniplumis had significantly larger tufts at intermediate grazing (Fig. 3) and higher densities on commercial farms compared to communal areas (Fig. 4).
- The absence of E. rigidor and rarity of S. uniplumis particularly on highly grazed plots in communal areas is a possible indicator of rangelands transitioning.
- Seedling recruitment was only recorded in commercial farms (Fig. 5) which could possibly be due to controlled grazing practices.
- Total densities and seedling recruitment tend to gradually increase away from grazing pressure.

CONCLUSIONS
- Perennial grass species that are more responsive to grazing impact are probably useful early warning indicators of desertification tipping points.
- The basal sizes, density and recruitment all show such responses.
- Total and especially species-specific responses show potential early warning indications, however, further analyses is key to understand the patterns.

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