

Industry-specific impact assessment program: mushroom

Impact assessment report for project *Mushroom analytics* (MU12005)

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Executive Summary

What the report is about

This report presents the results of an impact assessment of a Horticulture Innovation Australia Limited (Hort Innovation) investment in *MU12005: Mushroom analytics*. The project was funded by Hort Innovation over the period July 2013 to July 2015.

Methodology

The investment was first analysed qualitatively within a logical framework that included activities and outputs, outcomes and impacts. Actual and/or potential impacts then were categorised into a triple bottom line framework. Principal impacts identified were then considered for valuation in monetary terms (quantitative assessment). Past and future cash flows were expressed in 2017/18 dollar terms and were discounted to the year 2018/19 using a discount rate of 5% to estimate the investment criteria and a 5% reinvestment rate to estimate the modified internal rate of return (MIRR).

Results/key findings

The investment has left the mushroom industry better informed and able to deliver efficient and effective marketing and promotion investments. Consequently MU12005 is likely to contribute additional profitable sales for mushroom growers and improved resource allocation for marketing and promotion. Positive social impacts are also anticipated. These may include increased capacity in data collection and analytics and increased income in mushroom growing areas.

Investment Criteria

Total funding from all sources for the project was \$0.31 million (present value terms). All project funding was provided by Hort Innovation. The investment produced estimated total expected benefits of \$0.91 million (present value terms). This gave a net present value of \$0.60 million, an estimated benefit-cost ratio of 3 to 1, an internal rate of return of 24% and a MIRR of 9%.

Conclusions

Two social impacts were not valued. When inability to value all impacts is combined with conservative assumptions for the principal economic impacts valued, it is reasonable to conclude that the valuation may be an underestimate of the actual performance of the investment.

Keywords

Impact assessment, cost-benefit analysis, MU12005, mushroom, industry, analytics, data, market, research, consumers, purchasers, behaviour, channels.

Introduction

All research and development (R&D) and marketing levy investments undertaken by Horticulture Innovation Australia Limited (Hort Innovation) are guided and aligned to specific investment outcomes, defined through a Strategic Investment Plan (SIP). The SIP guides investment of the levy to achieve each industry's vision. The current industry SIPs apply for the financial years 2016/17 – 2020/21.

In accordance with the Organisational Evaluation Framework, Hort innovation has the obligation to evaluate the performance of its investment undertaken on behalf of industry.

This impact assessment program addresses this requirement through conducting a series of industry-specific ex-post independent impact assessments of the apple & pear (AP), avocado (AV), mushroom (MU) and table grape (TG) RD&E investment funds.

Twenty-seven RD&E investments (projects) were selected through a stratified, random sampling process. The industry samples were as follows:

- Nine AP projects were chosen worth \$15.46 million (nominal Hort Innovation investment) from an overall population of 19 projects worth an estimated \$33.31 million,
- Seven AV projects worth \$1.91 million (nominal Hort Innovation investment) from an overall population of 27 projects worth approximately \$9.97 million,
- Five MU projects worth \$1.75 million (nominal Hort Innovation investment) from a total population of 20 projects worth \$7.94 million, and
- Six TG projects worth \$2.84 million (nominal Hort Innovation investment) from an overall population of 11 projects worth \$5.0 million.

The project population for each industry included projects where a final deliverable had been submitted in the five-year period from 1 July 2013 to 30 June 2018.

The projects for each industry sample were chosen such that the investments represented (1) at least 10% of the total Hort Innovation RD&E investment expenditure for each industry, and (2) the SIP outcomes (proportionally) for each industry.

Project MU12005: *Mushroom analytics* was randomly selected as one of the 22 unique MT18009 investments and was analysed in this report.

General Method

The impact assessment follows general evaluation guidelines that are now well entrenched within the Australian primary industry research sector including Research and Development Corporations, Cooperative Research Centres, State Departments of Agriculture, and some universities. The approach includes both qualitative and quantitative descriptions that are in accord with the impact assessment guidelines of the CRRDC (CRRDC, 2018).

The evaluation process involved identifying and briefly describing project objectives, activities and outputs, outcomes, and impacts. The principal economic, environmental and social impacts were then summarised in a triple bottom line framework.

Some, but not all, of the impacts identified were then valued in monetary terms. Where impact valuation was exercised, the impact assessment uses cost-benefit analysis as its principal tool. The decision not to value certain impacts was due either to a shortage of necessary evidence/data, a high degree of uncertainty surrounding the potential impact, or the likely low relative significance of the impact compared to those that were valued. The impacts valued are therefore deemed to represent the principal benefits delivered by the project. However, as not all impacts were valued, the investment criteria reported for individual investments potentially represent an underestimate of the performance of that investment.

Background & Rationale

Background

In 2017/18, the Australian mushroom industry consisted of approximately 44 growers producing 70,463 tonnes of mainly white button mushroom (*Agaricus bisporus*) with a farm-gate value of \$456.6 million. Mushrooms are grown close to population centres, especially Adelaide, Melbourne Metro and the Sydney Basin. Mushrooms are produced year-round and grown under cover in controlled environments.

The Australian Mushroom Growers Association (AMGA) Limited was formed in 1961 and has been instrumental in developing the market for fresh Australian mushrooms and delivering research, development and extension (RD&E) projects. The AMGA has members who are growers, wholesalers and farm input suppliers.

The mushroom industry levy is only applied to *Agaricus* mushrooms. It is calculated on a dollar per kilogram of mushroom spawn. The total mushroom statutory levy (marketing and R&D) collected from growers averages approximately \$4.8 million per year. The industry invests around 80% of the mushroom levy into marketing activities. The remaining 20% is invested into RD&E and attracts contributions from the Australian Government (Hort Innovation, 2017).

Approximately 70% of Australian mushroom production is sold to consumers through the retail market. Generic marketing and promotions undertaken by the Australian mushroom industry targeted at the public are an important method of generating awareness about mushrooms and stimulating increased frequency of mushroom purchase and increasing the amount of mushrooms purchased per transaction.

The Australian mushroom industry's goal is to increase the volume of mushrooms being pulled through the supply chain. Ultimately the industry would like to move mushrooms from a discretionary purchase to a perceived essential item. From July 2012, the industry transitioned to a new marketing position that highlighted the variety of positive health outcomes associated with the regular consumption of mushrooms – the 'Power of Mushrooms' campaign.

To ensure the mushroom industry is making sound investment decisions through the 'Power of Mushrooms' campaign and to identify potential opportunities for refinement, a multi-year research project to capture and analyse market and consumer data was required.

Rationale

MU12005, the analytics for mushrooms project, was consistent with the objectives of the Australian Mushroom Industry Strategic Plan 2011-16 and the Strategic Investment Plan 2017-2021.

The project supports Industry Strategic Plan 2011-16 Objective 1: Marketing and Market Development 'to ensure demand closely matches estimated production levels by maintaining and developing existing markets and exploiting new market opportunities'. In particular, MU12005 aligns with Strategy 1.1: 'maintain a program of regular market and consumer monitoring to monitor consumer attitude and behaviour, measure and refine markets and market segments; guide the design of marketing programs and gauge the impact of marketing activities'.

MU12005 is consistent with Strategic Investment Plan 2017-2021 Outcome 1: increase domestic consumption to 4 kg per person per year by 2021, Strategy 1.2 (monitor consumption per capita), Strategy 1.4 (understand new markets) and Strategy 1.6 (use data to assess effectiveness of the marketing program).

MU12005 build on previous Australian mushroom industry market analytics investments including:

- MU09009 'Meal Pulse for Mushrooms' consumer research – measurement approaches and benchmarks to assess aspects of mushroom purchasing patterns, consumption and household penetration.
- 'Mushroom Monitor' – a key source of industry market intelligence. A multi-mode (qualitative and quantitative) shopper/consumer research study undertaken every 2-3 years since 1995 to understand usage, attitude, actions and opportunities for the mushroom industry.

To gather robust longitudinal data a three-year data collection and analysis project was required.

Project Details

Summary

Project Code: MU12005
 Title: *Analytics for mushrooms*
 Research Organisation: AMGA
 Principal Investigator: Greg Seymour
 Period of Funding: July 2013 to July 2015

Objectives

The objective of this project was to systematically collect data to:

1. Baseline and track changes in mushroom purchasing habits (such as household penetration, frequency of purchase, average purchase volume/value, product format participation, purchase on/off promotion) of shoppers that demonstrate progress in achieving behaviour change over time.
2. Track changes amongst mushroom purchasers about their level of understanding of the health benefits / outcomes of mushroom consumption, their level of awareness/exposure to mushroom industry marketing (and the claimed knowledge/behavioural actions from exposure) that demonstrate efficient and effective communication.
3. Review variances within the mushroom purchaser/consumer base (based on demographic variables) to understand opportunities to target specific audiences/refine communication.
4. Generate insights into emerging preferences in shopping channel, product format, meal preparation, communication channels/modes that can inform the development of innovative and relevant approaches.

Logical Framework

Table 1 provides a description of MU12005, a market data collection and analysis project, in a logical framework.

Table 1: Logical Framework for Project MU12005

Activities and Outputs	<p>Activities:</p> <ul style="list-style-type: none"> • Project design to collect purchaser, consumer, channel and behavioural data. • The utilisation of multiple independent data sources and methodologies to allow for cross referencing of results, validation and gap analysis. • Collection and analysis of RetailScan data from Coles Supermarkets between the September quarter 2012 and the June quarter 2015. Data accessed by 'Quick Turn Fresh' web-based interface managed by Nielsen, providing mushroom volume and value sales by week and by state. Data analysed by Modium and provided to AMGA. • Collection and analysis of Nielsen Homescan data which provides an annual snapshot of consumption by 10,000 Australian households. Homescan reveals actual consumer purchasing behaviour at the category, segment and product level as well as an understanding of purchase dynamics such as number of buyers, how much they buy, their loyalty, purchase frequency, repeat buying as well as understanding shoppers, who they are and where they shop. Customised reports prepared for AMGA. • Mushroom Monitor – comprehensive usage, attitude, understanding and awareness consumer study. A highly focussed investigation and analysis of mushroom category purchasers. Provided insights into what motivates purchasers to buy mushrooms and why, how they use mushrooms at home – in how many meals per week and in what quantities, what are their key sources of influence, what do they understand about health benefits and outcomes of mushrooms, what level of recall of industry marketing activities and how this impacts their behaviour. Data collected nationally by Modium from 2,000 individuals and 8 Sydney/Melbourne qualitative focus groups.
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	<ul style="list-style-type: none"> • 2013 baseline study of channel, retailer and purchaser behaviour, Nielsen Homescan. • 2014 (Aug) study of channel, retailer and purchaser behaviour, Nielsen Homescan. • 2014 (Oct) study of channel, retailer and purchaser behaviour, Nielsen Homescan. • 2014 (Oct) quantitative, purchase usage, and attitude research, Modium Group. • 2014 (Nov) Australian fresh mushroom market profile, Freshlogic. • 2015 (June) the state of fresh mushroom sales, Nielsen Homescan. • 2015 (June) 8 focus groups exploring affinity, knowledge, drivers, Myrad Research. • Data and analysis to inform mushroom industry strategic and operational planning particularly marketing and promotional planning. • Data and analysis to complete an evaluation of outputs and outcomes from the industry's levy investment program. • Presentation of data and analysis, 2014 Australian Mushroom Growers Conference. <p>Outputs:</p> <ul style="list-style-type: none"> • Knowledge to inform mushroom grower production and marketing decisions. • Presentation to the Mushroom Industry Advisory Committee to inform marketing and promotion investments.
Outcomes	<ul style="list-style-type: none"> • Mushroom industry better informed and able to deliver efficient and effective marketing and promotion investments. • Individual growers with knowledge to inform production and marketing decisions.
Impacts	<ul style="list-style-type: none"> • Additional profitable sales for mushroom growers due to more effective 'Power of Mushrooms' marketing campaign. • Improved resource allocation for marketing and promotion. • Increased capacity in data collection and analytics - AMGA and research companies. • Increased income in mushroom growing areas associated with a more profitable industry with additional sales (spillover impact).

Project Investment

Nominal Investment

Table 2 shows the annual investment (cash and in-kind) in project MU12005 by Hort Innovation. There were no 'other' investors in this project.

Table 2: Annual Investment in the Project MU12005 (nominal \$)

Year ended 30 June	Hort Innovation (\$)	Other (\$)	Total (\$)
2014	86,440	0	86,440
2015	86,440	0	86,440
2016	31,295	0	31,295
Totals	204,175	0	204,175

Program Management Costs

For the Hort Innovation investment the cost of managing the Hort Innovation funding was added to the Hort Innovation contribution for the project via a management cost multiplier (1.162). This multiplier was estimated based on the share of 'payments to suppliers and employees' in total Hort Innovation expenditure (3-year average) reported in the Hort Innovation's Statement of Cash Flows (Hort Innovation Annual Report, various years). This multiplier was then applied to the nominal investment by Hort Innovation shown in Table 2.

Real Investment and Extension Costs

For the purposes of the investment analysis, investment costs of all parties were expressed in 2017/18 dollar terms using the GDP deflator index. There were no additional costs associated with project extension. Results were communicated to the Mushroom Industry Advisory Committee and growers as part of the project.

Impacts

Table 3 provides a summary of the principal types of impacts delivered by the project. Impacts have been categorised into economic, environmental and social impacts.

Table 3: Triple Bottom Line Categories of Principal Impacts from Project MU12005

Economic	<ul style="list-style-type: none"> • Additional profitable sales for mushroom growers due to more effective ‘Power of Mushrooms’ marketing campaign. • Improved resource allocation for marketing and promotion.
Environmental	<ul style="list-style-type: none"> • Nil.
Social	<ul style="list-style-type: none"> • Increased capacity in data collection and analytics - AMGA and research companies. • Increased income in mushroom growing areas associated with a more profitable industry with additional sales (spillover impact).

Public versus Private Impacts

Impacts identified in this evaluation are mostly private in nature. Private benefits will be realised by mushroom growers via additional profitable sales and improved resource allocation in marketing and promotion. Public benefits will include increased health outcomes (additional mushroom purchase and consumption), capacity (AMGA and research companies) as well as increased income in mushroom growing areas associated with a more profitable industry.

Distribution of Private Impacts

The impacts on the mushroom industry from investment in this project will be shared along the supply chain with input suppliers, growers, processors, transporters, wholesalers, retailers and consumers all sharing impacts produced by the project. The share of impact retained by each link in the supply chain will depend on Australian mushroom market short and long term supply and demand elasticities – few mushrooms are exported.

Impacts on Other Australian Industries

Impacts on industries other than the mushroom industry may include potential gains in other industries via any future spillovers from the increase in research company capacity.

Impacts Overseas

No overseas impacts identified.

Match with National Priorities

The Australian Government’s Science and Research Priorities and Rural RD&E priorities are reproduced in Table 4. The project findings and related impacts will contribute to Rural RD&E priority 4 and to Science and Research Priority 1 and 8.

Table 4: Australian Government Research Priorities

Australian Government	
Rural RD&E Priorities (est. 2015)	Science and Research Priorities (est. 2015)
1. Advanced technology	1. Food
2. Biosecurity	2. Soil and Water
3. Soil, water and managing natural resources	3. Transport
4. Adoption of R&D	4. Cybersecurity
	5. Energy and Resources
	6. Manufacturing
	7. Environmental Change
	8. Health

Sources: (DAWR, 2015) and (OCS, 2015)

Alignment with the Mushroom Strategic Investment Plan 2017-2021

The strategic outcomes and strategies of the mushroom industry are outlined in the Mushroom Strategic Investment Plan 2017-2021¹ (Hort Innovation, 2016). Project MU08010 addressed SIP Outcome 1, Strategies 1.2, 1.4 and 1.6.

Valuation of Impacts

Impacts Valued

Analyses were undertaken for total benefits that included future expected benefits. A degree of conservatism was used when finalising assumptions, particularly when some uncertainty was involved. Sensitivity analyses were undertaken for those variables where there was greatest uncertainty or for those that were identified as key drivers of the investment criteria.

Two impacts were valued. The first was additional profitable sales for mushroom growers due to a more effective marketing campaign. The second impact valued was improved resource allocation efficiency for marketing and promotion.

Impacts Not Valued

Not all of the impacts identified in Table 3 could be valued in the assessment. Social impacts were hard to value due to lack of evidence/data, difficulty in quantifying the causal relationship and pathway between MU12005 and the impact and the complexity of assigning monetary values to the impact.

The social impacts identified but not valued were:

- Increased capacity in data collection and analytics – AMGA and research companies.
- Increased income in mushroom growing areas associated with a more profitable industry with lower production costs and additional sales (spillover impact).

Valuation of Impact 1: Additional Profitable Sales for Mushroom Growers

The MU12005 investment resulted in improved understanding of the mushroom consumer and targeting of the industry's 'Power of Mushrooms' marketing and promotion campaign. As a result of this additional understanding and improved marketing, it is likely that additional profitable sales of mushrooms will have been achieved.

Through its Strategic Investment Plan (SIP) 2017 – 2021 the industry has set itself a 'bold and ambitious' target of increasing profitable mushroom sales from 2.8kg per capita in 2017 to 4.0kg per capita in 2021.

Attribution

If the targeted increase in mushroom sales occurs it will have been due to a number of investments identified in SIP Outcome 1. These include the annual marketing program, a food service sector program, new market development and investment in health professionals. The forecast spend for SIP Outcome 1 is \$8,062,789. MU12005 constitutes 2.5% of this total.

Counterfactual

It is assumed that in the absence of Hort Innovation investment in MU12005, some alternative analysis of consumers and the effectiveness of marketing programs would have been completed. For this reason only 50% of the impacts are relevant to the MU12005 investment.

Valuation of Impact 2: Efficiency Gains in Australian Mushroom Marketing and Promotion Resource Allocation

Annually, \$3.4 million is spent on mushroom marketing and promotion by the industry – three year average of Hort Innovation mushroom program expenditure sourced from the company's annual reports. MU12005 will help target investments and understand what is working with the industry's marketing and promotion spend. Therefore, it can be assumed that the marketing and promotion investment is made in a more efficient manner than it would have been without the project being funded. It is assumed that there is an efficiency of 5% of R&D

¹ For further information, see: <https://www.horticulture.com.au/hort-innovation/funding-consultation-and-investing/investment-documents/strategic-investment-plans/>

spending. That is, the same outcomes and impact will be achieved with a 5% reduction in marketing and promotion spending.

Attribution

If the efficiency gain in marketing and promotion spend occurs it will have been due to MU12005 as well as a number of previous investments. Previous investments include the Mushroom Monitor which has been in place since 1995 and MU09006 'Meal Pulse for Mushrooms'. Consequently only part of the impact is attributable to MU12005, and for the purposes of this assessment, 80% has been assumed.

Counterfactual

It is assumed that in the absence of Hort Innovation investment in MU12005, some additional alternative analysis of consumers and the effectiveness of marketing programs would have been completed. For this reason only 50% of the impacts are relevant to the MU12005 investment.

Summary of Assumptions

A summary of the key assumptions made for valuation of the impacts is shown in Table 5.

Table 5: Summary of Assumptions

Variable	Assumption	Source/Comment
Impact 1: Additional Profitable Sales for Mushroom Growers		
Additional mushroom sales targeted through the SIP.	28,600 tonne/year	Mushroom SIP 2017-21 page 11 notes target of 55,000kg week by 52 weeks.
Mushroom grower profit on additional sales.	\$460/tonne	Farm gate value of mushroom industry production of \$456.6M divide production of 70,463 tonnes to give a gross value of \$6,480/tonne (Hort Innovation, 2018). Grower profit is 7.1% of gross value (IBIS World, 2018) and cross checked with Chudleigh 2011.
Attribution of additional mushroom sales to MU12005.	2.5%	See above.
Counterfactual.	50%	See above
Probability of achieving 'bold and ambitious' SIP target.	30%	Mushroom SIP 2017-21 notes that target was deliberately set as a 'challenge' for industry.
Year of first impact.	2017/18	Two years after MU12005 completed and allowing for adjustment of marketing and promotion programs.
Year in which impact reaches a peak.	2020/21	Consistent with Mushroom SIP 2017-21.
Probability of impact	80%	Analyst assumption.
Impact 2: Efficiency Gains in Australian Mushroom Marketing and Promotion Resource Allocation		
Total annual expenditure on mushroom marketing and promotion.	\$3.4 million	Hort Innovation, 2017.
Efficiency of spending due to MU09003.	5%	Analyst assumption.
Year of first impact.	2017/18	Two years after MU12005 completed and allowing for adjustment of marketing and promotion programs.
Year in last impact.	2022/23	Five years after first year of impact.

Results

All costs and benefits were discounted to 2018/19 using a discount rate of 5%. A reinvestment rate of 5% was used for estimating the Modified Internal Rate of Return (MIRR). The base analysis used the best available estimates for each variable, notwithstanding a level of uncertainty for many of the estimates. All analyses ran for the length of the project investment period plus 30 years from the last year of investment (2015/16) as per the CRRDC Impact Assessment Guidelines (CRRDC, 2018).

Investment Criteria

Tables 6 shows the investment criteria estimated for different periods of benefit for the total investment. Hort Innovation was the only contributor to this project so there is no second set of analyses showing results for Hort Innovation.

Table 6: Investment Criteria for Total Investment in Project MU12005

Investment Criteria	Years after Last Year of Investment						
	0	5	10	15	20	25	30
Present Value of Benefits (\$m)	0	0.35	0.56	0.68	0.78	0.85	0.91
Present Value of Costs (\$m)	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Net Present Value (\$m)	-0.31	0.04	0.25	0.38	0.47	0.55	0.60
Benefit-Cost Ratio	0	1.14	1.84	2.23	2.55	2.79	2.98
Internal Rate of Return (%)	negative	6.4	20.4	22.6	23.2	23.4	23.5
MIRR (%)	negative	5.9	11.1	10.4	9.7	9.1	8.7

The annual undiscounted benefit and cost cash flows for the total investment for the duration of MU12005 investment plus 30 years from the last year of investment are shown in Figure 1.

Figure 1: Annual Cash Flow of Undiscounted Total Benefits and Total Investment Costs

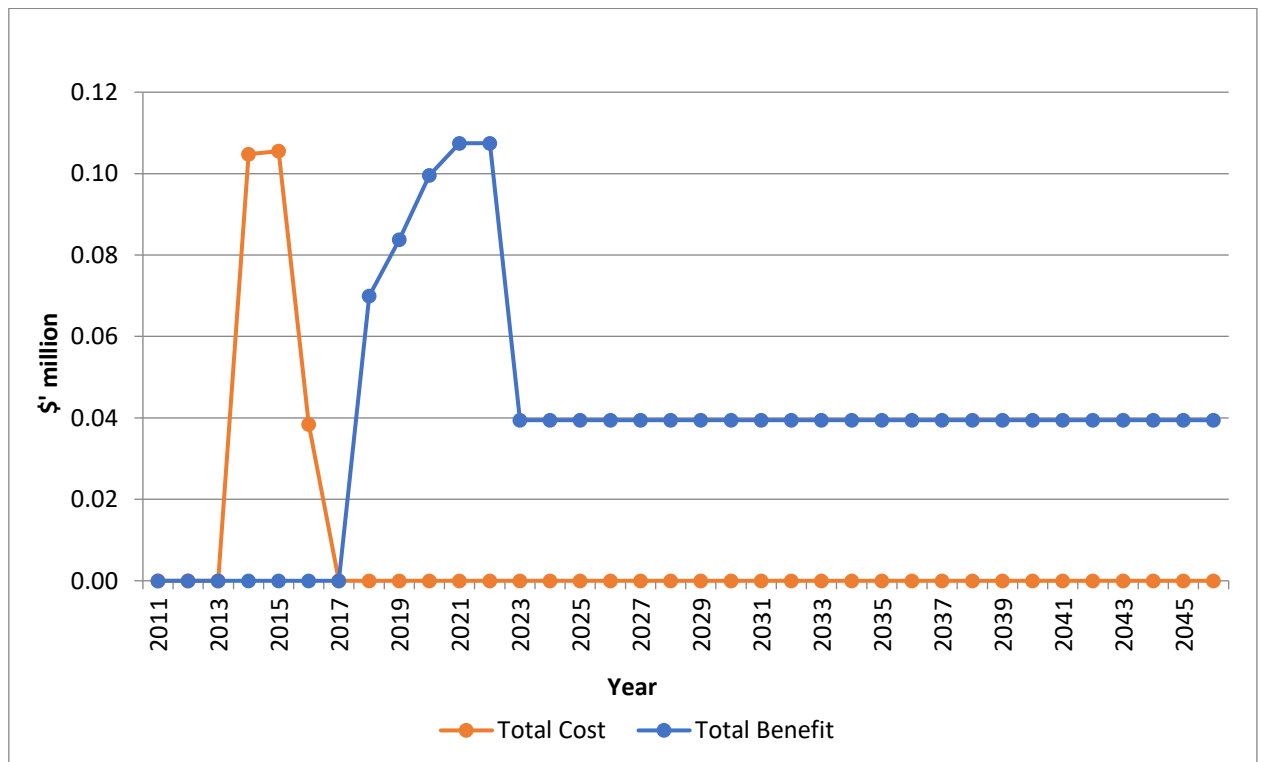


Table 7 shows the contribution of each impact to the total PVB.

Table 7: Contribution of Benefits

Impact	PVB (\$M)	% of Total PVB
Impact 1: additional profitable sales for mushroom growers	0.59	64.4
Impact 2: efficiency gains in marketing resource allocation	0.32	35.6
Total	0.91	100.0%

Sensitivity Analyses

A sensitivity analysis was carried out on the discount rate. The analysis was performed for the total investment and with benefits taken over the life of the investment plus 30 years from the last year of investment. All other parameters were held at their base values. Table 8 present the results. The results are moderately sensitive to the discount rate.

Table 8: Sensitivity to Discount Rate
(Total investment, 30 years)

Investment Criteria	Discount rate		
	0%	5%	10%
Present Value of Benefits (\$m)	1.42	0.91	0.69
Present Value of Costs (\$m)	0.25	0.31	0.37
Net Present Value (\$m)	1.17	0.60	0.32
Benefit-cost ratio	5.69	2.98	1.84

A sensitivity analysis was then undertaken for the assumed attribution of the forecast increase in mushroom sales to MU12005. Even with a halving of the assumed increase in mushroom sales, the project produces a positive return on investment – Table 9.

Table 9: Sensitivity to Attribution of Increased Mushroom Sales to MU12005
(Total investment, 30 years)

Investment Criteria	Increase in Mushroom Sales Attributable to MU12005		
	1.25%	2.5% (base)	5.0%
Present Value of Benefits (\$m)	0.62	0.91	1.50
Present Value of Costs (\$m)	0.31	0.31	0.31
Net Present Value (\$m)	0.31	0.60	1.19
Benefit-cost ratio	2.02	2.98	4.90

A final sensitivity test examined the assumed efficiency gain in marketing resource allocation attributable to MU12005. Halving the assumed gain in marketing resource allocation efficiency attributable to MU12005 makes only a small change to overall impact assessment results – Table 10.

Table 10: Sensitivity to Efficiency in Marketing Spend Attributable to MU12005
(Total investment, 30 years)

Investment Criteria	Increase in Efficiency of Marketing Spend Attributable to MU12005		
	2.5%	5% (base)	10%
Present Value of Benefits (\$m)	0.75	0.91	1.24
Present Value of Costs (\$m)	0.31	0.31	0.31
Net Present Value (\$m)	0.44	0.60	0.93
Benefit-cost ratio	2.45	2.98	4.04

Confidence Rating

The results produced are highly dependent on the assumptions made, some of which are uncertain. There are two factors that warrant recognition. The first factor is the coverage of benefits. Where there are multiple types of benefits it is often not possible to quantify all the benefits that may be linked to the investment. The second factor involves uncertainty regarding the assumptions made, including the linkage between the research and the assumed outcomes.

A confidence rating based on these two factors has been given to the results of the investment analysis (Table 11). The rating categories used are High, Medium and Low, where:

- High: denotes a good coverage of benefits or reasonable confidence in the assumptions made
- Medium: denotes only a reasonable coverage of benefits or some uncertainties in assumptions made
- Low: denotes a poor coverage of benefits or many uncertainties in assumptions made

Table 11: Confidence in Analysis of Project

Coverage of Benefits	Confidence in Assumptions
High	Medium-high

Coverage of benefits was assessed as high – the two major benefits were quantified.

Confidence in assumptions was rated as medium-high. Data were mostly drawn from Hort Innovation and AMGA sources.

Conclusion

The investment has left the mushroom industry better informed and able to deliver efficient and effective marketing and promotion investments. Consequently MU12005 is likely to contribute additional profitable sales for mushroom growers and improved resource allocation for marketing and promotion. Positive social impacts are also anticipated. These may include increased capacity in data collection and analytics and increased income in mushroom growing areas.

Two impacts were not valued. When inability to value all impacts is combined with conservative assumptions for the principal economic impacts valued, it is reasonable to conclude that the valuation may be an underestimate of the actual performance of the investment.

Glossary of Economic Terms

Cost-benefit analysis:	A conceptual framework for the economic evaluation of projects and programs in the public sector. It differs from a financial appraisal or evaluation in that it considers all gains (benefits) and losses (costs), regardless of to whom they accrue.
Benefit-cost ratio:	The ratio of the present value of investment benefits to the present value of investment costs.
Discounting:	The process of relating the costs and benefits of an investment to a base year using a stated discount rate.
Internal rate of return:	The discount rate at which an investment has a net present value of zero, i.e. where present value of benefits = present value of costs.
Investment criteria:	Measures of the economic worth of an investment such as Net Present Value, Benefit-Cost Ratio, and Internal Rate of Return.
Modified internal rate of return:	The internal rate of return of an investment that is modified so that the cash inflows from an investment are re-invested at the rate of the cost of capital (the re-investment rate).
Net present value:	The discounted value of the benefits of an investment less the discounted value of the costs, i.e. present value of benefits - present value of costs.
Present value of benefits:	The discounted value of benefits.
Present value of costs:	The discounted value of investment costs.

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Abbreviations

AMGA	Australian Mushroom Growers Association Limited
CRRDC	Council of Research and Development Corporations
DAWR	Department of Agriculture and Water Resources (Australian Government)
GDP	Gross Domestic Product
GVP	Gross Value of Production
IRR	Internal Rate of Return
MIRR	Modified Internal Rate of Return
OCS	Office of Chief Scientist Queensland
PVB	Present Value of Benefits
R&D	Research and Development
RD&E	Research, Development and Extension
SIP	Strategic Investment Plan