Australia's National Science Agency

Australian rangelands – Towards resilient systems under climate change

International Virtual Experts Meeting on Promoting Sustainable Agriculture

Dr. Cecile Godde| 10th August 2020

Brahman cattle, northern Queensland – Australia. Photo credits: C. Godde

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Acknowledgement to Country

Brahman cattle, northern Queensland – Australia. Photo credits: C. Godde

Australian rangelands

Some context

Australian rangelands

Environment

Semi-arid and arid rangelands cover **~75% of the Australian continent**
These are characterised by **relatively low annual rainfall, high climate variability**
Also, tropical savannas in the north
Wide range of vegetation, from tropical woodlands to shrublands, grasslands and saltbush

Australian rangelands (Bastin and the ACRIS Management Committee, 2008)

Socio-economics

Remoteness from population centres (2.3% of Australia's population)
Home to many of Australia's **indigenous people** (27.8% of rangeland population)
Largest industries in terms of annual value:

- Mining and oil and gas (gross value added $95.80 bn, 81% of Australia's industry)
- Tourism (value added $2.72bn, 5.2% of Australia's industry)
- Grazing cattle and sheep (value cattle products: $4.69 bn or 38.6% of Aust.'s cattle industry, 8.61 m heads | value sheep meat: $0.24 bn or 6.7%, 4.51 m heads)

(Foran et al. 2019)

Australian rangelands

Key challenges

1. Supporting local communities
2. Promoting the value of traditional knowledge and practices
3. Managing natural capital sustainably
4. Addressing climate change and variability
5. Improving policy and governance
6. Developing R&D contents and processes to support transformative change towards resilience

(ARS 2019, Nielsen et al. nd)

Agistment, northern Queensland – Australia.
Photo credits: C. Godde

Australian rangelands

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Deepening of our understanding of rangelands climate vulnerability and identifying adaptation options: necessary steps to implement successful adaptation pathways

Research at CSIRO

Examples of initiatives

Crop research

Example

Domestication of ‘wild’ rangeland plants

To improve profit and environmental outcomes (incl. GHG emissions) within sheep and cattle systems in arid and saline areas

For instance, Anameka™ old man saltbush was released as vegetative cuttings in 2015 and has since been adopted across Australia

Anameka™ old man saltbush. The team is now testing germplasm in dry and marginal soils in Iraq, Afghanistan, Tibet and Pakistan. CSIRO

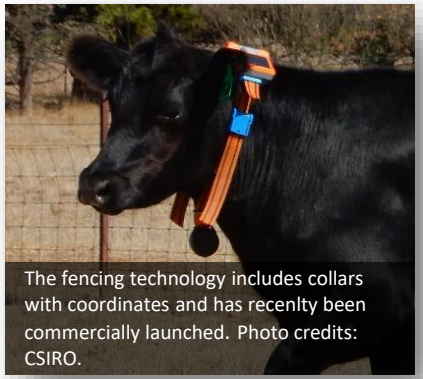
Digital agriculture – internet connected livestock

Example

Virtual fencing

Technology that enables livestock to be confined or moved without using fixed fences

www.csiro.au/en/Research/AF/Areas/Livestock/Virtual-fencing



The fencing technology includes collars with coordinates and has recenlty been commercially launched. Photo credits: CSIRO.

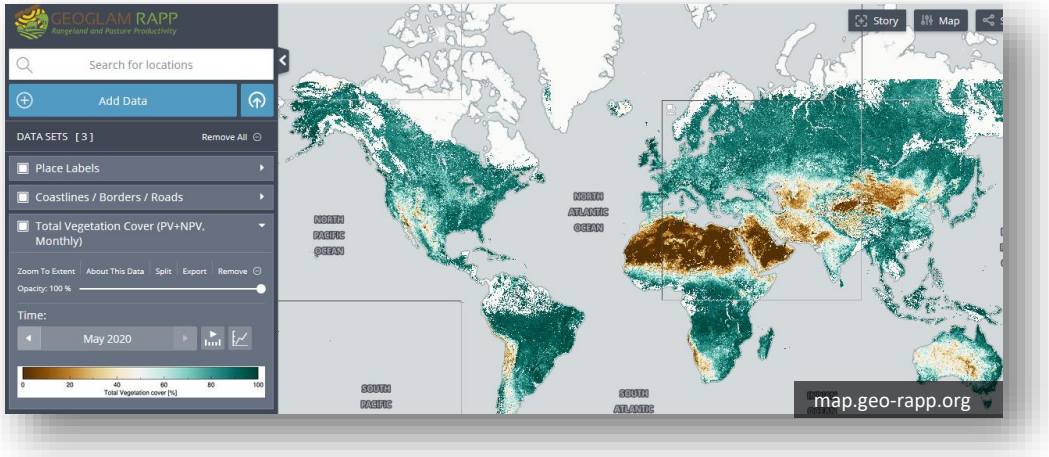
Digital agriculture – remote sensing

Example

Geoglam RAPP - Global Rangelands Monitoring

RaPP Map is an online tool that tracks the state and condition of global rangelands

Available at map.geo-rapp.org



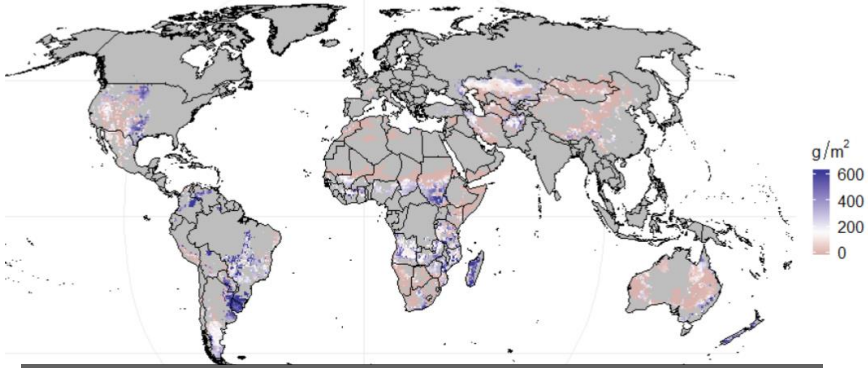
Socio-economic and biophysical models

Examples

G-Range - Global Rangeland model

Biophysical model that simulates global multispecies ecosystems dynamics

Available for download at www2.nrel.colostate.edu/projects/grange



Modelled mean rangeland herbaceous biomass for year 2000 (Godde et al., 2020)

CLEM - Crop Livestock Enterprise Model

(under the APSIM initiative)

New bio-economic model that simulates farm enterprises from large agribusinesses to subsistence smallholdings

Adapted to data-poor regions

Available for download at www.apsim.info/clem

Global integrated modelling

Provides context of global trends that can help understand how climate change, population growth and economic development can impact on international trade and demand for rangeland outputs

(E.g. Australian National Outlook 2019 report)

Global spatial datasets

Global spatial datasets

To characterise food systems at global scales. *Some examples:*

Maps of livestock data - information on biomass use, production, feed efficiency, excretion, and greenhouse gas emissions *(Herrero et al. 2013)*

Maps of multiple cropping systems and mixed crop-livestock systems *(Waha et al. 2020)*

Resilience thinking approaches

Example

RAPTA - The Resilience, Adaptation Pathways and Transformation Approach

The RAPTA guidelines package offers practical advice to design interventions (policies, projects, programs, strategies and other types of decisions)

For planners, project managers, policy makers, donors, farmers, researchers and other stakeholders

Available at: research.csiro.au/eap/rapta

But also…

Research on

- Crop and livestock genomics and breeding
- Water and soil management
- Pests and diseases
- Carbon farming policy and practices
- Drought policy for water and land in drylands
- Land Degradation Neutrality
- Supply chains
- Household surveys
- Climate forecasting
- And much more…

730 people working at CSIRO Agriculture & Food over 23 sites

More information at:
https://www.csiro.au/en/Research/AF
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Australian rangelands moving forward

Some concluding remarks

Some concluding remarks

- Rangeland systems are **complex socio-ecological systems** characterised by human, social, natural, physical and financial capitals
- They experience **increasing pressures** from anthropogenic activities
- **More transformative climate adaptation will be required** across ecological, socioeconomic, and institutional systems *(farm management adjustments, technological developments, income-related responses, institutional changes)*
- Adaptation options need to **account for all dimensions of sustainability**
- A key challenge: the many socio-economic, environmental and institutional **barriers to adoption**, which can be highly context-specific
- **Various opportunities exist**, incl. the careful blend of local knowledge with modern science and technology
- There is value in recognizing that rangelands around the world are **experiencing similar global change pressures**

Thank you

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