

Managing drought in Australian rangelands through collaborative research and industry adoption

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Droughts of varying lengths and intensity are persistent features of northern Australian rangelands, and remain a major challenge for grazing management. This is especially so for extensive livestock enterprises which rely on grazing of native, naturalised and sown pastures, with pasture production strongly dependant on warm season (November to March) rainfall. Extensive grazing is the dominant land use in Queensland rangelands, and high variability in year-to-year rainfall provides challenges in managing forage supply for livestock. Drought, especially multi-year droughts, can seriously affect both grazing enterprises and communities. While grazing enterprises are becoming increasingly adept at managing one or two years of low wet-season rainfall and reduced forage production, when dry conditions extend, and forage deficits worsen and become more widespread, options for individual grazing businesses to manage conditions diminish, putting pressure on the business, family and the resource base.

Government support for the livestock industry during drought has existed for a century, with drought policy over the last three decades focusing on risk management and financial support mechanisms with variable success (Botterill 2021). Research and extension programs directed at managing climate variability in extensive grazing systems have been promoted for three decades in Queensland, and significant effort has gone into understanding and predicting drought and better managing its impacts across physical, economic and social dimensions. Although the grazing industry is adapting to and managing droughts better than in the early 20th century, multi-year droughts remain a challenge, economically and socially, and they pose significant risk to rangeland health if not managed well. Better understanding of the decadal climate drivers could help predict when a dry summer is likely to become a multi-year drought event. Climate change and its effects on the various climate drivers will also affect the rangelands and the communities that rely on them, and what both will look like in 2070.

The most recent nine year extended dry period for Queensland (2012–2021) was one of the motives for establishing the Drought and Climate Adaptation Program (DCAP), which is sponsoring this Special Issue. DCAP is a Queensland Government initiative, to deliver a range of applied research, development and adoption projects focusing on improving producer capacity to manage drought and climate variability, and adapt to climate change. Six of these projects work closely with producers, ensuring project outcomes are closely aligned to industry needs and priorities. In addition, the Queensland Drought Mitigation Centre (QDMC) was established to bring together Queensland Government agencies and the University of Southern Queensland to lead the delivery of a range of grazing industry projects in DCAP. The QDMC also supports collaboration between a diverse range of national and international organisations which have an interest in improving understanding of drought and its impacts on agricultural systems worldwide.

These international collaborations supported by DCAP are developing, in consultation with producers, new and more skilful rainfall forecasts for northern Australia. Producer knowledge and skills are being improved to enhance drought management outcomes at the enterprise level through a business economic analysis approach. Information and products, including pasture growth alerts, are being developed and delivered through collaborative extension networks across the grazing industry to drive adoption of best grazing management practice.

This Special Issue of The Rangeland Journal looks at some of the work achieved in the DCAP projects to date, focusing on the northern Australian grazing industry, and how the goals of improving the resilience of industry and community link to drought policy. The papers range in topics from economics of drought preparedness (Bowen and Chudleigh 2021), social and cultural aspects of drought management (Paxton 2021), to technical papers describing the development of an automated

system for estimating the long-term carrying capacity of a property (Stone *et al.* 2021; and Zhang *et al.* 2021), and another on developing historical maps of drought declared areas from limited spatial information (Irvine 2021). McKeon *et al.* (2021) describes the grouping of 131 years of rainfall records in Queensland into periods of relatively wet or dry conditions, as a basis for the popular and engaging ‘Queensland’s Extended Wet and Dry periods’ poster. Two papers (Rolfe *et al.* 2021; and Cobon *et al.* 2021) describe approaches designed to engage graziers and build their capacity to manage climate variability in northern Australia. To provide a national context, the Special Issue opens with a paper on national drought policy (Botterill 2021) and how it has shaped policy and management responses over recent decades.

Taken together, these papers describe an integrated approach to providing additional, science-based skills to assist in managing a common feature of northern Australia’s rangelands, a feature that may be exacerbated by climate change.

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