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RESTORATION OF A GULLY SYSTEM IN A KEY UPLAND FERTILE VALLEY

INTRODUCTION

To avoid future degradation proactive rangeland management should be a priority. However, many rangelands are already degraded to the extent that preventative measures alone are insufficient to restore rangeland health within an acceptable timeframe, necessitating simultaneous restoration measures in key parts of the rangeland. Reduction in grass cover causes shallow sheet erosion. When this is coupled with a "nick point" incision in the landscape, rapid, headward gullying results. This affects the most productive parts of landscapes and their catchments. These "nick points" may be tracks, animal trails or road culverts; anything that lowers the local base level of the land and creates an energy gradient for gullying (Pringle & Tinley, 2003). Current attempts at improved grazing management in Namibia's highland savannas are undermined by continued loss of rainwater down gullies and into ephemeral rivers instead of soaking into the soil to support grass growth. This again limits habitat quality which negatively affects both livestock and wildlife.

Using principles of the Ecosystem Management Understanding (EMU) Process (Pringle & Tinley, 2003), and with the local farmers' encouragement, we developed a trial restoration project in the Auas-Oanob Conservancy. The EMU approach emphasises catchment ecology and the identification of geomorphic base levels that determine patterns of soil moisture balance (Tinley, 1982) and hence productivity, diversity and general ecological health. This approach is in stark contrast to the "symptoms – band-aid" approach that appears to predominate. Our approach views rangelands as ecosystems controlled principally by base levels which, when incised, initiate cascading headward gully erosion and landscape leaking (Pringle, Watson & Tinley, 2006). No active intervention is worthwhile without complementary ecological grazing management. This project falls under the Biodiversity Transect Analysis in Africa (BIOTA) programme, funded by the German Ministry of Education and Research (BMBF).

METHODS

During a workshop farmers identified upland fertile valley systems as key features in their rangelands. Periodic waterlogging used to ensure that these valleys were dominated by perennial grasses, but many of the valleys have been cut by gullies that drain them and allow bushes to encroach (Figures 1 & 2). The restoration site is on sandy loam, with a mean annual rainfall of roughly 300 mm. The eroded valley, with a slope of about 1:70, was treated in March 2007 with filters made of branches cut selectively from *Acacia mellifera* that was growing in dense stands nearby. The branches were packed at strategic locations to slow down flowing water and trap sediment, while allowing excess water to pass through. Sometimes the branches were woven with wire and tied to trees or steel posts. Ten of the treated features are compared with ten similar features in other unfiltered gully systems. The sampled features were measured, by landscape function analysis (LFA) (Tongway & Hindley, 2004), with transects running across rills or gullies. The measured features consist of four gully confluences and

Figure 1. An intact grassy upland fertile valley acts as a benchmark, providing a vision for restoration of eroded valleys.

Figure 2. Gully erosion drains an upland valley, allowing bushes to take over where temporary waterlogging had excluded them.

six rills per gully system. Half of the measured features were fenced to exclude cattle both at the treated gully system and the unfiltered systems. The restoration work along roughly 2 km of rills and gullies took about 100 person days to complete and required the use of 30 steel posts (0,9 m length) and about 900 m of fencing wire.

RESULTS

No effective rain fell in 2007 after the filters had been put in place, and the following rainy season in 2008 started very late. However, in March 2008, a storm during which about 50 mm fell in 30 minutes, resulted in filters trapping some sediment (Figure 3), while lush grass later grew under many of the filters (Figure 4). Cross sections across rills and gullies showed variable results. At the biggest gully confluence in the treated system, soil was deposited above the filter, where the soil surface condition also improved. Below the filter the gully eroded further and the soil surface condition worsened in this zone (Figures 5 & 6).

CONCLUSIONS

The initial results are encouraging. However, after only one rainy season it is too early to conclude that the perennial grass has grown sufficiently to take over the filtering function from the branches, in order to flip the system from losing resources to capturing them and thereby allow self-repair to proceed. The problem of bush encroachment in the catchment was also partly addressed, by using some excess bushes for filter material and thereby converting a problem to a solution.

If the rainy season is poor, the filters may rot before they can function effectively in the subsequent rainy season. Such restoration work is therefore costly, but far cheaper than installing cement weirs. Any local restoration initiative should form part of a broader strategy, coordinated with neighbouring farmers. This strategy should then aim at catchment level management which restores hydrological functioning, thus allowing improved grazing management to become effective.

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Figure 3. Soil and mulch are trapped on the upslope side of a filter.

Figure 4. Lush grass establishes on the downslope side of a filter.

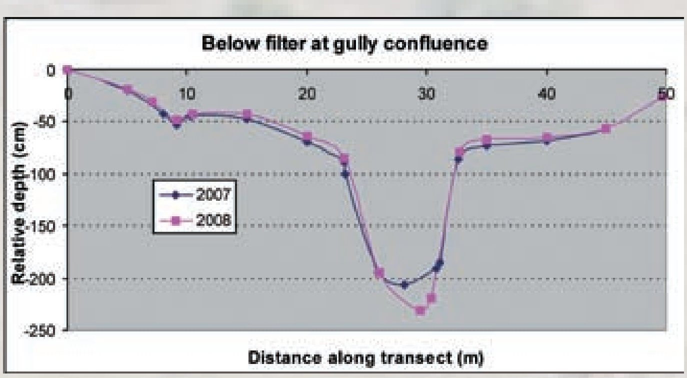

Figure 5. Changes in exaggerated cross section above the confluence of two gullies, over a year after treatment with filters.

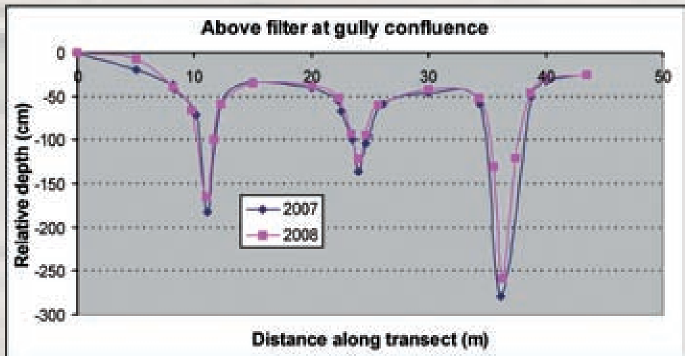

Figure 6. Changes in exaggerated cross section below the confluence of Figure 5.

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