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Strategic trampling to conserve soil moisture in a Namibian rangeland

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Key words: animal impact, BIOTA, rest, soil moisture, trampling

Introduction There is still a lot of controversy around trampling as a rangeland management tool. Savory (1999) promotes animal impact for a variety of benefits including removal of old plant material, invigoration of existing plants, mulching the soil surface with trampled vegetation, favouring establishment of new plants, returning nutrients to the soil surface and breaking soil crusts that interfere with seed germination and rainfall absorption. On the other hand, Miller (2005) points out that an extensive amount of hydrologic research has failed to support the hypothesis that trampling by large herbivores has beneficial impacts on infiltration, indicating instead that trampling tends to result in lower infiltration rates where it destroys stable soil aggregates. Those who promote trampling all agree that it must be followed by sufficient rest to allow recovery after trampling. This study, falling under the Biodiversity Transect Analysis in Africa (BIOTA) program, investigates trampling applied by three farmers on their low rainfall rangelands.

Materials and methods Strategic trampling is applied on sandy soil (3-8% clay) at Farm Weiveld (23.06°S, 18.88°E) in Namibia's Camelthorn Savanna, with a mean annual rainfall of about 250mm. Initial observations were casual, by digging soil to feel how moist it was at different depths, in relation to trampling by livestock under different conditions. Moisture content of soil augured on two occasions from measured depths on each side of the boundary fence was determined gravimetrically. Gypsum blocks have subsequently been buried at 10, 25, 50 and 80cm depth, both in and outside exclosures, replicated five times on each of three farms, for electronic determination of soil moisture availability. The number of perennial grasses growing within 0.75m of each of 100 sample points were counted on each side of a fence separating two paddocks, one of which had been briefly trampled earlier in the growing season.

Results Casual observations suggested that brief trampling after good rain conserved soil moisture, possibly by breaking the capillary connections that suck moisture from lower layers in untrampled soil. Figure 1 shows slightly more soil moisture at the end of the dry season, in April, between 30 and 80cm depth in the strategically trampled soil, suggesting that infiltration may have been improved. However, by mid dry season, in July, it appeared drier below 30cm, possibly due to higher transpiration through the five times greater density of perennial grasses there. No results are available yet from the gypsum blocks. The perennial grass density was significantly higher where brief trampling had been applied shortly after the first effective rain of the season (Figure 2).

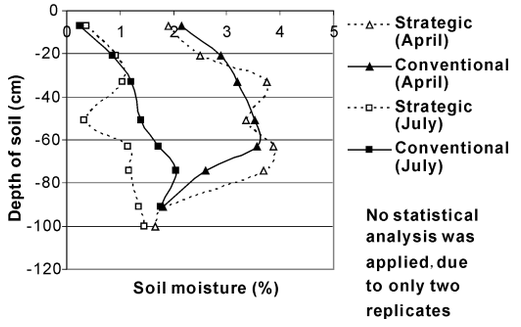

Figure 1 *Successive soil moisture profiles under strategic trampling and conventional rotation.*

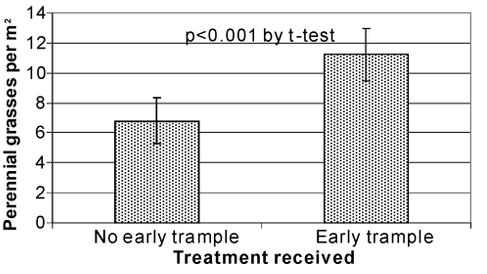

Figure 2 *Mean perennial grass density each side of fence that received different trampling treatments (error bars show 95% confidence limits).*

Conclusions Initial indications suggest that brief trampling, followed by rest, can be applied strategically both before and after rain to achieve certain rangeland management objectives, provided the conditions are favourable. While Savory (1999) seems to treat animal impact as a simple tool, with variables of type of animal, stocking density and timing, observations at Farm Weiveld suggest that trampling is more complex and should furthermore be differentiated between its variables of season, soil texture, soil moisture profile and organic matter content of the soil.

References

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