finalreport

Northern Grazing Systems Project Development

Abstract

MLA initiated this project as part of the Northern Grazing Systems (NGS) projects which aim to increase adoption of innovative best-practice grazing management by beef producers throughout northern Australia.

This initial development of work in Phase 1 of NGS is complete. Initially, an analysis of the grazing systems in northern Australia was undertaken to determine what activities were required to develop this project. Three major components identified were 1) synthesis of relevant scientific information on stocking rate, spelling, fire and intensity of infrastructure development, 2) regional assessment of current best practices and property profiles, and 3) a bio-economic framework combining the biophysical model GRASP and an economic analysis tool. Draft schedules (attached) covering these components have been developed for DPI&F (the regional assessments and bio-economic framework) and with CSIRO (synthesis component).

The success of MLA in gaining funding under Caring for Our Country has expanded the original plans under Phase 1 of NGS. This meant some changes to those plans developed late in 2008.

Executive Summary

Past research has improved our knowledge of the management and impact of key factors in grazing land management, including control of grazing distribution, management of stocking rate, wet season spelling, and fire. While there are still significant knowledge gaps, addressing these on a case by case basis is not likely to be the most effective investment of limited R, D&E resources. Rather, a more targeted and effective investment in research, demonstration, and extension activities is likely to occur from a coordinated approach that seeks:

- To gain the full value of past and recent investments in grazing trials and other R&D through its systems analysis and integration, targeted at addressing key management questions.
- To identify the best mix of practices for an enterprise, within a particular area and production system, based on bioeconomic modelling and consultation with producers and other specialists.
- To demonstrate the 'current best bet' combinations of practices in each region through use of 'implementation' sites on-property.
- To develop the 'future best bet' combinations of practices in each region through use of `field testing' sites on-property.

To do this, a new project, the Northern Grazing Systems (NGS) project, will be developed in collaboration with QDPI&F, NTDPI, DAFWA and CSIRO, as well as in cooperation with regional NRM groups and AgForward. Phase 1 o NGS involves analysis and synthesis of existing information and will continue till June 2010. Phase 2 till take the recommendations from Phase 1 and implement RD&E projects to fill the gaps identified. Over a period of up to 10 years, the whole NGS project will pursue analysis of completed research, bioeconomic modelling, and field studies to identify, test and demonstrate production systems that increase profitability, improve pasture condition, and reduce erosion for beef enterprises across northern Australia (Queensland, NT, and northern WA).

This project development work had a number of objectives:
- Develop a full proposal for the Northern Grazing Systems project;
- Form and meet with a core project team;
- Conduct a preliminary analysis of the system;
- Assist MLA to liaise with regional NRM groups and AgForward;
- Assist MLA to develop proposals seeking additional funding; and
- Assess the suitability of existing tools for analysing completed research and for bio-economic modelling.

A major output of this project was the development of a proposal that was submitted to Caring for Our Country (by MLA) and which was successful. This value-added to the work originally planned as part of Phase 1 of NGS. Draft schedules to undertake Phase 1 of NGS have been developed (see Appendices).

The systems analysis undertaken as part of this study highlighted a number of shortcomings in the currently-available tools. The GRASP model has been widely tested and widely applied throughout Australia. It is the obvious choice to use for the majority of the biophysical modelling that needs to be done within this project. However there are some enhancements required for this model to provide the necessary information for this project. These enhancements include:
- a daily/monthly algorithm for determining pasture condition (basal area, per cent perennial grasses);
- a daily/monthly algorithm for determining animal liveweight gain; and
- a woody plant growth model to stimulate dynamics over a 20 to 30 year period (most likely at an annual time step).

The work to be completed under Phase 1 will provide landholders in northern Australia with up-to-date information on scientific issues surrounding stocking rate, fire, infrastructure development and spelling. It will consider the interactions and trade-offs, and identify cost-effective grazing land management strategies for:

- improving animal production and economic performance;
- improving and maintaining land condition (especially vegetation, but also some consideration of soil health and water quality issues); and
- improving risk management in relation to climate variability.

Phase 1 of NGS is achievable, although the timeframes imposed by the Caring for Our Country project are somewhat tighter than originally envisaged. However, the linkage between industry and government funding (State and Commonwealth) will ensure that the NGS project has a high probability of being relevant to landholders and of being completed. Every effort should be made to commence Phase 1 as soon as possible.

Contents

1 Background

This project is part of the Northern Grazing Systems (NGS) project which aims to increase adoption of innovative best-practice grazing management by beef producers throughout Queensland, Northern Territory and the Kimberley and Pilbara regions of Western Australia. These practices have potential to benefit up to 3 million square km of northern Australia.

This project will improve understanding of interactions and trade-offs, and identify cost-effective grazing land management strategies for:
* improving animal production and economic performance;
* improving and maintaining land condition (vegetation, soil health and water quality); and
* improving risk management in relation to climate variability.

The importance of infrastructure development (fencing, waters), stocking rate management, pasture spelling, and prescribed burning have been demonstrated at various field study sites. However, we are unable to predict how variations and combinations of these practices will affect the productive capacity and resource condition of grazing land in particular situations. In addition, the economic and practical implications of implementing these strategies at an enterprise scale are often unclear. This is limiting the rate of adoption of practices to improve grazing and fire management across northern Australia.

In combination, the NGS project (it's pedantic, but phases and projects seem to be used interchangeably?) will integrate, enhance and extend key findings and knowledge generated from completed grazing and fire research funded by MLA and other research organisations across northern Australia.

2 Project Objectives

The objectives as listed in the project schedule were:

1. Develop a full proposal for the Northern Grazing Systems project;

2. Form and meet with a core project team;

3. Conduct a preliminary analysis of the system;

4. Assist MLA to liaise with regional NRM groups and AgForward;

5. Assist MLA to develop proposals seeking additional funding; and

6. Assess the suitability of existing tools for analysing completed research and for bio-economic modelling.

3 Methodology

The key steps in developing the project plan for Phase 1 of NGS included:
* A systems analysis of the grazing systems of northern Australia to identify key components that needed to be undertaken as a basis for the whole NGS project. This was largely completed by MLA before the commencement of the current project, and was used as a starting point for the work reported here. The main elements were to improve understanding of interactions and trade-offs, and identify cost-effective grazing land management strategies for: improving animal production and economic performance; improving and maintaining land

condition (vegetation, soil health and water quality); and improving risk management in relation to climate variability. These outcomes were to be used to evaluate the importance of infrastructure development (fencing, waters), stocking rate management, pasture spelling, and prescribed burning.

- A program logic process was completed to ensure that the outcomes would be achieved from the specific tasks/projects undertaken in Phase 1. (This was reported and presented in the Milestone 2 report).
- The tasks to be undertaken in Phase 1 were identified in a series of workshops with MLA and managers from relevant state agencies and CSIRO in Qld, NT and WA. During these workshops, the details of the tasks/projects were developed. This had two important outcomes. Firstly, it ensured that the final tasks/projects were well-considered and soundly based. Equally as important was the shared understanding that emerged between MLA and the main proponent leaders in Phase 1 of NGS.

It was a challenge to keep all those with a potential interest/involvement informed of progress without losing their interest as various details were discussed/argued back and forth as the scope and extent of Phase 1 was developed.

4   Results and Discussion

The main products of this preliminary project were project schedules covering the work to be done in Phase 1 of NGS (Appendix 2 and 3).

For each objective, comments are provided on what was achieved.

4.1   Develop a full proposal

This initial development of work in Phase 1 of NGS is complete. Initially, an analysis of the grazing systems in northern Australia was undertaken to determine what activities were required to develop this project. Three major components identified were 1) synthesis of relevant scientific information on stocking rate, spelling, fire and intensity of infrastructure development, 2) regional assessment of current best practices and property profiles, and 3) a bio-economic framework combining the biophysical model GRASP and an economic analysis tool.

There are extensive linkages between the three components of this project. The synthesis project will provide information upon which to develop rules and relationships to build into the bio-economic modelling framework. The framework will assist in the development of information on best management practices (as derived from the synthesis of existing information) by providing an analysis of the impact of those management practices on pasture and animal productivity, soil loss and water quality, and economic performance at the property level. The regional assessment will inform what modelling should be done and will provide feedback on the outcomes of both the synthesis and the modelling work.

4.2   Form and meet with a core project team

A core team has been formed. This comprises two people representing MLA (Dr Rodd Dyer and Dr Mick Quirk), one from CSIRO (Dr John McIvor) and two from DPI and F (Dr Joe Scanlan for bio-economic modelling; Dr Lester Pahl for regional assessment). Most of the key contributors (including N MacLeod CSIRO; Dr Peter Johnston DPI&F; Phil Holmes Consultant; Dr Steven Bray DPI&F) met in Brisbane on the 10th of November 2008. At this meeting, a general outline of the Northern Grazing Systems Project was presented and discussed. There was agreement on the general thrust of the project and support for the further development of project details, including the development of schedules and contracts.

A full team meeting will be held in Brisbane on 16/17th February with key members of all three components of the project. A draft program (developed by Dr Mick Quirk) is attached.

4.3 Conduct a preliminary analysis of the system

A preliminary analysis of the system under consideration as well as the tools available highlighted a number of shortcomings. The GRASP model has been widely tested and widely applied throughout Australia. It is the obvious choice to use for the majority of the biophysical modelling that needs to be done within this project. However, there are some enhancements required for this model to provide the necessary information for this project. These enhancements include:

- a daily/monthly algorithm for determining pasture condition (basal area, per cent perennial grasses);
- a daily/monthly algorithm for determining animal liveweight gain; and
- a woody plant growth model to stimulate dynamics over a 20 to 30 year period (most likely at an annual time step). A draft framework of this component has been completed and will be parameterised (in conjunction with Dr S Bray) against data from the TRAPS sites established by DPI&F.

The changes to GRASP will necessitate changes to the ENTERPRISE economic model. This relates to the variation in the annual liveweight gain that is sued in ENTERPRISE. Instead of a single figure, simulations will give a different liveweight gain for each differently managed part of a property. N MacLeod has indicated that these new inputs can be accounted for in alterations to the economic model.

Dr Greg McKeon has indicated his willingness to contribute to the development of the GRASP model to include the above enhancements, as these will contribute to his existing projects.

4.4 Assist MLA to liaise with regional NRM groups and AgForward

There has been little direct liaison with regional NRM groups or AgForward to date. Dr Scanlan met with the Fitzroy Basin Association in late November on related matters and discussed this project at that time. There are similarities between the general approaches for the two projects, although they have quite different outcomes.

The VRD, Mitchell grasslands of Qld and NT, and the Burdekin/Fitzroy regions have been identified as being the key areas in which to test the bio-economic modelling framework. Groups of people in these regions will be involved in determining what management systems should be evaluated and then will review the results of the modelling analysis.

4.5 Assist MLA to develop proposals seeking additional funding

MLA's application to Caring for Our Country was successful. This has expanded the scope of the initial project, primarily by expanding the number of regions to five – Burdekin/Fitzroy, Maranoa/Balonne, Mitchell grassland of western Qld, Mitchell grassland of NT, and VRD/East Kimberley areas in NT/WA. There has been a proposal forwarded to the Commonwealth government seeking funding for climate change-related aspects that would build on the project being developed as Phase 1 of NGS.

4.6 Assess the suitability of existing tools

A scan of the tools that may contribute to this project identified 16 different models with some relevance. As indicated above, the GRASP model appears to be the most logical for biophysical modelling of pastures across northern Australia, having already been used for similar activities for many years. Although other tools/models may be suitable, they have not had extensive use

in northern Australia and they would require substantial development work to deliver what is necessary in this project.

Within the economic analysis field, only two models were identified as being candidates. These were: Enterprise and Breedcow/Dynama. In their present forms, neither of these is entirely suitable. Discussions have commenced with Neil MacLeod to see if the Enterprise model can be modified to except data from more than one paddock and/or more than one time per year.

5 Success in Achieving Objectives

The objectives of this 'preparatory' project were met. The collaborative approach whereby MLA, CSIRO and state agencies worked together to finalise the plan for Phase 1 went smoothly, and resulted in a good understanding of the future project by all parties and the development of sound proposals.

6 Impact on Meat and Livestock Industry – now & in five years time

The key impact will come from the completion of Phase 1 of NGS. This will provide new insights into current literature and will provide economic analyses of various management options within five regions. Gaps that require research will be identified and these will be examined in Phase 2 of NGS through research and on-site demonstrations.

7 Conclusions and Recommendations

Phase 1 of NGS should commence as soon as possible. Given the tight timeframes from Caring for Our Country (to which Phase1 of NGS contributes), work needs to commence at the earliest possible time.

The joint approach in developing the proposals for Phase 1 should be considered as a template for future projects, although there may be cases where this is not appropriate. The input of Dr Rodd Dyer and Dr Mick Quirk was critical to the success in conducting and completing this project.

8 Appendices

8.1 Appendix 1 - Agenda for first whole-of-team meeting

Team meeting – 16-17 February 2009

AGENDA

	Start	Finish	Topic/activity	Who
Mon 16 Feb	12:15	13:00	**Lunch**	
	13:00	13:15	Welcome and workshop objectives	Rodd Dyer
	13:15	14:00	NGS - what is it all about?; Phase One; how everything fits together etc	Mick Quirk
	14:00	14:30	Synthesis overview	John McIvor
	14:30	15:00	BEM overview	Joe Scanlan
	15:00	15:30	**Smoko**	
	15:30	16:00	Reg Assessment overview	Lester Pahl
	16:00	16:30	How does Enterprise work?	Neil McLeod
	16:30	17:00	Other topics of general relevance	
Evening	18:30		**Dinner**	
Tues 17 Feb	8:15	8:30	**Coffee**	
	8:30	10:30	Component workshops: methods, clarification, planning	All
	10:30	11:00	**Smoko**	
	11:00	13:00	Component workshops: action plans; reporting	All
	13:00	13:45	**Lunch**	
	13:45	15:00	Report back	All
	15:00	15:15	**Smoko**	
	15:15	16:30	Other issues	All
	16:30	17:00	Sum-up and close	Rodd Dyer

8.2 Appendix 2 - Draft schedule for bio-economic analysis and regional assessment of management options

SCHEDULE

Research Organisation

Name	The State of Queensland acting through the Department of Primary Industries & Fisheries
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Administration Contact	
Name	Paul Hickey
Phone	07 3362 9406
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MLA

Meat & Livestock Australia Limited	ABN	39 081 678 364
Street Address	Level 1, 165 Walker Street, North Sydney NSW 2060	
Postal Address	Locked Bag 991 North Sydney NSW 2059	
Technical details:		
Manager	Rodd Dyer	
Phone	07 3620 5234	
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Administration contact:		
Name	Alice Williamson	
Phone	02 9463 9340	
E-mail	awilliamson@mla.com.au	

	Project

Project No.	B.NBP.0578		
Project Title	Enhancing adoption of improved grazing and fire management practices in northern Australia: Bio-economic analysis and regional assessment of management options		
Start date	1 Feb 2009	**Completion date**	1 Jul 2010

Purpose and description

This project is part of the Northern Grazing Systems (NGS) projects which aim to increase adoption of innovative best-practice grazing management by beef producers throughout Queensland, Northern Territory and the Kimberley and Pilbara regions of Western Australia. These practices have potential to benefit up to 3 million square km of northern Australia.

This project will improve understanding of interactions and trade-offs, and identify cost-effective grazing land management strategies for:
• improving animal production and economic performance;
• improving and maintaining land condition (vegetation, soil health and water quality); and
• improving risk management in relation to climate variability.

The importance of infrastructure development (fencing, waters), stocking rate management, pasture spelling, and prescribed burning have been demonstrated at various field study sites. However, we are unable to predict how variations and combinations of these practices will affect the productive capacity and resource condition of grazing land in particular situations. In addition, the economic and practical implications of implementing these strategies at an enterprise scale are often unclear. This is limiting the rate of adoption of practices to improve grazing and fire management across northern Australia.

In combination, these NGS projects will integrate, enhance and extend key findings and knowledge generated from completed grazing and fire research funded by MLA and other research organisations across northern Australia.

NGS will be undertaken in two phases:

Phase 1, to be completed by July 2010, will consist of three activities undertaken in five target regions (Victoria River District and east-Kimberly; Burdekin-Fitzroy woodlands; Mitchell grasslands - western Queensland; Mitchell grasslands - Barkly Tablelands; and Maranoa-Balonne woodlands):

1. Regional assessment - Source, collate and report region-specific research data and herd and pasture management practices, and facilitate the input of producers and other regional specialists in identifying and assessing best bet management guidelines.
2. Synthesis - Review, analysis and synthesis of data and outputs from completed field research studies across northern Australia to develop additional insights, produce relationships that assist extrapolation to a range of environments and starting conditions, and to generate a suite of best bet management guidelines and strategies for different environments and scales of operation.
3. Bio-economic modelling – Modify, link and apply existing simulation models to evaluate best bet guidelines and strategies in terms of their impacts on the productive capacity of grazing land, water quality, soil health, risk profile and economic performance.

Phase 2, to commence in approximately 12-15 months, will implement, test and increase adoption of these practices through on-property demonstration sites, field days, forums, training

workshops and MLA/DPI producer publications. It will also roll out the bio-economic modelling framework, for evaluating best-practice management strategies, across other regions of northern Australia, and will address key research gaps identified during the project.

This contract covers activities 1 & 3 in Phase 1 and is partly funded by DAFF through Caring for our Country.

Objectives

The Research Organisation will achieve the following objective(s) to MLA's reasonable satisfaction:

By 1 July 2010, the Research Organisation will have:

1. Documented current (range and relative occurrence) and best-bet strategies and practices related to infrastructure development, managing stocking rate, pasture spelling and prescribed burning for each of the five study regions:
• Savannas of the Victoria River District (NT) and east-Kimberly (WA)
• Woodlands of the Burdekin and Fitzroy catchments (north-east and central Qld)
• Mitchell grasslands of western Queensland
• Mitchell grasslands of the Barkly Tablelands (NT)
• Woodlands of the Maranoa-Balonne region (southern Qld)

2. Developed and defined representative grazing enterprises and required parameters for use in bio-economic modelling for each of the five study regions.

3. Contributed regional input to B.NBP.0579 for the synthesis and analysis of research and publications and development of key principles, response curves and best-bet guidelines for grazing land management relating to infrastructure development, managing stocking rate, pasture spelling and prescribed burning.

4. Developed a bio-economic modelling framework that evaluates biophysical and economic impacts of management strategies and practices (infrastructure development, managing stocking rate, pasture spelling and prescribed burning).

5. Used the bio-economic modelling framework to quantify the impacts and trade-offs associated with current and best-bet grazing land management strategies (infrastructure development, managing stocking rate, pasture spelling and prescribed burning), derived from Objective 1 and from B.NBP.0579, on measures of animal production, enterprise profit, land condition, water quality and risk in each of the five study regions.

6. Validated and refined with producers and other local specialists the best-bet guidelines (infrastructure development, managing stocking rate, pasture spelling and prescribed burning) from the bio-economic modelling for each region.

7. Using output from Objectives 5 & 6 and in conjunction with B.NBP.0579, contributed to the development of a revised set of best-bet guidelines for infrastructure development, managing stocking rate, pasture spelling and prescribed burning for each of the five study regions.

8. In conjunction with B.NBP.0579, contributed to the selection of a sub-set of best-bet guidelines for each of five study regions to be extended via regional producer demonstration sites.

9. In conjunction with B.NBP.0579, contributed to the identification of priority grazing land management research questions, and their justification, for each study region.

Additional details

> *Representative regional grazing enterprises*
> Each region requires representative enterprises to be specified in terms of herd structure and dynamics, production system, production parameters, and biophysical resources. Existing herd/property models used in regional versions of EdgeGLM, the Beef CRC (Bill Holmes), or other sources will be considered in this process. Information based on local experience and observations from the first series of regional workshops will also be critical to ensure regional credibility and relevance.
>
> *Review of best-practice recommendations before, and after, bioeconomic analyses*
> The project will undertake regional assessment and consultation with beef producers, researchers, extension officers and others in each of the five regions via two series of workshops and out-of-session reviews.
>
> The first series of regional workshops will help document current and best-bet grazing management practices, identify regional data, and define representative grazing enterprises that will be parameterised in the bio-economic model.
>
> The second series of regional workshops will validate and refine best-practice guidelines from the bioeconomic modelling for each region. The pros and cons of implementing draft best-practice guidelines will be evaluated in a whole enterprise systems framework.

Agents or subcontractors
Subject to the obligations relating to agents and subcontractors, MLA consents to the engagement of the following agents or subcontractors:
CSIRO
NT Department of Regional Development, Primary Industry, Fisheries and Resources
Dept of Agriculture and Food, WA

Milestones

Milestone	Achievement Criteria	Due Date
1	Signing of contract	1 Feb 2009
2	a. Team meeting held in conjunction with B.NBP.0579; b. Initial workshops with producers and regional specialists completed and outputs reported for each of the 5 target regions, including the current (range and relative occurrence) and perceived best-bet strategies and guidelines relating to infrastructure development, managing stocking rate, pasture spelling and prescribed burning, for each region. c. Representative grazing enterprises for each region (for bioeconomic modelling) defined. d. Bio-economic modelling framework completed for evaluating impacts of management strategies and practices on animal production, enterprise profit, land condition, water quality and risk. e. Regional science input to B.NBP.0579, for the synthesis of research and publications and the development of key principles, response curves, conceptual models and best-bet guidelines, reported.	15 May 2009
3	a. Preliminary output from bio-economic analysis of best-bet guidelines and strategies reported.	15 Aug 2009

Milestone	Achievement Criteria	Due Date
4	Detailed interim report (for inclusion in MLA reporting to DAFF) documenting: a. Outcomes from the first series of regional workshops with producers and regional experts, including the current (range and relative occurrence) and perceived best-bet strategies and guidelines for each study region. b. Representative grazing enterprises for each region (for bioeconomic modelling). c. For each region, feedback from producers and regional specialists on draft best-bet guidelines (sourced from B.NBP.0579). d. Bio-economic modelling framework for evaluating impacts of management strategies and practices on animal production, enterprise profit, land condition, water quality and risk. e. The impacts and trade-offs associated with current and best-bet grazing land management strategies, derived from bio-economic analysis for each of the five study regions. f. Outcomes from the second series of regional workshops with producers and regional experts, including validation and refinement of the best-bet guidelines and associated bioeconomic analysis. g. Regional science input to B.NBP.0579, for the synthesis of research and publications and the development of key principles, response curves, conceptual models and best-bet guidelines, reported.	15 Oct 2009
5	Revised and updated report including all elements in Milestone 4 (for inclusion in MLA reporting to DAFF).	15 Nov 2009
6	Final Report submitted and accepted by MLA including: a. Outcomes from the first series of regional workshops with producers and regional experts, including the current (range and relative occurrence) and perceived best-bet strategies and guidelines for each study region. b. Representative grazing enterprises for each region. c. Feedback from producers and regional specialists on draft best-bet guidelines sourced from B.NBP.0579. d. Bio-economic modelling framework for evaluating impacts of management strategies and practices on animal production, enterprise profit, land condition, water quality and risk. e. The impacts and trade-offs associated with current and best-bet grazing land management strategies, derived from bio-economic analysis for each of the five study regions. f. Outcomes from the second series of regional workshops with producers and regional experts, including validation and refinement of the best-bet guidelines and associated bioeconomic analysis. g. Regional feedback on revised best bet guidelines. h. Regional feedback on priority grazing land management research questions.	1 Jul 2010

8.3   Appendix 3 - Draft schedule for synthesis project

SCHEDULE

Research Organisation

Name	Commonwealth Scientific & Industrial Research Organisation, a body corporate established by the Science & Industry Research Act 1949 through its Division of Sustainable Ecosystems
ABN	41 687 119 230
Address	306 Carmody Road, St Lucia QLD 4067
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MLA

Meat & Livestock Australia Limited	ABN 39 081 678 364
Street Address	Level 1, 165 Walker Street, North Sydney NSW 2060
Postal Address	Locked Bag 991 North Sydney NSW 2059
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Administration contact:	
Name	Alice Williamson
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Project	

Project No.	B.NBP.0579		
Project Title	Enhancing adoption of improved grazing and fire management practices in northern Australia: Synthesis of research and identification of best bet management guidelines		
Start date	1 Feb 2009	**Completion date**	1 Jul 2010

Purpose and description

This project is part of the Northern Grazing Systems (NGS) projects which aim to increase adoption of innovative best-practice grazing management by beef producers throughout Queensland, Northern Territory and the Kimberley and Pilbara regions of Western Australia. These practices have potential to benefit up to 3 million square km of northern Australia.

This project will improve understanding of interactions and trade-offs, and identify cost-effective grazing land management strategies for:
• improving animal production and economic performance;
• improving and maintaining land condition (vegetation, soil health and water quality); and
• improving risk management in relation to climate variability.

The importance of infrastructure development (fencing, waters), stocking rate management, pasture spelling, and prescribed burning have been demonstrated at various field study sites. However, we are unable to predict how variations and combinations of these practices will affect the productive capacity and resource condition of grazing land in particular situations. In addition, the economic and practical implications of implementing these strategies at an enterprise scale are often unclear. This is limiting the rate of adoption of practices to improve grazing and fire management across northern Australia.

In combination, these NGS projects will integrate, enhance and extend key findings and knowledge generated from completed grazing and fire research funded by MLA and other research organisations across northern Australia.

NGS will be undertaken in two phases:

Phase 1, to be completed by July 2010, will consist of three activities undertaken in five target regions (Victoria River District and east-Kimberly; Burdekin-Fitzroy woodlands; Mitchell grasslands - western Queensland; Mitchell grasslands - Barkly Tablelands; and Maranoa-Balonne woodlands):

1. Regional assessment - Source, collate and report region-specific research data and herd and pasture management practices, and facilitate the input of producers and other regional specialists in identifying and assessing best bet management guidelines.
2. Synthesis - Review, analysis and synthesis of data and outputs from completed field research studies across northern Australia to develop additional insights, produce relationships that assist extrapolation to a range of environments and starting conditions, and to generate a suite of best bet management guidelines and strategies for different environments and scales of operation.
3. Bio-economic modelling – Modify, link and apply existing simulation models to evaluate best bet guidelines and strategies in terms of their impacts on the productive capacity of grazing land, water quality, soil health, risk profile and economic performance.

Phase 2, to commence in approximately 12-15 months, will implement, test and increase adoption of these practices through on-property demonstration sites, field days, forums, training

workshops and MLA/DPI producer publications. It will also roll out the bio-economic modelling framework, for evaluating best-practice management strategies, across other regions of northern Australia, and will address key research gaps identified during the project.

This contract covers activity 2 in Phase 1 and is partly funded by DAFF through Caring for our Country.

Objectives

The Research Organisation will achieve the following objective(s) to MLA's reasonable satisfaction:

By 1 July 2010 the Research Organisation will have:

1. Completed a synthesis and analysis of research and publications to review and/or develop key principles, response curves and best-bet guidelines for grazing land management particularly relating to infrastructure development, managing stocking rate, pasture spelling and prescribed burning. This work will apply across a climate and soil fertility continuum and for a range of enterprise scales and resource conditions throughout Northern Australia.

2. Contributed draft best bet guidelines to the bio-economic modelling studies in B.NBP.0578 to quantify the impacts and trade-offs associated with different grazing land management strategies (infrastructure development, managing stocking rate, pasture spelling and prescribed burning) on measures of animal production, enterprise profit, land condition, water quality, and risk in five study regions:
• Savannas of the Victoria River District (NT) and east-Kimberly (WA)
• Woodlands of the Burdekin and Fitzroy catchments (north-east and central Qld)
• Mitchell grasslands of western Queensland
• Mitchell grasslands of the Barkly Tablelands (NT)
• Woodlands of the Maranoa-Balonne region (southern Qld)

3. Using outputs from Objectives 1 and 2 and B.NBP.0578, developed a revised set of best-bet guidelines for infrastructure development, managing stocking rate, pasture spelling and prescribed burning for each of the five study regions.

4. From the guidelines and value propositions developed in Objectives 2 & 3, selected a sub-set of best-bet guidelines for each of five study regions to be extended via regional producer demonstration sites.

5. Identified priority grazing land management research questions, and their justification, for each study region.

Additional details

The primary contributors to this project and their inputs (as FTEs over 18 months from February 2009 to June 2010) will be John McIvor (0.40 FTE), Tony Grice (0.18 FTE), Leigh Hunt (0.20 FTE) (all from CSIRO Sustainable Ecosystems), and Steven Bray (0.18 FTE; Queensland Department of Primary Industries and Fisheries).

Grazing land management strategies will focus on:
- Infrastructure development (fencing and water points);
- Different ways of managing stocking rate over time;
- Pasture spelling strategies, in particular wet season spelling; and
- Prescribed burning.

Each set of regional best-bet guidelines will have associated 'value propositions' that summarise why a producer should use a particular strategy. This value proposition will capture, for the potential adoptee, how the particular strategy will add more value, or better solve a problem, than existing practices or other practice options.

Issues to be addressed
Development of infrastructure
- Impacts of paddock size and water point distribution on cattle grazing behaviour, their productivity, and the evenness of use of pasture at various scales (patch to paddock);
- Paddock sizes and spatial distribution of water points to optimise carrying capacity for different environments and production systems;
- Effective, but perhaps sub-optimal, options for large (40-120 km^2) and very large paddocks (>120 km^2) seeking more even use and higher carrying capacity;
- The impacts of relatively small paddocks (20-200 ha), as in some intensive grazing systems and some highly-developed continuous grazing operations;
- The best-bet guidelines for the range of climate/ soil fertility associations, enterprise scales and resource conditions across northern Australia;
- Assessment of the strength of evidence for the impacts of infrastructure development as well as the depth of understanding of underlying causal mechanisms;
- The key gaps in data or understanding that limit capacity to design and implement optimal infrastructure development for the various environments of northern Australia.

Stocking rate management
- The impacts of seasonal and annual levels of pasture utilisation;
- The impacts, either measured or predicted, of deliberate variation of stocking rate (via decisions made at monthly to annual time steps) relative to 'set-stocking' at, or around, the long-term carrying capacity;
- The influence of different environments, production systems and management intensities on the impacts of different stocking strategies, the ease of implementation, and the associated risks.
- The best-bet guidelines for the range of climate/ soil fertility associations, enterprise scales and resource conditions across northern Australia;
- Assessment of the strength of evidence for the impacts of stocking rate management as well as the depth of understanding of underlying causal mechanisms.
- The key gaps in data or understanding that limit capacity to design and implement optimal stocking strategies for the various environments of northern Australia.

Pasture spelling
- The impacts, or likely impacts, of wet season spelling in relation to starting land condition, the current stocking regime (i.e., the current levels of seasonal and annual utilisation) and the spelling regime (timing, frequency and duration);
- The effect of spelling regimes on tolerance of pasture to the overall level of utilisation: can a spelling regime permit net increases in carrying capacity independent of effects on pasture condition *per se*?;
- The impacts, or likely impacts, of periods of increased paddock utilisation required to accommodate the particular regime of wet season spelling;
- The impacts, if any, of spelling during the dry season;
- The influence of different environments, production systems and management intensities on the impacts of wet season spelling, the ease of implementation, and the associated risks.
- The best-bet guidelines for the range of climate/ soil fertility associations, enterprise scales and resource conditions across northern Australia;
- Assessment of the strength of evidence for the impacts of pasture spelling as well as the depth of understanding of underlying causal mechanisms.
- The key gaps in data or understanding that limit capacity to design and implement optimal pasture spelling regimes for the various environments of northern Australia.

<u>Use of prescribed burning</u>
- The effects of fire regimes (timing, frequency, intensity) on tree-grass balance
- The interactions between environment, fuel loads, grazing management and the potential frequency of effective fires for managing tree-grass balance
- The trade-offs between use of biomass for fire and its use for grazing
- The effects of fire regimes on re-setting cattle preference for plant species, patches, and land types
- The direct effects of fire regimes on soil condition
- The influence of different environments, production systems and management intensities on the role and impact for prescribed use of fire, the ease of implementation, and the associated risks.
- The best-bet guidelines for the range of climate/ soil fertility associations, enterprise scales and resource conditions across northern Australia;
- Assessment of the strength of evidence for the impacts of fire, as well as the depth of understanding of underlying causal mechanisms.
- The key gaps in data or understanding that limit capacity to design and implement optimal fire regimes for the various environments of northern Australia.

Review of best-practice recommendations before, and after, bioeconomic analyses
In conjunction with B.NBP.0578, the project will contribute to regional assessment and consultation with beef producers, researchers, extension officers and others in each of the five regions via two series of workshops and via out-of-session reviews.

The first series of regional workshops will help document current and best-bet grazing management practices, identify regional data, and define representative grazing enterprises that will be parameterised in the bio-economic model.

The second series of regional workshops will validate and refine best-practice guidelines from the bioeconomic modelling for each region. The pros and cons of implementing draft best-practice guidelines will be evaluated in a whole enterprise systems framework.

Agents or subcontractors
Subject to the obligations relating to agents and subcontractors, MLA consents to the engagement of the following agents or subcontractors:

Queensland Dept of Primary Industries and Fisheries
NT Department of Regional Development, Primary Industry, Fisheries and Resources
Dept of Agriculture and Food, WA

Interest

Milestone Number	Description	Percentage*
ALL	Meat and Livestock Australia	50.00
ALL	CSIRO	50.00

Communications

Subject to the confidentiality obligations, the Services will be communicated by the Research Organisation:

Activity	Key Message
Milestone reports	Report on achievement of each milestone. Reports for Milestones 4 and 5 will be supplied in a modified version of the MLA Final report template.
Final report	The final report will be supplied in electronic format and may be reproduced and published in the standard MLA style, with due acknowledgement to the project team. Only final reports submitted in accordance with MLA's style guide will be accepted by MLA. Report guidelines will be provided by MLA on request.

Milestones

Milestone	Achievement Criteria	Due Date
1	Signing of contract.	1 Feb 2009
2	Team workshop held in conjunction with B.NBP.0578.	15 May 2009
3	a. Draft best-bet guidelines for infrastructure development, managing stocking rate, pasture spelling and prescribed burning. b. Contributed draft best bet guidelines for the 5 study regions to the bio-economic modelling studies in B.NBP.0578 to quantify their impacts and trade-offs.	15 Aug 2009
4	Detailed interim report (for inclusion in MLA reporting to DAFF) documenting: a. The key principles, response curves and best-bet guidelines for grazing land management relating to infrastructure development, managing stocking rate, pasture spelling and prescribed burning across a climate and soil fertility continuum, and for a range of enterprise scales and resource conditions throughout Northern Australia. b. Draft best-bet guidelines for infrastructure development, managing stocking rate, pasture spelling and prescribed burning for each of the five study regions. c. Revised best-bet guidelines for infrastructure development, managing stocking rate, pasture spelling and prescribed burning for each of the five study regions, following bioeconomic evaluation and regional assessment of the draft guidelines. d. A sub-set of best-bet guidelines for each of five study regions to be extended via regional producer demonstration sites. e. Priority grazing land management research questions, and their justification, for each study region.	15 Oct 2009

Milestone	Achievement Criteria	Due Date
5	Revised and updated report including all elements in Milestone 4 (for inclusion in MLA reporting to DAFF).	15 Nov 2009
6	Final Report for MLA including: a. A detailed technical report containing revised grazing land management information, relationships, response curves, insights and best bet management guidelines generated from a synthesis and analysis of research. b. A general 4-8 page summary of key findings, recommendations and best bet guidelines for infrastructure development, managing stocking rate, pasture spelling and prescribed burning. c. A 4-6 page summary, specific for each of five study regions, of the revised key findings, recommendations and best bet guidelines for infrastructure development, managing stocking rate, pasture spelling and prescribed burning. d. A sub-set of best-bet guidelines and strategies for each study region to be extended via regional producer demonstration sites. e. Priority grazing land management research questions, and their justification, for each study region.	1 Jul 2010

A milestone is not achieved unless it is completed to MLA's reasonable satisfaction

Nominated Person(s)

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