

A three-legged approach towards improved development and adoption of best-bet practices for managing grazing lands across northern Australia

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Abstract. A novel combination of industry knowledge and experience, bio-economic modelling and research findings produced compelling whole-of-enterprise propositions for the improved adoption of best-bet management practices in the extensive beef grazing industry of northern Australia. The Northern Grazing Systems (NGS) project brought together three multi disciplinary teams cooperating towards a common goal for four key grazing land management issues identified by Meat and Livestock Australia: property infrastructure; pasture spelling; stocking rate management; and use of fire. On-property development and demonstrations by the regional teams allowed for further evaluation of strategies, improvements in research, and extension of findings to the broader industry. Identifying interactions, trade-offs, research gaps and cost-effectiveness of guidelines was a focal point for each team's work. Coordination and communication between the teams was essential to gather, understand, review and provide constructive feedback on new information generated. This three-legged approach has allowed a systematic and rigorous approach to evaluating the evidence base for current grazing land management recommendations and provided a participatory and adaptive framework for future Research, Development and Extension.

Key Words: Grazing land management, extension approach, Bio-economic modelling, research synthesis

Introduction

The northern beef industry (north of 26°S) accounts for over half of the national beef herd and represents an area of approximately three million square kilometres of grazing lands across Queensland, Northern Territory and the Kimberley and Pilbara regions of Western Australia. For beef producers in this northern industry, a major challenge is to boost productivity and profit while maintaining or improving the natural resource base that underpins their enterprises - their grazing land. Meat and Livestock Australia identified four grazing land management issues that required further investigation: paddock development (fences and water), managing stocking rate, pasture spelling and prescribed burning. While grazing land management strategies are generally well understood, the costs, benefits and practicalities of these strategies at a property level are often uncertain. This uncertainty is one of the reasons constraining higher levels of adoption of these best-bet strategies.

The three-legged approach

The Northern Grazing Systems (NGS) project evolved from identification of the need for stakeholders in grazing land management Research, Development and Extension (RD&E) to evaluate the evidence base for what was perceived to be best-bet management strategies and to more fully explore the likely benefits and costs of implementing these (Phase I). Furthermore, there was an opportunity in this project to systematically identify, prioritise and address research gaps for future RD&E (Phase II). Six target regions were identified for the initial NGS project: Victoria River District; Burdekin woodlands; Fitzroy woodlands; Mitchell grasslands-western Queensland; Mitchell grasslands-Barkly Tablelands; and Maranoa-Balonne woodlands. Three teams were brought together and worked concurrently in Phase I of the two-phase NGS project; the synthesis team, bio-economic modelling (BEM) team and regional assessment team (one regional team for each six region represented).

Synthesis team

Within Phase I, the synthesis team reviewed, analysed and integrated data and outputs from past field research studies and regional workshops across northern Australia, generating a suite of best-bet guidelines and strategies. The team produced the report "Grazing management guidelines for northern Australia: Scientific rationale and justification" (McIvor 2010) which addressed each of the four management issues and formed the basis for guidelines tailored to each of the six regions. For each management factor, information was detailed about common regional issues, signs, causes, management responses, evidence, implementation and caveats

to the information. The report concluded with recommendations for future extension and research activities.

Bio-Economic Modelling team

The Bio-Economic Modelling (BEM) team modified, linked and applied existing simulation models to evaluate best-bet guidelines in terms of their impacts on productive capacity, risk and economic performance. The GRASP pasture model has been used to explore a wide range of issues, from assessing safe carrying capacities for properties (Johnston *et al.* 1996) to examining effects of climate change in extensive grazing lands (McKeon *et al.* 2008). GRASP was modified to investigate three key practices – stocking rate strategies, spelling and use of fire (see Scanlan *et al.* 2011 for details). The regional assessment team (below) developed a representative beef breeding enterprise consisting of a number of paddocks and an animal production system (e.g. selling all weaners or selling bullocks) as a base for the BEM team to evaluate management strategies. A variant of the ENTERPRISE herd economic model (MacLeod and Ash 2001) was calibrated to represent the production systems developed at each regional workshop. This simulated property-level animal numbers and turnoff rates over the last 30 years and estimated gross margins, net profit and year-to-year variability using GRASP to simulate stocking rates and animal productivity.

Regional assessment team

The role of the regional assessment team was to link the synthesis and BEM teams and to adapt the information generated by those teams for specific end-user groups. The regional assessment team comprised of local extension officers, advisors and beef producers. On-property development and demonstration work allowed further evaluation of strategies, improved relevance of practices and confidence in estimates of their costs and benefits, and extension of findings to the broader industry.

Together with outputs from BEM and discussion and input from regional specialists and producers, the synthesis of past results underpinned best practice guidelines for each region – these provided a strong foundation for future extension programs. From these documents, other materials will be produced for specific audiences e.g. extension staff, producers, and other groups or individuals that directly or indirectly influence on-property grazing land management. Also identified were the specific knowledge and information gaps that limit the reliability, relevance and uptake of recommended practices and therefore priorities for future R, D & E.

A regional case study – Maranoa Balonne

For the Maranoa Balonne (MB) region, in southern Queensland, an initial workshop was held with graziers whose properties represented a good geographic spread across the MB region; agency staff not directly engaged in the project; and project staff. The aim was to record current grazing land management practices and define a representative property on which to test the bio-economic model.

The process involved several steps: getting participants to group the land types of the MB into broader management groups requiring similar management; documenting common practices (i.e. those perceived to be used by 70% or more of graziers in the region); documenting best practices and untested practices that might have merit as future management options; developing the size, infrastructure, herd structure and enterprises for the representative property on which the practices could be 'tested' with BEM; identifying research gaps and documenting regional demonstrations and unpublished information were further facilitated processes in the workshop.

The information gathered from this workshop was used to inform the synthesis document and the BEM modelling. The BEM and synthesis results were then reported back to the regional group in a second workshop for further evaluation and refinement. The major regional output from Phase I in the MB was a regional technical guide for grazing advisors and researchers (Paton *et al.* 2011). The target audience was technical people in the region including extension officers, NRM and Landcare staff, rural bank managers, agri-business staff, consultants and other advisory people who interact regularly with producers in the MB. The publication is now the repository of useful MB grazing management information and a legacy of the project to the region. The publication will be revised and updated as new information becomes available, especially from the Phase II regional activities and BEM information.

For the MB, Phase I project activities highlighted the need for increased focus on managing stocking rates for improved land condition. The Pannell *et al.* (2006) approach was used to further identify the best-bet management practices that had the highest 'relative advantage' and were readily 'trialable'. This assisted the regional project team to define development and

extension activities for Phase II that were targeted towards higher adoption amongst MB graziers. Phase II has the broad 'campaign' of "Managing stocking rates to achieve better outcomes for pastures and profits".

Many producers in the MB have a business focus on the number of head or the quantity of beef that needs to be turned off to meet their financial goals and personal success measures. Stocking rate and long-term carrying capacities appear to be key management figures that most producers may know but they don't necessarily relate to their turn off goals, land condition and opportunities for spelling and burning.

The graziers and agency advisor group that provided information for Phase I suggested conservative stocking rates plus or minus 10-25% change in annual stock numbers, depending on season, was common practice in the region. BEM analyses suggested the best outcomes for pastures and profits were from stocking around long-term carrying capacity with annual increases in stock numbers $\leq 10\%$ in a good season and annual reductions $\leq 40\%$ in poor seasons. The base level stocking rates suggested by producers were notable different from those of local research results and modelling activities. These differences were least for cleared pastures in good condition but were very large for pastures with inherently low carrying capacity that were in poor condition and with high tree densities. Possible reasons for these differences were discussed but require additional investigation.

These findings highlighted an important issue: Are science-based stocking rate recommendations accurate for the MB? Are producers adjusting their stocking rates to account for land condition and tree densities? Safe utilisation rates for the region's land types are based on small data sets and have not been thoroughly validated against all available research data or long-term producer experience. Additional BEM, in combination with long-term property data, would likely lead to better-informed extension activities around stocking rate management, particularly in relation to the impact of land types and different tree densities.

In Phase II of this work, the potential impacts of climate change on stocking rates were also being examined. A key question was: *With a variable and changing climate, what will motivate producers in the MB to understand measure and alter their stocking rates based on land condition, variation in pasture growth, and the business driver of optimising kilograms of beef turned-off?*

To answer these questions and to address the Phase II campaign, a group of Focus Farms were formed, representing a geographical spread across the region. The Focus Farms methodology was adapted from the O'Kane and Nettle (2009) Partner Farm philosophy. The Focus Farms' role, in conjunction with the project team, was to gather evidence and document stocking rates, kilograms of beef turned off and reasons for stocking rate management decisions used by industry. Animal live-weight gain data and paddock information (tree basal area, land type, land condition) has been collected in Phase II to address research gaps on animal production, utilisation rates and industry accepted stocking rates.

Benefits of the three-legged approach

The experience and knowledge of producers and extension staff, the key messages from field research, and the insights from simulation modelling have each been used to improve on-property decision making in grazing enterprises. This project appears to be one of the few times that these three approaches have been integrated to evaluate the evidence base for key grazing practices and underpin and guide subsequent R,D&E. The extent to which this has been successful, in terms of immediate improvements in the R, D&E and associated benefits for producers, is still to be fully evaluated. While the approach raised some new uncertainties, several aspects of the process worked well in most regions including:

The three project activities were done in parallel, rather than in sequence or in isolation, thereby ensuring 'real time' collaboration and integration. This also helped with completing the project (Phase 1) and achieving significant progress in a timely fashion;

- The combination of approaches was useful and challenging to all involved, including producers, although the extent to which extension staff, field researchers and modellers were able to combine effectively did vary across regions, and was affected by the workload (especially for the BEM team);
- The integration of activities in Phase I provided a strong foundation for an on-going integrated approach as Phase II research and extension activities develop;

The inclusion of a plan to take the work from this project into another phase, and the subsequent funding of that plan, provided the necessary continuity to build on Phase I and work towards significant benefits for beef cattle producers in each target region.

Among the many findings from the project, three key learnings stood out:

- There were some marked differences between what producers said to be current practice and what BEM indicated to be the best-performing management practices – this provides a useful tension and a focus for ongoing work in Phase II;
- Current models are not sufficiently flexible to examine some of the practices that land managers either practice or would like to evaluate, and other ways of exploring these options may be required.
- The evidence base for practices such as stocking rate management, pasture spelling and prescribed fire was less than expected and made reliable estimates of costs and benefits difficult. This has reduced confidence in some recommendations – while this will be addressed by further R, D & E it does reduce the immediate value of the project to beef producers (in terms of practices that have definitive benefits and costs). In other words, such an approach challenges assumptions and perceptions about best practice and may therefore be seen by some as too laborious and/or difficult compared to more general, and perhaps less rigorous, management guidelines.

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