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Subtropical pastures for southern meat producers

Planning for new R&D investments

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Abstract

The MLA Feedbase R&D Plan identified a number of potential needs for new R&D on improved establishment and management of subtropical grass and legume species in pastures in some southern/temperate red meat producing regions. This project has reviewed past and current R&D activities and consulted with producers, researchers, advisers and pasture seed producers to develop a new collaborative research program to address the following aim:

“To increase feedbase production and quality of subtropical grass based pastures through improved establishment and maintenance of legumes and other compatible forage components in targeted southern Australian red meat producing regions”.

The R&D planned will commence in 2012 and will involve activities across southern Queensland, central and northern inland New South Wales and southwest Western Australia.

Executive summary

There has been strong interest in sowing subtropical grass and (to a lesser extent) legume pasture species in southern QLD and north east NSW since the 1960s and '70s. In other areas, particularly northern inland NSW, and the south coast and northern agricultural areas of WA, there have been significant areas (over 200,000ha in each state) of subtropical grass species sown in more recent times-primarily since the 1990s.

More recently, interest has emerged in evaluating and trial sowing of subtropical pasture species in areas such as the central west and eastern Riverina in NSW, central and western Victoria and the mid north of SA. This growing interest has coincided with an 8-10 year sequence of low and variable rainfall in eastern Australia since 2000.

Drivers of expanding interest in these species have included a growing belief that perennial sown grasses and subtropical species in particular, have the potential to increase the resilience of farming and grazing systems that have previously been based primarily on sown temperate and volunteer annual pasture and crop species. This resilience is seen to be increasingly important to productivity in variable climatic systems and if climate change impacts unfold as forecast. Further, awareness of environmental and productivity benefits arising from reduced deep drainage, increased soil carbon and soil health and reduced erosion-that arise from increased ground cover achieved by perennial subtropical grass species, has been another important driver of growing interest in these species across a very wide range of environments in southern Australia.

Industry Needs Analyses:

A number of reviews and targeted producer consultation processes have been conducted across southern Australian meat producing regions in the past two years, with the objective of determining industry needs and barriers to more widespread adoption of subtropical pastures.

A review of productivity decline in sown grass pastures in southern QLD published in 2011 highlighted widespread declines in productivity and carrying capacity of sown grass (particularly buffel grass) pastures by up to 50% over the past 20 years. The decline in productivity is known to be caused by a lack of available nitrogen in the soil, as nitrogen and other nutrients become tied up in organic matter and roots and crowns of old grass clumps. However subsequent overgrazing exacerbates this decline and may lead to lower land condition. Introduction of legumes into the grass dominated systems is seen as the most likely solution although the southern QLD environment is particularly challenging as it is relatively cool for tropical legumes (prone to frost) and relatively too dry in winter and hot in spring for temperate legumes; establishment into grass dominated areas is difficult; establishing and maintaining effective rhizobium populations for legumes are difficult; phosphorus nutrition requirements for both legumes and grasses are significant on some soil types; and grazing management for persistence of legumes is different to traditional grazing management practices.

A report was published in 2009 on the outcomes of producer consultation on constraints to more widespread adoption of sown subtropical grass pastures in northern inland NSW. Reasons given for the relatively low adoption included difficulty and high cost of

establishment; perceived poor forage quality; susceptibility to frost; lack of knowledge and practical experience with suitable companion legumes and establishing compatible grass/legume mixes; uncertainty about fertilizer requirements and optimum grazing management practices for high livestock productivity and sown pasture persistence; lack of evidence of comparative production and quality parameters between subtropical grass species and existing native perennial grass-based pastures.

A review written in 2011 reports significant areas of “poor”, sandy soils in the south coast and northern agricultural region of WA which are marginal or unsuitable for cropping have been sown to subtropical grasses, with substantial productivity and NRM benefits (reduced wind erosion, decreased deep drainage, increased soil carbon) demonstrated. However, grazing productivity is frequently below expectations due to one or more of the following-sub-optimal perennial plant density, over-grazing, low legume content and/or low fertility.

R & D to address Industry Needs:

R & D activities currently underway or recently completed in the target zones will address some of the industry needs identified above. Taking these into account, the following are proposed as R & D activities that warrant future investment by MLA and collaborating partners in a coordinated project across the three priority regions. These conclusions are based primarily on reviews of recent publications arising from work in each of the three target regions, as well as from priorities identified at a planning workshop involving producers, researchers, extension officers, consultants and seed producers from those regions, held in Sydney on 31st October 2011.

Project Title and Overall Aim:

Increase feedbase production and quality of subtropical grass based pastures through improved establishment and maintenance of legumes and other compatible forage components in targeted southern Australia red meat producing regions.

Proposed Project Activities:

1. Evaluate the effectiveness and survival of rhizobia for tropical legumes in a range of soil types in southern QLD/northern NSW
2. Evaluate the potential for tropical legumes (establishment techniques, persistence and productivity) to be included in mixtures with subtropical grasses in northern and central NSW and southern QLD
3. Evaluate the potential for incorporating temperate legume species into existing subtropical grass pastures on a range of soil types-establishment techniques, times of sowing, fertilizer needs and grazing management requirements
4. Evaluate the feasibility and economics of strategies to manage seasonality of forage supply from subtropical grass based pastures
5. Supporting sites-commercial scale integration, demonstration and evaluation of best practice in subtropical pasture management
6. Project integration

Table of Contents

1. Background	6
2. Project objectives.....	8
3. Methodology.....	9
APPENDIX	13
BIBLIOGRAPHY	13

1. Background

Following development of a Feedbase Investment Plan in 2010, MLA issued a call for projects on researchable feedbase issues for southern red meat producing regions of Australia. Several proposals received focused on the performance of subtropical pasture species in these regions.

MLA has resolved that the interests of a range of organisations and individuals to undertake R & D in this area be coordinated in order to collectively develop a single collaborative project for potential investments by MLA and partner organisations.

Target regions for future subtropical pastures R & D activities:

There has been strong interest in sowing subtropical grass and (to a lesser extent) legume pasture species in cleared forest areas for grazing cattle in southern QLD and north east NSW since the 1960s and '70s. In other areas, particularly northern inland NSW, and the south coast and northern agricultural areas of WA, there have been significant areas (over 200,000ha in each state) of subtropical grass species sown in more recent times-primarily since the 1990s.

More recently, interest has emerged in evaluating and trial sowing of subtropical pasture species in areas such as the central west and eastern Riverina in NSW, central and western Victoria and the mid north of SA. This growing interest has coincided with an 8-10 year sequence of low and variable rainfall in eastern Australia since 2000.

Drivers of expanding interest in these species have included a growing belief that perennial sown grasses and subtropical species in particular, have the potential to increase the resilience of farming and grazing systems that have previously been based primarily on sown temperate and volunteer annual pasture and crop species. This resilience is seen to be increasingly important to productivity in variable climatic systems and if climate change impacts unfold as forecast. Further, awareness of environmental and productivity benefits arising from reduced deep drainage, increased soil carbon and soil health and reduced erosion-that arise from increased ground cover achieved by perennial subtropical grass species, has been another important driver of growing interest in these species across a very wide range of environments in southern Australia.

With the limited resources of MLA and collaborating organisations to invest in new subtropical pastures R & D activities, the primary focus for that new investment will need to be limited to those regions with:

- The largest populations of red meat producing livestock, and
- Evidence of the prospects of subtropical species establishing and persisting under prevailing soil, climatic and land management conditions.

On these grounds it is proposed that planning for new investments by MLA and others in subtropical pastures R & D will be substantially focused on the following regions:

- Southern QLD
- Central and northern inland NSW
- South coast and northern agricultural areas in WA.

Flow-on benefits to other regions where meat producers are showing increasing interest in subtropical pastures should be kept in mind by MLA and collaborating agencies.

Industry Needs Analyses:

A number of reviews and targeted producer consultation processes have been conducted across the priority regions in the past two years, with the objective of determining industry needs and barriers to more widespread adoption of subtropical pastures. Although there are some needs and barriers that are common to all regions, the differences in climate, soil types and production systems are such that the industry needs will be presented here on a region by region basis.

One area of work that is needed across all regions, and which would benefit from a common or standardized approach, is the collection and analysis of data that will enable economic analysis of the costs and benefits of investments by red meat producers in establishing and managing subtropical pastures.

Southern QLD

The Peck et al (2011) review of productivity decline in sown grass pastures in southern QLD highlighted widespread declines in productivity and carrying capacity of sown grass (particularly buffel grass) pastures by up to 50% over the past 20 years. The decline in productivity is known to be caused by a lack of available nitrogen in the soil, as nitrogen and other nutrients become tied up in organic matter and roots and crowns of old grass clumps. However subsequent overgrazing exacerbates this decline and may lead to lower land condition. Introduction of legumes into the grass dominated systems is seen as the most likely solution although the southern QLD environment is particularly challenging as it is relatively cool for tropical legumes (prone to frost) and relatively too dry in winter and hot in spring for temperate legumes; establishment into grass dominated areas is difficult; establishing and maintaining effective rhizobium populations for legumes are difficult; phosphorus nutrition requirements for both legumes and grasses are significant on some soil types; and grazing management for persistence of legumes is different to traditional grazing management practices.

Central and northern Inland NSW

McCormick et al (2009) reported the outcomes of producer consultation on constraints to more widespread adoption of sown subtropical grass pastures in the region. Reasons given for the relatively low adoption included:

- Difficulty and high cost of establishment
- Perceived poor forage quality
- Susceptibility to frost
- Lack of knowledge and practical experience in suitable companion legumes and establishing compatible grass/legume mixes
- Uncertainty about fertilizer requirements and optimum grazing management practices for high livestock productivity and sown pasture persistence
- Lack of evidence of comparative production and quality parameters between subtropical grass species and existing native perennial grass-based pastures

Interest in such pastures has increased significantly during the past decade of dry and variable seasons and adoption rates have increased due to research and extension addressing some of the issues above.

South coast and northern agricultural areas in WA

Moore and Sanford (2011) report significant areas of “poor”, sandy soils in these regions which are marginal or unsuitable for cropping have been sown to subtropical grasses, with substantial productivity and NRM benefits (reduced wind erosion, decreased deep drainage, increased soil carbon) demonstrated. Kikuyu is the dominant species sown on the south coast with Rhodes grass and panic grass the dominant species in the northern agricultural region (NAR).

In the NAR, grazing productivity is frequently below expectations due to one or more of the following-sub-optimal perennial plant density, over-grazing, low legume content and/or low fertility. There is an opportunity to develop, demonstrate and promote agronomic packages for high production-high quality perennial grass-based farming systems for meat production. However a number of constraints have been identified:

- The reliable establishment and management of companion annual legumes to provide the nitrogen to drive production and improve feed quality
- The nutrient requirements and soil fertility targets for the main soil types-for both perennial grasses and different companion annual legumes
- Cost-benefit analyses of establishing companion annual legumes and high production systems

In the south coast region the area of kikuyu continues to expand, providing livestock production and NRM benefits, but a number of constraints to livestock production have been identified:

- Poor winter production in kikuyu dominated pasture
- Difficulty in establishing legumes and/or winter active annual grass to address poor winter production in kikuyu dominated pasture
- Lack of understanding of optimum macro and micro nutrient requirements of kikuyu based pastures

2. Project objectives

To build the background case and the project plan for MLA and Red Meat Co-Investment Committee partners to invest in a cross-discipline, cross organisation project to explore the following questions:

1. What are the major challenges associated with the use of subtropical pastures/species for red meat production in southern Australia? (with a primary focus on NSW, southern QLD and the south west of WA)
2. What are the opportunities to significantly improve the performance of and use of subtropicals in these regions and what would the likely impact be on meat production enterprises?

3. What is the appropriate R&D to address/overcome these challenges and what would be the appropriate design/operation and level of investment in such a project?

3. Methodology

Ian Rogan from Ian Maxwell Rogan Consulting has worked closely with Dr Suzanne Boschma, Senior Research Scientist with NSW Department of Primary Industries, to conduct this project. Dr Boschma, a scientist with significant experience working with subtropical pastures, contacted all known research groups around Australia with current or past R&D activity of relevance and compiled a significant literature review based on the material received from those groups.

Based on that literature review, a meeting with Dr Boschma and preliminary telephone consultation with key researchers and advisers/consultants, Ian Rogan produced a background discussion paper focusing on industry needs and R&D to date on subtropical pastures and related activities in southern/temperate red meat producing regions of Australia. That consultation also identified a group (12 in total) of livestock producers, researchers, advisers/consultants and commercial seed producers from the targeted regions who had significant experience with subtropical pastures in those regions. These people (see appendix for a list) and representatives of MLA were sent the background paper and were invited to attend a workshop to assist the planning of the new subtropical pastures R&D project. The workshop was held in Sydney on 31st October 2011.

The outcome of the workshop was consensus on the priorities for future R&D on subtropical pastures in these regions. Potential collaborators in future R&D activities were then invited to submit rationale, objectives, methodology, budgets and deliverables for different elements of those priorities. Submissions were received from the NSW Department of Primary Industries(NSWDPI), the Queensland Department of Employment, Economic Development and Innovation(DEEDI) and the Department of Agriculture and Food, Western Australia(DAFWA).

Ian Rogan prepared a draft proposal for new R&D activities to be conducted across three states (southern QLD, northern and central inland NSW, south west WA) over 5 years commencing in July 2012. The proposed project would be managed by NSW DPI, with collaborative elements involving DEEDI and DAFWA. The draft proposal was reviewed by project partners and submitted to MLA on 22nd December 2011.

Results

A proposal for a new, collaborative R&D project was developed and submitted to MLA for contracting. The project will be managed by NSW DPI and will involve significant collaboration between that organisation and QLD DEEDI and DAFWA.

Project title:

Increase feedbase production and quality of subtropical grass based pastures through improved establishment and maintenance of legumes and other compatible forage components in targeted southern Australia red meat producing regions.

Project components:

1. Evaluate effectiveness and survival of rhizobia for tropical legumes in a range of soil types in southern QLD/northern NSW.

Objectives

- test the potential of native rhizobia from soils in southern QLD and northern NSW to form effective nodules on key legume species currently considered to have specific rhizobia requirements;
 - test the relative effectiveness of different rhizobia establishment strategies in the difficult conditions (small seeds; hot/dry summers) that are common in subtropical pastures.
2. Evaluate the potential for tropical legumes (establishment techniques, persistence and productivity) to be included in mixtures with subtropical grasses in northern and central NSW and southern QLD

Objectives

- Test the suitability of tropical legumes at a range of sites with varying soil types and annual rainfall in northern and central NSW and southern QLD, and identify those species and cultivars that are most productive and persistent
 - Conduct component studies to better understand the agronomy of tropical legumes in these environments and develop agronomy packages
3. Evaluate the potential for incorporating temperate legume species into existing subtropical grass pastures on a range of soil types in northern and central NSW and SW WA-establishment techniques, times of sowing, fertilizer needs and grazing management requirements

Objectives

- Identify companion annual and/or perennial legumes which are persistent and productive in established perennial grass-based pastures
 - Develop reliable, cost effective methods for establishing legumes into perennial grass-based pastures
 - Determine the cost-benefit analysis of companion legumes
4. Evaluate the feasibility and economics of strategies to manage seasonality of forage supply from subtropical grass based pastures.

Objectives

- To develop and evaluate the costs-benefits of a range of management options to increase winter feed availability and quality in perennial grass based pastures.
5. Supporting sites-commercial scale integration, demonstration and evaluation of best practice in subtropical pasture management.

Objectives

- In collaboration with producer groups in target regions, evaluate the establishment, productivity and persistence of subtropical based pastures under commercial grazing conditions
- Determine the profitability impacts of best practice in subtropical pasture management
- Engage leading meat producers/producer groups in participatory R&D that is the first step towards increased adoption of subtropical based pastures for red meat production in southern meat producing regions

6. Project integration

Objectives

- Maintain effective communication between project partners (including MLA)
- Ensure all reporting obligations are met
- Maximize sharing of R&D outputs and communication of those outputs to industry

Discussion

1. Comments on the R&D planning process used and the lessons from this new, co-development model

To quote the terms-of-reference from MLA for this project....."This R&D project development must be carried out in accordance with the new, collaborative model endorsed by the Red Meat Co-Investment Committee (RMCiC). This involves the traditional funders and the traditional research providers collaborating in the development of projects that both groups are then committed to progressing. In this case, the process will involve MLA appointing a contractor to lead the project development process, and the RMCiC will appoint a "partner" from the R&D agencies as "co-leader". The contractor will provide the independence required in the process and bring producer, commercial and MLA linkages, while the agency partner will bring the connections to the research and extension teams across the RMCiC agencies and to the decision making processes within those agencies."

It is the opinion of both Dr Boschma (the R&D agency representative) and Ian Rogan (the independent contractor) that this process has worked well in the collaborative planning and development of this new R&D proposal. The strong involvement of both the independent contractor and the experienced researcher was equally important to the ultimate outcome. The engagement of informed producers, advisers/consultants as well as researchers in the planning process was critical, and successful. One slight weakness in the process was the absence, from the beginning, of a clear "proforma" and associated guidelines on the ultimate form of the R&D proposal required. This made it somewhat difficult to anticipate the level of detail required in some aspects of the proposal.

2. Plans for engagement of leading meat producers

The need for producer participation in the planning and implementation of this new R&D project has been clearly accepted by all parties. The following are examples of actual and planned actions that are evidence of this:

- A number of red meat producers from NSW and WA contributed to the project planning workshop (see Appendix for full list of participants). It is planned that this group will participate in annual reviews of project activities that are planned and resourced under activity 6-project integration
- Several surveys of producers in target regions were conducted in recent years to develop an understanding of constraints to more widespread adoption of subtropical based pastures. Reports of these surveys were reviewed during the analysis of industry needs in planning this project
- The planned methodology for some components of activities 1,2,3 and 4 (see previous section of this report) indicate an intention of project partners for planning and conduct of project activities on commercial, meat producing properties.
- An explicit component of the project , activity 5 (see previous section), will involve the planning of two to three commercial scale supporting or demonstration sites in each of the target regions for the project. The location and design of activities at these sites and their ongoing operation will be planned and implemented in consultation with existing or new commercial producer groups in those regions.

APPENDIX

List of contributors to a project planning workshop

The following producers, researchers, extension officers, consultants and seed producers contributed to a workshop held in Sydney on 31st October 2011 which developed the priorities for future R & D on subtropical pastures in southern red meat producing zones of Australia: Don Mack (NSW), Bob Wilson (WA), Morgan Sounness (WA), Bob Freebairn (NSW), Geoff Moore (WA), Brian Johnson (QLD), Suzanne Boschma (NSW), Carol Harris (NSW), David Lawrence (QLD), Lester McCormick (NSW), Phil Barrett-Lennard (WA), Allan Newman (NSW), Warren Mason (NSW)

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