

Is wet season spelling achievable at a whole of property scale?

Agri-Science Queensland Innovation Opportunity

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Summary

This study examined issues with adoption and implementation of wet season spelling strategies across northern Australia at the whole of property level.

Continuous grazing of pastures often leads to increased pressure on desirable species and in some instances a decline in land condition overtime. The use of wet season spelling is a highly recommended best management practice for beef producers across northern Australia. Significant effort has evolved around research to quantify the benefits of wet season spelling. These include increased ground cover, maintenance and/or improvement in land condition, improved pasture and animal production and reduction in loss of sediment.

This study reviewed current guidelines and implementation processes for wet season spelling at the whole of property level. The review concludes that insufficient processes are described in detail to facilitate successful beef enterprise adoption of this highly recommended management practice. The review also highlights gaps in research and extension materials available for beef producers, including enterprise case studies that describe sound and successful, proven adoption strategies.

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Background

Continuous grazing of pastures often leads to increased pressure on desirable species and in some instances a decline in land condition over time. The use of wet season spelling is a highly recommended best management practice allowing plant recovery and new native plant recruitment through seed set. Recent research has shown that wet season spelling can improve ground cover, land condition, pasture and animal production and reduce loss of sediment.

However, producers are challenged when attempting to forward plan and incorporate a wet season spelling rotation into their grazing land management plan at the whole-property scale. This is mainly due to the complications and considerations associated with implementing a 'spell' in one paddock, often at the expense of animals overgrazing other paddocks. Challenges are also faced when attempting to coincide paddock movements with routine animal management practices to avoid additional mustering/handling costs.

The benefits of implementing a 'spelling' regime in a paddock depend on the balance between the improvements made in the spelled paddock and the costs incurred from having the cattle elsewhere, either on or off the property. These costs can be financial (e.g. agistment when the cattle are removed from the property), or reduced production per animal as stocking rate is increase in another paddock on the property, or reduced land productivity as pasture damage may occur in this more heavily stocked area, leading to an eventual decline in land condition.

This study aimed to better understand issues with the adoption of wet season spelling through a review of current research, extension materials and implementation guidelines. The study also involved consultation with public and private service providers, considered to be specialists in the field of grazing land management. This consultation activity studied the current recommendations of grazing land management specialists working with northern beef producers, resources utilised and known barriers including strategies to overcome foreseen common issues.

Project Objectives

This project investigated the issues associated with the adoption of wet season spelling in the beef industry. The project, through its methodology, aimed to determine and therefore propose strategies to develop improved guidelines for beef producers.

Project objectives:

- Identification of issues limiting successful adoption and implementation of wet season spelling.
- Identification of potential collaborators for whole of business case studies demonstrating where successful implementation of wet season spelling has occurred and the economic benefit.
- Establish a plan for the development of an industry publication and other extension materials.

Methodology

Table 1 Project activities and milestones

Activity	Description	Who	Scheduled Start	Scheduled Finish
1. Literature Review	Literature review on the research, implementation and current extension guidelines of wet season spelling	Mellissa Holzwart Alice Bambling Lauren Williams Holly Reid Brigid Nelson	16/10/2017	30/01/2018
2. Consultation	Consultation involving industry to determine issues with successful implementation and identify gaps in current implementation strategy guidelines of wet season spelling of paddocks and pastures	Mellissa Holzwart Alice Bambling Brigid Nelson	1/02/2018	5/03/2018
3. Identification of potential collaborators for whole of business case studies	Project meeting to identify and nominate potential collaborators for whole of business case studies. Identify businesses that represent Northern Australia (Queensland, Northern Territory and possibly Western Australia).	Mellissa Holzwart Alice Bambling Lauren Williams Holly Reid Brigid Nelson	6/03/2018	13/04/2018
4. Establish a plan for the development of an industry publication and other extension materials	Using information obtained from project activities 1 and 2, develop a plan for future project direction, highlighting key areas requiring development.	Mellissa Holzwart Alice Bambling Brigid Nelson	6/03/2018	1/06/2018
5. Scoping study report (Final Report)	Scoping study report detailing recommendations for future project direction, focused on increasing adoption and filling gaps in current extension guidelines and materials.	Mellissa Holzwart Alice Bambling Brigid Nelson	8/03/2018	27/07/2018

- Literature review

The literature review examined published scientific papers, workshop and course materials, available information in the form of factsheets, brochures and news articles and published producer case studies. The review considered in detail the benefits of wet season spelling as described by research as well as current extension implementation guidelines. The review also identified gaps in the available research and implementation guidelines available for beef producers. The gaps identified, particularly in the availability of extension implementation guidelines, assisted this project when recommending strategies for future project direction.

- Consultation

The project aimed to engage industry when examining possible issues associated with the adoption of wet season spelling and the likely problems faced by beef producers. To engage industry, a producer based scenario was developed. Eight key specialists in the field of grazing land management, based across Queensland and the Northern Territory, were identified. These specialists were chosen to represent both private and public service providers to the northern beef industry.

The specialists were provided the same scenario and asked to respond to the 'mock producer based enquiry'. Information sought related to key first steps for the producers to follow when implementing wet season spelling for the first time, recommended processes, possible issues and barriers the producers may encounter when adopting the practice and tactics to overcome these issues and resources and tools recommended.

The methodology differed slightly from the initial project proposal. Initially workshops were planned to engage both research and extension officers as well as industry representation. However, as the project progressed and the logistics realised, it was collectively decided to a change in the methodology for this component of the project. The scenario based responses proved to be an equally effective method in gaining very detailed and specific insights from grazing land management specialists.

- Identification of potential collaborators for whole of business case studies

The project team in consultation with Departmental staff across multiple regions, identified and collated a list of six potential industry collaborators for possible future whole of business case studies.

- Establish a plan for the development of an industry publication and other extension materials

The project team assessed the information gathered in project activities 1 and 2 (see Table 1). The key learnings from each of these project components was analysed with key areas for future development highlighted.

- Scoping study final report

This document, the third project activity, assessed and interpreted the results from both the literature review and consultation activities. This report summarises recommendations for possible future project directions, including strategies for the development of an extension document on wet season spelling.

Results

Wet season spelling is a recommended best management practice for northern beef producers.

Largely, the topic has received considerable attention in terms of published research. However the research completed has mostly relied on simulated modelled outputs with limited field based experiments, particularly commercial scale, across northern Australia.

Due to the importance and emphasis that is placed on this management practice for beef producers, significant time and effort was taken in this project to examine all components of the practice relating to both recommendations described by research and practical information for on-property adoption. Practical information available to beef producers on the topic of wet season spelling, the benefits to land and animal productivity, relationships between wet season spelling and recovery of land condition, the economic benefits of wet season spelling, and successful implementation of the practice at the whole of property level, was found to be limited.

Review of current research and extension literature

The literature review examined current research and extension documentation relating to the implementation of wet season spelling. Other scientific literature reviews on the topic have been completed prior to this project however this review differed as it aimed to match the results and guidelines with documented extension materials for beef producers.

- Stocking rate management, initial land condition, duration of spelling, frequency of spelling, season of spelling, and rainfall received will have the greatest effects of the success of wet season spelling.
- Guidelines suggest wet season spelling must occur during the growing season in order for any benefits to be realised, longer periods of spelling are more effective than shorter spells and the poorer the starting land condition, the more frequent the spelling will be required in order to achieve a positive shift in land condition.
- Maximum benefits are achieved when spelling is implemented in good pasture growing seasons. Literature also suggests a reduction in the total property stocking rate is often needed in order to implement the wet season spelling regime.
- Known economic benefits of wet season spelling is limited to a few model based scenarios.
- Literature relating to the topic of wet season spelling is reasonably diverse however only a few examples are specific to northern Australia.
- Limited data exists from field based experiments examining wet season spelling across northern Australia. Most guidelines developed from literature are based on modelled outputs.

Considerable workshops, courses, information and tools are available to beef producers on the topic of grazing land management. However, information relating to implementation of wet season spelling regimes across the whole of property is found to be brief across most of these learning aids and refers to further planning and advice needed. Paul Jones (pers comm 2018) is currently conducting wet season spelling experimentation at the long term Wambiana Grazing Trial to assess recover times from overgrazed pastures.

Consultation activity

The responses to a mock producer based scenario from 8 grazing land management specialists were analysed. The results were summarised with the following outcomes determined.

- Extensive one to one support is currently recommended in order for producers to successfully implement a whole of property wet season spelling plan.
- Vital to understand property/paddock/land type carrying capacity and land condition in order to plan a wet season spelling regime.
- A detailed property map including infrastructure and land types is the most important tool required when planning wet season spelling regimes.
- Challenges posed to producers: Maximum benefits occur in good seasons. Good seasons are often a point of higher carrying capacity and therefore stocking rate, therefore making it difficult to implement wet season spelling without a significant reduction in stock numbers from the property.

- Challenges posed to producers continued: Trade-off between more infrastructures (fencing and waters) or mobbing up of stock required in order to implement a wet season spelling regime of some level. Economics of this are not well understood.
- Sufficient courses / workshops are available and highly recommended to producers by specialists in these areas.

Identification of potential collaborators for whole of business case studies

Six potential collaborators were identified based on knowledge that the business has successfully adopted wet season spelling across extensive areas of their beef property. The collaborators identified are all of a commercial scale and represent the northern beef industry. The collaborators were not approached in this project, however, developing case studies from these collaborators will be a focus of further work as part of the larger DAF Reef and Drought Extension project.

Establish a plan for the development of an industry publication and other extension materials

The results of both the literature review and consultation project components were analysed by project staff. It was determined that whilst many guidelines and principles for the implementation of wet season spelling are consistent across research and the recommendation of specialists in the field, there is not a simple, standalone extension package or product available to beef producers. The project team detailed a plan to produce a document that beef producers can follow to design their wet season spelling system without reliance on extensive one to one consultant and/or extension support.

- Using information gathered from this project, develop a full range of key steps and processes for beef producers to follow when implementing wet season spelling regimes.
- Test the proposed steps and processes at the producer level to determine practicality and transparency of messages.
- Utilise list of potential collaborators for whole of business case studies to identify four to six willing participants. Develop publically available case studies on successful implementation of wet season spelling at the whole of property level.
- Prepare a standalone extension product focussed on wet season spelling implementation processes which includes producer case studies.

Conclusions/Significance/Recommendations

Conclusions

This study found gaps currently exist in available research and extension materials. Whilst a diverse range of literature has examined the topic of wet season spelling, and generally guidelines are accepted across the literature, results are largely based on modelled outputs that do not consider economics, specific to northern Australian beef enterprises. Literature considering economics of wet season spelling is limited and largely based on limited data from field experiments.

Similar to research, there is considerable published learning materials on the topic of grazing land management as a whole. Within most of these materials, wet season spelling is highlighted as a key management practice. This study found that detailed information relating the full range of steps and processes for successful implementation of wet season spelling does not currently exist. The project also found that very few published case studies that describe sound and successful strategies for implementing wet season spelling rotations in extensive beef operations, including economics exist.

Significance

This study investigated the topic of wet season spelling with an aim to better understand issues associated with adoption and to therefore propose strategies to develop better guidelines for beef producers. The development of improved guidelines and recommendations will assist not only beef producers to increase the skills and knowledge required to implement this practice, but also assist extension staff working with producers to achieve adoption of grazing best management practices such as wet season spelling.

Recommendations

This study recommends that further project work be undertaken to address the issue of available extension materials describing the full range of steps and processes required for the successful adoption of wet season spelling. This project through the review of current literature and extension materials has highlighted some key guidelines, steps, processes and tools required. However, further investigation is required to test these guidelines at the beef producer level.

Key Messages

Wet season spelling of pastures to maintain or improve land condition is a highly recommended best practice across northern Australia.

Considerable effort has evolved around research to better understand and quantify the benefits of wet season spelling and the likely improvements in land condition as a result of pasture spelling.

Issues exist with the successful adoption of wet season spelling across many northern beef enterprises.

Largely, it is recommended beef producers seek extensive one to one support from specialists in the field of grazing land management prior to implementing wet season spelling regimes at the whole of property level.

To successfully implement wet season spelling a beef producer must have a detailed property map including infrastructure and land types and an understanding of land condition trends across the property.

This project provided the opportunity for both early and mid-career DAF Professional Officers to enhance their knowledge and research skills when compiling this report.

Where to next

The Grazing BMP and Extension Support project plans to continue to examine this topic including the possibility of investigating and acting on each of the recommendations as highlighted in this report.

Budget Summary

The project was slightly underspent on budget.

Budget

- \$5,000

Expenses

- \$4,000 (spent)
 - Four private industry consultants chosen as specialists in the field of grazing land management and wet season spelling were engaged to assist with project activity 2 – Consultation. Refer to Methodology.

Appendix 1 – Wet season spelling literature review

Is wet season spelling achievable at a whole of property scale?

A review of current extension and implementation guidelines

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Executive summary

Continuous grazing of pastures often leads to increased pressure on desirable species and in some instances a decline in land condition over time. The use of wet season spelling is a highly recommended best management practice for beef producers across northern Australia. This review describes the benefits of wet season spelling; increased ground cover, maintenance and/or improvement in land condition, improved pasture and animal production and reduction in loss of sediment, as detailed by recent research.

This review also examines current, available guidelines and implementation processes for wet season spelling at the whole of property level. Several scientific literature reviews on the topic have been completed and documented prior to this project. The review completed during this project differed from those completed previously as it aimed to match the results and guidelines described by scientific literature with documented extension materials available for beef producers.

The review concludes that insufficient processes are described in detail to facilitate successful beef enterprise adoption of this management practice. The review also highlights gaps in research and extension materials available for beef producers, including enterprise case studies that describe sound and successful, proven strategies.

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1.0 Background

Wet season spelling is the action of resting pasture from grazing. Wet season spelling is the common industry terminology used to describe this targeted grazing management practice. Research and some extension materials however often describes the action as pasture resting, rest, pasture spelling and spell. To be consistent with industry terminology, this practice will be referred to as 'wet season spelling' in this report.

Wet season spelling occurs when livestock are removed from an area (paddock, pasture or property) for a period of time. Wet season spelling typically occurs during the prescribed growing season and usually for less than a year. (Scanlan *et al* 2014, Hunt *et al* 2014, O'Reagain *et al* 2014).

Wet season spelling is a highly recommended grazing land management practice across northern Australia and has been suggested, or recommended, by many publications and resources as a key grazing land management strategy (Quirk and McIvor, 2003, Meat and Livestock Australia, 2017, Grazing BMP Program, 2018) that promotes plant recovery and new plant recruitment through seed set.

Wet season spelling is broadly recommended to achieve two grazing land management outcomes; firstly to maintain or improve land condition and secondly to increase paddock biomass yields. However, literature also describes wet season spelling as a targeted grazing land management strategy for managing overall grazing pressure (Scanlan *et al*, 2012).

Research has highlighted three key factors determining the overall success of wet season spelling. These are timing / season of rest/spell, duration of rest/spell and frequency of rest/spell. Guidelines around each of these factors have been described to an extent in the literature examined.

Wet season spelling can improve pasture condition with most response occurring in the early growing season (Ash *et al* 2011). Therefore, the guidelines developed from research around season/timing of rest/spell suggest that pastures should receive a rest/spell during the growing season and should commence after 30-50mm of rainfall (generally regarded as the commencement of the growing season) to initiate pasture growth. Producer experience highlights that in situations where access is limited after significant rainfall the rest/spell may need to commence prior to the start of the growing or wet season.

The research examining duration of rest suggests rest periods should be a minimum of eight weeks from the start of effective pasture growth for any significant benefit to be realised. Similar to timing of the rest/spell, it is acknowledged that in extensive situations a full wet season spell/rest may be more practical to manage and implement due to paddock access issues after rainfall events.

The current guidelines around frequency of rest/spell suggest that pastures require a minimum of two rest/spell periods during the growing season to improve land condition by one classification as per the ABCD land condition framework (Meat and Livestock Australia, 2017). Guidelines also suggest that when poor seasonal and therefore pasture growth conditions are experienced, more rest/spell periods will be required to shift land condition. An emphasis on stocking rate management used in conjunction with the resting/spelling is also critical in the overall success of the strategy in improving land condition (Orr and O'Reagain, 2011).

This review provides a summary of the scientific literature and extension materials available to beef producers on the implementation of wet season spelling at the whole of property level. This review is similar to many before it in examining scientific literature documenting impacts of pasture spelling/resting and discusses the relative economic benefits, however it does differ from other

reviews by attempting to match the results and guidelines described by scientific literature with documented extension materials available for beef producers.

This review also attempts to better understand the issues with the practical implementation issues of wet season spelling. The insights learnt will be used by industry to formulate strategies to address gaps in current implementation strategy guidelines and further research needs to a lesser extent.

2.0 Impacts of wet season spelling

In terms of field based experiments across Northern Australia, data is available from a limited number of explicit studies that focus solely on examining the effects of pasture resting. Other data often comes from enclosure based trials, established to investigate other issues, and however provided a level of data for pasture response to the complete absence of grazing.

A synthesis report prepared by McIvor *et al* (2010) focussed on identifying best bet grazing land management guidelines from research outcomes. One of the guidelines discussed in the report was pasture resting, as implied by wet season spelling. The report had similar aims to the current project and therefore was heavily utilised when preparing the current review.

McIvor *et al* (2010) described eleven field based experiments of pasture resting and ten enclosure studies. A comprehensive analysis of the results from both field and enclosure based experiments concluded that resting pastures, as implied by the practice of wet season spelling, can play a significant role in determining overall land condition.

The benefits of wet season spelling are frequently described as increased ground cover, maintenance and/or improvement in land condition, improved pasture and animal production and reduction in loss of sediment (Department of Agriculture and Fisheries, 2018).

A synthesis report prepared by O'Reagain *et al* (2014) describes wet season spelling as a key principle of sustainable pasture management and a vital tool when managing grazing lands in variable rainfall climates. It describes known experimental and anecdotal evidence of the benefits of wet season spelling as improvements in pasture condition and increased feed supply by providing a bank of ungrazed pasture.

An accumulation of herbage mass is also described by Hunt *et al* (2014) as providing sufficient fuel load for prescribed burning, particularly in situations where a high fuel load is required for intense fire to control woodland thickening.

3.0 Factors effecting success of wet season spelling

McIvor *et al* (2010) concluded that the most important factors determining the effectiveness of pasture resting are the frequency of rest, duration of rest and seasonal conditions (i.e. the timing of the rest). This was consistent with conclusions also made by Scanlan *et al* (2014) and Hunt *et al* (2014) in separate synthesis studies.

These three factors were investigated in further detail in the following sections.

3.1 Frequency of wet season spelling

The number of occasions of wet season spelling required to achieve a particular goal will be largely determined by the starting land condition of the area. Success will also be largely influenced by the seasonal conditions and therefore overall rainfall received and timing of rainfall experienced during the wet season spell (Scanlan *et al* 2011).

Mclvor *et al* (2010) suggests that the practice of wet season spelling alone will not be sufficient to recover land classified to be in D land condition as per the ABCD land condition framework. Quirk and Mclvor (2003) also state that the functions of pasture maintenance and recovery are exceeded when optimal growing conditions are experienced and therefore when sub-optimal growing conditions occur, more frequent periods of wet season spelling will be required to achieve grazing land management goals.

Limited experimental evidence suggests that as land condition declines or the poorer the starting land condition (excluding land that is in D land condition), more frequent the wet season spelling is required if land condition is to be improved. Despite the limited scientific evidence surrounding this guideline there appears to be support for the statement across the grazing research community. In a five year study Jones *et al* (2016) reported pasture spelling did not produce the expected differences in land condition and demonstrated the recovery is a longer term process. The report concluded this lack of clarity does not detract from the importance of 3P grasses for sustainability and profitability, nor the understanding that wet season spelling should be practised for the improvement and/or maintenance of land condition. There is strong confidence that land condition will improve with spelling and good grazing management, although it will take longer to measure than initially thought. Increasing the frequency of wet season spelling is expected to provide higher levels of positive pasture response. However, increased frequency of wet season spelling represents an opportunity cost or trade-off. Increasing the number of rest periods can be expected to give a greater pasture response but represents a trade-off as grazing is foregone during the rest period.

Evidence consistently drawn from enclosure studies (Mclvor, 2001; Mclvor and Gardener, 1990; Orr *et al* 2006) highlights the improvements and shifts possible in land condition when wet season spelling is used in one or two consecutive growing seasons. This is provided that the consecutive growing seasons experienced are favourable. The work highlights that shifts in land condition from B condition to A condition are possible in one to two growing seasons whereas recovery of C condition land will take longer. Results show that C condition land may need two to four years of rest or longer. Jones *et al* (2016) reported that typically time frames in the order of 10 years are likely before spelling will have an obvious impact on land condition and productivity depending on seasons and the viable seedbank.

From this, Mclvor *et al* (2010) suggests that pastures require two growing seasons under decent seasonal conditions to improve by one ABCD land condition class. When the seasonal conditions are poor, such as in times of drought, more rest periods will be required to achieve this result.

Despite a reasonable amount of published data on field and enclosure based research, it is difficult to determine conclusions regarding required frequency of wet season spelling. The experimental field data available utilises different techniques and approaches and the enclosure studies providing pastures with a wet season spell in all years with no grazing pressure applied. Mclvor *et al* (2010) therefore concluded that it would be dangerous to extend the results of these studies to industry as the presence of grazing may have significant effects.

3.2 Duration of wet season spelling

Most studies examined in this review compared no wet season spell with a with season spell rather than studying different durations of wet season spelling. Orr and Paton (1997) did examine duration of rest in plots that were rested annually for zero, two, four, or six months. The results of that work showed higher pasture yields of desirable species in the treatments of longer rest (four and six months) compared to the shorter periods of rest (zero and two months). This result conflicts with work

done by Ash *et al* (2001, 2011) which found that two months of wet season spelling that occurs in the early growing season is sufficient to maintain the pastures examined in good condition and to improve those in poorer condition.

Whilst it is considered not possible to prescribe generally the period of absence of grazing required there have been many suggestions made in the literature examined.

The recommendations around the duration of wet season spelling are made both according to time (expressed in weeks or months) and also plant characteristics to achieve (such as seed set, of growth phase).

Scanlan *et al* (2014) recognised limitations in available evidence however recommended wet season spelling for a full growing season. This was supported by Post *et al* (2006) and O'Reagain *et al* (2008). O'Reagain *et al* (2008) however recommended that shorter wet season spells may be adequate to improve land condition in periods of high, optimal rainfall.

This review has found evidence to support the statement that the duration of the wet season spell is a trade-off between the benefit to the pasture where there is a greater benefit with longer spells but perceived declining economic benefits as the period increases due to a loss of grazing.

Despite this, Scanlan *et al* (2014) and Hunt *et al* (2014) both recommend wet season spelling of pastures for the whole wet season. Both describe similar additional benefits from wet season spelling pastures for the entire growing season including; allowing new plant recruitment as seedlings establish, grow and set seed, longer periods are more likely to therefore encounter periods of optimal growing conditions, provides periods of non-grazing at the start of the growing season when plants are most sensitive to defoliation, will allow for a range of flowering times across plant species, allows plants to increase plant root reserves which occurs mostly late wet season and do not have to shift cattle during the wet season when access may be an issue.

3.3 Seasonal conditions and the timing of wet season spelling

Several studies examined suggest that resting pastures during the wet season (as its name implies) is important for maintaining pasture condition and productivity. A number of studies have shown that pastures are more sensitive to defoliation during the early growing season than at other times of the year (Ash and McIvor, 1998) and it is strongly supported that eliminating grazing at these times could benefit the pasture.

To improve plant vigour and survivability and the overall composition of a pasture base, wet season spelling that occurs at the start of the growing season is recommended to be most effective when grasses are most susceptible to heavy defoliation. Dry season rest, by comparison, is not likely to greatly assist pasture or land condition recovery.

Dry season management of stocking rates and grazing pressure, however, is still required to manage for sufficient ground cover to promote better water infiltration and reduced rainfall runoff when the season breaks.

Only found one study was found from northern Australian study that compared season of rest (Hacker and Tunbridge 1991). This review concludes that more work may be required to consolidate the impacts and effect of time of year on response to wet season spelling.

4.0 Current available extension materials for wet season spelling

Currently, many workshops, extension materials and information fact sheets are available on the topic of grazing land management. These include the following formalised training packages and is not limited to:

- Grazing Land Management EDGE Workshop (Meat and Livestock Australia, 2017)
- StockTake (Meat and Livestock Australia, 2005)
- Grazing Fundamentals EDGE Workshop (Meat and Livestock Australia, 2017)
- Grazing for Profit (Resource Consulting Services)
- Keep in Touch Days (Resource Consulting Services)
- Grazing Land Management Technical Manual (Meat and Livestock Australia, 2003)

These training packages all promote resting/spelling pasture is a critical part of management.

5.0 Economics of wet season spelling

Limited concise information is available for beef producers on the economic benefit of adopting wet season spelling.

Macleod *et al* (2009) evaluated the benefits of wet season spelling through economic modelling of seven scenarios. The results of the modelling highlighted minimal economic advantages when wet season spelling is used with conservative pasture utilisation rates in a situation where land condition has already declined. The study heavily emphasised a shortage in quantitative data drawn directly from wet season spelling experiments providing carrying capacity and animal performance data. Therefore, the authors concluded that the collection of such data should be a high research priority and that the results of the modelling should be interpreted accordingly.

Moravek *et al* (2016) examined four individual studies which considered stocking rate and wet season spelling impact on beef enterprise profitability. This study concluded that there was not a consistent outcome across the four studies in terms of profitability of wet season spelling.

6.0 Issues with the successful implementation of wet season spelling

It is widely perceived that the benefits of wet season spelling are a trade-off between the improvements made to the paddock or area targeted and the costs associated with destocking the paddock or area. The costs are described as possibly being from agistment whereby the cattle have to leave the property altogether or reduced production (per animal) as the stocking rate increases in other paddocks or areas of the property. Additional costs include possible damage leading to decline in land condition in other areas where stocking rates exceed carrying capacity as a result of adding in cattle from the spelled paddocks.

Additional concerns when implementing wet season spelling revolves around property infrastructure and having sufficient paddocks to implement a level of paddock rotations. Water infrastructure also needs to be considered particularly in mob sizes are increased to facilitate a level of rotational grazing.

Challenges are also faced when attempting to coincide paddock movements with routine animal management practices to avoid additional mustering/handling costs associated with shifting cattle.

Generally, the impact of each of these issues is not fully understood at the beef enterprise level. This review searched producer based case studies to provide insights into this area. However, the case studies examined were brief in nature and did not offer extensive information into the implementation

strategies used, issues faced and steps used to overcome them. Producer insights are considered to be very important moving forward plus the inclusion of enterprise economic data would be extremely valuable in guiding future direction on the topic, in terms of extension and additional research

7.0 Conclusions

This review was consistent with many others before, by concluding that there is a gap in knowledge to predict the rate of which land and pastures will recover as a result of using pasture resting/spelling. There are knowledge gaps in understanding the cost effectiveness of using wet season spelling to improve land condition for many land types across northern Australia.

The science is consistent on describing known impacts associated with wet season spelling and the factors which impact on its success. Practical implementation processes however are lacking in support of these known factors and rules of thumb. Producer case studies were examined to an extent in this review however these did not provide detailed information on the frequency and duration of rest/spell being used, the economic benefits realised and practical implementation strategies and therefore provided no evidence of benefit of wet season spelling for this report.

In summary, a review of both scientific and extension materials found:

- Stocking rate management, initial land condition, duration of spelling, frequency of spelling, season of spelling, and rainfall received will have the greatest effects on the success of wet season spelling.
- Wet season spelling must occur during the growing season in order for any benefits to be realised, longer periods of spelling are more effective than shorter spells and the poorer the starting land condition, the more frequent the spelling will be required in order to achieve a positive shift in land condition.
- Maximum benefits are achieved when spelling is implemented in good pasture growing seasons. Literature also suggests a reduction in the total property stocking rate is often needed in order to implement the wet season spelling regime.
- Known economic benefits of wet season spelling is limited to a few model based scenarios.
- Literature relating to the topic of wet season spelling is reasonably diverse however only a few examples are specific to northern Australia.
- Limited data exists from field based experiments examining wet season spelling across northern Australia. Most guidelines developed from literature are based on modelled outputs.

Considerable workshops, courses, information and tools are available to beef producers on the topic of grazing land management. However, information relating to implementation of wet season spelling regimes across the whole of property is found to be brief across most of these learning aids and refers to further planning and advice needed. The documentation of the practical steps to implement wet season spelling at a commercial scale should be a priority.

8.0 References

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