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# In search of an alternative to fire for manipulating bush encroachment in the arid Karoo region of South Africa

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## Introduction

Burning of natural rangeland in order to rejuvenate and increase palatability of grazing is a common practice in parts of South Africa. Concern about the long-term effects on biodiversity and the depletion of much-needed soil carbon led to this investigation.

## Materials and Methods

This study was carried out in the mountainous parts of Murraysburg in the Central Karoo region of South Africa. Two different veld types were chosen. The first site had an average annual rainfall of 400 mm on an altitude of 1500 m above sea level, with hardy, unpalatable perennial bushes (dominated by *Euryops* spp. and *Dicerotheramnus rhinocerotis*). The second site had an average annual rainfall of 600 mm on an altitude of 1700 m above sea level, with less palatable sour grass (dominated by *Merxmuellera disticha*).

A complete randomised block design was used with three replicates at the first site and two replicates at the second site. Seven treatments were tested, *i.e.* (1) Control (no treatment), (2) burning in different seasons, (3) high-density grazing, (4) a brush cutter and (5) a knife-roller. Two different herbicides were also used. The first site was divided into almost square blocks of 80 m x 100 m. The second site was divided into longitudinal blocks of 15 m x 60 m.

## Results and Discussion

No carbon was removed from the rolled plots and the broken plant material acted as mulch against erosion and early grazing. In the burnt plots, all competition was successfully removed, but soil was exposed to erosion and seedlings were grazed too early by wildlife, resulting in over grazing. Less palatable species get a chance to compete and the plants do not get a chance to flower and produce seed. The burnt plots caused deaths of smaller animals. We found at least three dead tortoises on less than three hectares. The herbicides had no effect on the hardy bushes.

Initially the knife roller and burning removed the hardy bushes, but after a few years they came back. From experience we know that the bushes grow back so you have to burn again after about 7 years. In the long term you eventually change the species compilation to only grass. We suspect that this will also be the case with the knife-roller.



**Figure 1. Knife roller in action. The initial concept of one long roller was modified to be able to work in gullies.**



**Figure 2. Results of the knife roller. The flattened bushes served as an excellent medium for grasses to grow.**

## Conclusion

Short term experiments showed that the knife-roller could be used as an alternative to burning, but it has its short comings. The knife roller is pulled by a tractor so you will not be able to go up a mountain, therefore there would still be a need to burn the steep slopes.