



Monaro Farming Systems

Research, Development and Extension Plan

May 2010

This plan recognises the need for MFS to take a lead in demonstrating promising technologies to Monaro farmers and to engage with, and support professional research partners to explore new farming options and to increase knowledge of the underlying biology of farming systems relevant to the Monaro.

Objectives: to identify opportunities for MFS to

- (i) support and/or conduct **research** to resolve constraints to productivity and sustainability of Monaro farm systems,
- (ii) conduct **demonstrations** of new options and new technologies that potentially offer productivity and sustainability gains for Monaro farm systems.

Conduct of the R&D plan:

A R&D plan is not a static document and should be reviewed annually to assess progress towards the objectives, to prioritise effort, to retire issues that have been resolved or have lost their importance, and to add new issues for resolution.

Current MFS priority issues for R&D

1. Legume / soil nitrogen balance

Low legume content pastures is estimated to affect >50% of Monaro farms with the largest issue on black/basalt-derived soils which comprise about 25% of the Monaro. Lack of legume N is likely to be a major factor limiting productivity, responses to fertiliser applications, to result in poor water-use efficiency and will require higher inputs of fertiliser N in dual-purpose crop enterprises.

2. Pasture productivity

There is a general lack of information concerning pasture growth patterns and feed quality of introduced and/or native pastures species in the Monaro environment. This makes planning and optimisation of grazing system management and stocking rates extremely difficult.

3. Soil nutrition

The Monaro has contrasting soil types which differ substantially in their intrinsic fertility and fertiliser requirements. There are new soil tests and decision support tools available, and soil 'critical' nutrient requirements have been revised in recent years. An opportunity exists to raise general awareness of the new developments in soil fertility management and to assist management decisions by adopting objective guidelines for soil fertility management that are tailored to the nutrient requirements of Monaro soils and recognise associated constraints such as low clover content and pasture type.

4. Measuring conversion outputs

There is only a small amount of information regarding achievable/target production output on the Monaro. There would be value in gathering existing information, and extending this information for various rainfall and soil types.

5. Winter feed gap and stocking rates

Winter feed production is low and highly variable from year to year. This effectively sets the stocking potential of Monaro farms. Options for increasing autumn-winter production (and/or feed quality) and for managing the winter feed gap are needed.

6. Enterprise mix

Given the recent change in the relative economics between wool and meat production and the introduction of dual purpose cropping, information on performance of various enterprises on the Monaro would be of value to producers looking to change their enterprise mix. Flexibility in handling vastly different seasonal conditions needs to be considered.

1. Legume / soil nitrogen balance

The problem:

Low legume content pastures is estimated to affect >50% of Monaro farms with the largest issue on black/basalt-derived soils which comprise about 25% of the Monaro. Newly established sub clover may only persist at high density for 3 or so years on these soils. The widespread lack of legume N is likely to limit productivity, to restrict responses to fertiliser applications, to result in poor water-use efficiency and will require higher inputs of fertiliser N in dual-purpose crop enterprises.

The issues thought likely to be affecting legume persistence:

- (i) Are the growth and seed production requirements of subterranean clover mismatched with seasonal conditions that are typical of the Monaro?
 - (a) available soil moisture is often only sufficient for germination after growing season temperatures have dropped to suboptimal levels (winter),
 - (b) frosts and /or droughts at flowering time,
 - (c) summer rainfall leads to large loss of seeds,
 - (d) high residual dry matter in autumn block subclover germinations due to shading and/or allelopathy,
 - (e) pests and diseases (?)
 - (f) suboptimal soil fertility (*see later discussion of soil fertility issues*).
- (ii) Are there alternative legumes, better adapted to the Monaro climate?
- (iii) Dominant species on the Monaro are drought tolerant perennial grasses - should the emphasis shift to use of drought-tolerant perennial legumes?

Research needs:

- (i) What is already known?

ACTIVITY	ACTION
There has been a long history of survey, research and demonstration projects on the Monaro but the information is effectively lost to MFS members and is needed to inform future research projects.	The University of Sydney via Dr Lachy Ingram have agreed to collate as much of the information that they can find (due start May 2010).

- (ii) Why does subterranean clover fail to persist?

Research should be cognisant of the fact that legume persistence issues are greatest on heavy black soils > basalt-derived > granite-derived soils. The issues may be different on each soil type and may differ between climatic zones on the Monaro.

ACTIVITY	ACTION
Adaptation of annual legumes to Monaro environments: <ul style="list-style-type: none"> • Is plant-available soil moisture mismatched with growing season temperatures and suboptimal for adequate clover germinations? • Do frosts and /or droughts at flowering regularly suppress seed set? • Is the incidence of summer rainfall sufficient to cause large loss of seeds; is higher hard seededness desirable? • Does the incidence of high residual dry matter in autumn block sub clover germinations due to shading and/or allelopathy? <i>Strategy: computer modelling followed by field trials (?)</i>	A study of legume adaptation to Monaro soils & environments should ideally combine computer modelling (GrassGro) and field-based research. It is expected to be suited to a postdoctoral research project (3 years) or a series of smaller Masters level projects co-ordinated by a University professional.

<ul style="list-style-type: none"> Are the influences of pests and diseases limiting subclover performance? <i>Strategy: field experimentation</i> 	Approach Sydney University and/or other research providers to discuss a joint application to Pastures Australia / MLA / AWI / CMA for research funding.
<ul style="list-style-type: none"> Is suboptimal soil fertility constraining legume growth and persistence? 	<i>See later discussion of soil fertility issues</i>

(iii) Alternative legumes

ACTIVITY	ACTION
<p>Examine the potential for using alternative legumes in Monaro farming system environments.</p> <ul style="list-style-type: none"> There have been trials of alternative legumes in the past. There are now many more new legumes species being trialled in Australia, some of which have proven very promising in some farming districts There are very recent trials (Bungarby / Berridale) on the Monaro (contacts are Mr Luke Pope, and Dr Belinda Hackney NSW DPI) which included some of the newer species and they have highlighted a few interesting options. <p><i>Strategy: there are a limited number of alternative legumes that have or are showing promise in terms of density of persistence (Caucasian clover, arrowleaf clover??) all of which are likely to have establishment, seed availability, rhizobia issues that may require attention if they are to be adopted on the Monaro. Merit must first be established and a plan to cover any "issues" developed provided the merit tests indicate value to Monaro farmers.</i></p>	<p>Initial aim: establish potential.</p> <p>(i) Use results of legume adaptation research to inform an alternative legume program as results come to hand.</p> <p>(ii) Invite Luke Pope and Belinda Hackney to address a field day or other event on the results of recent and past trials of alternative legumes for the Monaro - what are the most promising options, their performance and weaknesses? What will constrain wider trialling?</p> <p>If there are interesting options: (i) form an alliance with NSW DPI to promote wider testing of the most promising species in the differing Monaro environments. Measures of success - yield and persistence relative to subclover; (ii) contact and possibly sponsor a visit to the Monaro by Dr Angelo Loi (DAFWA; angelo.loi@agric.wa.gov.au) who is involved in alternative legume introductions in WA and may be able to help MFS source enough seed, rhizobia for field trialling of alternatives.</p> <p>Seek funding for these activities from Pastures Australia / MLA / RIRDC / AWI / CMA / (GRDC if linked to grazing crops initiatives).</p> <p>(iii) Subsequent aim: address constraints to wider use on Monaro farms - seed availability, establishment issues, rhizobium suitability, etc.</p>

(iv) Perennial legume options

ACTIVITY	ACTION
<p>Investigate the potential for wider use of lucerne on the Monaro.</p> <ul style="list-style-type: none"> Does it have a wider role Pure lucerne or mixtures 	<p>(i) Establish Evergraze demonstration trials on 'Bellevue' (basalt soil) and Cobana (granite soil)</p> <p>(ii) Increase linkages to lucerne pasture research ('Coolringdon') - University of Sydney projects (Mr L Ingram).</p> <p>(iii) Invite a lucerne breeder / developer / wholesaler such as</p>

<p>(establishment in mixed pastures)</p> <ul style="list-style-type: none"> • What variety(s) are best suited • Costs vs benefits 	<p>Mr Reg Hill (PGG Wrightson Seeds) to talk to a field day / meeting about the range of lucernes now available, their dormancy types and application, advances in grazing tolerance and especially suitability to Monaro soils and environments - <i>will require priming with information about Monaro soils and climates for maximum value.</i></p>
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Demonstration opportunities:

ACTIVITY	ACTION
<p><u>Perennial legume options</u> Evergraze Project: to demonstrate the utility of lucerne in pure and mixed pastures relative to grass/subclover pasture at two sites: 'Bellevue' - basalt soil, 700 mm rainfall and 'Cobana' – granite soil, 650 mm</p> <p><u>Alternative legumes</u> Replicated demonstration trials of the most promising alternatives species sown in representative soils and climates across the Monaro - as part of research project measuring their yield and persistence relative to subclover.</p> <p><u>Legume adaptation research</u> Seek demonstration field day opportunities as they arise.</p>	<p>Underway</p> <p>Form alliance with Mr Luke Pope (NSWDPI) to extend the current trial to larger plots on member farms once potential merit of most promising alternatives is established; seek joint funding from Pastures Australia / MLA / RIRDC / AWI / CMA / (GRDC if linked to grazing crops initiatives).</p> <p>Always encourage research personnel to set trials up with future demonstration / field day options in mind.</p>

Pasture productivity

The problem:

General lack of information concerning pasture growth patterns and feed quality (and annual variability in these factors), of introduced and native pastures species in the Monaro environment. This makes planning and optimisation of management and stocking rates extremely difficult.

The issues:

- (i) Pasture production growth curves are required for major species (pasture types) and climatic locations on the Monaro.
- (ii) Quantitative information concerning the variability of growth patterns due to climate variability is needed.
- (iii) Pasture quality data by species (pasture type) and season is needed.
- (iv) All of the above to be used to plan, predict and/or model animal production from Monaro grazing systems.

Research needs:

- (i) What is already known?

ACTIVITY	ACTION
There has been a long history of survey, research and demonstration projects on the Monaro but the information is effectively lost to MFS members. There is likely to have been some data collected addressing each of these issues - this is required as a starting point for all future work.	The University of Sydney via Dr Lachy Ingram have agreed to collate as much of the information that they can find.

- (ii) Pasture production growth curves for major species (pasture types) and climatic locations on the Monaro.

Grazing system modelling using GrassGro is likely to be the most effective way to utilise all available data and to extend it to estimate production growth curves, to understand the risks associated with climate variability and to plan animal production options for Monaro grazing systems.

ACTIVITY	ACTION
<p>Use GrassGro to model Monaro grazing systems:</p> <ul style="list-style-type: none"> • Develop a plan to encourage use of GrassGro by key local advisors and leading farmer members; develop a strategy for dissemination of GrassGro analyses to farmer members. • Collate the key data inputs needed to run GrassGro analyses for representative GrassGro farming environments. • Generate pasture growth information, analyse local farming issues, etc 	<p>MFS is in the fortunate position of having three key GrassGro exponents in the local area. Expert users: Mr Doug Alcock (NSWDPI, Cooma); Mr Phil Graham (NSWDPI, Yass) and the developer of GrassGro; Dr Andrew Moore (CSIRO, Canberra).</p> <ol style="list-style-type: none"> (i) Form an alliance with these local experts and aim to develop joint activities for application of GrassGro to Monaro farming systems, (ii) Access soil profile data collected by Ms Libby Salmon (then CSIRO) and Monaro farmers as part of an AWI PIRD project. (iii) Use \$6000 funding awarded to MFS in collaboration with Mr Doug Alcock to extend the number of described soil profiles on the Monaro to twelve (12). (iv) Work with local GrassGro experts to develop

	GrassGro farm systems to represent key Monaro locations.
<p>Train or utilise key GrassGro users in the following roles:</p> <p>(i) Highly skilled GrassGro users who can generate farming scenarios representing key Monaro locations.</p> <p>(ii) Key MFS GrassGro users who can use GrassGro scenarios to explore grazing systems problems.</p> <p>(iii) GrassGro competent farmer members who understand how the modelling can be used, can request analysis to local issues and can interpret outputs from modelling exercises.</p> <p>Get measurements of feed quality for different pasture types, particularly in the winter months.</p>	<p>Apply for funding (Woolworths) to train the required hierarchy of skilled GrassGro users and commence analysis of pasture growth patterns; grazing management options, etc.</p> <p>Could be done on Evergraze trial sites.</p>

Demonstration opportunities:

ACTIVITY	ACTION
<p>Monaro farming environment map</p> <p>Develop an instructive and promotional map of the Monaro that combines the key soil moisture characteristics collated for use in GrassGro modelling, with soil and climate mapping (rainfall probabilities, temp profiles) information to demonstrate the influences of soil and climate on the pasture growth patterns of Monaro farming systems.</p> <p>Maps to be designed for the "farm office wall" and MFS-branded to double as an MFS promotional tool.</p>	<p>(i) Co-opt Dr Richard Simpson (CSIRO) and Dr Lachy Ingram (Sydney University) to draft a version of the map (start end Aug 2010?).</p> <p>(ii) Consider the need to gain CMA or other funding support to complete the exercise.</p>

Soil nutrition

The problem:

The Monaro has contrasting soil types which differ substantially in their intrinsic fertility and fertiliser requirements. There is a perception that some parts of the Monaro are chronically under-fertilised but this may also be more a problem of how best to address the soil fertility issues of the contrasting soil types or a problem of poor fertiliser responses due to low legume content. There are new soil tests and decision support tools available and soil 'critical' nutrient requirements have been revised in recent years. An opportunity exists to raise general awareness of the new developments in soil fertility management and to assist management decisions by adopting objective guidelines for soil fertility management that are tailored to the soil types of the Monaro and recognise associated issues such as low clover content and pasture composition.

The issues:

- (i) Need to increase awareness of the new PBI soil test and revised interpretations for P, S and K soil tests and apply new decision support tools for P management.
- (ii) Can the new P-management tool be adapted to guide S-fertiliser applications for soils where they are the primary fertiliser?
- (iii) Can Monaro farmers use and/or adapt the new fertiliser cash flow tool to provide useful fertiliser benefit-cost analyses
- (iv) Need for programs that recognise the large differences in soil fertility requirements of the major Monaro soil types and which, consequently, can assist management decisions by Monaro farmers

Research needs:

- (i) What is already known?

ACTIVITY	ACTION
There has been a long history of survey, research and demonstration projects on the Monaro but the information is effectively lost to MFS members. There is likely to have been some data collected addressing each of these issues - this is required as a starting point for all future work.	The University of Sydney via Dr Lachy Ingram have agreed to collate as much of the information that they can find.

Demonstration opportunities:

ACTIVITY	ACTION
Soil management 'club' or 'network' There is already a wealth of soil nutrition knowledge available. The major issues for farmers are usually the planning and sustained implementation of a soil testing program on farm, knowing how to correctly interpretation of soil test information, and how to translate this into a cost-effective fertiliser investment. A significant problem is that soil testing is a once per year activity (so is easily forgotten)	(i) Kick start a soil nutrition awareness program with a workshop series on targeted fertiliser use, soil test planning and farm testing regimes (leads into formation of an on-going "soil club"). (ii) Plan and then gauge member support for a soil testing club or network, centrally managed, which offers (i) reminders about soil testing and fertiliser information via the MFS newsletter, (ii) discounted soil testing (?), (iii) an annual soil test interpretation update workshop and assistance with farm nutrient planning, (iv) collating information and plotting trends and distribution patterns. (a) Consider negotiating workshops as part of NSW DPI Landscan project or other existing local consultant based activities.

<p>and yields its most useful results after two or three years of regular testing.</p> <p>MFS has the organisational structure to address all three of the major issues for its members and to provide incentives that encourage regular soil testing by holding timely workshops and negotiating bulk soil testing discounts.</p>	<p>(b) Condition-of-entry to soils club should include provision of key data (copy of soil test information, annual fertiliser application, stocking rates/other paddock history as relevant/reasonable) to an MFS soils data base - data to be used to gauge amounts of fertiliser to apply to differing soil types and to illustrate successful soil fertility management strategies.</p> <p>(c) Use co-ordinated soil testing across the membership to negotiate special deals for members with a leading and accredited soil testing laboratory.</p> <p>(iii) Use the momentum of the annual workshops to address related issues of appropriate stocking rates, seasonal conditions, soil type specific nutritional needs, alternative fertilisers, etc.</p>
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Measuring conversion of outputs

The problem:

There is only a small amount of information regarding achievable/target production output on the Monaro. There would be value in gathering existing information, and extending this information for various rainfall and soil types.

Need for more information on potential business gain from producing more dry matter and how to measure this? Many producers do not compare year to year performance or measure profit drivers within their business and therefore do not have this information or tools to drive management decisions.

The issues:

- (i) Production per hectare (of pasture, wool, meat) is believed to be low on the Monaro relative to other areas of comparable rainfall in Southern NSW.
- (ii) There is little information on achievable output, though some exists from the Boyce & Co financial analysis.
- (iii) The large variation in soil and rainfall types within the Monaro will mean there is a large variation in sustainable output.
- (iv) It is believed that much of this information will be accumulated from other projects, such as Evergraze, and Grassgro projects.
- (v) Projects will be conducted with a view to gradually accumulating this information.

Research needs:

- (i) What is already known?

ACTIVITY	ACTION
<p>There is existing benchmarking data from Boyce & Co's financial analyses. Holmes & Sackett also provide very good information.</p> <p>MFS activities need to include measurements on-</p> <ul style="list-style-type: none"> • Kgms DM/ha • \$/ha • Kg wool/ha • Kg prod/rainfall. 	<p>Approach Boyce and Co re accumulating their data on this topic (not primary focus, activate when appropriate).</p> <p>Once data collated, document benchmarks for the Monaro ie. set standards to demonstrate to farmers what is achievable and provide platform for performance plotting.</p>

Demonstration opportunities:

ACTIVITY	ACTION
Evergraze Sites	Measure production output from these sites
Grassgro	Expected production outputs from GrassGro simulation work should be recorded.
Field Day	Field days where possible should contain production targets

Winter feed gap / stocking rates

The problem:

Winter feed production is low and highly variable from year to year. This effectively sets the stocking potential of Monaro farms. Options for managing the winter feed gap are needed.

The issues:

- (i) Huge differences in winter productivity occur between pasture types (e.g. native vs improved species). Need to understand these differences and why they occur (e.g. soil nutrition vs species vs soil water-holding characteristics) and their impact on feed requirements over winter for different enterprises and/or enterprise mixes.
- (ii) Many of the preceding MFS priority R&D areas will also effectively contribute to reducing winter feed gaps: improved legume content will inject more N into the pasture systems assisting grass production in winter periods (although legumes themselves usually grow slower at low temperatures), a better understanding of seasonal pasture production patterns and their associated probabilities will assist management and feed budgeting, and better soil fertility management should ensure that plant nutrition is not the most limiting factor in autumn-winter months.
- (iii) Dual purpose crops were first developed for Australia inspired by feed gap problems on the Monaro. They potentially offer higher winter production than pasture especially when sown on early (February) rain, and very high potential grain yields (for sale or on-farm use). They are not suited to all places or farms and must be a good fit with other farm operations, management objectives, equipment, skills and aspirations. Nevertheless, they offer a new and potentially important niche enterprise. If climate change predictions are correct, it is possible that dual-purpose crops will be an even more attractive option for the Monaro into the future.

Research needs:

- (i) What is already known?

ACTIVITY	ACTION
There has been a long history of survey, research and demonstration projects on the Monaro but the information is effectively lost to MFS members. There is likely to have been some data collected addressing each of these issues - this is required as a starting point for all future work.	The University of Sydney via Dr Lachy Ingram have agreed to collate as much of the information that they can find.

- (ii) Improved forage growth in autumn-winter

ACTIVITY	ACTION
<ul style="list-style-type: none"> • Pasture production patterns and seasonal influences on them • Dual purpose crops The introduction of dual-purpose crops to commercial operations on the Monaro is demonstrating high potential value for some farms, but there are also numerous challenges for (i) achieving the high potential yields expected of these crops, (ii) managing soil-borne diseases and (iii) developing appropriate crop, break crop and pasture rotations. <p>Grass Gro modelling</p>	<p>Maintain a winter-feed gap focus within initiatives begun under all preceding high priority R&D issues.</p> <p>(i) Support CSIRO R&D initiatives (Dr John Kirkegaard, CSIRO - Mr John Jeffreys [Delegate Station]) to gain GRDC support for dual-purpose crop studies on the Monaro.</p> <p>Their initial aims are to examine the option of using grazing canola varieties to develop dual purpose break crops in rotation with dual-purpose wheats and pasture.</p>

Demonstration opportunities:

ACTIVITY	ACTION
Dual purpose crops	<p>MFS should maintain an "open-mind" policy on the place of dual crops on Monaro farms because it is one of few new options available to farmers at present and may be an important alternative option if climate changes occur as predicted. MFS should also encourage those members taking a pioneering role in developing credible new farming options. To this end MFS should encourage engagement with Dr John Kirkegaard (CSIRO) in his work on the Monaro to achieve Field Day opportunities for MFS members.</p> <p>Incorporate reports on dual purpose cropping and analysis of its benefits/costs into MFS field days, meetings and newsletters on a regular basis to update other members on progress and potential value.</p>

Enterprise Mix

The problem:

Given the recent change in the relative economics between wool and meat production and the introduction of dual purpose cropping, information on performance of various enterprises on the Monaro would be of value to producers looking to change their enterprise mix. Flexibility in handling vastly different seasonal conditions needs to be considered.

The issues:

- (i) The relatively high performance of the meat market has meant many Monaro producers have shifted toward a greater emphasis on lamb or cattle production rather than wool.
- (ii) Understanding the key differences between different enterprises in terms of feed requirements, seasonal risk etc would be very beneficial to producers.
- (iii) Developing an enterprise balance that is flexible to cope with large seasonal fluctuations is also considered important.
- (iv) Need for a better understanding of the potential of opportunities of horizontal and vertical integration, what are the farm enterprise structural mix opportunities?
- (v) Understanding the impacts on profit risk/return
- (vi) Introducing a cropping system into an existing grazing system

Research needs:

- (i) What is already known?

ACTIVITY	ACTION
There is some existing information from Boyce & Co's financial analyses. Holmes & Sackett also provide very good information, which probably has some lessons for the Monaro.	Approach Boyce and Co re accumulating their data on this topic.
Phil Graham has done some very good work on impact of ewe type on farm profitability in the Cowra/Yass area.	Phil Graham & Doug Alcock are presenting this information at the Monaro Mums field day (14 May 2010).

Demonstration opportunities:

ACTIVITY	ACTION
Monaro Mums Field Day	<i>Raise some of these issues through Dave Sackett and Phil Graham, and get feedback from producers on interest in the issue.</i>
GrassGro	<i>Different enterprises and their implications/profitability can be examined by GrassGro when simulations are set up for different Monaro regions.</i>
Monaro Mums Project	<i>Doing a full scale paddock trial utilising various ewe types would be a very large project. Questions generated from the Monaro Mums field day will be addressed by modelling and other avenues.</i>

Acknowledgements

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Attendees of the 14th March 2008, MFS **Think Tank on Research Development and Extension** which include David Mitchell (MFS), Mike Stephens (MFS), John Auer (MFS), Jono Forest (Boyce Chartered Accountants), Richard Simpson (CSIRO), Doug Alcock (NSW DPI), Luke Pope (NSW DPI), Jim Shovelton (MS&A) and Inakwu Odeh (Sydney University)

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