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# From reindeer to rhino: Reflections on 'Climate change mitigation and adaptation benefits of wilder rangelands'

Ever since the Swedish botanist Anders Sparrman<sup>1</sup> commented in 1786 on the state of overgrazing brought about by sedentary trekboer pastoralists in the southwestern Cape, the optimal use of rangelands in South Africa has been the subject of debate. Two centuries later, Hoffman and Ashwell<sup>2</sup> painted a bleak picture of our stewardship of this precious resource. These rangelands are not merely a source of fibre and food production, but are also key for biodiversity conservation and rural livelihoods. The prospects of global change, and its impacts on these rangelands, are now being explored in the ongoing debate about the sustainable use of rangelands (e.g. Gillson et al.<sup>3</sup>). Part of this discussion has to be on how we can develop new ways of using these rangelands that are both sustainable and of value to society. It is fitting that, in going the full circle of the Swedish connection, a recent workshop was held under the auspices of the 2019 South Africa–Sweden University Forum's (SASUF) Research and Innovation Week that focused on innovative and out-of-the-box ideas around future rangelands.

The workshop, entitled 'Climate change mitigation and adaptation potential of wilder rangelands' was held at the Centre for African Conservation Ecology, Nelson Mandela University and was co-hosted by Joris Cromsigt (Swedish University of Agricultural Sciences) and Graham Kerley (Nelson Mandela University). It brought together researchers, managers and policymakers from South Africa, Botswana, and Sweden with a goal of building networks and encouraging novel debates around rangelands in the light of anthropogenic climate change. Such debate is urgent because rangeland practices are not only increasingly threatened by the changing climate, including issues such as desertification, woody plant encroachment and extreme weather<sup>4</sup>, but rangeland practices are also a major driver of anthropogenic climate change<sup>5</sup>. We urgently need novel models for our rangeland management that increase the capacity of rangelands to adapt to changing climates and contribute to mitigating climate change.

Traditionally, discussions on South African rangelands have focused on concepts like grazing management systems, 'carrying capacities' and overgrazing, with a heavy focus on domestic livestock.<sup>6</sup> Equilibrium views of ecosystem dynamics often formed the basis of these earlier discussions, which mostly had a local (regional, biome, national) focus. It is only in the last 30 years that this debate has been extended to include indigenous wildlife<sup>7</sup>, disequilibrium dynamics<sup>8</sup>, and broader ecosystem services provided by rangelands. The scale has also expanded to consider global issues such as climate change, for example, the role of methane production by domestic herbivores as a climate forcer.<sup>9</sup>

The recent paper by Cromsigt et al.<sup>10</sup> exploring how rangeland management could be integrated into climate change adaptation and mitigation strategies, is a novel but logical development of this debate.

A key lesson from this paper, which served as a catalyst for our workshop, is that the functional diversity, and the spatial-temporal dynamics, of species-rich wild grazing systems offer interesting opportunities for climate change adaptation and mitigation. For example, wild systems include a diversity of non-ruminant species, which emit very little methane. The paper thus concluded that solutions for some climate change challenges might lie in wilder rangelands. Wilder rangelands might entail replacing managed livestock systems with harvested communities of native wild herbivores and/or 'rewilding' livestock grazing practices through learning from wild grazing systems. By extension, management of rangelands may provide avenues to both adapt to climate change as well as to mitigate it.

Workshop participants provided a variety of relevant insights. Joris Cromsigt began with an example of rangelands in Europe's far north where reindeer (*Rangifer tarandus*) may play a role in cooling the tundra because their impacts increase the extent to which these rangelands reflect sunlight (albedo) by turning shrub-dominated tundra into grassland steppe.<sup>11</sup> Importantly, in these regions, the possible cooling effect of shrubs sequestering carbon is offset by the warming effect of their low albedo.<sup>12</sup> Rewilding the Nordic tundra with reindeer may thus be among the more effective ways of mitigating climate change in this region, and is very urgent in the light of the current rapid woody encroachment. Cromsigt then extended the analogy from reindeer to rhino and, based on data from Hluhluwe iMfolozi Park, showed how rhino (and other large wild grazers) may have similar positive effects on the reflective properties of African rangelands: they promote grassy vegetation with high albedo over woody vegetation. Contributions by Kathleen Smart (Rhodes University) and Tony Palmer (Agricultural Research Council) clearly suggested that, similar to the tundra systems, albedo effects may offset the carbon benefits of woody encroachment in South African rangelands, particularly in the arid to semi-arid zone. Shaun Welman (Nelson Mandela University), Marietjie Landman (Sol Plaatje University) and Sheunesu Ruwanza (Rhodes University) highlighted important gaps in our knowledge, such as in terms of grazing–soil interactions and the ecophysiology of wild grazers. Student contributors Tebogo Sebake and Masego Mokobela (Nelson Mandela University) emphasised how a new generation can show the way through their insights and enthusiasm to take on the challenges. There was also a series of talks by local NGOs. Participants also stressed that careful consideration should be given to how and where rewilding of rangelands is done so as to maximise the benefits for rural communities. In addressing this, care needs to be taken that wilder rangelands as a climate change mitigation tool are not imposed on the poorest people for the benefit of the richest, but rather that a new model is provided that increases social equitability and empowerment.

Participation by representatives of government departments with a responsibility towards policy and management of rangelands was a key opportunity for them to provide insights into policy approaches to these issues. It emerged that the approach by the Department of Environmental Affairs (Hlengiwe Mbatha, now Department of Environment, Forestry and Fisheries) to mitigation is heavily invested in carbon sequestration interventions. Suggestions and



insights from this workshop might provide a framework to review critically and broaden this strategy and empower the Department to consider additional opportunities for climate change adaptation and mitigation – in line with the National Climate Change Response policy of tackling climate change mitigation while reducing risks and vulnerabilities. Although not the core focus of the Department of Agriculture, Rural Development and Land Reform (Siviwe Shwababa), including climate change adaptation and mitigation interventions in the land reform programme may provide additional opportunities to manage rangelands sustainably while empowering rural communities. For both these departments, the prospects of linking Green Economy initiatives, and specifically the wildlife aspect, to climate change adaptation and mitigation and sustainable social transformation need to be explored.

The workshop successfully initiated by a small network of scientists and managers in Sweden and South Africa with a shared interest in rangelands and climate change adaptation and mitigation, has refreshed the rangeland debate in South Africa. The gathering concluded that wilder rangelands might provide significant opportunities for climate change mitigation, through carbon storage, ecological restoration, altered fire dynamics, increased albedo and reduced methane production, while achieving equitable social empowerment. Wilder rangelands may also be better adapted to changing climatic conditions, and as such, would not be yet another ecological restoration model separating humans from the natural environment, but instead might investigate the potential of wilder landscapes to include people. Novel ways of using our rangelands should be co-created through close interaction among scientists, policymakers and local communities. Critically, however, what is needed for policy and management interventions to be robust, are evidence-based insights into how wilder rangeland management practices can influence the drivers of climate change to the benefit of society, while at the same time providing adaptation responses to deal with ongoing climate change. As a next step, arising from this workshop, we will continue this initiative through the SASUF mechanism, by convening a meeting in Sweden in 2020. Clearly, this broader and ambitious opportunity needs to be developed further.

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