

final report

Project code: B.CMP.0064
Prepared by: Hassall & Associates Pty Limited
Date published: July 2004
ISBN: 9781740362498

PUBLISHED BY
Meat & Livestock Australia Limited
Locked Bag 991
NORTH SYDNEY NSW 2059

Evaluation Process for MLA On-Farm Research and Development

Triple Bottom Line Evaluations Volume 1: Review of southern beef and lamb and sheepmeat programs

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

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Abbreviations used in this report

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
BCA	Benefit Cost Analysis
BCR	Benefit Cost Ratio
FCI	Farm Cash Income
LSM	Lamb and Sheepmeat
M&E	Monitoring and Evaluation
MLA	Meat and Livestock Australia
NLWRA	National Land and Water Resources Audit
NPV	Net Present Value
NPVI	Net Present Value per dollar Invested
PI	Performance Indicator
PIRD	Producer Initiated Research and Development
R&D	Research and Development
RDC	Research and Development Corporations
SB	Southern Beef
SGS	Sustainable Grazing Systems
SMEQ	Sheep Meat Eating Quality
TBL	Triple Bottom Line

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Executive summary

Meat and Livestock Australia (MLA) has engaged Hassall & Associates to:

- Conduct Triple Bottom Line (TBL) evaluations of two programs within the on-farm research and development (R&D) portfolio at MLA: the Southern Beef and Lamb and Sheepmeat programs. The review focuses on R&D projects within these programs that have been completed or have had substantial outputs by June 2003. The results of these evaluations are contained in *Volume 1* of this report.
- Develop standardised approaches for conducting future TBL evaluations. This will guide how MLA can incorporate TBL thinking and measures into program and project development, evaluation and management. The standardised approaches are detailed in *Volume 2* of this report.

TBL evaluations for R&D programs address the financial, social and environmental outcomes achieved through the investment by industry and the Australian Government.

The study is predominately a desk-top exercise. Previous reviews of programs and projects have been assessed to determine the nature of the ascribed benefits. The financial, social and environmental achievements of the Southern Beef and the Lamb and Sheepmeat programs have then been assessed. A workshop with MLA staff has analysed the requirements for suitable guidelines for conducting TBL evaluations in the future. Attendees represented Livestock Producer Innovation, Processing Product Innovation, Infrastructure (Supply Chains) and Communication.

The main finding from the examination of the previous reviews is that the approaches to evaluation are inconsistent. The main sources of inconsistency are whether the benefits:

- Are clearly described;
- Are estimated and/or quantified;
- Consider the baseline (e.g. what would have happened without the research);
- Consider how many people would use the R&D; and
- Consider causality and attribution (e.g. what the R&D actually achieved as compared to other factors such as seasons and higher prices).

For the financial analysis, the net benefit of both programs to industry participants is estimated to be \$26 million (over 10 years with a 7% discount rate) with a benefit cost ratio of 1.29. The majority of the benefits are derived from the Lamb and Sheepmeat program (\$22.7 million), however, it is important to note that its expenditure is approximately double that of Southern Beef. The majority of the benefits arise from three projects: Lambplan, Sustainable Grazing Systems and Breedplan.

The results are particularly sensitive to assumptions regarding increases to farm cash income, and somewhat sensitive to assumptions regarding the adoption rates. The data available is variable in quality and a significant number of assumptions had to be made regarding potential impact. This results in a low confidence regarding the absolute value of the results.

For the social analysis, the two major findings are the:

- Increased capacity of participants – higher skills, confidence and decision making abilities. Over the period, there has been a total of approximately 20,000 participants in the 13 projects considered. It is likely that there is double up and a number of producers who have participated in more than one MLA project. The extent to which these participants have higher skills cannot be ascertained from the data available; and
- Formation of groups – leading to improved networks and information flow. There have been approximately 250 marketing, supply chain, production, and business groups formed. Again, there are likely to be some producers that have participated in more than one group.

For the environmental analysis, the benefits are mainly derived from the Sustainable Grazing Systems project. One half of the respondents to the ABARE survey reported improved perennial pastures, water usage and a lower weed incidence. Overall, there was an increased recognition of two environmental issues – soil acidity and water quality issues. Whether this is a benefit depends on the distribution of the particular issues. There is no data available about the magnitude of the benefits reported. There is also an unclear baseline – where did people start from and what would have happened without the project/program.

In terms of the nominated intended outcomes of the overall Southern Beef and Lamb and Sheepmeat programs the following summary can be made:

Financial parameters have been recognised and generally incorporated by MLA into all program activities. More consistency is needed in how the parameters are defined. Social and environmental parameters have generally not been recognised and incorporated. At the project level, Sustainable Grazing Systems recognised social and environmental parameters to some extent. The other projects did not, although a detailed consideration of each project's objectives has not been conducted.



At the program level, it is very unclear whether financial, social or environmental benefits have been developed and demonstrated. At the project level, there have been financial benefits for the Sustainable Grazing Systems, Lambplan and Breedplan projects. There have been social benefits nominated for some projects involving producer groups, particularly in terms of developed networks and information flow. Some environmental benefits have been developed for Sustainable Grazing Systems.

In terms of capacity, it is likely that the participation, improved networks and information flow will have resulted in an increase in producers' knowledge, awareness, skills, attitudes, confidence and motivation to change. However, the extent cannot be ascertained.

Practice change and impact information is scant. The assumptions used indicate that there are financial benefits for certain projects, which in turn aggregate to give a small net financial benefit at the program level. Social impacts are likely to result from the networks and improved information flow. The environmental benefits at a program level are likely to be minor.

Information was not available to assess the direct objectives or targets of the two programs.

The reviews of the two programs point to the importance of:

- Good program/project design;
- Management and evaluation at the appropriate levels where decisions about investment are made;
- Full alignment of the objectives at different levels, and also to include all three elements of the TBL;
- Setting up current programs and projects in such a way to facilitate a TBL evaluation;
- Investment in monitoring - being able to provide key data on performance; and
- Standardisation of evaluation techniques.

These points are all included within the guidelines that have been established as part of this project (refer to Volume 2). Implementation of these guidelines by MLA is the major recommendation from this study.

1. Introduction

Hassall & Associates has been engaged by Meat and Livestock Australia (MLA) to conduct Triple Bottom Line (TBL) evaluations of two programs (*Volume 1*) and to develop standardised approaches for conducting future TBL evaluations (*Volume 2*).

1.1 Scope of the project

Since MLA's formation in 1998, various internal and external reviews have been made of MLA's investment in its Research and Development (R&D) activities. The reviews have been conducted primarily at the project level (e.g. Sustainable Grazing Systems and EDGENetwork®) at completion of the project or at points where decisions are being made to reinvest or not¹. The reviews generally have not followed a consistent approach or presentation, which does not allow aggregation or comparison of results. This project aims to directly address the previous *ad hoc* nature of evaluations by developing standardised approaches.

In addition, there is an increasing need to consider the financial, social and environment impacts of R&D investment (the TBL – see section 1.2).

There are two parts to this project, presented separately in two volumes of this report.

The first part is a review, according to the TBL, of two programs within the on-farm research portfolio at MLA: the Southern Beef (SB) and Lamb and Sheepmeat (LSM) programs. The review focuses on R&D projects within these programs that have been completed or have had substantial outputs by June 2003. In this respect, the review period is actually July 1998 to June 2003. More description of the two programs is provided in Chapter 2.

The second part is the development of a standardised methodology and framework for undertaking ex-post Triple Bottom Line reviews in the future. This will guide how MLA can incorporate TBL thinking and measures into program and project development, evaluation and management.

The two parts of the review have occurred concurrently.

¹ Reviews at the end of an R&D project (or mid-point) are generally referred to as *ex-post*. *Ex-ante* reviews, by contrast, are conducted before project commencement in order to assess likely impacts and hence guide investment decisions. See section 2.1 for a discussion of terminology – SGS is often referred to as a *program*, whereas in this analysis it is a *project*.

1.2 Structure of the report

Within Volume 1, the remainder of Chapter 1 describes TBL evaluation and the approach used in this study. Chapter 2 outlines the SB and LSM programs. Chapter 3 outlines the evaluation framework used by Hassall & Associates. Chapter 4 presents the findings of the analysis of *ad hoc* reviews. Chapter 5 presents the financial analysis, whilst chapter 6 presents the social and environmental analysis. Chapter 7 summarises the main findings and draws conclusions and recommendations.

Volume 2 outlines a standardised approach to conduct future TBL evaluations.

1.3 Triple Bottom Line evaluations

Industry and government stakeholders have an increasing expectation for Research and Development Corporations (RDCs) to demonstrate the outcomes from their investment. The Australian Government Department of Agriculture Fisheries and Forestry has required all RDCs to be able to demonstrate the range of outcomes that are being achieved by public investment in R&D.

These outcomes include all aspects of the Triple Bottom Line (financial, social and environmental). The expectation is derived from the growing realisation that environmental sustainability and people issues are as important as financial issues in assessing the impacts and returns from investment in R&D. All need to be achieved in order to enable industry to address its current issues and to better position industry for the future. Previously, the financial issues were primary, and were the main basis for demonstrating achievements. The social and environmental issues were add-ons or quite secondary.

This represents a paradigm change for R&D in general, and leads to a different basis for evaluating the industry and government investment through MLA's activities.

Measuring TBL outcomes is difficult and complex. The old adage is true "if it were easy then it would have been done by now". The complexity arises from several sources:

- Long time frames and lags for the R&D benefits to be realised and adopted;
- Presence of intangibles (e.g. flow on effects, motivations) that are difficult to identify, let alone describe or assess;
- Complexity of supply chain considerations and multiple players;
- Programs not being set up to identify intended financial, social and environmental outcomes and assess the performance of each;



- Data not being available to assess either the baseline or achievements. This is a direct consequence of the programs not being set up for it. The baseline can be difficult to measure and it also is not static – it represents what would have been the situation without intervention;
- Difficulty of assigning causality and attribution. Did the R&D investment lead to a certain achievement, or was it due to other factors, such as seasonal and market conditions, or other investment by industry and government stakeholders? There are often many reasons for change; and
- Lack of consistency in previous evaluations - different methods and reporting being used.

To date, TBL has tended to have an accounting or accountability focus and apply particularly to the performance of corporations (both public and private sector organisations). In this field, there has been a steady progression of ideas from environmental and sustainability reporting through to *Corporate Social Responsibility* and the *Global Reporting Initiative*². The focus has been on ensuring that corporations consider the environmental and social impacts of their operations³. Most participating organisations appear to focus on the provision of additional information to their shareholders and other key stakeholders in order to present a positive portrayal of their business.

This accounting focus is in contrast to a management emphasis, where performance information is required in order to direct investment and assess the level of achievement of intended outcomes. R&D program evaluations need to assess performance both to demonstrate accountability (wise and proper use of stakeholder funds) and to assist in investment decisions.

There have been relatively few examples of TBL evaluations that can serve as models for how future R&D evaluations can be conducted. The SGS final report was presented as a TBL (MLA 2002), as was a review of the investment by GRDC in Farming Systems projects (Hassall & Associates 2004). Other reviews have considered social and environmental outcomes, but not as part of a coherent and consistent methodology.

Emerging best practice is to treat each element of the TBL separately, rather than trying to combine them into one single result⁴. The main rationale appears to be the difficulty in reconciling quite different results.

² see www.globalreporting.org

³ Social responsibilities include internal (e.g. is it a good working environment, does the company provide child care, etc) and external/wider social responsibilities (e.g. does the company support welfare causes, does the company's operations reduce community sickness (for example) or contribute to community well-being).

⁴ As a side note, obtaining one result is traditionally what an economic analysis tries to achieve by valuing environmental benefits (e.g. through willingness to pay methods) and social outcomes (increased utility). However, it is evident that not all benefits can be appropriately valued.

Keeping the TBL elements separate means that questions about potential double-counting of benefits and non-recognition of synergies⁵ are avoided – as all benefits are reported and are not ‘added-up’. It also means that questions about trade-offs between types of benefit (e.g. is it better to obtain more financial or more social benefit) are not addressed. However, these questions are largely beyond the scope of a TBL evaluation.

The specific challenges for this project are that the programs have not been set up for a TBL evaluation and there is limited data available to assess financial, social and environmental performance.

The next sections describe each element of the TBL evaluation in more detail.

Financial

Financial is not synonymous with *economic*. A financial analysis is concerned with the dollar benefits and costs that are incurred by firms. An economic analysis is concerned with broader societal changes in values.

The financial elements are derived from the nominated costs and benefits of the program. Due consideration is given to ensuring that critical issues that influence R&D decisions are adequately reflected in the underlying assumptions and associated contingencies. These include:

- Adoption rates associated with research;
- Lag times in take-up of R&D outputs;
- Riskiness of research (i.e. potential for success);
- Transaction costs associated with the uptake of R&D output;
- Scale economies (and impacts at the beneficiary level);
- Intellectual property rights (and impacts this may have on information transfer);
- Marketing; and
- Price and elasticity.

Key factors considered in the financial evaluation include:

- Specifying the base case, or the “without” R&D investment scenario, so that all costs and benefits attributable to this case are “netted out”, and not accounted for as incremental impacts under the “with” R&D investment scenarios; and
- Validating assumptions underlying each scenario for each program with program managers.

⁵ e.g. improving a pasture can have both environmental and financial benefits.

The main reporting indicators for the financial analysis are Net Present Value (NPV), Benefit Cost Ratio (BCR) and Net Present Value per R&D dollar Invested (NPVI).

Social

The social elements are derived from program information as well as consultation with Program Managers. Typical social benefits include social capital of users and the community. Social capital is a capacity to then do some other research or practice change, increased confidence and motivation, improved networks and information flow. Social benefits arising from an improved performance of the industry (employment, multiplier effects, farm amalgamations) may not be attributable to R&D programs but should be considered. Community well-being should also be considered, although this is much harder to define.

Increased social capital implies an increased ability and motivation to make informed decisions (and do something). Ability includes awareness, attitudes, skills, knowledge commitment (motivation) and confidence. Capacity building implies working with people, usually in groups, to take them “further along the scale” in terms of their awareness, commitment/motivation and ability to make more informed decisions and undertake actions to achieve sustainable landscape change.

Social analyses must take into account the vastly different points that producers, industries and communities start from, in relation to R&D capacity. There are also stages of development, from early to more sophisticated development. A producer that has already developed considerable capacity would be expected to use projects to enhance and perhaps more widely apply that capacity. Another producer just starting out on R&D issues would probably have far less ambitious expectations revolving around participation in the project, group formation, completion of task, as well as an expanded awareness of the issue at hand and where that issue fits more broadly. Assessing where a community is located with respect to the map of outcomes can provide a good benchmark or baseline from which community specific development might be expected to occur.

Through participation in R&D and adopting findings, the level of awareness may become increasingly sophisticated such that a producer (or group) begins to see their particular issue within a wider context. This may become a platform for further participation in these wider management issues. Increasing awareness may progressively become part of the capacity when that awareness extends to being able to recognise that R&D issues are likely to emerge and the producer (or group) then uses that awareness to take pre-emptive action.

Environmental

The chairs of the RDCs propose that environmental outcomes should at least consider dryland salinity, water quality, biodiversity and greenhouse gas emissions. These are considered the main priorities for MLA at this point.

The environmental benefits, or increases to the natural capital, often include impacts from an increased understanding of environmental issues and capacity to better manage natural resources (e.g. the SGS final report contains a consideration of increased numbers of producers that recognised the issues and potential practice changes). The actual benefits are derived from on and off farm biophysical change. These changes may include increased soil health and reduced erosion (on-farm), reduced water and nutrient 'leakage' (off-farm), reduced greenhouse gas emissions (off-farm) and improved biodiversity (both on- and off-farm).

Off-farm environmental benefits/costs are difficult to link to actual farming practices in the short to medium term. Off-farm environmental indicators such as water quality will not strictly apply to program/project level monitoring and evaluation. Rather, these indicators may apply to the overall impact of all collective R&D. RDCs should consider a collective response to determining R&D impacts on off-farm environmental issues.

On-farm benefits are therefore likely to include changes to:

- Groundcover (% , timing and duration);
- perennial species (%);
- Completion of nutrient budgets; and
- Remnant native vegetation (size, proportion of property, health and connectivity).

Micro-soil measures (e.g. soil organic carbon levels, acidity, sodicity, infiltration/structure, electrical conductivity, etc.) are not likely to be appropriate for assessing trends due to high spatial and temporal variability.

Summary

In summary the major TBL benefits relevant to R&D programs are:

- Financial: improved profitability of farms and the industry, more adoption or faster adoption of practices that can improve financial performance;
- Social: increased human and social capital; and
- Environmental: biophysical changes (soil, air, water, biodiversity, landscape), changed practices that can lead to environmental improvement.

1.4 Review approach

The main emphasis of the review of the two programs is on the effectiveness of each program. That is, what has been the level of performance against the intended outcomes? As TBL outcomes have not been defined previously, particularly for the social and environmental elements, Hassall & Associates has nominated some potential TBL outcomes (Chapter 3). The review does not consider appropriateness (how well the objectives of the program meet producer and community needs), or efficiency (whether the outputs were obtained for the least cost).

The study is predominately a desk-top exercise. Previous reviews of programs and projects (the *ad hoc* reviews) have been assessed to determine the scope of the ascribed benefits, as well as the comprehensiveness of consideration of causality and attribution, description of the baseline and quantification/estimation of the benefits. The review did not consider unintended benefits of the projects.

Previous surveys, including the ABARE survey conducted for Sustainable Grazing Systems and the Southern Producers' Survey conducted by Solutions Marketing and Research, also have been examined to obtain data on program performance.

The achievements of the SB and LSM programs have then been assessed. Findings have been provided to MLA staff for comment. A workshop was held with a cross-section of MLA staff, with attendees from Livestock Producer Innovation, Processing Product Innovation, Infrastructure (Supply Chains) and Communication. The workshop discussed preliminary results and considered the requirements for suitable guidelines for conducting TBL evaluations in the future.

1.4.1 Financial analysis

There are two levels of analysis when considering financial performance of MLA programs. The first is the impact on the industry as a whole and the second is what is the impact on participants.

The financial performance at an **industry level** needs to consider the impacts on market share and the underlying demand and supply of beef. The key questions to ask are, has the investment in R&D led to a greater consumption of beef and/or a higher average price received across all grades? This review does not assess the consumer's perceptions of quality and interactions between product differentiation, prices and demand for product on an industry wide basis. Therefore the review does not provide a definitive answer on the overall impact of the program. This needs to be recognised as a limitation to the analysis.

The financial performance at a **participant level** needs to consider the benefits and costs relevant to each firm (including MLA). The result, however, cannot be inferred as an overall industry benefit as it might merely represent a transfer from one company (a non-participant) to another (a participant). That is, those involved may attract benefits at the expense of another firm, or they may capture a greater market share. The financial performance at a participant level does give a useful indication for the financial efficiency of the investment (how well program inputs are turned into benefits).

A benefit cost analysis (BCA) framework is used to assess the financial impacts of the MLA programs to the participants. Using the BCA framework, the benefits and costs resulting from implementation of the program are identified and measured. That is, the additional benefits that can only be obtained by undertaking the program and the additional costs that can only be avoided by not adopting the program are considered (Sinden & Thampapillai 1995).

Key indicators arising from this approach include net present value (NPV) and benefit-cost ratio (BCR). The NPV is the sum of the current and future benefits and costs in today's dollars. A positive NPV indicates that benefits of the program have exceeded costs and the project has been worthwhile from efficiency perspective. A BCR is the benefits divided by the costs – a ratio greater than one is desirable.

Costs arising from the program include MLA investment in program development, promotion and administration as well as costs of participation in the program. Past expenditure has been indexed to 2003 dollars and this figure is included as a once-off cost of program development.

The benefits of involvement relate to the increases in profitability, larger numbers of producers that change practice or the acceleration of changing practices. Some intangible impacts are not explicitly included into the financial assessment.

The data and assumptions for the financial analysis have been run through the ex-ante tool used to assess R&D investment (IMAP software).

1.4.2 Social and environmental analysis

The identified environmental benefits (and costs) in Chapter 4, which relate to projects, are considered in the context of the whole SB and LSM programs.

2. Programs reviewed

The terminology and level of evaluation needs to be clarified as it is evident that there are many different levels in which activities are grouped and managed by MLA.

Programs refer to the main structure of organising activities and funds. Programs are the primary level in which MLA needs to be accountable to external stakeholders. The main programs within LPI include: SB and LSM (the two under review), as well as Northern Beef, Strategic Research and Communications.

Sub-programs are the organisation into themes. These themes go across programs, and include: feedbase/pastures, animals, supply chains and adoption.

Projects are the main organisation and implementation of R&D activity, and include⁶ SGS, LambPlan, BreedPlan, EDGENetwork®, to name a few. Most of the data collected is actually at a project level, which leads to questions about how it is best aggregated (especially in the context where there is an unclear organisation of activity at the program level). The following sections show which projects and sub-programs have been included in the review, as well as give a description of the programs.

The evaluation of SB and LSM is at the program level, by aggregating from data that is applicable to the project level. This does not allow for synergies and overlaps between programs (e.g. a pasture improvement might in turn be better utilised by an animal with superior genetics). This is a limitation of the analysis.

2.1 Southern Beef program

From the Annual Reports, the implicit objectives of the SB program are to:

- Enhance sustainability - [joint with LSM] – water use, acid and drought tolerant pastures, biodiversity indicators, greenhouse gas abatement
- Enhance efficiency - genetic gain, feed conversion, manage climate variability, reproduction, disease control
- Increase compliance with customer specifications⁷
- Increase adoption (business management skills and product delivery) – establish best practice principles, support producer networks, deliver EDGENetwork

⁶ Projects are sometimes referred to as programs, which is a source of confusion.

⁷ In Lamb, this is a separate sub-program.

- Program communication, Monitoring and evaluation (M&E) - improve adoption by 50%, M&E for biophysical changes and adoption of practices.

These objectives are sometimes simplified by MLA staff to:

- Maximise beef production from available feed resources;
- Minimise cost of cattle diseases;
- Prevent degradation of the land by improving pasture management; and
- Use production systems that meet customer specifications and implement best practice (business and beef production) skills.

Defined targets for the SB program include:

- Reduce cost of production per kg by 10% for individual farm businesses;
- >50% producers know how to meet customer specifications;
- 30% increase in producers adopting best practice;
- 30% increase in businesses adopting sustainable practices; and
- 15,000 producers in networks and 1,000 producers through EDGENetwork® workshops.

Agtrans (2003) nominated performance indicators (PI) for SB include:

- Financial: Cost per kg, Costs as % receipts, Turnoff and death rates, Rate of return, Knowledge of specifications, % adoption of practices to meet specifications, No. of animals with MSA grading;
- Social: Number of participants for EDGENetwork® and producer networks, % adopting practices; and
- Environmental: % using sustainable practices.

As background, Black, J and Scott, L (2002) outline that the main factors affecting profitability (net profit/enterprise/year) are:

- Pasture growth and utilisation;
- Increase throughput of animals for sale: stocking rate, increasing fecundity & multiple births, purchasing calves;
- Early weaning and reduced spread of calving (to reduce pressure on high productivity pasture by breeding stock as compared to sale stock);
- Increased price;
- Lower costs of production; and
- Managing variability (rainfall and pasture growth): match the pasture availability with use.

The projects included in the SB program are shown in Table 2.1.

Table 2-1 Projects included in the Southern Beef program

<i>Sub-program</i>	<i>Projects</i>
Pastures/feedbase	Sustainable Grazing Systems (SGS) Feedbase and Sustainability (includes biological weed control, lucerne breeding, pasture improvement)
Animal	Breedplan – research & delivery Other genetics (assessed as input to Breedplan) Beef tenderness and marbling Feed efficiency Hide improvement
Supply Chain	Beefnet
Adoption/ communication	EDGENetwork ® Producer Initiated Research and Development (PIRDs)

2.2 Lamb and sheepmeat program

From the Annual Reports, the implicit objectives of the LSM program⁸ are to:

- Improve profitability (weaning %, carcass weight and yield) and lower cost of production;
- Improve quality and meeting of market specifications (eating quality, compliance with specifications);
- Improve sustainability (increase water use efficiency and use of perennials; monitor greenhouse);
- Improve health and welfare (Ovine Johne's Disease);
- Improve social development, technology adoption and innovation (training – EDGENetwork, Benchmarking, PIRDs, Producer Networks), improved practices, information, supply chain links and networks.

There is also a desire to expand results for grazing management from high rainfall zones to also cover wheat-sheep and pastoral zones.

Agtrans (2003) nominated PIs for LSM include:

- Financial: Cost per kg, Costs as % receipts, Rate of return, Farm business profit, Lamb marking %, Lambs sold as proportion of ewes mated, Lamb carcass weight, Lamb meat yield (Lambplan), No. of chains adopting SMEQ – lamb & mutton, No animals in chains with SMEQ – lamb & mutton, No. supply chains, No. lambs in supply chains, No. lambs sold over the hooks, Knowledge of specifications, % adoption of practices to meet specifications, Mutton carcass weight;
- Social; No. of participants for EDGE and producer networks, % adopting practices;

⁸ Also includes goats.

- Environmental: % perennial species, % sustainable practices, level greenhouse gas emissions; and
- Other/Animal health and welfare: OJD control information provided.

The projects included in the LSM program are shown in Table 2.2.

Table 2-2 Projects included in the LSM program

<i>Sub-program</i>	<i>Projects</i>
Pastures/feedbase	Sustainable Grazing Systems (SGS) Feedbase and Sustainability (includes biological weed control, lucerne breeding, pasture improvement)
Animal	Lambplan – research & delivery Other genetics (assessed as input to Lambplan) Meat production from wool sheep Sheep Meat Eating Quality (SMEQ)
Supply Chain	Lamb supply
Adoption/ communication	EDGE network ® Producer Initiated Research and Development (PIRDs)

2.3 Program costs

MLA has supplied project costs for the period 1998/99 to 2002/03. These costs have been converted to 2003 dollars. The costs have some uncertainty associated with them due to the transition between three different financial and accounting systems used during the period. These costs are shown in Table 2.3.

The table also shows the in-kind and implementation costs estimated for each of the projects. The in-kind costs represent primarily the efforts put in by researchers, other organisations and producers. The implementation costs refer primarily to the costs borne by producers to implement change. In some cases, data of likely contributions made by other parties was available (EDGEnetwork®, Lambplan, PIRDs). In other cases, it is assumed that MLA costs comprise 50% of the total R&D costs⁹.

⁹ Tested in a sensitivity analysis (Chapter 5).

Table 2-3 MLA and implementation expenditure

<i>Project</i>	<i>MLA Cost 1998/99 to 2002/03 (\$)</i>	<i>In-kind and Implementation Cost (\$)</i>	<i>Program* (SB/LSM)</i>
SGS	\$12,345,000	\$12,345,000	SB/LSM
Feedbase and Sustainability	\$4,451,000	\$4,451,000	SB/LSM
Breedplan (SB only) ¹⁰	\$1,836,000	\$1,836,000	SB
Lambplan	\$9,806,000	\$8,000,000	LSM
Beefnet	\$2,243,000	\$2,243,000	SB
Lamb Supply	\$1,766,000	\$1,766,000	LSM
Beef Supply (SB consistency)	\$1,327,000	\$1,327,000	SB
Hide Improvement	\$1,001,000	\$1,001,000	SB
Meat Production from Wool Sheep	\$484,000	\$484,000	LSM
Sheep Meat Eating Quality	\$3,102,000	\$3,102,000	LSM
EDGEnetwork	\$8,410,000	\$14,438,260	SB/LSM
PIRDs	\$997,000	\$1,096,700	SB/LSM
Communications overhead	\$696,000		SB/LSM
Total	\$49,271,000	\$52,896,960	

Source: MLA. All costs have been converted to 2003 dollars.

*Allocation of project to program. SB=Southern Beef. LSM = Lamb and Sheepmeat.

¹⁰ Includes Feed Efficiency and Finishing. The Northern Beef component (50% of total) is excluded from analysis.

3. Evaluation framework

An evaluation framework allows the objectives of the evaluation to be addressed in a rational way. An evaluation framework ensures that outcomes are adequately specified. It also defines linkages (causality) between different types of outcomes. This gives the basis to assess performance. Figure 3.1 shows a map of intended outcomes, which follow a sequence from participation, awareness, capacity, practice change and impact. This is not saying that the adoption happens in a linear way, but rather that the outcomes occur at different levels. Table 3.1 allocates the outcomes via the TBL.

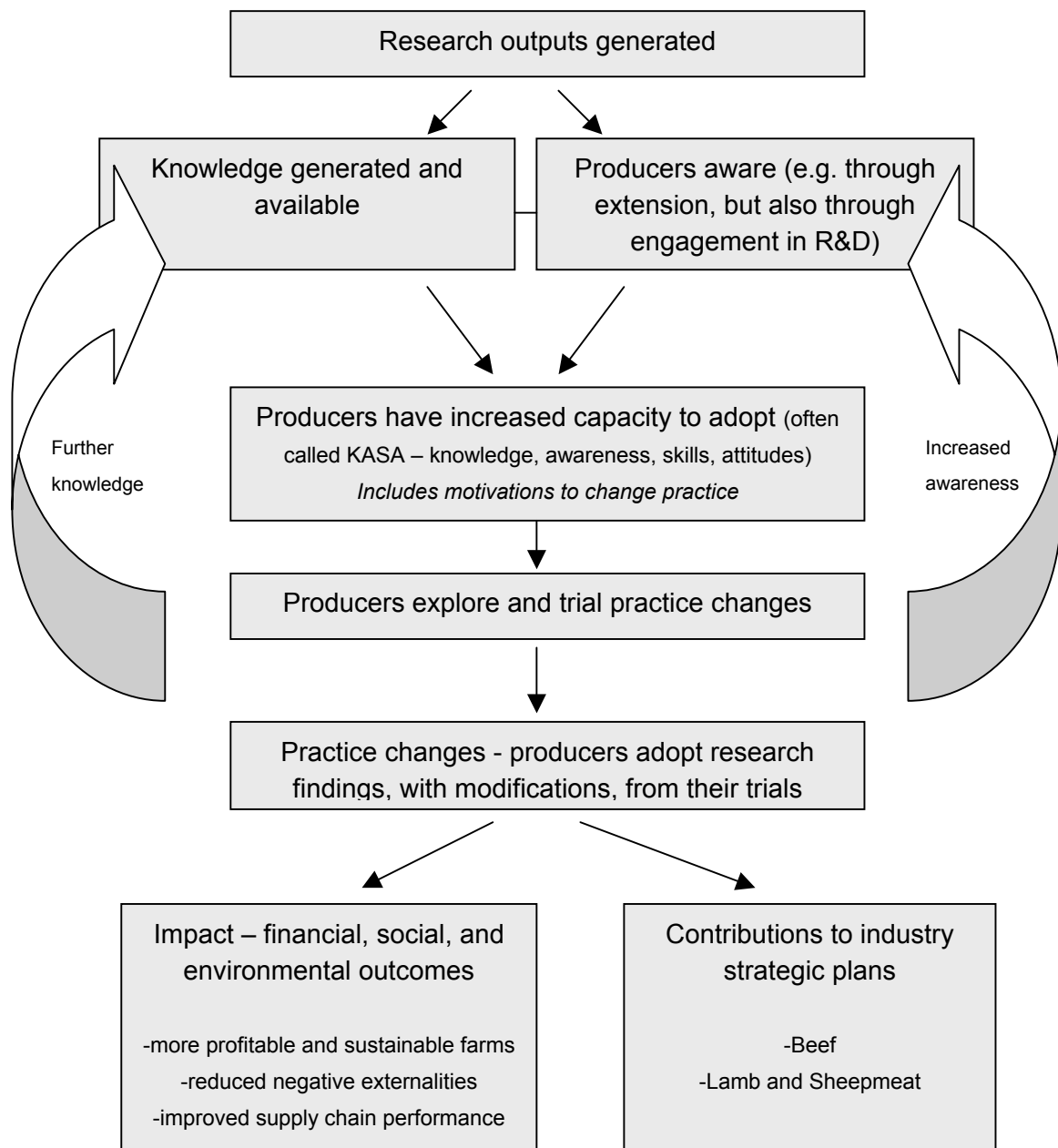


Figure 3.1: Intended outcomes of MLA investment

Table 3.1 Intended R&D outcomes

	Financial	Social	Environmental
Precursor for outcomes to occur	Financial parameters recognised and incorporated into all program/project activities	Social parameters recognised and incorporated into all program/project activities	Environmental parameters recognised and incorporated into all program/project activities
Short-term intended outcomes	Financial benefits developed & demonstrated	Developed networks and information flow	Environmental benefits developed & demonstrated
Medium-term intended outcomes	Producers aware of financial options Capacity to change financial options – consideration and assessment of financial options	Improved capacity - knowledge, awareness, skills attitudes, confidence and motivation to change	Producers aware of environmental options Capacity to change environmental options
Long-term intended outcomes	Practice change Increased profits	Strengthened and expanded networks and information flow Utilisation of additional capacity in other arenas of farm life Achievements of personal and farm goals Impacts on family, community and industry	Practice change Improved “sustainability”

The performance measures appropriate to these outcomes are shown in Table 3.2. See Volume 2 for qualifications and further discussion about these indicators. Not all of these indicators can be used for the review of SB and LSM because of a lack of data collected at the appropriate level.

Table 3.2 Potential performance indicators for outcomes

	Financial	Social	Environmental
Precursor for outcomes to occur	Financial parameters recognised and incorporated into all program and project activities	Social parameters are recognised and incorporated into all program and project activities	Environmental parameters are recognised and incorporated into all program/ project activities
Short-term outcomes	Research results show financial benefits (e.g. costs/kg production, rates of genetic gain, potential production, carcass weights)	Developed networks and information flow Participation in R&D programs, groups or courses (number and frequency)	Research results show environmental benefits (e.g. improved groundcover % and duration; nutrient budgeting)
Medium-term outcomes	Producer awareness of financial options Producers consider and assess financial options (number and extent) Property management plan incorporates parameters issues Producers have defined risk management strategies (number and extent)	Confidence Capacity to manage farm (skills, knowledge, attitudes, motivation) Property management plan - developed, used and adapted	Producer awareness of environmental options Producers consider and assess environmental options (number and extent) Property management plan incorporates environmental issues
Long-term outcomes	New practices adopted (e.g. changing enterprise, inputs, or timing of operations) \$/ha/yr Gross Margins, by enterprise & whole of farm Changes to whole farm budget (incl. implementation costs) Kg/ha/mm rainfall \$/ha/mm rainfall (whole farm) Costs/kg production % potential production achieved	Strengthened and expanded networks and information flow (changed relationships) Additional capacity is used in other arenas Achievement of personal and farm goals Impacts on family, community and industry	Remnant native vegetation size and connectivity (trees, shrubs, pastures/grasslands) Proportion of perennial species (trees, shrubs, pastures/grasslands) Groundcover % and duration

4. Findings from previous reviews

This section describes the various benefits that have been ascribed to various MLA programs and projects, as evident in the previous *ad hoc* reviews. The reviews used are listed in the references (Chapter 8) and marked with an asterisk. The benefits have been grouped by TBL element and program.

No judgement is made at this point about whether the benefits are valid or not.

4.1 Financial

Southern Beef

- Improved productivity (5%) by Prograze participants;
- Improved production (increased rotational grazing, increased stocking rates, fodder budgeting, soil testing) by SGS participants;
- Increased production (tagasaste);
- Decreased weed control costs;
- Individual case studies of increased profit for PIRD participants;
- Beef marbling gene found;
- Increased liveweight (beef genetics);
- Increased sale weights (Beefcheque) whilst maintaining stocking rates;
- Net feed efficiency increased; and
- Cattle sold under marketing banner of Beefnet.

Lamb and Sheepmeat

- Improved productivity (5%) by Prograze participants;
- Improved production (increased rotational grazing, increased stocking rates, fodder budgeting, soil testing) by SGS participants;
- Increased production (tagasaste);
- Decreased weed control costs;
- Individual case studies of increased profit for PIRD participants;
- Increased profit from silage feeding;
- Increased profit from MGSE.

4.2 Social

Southern Beef

- Prograze participants more confident;
- SGS participants more knowledgeable, confident, better decision makers;

- Participation in PIRD groups have lead to management changes¹¹;
- Involvement of Landcare groups in biological weed control;
- 73 Beefnet (supply chain) groups formed – discussed production and marketing issues with peers¹²;
- World first that production trait (marbling) isolated; and
- Self-help groups (Beefcheque) – some established without MLA funding.

Lamb and Sheepmeat

- Prograze participants more confident;
- SGS participants more knowledgeable, confident, better decision makers;
- Participation in PIRD groups have lead to management changes;
- Involvement of Landcare groups in biological weed control;
- Increased capacity in Supply Chain; and
- Increased producer/processor relationships Q Lamb alliance (increased knowledge of requirements and increased control over product quality).

4.3 Environmental

Southern Beef

- 50% Prograze participants had improved perennial pastures, better water usage, lower weed incidence;
- Increased feed efficiency might be used to spell pastures;
- Increased ground-cover (tagasaste); and
- Increased recognition of environmental issues for SGS (different only for soil acidity and water quality – depends also on distribution of problems?).

Lamb and Sheepmeat

- 50% Prograze participants had improved perennial pastures, better water usage, lower weed incidence;
- Increased feed efficiency might be used to spell pastures;
- Increased ground-cover (tagasaste);
- Increased recognition of environmental issues for SGS (different only for soil acidity and water quality – depends also on distribution of problems?);
- Environmental Management System under development (output); and
- Education regarding weed incidence in pastures (from silage).

¹¹ Potential financial benefits.

¹² Potential financial benefits.

4.4 Issues in description, quantification and estimation of benefits

The main issues are whether the benefits:

- Are clearly described;
- Are estimated and/or quantified
- Consider the baseline (e.g. what would have happened without the research);
- Consider how many people would use the R&D; and
- Consider causality and attribution (e.g. what the R&D actually did as compared to other factors such as seasons and higher prices).

Tables 4.1 to 4.3 show whether the benefit statements are appropriately described and estimated. In general the benefit statements are not appropriately described nor estimated. Hassall & Associates has then used the quantification (e.g. for SGS and EDGENetwork®) where it is available in the analysis of the SB and LSM programs (see Chapters 5 and 6).

Table 4.1: Financial description assessment

	Program	Sub-program ¹³	Quantified	Baseline defined	Benefits defined	Adoption defined	Attribution defined
Improved productivity (5%) by Prograze participants	SB & LSM	P/Ad	Yes	Unclear	Yes	Yes	Indirect
Improved production (increased rotational grazing, increased stocking rates, fodder budgeting, soil testing) by SGS participants	SB & LSM	P	Partly	Unclear	Unclear ¹⁴	Yes	Indirect
Increased production (tagasaste) ¹⁵	SB & LSM	P	Yes	Unclear	Yes	Yes	Indirect
Decreased weed control costs (Biological control)	SB & LSM	P	Partly	Unclear	Yes	Unclear	Indirect
Individual case studies of increased profit for PIRD participants	SB & LSM	Ad	Partly	Unclear	Unclear overall benefit	Unclear	Indirect
Beef marbling gene found	SB	A	No	No	No	No	No
Net feed efficiency increased	SB	A	Yes	Unclear	Yes	No	Indirect
Increased liveweight (beef genetics)	SB	A	Yes	Unclear	Yes	No	No
Increased saleweights (Beefcheque) whilst maintaining SR	SB	Ad/P	Yes	Unclear	Yes	Yes	Indirect
Cattle sold under marketing banner of Beefnet	SB	SC	Partly	Unclear	Unclear	Yes	Indirect
Increased profit from silage feeding	LSM	P	Yes	Unclear	Yes	No	No
Increased profit from MSGE	LSM	A	Yes	Unclear	Yes	Yes	Indirect
Increased supply chain	LSM	SC	No	Unclear	Unclear	No	No
Producer-processor alliance increased return	LSM	SC	Yes	Unclear	Yes	Yes	No

¹³ Key: P – Pastures A – animals (breeding, etc) Ad – adoption SC - Supply chain.

¹⁴ Some indications available from the national experiment.

¹⁵ Tagasaste is coded for SB and LSM but may be better allocated to Northern Beef.

Table 4.2: Social description assessment

	Program	Sub-program ¹⁶	Quantified/described	Baseline	Benefits	Flow-on \$ Benefits?	Adoption rate	Attribution
Prograze participants more confident	Both	P/Ad	Partly	No	No		No	Indirect
SGS participants more knowledgeable, confident, better decision makers	Both	P	No	No	No		No	Indirect
Involvement of Landcare groups in bio weed control	Both	P	No	No	No		No	No
Self-help groups (Beefcheque)	Beef	P/Ad	No	No	No		No	Some established without MLA funding
Participation in PIRD groups that have made changes	Both	Ad	No	No	No	Possible	No	Indirect
World first that production trait (marbling) isolated	Both	A	No	No	No		No	Indirect
73 Beefnet (supply chain) groups formed – discussed production and marketing issues with peers	Beef	SC	Partly	No	No	Possible	No	Indirect
Increased capacity in SC. (Note: Developed material for EN)	Sheep	SC	Partly (for outputs)	No	No		No	Indirect
Increased producer/processor relationships in Qlamb alliance – increased knowledge of requirements and increased control over product quality	Sheep	SC	Partly	No	No	Possible	No	Indirect

¹⁶ Key: P – Pastures A – animals (breeding, etc) Ad – adoption SC - Supply chain.

Table 4.3: Environmental description assessment

	Program	Sub-program ¹⁷	Quantified/described	Baseline	Benefits	Adoption rate	Attribution
Increased ground cover (tagasate)	Both	P	No	No	No	Yes	Indirect
SGS increased recognition of environmental issues	Both	P	* Partly	No	No	Yes	Indirect
50% Prograze participants had improved perennial pastures, better water usage, lower weed incidence	Both	P/Ad	Partly	No	Unclear	Yes	Indirect
Increased feed efficiency might be used to spell pastures	Beef	A	No	No	No	No	No
EMS under development – intended output	Sheep	SC	No	No	No	No	No
Education re weed incidence in pasture (from silage)	Sheep	P	Partly	No	No	No	No

*From ABARE survey data, this is differentiated only for soil acidity and water quality; but not dryland salinity, soil erosion and weed control. Depends on distribution of environmental issue.

¹⁷ Key: P – Pastures A – animals (breeding, etc) Ad – adoption SC - Supply chain.

5. Financial analysis results

5.1 Input data

5.1.1 Generic assumptions

Financial benefits estimated result from the adoption and positive effect on net farm cash income (FCI). Nine of the 13 projects have used default estimates of adoption and affect on FCI, due to limitations in data available. The assumed levels are a 0.5% increase in FCI per farm and adoption and 5.0% adoption rate across the relevant industry. The base levels of FCI and farm numbers are detailed in Table 5.1.

Table 5-1 Farm income and industry size

	<i>Southern Beef</i>	<i>Lamb & Sheepmeat</i>	<i>Average/Total</i>
Farm cash income*	\$48,933	\$41,598	\$45,266
Farm numbers**	25,876	37,980	63,856

* Source: ABARE five-year average 1998/99 to 2002/03 by industry.

** Source: ABARE – generated as part of Hassall & Associates (2004b, see Appendix 3, includes mixed farms).

Therefore, a 0.5% increase in FCI equates to \$225/year and the 5% adoption (though also varying by industry) will mean a change in FCI for 3,200 farms.

The lag for implementation of R&D and hence realisation of benefits is assumed to be 2 years. The benefit is assumed to last for 5 years.

There are two broad categories of costs involved with agricultural research. The first is actual costs (both cash and in-kind) of research and extension. The second is implementation costs.

Financial costs estimated include MLA's research costs, in-kind contributions and estimate of training and one off implementation costs on farm. MLA's costs are detailed in Section 2.3. In-kind and implementation costs are assumed to be similar to the MLA costs, except when information has been provided (SGS, Lambplan, EDGENetwork and estimate for Breedplan).

The benefits and costs have been apportioned 60% to LSM and 40% SB for cross-industry projects.

Sensitivity analysis is conducted on key assumptions (see Section 5.4).

5.1.2 Individual project assumptions

Individual project assumptions are listed in Table 5.2.

Table 5-2 Key project assumptions

<i>Program</i>	<i>Increase FCI (%)</i>	<i>Base adoption %</i>
SGS	3%	8,000
Feedbase and Sustainability	0.5%	5.0%
Breedplan	0.5%	50.0%
Lambplan	\$1.40 /animal	8,490,727 animals
Beefnet	0.5%	36.0%
Lamb Supply	\$5.00	230,000 animals
Beef Supply (SBC)	0.5%	5.0%
Hide Improvement	0.5%	5.0%
Feed Efficiency and Finishing	-	-
Meat Prod. from Wool Sheep	0.5%	5.0%
Sheep Meat Eating Quality	0.5%	5.0%
EDGEnetwork	3.0%	3,837
PIRDs	0.5%	50%
Communications overhead	0	0

5.2 Base case results

The net benefit is assessed over a 10 year time period using a 7% discount rate. Based on the assumptions outlined, the net benefit of both programs to industry participants is estimated to be \$26 million, with a BCR of 1.29 (Tables 5.3 and 5.4, with Table 5.5 showing the net benefit by project). The NPVI is very low. It can be seen that the majority of the benefits are derived from the LSM program. However, this must partly reflect expenditure, as the BCR of each is positive. Examination shows that expenditure is approximately double for LSM. The majority of the benefits arise from three projects: Lambplan, SGS and Breedplan.

Table 5-3 Net benefit across all programs

Present Value of Benefits	\$116,752,827
Present Value of Costs	-\$90,790,846
NPV (10yrs, 7% discount rate)	\$25,961,981
BCR	1.29
NPVI	0.29

Table 5-4 Net benefits by program

	<i>Southern Beef</i>	<i>Lamb & Sheepmeat</i>
NPV	\$3,236,380	\$22,725,600
BCR	1.10	1.39
NPVI	0.10	0.39

Table 5-5 Net benefits by project

<i>Project¹⁸</i>	<i>NPV (\$)</i>	<i>BCR</i>
SGS	13,451,493	1.60
Feedbase and Sustainability	-5,668,089	0.30
Breedplan	7,275,271	3.19
Lambplan	23,633,646	2.46
Beefnet	-3,465,784	0.15
Lamb Supply	656,070	1.21
Beef Supply (SBC)	-1,339,761	0.44
Hide Improvement	-750,347	0.59
Feed Efficiency and Finishing	-	-
Meat Prod. from Wool Sheep	446,887	1.51
Sheep Meat Eating Quality	-4,286,505	0.24
EDGEnetwork	-3,313,854	0.84
PIRDs	-26,578	0.99
Communications overhead	-650,467	0.00
Total	25,961,981	1.29

5.3 IMAP results

The MLA IMAP package enables a formal structure to be used to assess the costs and benefits of a project. The spreadsheet allows specification of the benefits in a number of ways such as change in profit or change in numbers produced and also allows detail on factors such as rate of change. Benefits can also be changes in long-term capacity or costs avoided.

¹⁸ It is noted that other specific economic evaluations have reached different results to the broad evaluation process used for this TBL evaluation. For example, Farquarson *et al.* (2001) has examined the past performance of genetic research in Australia. The major differences between the studies are the time period evaluated (1970-2001 versus expenditure between 1998-2001), inclusion of other impacts (e.g. semen imports and cross breeding) and the assumptions of uptake across the industry. The BCR for both analyses are of similar order.

In essence, however, IMAP requires detail on:

- Costs;
- Program effects;
- Adoption; and
- Discount rate;

IMAP is not suitable for use in this financial analysis as it has a very large number of assumptions required for the model to run properly. The results could be replicated within the IMAP framework given similar assumptions on costs and annual benefits.

However, given the coarseness of our financial analysis (driven in the main by lack of data), the use of IMAP would simply serve to add a complicated layer of assumptions that would be less transparent. This has potential to add a false sense of accuracy to the results associated with the process of estimating a large number of variables.

If provided sufficient data, IMAP can be a useful pre and post evaluation tool. Even if IMAP is used, it is necessary to define what data needs to be collected during a project in order to then assess it against stated objectives. IMAP may be useful if it encourages proper project planning and management (e.g. definition of objectives and data requirements).

As a minor point, consistent use of a tool such as IMAP is essential. To achieve this, an individual or group within the organisation with specialised skills would be required and a workshop situation would be best to achieve realistic and consistent inputs.

It should be noted that the IMAP framework is not simply an industry financial analysis tool. Many of the variables assessed relate to corporate strategy and factors such as commercialisation.

Finally, IMAP is not a benefit cost methodology *per se*. A formalised structure to achieve consistency in estimation and analysis can be achieved through other processes such as workshops, analyses by external or centralised analysis within MLA. These other processes may be a better use of resources than implementing IMAP.

5.4 Sensitivity and threshold analysis

The following variables were tested to estimate the sensitivity of the results to a change in assumptions. The four variables chosen are:

- Increase in farm cash income;
- Adoption rate;
- Length of benefit; and
- Discount rate.

The sensitivity tests for each variable are shown in Table 5.6. Lower estimates are not analysed for an increase in FCI and also number of years of benefit. This reflects the conservative nature of estimates for these variables for the current study.

Table 5.6 Sensitivity test values

<i>Variable</i>	<i>Lower</i>	<i>Base</i>	<i>Upper</i>
Increase in FCI	-	0.5%	5%
Adoption	2%	5%	10%
Length	-	5 years	10
Discount rate	4%	7%	10%

These scenarios can provide indications as to which parameters might be best for MLA to try to influence. It should be noted that it is essential to be able to provide evidence that these ranges actually can occur. It is also likely that significant expenditure will be needed in order to achieve these results – the analysis does not assume any additional expenditure, as the nature of the study is to look backwards and assess what could have been achieved with the investment.

5.4.1 Increase in farm cash income (FCI)

Increasing the FCI impact to a standard 5% for all projects that are specified in this way has a significant impact on the NPV. Both, Lambplan and Lamb Supply are currently estimated in terms of return per animal and are increased by 50% for the sensitivity analysis (to \$2.10 and \$7.50 per head respectively).

The increase in FCI sees all programs have a positive return (Table 5.7). In particular, there is a large increase in the NPV of Breedplan and SGS as they have assumed high adoption rates.

Table 5-7 Sensitivity analysis (FCI = 5%)

	Base Case (0.5%)	Sensitivity (5%)
Present Value of Benefits	\$116,752,827	\$355,563,795
Present Value of Costs	-\$90,790,846	-\$90,790,846
NPV (10yrs, 7% d.r.)	\$25,961,981	\$264,772,948
BCR	1.29	3.92

5.4.2 Adoption rate

Increasing the adoption rate of each program to a standard 2% and 10% also has a significant impact on the total NPV. Where adoption is not specified as a percentage increase, for example when actual estimates of participation are available for either the number of participants or animals (this is the case for SGS, Breedplan, Lambplan, Beefnet, EDGENetwork and PIRDs), a factor of 0.9 and 1.1 has been used. The results are shown in Table 5.8.

Table 5-8 Sensitivity Analysis (Adoption = 2% and 10%)

	Sensitivity (2%)	Base Case (0.5%)	Sensitivity (10%)
Present Value of Benefits	\$101,891,301	\$116,752,827	\$134,471,271
Present Value of Costs	-\$90,790,846	-\$90,790,846	-\$90,790,846
NPV (10yrs, 7% d.r.)	\$11,100,454	\$25,961,981	\$43,680,424
BCR	1.12	1.29	1.48

5.4.3 Length of benefit

Increasing the period that the R&D continues to have a benefit or impact on FCI is raised from 5 years to 10 years. All projects are treated equally and the results are shown in Table 5.9.

Table 5-9 Sensitivity Analysis (Length of benefit 10 years)

	Base Case (5 years)	Sensitivity (10 years)
Present Value of Benefits	\$116,752,827	\$153,459,628
Present Value of Costs	-\$90,790,846	-\$90,790,846
NPV (10yrs, 7% d.r.)	\$25,961,981	\$62,668,782
BCR	1.29	1.69

There are a number of projects that retain a negative NPV. This is due to the low annual benefit that is derived from programs such as Beefnet, Beef Supply and Hide Improvement (given the assumptions of the analysis).

5.4.4 Discount Rate

The discount rate is tested at both 4% and 10% (standard practice – see Table 5.10).

Table 5-10 Sensitivity Analysis (Discount Rate = 4% and 10%)

	Sensitivity (4%)	Base Case (7%)	Sensitivity (10%)
Present Value of Benefits	\$138,054,884	\$116,752,827	\$99,349,405
Present Value of Costs	-\$94,760,096	-\$90,790,846	-\$87,107,736
NPV (10yrs, 7% d.r.)	\$43,294,788	\$25,961,981	\$12,241,669
BCR	1.46	1.29	1.14

5.4.5 Discussion

The results show the type of information available from the financial analysis. This information can be useful for management decisions regarding directing investment across a R&D portfolio or within a specific project. The results are particularly sensitive to assumptions regarding FCI (farm cash income), and somewhat sensitive to assumptions regarding the adoption rates.

The data available is variable in quality and a significant number of assumptions had to be made regarding potential impact. This results in a low confidence regarding the absolute value of the results.

This shows the importance of monitoring and being able to provide key data. As a related point, it also draws out the lack of specificity of objectives – what financial outcome is desired?

The review results are within the range quoted by Alston *et al.* (2002) for agricultural R&D returns. The more significant point to come from the Alston study is that there are marked differences in assumptions between different analyses. There are significant differences regarding attribution, definition of a base case (either no research or a different research program), treatment of costs, selection of projects to evaluate, aggregation and direct measurement of benefits. Overall, the three main variables that impacts the results of the analysis are:

- correct specification of the costs involved associated with the research program and implementation;
- correct specification of the benefits that are attributable to the research program; and
- the length of time that the benefits continue to be apparent;

This analysis has been conservative in estimating benefits to a particular project, the adoption of research-based innovations or technology and the amount of time that the benefits from research accrue (i.e. the time before other research, wider market conditions or changed regulations would render the benefits of research obsolete).

For the purposes of this study no analysis is made of whether the farmer or consumer is benefited in the long run.

The financial study points to the importance of good program/project design, investment in monitoring and standardisation of evaluation techniques. These are all included within the guidelines that have been established as part of this project (refer to Volume 2).

6. Social and environmental analysis

6.1 Social impacts

The two major findings to come from the desk-top review are:

- Increased capacity of participants – higher skills, confidence and decision making abilities. The main projects were SGS, EDGENetwork®, PIRDs and Beefnet. Over the period, there have been approximately 20,000 participants in the 13 projects considered. These are not discrete people, as it is likely that there are a smaller number of producers who have participated in more than one MLA project. The extent to which these participants have higher skills cannot be ascertained from the data available.
- Formation of groups – leading to improved networks and information flow. There have been approximately 250 marketing, supply chain, production, and business groups formed. Again, there are likely to be some producers that have participated in more than one group.

Further information regarding social impacts is not available.

6.2 Environmental impacts

The environmental impacts are mainly associated with the SGS project. One half of the respondents to the ABARE survey reported improved perennial pastures, water usage and a lower weed incidence. Overall, there was an increased recognition of environmental issues. When this recognition was investigated by going back to ABARE source data, it is evident that it is only for two issues – soil acidity and water quality. The immediate qualification that must be placed on the interpretation of these results is that it depends on the distribution of the particular challenges – a high recognition is not important if the right people (the ones affected) do not know about it.

Further, there is no data available about the magnitude of the benefits reported (e.g. how much better is the water usage?). There is an unclear baseline – where did people start from and what would have happened without the project/program.

Further information regarding environmental impacts is not available.

7. Summary of findings

In terms of the nominated intended outcomes of the two programs (SB and LSM) the following summary can be made:

Financial parameters have been recognised and generally incorporated into all program activities. More consistency is needed in how the parameters are defined. Social and environmental parameters have generally not been recognised and incorporated. At the project level, SGS recognised social and environmental parameters to some extent. The other projects did not, although a detailed consideration of each project's objectives has not been conducted.

At the program level, it is very unclear whether financial, social or environmental benefits have been developed and demonstrated. At the project level, there have been financial benefits for the SGS, Lambplan and Breedplan projects. There have been social benefits nominated for SGS, EDGENetwork® and PIRDS, particularly in terms of developed networks and information flow. Some environmental benefits have been developed for SGS.

In terms of capacity, it is likely that there has been an increase in producers' knowledge, awareness, skills, attitudes, confidence and motivation to change. However, the extent cannot be ascertained.

Practice change and impact information is scant. The assumptions used indicate that there are financial benefits for certain projects, which in turn aggregate to give a small net financial benefit at the program level (NPV of \$26M and BCR of 1.3 – over 10 years with a 7% discount rate, for both programs). There are social impacts likely to result from the networks and improved information flow. The environmental benefits at a program level are likely to be minor.

Information was not available to assess the direct objectives or targets of the SB or LSM programs, except the extent of participation in EDGENetwork® workshops (objectives and targets met).

The reviews of the two programs point to the importance of:

- Good program/project design;
- Management and evaluation at the appropriate levels where decisions about investment are made - note that it appears that there are too many levels within MLA;
- Full alignment of the objectives at different levels, and also to include all three elements of the TBL;
- Setting up current programs and projects in such a way to facilitate a TBL evaluation;
- Investment in monitoring - being able to provide key data on performance; and
- Standardisation of evaluation techniques.

These points are all included within the guidelines that have been established as part of this project (refer to Volume 2). Implementation of these guidelines by MLA is the major recommendation from this study.

8. References

The *ad hoc* reviews included in the analysis are marked with an asterisk *. These references cover both Volume 1 and Volume 2.

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