

Horticulture impact assessment program 2020-21 to 2022-23 (MT21015)

Annex 15: Impact assessment for the project Risk and crisis management planning for the melon industry (VM18002)

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13 June 2022

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Funding statement:

This project has been funded by Hort Innovation, using multiple research and development levies and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

Publishing details:

Published and distributed by: Hort Innovation

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www.horticulture.com.au

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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 *VM18002 Risk and crisis management planning for the melon industry*. The project was funded by Hort Innovation over the period June 2019 to April 2021.

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 2020-21 dollar terms and were discounted to the year 2020-21 using a real (inflation-adjusted), risk free, pre-tax 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 Hort Innovation investment in project VM18002 delivered an updated crisis management plan (CMP) and established and trained a crisis management team (CMT).

From these outputs, VM18002 improved the melon industry's risk management capacity relating to a range of potential risk events including biosecurity, contamination, supply chains and reputation damage. As a result, VM18002 was assessed to have supported a reduced risk profile for the industry with a range of economic, social, and environmental impacts. These were quantified where possible based on available data:

The impact valued was:

- [Economic] Decreased risk to the melon industry from events considered high to extreme and requiring CMT involvement, including, but not limited to: biosecurity, contamination, supply chains and reputation damage. These risks have the capacity to impact industry through increased yield losses, increased production and supply chain costs, reduced demand, reduced prices received, or a combination of these.

Additional economic, social and environmental outcomes were identified but could not be valued due to a lack of data. These have the potential to provide additional industry impact above what has been identified.

Investment criteria

Total funding from all sources for the project was \$0.16 million (2021 equivalent value). The investment produced estimated total expected benefits of \$2.9 million (2021 equivalent value). This gave a net present value of \$2.7 million, an estimated benefit-cost ratio of 18.6 to 1, an internal rate of return of 495% and a modified internal rate of return of 21%.

Conclusions

Effective crisis risk management requires a sustained investment to manage the risk of a risk event happening. The impact of VM18002 was valued in the context of its contribution to long-term risk management, and modelled as a reduced risk profile faced by the melon industry starting in 2020 with the delivery of the CMP and training of the CMT.

A declining residual benefit was included from 2022 reflecting the need for the CMP to be regularly updated to reflect current risks, and the CMT to be continuously trained to maintain risk management capacity relevant to current risks. Industries are recommended to regularly review their CMP and CMT. Without further review beyond this initial establishment and training in VM18002 the CMP may not be reflective of the industries risk profile, and the CMT may have lost corporate knowledge and skills relating to industry risks and responses.

Keywords

Impact assessment, cost-benefit analysis, melon, risk, crisis, management

Introduction

Evaluating the impacts of levy investments is important to demonstrate to levy payers, Government and other industry stakeholders the economic, social and environmental outcomes of investment for industry, as well as being an important step to inform the ongoing investment agenda.

The importance of ex-post evaluation was recognised through the Horticulture Innovation Australia Limited (Hort Innovation) independent review of performance completed in 2017, and was incorporated into the Organisational Evaluation Framework.

Reflecting its commitment to continuous improvement in the delivery of levy funded research, development and extension (RD&E), Hort Innovation required a series of impact assessments to be carried out annually on a representative sample of investments of its RD&E portfolio. The assessments were required to meet the following Hort Innovation evaluation reporting requirements:

- Reporting against the Hort Innovation's Strategic Plan and the Evaluation Framework associated with Hort Innovation's Statutory Funding Agreement with the Commonwealth Government.
- Reporting against strategic priorities set out in the Strategic Investment Plan for each Hort Innovation industry fund.
- Annual Reporting to Hort Innovation stakeholders.
- Reporting to the Council of Rural Research and Development Corporations (CRRDC).

As part of its commitment to meeting these reporting requirements, Ag Econ was commissioned to deliver the *Horticulture Impact Assessment Program 2020-21 to 2022-23 (MT21015)*. This program consisted of an annual impact assessment of 15 randomly selected Hort Innovation RD&E investments (projects) each year.

Project *VM18002 Risk and crisis management planning for the melon industry* was randomly selected as one of the 15 investments in the 2020-21 sample. This report presents the analysis and findings of the project impact assessment.

General method

The 2020-21 population was defined as an RD&E investment where a final deliverable had been submitted in the 2020-21 financial year. This generated an initial population of 175 Hort Innovation investments, worth an estimated \$101.14 million (nominal Hort Innovation investment). The population was then stratified according to the Hort Innovation RD&E research portfolios and five, pre-defined project size classes. Projects in the Frontiers Fund, and those of less than \$80,000 Hort Innovation investment being removed from the sample. From the remaining eligible population of 59 projects, with a combined value of \$39.51 million, a random sample of 15 projects was selected worth a total of \$9.7 million (nominal Hort Innovation investment), equal to 25% of the eligible RD&E population (in nominal terms).

The impact assessment followed 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 included both qualitative and quantitative descriptions that are in accord with the impact assessment guidelines of the CRRDC (CRRDC, 2018).

The evaluation process involved reviewing project contracts, milestones, and other documents; interviewing relevant Hort Innovation staff, project delivery partners, and growers and other industry stakeholders where appropriate; and collating additional industry and economic data where necessary. Through this process, the project activities, outputs, outcomes, and impacts were identified and briefly described; and the principal economic, environmental, and social impacts were summarised in a triple bottom line framework.

Some, but not all, of the impacts identified were 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 and rationale

Industry background

In 2020, the combined Australian melon industry included approximately 250 growers, with Queensland accounting for 34% of production, New South Wales 28%, Northern Territory 21%, Western Australia 14%, and with small volumes in Victoria and South Australia. Production was dominated by watermelon (69%), rockmelon (26%), honeydew melon (4%) and other melons including piel del sapo and orange candy (1%) (Hort Innovation 2022a). Combined melon production was 183 thousand tonnes for the year ending June 2021, with a farmgate value of \$149 million. Approximately 92% of combined production went to the domestic fresh market, 7% to exports, and 1% to processing (Hort Innovation 2022a).

Producers in the melon industry pay levies to the Department of Agriculture, Fisheries and Forestry (DAFF), who is responsible for the collection, administration and disbursement of levies and charges on behalf of Australian agricultural industries. Levy is payable on melons that are produced in Australia and either sold by the producer or used by the producer in the production of other goods. Hort Innovation manages the melon levy funds which are directed to R&D.

Rationale

In 2018 a listeria outbreak in Australian rockmelons had major adverse impacts on the Australian melon industry. The bacterium *Listeria monocytogenes* was detected in rockmelons from New South Wales and linked with public illness and fatalities in New South Wales and Victoria. Demand for melon in Australia and key export markets decreased because of the outbreak, resulting in both reduced prices and production. Following the listeria outbreak in early 2018, the Australian melon industry and its stakeholders were increasingly concerned with the challenge that biosecurity and food safety hazards posed to industry profitability.

Project VM18002 was initiated following the 2018 listeria outbreak, with the industry subsequently identifying a need to review its crisis management guidelines. The project was envisaged to help the industry identify, mitigate, and respond to other crisis scenarios through proactive risk management planning for threats including, but not limited to environmental contamination, biosecurity, food safety, supply chain disruptions and labour issues.

Alignment with the Melon Strategic Investment Plan 2018-2021

VM18002 was closely aligned to Outcome 4 of the Melon 2018-21 SIP: *By 2021, the Australian melon industry has implemented actions in prioritised areas to mitigate and minimise risks including food safety and biosecurity.*

Alignment with national priorities

The Australian Government’s National RD&E priorities (2015a) and Science and Research Priorities (2015b) are reproduced in Table 1. The VM18002 project outcomes and related impacts will contribute to RD&E Priority 4, and to Science and Research Priority 1.

Table 1. National Agricultural Innovation Priorities and Science and Research Priorities

Australian Government	
National RD&E Priorities (2015a)	Science and Research Priorities (2015b)
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.

Project details

Summary

Table 2. Project details

Project code	VM18002
Title	<i>Risk and crisis management planning for the melon industry</i>
Research organization	Control Risks
Project leader	Matthew Garda
Funding period	June 2019 to April 2021

Logical framework

A logical framework is shown in Table 3 to highlight the connection between the project activities, outputs, outcomes, and impact.

Table 3. Project logical framework

Activities	<ul style="list-style-type: none"> • Ensure potential industry risks and threats were identified to inform preparedness. • Revise and enhance the industry’s crisis management plan (CMP). • Establish and train the industry crisis management team (CMT). • Provide crisis management media training for nominated CMT members to act as spokespersons.
Outputs	<ul style="list-style-type: none"> • CMP Gap Analysis report. • Industry risk assessment workshop for ten key industry stakeholders including Hort Innovation, AMA, growers, and supply chain participants. • Risk workshop post-activity report . • Revised CMP . • Industry risk register (Located in the CMP). • CMT established and trained. • One-on-one media training workshops for CMT. • Media training guidelines and principles (located in the CMP).

	<ul style="list-style-type: none"> • Two crisis management training workshops for CMT. • Industry awareness flyer (crisis management card) prepared for drafting. • Post-activity report and next steps document.
Outcomes	<ul style="list-style-type: none"> • The risk workshop promoted awareness of potential industry risks and crises that may have been needed to be prepared for and managed in the following 12-24 months. • The revised CMP ensured the industry has a relevant, fit-for-purpose CMP that underpins its crisis management response and can be continually updated and enhanced. • The media workshop ensured CMT spokespersons had appropriate instruction to respond to media enquiries and promote the industry’s key messages during a crisis while protecting its reputation. • The training workshops ensured the CMT were able to apply the CMP to a plausible crisis management scenario • The awareness flyer established a centralised contact number for reporting industry crises. • An improved melon industry risk management capacity and a culture of continuous improvement in risk management.
Impacts	<ul style="list-style-type: none"> • [Economic] Decreased risk to the melon industry from events considered high to extreme and requiring CMT involvement, including: biosecurity, contamination, supply chain disruptions and reputation damage. These risks have the capacity to impact industry through yield losses, increased production and supply chain costs, reduced demand, reduced prices received, or a combination of these. • [Social] Decreased risk of industry and broader community injury or fatality. • [Economic] Decreased risk of community and regional instability, including direct employment, that would result from disrupted melon industry production. • [Social] Decreased risk of a reduction in the supply of fresh and affordable domestic horticultural produce, supporting fruit consumption with associated health and wellbeing benefits. • [Environmental] Decreased risk of negative environmental outcomes associated with the identified crises such as environmental contamination.

Project cost

Nominal investment

Table 4. Project nominal investment

Year end 30 June	Hort Innovation (\$)	Other (\$)	Total
2019	25,076	0	25,076
2020	75,228	0	75,228
2021	25,076	0	25,076
Total	125,380	0	125,380

Program management costs

R&D costs should also include the administrative and overhead costs associated with managing and supporting the project. The Hort Innovation overhead and administrative costs were calculated for each project funding year based on the data presented in the *Statement of Comprehensive Income* in the *Hort Innovation Annual Report* for the relevant year. Where the overhead and administrative costs were equal to the total expenses, less the research and development and marketing expenses. The overhead and administrative costs were then calculated as a proportion of combined project expenses (RD&E and marketing), averaging 15.7% for the VM18002 funding period (2019-2021). This figure was then applied to the nominal Hort Innovation investment shown in Table 4.

Real investment costs

For purposes of the investment analysis, the investment costs of all parties were expressed in 2020-21 dollar terms using the Implicit Price Deflator for Gross Domestic Product (ABS, 2022).

Extension costs

The target stakeholders for the project (being melon industry leadership and appointments to the newly created CMT) were engaged directly through VM18002.

Valuation of impact

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.

Impacts valued

The impact(s) valued were:

- [Economic] Decreased risk to the melon industry from events considered high to extreme and requiring CMT involvement, including, but not limited to: biosecurity, contamination, supply chains and reputation damage. These risks have the capacity to impact industry through increased yield losses, increased production and supply chain costs, reduced demand, reduced prices received, or a combination of these.

Risk is measured as probability and consequences. Crisis management planning does not reduce the probability of occurrence of the identified industry risk events, but through improved risk response capacity, preparedness reduces the likely consequences. While an initial negative shock may still occur, by being proactive in management the industry may be able to reduce the number of affected businesses and the recovery period. In addition, by being proactive and showing strong crisis management skills, the industry may be able to recover to a point of strength beyond where they were before the incident due to increased stakeholder confidence in the industry's capacity for crisis management.

While no crisis occurred during this project period, to assign no benefit to the reduced industry risk profile during this period would misrepresent the nature and value of long-term risk-management. Effective management of longer term risks requires sustained investment to manage the probability of a crisis happening in any one of those years. As such, the impact of VM18002 was valued in the context of its contribution to long-term risk management, and modelled as a reduced risk profile faced by the melon industry starting in 2020 with the delivery of the CMP and commencement of CMT training and continuing to the project end in 2021. A declining residual benefit was included from 2022 reflecting the need for the CMP to be regularly updated to reflect current risks, and the CMT to be continuously trained to maintain risk management capacity relevant to current risks.

Impacts not valued

Not all of the impacts identified in Table 3 could be valued in the assessment, particularly where there was a lack of data to quantify the identified impact. Other identified impacts from reduced risk that were not valued included:

- [Social] Decreased risk of industry and broader community injury or fatality.
- [Economic] Decreased risk of community and regional instability, including direct employment, that would result from disrupted melon industry production.
- [Social] Decreased risk of a reduction in the supply of fresh and affordable domestic horticultural produce, supporting fruit consumption with associated health and wellbeing benefits.
- [Environmental] Decreased risk of negative environmental outcomes associated with the identified crises such as environmental contamination.

Public versus private impacts

The impacts identified from the investment are predominantly private impacts accruing to melon growers. However, some public benefits also have been produced in the form of capacity built and spillovers to regional communities from reduced industry risk supporting more sustainable melon businesses.

Distribution of private impacts

This analysis quantified private benefits accruing to melon growers. Additional spillover private impacts would be generated in the wider economy. Changes in farm input costs (increase or decrease) would result in spillover changes (increase or decrease) in income for businesses providing those goods and services. The total private impacts will have

been further redistributed between growers, processor/packers, wholesalers, exporters, and retailers depending on both short- and long-term supply and demand elasticities.

Impacts on other Australian industries

The updated CMP and CMT model may also be relevant to other horticultural industries who face similar industry risks.

Impacts overseas

With up to 11% of Australian melons exported, including up to 30% of muskmelons (rockmelons and honeydew melons) and 5% of watermelons, decreased risk and associated decreased industry volatility will have some impact on Australia's international trading partners depending on Australia's export market concentration and relative market share.

Data and assumptions

A summary of the key assumptions made in the assessment is provided in Table 5.

Table 5. Summary of assumptions for impact valuation

Variable	Assumption	Source / comment
General assumptions		
Discount rate	5% (\pm 50%)	CRRDC Guidelines (2018)
Annual production (t)	186,298 (\pm 3%)	Australian Horticulture Statistics Handbook (Hort Innovation 2022b) average (and standard deviation) of the combined melon industry production for the impact period 2020-2021.
Production value (\$/kg)	\$0.82 (\pm 1%)	Australian Horticulture Statistics Handbook (Hort Innovation 2022b) average (and standard deviation) of the combined melon industry \$/kg price for the impact period 2020-2021. Adjusted to 2021 values using the implicit price deflator (ABS, 2022)
Counterfactual (without VM18002) risk profile		
Annual likelihood of crisis occurrence	57% (\pm 59%)	Average likelihood of identified risk events considered high to extreme and requiring CMT involvement, including: biosecurity, contamination, supply chains and reputation damage. Using a binomial distribution, this equates a likelihood of occurrence of \approx 100% by year 7 (tested at 3 years and 21 years based of the standard deviation of the annual probability of the identified risks).
Consequences (% decline in industry production)	-16% (\pm 33%)	Analyst assumption. The CMP did not provide quantified consequences given the large range of potential industry crises that it was seeking to address. An estimate was calculated based on the 2018 listeria event that resulted in a drop in Australian muskmelon industry sales of 32% compared to 2017 (Hort Innovation 2022b). Based on 2020-21 production, a muskmelon drop of this size would result in an 11% drop in total melon saleable production (which may reflect a drop in demand/sales or a drop in supply/production depending on the nature of the crisis event), while a 32% decrease in watermelon saleable production equates to 21% of total melons. A midpoint of 16% was used (tested at 11% and 21%). Further, the CMP ratings for probability and consequence showed a negative correlated with higher probability events having lower consequences (and vice versa). This was applied in the analysis.

Time to recovery following impact	3 years ($\pm 33\%$)	Analyst assumption based off the 2018 listeria event from which it took muskmelons 3 years to return to pre-event production values (Hort Innovation 2022b). Watermelon production value had not returned to pre-event levels after 3 years, but was also experiencing trend declines in industry value prior to the listeria event.
Change in risk profile with VM18002		
Change in likelihood of crisis occurrence (% change from counterfactual)	0%	Analyst assumption in discussion with Control Risks. The project focused on crisis management to minimise the industry impact rather than reducing the likelihood of occurrence.
Change in consequences (% change from counterfactual)	-5% ($\pm 100\%$)	Analyst assumption in discussion with Control Risks. With a CMP and CMT in place, it is expected that the impact could be reduced from years to weeks. Working on a 1 year increment, a reduction below 1 year is measured as a reduction in the size of the shock.
Change in time to recovery following impact (% change from counterfactual)	-1 year ($\pm 100\%$)	Analyst assumption in discussion with Control Risks. With a CMP and CMT in place, it is expected that impact duration could be reduced from years to weeks. This was taken as the best case scenario (2 year reduction to less than 1 year), with the baseline benefit being a 1 year reduction to a 2 year recovery, and worst case being no reduction in recovery (reduction in initial impact only).
VM18002 residual impact (years from end of project)	2 years ($\pm 50\%$)	Analyst assumption in discussion with Control Risks. Industries are recommended to review their CMP and CMT every six months to a year. Without further review beyond the initial establishment and training in VM18002, residual benefits may last for 2 years after which the CMP would not be reflective of the industries risk profile, and the CMT may have lost corporate knowledge and skills relating to industry risks and responses. Tested for sensitivity at 1 and 3 years.
Attribution of outcome (risk reduction)	75% ($\pm 50\%$)	Analyst assumption in discussion with stakeholders. There were no activities outside of VM18002 working towards achieving the outcomes.
R&D counterfactual attribution	75% ($\pm 50\%$)	Analyst assumption in discussion with stakeholders. A low likelihood that the same outcomes would have been delivered without levy investment.

Results

All costs and benefits were discounted to 2020-21 using a real 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 (2020-21) as per the CRRDC Impact Assessment Guidelines (CRRDC, 2018).

Investment criteria

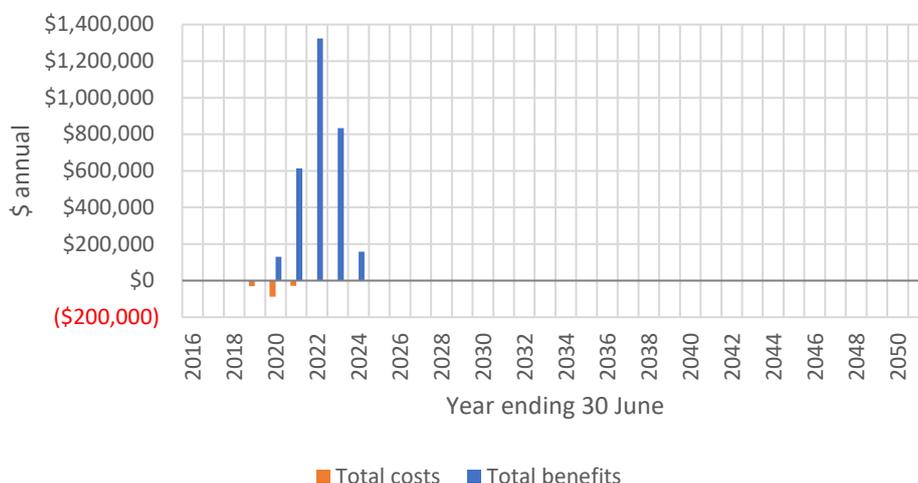
Table 6 shows the impact metrics estimated for different periods of benefit for the total investment. Hort Innovation was the only investor in VM18002.

Table 6. Impact metrics for the total investment in project VM18002

Impact metric	Years after last year of investment						
	0	5	10	15	20	25	30
PVC (\$m)	0.16	0.16	0.16	0.16	0.16	0.16	0.16
PVB (\$m)	0.75	2.90	2.90	2.90	2.90	2.90	2.90
NPV (\$m)	0.59	2.75	2.75	2.75	2.75	2.75	2.75
BCR	4.82	18.63	18.63	18.63	18.63	18.63	18.63
IRR	412%	495%	495%	495%	495%	495%	495%
MIRR	354%	97%	52%	36%	28%	24%	21%

Figure 1 shows the annual undiscounted benefit and cost cash flows for the total investment of VM18002. Cash flows are shown for the duration of the investment plus 30 years from the last year of investment.

Figure 3. Annual cash flow of undiscounted total benefits and total investment costs



Sensitivity analysis

A sensitivity analysis was carried out on key variables identified in the analysis where a data range was identified, or there was a level of uncertainty around the data (Table 7). Data ranges and sources are further described in Table 5. Changes in each variable are tested separately to show their potential individual changes on the baseline result.

Table 7. Impact BCR sensitivity to changes in key underlying variables

Variable		Low	Baseline	High
Discount rate	Variable range	3%	5%	8%
	BCR range	19.59	18.63	17.75
Industry production (t)	Variable range	181,029	186,298	191,567
	BCR range	18.10	18.63	19.16
Industry production value (\$/kg)	Variable range	0.815	0.820	0.824
	BCR range	18.52	18.63	18.74
Annual risk of crisis occurrence	Variable range	23%	57%	92%
	BCR range	14.62	18.63	12.77
Consequences (reduced production) with project (compared to 10.6% without)	Variable range	10.6%	10.1%	9.6%
	BCR range	16.06	18.63	21.20
Counterfactual time to recovery (years)	Variable range	2	3	4
	BCR range	18.33	18.63	18.93

New time to recovery (years change from counterfactual)	Variable range	1	2	3
	BCR range	34.39	18.63	3.37
Project residual impact (years)	Variable range	1	2	3
	BCR range	17.08	18.63	19.57
Attribution of outcome (risk reduction)	Variable range	50%	75%	100%
	BCR range	12.42	18.63	24.84
R&D counterfactual	Variable range	50%	75%	100%
	BCR range	12.42	18.63	24.84

Discussion and conclusions

The analysis showed that the quantified benefits were greater than the investment cost for VM18002, with a BCR 18.63:1. The results reflect the benefit of improved industry risk management capacity and preparedness as a result of the updated CMP and training of the CMT. While this was not assessed to have changed the probability of risk events occurring, it was instead modelled as a reduction in the consequences of these risks, including a reduced industry shock (production value decrease) and a reduced time to recovery.

Sensitivity testing showed that changes in nine key underlying variables resulted in a BCR ranging from 3.4 to 34.4. The results were most sensitive to the tested ranges for the reduced time to recovery. A conservative approach was taken with a reduction in likely time to recover from 3 years (as experienced following the 2018 listeria outbreak) to 2 years. It is possible that the benefit could be far greater, with Control Risks expecting that impact duration could be reduced from years to weeks; however, this would vary depending on the nature of the risk event. Even in the event of no reduction in time to recovery, early preparedness could still result in a reduced initial saleable production shock (tested in this analysis at -5%), which still generated a positive impact BCR of 3.4:1.

A lack of underlying data meant that there were economic, social and environmental impacts identified but not quantified which had the potential to provide additional impact to the melon industry. These included:

- [Social] Decreased risk of industry and broader community injury or fatality.
- [Economic] Decreased risk of community and regional instability, including direct employment, that would result from disrupted melon industry production.
- [Social] Decreased risk of a reduction in the supply of fresh and affordable domestic horticultural produce, supporting fruit consumption with associated health and wellbeing benefits.
- [Environmental] Decreased risk of negative environmental outcomes associated with the identified crises such as environmental contamination.

The analysis quantified private benefits (avoided risk) accruing to melon growers. Additional spillover impacts would be generated in the wider economy. A loss of production associated with the risk events would result in a subsequent loss of income for both upstream and downstream supply chain participants.

The CRRDC Guidelines focus on first round impacts, which reflect shifts in the supply and demand curves with no price effect. When considering these second-round price effects, a crisis even could result in decreased industry demand or supply (depending on the nature of the crisis), resulting in increased or decreased prices respectively. This price effect would shift some of the identified benefits between producers and consumers. The extent to which this would occur would depend on the slope of the supply and demand curves. By supporting reduced risk consequences VM18002 would effectively support higher industry production or demand in the event of a crisis, and thereby also help to avoid price shocks to the detriment of consumers, producers or both.

Acknowledgements

Ag Econ would like to acknowledge the input from the following:

Bianca Cairns, Hort Innovation; Sarah Cumpston; Hort Innovation; Martin Baghdadi, Control Risks

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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.
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.

Abbreviations

CRRDC Council of Rural Research and Development Corporations

DAFF Department of Agriculture, Fisheries and Forestry (Australian Government)

GDP Gross Domestic Product

GVP Gross Value of Production

IRR Internal Rate of Return

MIRR Modified Internal Rate of Return

PVB Present Value of Benefits

PVC Present Value of Costs

RD&E Research, Development and Extension

SIP Strategic Investment Plan