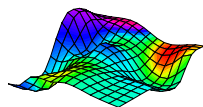


Report to

Dairy Australia

Cost Benefit Analyses
of Randomly Selected
Dairy Australia Investments

November 2009



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ACKNOWLEDGMENT

This report is the third in a series of cost benefit analyses completed for a number of Dairy Australia investments. The first report involved the derivation of financial sustainability measures for eight Dairy Australia investments that were deemed to have had a major impact across the Australian dairy industry. These eight projects, when compared to the total Dairy Australia investment between 2003/04 and 2005/06, demonstrated that a positive return has been generated for levy payers and Australia at large.

The second report in the evaluation series involved a benefit cost analysis of three of Dairy Australia's investment sub-programs selected at random from all sub-program investments made between 2003/04 and 2005/06. These analyses demonstrated the range of economic, environmental and social returns that can be generated from Dairy Australia's investment in research and development.

This is the third report in the evaluation series. Again, three investment sub-programs were selected at random and a benefit cost analysis complete for each. The sub-programs selected were drawn from a pool of investments completed by Dairy Australia in 2008/09. Dairy Australia engaged BDA Group to undertake these benefit cost analyses. Results from these evaluations again demonstrate that through Dairy Australia investment substantial benefits can be generated for both Australian dairy farmers as well as the broader community. In face of the recent global economic downturn, Dairy Australia has been able to complement the wider economic stimulus measures implemented by the Australian government to maintain economic activity in both rural and metropolitan areas.

Mr David Roche, Dairy Australia's Manager of Strategy and Planning, has overseen this assignment and his support is gratefully acknowledged. Other Dairy Australia and research partner staff kindly provided background information on specific investments and feedback on preliminary evaluations. Their contribution is also acknowledged. Despite every effort to clarify issues raised any remaining errors or omissions are the responsibility of the authors.

David Collins

BDA Group

Disclaimer: All surveys, forecasts, projections and recommendations made in reports or studies associated with the project are made in good faith on the basis of information available at the time; and achievement of objectives, projections or forecasts set out in such reports or studies will depend among other things on the actions of Dairy Australia and their partners, over which we have no control. Notwithstanding anything contained therein, neither BDA Group nor its servants or agents will, except as the law may require, be liable for any loss or other consequences arising out of the project.

EXECUTIVE SUMMARY

The Council of Rural Research and Development Corporations' Chairs has adopted an evaluation framework, based on cost benefit analysis, to provide objective and robust information on the returns delivered from their collective investment to Australia's primary producers and the Australian community more broadly. As part of this process Dairy Australia engaged BDA Group to complete a cost benefit analysis of three randomly selected investments made by Dairy Australia in 2008/09. The purpose of the study was to provide an indication of the range of returns generated on Dairy Australia's investment.

Dairy Australia's investments included in this study were grouped on the basis of their sub-programs. The three sub-programs selected included:

- Cowtime Extension** – Investment in this sub-program targeted on-farm changes designed to improve milk harvesting – defined as those activities undertaken from the time cows are brought in from their paddocks for milking and then returned.

- Systems Management** – Investment in this sub-program was to equip the dairy industry with the resources and tools to increase farm profitability through a more efficient and productive workforce and for dairy farmers to embrace innovative technologies to improve farm productivity through time.

- NCDEA** – The National Centre for Dairy Education Australia (NCDEA) is a partnership between Dairy Australia and the Goulburn Ovens Institute of TAFE. The partnership was formed in 2005 to develop and deliver Vocational Education and Training courses and competencies for the benefit of the Australian dairy industry and the wider community.

The investment made by Dairy Australia in these sub-programs has delivered a broad range of economic, environmental and social benefits to both dairy farmers and the wider community. The range of benefits considered in this study is summarised in the Tables below.

COWTIME EXTENSION BENEFITS

	Economic	Environmental	Social
Quantified	<ul style="list-style-type: none"> • Reduced milking times • Reduced energy costs 		<ul style="list-style-type: none"> • Increased economic activity • Lower dairy product prices
Non-Quantified		<ul style="list-style-type: none"> • Reduced CO₂-e emissions 	<ul style="list-style-type: none"> • More positive milking experience • Building capacity for industry innovation

SYSTEMS MANAGEMENT SUB-PROGRAM BENEFITS

	Economic	Environmental	Social
Quantified	<ul style="list-style-type: none"> • Increased farm profits • Value of information • Reduced staff turnover 	<ul style="list-style-type: none"> • Reduced nutrient runoff 	<ul style="list-style-type: none"> • Increased economic activity • Lower dairy product prices
Non-Quantified	<ul style="list-style-type: none"> • Balance sheet changes • Networking • Reduced compliance costs • Increased productivity from better people deployment 	<ul style="list-style-type: none"> • Reduced water use 	<ul style="list-style-type: none"> • Increased industry capability • Reduced mortality • Increased scientific capability • Improved OH&S outcomes • Better work / life balance

NCDEA SUB-PROGRAM BENEFITS

	Economic	Environmental	Social
Quantified	<ul style="list-style-type: none"> • Increased earnings • Reduced energy costs 		<ul style="list-style-type: none"> • Increased economic activity • Lower dairy product prices
Non-Quantified			<ul style="list-style-type: none"> • Improved worker health

As the focus of the study was on assessing quantifiable impacts, some benefits have not been included in the estimation of financial sustainability measures. Financial sustainability measures are reported in the Table below for each sub-program evaluated. Returns to dairy farmers are based on direct economic benefits to them and the cost they incur through the payment of the dairy levy. Returns to Australia are based on economic, environmental and social benefits captured by the wider community (excluding dairy farmers) and the cost to the government through the provision of matching funds.

FINANCIAL SUSTAINABILITY MEASURES: RETURNS TO DAIRY FARMERS AND AUSTRALIA

Measure	Cowtime Extension		Systems Management		NCDEA	
	Farmers	Australia	Farmers	Australia	Farmers	Australia
Present Value of Benefits	\$3.0m	\$1.9m	\$40.6m	\$27.4m	\$15.5m	\$27.4m
Present Value of Costs	\$0.2m	\$0.2m	\$1.9m	\$1.9m	\$1.2m	\$1.2m
Net Present Value	\$2.8m	\$1.7m	\$38.7m	\$25.5m	\$14.3m	\$26.2m
Benefit Cost Ratio	15	10	21	14	13	23

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1 INTRODUCTION

In 2006 the Council of Rural Research and Development Corporations' Chairs (CRRDCC) announced that "to help levy payers and the government better understand the value of the investment in rural research and development (R&D), the Rural Research Corporations (RDCs) have embarked on an ambitious plan to estimate aggregate RDC returns.¹" This will enable individual research and development corporations to develop improved in-house evaluation systems as well as enabling evaluation results to be aggregated across all these corporations. The evaluation framework is based on cost benefit analysis methods with standardised time frames, discount rates and treatment of investment risk.

This report is the third in a series of evaluations coordinated by the CRRDCC. It is based on the random selection of three Dairy Australia sub-programs and the evaluation of the economic, environmental and social benefits that can be attributed to Dairy Australia's investment in each of these sub-programs.

1. The first report² was submitted to Dairy Australia in November 2007, and in that report BDA Group estimated that a minimum return of \$6.60 had been achieved on every dollar invested by Australian dairy farmers. Further, it was estimated that additional returns of \$10.10 to Australia at large was generated on every dollar of funds invested by all parties involved. On total matching funds of \$43m (current dollars) in present value terms, and total benefits to Australia excluding Dairy farmers of \$851m in present value terms, returns to Australia were estimated at \$20 on each dollar of matching funds provided.
2. The second report was submitted to Dairy Australia in May 2008³. In this study four randomly selected sub-programs were evaluated. Across these four investments it was estimated that dairy farmers achieved a payoff of between \$2 and \$18 for every dollar of levy paid and that the Australian community achieved a payoff of between \$2 and \$20 for every dollar of matching funds provided to Dairy Australia for investment in research and development.

The evaluation guidelines⁴ developed by the CRRDCC require each research and development corporation to complete an evaluation of another three randomly selected sub-programs. Sub programs were to be selected from the same time period from which sub-programs were selected for the previous evaluation of randomly selected sub-programs (2003/04 to 2005/06). The purpose of this next evaluation was to provide an indication of the range and trends from the total Dairy Australia investment portfolio over a given three year period. The chosen sample was to be statistically representative of all investments made by Dairy Australia to ensure that the

¹ CRRDCC 2006 The Benefits of Rural R&D, September 5.

² BDA Group 2007, Cost Benefit Analyses of Research Funded by Dairy Australia, November.

³ BDA Group 2008, Cost Benefit Analyses of Randomly Selected Dairy Australia Investments, May.

⁴ CRRDCC 2009, Guidelines for Evaluation, April update.

mean of returns estimated across the sample is within 0.35 standard deviations of the population⁵ mean. A pool of evaluations was to be built over three years, following which the time period would be extended by one year.

This report is divided into four main sections. The next section provides details of how sub-programs were selected and the financial sustainability measures reported. In the final three sections a detailed benefit cost analysis of each of the three randomly selected sub-programs is provided.

2 SAMPLE DETAILS & EVALUATION

This year Dairy Australia has decided to modify the proposed selection process so that greater value can be extracted by Dairy Australia in terms of on-going support of their in-house evaluation efforts. Dairy Australia is the only research and development corporation that has developed and implemented a prospective evaluation system, based on objective benefit cost analysis methods of all proposed investment sub-programs. These evaluations support Dairy Australia's annual strategic planning cycle and the selection of appropriate sub-program investments. Further, the 2007 portfolio evaluation² provided estimates of the minimum portfolio return (2003/04 to 2005/06) to both levy payers and the Australian community and hence further evaluation of investments from this period would be of little value to Dairy Australia and its stakeholders.

In this evaluation report three sub-programs from the 2008/09 investment portfolio were selected at random and cost benefit analyses completed for each. For each sub-program considerable attention was paid to describing the range of (quantifiable and non-quantifiable) benefits that could be sensibly attributed to each sub-program. Also, to ensure consistency with broader evaluation efforts of the CRRDCC financial sustainability measures were reported for levy payers and the matching funds provided by the Australian government. For the latter, this required an assessment of the counterfactual or what impacts might have otherwise occurred without Dairy Australia's investment.

The three sub-programs selected included:

1. ***Cowtime Extension*** – which mainly involved continued support of the Cowtime initiative.
2. ***Systems Management*** – which represents Dairy Australia's investment in dairy extension and building capability across people working in the industry.
3. ***NCDEA*** – which represents Dairy Australia's support for the development and establishment of the National Centre for Dairy Education Australia.

⁵ Population refers to the total RDC investment portfolio over a minimum of three years.

Cost benefit analysis was used in this study to derive financial sustainability measures. Evaluation guidelines developed by the CRRDCC were followed with economic, environmental and social benefits quantified where possible. Financial sustainability measures are only reported at the sub-program level and no attempt has been made to reconcile these measures at the portfolio level.

This report differs from the Hero Study² in that the initial focus is on the sub-program investment rather than the outcomes achieved. Consequently, invested funds have only been considered at the aggregate Dairy Australia level, including funds collected through the levy as well as the government matching contribution. Economic benefits to dairy farmers are considered against the levy funds collected, while economic benefits to other sectors and environmental and social benefits are considered against the matching funds provided. Only those sub-programs that were eligible for matching funds were considered.

Financial sustainability measures reported include:

- **PVB** present value of benefits generated to either dairy farmers or Australia more broadly.
- **PVC** present value of costs – either invested funds collected through the dairy levy or through matching funds provided by the federal government.
- **NPV** net present value of the investment - calculated as the difference between PVB and PVC.
- **BCR** benefit cost ratio - which expresses the value of benefits for each dollar invested.
- **IRR** internal rate of return, which provides a measure of the required discount rate where the PVB equals the PVC.

Caution should be exercised in extrapolating the returns reported here to comment on anything other than the range of returns that can be achieved on Dairy Australia's investment in research, development and delivery. The analysis does not demonstrate, or otherwise, that government support of R&D through matching funds is justified from a social perspective. This would, as noted by the Productivity Commission, require an evaluation of the extent that government support leads to more R&D being undertaken and whether the benefits were diffused⁶.

Apart from the evaluations being carried out under the CRRDCC initiative, the evaluation results presented here provide a more detailed analysis of the potential returns to dairy farmers from Dairy Australia's investment and the environmental and social dividend that the broader Australian community obtains. Dairy Australia evaluates their prospective investments⁷ every year to ensure maximum triple bottom line benefits can be generated.

⁶ Productivity Commission 2007, Public Support for Science and Innovation, Research Report, Productivity Commission, Canberra.

⁷ Evaluation results across Dairy Australia's entire portfolio is reported each year in both their annual Strategic and Operating Plans.

3 COWTIME EXTENSION

In 2008/09 Dairy Australia invested \$0.34 million in their Animal Systems (non genetics) sub-program. The focus of the sub-program was on promoting animal performance in areas outside of Dairy Australia's other research and development expenditures aimed at delivering productivity gains from genetic technologies and data management improvements across the dairy industry.

The Animal Systems sub-program consisted of three key areas of investment.

1. **Cowtime Extension** – this area of investment was initiated in 2001 and comprises a structured program of extension tools and activities that are designed to improve milk harvesting⁸. Milk harvesting is defined by those farm activities that are undertaken from the time cows are brought in from their paddocks for milking and then returned. Investment in Cowtime by Dairy Australia was completed in 2009 and was undertaken in partnership with the Victorian Department of Primary Industries.
2. **Biomarkers** – this work was undertaken in partnership with the University of Melbourne and involved the support of post-doctoral studies. The investment involved scientific research into the genetic and phenotypic correlations of insulin-like growth factor-1 and other bioactives with milk yield and fertility in Holstein cows.
3. **Graduate training** – Dairy Australia, through this sub-program, supported a range of PhD students to develop industry scientific capability and to increase scientific understanding of non-genetic factors that influence milk yield and quality.

The CowTime Extension initiative accounted for most of Dairy Australia's investment in this sub-program and was the focus of the evaluation carried out in this study.

Between 2001 and 2004 most of the funds invested in CowTime were directed at developing appropriate tools and strategies for increasing labour productivity at milking, building awareness of good stock handling and making milking an easier, safer, more pleasant and more attractive occupation⁹. By 2009 92% of the Australian dairy industry was aware of CowTime with 17% having had involvement with either the one-day clinics or the Shed Shake up day – the main extension vehicle of CowTime¹⁰.

⁸ Richard Habgood Consulting 2007, Cost Benefit Analysis of the CowTime project, Prepared for the Victorian Department of Primary Industries, August.

⁹ CowTime Guidelines February 2003

¹⁰ Down to Earth Research 2009, CowTime tracking Survey

Dairy Australia's investment in CowTime in 2008/09 was primarily for the extension of CowTime material to Australian dairy farmers. This was the final year of support by Dairy Australia as CowTime material has now been successfully integrated into other existing extension and education services.

3.1 INVESTMENT DETAILS

Dairy Australia's investment in Cowtime Extension was \$0.2m in 2008/09. Because the CowTime Extension investment was structured as a two year initiative, costs and outputs across the two years are included in this evaluation and are reported in Table 1.

CowTime was initially developed with support provided by Dairy Australia, Queensland Department of Primary Industries, Victorian Department of Primary Industries, University of Melbourne and Gardiner Foundation. The initiative was also well supported by representative dairy industry bodies and private businesses. Over 2007/08 and 2008/09 the total CowTime budget was \$0.4m with support mainly from Dairy Australia (65%) and the Victorian Department of Primary Industries (29%). Activities undertaken included¹¹:

- 42 Shed Shake-up days to 755 dairy farmers
- 618 farms benchmarked using the Milking Monitor web-based tool
- 47 farms benchmarked using the Dairy Energy Monitor web based tool
- 20 training activities for Farm advisors and Dairy Extension Centre staff
- participation in a number of courses run through the National Centre for Dairy Education Australia
- preparation and dissemination of other relevant material and information.

TABLE 1: COWTIME EXTENSION COSTS: BY PARTNER: \$'000

Year	Dairy Australia	Australia		TOTAL
		Victorian Department of Primary Industries	Others	
2008	\$215	\$96	\$22	\$333
2009	\$215	\$100	\$24	\$339

Note: 2008 refers to the financial year ending June 30, 2008.

¹¹ CowTime Draft Final Report 2009, Victorian Department of Primary Industries

3.2 INDUSTRY IMPACT

In 2009 a tracking survey was completed for the CowTime initiative¹⁰. This survey involved in-depth interviews with a sample of participants who had completed the Shed Shake up day. Of the 755 farmers involved (including 65 farmers attending a Watt's n Your Dairy day) it was found that 55% had made alterations to their milking system as a result of their participation. Changes made included:

In the dairy – such as not milking out slow milkers, improved cow handling, improved lighting, use of stall gates, use of rubber mats, better exit areas, use of cold water rather than hot water, noise reduction and use of thermometers.

In the yard - such as use of non-slip surfaces, better lighting, better back gate procedures and letting cows come in themselves.

Paddock to dairy - such as allowing cows to walk at their own pace, improved cow flow, less noise and better lane ways to reduce bottlenecks.

Cleaning up - such as use of automatic cleaning systems, increased water flow, use of exfoliation gloves, use of velcro around piping as an abrasive and reduced hosing down.

The counterfactual, or without Dairy Australia investment, was assessed on the basis of how much sooner impacts have been realised than would otherwise be the case. It would be expected that take up would occur in the future because of both the previous development of extension material and that CowTime has been picked up across the industry as a result of extension efforts between 2004 and 2008. While it would be reasonable to expect that farmers would access available extension material it is apparent that the high level of awareness of the program (92%) has not led to widespread participation at CowTime events (17% by 2009).

Without evidence that farmers have made changes themselves it is difficult to determine whether or not participation at CowTime events is one of the main drivers of change. However, anecdotal feedback from extension staff and the fact that the economic returns from changes are more marginal to the non-economic impacts it would be reasonable to expect that take up of practice changes by farmers maybe limited without active participation at a designated Cowtime event. The three year time period used as the counterfactual¹² for other dairy extension investments was increased to five years to reflect the more limited avenues dairy farmers have to access and evaluate relevant practice changes and the limited economic incentives external agents or service providers have in proving advice in this area.

¹² This is consistent with other studies that have examined the counterfactual for extension programs in the Australian dairy industry – see Malcolm, B. & Paine, M. 2005, A Social Benefit Cost Analysis of Dairy Moving Forward, A report prepared fro Dairy Australia, Faculty of Land & Food Resources, University of Melbourne, December.

3.3 TRIPLE BOTTOM LINE BENEFITS

Benefits estimated in this section are based on the reported industry impacts in the previous section.

Economic

Economic gains will be realised as a result of changes made by farmers because of their participation in CowTime. While some farmers have reported changes involving equipment used (such as updating equipment, building a new dairy, extending the dairy, purchasing additional equipment and improving yards) it is difficult to attribute such changes to their participation in CowTime alone as many other costs and benefits would need to be considered. The reported impacts above typically involve minimal additional cost but could be expected to deliver some time savings over the milking period.

Richard Habgood Consulting has reported time savings of, on average, 100 hours a year. This estimated saving was based on a time saving of around 10 minutes per milking and was obtained from a survey of CowTime participants between 2004 and 2007⁸. The value of farm labour is around \$20 per hour¹³ and using this value the benefit from a 100 hour saving was estimated at \$2,000 per farm per year. Across the 380 farmers who have implemented changes, the total time saving benefit across the dairy industry would be \$760,000 in 2008/09.

Economic benefits in the form of energy savings will also be realised by those participants attending the Watt's N Your Dairy days. Richard Habgood Consulting estimated the value of these savings, based on a reduced heat setting (8 degrees) and minor improvements to the cooling system, at \$350 per farm (2009 dollars). Across the 65 farmers participating at the event, the total value of the energy saving across the industry would be \$22,750 per year.

Environmental

Environmental benefits have not been quantified in this study. However, the reduction in energy use would also deliver a minor reduction in greenhouse gas emissions.

Social

An important aspect of the CowTime initiative was to reduce both cow and operator stress and making milking a safer and more acceptable activity. While no quantitative data was collected through exit and follow up surveys it was evident from feedback obtained during these surveys that CowTime has resulted in improved operator safety, cow comfort and general working conditions with 77% of participants reporting that CowTime had made

¹³ The value was based on Pastoral Industry Award for an experienced worker. It should also be noted that the labour saving is estimated on an opportunity cost basis.

their milking easier. It was also found that 53% of participating farmers believed that they had calmer cows and 43% of farmers reported that they were experiencing less frustration since implementing changes¹⁴.

The Cowtime Extension investment has also helped to support an innovative culture across the industry. Participating dairy farmers have been able to observe the success of the changes they have made and in turn has helped develop an environment in which dairy farmers are more receptive to evaluating and implementing profitable changes to their business.

Social gains will also be realised as a result of increased farm profitability and the associated economic activity generated in regional areas. For every dollar of economic benefit captured by Australian dairy farmers, production, as measured by milk revenue, will expand by an estimated \$1.13. The increased profit earned on this extra production is included in the farm level benefits estimated earlier. However, this increased production will generate additional demand for dairy inputs, including employed labour. The additional economic activity was estimated¹⁵ at 54 cents of every dollar of economic benefit captured by dairy farmers

3.4 FINANCIAL SUSTAINABILITY MEASURES

Financial sustainability measures were estimated across different sectors of the Australian community, including dairy farmers (as levy payers) and the Australian community more broadly. In Table 2 the distribution of benefits across different sectors is provided. It was assumed that 90% of economic benefits realised on-farm were captured by dairy farmers with the remainder captured by dairy consumers¹⁶.

TABLE 2: ESTIMATED INVESTMENT BENEFITS: BY SECTOR: \$'000

Year	Dairy Farmers	Australia		TOTAL
		Dairy Consumers	Economic Activity	
2008	\$352	\$39	\$190	\$581
2009	\$705	\$78	\$381	\$1,164
2010	\$705	\$78	\$381	\$1,164
2011	\$705	\$78	\$381	\$1,164
2012	\$705	\$78	\$381	\$1,164
2013	\$352	\$39	\$190	\$581

¹⁴ These results were based on a previous survey (2008) by Down to Earth Research.

¹⁵ Derived from ABS Input-Output Tables for Dairy – Cat. 5209.0.55.001

¹⁶ Based on CRA and BDA Group Economic models as discussed in the 2007 Hero study report.

Levy Payers

Financial sustainability measures were derived first for levy payers. Relevant costs include payments made by growers via the output levy on dairy production and relevant benefits include only those gains to dairy farmers. Financial sustainability measures are reported in the table below. Measures are reported for costs and benefits realised up to 2013 with all values expressed in 2009 dollars. The IRR was not derived because the program generated a positive net benefit in the first year. Finally, measures were only derived for "to date" (to the end of 2008/09) and to 2014¹⁷ as no benefits have been attributed to the program past 2013 because of the five year lead time assumed under the counterfactual.

The payoff to levy payers was estimated at \$2.8m in net present value terms or a return of \$15 for every dollar invested through the farm levy.

TABLE 3: FINANCIAL SUSTAINABILITY MEASURES: RETURNS TO LEVY PAYERS

Measure	To date	2014
PVB	\$1.0m	\$3.0m
PVC	\$0.2m	\$0.2m
NPV	\$0.8m	\$2.8m
BCR	5.0	15.0

Note: PVB is the present value of benefits and PVC is the present value of costs.

Australia

Financial sustainability measures were derived secondly on matching funds provided by the federal government. Relevant costs include matching funds provided and relevant benefits include only those gains to Australia (excluding dairy farmers). Financial sustainability measures are reported in the table below for the same reporting period as used for levy payers.

TABLE 4: FINANCIAL SUSTAINABILITY MEASURES: RETURNS TO AUSTRALIA

Measure	To date	2014
PVB	\$0.6m	\$1.9m
PVC	\$0.2m	\$0.2m
NPV	\$0.4m	\$1.7m
BCR	3.0	9.5

¹⁷ The CRRDCC method requires benefits to be reported in five year intervals.

The payoff to Australia was estimated at \$1.7m in net present value terms or a return of \$9.5 for every dollar invested through government matching funds.

3.5 CONCLUSIONS

Investment in Cowtime Extension was estimated to deliver a positive return to both levy payers and Australia. While modest economic gains have been achieved in absolute terms, the real strength of the sub-program was in assisting dairy farmers to reduce operator stress during milking, and this has been a major success of the Cowtime Extension program. The range of benefits from the investment is summarised in Table 5.

TABLE 5: ANIMAL SYSTEMS SUB-PROGRAM BENEFITS

	Economic	Environmental	Social
Quantified	<ul style="list-style-type: none"> • Reduced milking times • Reduced energy costs 		<ul style="list-style-type: none"> • Increased economic activity • Lower dairy product prices
Non-Quantified		<ul style="list-style-type: none"> • Reduced CO₂-e emissions 	<ul style="list-style-type: none"> • More positive milking experience • Building capacity for industry innovation

4 SYSTEMS MANAGEMENT

Dairy Australia's Systems Management sub-program was a new area of funding support that saw the amalgamation of four previous sub-programs. The program aims to equip the dairy industry with the resources and tools to increase farm profitability through a more efficient and productive workforce and for dairy farmers to embrace innovative technologies to improve farm productivity through time.

Previously, Dairy Australia and its partners had supported capacity building across the industry in a more fragmented way based around specific industry issues and emerging technologies. By amalgamating resources under one sub-program Dairy Australia has been better able to prioritise capacity building efforts and to resource them more appropriately.

The Systems Management sub-program is comprised of four key and inter-linked areas.

- (1) ***The People in Dairy*** – (TPiD) which focuses on people management and employment issues facing the industry.
- (2) ***Data Development*** – which provides funding support for the collection and management of farm financial and economic performance data.
- (3) ***Extension*** – funding support of the Victorian Dairy Extension Centre (DEC) and Dairy Pathways (NSW) programs which are aimed at providing extension infrastructure and services to dairy farmers and the broader community.
- (4) ***Rural innovation and change*** – which is aimed at understanding Australian dairy farmer's needs for innovation and change.

Data development and rural innovation and change include the Dairy Industry Farm Monitor project, the Rural Innovation & Change Group (RIRG) and the Cooperative Venture for Capacity Building. These investments can be considered as a cost of business for Dairy Australia as they seek to identify and prioritise future industry research, development and extension needs. In particular, RIRG is a unique and strategic research and development capacity located in Melbourne University that improves innovation performance across Australian dairy farms with links to a wide range of successful Dairy Australia industry initiatives including *Dealing with Today Planning for Tomorrow*, *Countdown Down Under*, *Feed, Fibre, Future*, and *Dairy Moving Forward*.

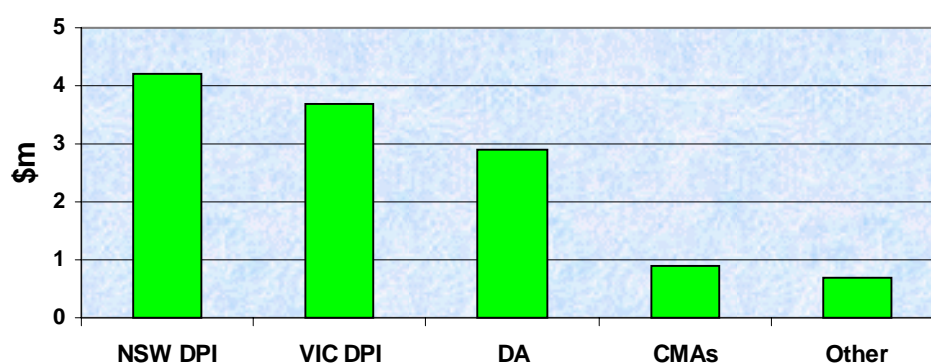
The People in Dairy initiative commenced in 2005/06 and active extension of materials to the dairy industry commenced in 2008/09. Dairy Australia's investment in extension is an-ongoing commitment and pathway for the successful transfer of technologies (products, processes and information) to the industry.

The success of the Systems Management sub-program can be assessed through time in terms of how much sooner technologies are taken up across the industry and the ability of the industry to secure and grow the required workforce and skills base.

4.1 INVESTMENT DETAILS

In 2008/09 Dairy Australia invested nearly \$3m in the Systems Management sub-program. This investment was allocated to 52 individual projects. The major investment partners were the Victorian Department of Primary Industries and the NSW Department of Primary Industries. A break down of the investment by different partners is provided in Figure 1.

FIGURE 1: INVESTMENT CONTRIBUTIONS TO SYSTEMS MANAGEMENT SUB-PROGRAM



The investment with NSW DPI was for the Dairy Pathways Phase 2 project. This project was an extension project but was largely funded by NSW DPI with Dairy Australia's (DA) contribution accounting for less than 4% of total funds. The investment with VIC DPI was largely for the Dairy Extension Centre, which was also supported by the Geoffrey Gardiner Foundation, Catchment Management Authorities (CMAs) and the Victorian Department of Sustainability and Environment.

Because most of Dairy Australia's funding was allocated to the DEC and TPiD activities (86%) the evaluation undertaken here focuses only on these two activities.

DEC

DEC's purpose is to accelerate the adoption of competitively advantageous innovations across the dairy industry¹⁸. DEC achieves outcomes through a range of activities that can be described as:

¹⁸ DEC December 2008 Board Meeting paper, Attachment 8

- **Intensive Farm Consultations** – which includes one to one farm visits and multiple-day programs run with a small group of farmers. These consultations enable dairy farmers to identify profitable changes that they can make.
- **Information Presentations** – which includes farmers and service providers participating at one-day events. These presentations are largely to groups of farmers or service providers and enables relevant information to be conveyed to them.
- **Networking** – which includes support for discussion groups and stakeholder engagement activities. These networking activities enables specific groups to keep up-to-date with industry and associated developments and provides an opportunity for DEC staff to better understand issues confronting the industry.

TPiD

TPiD's purpose is to better equip and inform human resource capability within the dairy industry. This was a new initiative that commenced in 2006 and commenced active delivery to the dairy industry in 2008/09¹⁹. The decision to develop and implement TPiD initiative followed a review of 25 industry and government employment projects in 2006²⁰ in which it was identified that greater industry involvement was required to increase the capacity across the industry to generate attractive jobs and to develop workforce skills and careers. The main activities undertaken through TPiD include:

- **On-line resources** – designed to provide relevant information and tools to farmers and their advisors.
- **Advisor capacity building** – includes the establishment of an advisor network and training workshops and the development of a Diploma of Business (HR) delivered in conjunction with the National Centre for Dairy Education Australia.
- **Delivery to farmers** – includes media articles, newsletters and group presentations to convey information on effective people management and deployment.
- **Workforce planning and action** – supporting dairy farmers in the process of employing staff through the development of suitable regional workforce action plans and encouraging young people into the industry (Cows Create Careers).

¹⁹ Background information prepared by TPiD staff for RDP Expo on 21st May 2009. 2009/10- budget is \$862,000.

²⁰ Nettle, R. & Johnson, R. 2006, "A review of employment projects in the Australian dairy Industry 1998-2006", Final report prepared for the Dairy Employment Management Committee, Innovation and Change Management Group, University of Melbourne, January.

- **Leadership development** – support and mentoring of dairy industry people so that the industry is better able to contribute to public policy development and implementation regarding employment in the industry.

4.2 INDUSTRY IMPACT

DEC

DEC activities will deliver benefits to farmers and the wider community as a result of any practice change that might occur as well as the value of the information provided to farmers, service providers and the community at large. A suitable metric to gauge the level of impact from DEC activities is the level of participation in DEC funded activities by dairy farmers, service providers and other community members. Participation rates are reported in Table 6²¹ for each of the different DEC work areas. Over 2008/09 1,234 farmers participated in intensive consultations with DEC staff, information was conveyed to 5,450 farmers and service providers and 850 people were involved with DEC staff in broader networking activities.

TABLE 6: PARTICIPATION RATES IN DEC FUNDED ACTIVITIES: 2008/09

Work areas	Intensive Consultations		Information		Networking
	<i>One-to-one</i>	<i>Groups</i>	<i>Farmers</i>	<i>Providers</i>	
Feeding systems		390	282	242	30
Cows			321	130	
Business	88				
Irrigation	124		518	324	
Nutrients	300			115	
Climate change			223	59	
Dairy Communities		202	81	236	820
Emergency Management	130		1,952	967	
TOTAL	642	592	3377	2073	850

Note: Industry consultations are the number of farmers participating and some of these farmers had more than one consultation

²¹ DEC Annual Progress Report 2008-09, September

Three impacts from the DEC activities can be described.

- ***Practice change***

Benefits in any given year will be determined by the conversion rate (number of farmers participating in DEC intensive farm consultations that actually undertake related action on their property) and the financial or other consequences of that practice change. The counterfactual would consider the situation where no Dairy Australia support was provided for DEC funded activities that were undertaken. A three year time horizon was used as the counterfactual as it would be reasonable to expect that dairy farmers attending the consultations would have sought other avenues to increase their skills and ultimately make the change that could be attributed to DEC activities²².

There is limited survey data from DEC activities that can be used to estimate the nature of on-farm changes or the number of participants implementing such changes. However, discussions were held with senior DEC staff from each work area and from these discussions it was possible to describe the range of practice changes that have been made by dairy farmers.

(1) Profitable Farming Systems

Farm level changes in this work area can largely be attributed to the *Feeding Pastures for Profit* program which is designed to help farmers increase pasture production and use pastures more effectively. Impacts can be described in terms of greater pasture production and also in terms of improved pasture quality and better matching of feed supplements to available pasture throughout the year. Typical annual pasture productivity benefits have been estimated at around \$6,500 per farm based on a 10% reduction in fodder costs²³ and net of implementation costs. To derive a cost saving that could be attributed to the DEC activity the average net benefit of \$6,500 was increased to \$13,500 on the basis that average fodder costs in Victoria are typically around 20% higher than the Australian average and fodder costs per farm have increased by some 20% since 2005/06²⁴ as a result of prolonged drought conditions across dairy producing regions.

DEC staff also provided delivery support for dairy Cow Nutrition and Soils and Fertiliser courses that were managed by the National Centre for Dairy Education Australia. These consultations were

²² This is consistent with other studies that have examined the counterfactual for extension programs in the Australian dairy industry – see Malcolm, B. & Paine, M. 2005, A Social Benefit Cost Analysis of Dairy Moving Forward, A report prepared for Dairy Australia, Faculty of Land & Food Resources, University of Melbourne, December. Alternatively, DEC might also have continued without Dairy Australia support, but with a lower level of funding and hence participation rates achieved across dairy farmers would be lower.

²³ BDA Group 2007, Benefit Cost Analysis of Selected Dairy Australia Investments, Report to Dairy Australia, November page 32.

²⁴ ABARE 2008, Australian Dairy, 08.1, September.

not included in this evaluation as benefits from Dairy Australia's support of the NCDEA has been evaluated separately in this study and including them here would result in a double counting of industry benefits.

Conversion rates were estimated at 60%, that is, of the 390 participants 234 farmers are estimated to have made farm level changes and, on average, generate a net annual benefit of \$13,500 per farm. This conversion rate was based on survey information collected as part of Dairy Australia's successful *Dairy Moving Forward* program that was similar in many regards to the *Feeding Pastures for Profit* activity²³.

(2) Business Management

Consultations under the DEC Business management work area totaled 88 farmers with 68 being involved with the Dairy Farm Monitor reporting activity. This report involved the preparation of Farm Monitor reports for 2008-09 that provides indicative farm performance data for the wider industry. Dairy farmers use this information to gauge the performance of their own business and to identify where productivity improvements might be made. Around 500 copies were distributed to farmers with an estimated 1,000 being downloaded from the DEC website. A breakdown of downloads by dairy farmers and others was not available, but it was assumed that the majority, 75%, would be downloaded by dairy farmers for their own use. The commercial value of the Farm Monitor reports was estimated at \$150 each based on similar economic performance data that is commercially available, such as private forecasting reports and a number of Australian Bureau of Statistics publications.

The other activity under the Business Management work area was the participation of 20 farmers in Talking Stock: Taking Action (TSTA). TSTA has been a successful strategy supported by Dairy Australia over recent years to help farmers identify and implement changes that can increase farm profitability. Previous evaluations of TSTA²⁵ have demonstrated that, on average, around 32% of participants make changes to reduce their feed costs while many other participants implemented changes to their balance sheet to increase cash flows. Farmers that realised feed cost savings generated benefits of, on average, \$20,000 per farm.

No economic benefits were estimated for on-farm changes relating to balance sheet changes. While such strategies will have cash flow impacts in the current and future seasons (as financing costs are reduced) it was not possible to determine if any economic benefits are generated, as this would require an assessment of changes in the capital value of assets held through time and the

²⁵ BDA Group 2009, Economic Evaluation of the Dealing with Today Planning for Tomorrow The Final Phase, Report to Dairy Australia, July

associated reduction in financing costs. For the purpose of this evaluation these potential benefits were excluded.

(3) Connecting Dairy Communities

Activities under this work area included 33 farmers and service providers participating in impact groups that focussed on fire recovery and water reforms. The value to participants is largely based on the information conveyed to them and as such these impacts have been included in the next section.

The other main activity undertaken in this work area was the facilitation of 11 groups (169 farmers) as part of the wider Sustainable Farm Families program (SFF)²⁶, coordinated in Victoria by Western District Health Service. DEC's financial contribution was \$23,000 and represented about 10% of total program costs. An evaluation of the SFF program in 2007²⁷ demonstrated that the program had been successful in reducing mortality associated with Type 2 diabetes and cardiovascular disease amongst its participants. While it is recognised that DEC investment might have contributed to a reduction in mortality across the 169 participants benefits that might be attributed to this investment have not been quantified. The main reason for this decision was that the benefits would be more sensibly included in a wider evaluation of the SFF program and it is likely that other parties (including other government departments) may have contributed in the absence of any DEC support.

(4) Irrigation

Under this work area DEC staff carried out 43 farm visits and 81 in-depth office based consultations. While little objective information is available on what changes participating farmers have made, DEC staff expect that around 80% have made changes that have resulted in lower water use than would have otherwise been the case. The other 20% of participants were mainly briefed on changes in water policy and how this might impact on future water trading decisions.

Consultations largely centered around the better use of water for pasture production, feed budgets and rations to minimise overall feed costs. The farm level benefit has been estimated at \$15,000 per farm. Possible benefits are likely to range from around \$11,000 to \$20,000 per farm.

²⁶ This program has been running since 2003 and is aimed at a number of industries including dairy, cotton, sugar and grains.

²⁷ Boymal, J, Rogers, P., Brumby, S. & Wilder, S. 2007, Living Longer on the Land: An economic evaluation of the Sustainable Farm Families Program, RIRDC Publication No. 07/094, October.

At the lower end DEC staff have estimated that some participants have purchased water and applied it at more appropriate times to maximise pasture productivity rather than buying in feed supplements. The average pasture response of water applied is around 1.8t per ML. At an average feed price of \$288 per tonne this response would be equivalent to \$518 of purchased feed. With water prices around \$300 per ML this would represent an effective feed cost saving of \$218 per ML purchased. DEC staff estimated that the average purchase volumes were in the order of 50 ML per farm, delivering an average farm benefit of \$10,900 per year.

At the other end many farmers have reduced their feed costs by gaining a better understanding of irrigation scheduling, feed sourcing, ration mixtures (dry matter, energy, protein and fibre) and feeding out. Benefits have been estimated at \$20,000 per farm²⁵.

(5) Nutrients

Under this work area 484 farm visits were carried out and effluent management pilot courses were provided to 15 service providers. Potential benefits from the delivery of courses to service providers have been included under broader information provision discussed in the next section. However, it should be noted that these course are provided under a long term DEC strategy to increase industry capability in the area of effluent management with the objective of gradually moving out of this area of direct support to dairy farmers²⁸.

For the 484 farm visits advice was provided to 300 dairy farmers. The advice included the preparation of 100 effluent plans, 100 Nutrient plans, 50 Water quality plans and 50 Feedpad plans. Conversion rates are thought to be high and it was assumed that a similar proportion of dairy farmers that participated in Dairy Australia's *Dairying for Tomorrow* program (80%) have acted on their plans and implemented on-farm changes. The impact of these changes have been²⁹:

Nutrient / Effluent / Feedpad Plans

The main impact has been the better use of effluent as a replacement for applied fertiliser and the better matching of applied nutrients to pasture plant requirements - with farm benefits of, on average, \$5,000 per farm. In addition, there has been a reduction in the

²⁸ Work in this area started around 12 years ago as there was a clear market failure, in that service providers were not in a position to provide advice to their clients. When service providers are able to provide appropriate advice in this area DEC resources would be reduced accordingly.

²⁹ Reported impacts were based on the impacts observed in the *Dairying for Tomorrow* program which was evaluated by BDA Group in 2007 as part of the CRRDCC evaluation of major projects.

volume of phosphorus run-off, estimated at 112 kgs per farm with an environmental benefit of \$1,600 per farm.

Water quality Plans

The main impact has been a reduction in water use for stock and domestic purposes. The average saving was estimated by DEC staff at 3.5 ML per farm. Using a water price of \$300 per ML, this would represent a farm benefit of just over \$1,000.

(6) Emergency Management

Most of the work undertaken in this area related to the continuing drought conditions and the fall in milk prices over 2008/09. Some 130 farmers participated in DEC organised consultations. Issues covered in these consultations included discussions around selling water (20%), selling cows (30%) or use of different forage species and feed management to get the most production out of available water supplies (50%)³⁰. Conversion rates were assumed to be high – 80%.

No impacts have been estimated for discussions around selling water as these discussions were based around the 4% government imposed trading cap on permanent water in each irrigation area. Further, water trading was largely a balance sheet decision and as previously assumed no direct economic benefits have been quantified to sales of permanent water entitlements.

Discussions around selling cows were based on assisting dairy farmers to identify marginal cows in their herd for disposal. DEC staff estimated that participating farms would have sold around 10% of their marginal cows (30 cows³¹) and as result would have avoided on-going losses of, on average, \$129 per cow or \$3,600 per farm.

Impacts from changes made to forage choice and feed management were assumed to be in the range of that achieved under the Irrigation and Pastures work areas - \$7,500 to \$13,500 per farm, as suggested farm level changes have been based on DEC information that supports both these work areas. For the purpose of this evaluation an average farm benefit of \$10,000 a year was assumed.

³⁰ Estimates provided by DEC staff.

³¹ Based on statewide average as reported in Dairy Farm Monitor for 2008/09.

- **Information**

People attend information presentations because they expect that the information conveyed to them will have a beneficial impact on their decision making and business profitability. The value of the information can be determined by assessing the willingness of people to pay for that information. Most of the seminars and field days attracted a wide range of participants, including 3,377 dairy farmers and 2,073 service providers.³²

Topics presented at the seminars and workshops covered a broad range of issues including water policy, risk management, feed budgeting, pasture productivity, adaptive forage planning, extended lactation, climate change awareness, effluent management, drought planning, emergency fire relief and seasonal updates.

The willingness of people to pay for the information conveyed to them has not been examined as part of DEC activities. However, exit and follow-up surveys completed for the *Dealing with Today Planning for Tomorrow* Initiative indicated that the average value to people from participating in the workshops and seminars was \$410 per person. This value was found to be consistent with other estimates of the value of information and was used in this study to estimate the benefits to people from the information conveyed to them³³.

- **Networking**

These activities are treated here as a "cost of business" and part of the continual development and planning that is required to operate DEC effectively through time. While it is recognised that many people involved in DEC networking activities may have been better able to access information to increase farm profitability, any changes made are likely to be more marginal to the impacts and benefits generated from the more issue specific DEC activities available. Consequently, possible benefits from these changes were not quantified in this evaluation.

TPiD

The People in Dairy initiative started its delivery phase in 2008/09. At this stage there has been limited quantification of the impacts of the program on farm level practice changes. However, it is recognised that impacts might include greater labour efficiency, reduced compliance costs, increased farm productivity, improved OH&S outcomes, a better work life balance farmers and employees and reduced staff turnover. For the purpose

³² The 263 farmers and 60 service providers participating in the CowTime Shed Shake ups have been excluded as the benefits from this participation have been included in the CowTime evaluation. Also, 180 farmers and 92 service providers participating in the *Dealing with Today Planning for Tomorrow* (DTPT) workshops have also been excluded as the value of this participation has been included in a separate evaluation of the DTPT initiative.

³³ BDA Group 2009, Economic Evaluation of the Dealing With Today Planning for Tomorrow Final Phase Initiative , report to Dairy Australia, July.

of this evaluation only the impact on staff turnover was assessed as the other potential benefits are yet to be determined. A more complete evaluation will be undertaken by TPiD at a later date and hence the evaluation here will understate the impacts that are likely to be realised.

Although there is limited data on labour turnover rates in the Australian dairy industry some general observations can be made³⁴. It is estimated that Australian dairy farms collectively employ some 10,000 people on a full-time equivalent basis excluding farm owners and operators³⁵. Turnover rates are assumed to be in the order of 10%³⁶ or 1,000 people per year and it is assumed that turnover rates might be reduced by 3% points to 7% as a result of TPiD, with the reduction commencing in 2009/10 and taking 5 years to be achieved. TPiD staff have estimated that the recruitment / turnover cost per person at a farm hand level is at least \$12,000³⁷. On this basis the industry cost saving after 5 years would be \$3.6m.

The counterfactual was described in terms of how long it would have otherwise taken for the industry to address employment issues and career planning without Dairy Australia support. Given that few other agents or organisations have little incentive to invest in this area it was assumed that under the counterfactual it would take a further 7 years before similar outcomes were achieved from broader government based employment related initiatives.

4.3 TRIPLE BOTTOM LINE BENEFITS

Investment by Dairy Australia in the Systems Management sub-program has generated economic, environmental and social benefits.

Economic

In this section the benefits to Australian dairy farmers as described in Section 4.2 are summarised and reported in Table 7.

³⁴ Turnover rates are thought to be high in the industry, especially for farm hands. A 2004 study by ACCIRT, University of Sydney – "Dairy Employment for the Future a survey of south western Victorian dairy farms" reported that the turnover rate for employed farm hands was 66% in the year the study was completed. Also, the New Zealand dairy industry has targeted high turnover rates as a major issue facing New Zealand dairy farms. The New Zealand Department of Labour has estimated worker turnover rates at between 20% and 40% between 1999 and 2008 with distinct seasonal fluctuations.

³⁵ Around 100 cows are run per full time labour equivalent (Farm Monitor report) and across 1.8m dairy cows this would be equivalent to 18,000 people. From this 8,000 farm owners and operators were deducted.

³⁶ Turnover rates were assumed to be slightly higher than the national average of 9% as reported in the Australian Institute of Management's 2009 National Salary Survey.

³⁷ Preliminary Program Evaluation completed in July 2008. This was based on a minimum turnover cost for farms employing full-time labour. The evaluations was undertaken by Dr Pauline Brightling.

TABLE 7: ECONOMIC BENEFITS: BY YEAR: \$MILLIONS

Year	TPiD	DEC		TOTAL
		Consultations	Information	
2009	\$0.00	\$7.15	\$1.08	\$8.23
2010	\$0.65	\$7.15	\$1.08	\$8.88
2011	\$1.30	\$7.15	\$1.08	\$9.53
2012	\$1.94			\$1.94
2013	\$2.59			\$2.59
2014	\$3.24			\$3.24
2015	\$3.24			\$3.24
2016	\$3.24			\$3.24
2017	\$2.59			\$2.59
2018	\$1.94			\$1.94
2019	\$1.30			\$1.30
2020	\$0.65			\$0.65

Note: Dairy farmers capture 90% of generated benefits.

Environmental

Environmental benefits are based on reduced phosphorous run-off from the 160 farms implementing Nutrient / Effluent / Feedpad Plans. The total value of these benefits is estimated at \$256,000 a year from 2008/09 to 20010/11.

Social

Quantified social benefits will include gains to Australian dairy consumers as a result of increased industry profitability and as a result lower dairy prices, benefits to non-dairy farmers from participation at DEC supported information activities and flow-on impacts to the broader economy.

Benefits are summarised and reported in Table 8. Consumer benefits are estimated on the basis that 10% of farm level benefits are captured by Australian Dairy consumers through lower prices³⁸.

³⁸ Based on CRA and BDA Group Economic models as discussed in the 2007 Hero study report.

TABLE 8: SOCIAL BENEFITS: BY YEAR: \$MILLIONS

Year	Information	Consumer	Flow-On	TOTAL
2009	\$0.79	\$0.79	\$3.86	\$5.44
2010	\$0.79	\$0.87	\$4.21	\$5.86
2011	\$0.79	\$0.94	\$4.56	\$6.29
2012		\$0.22	\$1.05	\$1.27
2013		\$0.29	\$1.40	\$1.69
2014		\$0.36	\$1.75	\$2.11
2015		\$0.36	\$1.75	\$2.11
2016		\$0.36	\$1.75	\$2.11
2017		\$0.29	\$1.40	\$1.69
2018		\$0.22	\$1.05	\$1.27
2019		\$0.14	\$0.70	\$0.84
2020		\$0.07	\$0.35	\$0.42

Benefits to regional economies can be described in terms of flow on impacts to regional economies as a result of increased dairy production. Dairy production will increase as a result of greater profitability realised through Dairy Australia's investment. For every dollar of economic benefit captured by Australian dairy farmers, production, as measured by milk revenue, will expand by an estimated \$1.13. The increased profit earned on this extra production is included in the farm level benefits estimated earlier. However, this increased production will generate additional demand for dairy inputs, including employed labour. The additional economic activity was estimated³⁹ at 54 cents of every dollar of economic benefit captured by dairy farmers.

4.4 FINANCIAL SUSTAINABILITY MEASURES

Financial sustainability measures were estimated across different sectors of the Australia community, including dairy farmers and the Australian community more broadly. In Table 9 below the distribution of benefits across different sectors is provided.

³⁹ Derived from ABS Input-Output Tables for Dairy – Cat. 5209.0.55.001

TABLE 9: ESTIMATED INVESTMENT BENEFITS: BY SECTOR: \$MILLIONS

	Levy Payers	Australia				TOTAL
	Non-Levy Payers	Environment	Consumers	Economic Activity		
2009	\$8.23	\$0.79	\$0.26	\$0.79	\$3.86	\$5.70
2010	\$8.88	\$0.79	\$0.26	\$0.87	\$4.21	\$6.12
2011	\$9.53	\$0.79	\$0.26	\$0.94	\$4.56	\$6.55
2012	\$1.94			\$0.22	\$1.05	\$1.27
2013	\$2.59			\$0.29	\$1.40	\$1.69
2014	\$3.24			\$0.36	\$1.75	\$2.11
2015	\$3.24			\$0.36	\$1.75	\$2.11
2016	\$3.24			\$0.36	\$1.75	\$2.11
2017	\$2.59			\$0.29	\$1.40	\$1.69
2018	\$1.94			\$0.22	\$1.05	\$1.27
2019	\$1.30			\$0.14	\$0.70	\$0.84
2020	\$0.65			\$0.07	\$0.35	\$0.42

Levy Payers

Financial sustainability measures were derived first for levy payers. Relevant costs include all Dairy Australia costs less matching funds and relevant benefits include only those gains to dairy farmers. Financial sustainability measures are reported in the table below. Benefits are reported under different five year time periods. The internal rate of return is not reported as benefits exceed costs in year one.

The payoff to levy payers achieved to date from investment in the Systems Management sub-program was estimated at \$6.7m in net present value terms or a return of \$5.50 for every dollar invested through the farm levy. As the benefits from the TPiD initiative builds through time it is estimated that the payoff to levy payers will increase to \$38.7m by 2024.

TABLE 10: FINANCIAL SUSTAINABILITY MEASURES: RETURNS TO LEVY PAYERS

Measure	To date	2014	2019	2024
PVB	\$8.2m	\$31.7m	\$40.2m	\$40.6m
PVC	\$1.5m	\$1.9m	\$1.9m	\$1.9m
NPV	\$6.7m	\$29.8m	\$38.3m	\$38.7m
BCR	5.5	16.7	21.2	21.4

Note: PVB is the present value of benefits and PVC is the present value of costs

Australia

The final segment for which financial sustainability measures were derived was the Australian community at large, based on matching funds provided by the federal government and invested by Dairy Australia in the Systems Management sub-program. Benefits include those that have been realised by non-dairy participants at DEC funded activities, Australian consumers of dairy products, the broader community (environmental benefits) and regional economies. Financial sustainability measures are reported in the table below and provide an indication of the estimated return to matching funds provided.

TABLE 11: FINANCIAL SUSTAINABILITY MEASURES: RETURNS TO AUSTRALIA

Measure	To date	2014	2019	2024
PVB	\$5.7m	\$21.6m	\$27.2m	\$27.4m
PVC	\$1.5m	\$1.9m	\$1.9m	\$1.9m
NPV	\$4.2m	\$19.7m	\$25.3m	\$25.5m
BCR	3.8	11.4	14.3	14.4

Note: PVB is the present value of benefits and PVC is the present value of costs

The payoff to Australia to date from matching funds was estimated at \$4.2m in net present value terms or a return of \$3.80 for every dollar contributed by the federal government.

4.5 CONCLUSIONS AND SENSITIVITY ANALYSIS

The return on both levy payer and government funds was estimated to be significant with substantial returns generated to date. Benefits to the wider Australian community was estimated to be almost as great as benefits to Dairy farmers with nearly \$1m of environmental benefits being generated as a result of reduced nutrient run-off from dairy farms. The full range of benefits that have been considered in this evaluation is reported in Table 12.

TABLE 12: SYSTEMS MANAGEMENT SUB-PROGRAM BENEFITS

	Economic	Environmental	Social
Quantified	<ul style="list-style-type: none"> • Increased farm profits • Value of information • Reduced staff turnover 	<ul style="list-style-type: none"> • Reduced nutrient runoff 	<ul style="list-style-type: none"> • Increased economic activity • Lower dairy product prices
Non-Quantified	<ul style="list-style-type: none"> • Balance sheet changes • Networking • Reduced compliance costs • Increased productivity from better people deployment 	<ul style="list-style-type: none"> • Reduced water use 	<ul style="list-style-type: none"> • Increased industry capability • Reduced mortality • Increased scientific capability • Improved OH&S outcomes • Better work / life balance

One of the main assumptions in the evaluation was the assumed counterfactual for DEC impacts generated under the partnership with the Victorian Department of Primary Industries. At one extreme the counterfactual might consider the case where DEC activities would be undertaken anyway, with Dairy Australia funds simply being replaced by Victorian government funds. If this were the case then no benefits from DEC activities could be attributed to Dairy Australia's investment and the payoff from the sub-program would be negative to date with benefits increasing to \$14m by 2020 – due to benefits realised from TPiD initiative. It is unlikely that Dairy Australia funds would have had no impact on activities undertaken by DEC. It was found that the Dairy Australia investment in DEC would only need to account for 9% of the benefits generated in 208/09 for the investment to break-even. Given that Dairy Australia's involvement in DEC is highly valued by the Department of Primary Industries for their strategic contribution in planning areas of extension work, it would be reasonable to assume that more than 9% of the benefits generated by DEC could be attributed to levy payer funds.

5 NATIONAL CENTRE FOR DAIRY EDUCATION AUSTRALIA

The National Centre for Dairy Education Australia (NCDEA) is a partnership between Dairy Australia and the Goulburn Ovens Institute of TAFE (GOTAFE). The partnership was formed in 2005 to develop and deliver Vocational Education and Training (VET) courses and competencies for the benefit of the Australian dairy industry and the wider community.

VET courses had traditionally been offered through the University of Melbourne. Government support for VET is based on student contact hours (SCH), and is around \$10 per SCH⁴⁰. In 2005 the University of Melbourne decided to withdraw from VET because (1) their cost structure to deliver VET was around \$10 per SCH higher than TAFEs, (2) infrastructure associated with many exiting campuses was aging and represented a financial burden, and (3) VET was not seen as a priority against other courses and programs offered⁴¹.

In response to the University of Melbourne's decision to withdraw from VET the Victorian Learning and Employment Skills Commission sought Expressions of Interest from appropriate organisations to assume delivery of agricultural related VET programs that were previously offered by the University. Dairy Australia and GOTAFE were successful in their bid to deliver the 153,000 SCH which were deemed of relevance to the Australian dairy industry.

The decision by Dairy Australia to enter into the partnership with GOTAFE was seen as an opportunity to improve the quality of educational services as Australian Dairy Farmers had concluded that rural skills training was inadequate⁴². This has required investment in developing more appropriate course materials and delivery approaches.

Since its inception, NCDEA has achieved an increase in SCH from 153,000 in 2006 to over 300,000 in 2009. Through the NCDEA participants are offered a choice of 40 courses that range from Certificate II to an Advanced Diploma. There are around 61 units of competency and a range of short courses. The increase in SCH between 2005 and 2009 can be attributed to NCDEA activities and has not occurred as a result of participants shifting from other VET providers. Most of the increase in SCH can be attributed to existing employees and employers in the dairy industry upgrading and further developing their skills⁴⁰.

⁴⁰ KPMG 2008, Review of the National Centre for Dairy Education Australia, Report prepared for Dairy Australia, October. Funding is provided between \$9.75 and \$10.50 per SCH (Page 28).

⁴¹ Joy Manners and Assoc 2005, Options Paper – Industry Response to decision by University of Melbourne to withdraw from Vocational Education and Training in Agriculture and related disciplines, prepared for Australian Dairy Industry Council and Dairy Australia.

⁴² Australian Dairy Farmers Ltd 2005, House of Representatives Standing Committee on Agriculture, Fisheries and Forestry, Inquiry into Rural Skills Training and Research, Submission June.

5.1 INVESTMENT DETAILS

In this evaluation NCDEA investment is considered from initial delivery in 2006 to 2009. Over this period considerable funds were allocated to development and coordination of learning materials. A breakdown of annual Dairy Australia and GOTAFE costs is provided in Table 13. GOTAFE costs include expenditures in excess of revenue received for delivery of NCDEA courses and competencies.

TABLE 13: NCDEA PARTNER: \$'000

Party	2006	2007	2008	2009
Dairy Australia	\$200	\$450	\$450	\$475
GOTAFE	\$1,700	\$1,700	\$1,000	\$500
Total	\$1,900	\$2,150	\$1,450	\$975

Note: Years refer to financial year.

5.2 INDUSTRY IMPACT

The observable industry impact from NCDEA is the increase in SCH, which provides a measure of the increased participation of the Australian workforce in training and skills development. A breakdown of SCH delivered is provided in Table 14. An estimation of the share of SCH provided to existing dairy industry participants is also provided. For the purpose of this evaluation it was assumed that the increase in SCH from 2006 was mainly by dairy industry employees or employers⁴³.

TABLE 14: NCDEA SCH DELIVERED: '000 HOURS

	2006	2007	2008	2009
Total SCH	153	254	300	320
Dairy Industry	0%	40%	49%	52%

Participation in further education can deliver the following impacts⁴⁴.

⁴³ This is likely to be conservative. It was not known how many pre-NCDEA participants were from or entered the dairy industry.

⁴⁴ KPMG 2009, Economic Modelling of Improved Funding and Reform Arrangements for Universities, March. It should also be noted that earning premiums for self employed people would be reflected in their business profitability.

1. Private returns Individuals undertake education to increase their pre-tax earnings. For example, KPMG estimated that the increase in pre-tax earnings for people holding a Diploma or Advanced Diploma compared to those without a post school qualification was around 17%. Similar returns were estimated by Long and Shah⁴⁵ who found that a basic vocational qualification (Certificate II) yielded a 14.1% increase in pre-tax income and an associate diploma (Certificate IV) yielded a 25.9% increase. Private returns can also equal social returns as wage rates will reflect the increased productivity of trained people.
2. Externalities Education can be considered as a public good in that it can not be depleted if shared with others. In this manner workforce skills might be higher than that suggested by SCH alone.
3. Health Higher education and incomes are typically associated with better health. Also, many education programs are not solely related to productivity improvements but rather occupational health and safety issues.
4. Community KPMG cite references to a study that found a negative correlation between educational inequality and the level of general trust.

In this evaluation the focus is on private returns as there is little data to support the estimation of other impacts. The evaluation approach used here is based on estimating the private returns from participation in NCDEA courses or competencies over and above the private returns that would have otherwise occurred. The latter represents the counterfactual.

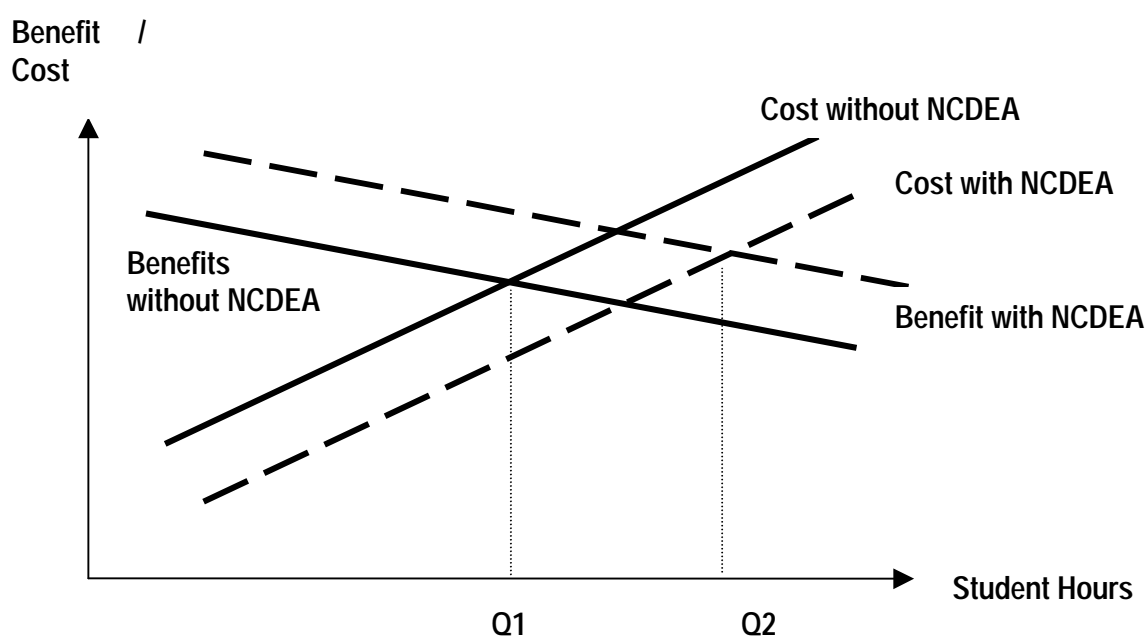
Private returns (such as increased income earning capacity) will be determined by people's willingness to pay for education. People will enroll in a NCDEA course or competency if they perceive the benefits to them to be greater than the costs they incur. At a given point in time the number of student contact hours delivered will be determined by the extent to which people perceive that benefits to them exceed the costs they incur. This is shown in Figure 2.

The economic model presented in Figure 2 is based on a demand / supply analysis of SCH – where demand represents the aggregate benefits across all SCH provided and supply represents aggregate costs to those people participating. Under the counterfactual a number of SCH will be provided each year – given by Q1. At this level the marginal benefit from the last SCH will be equal to the marginal cost incurred. No more SCH would

⁴⁵ Long, M. & Shah, C. 2008, Private Returns to vocational education and training qualifications, Centre for Economics of Education and Training, Monas University, Melbourne

be sought (or provided) as the perceived benefit would be less than the cost incurred. With NCDEA two outcomes might occur. The first is a reduction in the cost to people for each contact hour. This might occur as course delivery is better targeted to the dairy workforce (temporal or spatial) or cost savings are achieved in course material and delivery. Alternatively, the second impact might be to increase the perceived value of courses and hence the benefit of a contact hour to a person. This might occur as a result of more relevant course material or better access to the range of courses or competencies covered. These impacts are shown in Figure 2 as a decrease in the cost with NCDEA and an increase in the benefit with NCDEA.

Figure 2: BENEFITS AND COSTS FOR NCDEA SCH



If NCDEA were successful in either reducing the cost people incur for each SCH or to increase the benefit they receive from each SCH then it would be expected that the number of SCH would increase. This has indeed been the case and is represented in Figure 2 as an increase from Q1 to Q2.

One final consideration is the period over which NCDEA impacts are maintained. The initial years involved considerable development activities that has resulted in a significant increase in SCH. Following a review of NCDEA by KPMG in 2008 Dairy Australia agreed to increase their investment to around \$1m a year (for 3 – 5 years) from 2009/10 onwards⁴⁶. This investment was seen as necessary to maintain high participation rates and to ensure that delivery could be expanded nationally. If successful, participation rates as measured by SCH should continue to increase in the future.

⁴⁶ Internal Dairy Australia File note – Questions and Answers to KPMG Review, November 2008

For the purpose of this evaluation it was assumed that to maintain total current SCH provided now an investment by Dairy Australia and GOTAFE would be required for an additional 3 years. Dairy Australia investment was assumed to be \$470,000 a year and GOTAFE \$200,000 in 2009/10, after which time GOTAFE cash flow would be neutral. In this way any future investment in NCDEA development can be evaluated in terms of future increases in SCH.

5.3 TRIPLE BOTTOM LINE BENEFITS

In this section economic and social benefits are quantified. Benefits are quantified on the basis of increased private returns from NCDEA participation (SCH). Other impacts discussed in the previous section have not been quantified.

Economic

The approach used to estimate private returns from the Dairy Australia investment in NCDEA was based on the economic model discussed in the previous section. Private returns can be described as the aggregated difference in benefits and costs to individuals for each SCH completed. While the actual benefit and cost to each individual is unknown, it was possible to derive an aggregate estimate using assumed demand and supply elasticities⁴⁷ and a starting level of SCH in 2006 and costs to participants. These costs discussed below.

Cost per SCH⁴⁵ The cost of participation in a NCDEA course to an individual has three components. (1) course costs (such as fees, accommodation, travel, equipment and materials), opportunity cost (foregone earnings in order to study) and (3) non-compliance costs (where students enroll but do not pass or obtain a qualification). Long and Shah report a range of costs depending on gender and level of study. These are reported in Table 15 below.

TABLE 15: ANNUAL VET EDUCATIONAL COSTS

Course	Female		Male	
	Part Time	Full Time	Part Time	Full Time
Certificate	\$4,950	\$14,796	\$4,950	\$23,305
Diploma	\$13,200	\$32,878	\$13,200	\$49,770

Note: Middle estimate and any age group reported for part time and 29 year old middle estimate for full time.

⁴⁷ Demand elasticities provide a measure of the level of benefits received for each additional SCH and supply elasticities provide a measure of the costs for each additional SCH.

The average cost of enrolling in a VET course will depend on the percentage of males to females, educational attainment levels and percentage of part-time to full-time students. This breakdown for all VET enrollments⁴⁵ is provided in Table 16, and was used to derive an average VET cost of \$11,750 (Full time equivalent). Assuming annual nominal hours of around 1,000 per course⁴¹ (Full-time equivalent basis) the average cost per SCH was estimated at \$11.75.

TABLE 16: BREAKDOWN OF VET ENROLLMENTS

Gender	Diploma		Certificate	
	<i>Attained</i>	<i>Part-Time</i>	<i>Attained</i>	<i>Part-Time</i>
Male	10%	57%	43%	76%
Female	8%	61%	31%	77%

Demand Elasticity There have been few studies assessing the demand for VET courses. A study by Gallet⁴⁸ concluded that the demand for education was not overly responsive to tuition costs and KPMG⁴⁴ has reported that the demand for educational services has been maintained in the face of rising educational costs. In this evaluation it was assumed that the demand elasticity is relatively elastic (-1.5) on the basis that the benefit received for each SCH is not overly responsive to the total number of SCH provided and that benefits to individuals from each SCH would tend to be similar⁴⁹.

Supply Elasticity No empirical studies of the supply elasticity for education was found in the literature. For the purpose of this evaluation it was assumed that the supply elasticity was relatively inelastic (0.5) on the basis that each additional SCH undertaken by an individual would place increasingly significant opportunity costs on them. For example, the difference in full-time costs compared to part-time costs (on a full time equivalent basis), as reported in Table 15, is over 50% higher.

Using the estimated costs and elasticities derived above, the generated private gain from increased SCH as a result of NCDEA operations was derived. It was assumed that 30% of benefits were generated as a result of lower costs to participants and 70% from increased value to participants of each SCH. This weighting was deemed appropriate as opportunity costs from foregone income is typically significantly larger than tuition costs

⁴⁸ Gallet. C. 2007, A comparative analysis of the demand for higher education: results from a meta-analysis of elasticities. Economic Bulletin, Vol. 9, No. 7, pp 1-14.

⁴⁹ This assumption is tested with sensitivity analysis.

and are not influenced by NCDEA operations and that much of the focus of NCDEA developed courses and competencies was aimed at improving content and relevance⁵⁰. Quantified private benefits are reported in Table 17. The distribution between dairy and other industries was made on the basis of the assumed proportion of VET enrolments by dairy industry employees or employers (see Table 14). SCH delivered in 2006 was taken as a base. Total economic benefits are estimated at \$4.2m in 2007 and increasing to \$8.1m from 2009.

TABLE 17: ESTIMATED NCDEA BENEFITS: \$M

Year	SCH ('000)	Dairy	Non-Dairy	Total
2006 Base	153			
2007	254	\$1.7	\$2.5	\$4.2
2008	300	\$3.3	\$3.5	\$6.8
2009	320	\$4.2	\$3.9	\$8.1
2010	320	\$4.2	\$3.9	\$8.1
2011	320	\$4.2	\$3.9	\$8.1
2012	320	\$4.2	\$3.9	\$8.1

Note: All dollars are current and year refers to calendar year.

Sensitivity analysis was carried out on the assumed elasticity of demand, or the responsiveness of SCH undertaken to changes in perceived value. Under an assumed inelastic elasticity of demand for SCH of -0.5 it was estimated that economic returns would be 50% higher, and hence the use of a more elastic elasticity of demand would generate a conservative estimate of total benefits.

Social

Social benefits have been described in Section 5.2, and include productivity externalities, health and community impacts that deliver benefits to other people rather than those that enjoy the direct private benefit from participating in a NCDEA course. These possible benefits are recognised but have not been quantified.

Social gains will include consumer benefits from a more competitive dairy sector as well as flow on impacts from increased production across regional areas of Australia. It was estimated that 90% of the economic benefits initially generated in the dairy industry would be ultimately captured by dairy farmers¹⁶. The remainder would be largely captured by Australian consumers.

⁵⁰ Total private benefits are not sensitive to this breakdown.

Benefits to regional economies can be described in terms of flow on impacts to regional economies as a result of increased dairy production. Dairy production will increase as a result of greater profitability realised through Dairy Australia's investment. For every dollar of economic benefit captured by Australian dairy farmers, production, as measured by milk revenue, will expand by an estimated \$1.13. The increased profit earned on this extra production is included in the farm level benefits estimated earlier. However, this increased production will generate additional demand for dairy inputs, including employed labour. The additional economic activity was estimated⁵¹ at 54 cents of every dollar of economic benefit captured by dairy farmers.

5.4 FINANCIAL SUSTAINABILITY MEASURES

Financial sustainability measures were estimated across different sectors of the Australia community, including dairy farmers and the Australian community more broadly. In Table 18 below the distribution of benefits across different sectors is provided.

TABLE 18: ESTIMATED INVESTMENT BENEFITS: BY SECTOR: \$'000

	Australia				TOTAL
	Levy Payers	Non-Dairy Students	Dairy Consumers	Economic Activity	
2007	\$1,530	\$170	\$826	\$2,500	\$3,496
2008	\$2,970	\$330	\$1,604	\$3,500	\$5,434
2009	\$3,780	\$420	\$2,041	\$3,900	\$6,361
20010	\$3,780	\$420	\$2,041	\$3,900	\$6,361
2011	\$3,780	\$420	\$2,041	\$3,900	\$6,361
2012	\$3,780	\$420	\$2,041	\$3,900	\$6,361

Levy Payers

Financial sustainability measures were derived first for levy payers. Relevant costs include all Dairy Australia costs less matching funds and relevant benefits include only those gains to dairy farmers. Financial sustainability measures are reported in the table below. Measures are reported for two periods – to date and to 2014.

⁵¹ Derived from ABS Input-Output Tables for Dairy – Cat. 5209.0.55.001

The payoff to levy payers achieved to date was estimated at \$6.4m in net present value terms or a return of \$10.00 for every dollar invested through the farm levy. The pay off on levy funds to 2014 was estimated to increase to \$14.30m in net present value terms, reflecting the broader industry impacts as a result of the establishment and development of NCDEA. The high IRR reflects the short time period between the time Dairy Australia made the initial investment in NCDEA and when benefits were first realised.

TABLE 19: FINANCIAL SUSTAINABILITY MEASURES: RETURNS TO LEVY PAYERS

Measure	To date	2014
PVB	\$7.1m	\$15.5m
PVC	\$0.7m	\$1.2m
NPV	\$6.4m	\$14.3m
BCR	10	13
IRR	1,280%	1,282%

Note: PVB is the present value of benefits and PVC is the present value of costs

Australia

The final segment for which financial sustainability measures were derived was the Australian community at large, based on matching funds provided by the federal government and invested by Dairy Australia in the establishment and running of the NCDEA. Benefits include those that have been realised by students who are employed outside of the dairy industry (or as full time students), Australian consumers of dairy products who benefit from lower prices for dairy products and regional economies that benefit from increased economic activity. Financial sustainability measures are reported in the table below and provide an indication of the estimated return to matching funds provided.

TABLE 20: FINANCIAL SUSTAINABILITY MEASURES: RETURNS TO AUSTRALIA

Measure	To date	2014
PVB	\$13.1m	\$27.4m
PVC	\$0.7m	\$1.2m
NPV	\$12.4m	\$26.2m
BCR	19	23
IRR	3,038%	3,039%

Note: PVB is the present value of benefits and PVC is the present value of costs

The payoff to Australia to date from matching funds provided between 2005/06 and 2008/09 was estimated at \$12.4m in net present value terms or a return of \$19 for every dollar contributed by the federal government. Including costs and benefits to 2014, the estimated pay off was \$26.2m in net present value terms.

5.5 CONCLUSIONS

Investment by Dairy Australia in the NCDEA has delivered a substantial pay off to the dairy industry and Australia more broadly. One of the key indicators of the success of the NCDEA has been an increase in the number of people accessing the various courses and competencies offered. The range of benefits that have been achieved from Dairy Australia's investment in the establishment and operation of the NCDEA is summarised in Table 21.

TABLE 21: NCDEA SUB-PROGRAM BENEFITS

	Economic	Environmental	Social
Quantified	<ul style="list-style-type: none"> • Increased earnings • Reduced energy costs 		<ul style="list-style-type: none"> • Increased economic activity • Lower dairy product prices
Non-Quantified			<ul style="list-style-type: none"> • Improved worker health