final report

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Reducing the Cost of Pasture Establishment

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Executive Summary

The following are the key findings and recommendations from this Project:
The opportunities for reducing the costs of pasture establishment are limited and often outside of the control of producers (for example input costs).
The low rate of pasture sowing in southern Australia - which is the rationale for this Project - may well be related to the prolonged period of drought throughout southern Australia and its economic impact and not necessarily the perceived high cost and concerns by producers over persistence. By contrast anecdotal evidence suggests that the current improved seasonal conditions and high prices for livestock and wool is leading to renewed interest in pasture sowing.
There is a fundamental question over the actual methodology used for determining the cost of pasture establishment and this may be contributing to the concerns expressed by landholders over the cost of pasture establishment.
While the clear intention of this Project is to explore the various ways and means of *reducing* the costs of pasture establishment ("the primary focus for the project must be on the potential to reduce establishment costs" - TOR) most of the feedback and comments from industry specialists and producers relate to improvements in pasture establishment success and/or recommendations about pasture establishment in general, not necessarily to reducing these costs.
This is based on the recurring belief that *"the biggest cost of pasture sowing is failure...!"*
The techniques and methodology for sowing and establishing pastures are generally well understood and there is an overwhelming belief that most of the information about the successful establishment of pastures is already known. Farmers are well equipped with information on weed control, fertiliser requirement, seedbed preparation techniques and post sowing management for established new pastures.
The issue is therefore fundamentally about the extension and adoption on-farm of known best practice in the area of pasture establishment.
There are however some key areas which are not well defined or have no clear answers.
As a consequence of this Project three prospective areas have therefore been identified as necessitating further RD& E. These are:
Sowing Rates and Seed Mixes of Pastures
Time of Sowing / Spring Sowing of Pastures
Determining the Cost of Pasture Establishment

Contents

1. Objectives

In 2010, Meat and Livestock Australia Ltd acting as agent for the Red Meat Co-investment Committee (RMCiC) commissioned the development of a Feedbase Investment Plan in concert with the PISC process of developing national beef and sheep industry RD&E strategies.

The persistence of sown perennial pastures and the high cost of resowing these pastures have been identified as very important issues for meat producers and major factors affecting both the decision to resow (or not) and in the selection of species/varieties for resowing. As part of the development of the Feedbase R&D Plan, MLA called for project proposals – one of the submitted proposals [*New options for the establishment of perennial grasses in lower rainfall environments (PAM 55)]* focussed on establishment, but not specifically on reducing the cost.

The cost of pasture establishment in southern Australia is high ("around $350/ ha for temperate pastures") and, when coupled with a potential for failure, it appears that many meat producers have concluded that the payback time is too long compared to the expected persistence of the key pasture species.

As a result, resowing rates for perennial pastures are very low across all agro-ecological zones in southern Australia, so potential production, productivity and NRM outcomes are not being achieved. This is despite the development of newer improved varieties with higher genetic merit.

In response, MLA has undertaken two 'development studies' – one focussed on the issue of persistence (and how to improve it), and this Project which focuses on exploring the potential for reducing pasture establishment costs.

In summary the objective of this Project is to undertake a "knowledge and opportunity audit that identifies and prioritises prospective areas of RD&E aimed at reducing the cost of pasture establishment for common perennial and annual species across southern Australia.

2. Methodology

This Project is a collaborative one between Stuart Burge, Consultant Agronomist, Cooma, NSW; and Dr Zhongnan Nie, Senior Research Scientist, DPI, Hamilton, Victoria.

It has been undertaken in accordance with the new "collective development' model which has been introduced by the Red Meat Co-investment Committee (comprising MLA and its various Agency partners) for R&D Projects. This new model is aimed at improving coordination, investment efficiency and a strong focus on the needs of meat producers. Under this novel approach an industry specialist (Stuart Burge) is appointed to work collaboratively with a nominated expert from the RMCiC agencies (Zhongnan Nie).

A further appointed agency representative Brad Nutt from DAFWA was unable to participate in this Project and therefore the findings and recommendations are relevant only to the southern states of NSW, Victoria, Tasmania and South Australia.

The methodology developed and used in undertaking this Project and thereby addressing its stated outcomes are here briefly described. They are also apparent from reading the Discussion Paper in the Appendix.

A Survey Form (see Appendix) was developed by Stuart Burge with the input of Zhongnan Nie based upon the Terms of Reference as provided by MLA (see Appendix). This focussed upon the key components of pasture sowing and was used as a "blueprint" for generating discussion and providing feedback. In developing this Survey Form there was a recognised need to keep it "template driven" in accordance with advice from Cameron Allan from MLA in order to ensure that the feedback is more focussed and better able to be synthesised into a Discussion Paper.

This Form was distributed to all of our known “contacts” within the pasture industry whom we believed were able to contribute meaningfully to the outcomes of this Project. This included government agency staff (including researchers and advisory officers), seed company representatives, farmers, advisors, agronomists and consultants. In turn all of these personal contacts were encouraged to forward on to their respective contacts and work colleagues. These people were communicated by email and respondents replied either by email or by telephone.
A literature search was also undertaken by Stuart Burge and Zhongnan Nie to help identify those areas requiring further investigation and RD&E. Additional input was also provided by respondents to the Survey.
The feedback provided by the industry contacts was analysed and synthesised into the Discussion Paper. In accordance with the TOR this Discussion Paper is presented as a “narrative’ based on a mix of literature inputs, consultations with producers, advisors and experts on pasture establishment that identifies the current costs associated with all the aspects of establishing pastures and the options for reducing those costs.
The Discussion Paper was then sent back to key industry representatives for further feedback with the primary aim of identifying possible RD&E opportunities in accordance with the stated Project objectives. These are presented in the body of this Report under Conclusions. The input of researchers Dr Zhongan Nie and Dr Richard Hayes (DPI NSW) are recognised for their contributions in helping to develop the two proposed R&D Projects.

3. Final Report: Conclusions

The rationale for this Project is the acknowledgement that the level of pasture sowing is very low across all agro-ecological zones of southern Australia, so that potential production, sustainability and NRM outcomes are not being achieved. This is despite the development of newer improved varieties with higher genetic merit.

The Discussion Paper (see Appendix) – which should be read in conjunction with this Report - includes an overview of the process undertaken to achieve the above stated outcomes together with feedback from producers, researchers and advisors to a series of questions on possible ways to reduce the costs of pasture establishment.
As a consequence of that process three prospective areas have been identified as necessitating further RD& E (see below).
It is apparent – as outlined in the Discussion Paper – that the opportunities for reducing the costs of pasture establishment are limited. Indeed, there is a clear consensus of opinion amongst researchers, farmers and extension advisors that the issue is really about the adoption of known best practice in the area of pasture establishment.
It is also recognized that the (acknowledged) low rate of pasture sowing may well be related to the prolonged period of drought throughout southern Australia and its economic impact. By contrast anecdotal evidence suggests that the current improved seasonal conditions and high prices for livestock and wool is leading to renewed interest in pasture sowing.
While the clear intention of this Project is to explore the various ways and means of *reducing* the costs of pasture establishment (“the primary focus for the project must be on the potential to reduce establishment costs” - TOR) most of the feedback and comments relate to improvements in pasture establishment success and/or recommendations about pasture establishment in general, not necessarily to reducing these costs.
This is based on the premise and recurring theme that “the biggest cost of pasture sowing is failure .....”
Indeed there is an overwhelming belief that most of the information about the successful establishment of pastures is already known, the opportunities for reducing the costs of pasture sowing are minimal – and often outside the control of producers anyway (for example input costs) – and that this is fundamentally an issue of increasing the adoption of known best practice. In other words that this is largely one of extension.

Despite this, the following are the three potential areas of RD&E which MLA and its collaborative Red Meat Co-Investment Committee partners are encouraged to address within the context of achieving the Project's stated goals.

4. Sowing Rates and Seed Mixes of Pastures

4.1 Background

The objective of this Project is to undertake an investigation into the sowing rate and time of sowing of a range of pasture types and species across a representative range of environments across southern Australia. This will identify the desirable number of established plants that supports long-term sward health and persistence across different environments and should include single sowings and simple mixes. Soil moisture will be a key measurement for reference, rather than rainfall.

The hypothesis that underpins the R&D is that there will be optimum ranges of plant density in the pasture establishment phase to accommodate various soil and climate conditions for sustained plant health and persistence. Sowing pastures at inappropriate rates (e.g. too high or too low) will result in either strong competition and weaker individual plants or insufficient plant density or cover, which leads to poor herbage production and persistence. The R&D will aim to quantify the optimum establishment density of a range of perennial pasture species mixtures across different landscapes and environments (e.g. high, medium and low rainfall) in Australia. This information will be critical to reduce establishment failure, therefore the costs for perennial pasture establishment.

A key factor that influences pasture establishment and persistence is soil moisture which is affected by a combination of rainfall, soil (e.g. soil type, texture, organic matter content), temperature, slope and aspect (e.g. south-facing vs north-facing) conditions. There is a need to quantify the relationship between soil moisture and these factors so that success in pasture establishment can be meaningfully translated into rainfall/temperature, soil and landscape conditions often used by landholders. This could be investigated (field and glasshouse experiments and modelling) through a PhD or post-doctoral project.

4.2 Overview

The techniques and methodology for sowing and establishing pastures are generally well understood. Farmers are well equipped with information on weed control, fertiliser requirement, seedbed preparation techniques and post sowing management for established new pastures. However, there are areas which are not well defined or have no clear answers.

4.3 Gaps and opportunities

Sowing rate

Recommendations on sowing rate vary and are often in a range for individual species. For instance, recommended sowing rate could be 15 - 25 kg/ha for perennial ryegrass and 2 - 4 kg/ha for cocksfoot. Seed cost at 25 kg/ha increases by >60% compared with sowing rate at 15 kg/ha for perennial ryegrass and seed cost at 4 kg/ha doubles that at 2 kg/ha for cocksfoot. Which rate is the right rate? The higher or lower ends or somewhere around the middle? We don't know.

Sowing time

We know the advantages and problems of sowing pastures in autumn or in spring. However, we are uncertain about the optimum sowing time for specific species/types/cultivars. With climate change projections in mind, this issue becomes more complicated. How does

seasonal growth pattern affect the time of sowing? Is it best to sow winter-active types in autumn and summer-active types in spring? How does seed size affect the time of sowing? What's the difference between species (e.g. grasses vs legumes) in coping with environmental stress if they are sown in mixture?

Environmental impact
Rainfall, temperature, wind, radiation and soil type and texture all affect pasture establishment and post establishment plant health and persistence. Should we reduce the sowing rate with reduced rainfall/moisture to ensure less inter-plant competition and long-term plant health and persistence, or on contrary increase the sowing rate to achieve enough established plants? What is the best indicator of these climate and soil parameters that can be used to develop appropriate sowing strategies for a range of environments? What is the ideal established plant density for different environments?

Pasture species and types
Recommendations on pasture establishment are generally made on species. However, there are large variations between different types (e.g. summer active vs. winter active, erect vs. prostrate, diploid vs. tetraploid, large leafed vs. fine leafed), not to say different cultivars/lines within a species. What is the optimum sowing time and rate for these types? How do they interact with environmental variations? How do they interact with companion species in mixtures?

4.4 Proposed work

The proposed project aims to answer most, if not all, of the above questions. Firstly, there will be a need to develop an environmental stress index that can be related to establishment and post establishment performance of pastures. Soil moisture may be used as such an index since its value depends on a combination of climatic and edaphic factors. Secondly, there is a need to assess a large quantity of establishment attributes (species/types, sowing rate, environmental stress) and quantify the relationships between these attributes. This can be done under controlled environmental conditions. Finally, a need to validate these relationships across a range of environments that could vary in annual rainfall, slope and aspects and soil types/textures. It is highly likely that these environments will be different regions across southern Australia, and representative pasture species/types will need to be tested for each of the regions.

4.5 Methodology

The project will have 4 linked phases, progressing in sequence.

Phase 1 – Define environmental stress indices
This will be a desktop study to define the most relevant environmental stress index/indices that can best represent a combination of climatic and edaphic impacts on pasture establishment and performance. Factors such as weeds, pests and diseases will not be considered since there has been scientifically validated information on their controls. Soil moisture may be a good indicator for this purpose; however, more appropriate indices can be defined through in-depth review of current and previous studies and modelling.

Phase 2 – Establish relationships
When environmental stress index/indices are determined, relationships between the indices and a number of sowing factors such as species/types, sowing rate and established plant numbers can be examined and quantified through controlled environment experiments. The results from these experiments will clarify a number of issues/queries. For instance, how

various species/types respond to environmental stress? What is the mortality (or survival) rate of those plants along the gradient of stress index? What is the impact of sowing rate on seedling survival under different stress levels? The information will be useful to develop guidelines for perennial pasture establishment.

Phase 3 – Field validation
This will be a major component of the project. Selected representative species/types will be sown at different sowing rates and time across different regions in southern Australia. Environmental stress indices and a number of establishment parameters (e.g. germination, seedling vigour and survival, established plants etc.) will be monitored during the establishment phase. Post establishment performance of pastures (density, yield and anti-nutritional factors etc.) will be examined for at least 2 years. These experiments will not only identify how successful the establishment will be in given treatment conditions, but also how pastures perform and sustain post establishment.

Phase 4 – Development of guidelines
Perennial pasture establishment guidelines will be developed based on the results from Phases 2 and 3. Likely outcomes in the guidelines include:
- Recommended sowing rates for individual species/types in given environmental conditions
- Recommended sowing time for individual species/types in given environmental conditions
- Required established plant number for individual species/types and in given environmental conditions for optimum post establishment performance
- Differences in response to environmental stress levels between species/types
- Differences in response to sowing time between species/types
- Pasture mixes – recommended sowing rates and time (limited mixtures only)

The information will assist farmers to reduce their establishment failure and save costs with the right sowing rates and sowing time in their given environmental conditions.

4.6 Collaborators

The work will be focused on perennial pasture systems in temperate Australia. Potential collaborators may include: Victoria (J Jacobs, Z Nie, V Burnett), ACT and SNSW (R Culvenor, G Sandral), NNSW (C Harris), SA (A Humphrey, A Craig), WA (P Sanford), Tasmania (E Hall).

4.7 Budgets

The table below provides a time schedule for the activities to be conducted in this Project which helps to explain the budgeting process. The proposal is for a 4.5-year project with major field work (Phase 3) being done in 3 years (years 2 - 4). Phase 1 will be desktop studies including some modelling work to define environmental stress index. This will be completed in the first half of year 1. Phase 2 is an experiment in a controlled environment (e.g. glasshouse) to identify relationships between the index and a number of establishment attributes. Most work of the phase will be completed in the second half of year 1. Based on the findings from these two phases it will then be possible to design the field validation work to be conducted over a range of environments. It is proposed 3 years for this work because that will enable it to address the success of establishment in association with the subsequent pasture yield and population change (botanical composition and frequency). Unfortunately it will not be possible to adequately address the persistence issue given the time frame. Phase 4 will be data analyses, developing guidelines and writing up papers (first half of year 5).

Proposed time schedule for pasture establishment activities

Activity	Year 1				Year 2				Year 3				Year 4				Year 5	
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2
Phase 1																		
Phase 2																		
Phase 3																		
Phase 4																		

In terms of developing a Budget it is difficult to accurately do so without details of staff, sites, operation costs etc. in hand. So the following budget is understandably only a guide and may vary considerably when using the costing models:
Phase 1 and 2: These two phases will be largely completed in year 1. It is estimated that about $100-150K will be needed to cover materials/devices, TO's time and time of a modeller.
Phase 3: Ideally there should be at least 4 - 5 sites (locations) across the states in southern Australia. A minimum of 3 sites is required to have trials over low to high rainfall environments. We also need to have trials to be sown in autumn and spring. For each trial, the budget is $60k - $80K per year. Therefore, if we run two trials (spring and autumn sowing) in a state, the budget is $120k - $160K per year. The budget will cover establishment of the trials, TO's time, operating costs etc. If two trials can be run in one site, it may save some costs.
Phase 4: This will be for half year only. It is estimated that this budget is $100-150K depending on how many sites we have.
So the total budget, using 3 sites in phase 3 as an example, will be $100-150K + 3 *3* ($120k - $160K) + $100-150K = $1280K - $1740K for 4.5 years. This is on the basis that the collaborating organisations will have in-kind contributions for all/most of their science staff.

5. Time of Sowing / Spring Sowing of Pastures

5.1 Overview

In the high rainfall permanent pasture zone, farmers need more flexibility in their sowing window. Autumn is typically too dry to establish pastures, winter is often too cold to promote pasture growth, and in many regions, the majority of rainfall is received from October - March.

However, the capacity to establish pastures outside the normal March - June planting period is constrained by the inability of legumes to flower and set seed following a late planting. This is because most annual legumes require photoperiod or temperature signals to trigger the transition from the vegetative to the reproductive growth stage. Legume seed set is critical to the establishment of a resilient legume base in pastures.

The use of perennial legume species would overcome this, as they do not require seed-set in the establishment year in order to ensure persistence for the life of the sward. However, few perennial legumes persist adequately in Australia, outside the very high (>850 mm) rainfall zones. Also, it is not clear that a perennial legume would persist adequately in a perennial-grass based pasture sward due to competition between two classes of perennial species, as well as management (eg grazing strategy) inevitably favouring one over the other.

The most fruitful option would be to develop annual legume technologies to enable perennial grass/annual legume pasture swards to be sown outside the normal autumn sowing window.

5.2 Research project

An opportunity currently exists to exploit the range of traits currently available in the new annual legume species recently released onto the Australian market and test their capacity to set seed at different sowing times. The novel legumes comprise species with different levels of hard seed, different hard seed break down patterns, delayed germination, smaller seed size and other traits that may lend them more to 'out of season sowing' compared to traditional subclover varieties.

However, it needs to be recognised from the outset that (thanks to the investment over 15 years by GRDC) most of the novel legumes were developed specifically for cropping zone environments. There may be no product currently on the shelf that would fit directly into perennial grass based pastures in the PPZ. That said, it would be expected that this research would at the very least identify species that could be further developed for this context, and provide insights into the specific traits that would need to be inserted into the existing cultivars for their deployment in this context.

5.3 Draft experimental design

There are two main approaches that could be explored here. First, a screening of the new annual legumes to determine how late they can be sown before seed production declines substantially. This work was done on subclover in the 60's and 70's, and perhaps (if one looked at the literature) for one or 2 other species, but has not been quantified for the cohort of alternative annual legume species that are now available. Ideally, this study would also determine the signals for these species (eg photoperiod, temp etc) in order that results can be extrapolated to contrasting environments, or contrasting years.

Suggest: A series of field trials (at least 3) spanning a range of environments eg North NSW, Sth NSW, Tas, WA conducted over 2-3 years which includes multiple species x sowing time as treatments. The studies would be small plots because they would probably need to be irrigated to reduce the effect of season. The objective of this study would be to answer the question 'under non-limiting moisture & soil nutrition conditions, what is the capacity for each of these species to set seed with different sowing times at sites of different latitude?'

The 2nd approach is to assume that there is a limit beyond which time no legume species can be sown and expected to set seed. In this instance, farmers could rely on sowing hard seed with their grass in year 1, expecting the legume not to emerge until year 2. This twin sowing approach is being widely promoted in the cropping zone as a way of undersowing pasture with the last crop of the cropping phase. I am proposing to utilise the technology in a perennial pasture context. However, as previously mentioned, the new legumes were developed with cropping environments in mind so it is unclear how well current cultivars will work in cooler, higher altitude, higher rainfall environments. Subclover cultivars that typically work in this zone have relatively low levels of hard seed.

Suggest: A staged experimental program. First, we need to assess the capacity for existing cultivars to be sown as hard seed and emerge the following year. This would need to be done under normal seasonal conditions, so would need to be repeated over at least 2 years. 3-4 sites would be ideal, and there would be no reason these trials could not be co-located with the trials described previously. This initial trialling will provide a shortlist of species that would then undergo more intensive work. It may be that different sites show success with different species, which could perhaps be attributed to seasonal factors. It will be important to understand the patterns/mechanisms for hard seed breakdown of this subset of species to

enable recommendations to be made to farmers wishing to undertake this practice. It may also be that further cultivar development is required for a species to be used in this way. This research would inform the extent and nature of the change required for the target species.

5.4 Budgets

Ideally there should be 4 nodes of activity: NNSW (DPI, Boschma), SNSW (DPI, Hayes/Sandral), Tas (UTas, Hall), WA (CSIRO, Norman?), with Andy Craig in SA (SARDI) as a (potential) collaborator. The team would add input to the above, but ultimately set about repeating the same trials across the country.

The best case scenario would be to allocate a $ value for each site eg $30 000 per site, 2 trials per site. Some groups would be in a position to take this on on that basis.

Other groups will not be able to take this on because they will have no spare capacity, so will need at least 0.5 of one position = $60 000 per group

Then, for more intensive work (eg assessing patterns of hard seed breakdown), it would require a full time position =$120 000. This may be instead of the site cost, rather than on top of. There may also be some capacity to manage the project by having one core node of activity, with satellite site which simply send samples back to the core for further processing. This core site probably could not be in WA due to restrictions on importing seed & soil.

6. Determining the Cost of Pasture Establishment

This has a major extension focus as opposed to the previous R&D Projects.
Central to any discussion about reducing costs of pasture establishment is the fundamental need to address the question of how those costs are actually determined.
It is generally acknowledged that there is a genuine need to get a better understanding of the true costs of pasture establishment and, furthermore, to promote the methodology for determining those costs amongst farmers and advisors.
It is evident that common practice has been for the cost of pasture sowing to be determined at a particular point of time – usually as part of an annual state-wide budgeting process (for example livestock gross margin budgets) - and that this budgetary figure then becomes a generalised ‘industry standard’ (for example $350 per hectare) irrespective of changes in input costs and livestock returns. Furthermore it also becomes ‘accepted’ that it takes “x” number of years to break-even ...
Accordingly a common concern expressed amongst respondents to this Project’s survey is that pasture sowing budgets are invariably outdated and often paint an unrealistically negative picture of the true cost of pasture establishment. Furthermore they do not allow for the variations or differences between farms, individual paddocks within the same farm nor the year or season when the pasture renovation took place (as this affects the time period before the paddock can be stocked together with the stocking rate).

(Allied to this is a question over the concept of ‘payback period’ which is used as a major determinant of the economics of pasture sowing. However the common Tools (see below) do adequately allow for the variability outlined above).

It is also apparent that while the focus in this Project is upon the *costs* there is also a need to emphasise the *benefits* of pasture sowing. Indeed, if the overall premise behind this Project is to be achieved – namely to “encourage the adoption of improved cultivars with higher genetic merit that can deliver improvements in livestock production and nrm benefits” – then it could be argued that there is a greater need to focus here than the costs (which have more of a negative connotation).

This will be discussed more fully in the section on Communication.
A key recommendation from the Discussion Paper is to:

"Develop an industry accepted Tool (or Economic Model) which provides a meaningful, accurate determination of the true cost of pasture establishment. Importantly, this Tool should be transparent, straightforward and easy to understand. It should be updated regularly to accommodate rapidly changing input costs and livestock returns. It should be promoted and accessible via a range of industry and government internet websites including MLA's".

There are two such Tools which are suitable for achieving this Purpose both of which are very similar. Importantly both Tools allow individual landholders to undertake their own "personalised" cost/benefit analysis of pasture establishment. In doing so they address some of the principal concerns expressed about the generalised pasture sowing budgets mentioned previously including notably the issue of pay-back period.

In New Zealand the innovative *Pasture Renewal Charitable Trust* has developed a "Cost-Benefit Analysis Spreadsheet Calculator" for a use with a range of different enterprises. This Tool is a key component of an industry wide program designed to "increase the rate of pasture renewal" within the NZ grazing industries and as such is just one of a number of initiatives produced to help achieve that goal.
The purpose of this Tool is to "analyse the direct costs and benefits of pasture renewal" and the spreadsheet is set-up in three sections: Paddock Characteristics, Costs and Cost-Benefit analysis.
Section 1: 'Paddock characteristics and cost of any capital development' provides an opportunity for farmers to record why the pasture in the paddock needs renewing and what corrective procedures may be required.
Section 2: 'The activities, materials and costs for the re-grassing programme' allows farmers to enter their own actual costs and can therefore be used as a stand-alone cost estimation.
Section 3: 'The cost-benefit analysis' identifies the likely returns, and the factors which have the biggest impact. A sensitivity section shows the financial impact of achieving lower or greater pasture yield than expected.
It is noteworthy – and given the feedback on this subject as outlined in the Discussion Paper – that the following financial indicators are used: total investment cost ie establishment cost ($); return from new pasture in Year 1($); return on investment (internal rate if return); and break-even point (years).
The second Tool and the one recommended in this Report is the *Evergraze* 'Pasture Improvement Calculator' which has been developed to "help work out the costs and benefits of resowing pastures". The tool allows inputs of costs of resowing, the benefits of the resown pastures to livestock, soils and the environment at any given financial values (ie different interest rates, tax rates, gross margins etc).
The Pasture Improvement Calculator contains all of the above features contained within the NZ one (albeit in a different format) as well as several other notable and worthy inclusions (for example the comparison of two different resowing options compared to current practice). Most importantly it has the considerable advantage of being developed specifically for Australian conditions (and livestock enterprises) by researchers and advisors working locally. It is also currently available on both the *Evergaze* and MLA websites.
Again like its NZ counterpart the Pasture Improvement Calculator is designed to work out the value of spending money now to resow or oversow a pasture and the dollar value over the next 10-15 years discounted to current values. The program uses the discounted cash flow technique to evaluate both the economic profitability and financial feasibility of a proposed investment in pasture improvement. It also shows the cash flow over this period and the break-even year (when the additional returns are greater than the initial costs plus interest).
It is evident therefore that both Tools are based upon the concepts of 'pay-back period' and internal rate of return for determining the economic worthiness of investing in pasture

establishment. In doing so it is consistent with the economic rationale and methodology used by similar such decision support Tools including the 'Five Easy Steps Phosphorus Tool'.

While the Pasture Improvement Calculator is an excellent tool and is available now on both the MLA and *Evergraze* websites it is of concern that most if not all of respondents to the Project survey - including researchers and advisors - were unaware of it and certainly not using it ! This reinforces the need for an extension campaign to promote its use.

6.1 Communication

With the exception of the two R& D Projects indicated above this overall Project effectively comes down to one of communication and adoption.
In the first instance communication of already known "best practice" in the field of pasture sowing technology (including the use of the Pasture Improvement Calculator) and secondly the extension of new information as it becomes available both from industry and government research.
This emphasis upon communication and extension of known technology is a clear and consistent message from most advisors and consultants to the pasture industry. This is based on the general consensus that establishment techniques for perennial temperate grasses and legumes are well developed and understood and that most states have detailed guides to assist producers.
The question then becomes one of how best to develop and undertake an effective communication strategy.
There is a clear need to promote best practice pasture establishment guidelines. In this regard the point of sale is identified as being a critical focus point for the dissemination of information to farmers and promotion of these guidelines. A targeted extension campaign must be directed to those distributors and retail outlets where farmers purchase their pasture sowing inputs, most notably seed.
It is also acknowledged that there is also a fundamental need to develop and undertake appropriate training and education of these people.

As outlined in the Discussion Paper it is recommended that a pasture management 'package' is developed which includes the following components as a part of a '*Four Point Plan'*:
1 *Why sow pastures* ie what are the *benefits*
2 What does it *cost*
3 *How* to successfully establish pastures ie what are the keys to success
4 Management of those pastures to ensure long term survival ie *persistence*

In relation to the above Four Point Plan the following are further recommendations to assist in bringing this about:

Why sow pastures ie what are the benefits
It is recommended that a program be developed similar to that of the Pasture Renewal Charitable Trust (PRCT) in NZ (see www.pasturerenewal.org.nz). The PRTC Project involves 14 agribusiness companies who have joined together *"to work collaboratively to promote the value of more frequent pasture renewal on New Zealand farms".*
The concept of using a 'Product' – in this case an e-book – based upon the theme of '*The Power of Pasture'* and entitled "*How to Be More Popular With the Girls*" with a further catchy by-line '*Find out how to make your pasture irresistible to your stock and increase their productivity'* demonstrates a particularly innovative approach to marketing and it is further recommended that a similar such approach be used in Australia.
There is also a series of Testimonials highlighting the benefits of pasture renovation all of which reinforce the commitment to improving and increasing the area of sown pastures in New Zealand.

Recommendation:
The PRCT concept and its contents should be used as a blueprint for a similar such Program and initiative within Australia. It includes all aspects of sowing pastures including all of those outlined in the 'Four Point Plan' above.

What does it *cost?*
This was discussed previously in the section on Determining the Cost of Pasture Establishment with the following recommendation:

Recommendation:
Develop an industry accepted Tool which provides a meaningful, accurate determination of the true cost of pasture establishment. Importantly, this Tool should be transparent, straightforward and easy to understand. It should be updated regularly to accommodate rapidly changing input costs and livestock returns. It should be promoted and accessible via a range of industry and government internet websites including MLA's.

It is further recommended that the *Evergaze* Pasture Improvement Calculator be accepted and promoted as that Tool.

How to successfully establish pastures
As mentioned previously, there is a general consensus that pasture establishment techniques are well developed and understood for most pasture types and there are numerous publications which provide clear guidelines about successful establishment of most known pasture types. Despite this, the incidence of sowing failure is reported to be high. It is clearly evident therefore that yet again there is an extension problem in translating that existing information into on-farm practice.
Where new species and pasture types are being released onto the market with their own unique establishment requirements then there will be a need to develop appropriate packages for these. For example some of the new annual legumes and medics would possibly need their own agronomy packages.
Recommendation(s):
A major extension program should be initiated in this area. A program such as the Prime Pastures Program in NSW in the 1990's should be used as a starting template. There is a need for a working group of key stakeholders (agency/industry) to help develop this program.
A major focus of the extension program should the agricultural retail outlets as well agricultural advisors – both public and private.
The Pasture Renewal Charitable Trust in NZ again represents a worthy blueprint for such a Program.

Management of those pastures to ensure long term survival ie persistence
This particular Project is complementary to a similar one which focuses on the persistence of sown pastures "*Researching the Pasture Persistence in Mixed Swards*".
It is recommended that the key findings from that Project should be incorporated into the management package(s) being developed here.

6.2 Education and Training

A recurring theme amongst a number of people, especially those in the seed industry, was the concern expressed about the inexperience of many agricultural retailers and advisors together with the fact that the overall level of knowledge and understanding about pasture management, especially pasture sowing, was generally very poor / inadequate.
A number of suggestions were offered as to how this may be remedied and these are described in the Discussion Paper.

Recommendation(s):

It is recommended that appropriate training and train-the-trainer “Pasture Courses” or programs should be developed which address this ‘skill shortage.’

It is further recommended that industry wide mentor(s) be engaged whose role is identified, promoted and described as having responsibility for undertaking such training. They will also be responsible for developing and updating the management guides on a regular basis as new knowledge and the results of R&D programs become available. They will also have responsibility for promoting and demonstrating the Pasture Improvement Calculator.

In effect they will become ‘independent’ resource people or industry specialists who can be engaged by industry to assist with training of both advisors (train-the-trainer) and landholders as necessary. Because of the acknowledged importance of the ‘point of sale’ in the seed industry then in the first instance agricultural retailers should be prioritised. These industry mentors should be employed on a casual contract basis.

A further proposal is that of accreditation of those individuals who have undertaken appropriate training in order to maintain industry standards.

7. Appendix

Discussion Paper
Reducing the Cost of Pasture Establishment Project

Process

This Project is a collaborative one between: Stuart Burge, Consultant Agronomist, Cooma, NSW; and Dr Zhongnan Nie, Senior Research Scientist, DPI, Hamilton, Victoria.
The contents of this discussion paper are based upon the following sources of information.
A Survey Form (see Appendix) was developed by Stuart Burge with the input of Zhongnan Nie based upon the Terms of Reference as provided by MLA. This focussed upon the key components of pasture sowing and was used as a "blueprint" for generating discussion and providing feedback.
This Form was distributed to all of our known "contacts" within the pasture industry whom we believed were able to contribute meaningfully to the outcomes of this Project. This included government agency staff, seed company representatives, farmers, advisors, agronomists and consultants.
These people were communicated by email and respondents replied either by email or by telephone.
A literature search was also undertaken by Stuart Burge utilising his own resources as well as key references provided by Zhongnan Nie and others as part of the Survey.

Preliminary Comments and Feedback

This Project is aimed specifically at addressing and exploring the various ways and means of *reducing* the costs of pasture sowing / establishment. As stated clearly in the TOR: "the primary focus for the project must be on the potential to reduce establishment costs".
Despite this clear intention, much of the feedback and comments relate to improvements in pasture establishment success and/or recommendations about pasture establishment in general, not necessarily to reducing these costs.
This is based on the premise and recurring theme that "the biggest cost of pasture sowing is failure .....".
To quote Dr Richard Culvenor from CSIRO: "*all this information aims to increase the success of sowing pastures rather than explicitly reducing costs but chance of failure is a factor in sowing costs".*
It should also be acknowledged that several respondents expressed considerable concern with the title of the Project itself and indeed its overall intention. This is best captured in the following feedback from John Evans of Heritage Seeds:
"Focussing on reducing the cost of pasture renovation is an inherently flawed approach as there is little to be gained and it sends the wrong message. A better approach would be to focus on quantifying and improving the returns from pasture renovation and avoiding pasture failures, which are no doubt the biggest cost in pasture renovation."
"The focus on reducing the cost of pasture renovation will most likely lead to lost production through a focus on cheaper inputs and therefore reduced returns. A more productive process would be to focus on improving the returns from improved pasture"

"The biggest cost in pasture establishment will be a failure, which is more likely if the focus is on reducing costs. With the focus on reducing costs, there may be the tendency to cut corners in paddock preparation, weed control and fertility etc, which may lead to establishment failures or poor performance of the new pasture"

"There is more to be gained from focusing on improving the returns from pasture renovation. That is, ensuring that best practices are used in paddock preparation, the appropriate species or species mix is selected for the application and the pasture is managed appropriately, including utilizing the extra feed grown".

These views were also reinforced by Tim Ekberg of "Farming Answers" Milawa, Victoria who has undertaken a considerable amount of work in this field and who has expressed some very passionate opinions. The following is representative:
"I think there is enough information about how to sow paddocks to achieve success. However, farmers will often:

- *take short cuts (inadequate weed control)*
- *use inadequate machinery*
- *not put seed and fertiliser together*
- *not check the paddock after sowing to determine germination and pest and weed problems*
- *Not treat weed or pests*

And I have only just started !!!".

Related to this 'theme' too is the fact that several people questioned what <u>is</u> the actual (true) cost of pasture establishment; how this is calculated; and whether the supposed "high" cost is in fact a perception and not a reality. This is best captured with the following quote from Richard Hayes (NSW DPI): "*There is no doubt pasture establishment is a substantial cost to a livestock enterprise. However, I argue that one of the major obstacles to be overcome is the way in which we perceive the cost"*. Implicit here is the concept of "payback period".
A similar related comment is the viewpoint expressed by several respondents – and inferred by others - that 'there is little that can be done because most of the major input costs are outside our control'. Again this is best described in the response by Rob Shea on behalf of the executive of the Perennial Pasture Systems group in western Victoria:
"There are no real ways that farmers can reduce establishment costs. Obviously reduction in seed, fertiliser, chemical and fuel prices would be beneficial but they are out of the farmers control. The general agreement was that the real need is to reduce the risk of failure and to enhance the possibility of a good result".

(Significantly, the chair of that group, landholder Tony Roberts subsequently provided a very considered and comprehensive overview of the keys to ensuring pasture sowing success. A response which in many ways encapsulates the attitude of many people surveyed on this subject).

Despite these comments, it is important to reiterate the stated brief of this Project which in the TOR states: "In some ways, the approach might be stated more broadly as 'reducing the payback period of sown pastures and while this might identify other important processes, the primary focus for the project must be on the potential to reduce establishment costs".

For these reasons, and using the information sources previously described, this Discussion Paper will be divided into two segments:

Factors which have been identified which lead to a <u>reduction</u> in the cost of pasture sowing. In other words deliberately addressing the requirements of this Project; and secondly Factors contributing to improvements in pasture establishment success which, if adopted, minimise sowing failure (and hence indirectly therefore to reducing the cost of pasture establishment).

<u>Determining the Cost of Pasture Sowing</u>

However before we do so, it is important to firstly address the issue relating to determining the cost of pasture sowing which is of fundamental importance to this overall discussion. Understandably the Project title infers that the cost of sowing pastures is high and, according to the Project TOR is seen to be a barrier by farmers to increasing the area sown to improved pastures.

'Establishment costs are high (around $350/ ha for temperate pastures) and when coupled with a potential for failure, it appears that many meat producers have concluded that the payback time is too long compared to the expected persistence of the key pasture species'.
It is apparent that few people – including both farmers and advisors – can readily quantify the cost of sowing pastures and provide a realistic, accurate and most importantly updated breakdown of the various cost components.
There is a clear viewpoint amongst several respondents, including most notably Richard Hayes from NSW DPI, that there is a need to "*get a better understanding of the true cost of pasture establishment*". Furthermore he suggests that "*our current advice on the costs associated with pasture establishment are simplistic and, in some cases, flawed*".

A critical aspect of his concern is that most pasture sowing budgets are outdated and expressed in terms of a 'pay-back period' often using out of date input costs and livestock returns. Importantly too such an approach is, by definition, a retrospective and generalised measure which does not allow for variations or differences between farms, individual paddocks within the same farm nor the year or season when the pasture renovation took place (as this affects the time period before the paddock can be stocked together with the stocking rate).

For example there is a perception amongst landholders – as well as many advisors and researchers - that 'the cost of pasture sowing is $350 /ha (this figure of $350 /ha is quoted regularly) and that it takes an unacceptably long period of time to pay this back'. Indeed such an attitude is at the heart of this Project. According to Richard and others surveyed "*such overtly negative economic advice is a major impediment to the rate of increase of pasture renovation".*

By contrast, according to a number of farmers questioned and advisor respondents who work closely with their farming clients, the true pay-back period is seen to be much shorter and that the economics of pasture sowing are indeed very attractive.

This is concisely and best explained in the following quote from Alan Humphries of SARDI South Australia:

"Economic analysis often paints a very poor picture of the opportunity cost of improving pastures. When we speak to farmers, the reality is that re-sowing and improving a very poor pasture with a more productive species can be repaid within 2-3 years. We need sensible economic analysis that shows that pasture renovation and maintenance are essential practice".
This is echoed by Steve Clark and Maggie Raeside from DPI Victoria:

"A final comment is that we feel the pay-back period for new pastures is often way too long and in some circumstances pay-back can be much quicker".

Recommendation:
Develop an industry accepted Tool or Economic Model which provides a meaningful, accurate determination of the true cost of pasture establishment. Importantly, this Tool should be transparent, straightforward and easy to understand. This Tool (or Economic Model) should be updated regularly to accommodate rapidly changing input costs and livestock returns. It should be promoted and accessible via a range of industry and government internet websites including MLA's.

(According to Kate Sargeant, DPI Victoria and *Evergraze* Extension Coordinator, some of the thinking which underpins the *Evergraze* Pasture Improvement Calculator would be applicable).

Factors which lead to a Reduction in the Cost of Pasture Sowing

It is noteworthy that there has been no firmly expressed consistent message from respondents – including notably researchers - which clearly identifies research areas urgently needing further investigation specifically as they relate to reductions in the cost of pasture establishment. While some broad "suggestions" have been made which may contribute to this outcome, most feedback relates to the need to develop agronomic packages relating to new pasture species and cultivars and the adoption of new farming systems. Understandably pasture establishment is one component of such packages. Rather, the overwhelming weight of response to this Project topic relates more to the area of extension and adoption of already known best practices in the area of pasture sowing methodology.

Despite this, the following are a list of proposals which have been identified as contributing directly to reductions in the cost of pasture establishment.

1 Pasture Sowing Rates

It has been proposed by several people that there is a need to determine the optimum sowing rates for a range of different species of grasses and legumes across a range of environments. This should include both the more 'traditional' pasture types as well as the newer species and cultivars as part of the development of an agronomic management package.

This viewpoint is expressed by CSIRO's Richard Culvenor - and supported by others - that *"I detect a modern trend of recommending sowing rates that are higher than necessary."* Richard however supports this belief with reference to research conducted previously by CSIRO and presented in a NSW DPI Prime Fact '*Summer Survival of Seedling Phalaris'.* One of the key findings of this research is the fact that a productive phalaris stand will have about 20–30 plants per square metre. A sowing rate of 1.5 kg/ha will distribute about 90 seeds per square metre. Under good conditions, approximately 20 plants per square metre will remain after the first summer. It is worth noting that these findings are for the low rainfall (<500 mm annual rainfall) environments.

A further significant finding in this regard was that 'size influences the plants' ability to survive over summer. On the basis that larger plants have higher survival rates it is evident that establishing an excessively high plant population which will result in smaller plants that are less able to cope with dry conditions over summer. This finding raises further questions about the recommended sowing rates of pastures, especially in those environments with a distinct and prolonged Mediterranean climate.

Similarly Kate Sargeant advises "*different sowing rates in different environments of a number of existing species could also be useful. I am not well enough across the research to say how much of this has already been done, but some good recommendations for sowing rates of standards like phalaris in a range of environments would be useful ".* Such an approach could also be justified on the basis that some of the newer cultivars are purported to have greater seedling vigour and adaptation to a range of environments (for example acid soils).

While there has been a considerable amount of recent investigation conducted by various seed companies on the sowing rates of some of the newer short term ryegrasses, especially under irrigation and under more favourable growing environments, it is suggested that a similar such investigations should take place across the board.

The focus here should include not only the 'older' more traditional varieties for which much is already known and documented but importantly too the newer ones developed in recent years whose *"unknown needs should be addressed in terms of pasture establishment". "Even with the new cultivars/lines (e.g. new cocksfoot, tall fescue or phalaris), people assume that the establishment and management guidelines for individual species would be applicable for them, which may lead to establishment failure".* (Zhongnan Nie).

Recommendation:
Undertake an investigation into the sowing rate and time of a range of pasture types and species across a representative range of environments across southern Australia. This will identify the desirable number of established plants that supports long-term sward health and persistence across different environments and should include single sowings and simple mixes. Soil moisture will be a key measurement for reference, rather than rainfall.
The hypothesis that underpins the R&D is that there will be optimum ranges of plant density in the pasture establishment phase to accommodate various soil and climate conditions for sustained plant health and persistence. Sowing pastures at inappropriate rates (e.g. too high or too low) will result in either strong competition and weaker individual plants or insufficient plant density or cover, which leads to poor herbage production and persistence. The R&D will aim to quantify the optimum establishment density of a range of perennial pasture species mixtures across different landscapes and environments (e.g. high, medium and low rainfall) in Australia. This information will be critical to reduce establishment failure, therefore the costs for perennial pasture establishment.
A key factor that influences pasture establishment and persistence is soil moisture which is affected by a combination of rainfall, soil (e.g. soil type, texture, organic matter content), temperature, slope and aspect (e.g. south-facing vs north-facing) conditions. There is a need to quantify the relationship between soil moisture and these factors so that success in pasture establishment can be meaningfully translated into rainfall/temperature, soil and landscape conditions often used by landholders. This could be investigated (field and glasshouse experiments and modelling) through a PhD or post-doctoral project.

2 Seed Mixes
A clear but somewhat ambiguous message which arises from both the feedback and the published literature relates to the contentious issue of seed mixes, selection of pasture species and in particular the use and advocacy of ‘shot gun’ mixes.
Increasingly famers are being advised to sow more complex mixes when sowing pastures often with a range of different species. The justification for this relates to the belief that such mixes contribute to improved productivity, competitiveness with weeds, and landscape adaptability.

Despite this, work conducted by Dr Jim Virgona and Shane Hildebrand questions such a practice. In a paper *Biodiversity and Sown Pastures: What You Sow is Not What You Get* the results of several studies into grassland and sown pasture diversity are reviewed and related to the results from a survey of sown pastures in southern NSW. These results show that complex mixtures don’t work in the higher rainfall zone of southern NSW because so few of the sown species survive over the medium to long term.

It has been further suggested by Steve Clark and Maggie Raeside from DPI Victoria therefore that the results of this work offer possible savings to the seed cost when the number of components of the mix is reduced to *“just a few which have the greatest chance of survival”.*

Such a viewpoint was supported by Richard Culvenor (CSIRO):

“Jim Virgona’s survey work in southern NSW on the success of sowing agronomist-recommended mixtures produced compelling evidence for species selection. Lots of complex and probably expensive mixes boiled down to 2 successful species in the end, sub clover and phalaris. Could be cost savings there”.
(As an aside, Steve Clark and Maggie Raeside in a joint submission suggested that a potentially useful Research Project into this area might include differential sowing times (e.g. summer-active Tall Fescue in spring oversown with a winter-active Tall Fescue the following

autumn) and spatially separating species in a paddock so animals get access to both and management can be individually targeted. However, again this is not directly related to reducing the cost of pasture establishment per se but more relates to developing new agronomic packages and novel grazing systems).
Despite these findings, several of the seed industry representatives have argued quite strongly that the inclination to recommend only a few of the more traditional pasture varieties - with higher levels of persistence - is denying landholders the opportunity to maximise their productive potential by using varieties with higher genetic merit . Therefore, there is an opportunity to evaluate new lines with potential genetic merits in simple mixes.
"The reality is that the genetic potential of new lines is reached by only a few farmers with good managing skills whilst the others dismiss the new lines as not being suitable to their system due to poor management".

3 Time of Sowing
In many parts of southern Australia the autumn breaks appear to becoming later and less reliable. This has led some agronomists and landholders to explore the option of late winter/early spring sowing of pastures. Such an approach has several advantages in terms of allowing farmers to extend the period of grazing through winter and increasing the chances of pasture establishment success.
On the down side it is not possible to sow annual clovers at this time and there is a greater imperative to sow only into good soil moisture in order to avoid establishment failure (ie if the spring finishes abruptly). It also raises questions of the suitability of some seed mixes (for instance lucerne sown in spring as part of a mix can be very competitive and dominate the sward).
The consequences too of late sowing of Phalaris in terms of reduced persistence was also highlighted in the research conducted by CSIRO during the 1960's and previously referred to in the Prime Fact. This work on the effect of sowing date on summer survival of phalaris demonstrated reduced survival with later sowing (ie after July at Wagga Wagga in NSW).
One claimed benefit of such an approach is that not only will the paddock be utilised for longer – and conversely the paddock not out of production for a shorter time - but there is a further reduction in the number of sprays required.
Despite this, and seen in the overall cost of pasture establishment – the spray savings from a spring sowing are negligible.

Factors contributing to Improvements in Pasture Establishment Success
As mentioned previously the overwhelming response to this Project related to improvements in pasture establishment success which, *if adopted*, will reduce or possibly even eliminate sowing failure (failure being regarded as "the biggest cost of pasture sowing").
Furthermore there was a general consensus that this Project is essentially an extension issue and the major thrust or emphasis should be upon developing and more importantly promoting successful pasture establishment guidelines. As Jason Hill from Seedmark succinctly observes *"everything comes down to extension – we have 95% or the answers to 100 % of the situations".*
Central to this is also the view that there is a fundamental need to promote the *benefits* of sowing improved pastures.
It needs also to be stressed that any management system that focuses upon pasture establishment must also include and address the management of those sown pastures for the long term ie for long term persistence.

Recommendation:
It is recommended that a pasture management 'package' is developed which includes the following components as a part of a '*Four Point Plan'*:
1 *Why sow pastures* ie what are the benefits
2 What does it *cost*
3 *How* to successfully establish pastures ie the keys to success

4 Management of those pastures to ensure long term survival ie persistence
Of course it could be argued – and indeed has been in the Project TOR – that *'over the past 15 years improved processes for establishing temperate pasture species (perennials and annuals) have been developed. Most states have detailed guides to assist producers once the decision to resow has been made'.*

Similarly Zhongnan Nie makes the point that *"there is a general consensus that establishment techniques for perennial temperate grasses and legumes are well developed and understood".*
(Although he qualifies this with regard to some of the newer varieties released in recent years whose *"unknown needs to be addressed in terms of pasture establishment".*
However, according to much of the feedback, especially the seed industry representatives and agricultural advisors/consultants who are close to "the coal face" the issue here is really one of adoption.
That is, there is a clear need to promote best practice pasture establishment guidelines. In this regard the point of sale is identified as being a critical focus point for the dissemination of information to farmers and promotion of these guidelines. A targeted extension campaign must be directed to those distributors and retail outlets where farmers purchase their pasture sowing inputs, most notably seed.
It is also acknowledged that there is also a fundamental need to develop and undertake appropriate training and education of these people (see feedback comments under Section Valuable Feedback in later section).
In relation to the above Four Point Plan the following are further recommendations to assist in bringing this about:

1 *Why sow pastures* ie what are the benefits
It is recommended that a program be developed similar to that of the Pasture Renewal Charitable Trust (PRCT) in NZ (see www.pasturerenewal.org.nz). The PRTC Project involves 14 agribusiness companies who have joined together *"to work collaboratively to promote the value of more frequent pasture renewal on New Zealand farms".*
According to Rob Salmon and in reference to this Project *"thinking about how to engage in a wider network of protagonists this model has worked very well and has some real traction".*
The concept of using a 'Product' – in this case an e-book – based upon the theme of 'The Power of Pasture' and entitled "*How to Be More Popular With the Girls*" with a further catchy by-line 'Find out how to make your pasture irresistible to your stock and increase their productivity' demonstrates a particularly innovative approach to marketing and it is further recommended that a similar such approach be used in Australia.

Recommendation:
The PRCT concept and its contents should be explored and used as a blueprint for a similar such Program and initiative within Australia. It includes all aspects of sowing pastures including all of those outlined in the 'Four Point Plan' above.

2 What does it *cost?*
This was discussed previously with the following recommendation:

Recommendation:
Develop an industry accepted Tool (or Economic Model) which provides a meaningful, accurate determination of the true cost of pasture establishment. Importantly, this Tool should be transparent, straightforward and easy to understand. This Tool /Economic Model should be updated regularly to accommodate rapidly changing input costs and livestock returns. It should be promoted and accessible via a range of industry and government internet websites including MLA's.

It is noteworthy Pasture Renewal Charitable Trust in NZ also includes a "Cost-Benefit Analysis Spreadsheet Calculator" for a use with a range of different enterprises.

3 *How* to successfully establish pastures

As mentioned previously, there is a general consensus that pasture establishment techniques are well developed and understood for most pasture types and there are numerous publications which provide clear guidelines about successful establishment of most known pasture types. Despite this, the incidence of sowing failure is reported to be high. It is clearly evident therefore that yet again there is an extension problem in translating that existing information into on-farm practice.

Where new species and pasture types are being released onto the market with their own unique establishment requirements then there will be a need to develop appropriate packages for these. For example some of the new annual legumes and medics would possibly need their own agronomy packages.

Recommendation(s):

A major extension program should be initiated in this area. A program such as the Prime Pastures Program in NSW in the 1990's could possibly be used as a starting template. There is a need for a working group of key stakeholders (agency/industry) to help develop this program.

On the basis that there is a general consensus that this Project is more one of extension than the need for further research, then it is further proposed that funding be prioritised to this area.

A major focus of the extension program should the agricultural retail outlets as well agricultural advisors – both public and private.

The Pasture Renewal Charitable Trust in NZ again represents a worthy blueprint for such a Program.

4 Management of those pastures to ensure long term survival ie persistence

This particular Project is complementary to a similar one which focuses on the persistence of sown pastures "*Researching the Pasture Persistence in Mixed Swards*".

It is recommended that some of the findings of that Project should be incorporated into the management package(s) being developed here. In doing so farmers will be presented with the essential 'complete picture'.

<u>Additional Comments/Thoughts</u>

The following is a list of thoughts and comments which have been included in this Discussion Paper for the purpose of generating feedback and possible inclusion in subsequent RD&E Projects.

- In relation to the development of a pasture establishment "sowing guide", various individuals suggested the need for a "recipe' approach to sowing pastures and, related to this, the need for a sowing 'plan of action'. That is, a prescriptive step-by-step guide which MUST be followed to guarantee success.
  The successful NSW Agriculture (NSW DPI) Prime Pastures Program utilised this approach which was based on the 'Prime Pastures Checklist.' It also introduced the concept of the 'three A's' of pasture sowing: 'Adequate' soil moisture at sowing; 'Accurate' seed placement; and 'Absolute' weed and pest control.
  Of course the 'recipe' or 'establishment package' – including especially pasture variety recommendations - needs to be tailored to different environments but the principles remain the same.
- The need and recommendation to undertake research on the sowing rates of pastures was raised previously in this Discussion Paper. However consideration should be given to developing a sowing rate recommendation based on that used by and promoted by GRDC for crop seeding. This formulaic approach is based upon

using the following factors when determining seeding rates: target plant density; seed weight; germination percentage; and establishment percentage.
The notion of a target plant density is seen to be a critical one as it allows for variability to accommodate differences in such things as environment, soil type, fertility, pasture longevity etc.
(It is also consistent with the development of sensible weed control strategies whereby a target plant composition is defined – in terms of both desirable and non desirable species).
Such an approach is implicit in the feedback comment from Alan Humphries of SARDI who poses the question:
"What really is the baseline level for different species and regions for which pasture re-sowing is warranted? (A lot can be achieved with strategic grazing or herbicide sprays to rescue a declining pasture)"

Valuable Feedback
The following are a list of issues raised by various individuals which contribute meaningfully to this discussion. They have been provided by highly experienced and reputable industry professionals and as such should be considered by a working group which may have responsibility for developing establishment guidelines and associated extension program. Some of these may be described as coming "out of left field" but nonetheless are certainly worthy of consideration in an attempt to change on-farm practice and increase adoption. In most cases they have been reproduced in their original format in order to convey the full meaning and integrity of the response.
Education and Training:
A recurring theme amongst a number of people, especially those in the seed industry, was the concern expressed about the inexperience of many agricultural retailers and advisors together with the fact that the overall level of knowledge and understanding about pasture management, especially pasture sowing, was generally very poor.

"Over the last few years – an appreciable void of knowledge / experience has been noted – largely due to a run of newly qualified but largely inexperienced advisors / agronomists joining the industry.
These new advisors need to develop some experience 'on the double' – the industry cannot afford to give them a lengthy timeline to develop the skills and experience levels."

A number of suggestions were offered as to how this may be remedied:

"Perhaps one way to achieve improvement is for intensive pasture courses to be run – possibly partially subsidised - encompassing such subjects as soil science and interactions with improved pasture species / methods of planting / pasture species and variety suitability / post sowing management.
Involve seed companies / fertiliser reps / agronomists /retailers/ successful growers and 'early adopters'.
Similar courses have been run successfully in the past (e.g. Prograze)."

The concept of accreditation of advisors as well as industry mentoring system was also raised:
"Create an industry wide pasture establishment and pasture management accreditation system for pasture agronomists, with several modules in each."

"Perhaps an industry wide accreditation program for pasture agronomists could be successful – to secure accreditation, one requirement could be for advisors to undertake their own R & D sites – with certain stipulations ('controls') in place across all sites and all regions.

"The clear benefit would be an immediate and ongoing rise in skill base – this would in turn offer many positives to both our industry and growers alike.
More experienced advisors in more regions with more answers not just order takers – a good start!!"

"With other parts of the industry e.g. commercial farm input companies (Elders / Landmark / CRT / key independent extension entities) – develop a database of both senior advisors who could operate in a mentor type role – along with junior, relatively inexperienced agronomists – perhaps initiate a buddy type system – consider online learning modules – senior folk to manage the progression of the younger folk through the modules."

Similar such comments are echoed below:
"The challenge for the industry is to get everyone up to speed with what we already know. Communication of new research results is often left to third parties such as seed, agricultural chemical and fertiliser companies and farmers usually think this data has less relevance as it is not impartial.
Resellers are also part of the problem. For example a reseller will hold a pasture update where seed companies come along and tell them and/or their growers what's new. The focus is always on selling new seed lines and not enough on management. This has resulted in some growers believing that a new variety will fix their problem.
The reality is that the genetic potential of new lines is reached by only a few farmers with good managing skills whilst the others dismiss the new lines as not being suitable to their system due to poor management.
So what we need to do is to show clearly HOW to get it right and WHAT the benefits of this are.".

And finally:
"As an industry we need to instigate the practise of a systems approach leading into any new sowings of productive pasture especially permanent pastures.
And as an industry I feel seed companies need to be a lot more responsible for promoting and advising this methodology rather than just selling seed for the sake of a sale.
Development of these practises would be the best and easiest way to increase understanding and profitability of pasture and production systems, and it needs to cover not only what how much a species produces and how it persists but also the management of nutrition for improved production and also how to and what chemicals assist in making the pastures and preparation for pastures a lot more productive ".

Reducing the Cost of Pasture Establishment Project
Industry Feedback Survey

Background

The Red Meat Co-investment Committee (MLA and its agency partners) are undertaking a Project entitled *Reducing the Cost of Pasture Establishment*. As the title suggests the purpose of this Project is to explore potential options for reducing the cost/risk of pasture establishment. In doing so, a further output is to identify any possible R/D/E project(s) - and who might best deliver them - aimed at reducing pasture establishment costs of perennial and annual species across southern Australia.

Why the Need?

It is generally acknowledged that the level of pasture sowing is very low across all agro-ecological zones of southern Australia, so that potential production, sustainability and NRM outcomes are not being achieved. This is despite the development of newer improved varieties with higher genetic merit.

The persistence of sown pastures and the high cost of re-sowing these pastures have been identified as major issues for producers influencing both their decision to re-sow (or not) and selection of pasture species and varieties.

In response, MLA has commissioned two 'development studies' – one on the issue of persistence (and how to improve it), and *this* Project, which focuses on *exploring the potential for reducing pasture establishment costs.*

Assistance sought – please...

A first essential step in this process is to seek input from all those working in the pasture industry on how this might be achieved. A format or overview for the presentation of information and ideas is attached. What we are looking for is a compilation of:

- what has been done including research papers, written and published information in the area of pasture establishment
- what needs to be done ie identify any knowledge gaps or deficiencies in our current understanding
- any ideas / suggestions / opinions – no matter how "different" – based on your own personal experience and knowledge
- what will be the benefit ie improved returns, reduced risk, lower cost
- proposed research opportunities and who should undertake this work (and where)
- any additional contacts who could contribute meaningfully to this Project

The following is an indicative list of the various components (costs) of pasture establishment and possible discussion points to be addressed:

Plant

- cost of pasture seed
- sowing rates
- selection of species/cultivars
- species characteristics which may be modified (eg seed size) and that may lead through to lower costs
- the rationale behind seed mixes and combination of species sown

Environment

- annual and seasonal rainfall pattern and temperature

- soil type, fertility, moisture, pH and aluminium level
- seed and seedling protection from predators/diseases

Preparation and sowing

- seedbed preparation and actions leading up to sowing
- nutrition and fertiliser application at sowing
- 'sowing' methods and options
- weed and pest control
- seed modification or coating
- inoculation of legume seed

Post sowing management

- grazing management
- fertiliser management
- weed, pest and disease management
- management tactics to recruit a bigger population of the desirable spp
- are the full array of benefits from sowing improved pasture species being captured in current Benefit Cost Analyses or partial budgets.

Feedback Sheet

Please provide any information on what has been done in this field including research papers, and other written and published information in the area of pasture establishment. This can either be hard copy, soft copy or links to web sites

1. What needs to be done ie any knowledge gaps or deficiencies in our current understanding
2. Any ideas / suggestions / opinions / issues – no matter how "different" – based on your own personal experience and knowledge
3. What will be the benefit ie improved returns, reduced risk, lower cost
4. Proposed research opportunities and who should undertake this work (and where)
5. Any additional contacts who could contribute meaningfully to this Project

Reducing the cost of pasture establishment
Terms of Reference

Background:
In 2010, MLA acting as agent for the Red Meat Co-investment Committee (RMCiC) commissioned the development of a Feedbase Investment Plan (the FIP) in concert with the PISC process of developing national beef and sheep industry RD&E strategies.
The persistence of sown perennial pastures and the high cost of resowing these pastures were identified as very important issues for meat producers and major factors affecting both the decision to resow (or not) and in the selection of species/varieties for resowing. As part of the development of the Feedbase R&D Plan, MLA called for project proposals – one of the submitted proposals [*New options for the establishment of perennial grasses in lower rainfall environments (PAM 55)]* focussed on establishment, but not specifically on reducing the cost.
Establishment costs are high (around $350/ ha for temperate pastures) and when coupled with a potential for failure, it appears that many meat producers have concluded that the payback time is too long compared to the expected persistence of the key pasture species. As a result, resowing rates for perennial pastures are very low across all agroecological zones, so potential production, productivity and NRM outcomes are not being achieved.
In response, MLA is seeking to commission two 'development studies' – one focussed on the issue of persistence (and how to improve it), and this TOR focussed on exploring the potential for reducing pasture establishment costs.
Account needs to be taken of the following issues:
Over the past 15 years improved processes for establishing temperate pasture species (perennials and annuals) have been developed. Most states have detailed guides to assist producers once the decision to resow has been made.
The Future Farm Industries CRC has recently completed establishment work covering non-traditional species and the recruitment of native species.
DAFWA and NSW DPI are exploring how to lower the cost of new annual legume species utilising hard seeded characteristics of the legume.
There has been (and continues to be) significant investment by MLA and others in the breeding/selection of improved pasture species and varieties.

The Red Meat Co-investment Committee (MLA and agency partners) has developed a new "collective development" model for R&D projects. This new model is aimed at improving coordination, investment efficiency and a strong focus on the needs of meat producers. In this instance, MLA is looking to appoint a consultant to lead this process in conjunction with a nominated expert from the RMCiC agencies.

Purpose of the brief
The economics of pasture improvement (including the impact of discounting) means that a $1 reduction in the up-front cost of pasture establishment has a significantly greater impact on investment returns than a $1 gain from extending pasture persistence into later years. Therefore, while increasing the persistence of pasture species may encourage an increase in pasture re-sowing, a reduction in the initial costs/risks would be expected to have a significantly greater impact. This brief is to explore that potential.
In order to encourage the adoption of improved cultivars with higher genetic merit that can deliver improvements in livestock production and nrm benefits, this project is seeking a wide ranging exploration of the potential opportunities to reduce the cost of pasture establishment. In addition, the project might identify the extent to which better information/support for making decisions around pasture (re)establishment could be important. In some ways, the approach might be stated more broadly as "reducing the payback period of sown pastures" and while this might identify other important processes, the primary focus for the project must be on the potential to reduce establishment costs.

Specifically, are there opportunities for MLA, the RMCiC partners and/or commercial seed companies to invest in research, development or extension aimed at reducing pasture establishment costs.

Scope

The purpose of this project is to explore any and all potential options for reducing the cost/risk of pasture establishment – therefore the list below is indicative but should not be seen as limiting if other opportunities emerge during the conduct of the project. Some approaches that might be the start of considerations include:

- Cost of pasture seed/sowing rates
- The rationale behind mixes (if this is adding to seed cost)
- The combination of species sown
- The range of preparation actions leading up to pasture establishment
- 'Sowing' methods and options
- Potential for seed modification or coating (that may change the sowing options)
- Management tactics to recruit a bigger population of the desirable spp
- Species characteristics which may be modified (eg seed size) and that may lead through to lower costs
- Are the full array of benefits from sowing improved pasture species being captured in current BCA's or partial budgets.

In summary, this project is seeking a knowledge and opportunity audit that identifies and prioritises prospective areas of RD&E aimed at reducing the cost of pasture establishment for common perennial and annual species across southern Australia.

Outputs

There are two key outputs that are required from this project:

1. A discussion paper (a narrative - not just a literature review - that is based on the appropriate mix of literature inputs, consultations with producers, advisors and experts on pasture establishment etc) that identifies the current costs associated with all the aspects of establishing pastures and the options for reducing those costs. This discussion paper will form the basis of an industry wide consultation workshop that will inform the final report (2 below)
2. A final report that updates the discussion paper (on the basis of the workshop and any other consultation processes) and makes recommendations that reflect on:

- research and development opportunities that might directly or indirectly reduce pasture establishment costs;
- research and development opportunities that might lead to different methods for pasture establishment, methods that are likely to be lower cost than current practice;
- *[where there are proposed cost reductions by any method, any uncertainty or implications around establishment success or subsequent production must be included in the consideration]*
- how such an R, D and or E program might be organised/structured/funded;
- mechanisms that might engage meat producers more strongly around the question of reducing pasture establishment costs;
- delivery of new information about ways to reduce pasture establishment costs to meat producers and any cost/risk trade-offs.