Hort Innovation

Final Report

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Horticulture Impact Assessment Program:

Appendix 9: Mushroom Production Waste Streams, Novel Approaches to Management and Value Creation (MU17005 Impact Assessment)

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Delivery partner:

AgEconPlus and Agtrans Research

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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 *MU17005: Mushroom Production Waste Streams, Novel Approaches to Management and Value Creation.* The project was funded by Hort Innovation over the period December 2018 and October 2019.

Methodology

The investment was analysed qualitatively within a logical framework that included activities and outputs, outcomes and impacts. Impacts were categorised into a triple bottom line framework. Principal impacts identified were then considered for valuation. Past and future cash flows were expressed in 2019/20 dollar terms and were discounted to the year 2019/20 using a discount rate of 5% to estimate the investment criteria.

Results/key findings

The investment has identified cost reduction/value adding opportunities for Australian mushroom growers. The Australian Mushroom Growers Association is meeting with growers in the first half of 2021 to advance the opportunity. If realised, MU17005 findings are likely to deliver a more profitable Australian mushroom industry. Positive environmental and social impacts are also anticipated. Environmental and social impacts will include a reduction in any environmental costs associated with mushroom waste disposal, augmentation of the mushroom industry's social licence to operate, capacity built by researchers and spillover economic benefits for mushroom growing areas.

Investment Criteria

Total funding from all sources for the project was $0.96 million (present value terms). All project funding was provided by Hort Innovation. The investment produced estimated total expected benefits of $3.97 million (present value terms). This gave a net present value of $3.01 million, an estimated benefit-cost ratio of 4.1 to 1, an internal rate of return of 14.8% and a modified internal rate of return of 9.5%.

Conclusions

Four environmental and 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; MU17005; mushroom; waste; value add; novel approaches; Spent Mushroom Substrate (SMS); Spent Mushroom Compost (SMC); waste; recycling; stem; pelletiser; anaerobic digester; high value food; shelf life; exotic.

Introduction

Horticulture Innovation Australia Limited (Hort Innovation) required a series of impact assessments to be carried out annually on a number of investments in the Hort Innovation research, development, and extension (RD&E) portfolio. The assessments were required to meet the following Hort Innovation evaluation reporting requirements:

- Reporting against the Hort Innovation's current Strategic Plan and the Evaluation Framework associated with Hort Innovation's Statutory Funding Agreement with the Commonwealth Government.
- Annual Reporting to Hort Innovation stakeholders.
- Reporting to the Council of Rural Research and Development Corporations (CRRDC).

Under the impact assessment program (Project MT18011), three series of impact assessments were conducted in calendar 2019, 2020 and 2021. Each included 15 randomly selected Hort Innovation RD&E investments (projects). The third series of impact assessments (current series) was randomly selected from an overall population of 56 Hort Innovation investments worth an estimated $38.9 million (nominal Hort Innovation investment) where a final deliverable had been submitted in the 2019/20 financial year.

The 15 investments were selected through a stratified, random sampling process such that investments chosen represented at least 10% of the total Hort Innovation RD&E investment in the overall population (in nominal terms) and was representative of the Hort Innovation investment across six, pre-defined project size classes.

Project *MU17005: Mushroom Production Waste Streams, Novel Approaches to Management and Value Creation* was randomly selected as one of the 15 investments under MT18011 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

The Australian mushroom industry consisted of approximately 44 growers producing an average 70,431 tonnes of mainly white button mushroom (*Agaricus bisporus*) with a gross value of production of $420.7 million – Table 1.

Table 1: Mushroom Industry Performance 2018-2020

Year Ending 30 June	Production (t)	Gross Value of Production ($m)	Farmgate Value of Production ($m)
2018	70,463	456.6	433.8
2019	72,006	437.7	415.8
2020	68,823	367.8	349.4
Average	70,431	420.7	399.7

Source: Australian Horticulture Statistics Handbook, 2020, AgEconPlus estimate of farmgate value

Mushrooms are grown close to population centres, especially Adelaide, Melbourne Metro, and the Sydney Basin. Most production is destined for the fresh domestic market (97%) and a proportion of the crop is sliced (processed) and sold fresh in a value-added form. An even smaller proportion of the Australian mushroom crop is exported in fresh form. Mushrooms are produced year-round and grown under cover in controlled environments.

Mushroom research and development (R&D) activity is guided by the Mushroom Industry's Strategic Investment Plan (SIP). Activities are funded by levies and the R&D levy funds are managed by Hort Innovation. 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 $4.8 million per year. The industry invests approximately 80% of the mushroom levy into marketing activities. The remaining 20% is invested into R&D and attracts contributions from the Australian Government.

The current SIP has been driven by levy payers and addresses the Australian Mushroom Industry's needs from 2017 to 2021. Strategies and priorities in the Plan have been driven by two desired outcomes (Hort Innovation, 2017):

1. Achieve the bold and ambitious target of domestic consumption of 4 kilograms per person per year of mushrooms by 2021.
2. Mushroom growers are profitable and sustainable through increased yields, reduced costs, and effective risk management.

The Mushroom Strategic Investment Advisory Panel (SIAP) made up of levy payers, the supply chain and representation from the peak industry body, overseas delivery of the SIP. The SIAP meets to discusses investment ideas, reviews marketing and R&D proposals, and makes project recommendations to Hort Innovation.

Rationale

The Australian mushroom industry is one of the most advanced in the world, but geographic limitations and high labour and transportation costs exacerbate the price competitiveness of the industry. In addition, every year in Australia, 200,000 - 260,000 tonnes of mushroom waste is produced in the form of Spent Mushroom Substrate (SMS) and sub-prime mushrooms such as stems. A higher return on mushroom waste will be a key factor to alleviate these abovementioned issues and improve profitability.

Project Details

Summary

Project Code: MU17005

Title: *Mushroom Production Waste Streams, Novel Approaches to Management and Value Creation*

Research Organisation: Xinova

Principal Investigator: Scott Needham

Period of Funding: December 2018 to October 2019

Objectives

The objective of this project was to generate operational cost savings and new revenue from the primary sources of mushroom waste i.e., the disposal of SMS and subprime, edible mushrooms.

Logical Framework

Table 1 provides a description of MU17005 in a logical framework.

Table 2: Logical Framework for Project MU17005

Activities	• Phase 1 activities focussed on definition of project scope and the development of three opportunity areas: 1) Improved efficiency of the mushroom production process, 2) Adding value to the production process by repurposing production waste, and 3) Identification of new commercial opportunities – new products, and new markets. • Phase 1 included visits to six mushroom operations across QLD, NSW, and VIC to review current production and waste management practices, market, and supply chain dynamics, as well as understand previous trials with waste systems. • Phase 2 required a deep review of the international scientific literature and spanned technologies, industries, and best practice. Phase 2 included an ideation workshop which converged themes and solution types. The ideation workshop identified 30 concepts, and four broad solution areas which were presented to the Mushroom SIAP. Following the SIAP presentation, three broad themes were selected for further development, they were: 1) Energy and fertiliser, 2) High value foods, and 3) Recycling waste for further production. Further research and analysis resulted in eight possible solutions within the three themes: 1. Pelletiser systems, 2. Anerobic digester, 3. Insect bioconversion, 4. Mushroom powders, 5. Edible shelf-life extenders, 6. Recycling SMS, 7. Exotic mushrooms from SMS, and 8. Recycling CO2. • Phase 3 investigations included business case development. Possible waste solutions were assessed against desirability (‘does the solution deal

	with a large volume of mushroom waste', 'does the solution generate a unique mushroom product'), feasibility ('does the solution offer minimum changes to existing production systems'), and economically viability (limited capital expenditure, investment payback within five years). • Key solutions identified, including those shown above in bold, had the capacity to generate $55 million/year of operational cost savings and/or new revenue for the industry, while utilising hundreds of thousands of tonnes of waste. Beyond substantial returns on waste, new technologies, partners, and strategies were identified to expedite the industry's movement up the commercial value chain. • A pelletiser system uses non-thermal dewatering of SMS for both energy and fertiliser sales. This option would increase revenues and generate operational cost savings. Growers with the highest quantities of spent substrate and the lowest sale price have the most compelling opportunity. • Mushroom powders involve drying and powdering edible mushroom waste into a shelf-stable powder for high value food markets. Potential food markets include high-margin supplements or ingredients for meat alternative products. • Edible shelf-life extenders involve applying an edible coating to fresh mushrooms to extend shelf-life and reduce costs and spoilage. At project completion the technology still required further development and regulatory approval.
Outputs	• An understanding of issues associated with mushroom waste and a plan to capitalise on the resource that will generate either cost savings and/or industry value add. • Milestone documents reporting progress to Hort Innovation. • A final report detailing the three most prospective innovation opportunities.
Outcomes (potential)	Potential outcomes from the project if recommendations are adopted by industry include: • A reduction in the waste generated by industry. • Cost savings if waste is used for the generation of energy. • Revenue increases if waste is used for value added products such as fertiliser and edible powders.
Impacts (potential)	• [Economic] Progress toward a more profitable Australian mushroom industry (reduction in waste costs and an increase in revenue streams from value added 'waste' material). • [Environmental] Progress toward a reduction in the environmental cost of mushroom waste disposal. • [Social] Progress toward augmentation of the mushroom industry's social licence to operate (reduction in any environmental cost associated with mushroom waste disposal). • [Social] Capacity built by researchers understanding waste reduction and value adding opportunities. • [Social] Potential spillover impacts with a more sustainable and profitable industry adding to economic activity in mushroom growing areas.

Project Investment

Nominal Investment

Table 3 shows the annual investment (cash and in-kind) in project MU17005 by Hort Innovation. There were no 'other' investors in this project.

Table 3: Annual Investment in the Project MU17005 (nominal $)

Year ended 30 June	Hort Innovation ($)	Total ($)
2019	$697,000	$697,000
2020	$95,000	$95,000
Totals	**$792,000**	**$792,000**

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 3.

Real Investment and Extension Costs

For the purposes of the investment analysis, investment costs of all parties were expressed in 2019/20 dollar terms using the GDP deflator index. Project extension included relevant articles in the Australian Mushrooms Journal. In 2021, peak industry body Australian Mushroom Growers Association (AMGA) is planning a working group of growers to advance project opportunities especially mushroom powders (Martine Poulain, Relationship and General Manager, AMGA, pers. comm., March 2021).

Impacts

Table 4 provides a summary of the principal types of impacts delivered by the project. Impacts have been categorised into economic, environmental and social impacts.

Table 4: Triple Bottom Line Categories of Principal Impacts from Project MU17005

Economic	• Progress toward a more profitable Australian mushroom industry.
Environmental	• Progress toward a reduction in the environmental cost of mushroom waste disposal.
Social	• Progress toward augmentation of the mushroom industry's social licence to operate. • Capacity built by researchers understanding waste reduction and value adding opportunities. • Potential spillover impacts with a more sustainable and profitable industry adding to economic activity in mushroom growing areas.

Public versus Private Impacts

Potential impacts identified in this evaluation are both public and private in nature. Potential private benefits may include a more profitable growing sector with waste cost savings and additional revenue streams from 'value added' waste. Also, a reduction in waste may augment the mushroom industry's social licence to operate and this is also a private benefit. Public benefits may include increased a reduction in the environmental cost of mushroom waste disposal and potential spillover benefits from a more sustainable and profitable industry adding to economic activity in mushroom growing areas.

Distribution of Private Impacts

The impacts on the mushroom industry from investment in this project will be shared along the mushroom supply chain. The share of total impacts retained by each link in the supply chain will be dependent on a combination of both short- and long-term supply and demand elasticities.

Impacts on Other Australian Industries

The project will also have potential impacts on the current waste utilisation sector e.g., those that use SMS for the production of horticultural media and, potentially, the supplements industry e.g., those working in the health food industry where mushroom powders may generate future sales or displace current products.

Impacts Overseas

The Australian mushroom industry is well networked with overseas mushroom producers. Approaches and technologies developed through this project may be communicated to overseas growers and adopted by overseas mushroom industries.

Match with National Priorities

The Australian Government's Science and Research Priorities and Rural RD&E priorities are reproduced in Table 5. The project findings and related impacts will contribute to Rural RD&E priority 1 and 3 and to Science and Research Priority 1.

Table 5: Australian Government Research Priorities

Australian Government	
Rural RD&E Priorities (est. 2015)	**Science and Research Priorities (est. 2015)**
1. Advanced technology 2. Biosecurity 3. Soil, water and managing natural resources 4. Adoption of R&D	1. Food 2. Soil and Water 3. Transport 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 Industry's SIP 2017-2021 (Hort Innovation 2017). Project MU17005 addressed Outcome 2 ('mushroom growers are profitable and sustainable through increased yields, reduced costs and effective risk management').

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.

One potential impact from the project were valued – progress toward a more profitable Australian mushroom industry.

Impacts Not Valued

Not all of the impacts identified in Table 4 could be valued in the assessment. Environmental and social impacts were hard to value due to lack of evidence/data, difficulty in quantifying the causal relationship and pathway between MU17005 and the impact and the complexity of assigning monetary values to the impact.

The environmental and social impacts identified but not valued were:

- Progress toward a reduction in the environmental cost of mushroom waste disposal.
- Progress toward augmentation of the mushroom industry's social licence to operate.
- Capacity built by researchers understanding waste reduction and value adding opportunities.
- Potential spillover impacts with a more sustainable and profitable industry adding to economic activity in mushroom growing areas.

Valuation of Impact 1: Progress toward a more profitable Australian mushroom industry

Implementation of MU17005 findings has the potential to reduce the volume and cost of mushroom production waste streams (SMS and subprime mushroom items such as stems) and create new revenue streams such as high value mushroom powders. The concepts investigated in MU17005 such as pelletiser systems, mushroom powders and edible shelf-life extenders have proved to be desirable, feasible and economically viable. However, it remains to be seen whether they are partially or fully implemented. If implemented, project recommendations have the potential to create a more profitable Australian mushroom industry.

Attribution

A 35% attribution factor has been assumed for MU17005's contribution to a more profitable Australian mushroom industry achieved through waste reduction/value adding activities – further research and investment will be required to achieve a commercial outcome.

Counterfactual

It is assumed that in the absence of Hort Innovation investment in MU17005, it is only 30% likely that novel approaches to waste management and value creation would have been investigated.

Summary of Assumptions

A summary of the key assumptions made for valuation of the impacts is shown in Table 6.

Table 6: Summary of Assumptions

Variable	Assumption	Source/Comment
Impact 1: Progress toward a more profitable Australian mushroom industry		
Annual mushroom production.	70,431 tonnes.	See Table 1 above.
Share of production adopting MU17005 findings.	60%	At the time that this analysis was being completed, meetings were taking place between AMGA and large growers interested in advancing the opportunity.
Current mushroom growing profit.	$403/tonne.	Farmgate value of mushroom industry production of $399.7M divide production of 70,431 tonnes to give a gross value of $5,675/tonne (see Table 1 above). Grower profit is 7.1% of gross value (IBIS World 2018) and cross checked with Chudleigh 2011.
Increase in profit with MU17005 cost reduction/ value adding initiatives in place.	20%	Analyst assumption made following discussion with project principal investigator Scott Needham and tested below using sensitivity analysis.
Year of first impact.	2024/25	Five years after MU17005 completed and allows for further research and investment.
Attribution of impacts to MU17005.	35%	See above text.
Counterfactual.	30%	See above text.
Probability of valuable outputs.	100%	Valuable outputs have been delivered to industry.
Probability of valuable outcome.	70%	AMGA is meeting with growers in the first half of 2021 to advance the opportunity.
Probability of valuable impact.	70%	It is likely that successful outcomes will result in successful impacts.

Results

All costs and benefits were discounted to 2019/20 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 (2019/20) as per the CRRDC Impact Assessment Guidelines (CRRDC, 2018).

Investment Criteria

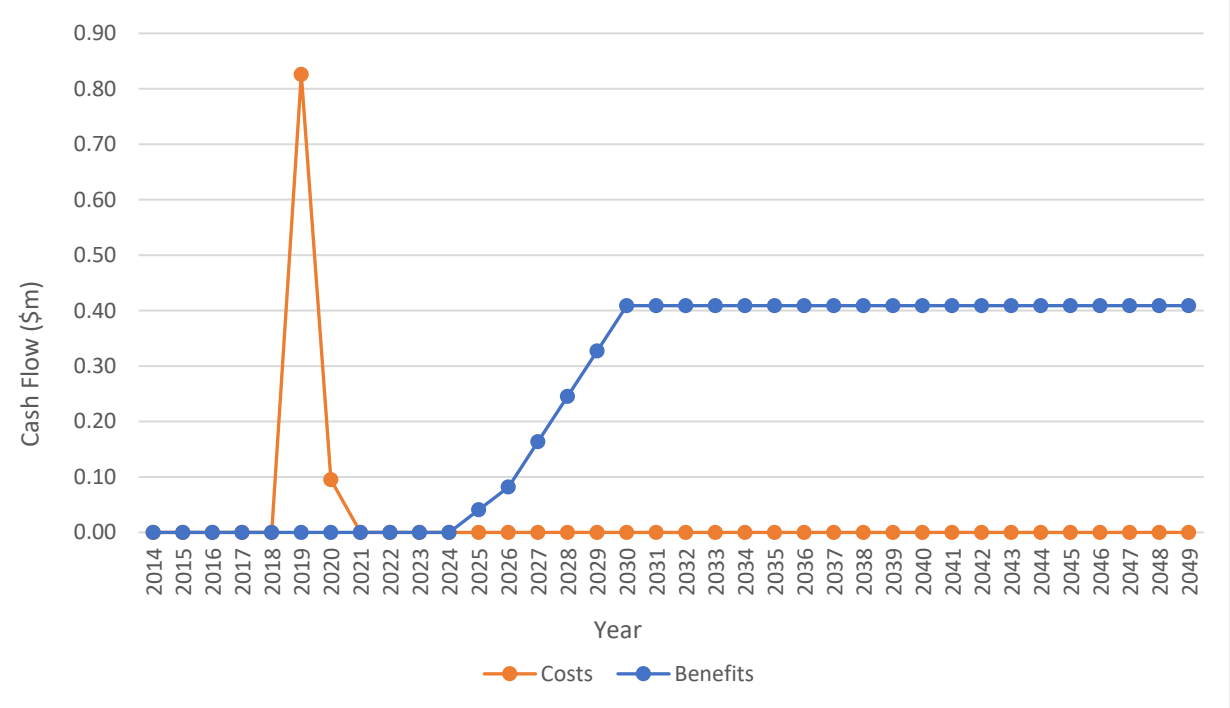
Tables 7 shows the investment criteria estimated for different periods of benefit for the total investment. Hort Innovation was the only contributor to this project so there is no second set of analyses showing results for Hort Innovation.

Table 7: Investment Criteria for Total Investment in Project MU17005

Investment Criteria	Years after Last Year of Investment						
	0	5	10	15	20	25	30
Present Value of Benefits ($m)	0.00	0.03	0.84	1.92	2.78	3.44	3.97
Present Value of Costs ($m)	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Net Present Value ($m)	-0.96	-0.93	-0.13	0.96	1.81	2.48	3.00
Benefit-Cost Ratio	0.00	0.03	0.87	2.00	2.88	3.58	4.12
Internal Rate of Return (%)	negative	negative	3.4	11.4	13.6	14.5	14.8
MIRR (%)	negative	negative	4.0	8.9	9.7	9.7	9.5

The annual undiscounted benefit and cost cash flows for the total investment for the duration of MU17005 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



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 sensitive to the discount rate due to the lag between project investment and forecast benefits.

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

Investment Criteria	Discount rate		
	0%	5%	10%
Present Value of Benefits ($m)	9.45	3.97	1.91
Present Value of Costs ($m)	0.92	0.96	1.00
Net Present Value ($m)	8.52	3.00	0.90
Benefit-cost ratio	10.25	4.12	1.90

A sensitivity analysis was then undertaken for the assumed proportion of mushroom production adopting project findings. Even with a halving of the assumed proportion of production adopting, the project produces a positive return on investment – Table 9.

Table 9: Sensitivity to Share of Mushroom Production Adopting Project Findings
(Total investment, 30 years)

Investment Criteria	Proportion of Mushroom Production Adopting Project Findings		
	30%	60% (base)	90%
Present Value of Benefits ($m)	1.98	3.97	5.95
Present Value of Costs ($m)	0.96	0.96	0.96
Net Present Value ($m)	1.02	3.00	4.99
Benefit-cost ratio	2.06	4.12	6.18

A final sensitivity test examined the assumed increase in mushroom profit attributable to MU17005. If profit is only increased by 5%, and all other assumptions are held constant, investment in MU17005 continues to breakeven – Table 10.

Table 10: Sensitivity to Increase in Mushroom Profit Attributable to MU17005
(Total investment, 30 years)

Investment Criteria	Increase in Mushroom Profit Attributable to MU17005		
	5%	10%	20% (base)
Present Value of Benefits ($m)	0.99	1.98	3.97
Present Value of Costs ($m)	0.96	0.96	0.96
Net Present Value ($m)	0.03	1.02	3.00
Benefit-cost ratio	1.03	2.06	4.12

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
Medium-high	Low

Coverage of benefits was assessed as medium-high. The main benefits of the research project were lower costs of production and additional profitable sales, and these were quantified.

Confidence in assumptions was rated as low. Data were mostly drawn from Hort Innovation and AMGA sources. However, percentage based estimates were required, and these data were estimates.

Conclusion

The investment has identified cost reduction/value adding opportunities for Australian mushroom growers. AMGA is meeting with growers in the first half of 2021 to advance the opportunity. If realised, MU17005 findings are likely to deliver a more profitable Australian mushroom industry. Positive environmental and social impacts are also anticipated. Environmental and social impacts will include a reduction in any environmental costs associated with mushroom waste disposal, augmentation of the mushroom industry's social licence to operate, capacity built by researchers and spillover economic benefits for mushroom growing areas.

Four environmental and 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.

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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Martine Poulain, Relationship and General Manager, AMGA

John Vatikiotis, Mushroom Program Manager, Hort Innovation

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
SIAP	Strategic Investment Advisory Panel
SIP	Strategic Investment Plan