Rangelands Summary Paper

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and

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Theme 5
Drought management and climate change in rangelands
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A number of papers delivered on approaches to drought management

- **Can drought induced desertification be reduced by identifying early warning signals of tipping points?** Some uptake of early warning rainfall forecasts but it is difficult to predict ecosystem tipping points.

- **Effective drought management requires early action.** Drought management strategies to reduce livestock mortalities, including destocking programs, supplementary feeding, provision of early warning information, water development, and veterinary services are introduced too late in drought events and most have little emphasis on ecosystem sustainability.

- **There needs to be better integration of farmer expertise and science-based approaches to drought management and desertification.** This was highlighted in a study by Brinkmann et al that highlighted differences in coping strategies with pastoralists/farmers focussing on short-term responses whilst experts focussed on longer-term management strategies.

Climate change impacts in rangelands

- Changes in rainfall variability will have as much impact in rangelands as changes in total rainfall
- Changes in rainfall seasonality patterns will likely cause changes in plant species composition of rangelands
- Most damaging trends for livestock production occur in rangeland regions already most vulnerable in terms of productivity and socio-economics
- Large spatial variability in climate change impacts will affect regions in different ways and alter food trade and increase prices

Extracted from Howden plenary

- **Extreme heat**
- More frequent
- More intense

- **Heavy rainfall**
- More frequent
- More intense
- Increased severe cyclones

- **Drought**
- Increase in some regions

- **Fire weather**
- More frequent

Greenhouse gas mitigation

- Mitigation in agriculture is critical as the food system contributes about 29% of global emissions
- Mitigation options include improved on-farm management and efficiencies, direct reductions in methane, carbon sequestration in soils and vegetation, reducing losses and wastage in food systems
- Results from Kenya show emissions intensities from livestock systems are highly variable and the best low input systems can be as emission efficient as industrial-style intensification
- Increasing soil C in rangelands has production trade-offs and increasing woody vegetation (e.g. Leucaena hedgerows in semi-arid rangelands) doesn't always lead to large soil C increases
- Using rangelands for C sequestration needs to consider future climate change to ensure optimum landscape use for C abatement but this issue is rarely considered in policy-led C sequestration initiatives

Adapting to climate change

- Quite a few oral papers on managing drought and desertification but very little presented on adaptation to climate change but a number of posters addressed this issue as did Mark Howden in his plenary talk.

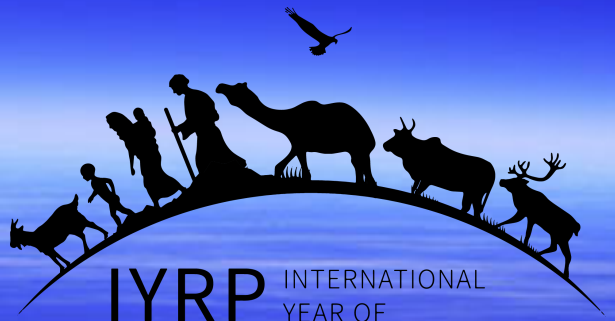
- There is a large diversity of adaptation options
  - on farm and off farm, diversification
  - approaches range from tactical to strategic, incremental to transformational
  - being proactive about adaptation empowers especially if approached with a goal of net benefits

- Working with ranchers shows that positive outcomes can be achieved where there is a focus on implementing practices that increase resilience to climate change, while balancing the other risks they face.

- Important to understand limits to adaptation, to remove barriers to adaptation and to integrate with emission-reduction strategies

Theme 3 – Livestock production systems in rangelands

- Despite societal concerns about environmental aspects of livestock production, in rangelands they help support 200 million households. In addition to livestock products, rangeland production systems provide co-benefits in ecosystem services e.g. C sequestration, biodiversity.
- Whilst feed shortage was identified in a large farmer survey as the main constraint to improved livestock productivity in Africa and Asia, improvements in productivity need to take a comprehensive, systems approach that addresses all constraints (feed, genetics, health, finance, markets).
- Grazing management for production and environmental outcomes featured in some talks and in many posters, with ongoing emphasis on evaluating grazing systems. Most studies suggest balancing forage production with stocking rate is key with grazing system of little importance for production; rest can benefit land condition and species richness.
- For livestock systems in rangelands to be sustained, Jimmy Smith in his plenary urged: embrace change; harness diversity; and engage widely.



Theme 1. Range/Grassland Ecology

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Global Rangeland Ecology Trends

- **Heavy use** Although keynotes pointed to a small proportion of rangeland that is in a degraded state, several research papers reference heavy use as a problem.
- **Transitions**

  Woody invasion mostly negative, one indicates return of trees as a positive

  Land degradation wide variety of causes

  Invasive species mostly species from “old” to “new” world, but one went other direction.

  Land use change major change now is cultivation, especially on the more productive end of the grassland ecotype. Seems fairly ubiquitous across the globe
- **System Shocks** New descriptive term, appears in one paper

  Drought

  Catastrophic fire

Descriptive Studies, Physical

- **Soil seed banks** Just a reminder here that the soil seed bank does not always mirror the above ground community. One study indicated that a climax C4 grassland had very little representation from the dominant perennial grasses in the seed bank and most of the seed bank consisted of ephemeral or annual species. Perhaps serves as a warning for extreme disturbance.
- **Plant and plant community assemblages**
  Describing new plant communities from previously unreported regions. Perhaps to enter into a larger descriptive data base.
- **Grazing behaviour** Several studies, many centered around the use and investigation of locally adapted animals

  Novel species Mostly adding small ruminants to a large ruminant system

  Novel strains Locally adapted. Effects seemed to be known through local knowledge, but not necessarily by the investigating scientists.

  Novel situations Using what could be considered common knowledge from another area in a new vegetation type.

Descriptive, Practice

- **Treatment layering** This could be superimposing treatments on top of one another or in some cases applying the same treatment (grazing as an example) repeated times. Especially prevalent in brush control studies
- **Prescribed fire** A reapplication of an established technique. Prescribed fire discussed to control brush (often layered with something else), remove fuel to prevent catastrophic wildfire, condition land for improved grazing, reduce brush to allow wildlife viewing, or ways and means to keep prescribed fire on the landscape (locally administered prescribed fire associations).
- **Prescribed grazing** Also called targeted grazing (mostly in North America). This is a more specific use of grazing animals to achieve desired outcomes.
- **Herding** Mostly for the benefit of the animal. Better nutrition, but also better seasonal use of the landscape, which can be better for the animal in the longer term.

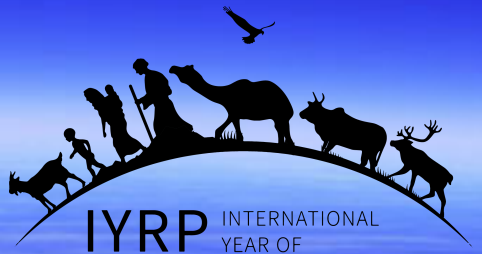
Climate Change Mitigation and Drought

- Soil carbon is a key focus Numerous papers
- Moderate stocking rates Several papers reference the utility of moderate stocking or use. See Andrew Ash's comments on grazing system as opposed to matching resource use with resource productivity.
- Traditional practices

  Continue Evaluation of historic practices such as grazing exclosures (a form of deferred grazing) in East Africa

  Return to Sometimes a challenge as thresholds may have been crossed or human population or resource use may have developed to a point where return to a historical practice may not be possible

  Often, but not always mobility The benefits of mobile pastoralism are of key interest. But, sometimes traditional grazing practices are more sedentary in nature.



Theme 4. Wildlife, Tourism, et al

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Conservation Initiatives

- **Maintain open spaces** Almost universally accepted that any practice, policy, or application that maintains open spaces will be good for wildlife, birds, and other non agricultural production goods and services
- **Community based tourism** Especially in Africa but not always.
- **Conservancies** Again mostly in Africa and often surrounding national parks.

  Conservancies seek to maintain buffers between wildlife areas and human areas in part by investing some of the financial proceeds derived from large and viewable wildlife back into the communities that support that wildlife (and shoulder the negative effects of that wildlife). Tolerating large predators is an example. Tourists are willing to pay to see large predators, but large predators also cause damage to local livestock. A community that is compensated for that damage is more willing to tolerate large predators.

Dangers

- In addition to the obvious:
  Climate change, invasive species, catastrophic fire, etc. Not to downplay these, as they are critical, but we are also reminded of them often.
- Cultivation and land-use change
  Conservancies in Africa – there were 2 key papers on conservancies that were being challenged by human pressure. Local herding groups become villages, villages become towns, and then there is a tendency for agriculture to intensify, including cultivation as the level of prior support is no longer adequate.
  Pampas in Brazil – significant conversion of grazing land to soybean plantations, to support an increasing human population. This is happening on the more productive end of grasslands.
- The proverbial elephant in the closet is:
- Human population growth
  Unique factoid (Anna Treydte, IRC/IGC 2021) 96% of the mammalian biomass on earth is humans or livestock.