Horticulture Impact Assessment Program:

Appendix 5: Berry Export Strategy, 2028 (MT17001 Impact Assessment)

Impact analyst:

Michael Clarke

Delivery partner:

AgEconPlus and Agtrans Research

Project code:

MT18011

Date:

19 September 2019

Funding statement:

This project has been funded by Hort Innovation, using 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

Level 7
141 Walker Street
North Sydney NSW 2060

Telephone: (02) 8295 2300

www.horticulture.com.au

Contents

Tables

Figures

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 *MT17001: Berry Export Strategy, 2028.* The project was funded by Hort Innovation over the period October 2017 to March 2018.

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 is likely to contribute to additional profitable export sales for strawberry, raspberry and blackberry growers. Environmental impacts are expected to include reduced fruit waste (positive) and additional carbon emissions associated with airfreight exports (negative). The project has contributed to the development of export capacity in the berry industries and, in the longer term increased income in regional Australia.

Investment Criteria

Total funding from all sources for the project was $0.15 million (present value terms). All project funding was provided by Hort Innovation. The investment produced estimated total expected benefits of $0.21 million (present value terms). This gave a net present value of $0.06 million, an estimated benefit-cost ratio of 1.4 to 1, an internal rate of return of 7% and a MIRR of 6%.

Conclusions

While several environmental and social impacts identified were not valued, the impacts were considered indirect, uncertain and/or minor compared with the impact valued. Nevertheless, combined with conservative assumptions for the impacts valued, investment criteria as provided by the valuation may be underestimates of the actual performance of the investment.

Keywords

Impact assessment, cost-benefit analysis, MT17001, strawberry, raspberry, blackberry, export, strategy, Trade Assessments Panel

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.
- Reporting against strategic priorities set out in the Strategic Investment Plan (SIP) for each Hort Innovation industry fund.
- Annual Reporting to Hort Innovation stakeholders.
- Reporting to the Council of Rural Research and Development Corporations (CRRDC).

The first series of impact assessments included 15 randomly selected Hort Innovation RD&E investments (projects) worth a total of approximately $9.31 million (nominal Hort Innovation investment). The investments were selected from an overall population of 85 Hort Innovation investments worth an estimated $50.38 million (nominal Hort Innovation investment) where a final deliverable had been submitted in the 2017/18 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 *MT17001: Berry Export Strategy, 2028* was selected as one of the 15 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

The *Berry Export Strategy, 2028* was prepared for the Australian strawberry and rubus (raspberry and blackberry) industries.

Strawberries

Strawberries are predominantly grown in Australia to service the domestic fresh market. Production in dominated by Victoria and QLD (77% of the national crop) and seasonal differences in those states allow for year round supply. Smaller strawberry growing industries are present in Western Australia (11%), South Australia (7%), Tasmania (4%) and NSW (1%). Production in Western Australia is export oriented. In 2017/18 the industry produced 93,545 tonnes of strawberries with a farm gate value of $445 million. Most strawberries are sold in branded punnets at retail outlets. Smaller volumes are supplied to the food service sector and 14% of the crop is processed, mainly into preserves. Strawberry varieties are mostly sourced from overseas. Nationally there are

around 200 strawberry growers with a further 60 growers who enter and leave the industry on a routine basis. The number of growers has decreased over the past decade as the supply base has consolidated into fewer larger and more sophisticated businesses.

In the three years to 2017/18 the Australian strawberry industry exported an average 3,732 tonnes per year, the equivalent of 4.4% of production by volume. Major markets were the United Arab Emirates, New Zealand, Singapore, Thailand and Hong Kong. Australia imported less than one tonne of fresh strawberries during the same period (Hort Innovation, 2018).

Raspberries and Blackberries (species of the rubus genus)
Berries in the rubus genus include raspberries, blackberries, boysenberries and loganberries. Raspberries account for 90% of Australian rubus production, blackberries for 9% and boysenberries and loganberries equate to about 1% of industry output. Growers target the domestic fresh market, production from protected cropping systems is year round and growers are mostly found in the southern states of Victoria and Tasmania. In 2017/18 the industry produced 6,189 tonnes of fruit with a farm gate value of $157 million. Most Australian fruit is sold fresh in punnets and 8% is processed. Frozen raspberry imports totalled 12,311 tonnes in 2017/18. There is strong growth in domestic consumption of raspberries and blackberries and industry structure is changing. Previously the industry was dominated by small plantings in the Yarra Valley, it is now moving to larger and sophisticated operations located Australia wide. There are approximately 120 Australian growers supplying raspberries and blackberries.

In the three years to 2017/18 the Australian raspberry and blackberry industry exported an average 3 tonnes per year, the equivalent of 0.1% of production by volume. Major markets included India and Fiji. Australia did not import fresh raspberries or blackberries during this period (Hort Innovation, 2018).

Rationale

The need to drive long term export growth is a principal cross-sectoral investment priority for most horticultural industries and these industries are faced with a growing range of export opportunities. Opportunities are greatest in Asia where increased capacity to pay is matched with improved market access. However, the Australian industry does not have these opportunities to itself. There is strong global competition in export markets and this is especially true in the berry industry where Australia faces competition from scale-based growers from countries such as the United States and Chile.

Preparation of an export strategy is timely. The three berry industries are undergoing a structural shift with significant growth and investment, both in terms of production, adoption of substrate based protected cropping, improved genetics and an expanding geographic footprint.

Production is increasing and there is broad industry interest and a strong commercial imperative for export market development. Rapid production increases are focusing the sectors on the need for new markets in order to ensure future profitability. The continued development of an export mindset and industry collaboration will be important for future export success.

In helping to better identify, size and address export opportunities for Australian strawberry, raspberry and blackberry growers, a project was required to set priorities. This project was also to be viewed as part of the berry industry's ongoing efforts to build export capabilities, skill sets and culture.

Specifically, a project was required that would:

- Increase export value, volume, number of commodities, formats, countries and markets accessed
- Increase positive activities and events in relation to new export market opportunities
- Increase industry engagement in export
- Direct new negotiations for market access and improvement based on phytosanitary protocols.

Project Details

Summary

Project Code: MT17001

Title: *Berry Export Strategy, 2028*

Research Organisation: Auspex Strategy Advisory

Principal Investigator: Vincent Hudson

Period of Funding: October 2017 to March 2018

Objectives

The project's key objectives were to develop a strategy for the three berry industries that would:

1. Create a single, authoritative resource to identify berry industry export priorities
2. Identify the long-term strategic export objectives for the berry industries
3. Identify and prioritise key export markets and key export commodities to guide investment of effort over a three-year time-horizon
4. Identify and assess trends and drivers impacting on trade and market access, including key vulnerabilities and opportunities for berry exports
5. Identify and rank market access and market improvement priorities for each market and each commodity to guide investment of effort over a three-year time-horizon
6. Identify market development priorities by market, and by commodity
7. Produce business cases for submission to the Trade Assessments Panel for each ranked priority

Logical Framework

The focus of MT17001 was to develop an overarching export strategy for the strawberry, raspberry and blackberry industries. Table 1 provides a detailed description of the project in a logical framework.

Table 1: Logical Framework for Project MT17001

Activities and Outputs	• Desktop review of the literature (overarching DAWR strategies, Hort Innovation strategies, industry and export data, market data for prospective overseas markets). • Design and delivery of a comprehensive consultation strategy. Consultation completed with Hort Innovation, industry representative bodies, state and federal governments, other relevant stakeholders (e.g. large individual growers, exporters). • Construction of a phytosanitary market access status matrix (commodity X market) to determine which export markets are available to the Australian berry industries. • Development of an understanding of exportable strawberry, raspberry and blackberry surpluses that may become available over both the short and longer term. • Development of an understanding of supply chain and export market dynamics (e.g. airfreight opportunities, grey trade developments, key trends and drivers impacting on trade and market access), cost/quality positioning and preparation of a priority market index. The issues addressed included market size, quality requirements, standards, economic fundamentals, policy, and regulatory frameworks (incl. key vulnerabilities and opportunities), retail dynamics, ease of doing business, non-tariff barriers, geopolitical factors and relative competitiveness of Australian exports. • Completion of economic analysis and forecasts to marry with qualitative assessments. • Development of a detailed strategy including short and longer term priorities. • Short term 3 year market/commodity specific priorities that can be delivered with existing market access and production/export technology. • Longer term 10 year market/commodity objectives with ranked market access and market improvement priorities and relevant RD&E projects. • Detailed business cases for specific longer term priorities. Business cases presented to

	Hort Innovation Trade Assessments Panel. • A strategy that has been used to focus industry and government development activities on an agreed set of short and longer term priorities, priority RD&E projects and underpin DAWR market access/ improvement priorities for the three industries. • Final strategy document (‘*Berry Export Strategy, 2028’*) including confidential business cases, priority export market profiles and a phytosanitary market access matrix made available to Hort Innovation and relevant industry representative bodies. • Increased awareness/focus within the 3 industries on export and identified priorities. • Increased understanding of the issues related to successful export development, the necessary activities and industry investment required to underpin market access.
Outcomes (potential)	• Potential project outcomes align with industry SIP targets. • An increase in strawberry exports from 4% to 8%+ of national production by volume in selected markets with a capacity and willingness to pay for premium fruit by 2021. • An increase in raspberry/blackberry exports to at least 5% of production by 2021 (Strategy notes that 2028 may be more realistic for this outcome).
Impacts (potential)	• Increase in profitable sales for strawberry growers. • Increase in profitable sales for raspberry/blackberry growers. • Avoided berry waste associated with additional production , with berries likely to have been wasted in the absence of export market development. • Environmental costs associated with servicing export markets (e.g. carbon emissions associated with export airfreight). • Export capacity, skills and culture developed by berry growers and supply chain partners. • Increased income in regional Australia associated with more profitable and sustainable strawberry, raspberry and blackberry industries (spill-over benefits).

Project Investment

Nominal Investment

Table 2 shows the annual investment (cash and in-kind) in project MT17001 by Hort Innovation. There were no ‘other’ investors in this project.

Table 2: Annual Investment in the Project MT17001 (nominal $)

Year ended 30 June	Hort Innovation ($)	Other ($)	Total ($)
2018	124,099	0	124,099
Totals	124,099	0	124,099

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. ‘Extension’ costs were included in budget totals – strategies and business cases were presented to Hort Innovation and industry representative bodies.

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 MT17001

Economic	• Increase in profitable sales for strawberry growers. • Increase in profitable sales for raspberry and blackberry growers.
Environmental	• Avoided berry waste associated with additional production , with berries likely to have been wasted in the absence of export market development. • Environmental costs associated with servicing export markets (e.g. carbon emissions associated with export airfreight).
Social	• Increased grower and supply chain partner capacity in export development and export culture. • Increased income in regional Australia associated with more profitable and sustainable strawberry, raspberry and blackberry industries (spill-over benefits).

Public versus Private Impacts

The majority of impacts identified in this evaluation are berry industry related and therefore are considered private benefits. Public environmental and social impacts have also been identified. Environmental impacts include a positive associated with reduction in dumped waste and a negative associated with additional environmental costs incurred servicing export markets (airfreight carbon emissions). Social impacts are positive including increased industry capacity (increased grower and supply chain ability to export) as well as additional regional incomes resulting from the increased profitability of berry production.

Distribution of Private Impacts

The impacts on the berry industry from investment in this project will be shared along the supply chain with growers, packers, transporters, wholesalers, exporters and air-freighters all sharing impacts produced by the project. The share of benefits captured by each link in the supply chain will depend on the interplay of both short- and long-term supply and demand elasticities for each berry and its closest substitutes.

Impacts on Other Australian Industries

Impacts on industries other than the berry industry and its associated sectors may include potential gains in other industries via any future spill-overs from the increase in export capacity.

Impacts Overseas

Impacts overseas will include additional supply of Australian berries and increased competition for alternative suppliers. There will be no spill-over benefits for berry industries in other countries – market insights and business cases have been prepared and kept confidential.

Match with National and Industry 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 primarily to Rural RD&E Priorities 2 and 4, and to Science and Research Priority 1.

Table 4: 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 Berry Strategic Investment Plans 2017-2021

The strategic outcomes and strategies of the berry industries are outlined in the Australian Strawberry Strategic Investment Plan 2017-2021 (Hort Innovation, 2016), and the Australian Rasberry and Blackberry Strategic Investment Plan 2017-2021 (Hort Innovation, 2016a)[1]. Project MT17001 addressed Strawberry Strategic Investment Plan (SIP) Outcome 2, Strategies 2.1, 2.2 and 2.3 and Raspberry and Blackberry SIP Outcome 2, Strategies 2.1, 2.2 and 2.3.

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 key impacts of the project were valued – increased export sales of strawberries and increased export sales of raspberries/blackberries. These two impacts were deemed to be the principal impacts of the project.

Impacts Not Valued

Not all of the impacts identified in Table 3 could be valued in the assessment. The environmental and social impacts were hard to value due to lack of evidence/data, difficulty in quantifying the causal relationship and pathway between MT17001 and the impact and the complexity of assigning monetary values to the impact. All economic impacts were quantified.

The environmental impacts identified but not valued were:

- Avoided waste associated with additional production that would have been dumped in the absence of export market development.
- Environmental costs associated with servicing export markets (e.g. carbon emissions associated with export airfreight).

The social impacts identified but not valued were:

- Increased grower and supply chain partner capacity in export development and export culture.
- Increased income in regional Australia associated with more profitable and sustainable strawberry, raspberry and blackberry industries (spill-over impact).

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

Valuation of Impact 1: Additional Strawberry Sales in Export Markets

The MT17001 investment provided a framework, established export priorities and garnered enthusiasm amongst growers for export. Subsequent investments to inform new/improved market access negotiations to give effect to the *Berry Export Strategy, 2028* have been planned. MT17001 will make a contribution to industry achieving its aspirational goal of doubling exports as a share of production. This analysis assumes that doubling exports from 4.4% of production to 8% of production will take a full ten years from project completion.

Attribution

A low attribution factor has been assumed for MT17001's contribution to industry's goal of doubling exports. Further export success linked to the *Berry Export Strategy, 2028* is dependent on additional levy investment in research projects to secure new/improved market access and grower investment in exporting.

Counterfactual

If MT17001 had not been completed it is likely that priorities identified as part of Berry Export Strategy, 2028 would have been identified through the Strawberry Strategic Investment Advisory Panel (SIAP). However, MT17001 has provided structure and an evidence base to guide further industry and grower investment.

Valuation of Impact 2: Additional Raspberry and Blackberry Sales in Export Markets

The MT17001 investment will not provide an immediate boost to raspberry and blackberry sales in export markets. Rather it identified a program of further investments over a five year period which will allow industry to be ready for export when they generate an exportable surplus. The aspirational SIP target of at least 5% of production directed to exports by 2021 will not be met. A much longer timetable is appropriate.

Attribution

A low attribution factor has been assumed for MT17001's contribution to the raspberry and blackberry industry's goal of increasing exports to 5% of production. The export strategy is one part of a much larger investment program.

Counterfactual

If MT17001 had not been completed it is likely that priorities identified as part of Berry Export Strategy, 2028 would have been identified through the SIAP. However, MT17001 has provided structure and an evidence base to guide further industry and grower 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 Strawberry Sales in Export Markets		
Additional strawberry sales targeted through the SIP.	4,300 t/year	Current export sales average 3,700 t/year (4.4% of production, 3 year average to 2017/18). Through the SIP industry has targeted 8,000 t (8% of production). 8,000 t less 3,700 t is 4,300 t.
Strawberry grower profit on additional export sales.	$1,144/t	Derived from DPIPWE Strawberry Gross Margin 2018 prepared using large Victorian grower data. Profit adjusted downward by 40% to allow for extra costs and low margins associated with exporting (e.g. additional packaging, disinfestation, metal detection tests, inspection, certification, airfreight, brokerage, etc.).
Attribution of additional strawberry sales in export markets to MT17001 (Berry	5%	Consultant estimate after considering other investments required for strawberry growers to become successful exporters and investment

Export Strategy, 2028).		required to support new/improved market access negotiations.
Year of first impact.	2020/21	Three years after MT17001 completion and allowing for design of follow-up actions by SIAP – assumption developed following consultation with Brad Mills, Relationship Manager, Strawberry, Hort Innovation.
Year in which impact reaches a peak.	2027/28	Consistent with the *Berry Export Strategy, 2028*.
Probability of achieving 'aspirational' SIP target	30%	MT17001 final report notes that export strategy target of double production is ambitious and is reliant on new/improved market access which is not within industry's control.
Counterfactual	20%	If Project MT17001 had not been completed it is 80% likely that priorities identified as part of the *Berry Export Strategy, 2028* would have been identified through the Strawberry SIAP. However, MT17001 has provided structure and an evidence base to guide further industry and grower investment.
Impact 2: Additional Raspberry and Blackberry Sales in Export Markets		
Additional raspberry and blackberry sales targeted through the SIP.	307 t/year	Current export sales average 3 t/year (0.1% of production, 3 year average to 2017/18). Through the SIP industry has targeted 310 t/year (5% of production). 310 t less 3 t is 307 t.
Raspberry and blackberry grower profit on additional export sales.	$6,534/t	Derived from DPIPWE Raspberry Gross Margin 2018 prepared for production using substrata. Profit adjusted downward by 40% to allow for extra costs and low margins associated with exporting (e.g. additional packaging, disinfestation, inspection, certification, airfreight, brokerage, etc.).
Attribution of additional raspberry and blackberry sales in export markets to MT17001 (Berry Export Strategy, 2028).	5%	Consultant estimate after considering other investments required for growers to become successful exporters and investment required to support new/improved market access negotiations.
Year of first impact.	2024/25	Seven years after MT17001 completion and allowing for further investment and development of a sustained exportable surplus – assumption developed following consultation with Brad Mills (Hort Innovation) and raspberry/blackberry growers.
Year in which impact reaches a peak.	2027/28	Consistent with the *Berry Export Strategy, 2028*.
Probability of achieving 'aspirational' SIP target	30%	MT17001 final report notes that export strategy target is ambitious.
Counterfactual	20%	If Project MT17001 had not been completed it is 80% likely that priorities identified as part of the *Berry Export Strategy, 2028* would have been identified through the SIAP. However, MT17001 has provided structure and an evidence base to guide further industry and grower investment.

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 (2017/18) as per the CRRDC Impact Assessment Guidelines (CRRDC, 2018).

Investment Criteria

Table 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 MT17001

Investment Criteria	Years after Last Year of Investment						
	0	5	10	15	20	25	30
Present Value of Benefits ($m)	0	0	0.04	0.10	0.15	0.18	0.21
Present Value of Costs ($m)	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Net Present Value ($m)	-0.15	-0.15	-0.11	-0.05	0	0.03	0.06
Benefit-Cost Ratio	0	0	0.29	0.67	0.98	1.21	1.39
Internal Rate of Return (%)	negative	negative	negative	1.3	4.8	6.4	7.2
MIRR (%)	negative	negative	negative	2.5	4.9	5.8	6.1

The annual undiscounted benefit and cost cash flows for the total investment for the duration of MT17001 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

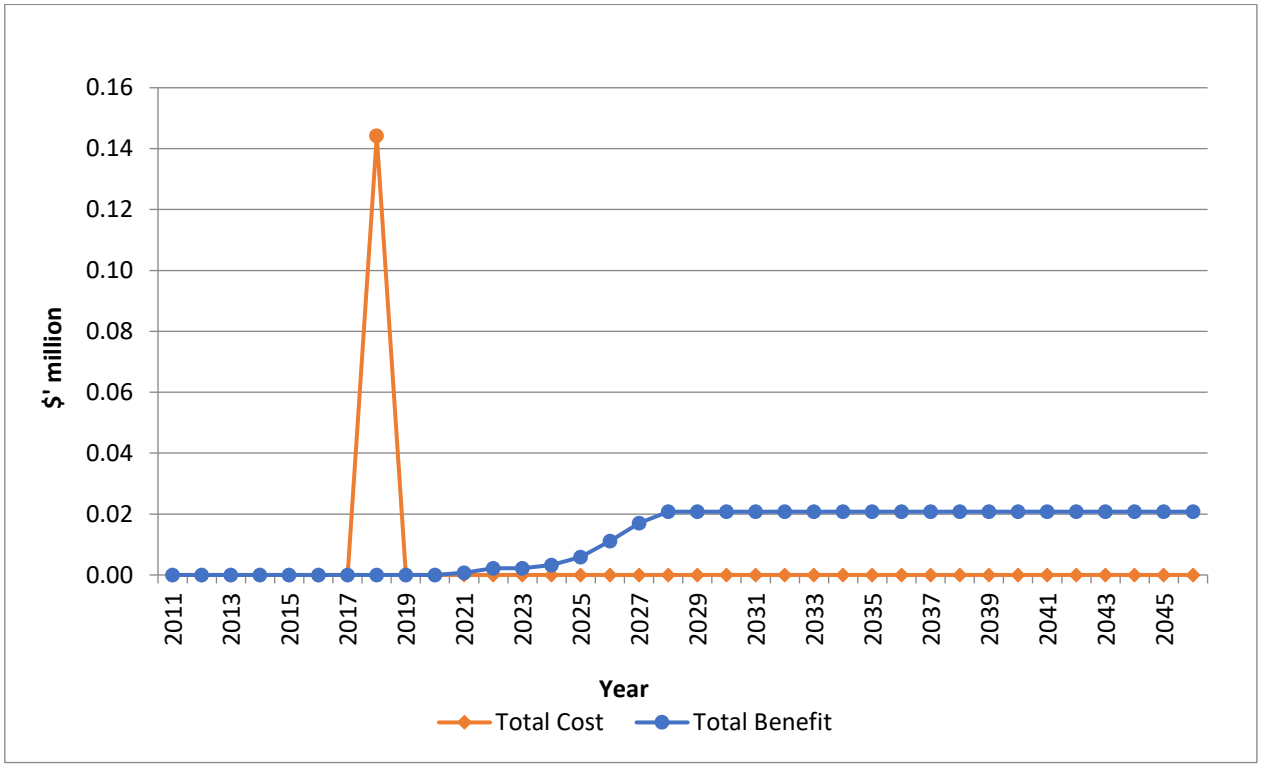

Table 7 shows the contribution of each impact to the total PVB.

Table 7: Contribution of Benefits

Impact	PVB ($M)	% of Total PBV
Impact 1: Additional strawberry sales in export markets	0.15	72.2%
Impact 2: Additional raspberry/blackberry sales in export markets	0.06	27.8%
Total	0.21	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 show a high level of sensitivity to the discount rate. This is because project benefits are delayed and occur over many subsequent years. At the 10% discount rate project costs exceed project benefits.

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

Investment Criteria	Discount rate		
	0%	5% (base)	10%
Present Value of Benefits ($m)	0.48	0.21	0.11
Present Value of Costs ($m)	0.14	0.15	0.16
Net Present Value ($m)	0.33	0.06	-0.05
Benefit-cost ratio	3.32	1.39	0.67

A sensitivity analysis was then undertaken for the assumed increase in strawberry exports. At a 6% increase in strawberry exports, a steady state increase in exports of 2,300 t/year, the project produces a negative return on investment – Table 9.

Table 9: Sensitivity to Increase in Strawberry Exports
(Total investment, 30 years)

Investment Criteria	% of Strawberry Production Exported		
	6%	8% (base)	10%
Present Value of Benefits ($m)	0.14	0.21	0.28
Present Value of Costs ($m)	0.15	0.15	0.15
Net Present Value ($m)	0.01	0.06	0.13
Benefit-cost ratio	0.93	1.39	1.86

A final sensitivity test examined assumed increase in raspberry/blackberry exports. At a more modest 3% increase in raspberry/blackberry exports, a steady state increase in exports of 183 t/year, the project continues to produce a positive return on investment (Table 10). Investment performance is driven by the increase in strawberry exports.

Table 10: Sensitivity to Increase in Raspberry/Blackberry Exports
(Total investment, 30 years)

Investment Criteria	% of Raspberry/Blackberry Production Exported		
	3%	5%	8%
Present Value of Benefits ($m)	0.19	0.21	0.24
Present Value of Costs ($m)	0.15	0.15	0.15
Net Present Value ($m)	0.04	0.06	0.09
Benefit-cost ratio	1.24	1.39	1.63

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-low

Coverage of benefits was assessed as high. The two economic benefits (increased strawberry exports and increased raspberry/blackberry exports) were quantified.

Confidence in assumptions was rated as medium-low. The analysis relied on assumed improvements in percentage of each crop exported and while these assumptions were made after consultation with Hort Innovation and industry, they remain somewhat uncertain.

Conclusion

The investment in MT17001 is likely to contribute to additional profitable export sales for strawberry, raspberry and blackberry growers. Environmental impacts are expected to include reduced fruit waste (positive) and additional carbon emissions associated with airfreight exports (negative). The project has contributed to the development of export capacity in the berry industries and increased long term income in regional Australia.

Total funding from all sources for the project was $0.15 million (present value terms). All project funding was provided by Hort Innovation. The investment produced estimated total expected benefits of $0.21 million (present value terms). This gave a net present value of $0.06 million, an estimated benefit-cost ratio of 1.4 to 1, an internal rate of return of 7% and a modified internal rate of return of 6%.

While several environmental and social impacts identified were not valued, the impacts were considered indirect, uncertain and/or minor compared with the impacts valued. Nevertheless, combined with conservative assumptions for the impacts valued, investment criteria as provided by the valuation may be underestimates 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.

Reference List

Council of Rural Research and Development Corporations. (2018). Cross-RDC Impact Assessment Program: Guidelines. Canberra: Council of Rural Research and Development Corporations. Retrieved from http://www.ruralrdc.com.au/wp-content/uploads/2018/08/201804_RDC-IA-Guidelines-V.2.pdf

Department of Agriculture and Water Resources. (2015). Agricultural Competitiveness White Paper. Canberra: Commonwealth of Australia. Retrieved from http://agwhitepaper.agriculture.gov.au/SiteCollectionDocuments/ag-competitiveness-white-paper.pdf

DPIPWE (2018) Strawberry Gross Margin Budgets – On Substrata and In Ground. Retrieved at https://dpipwe.tas.gov.au/Documents/Strawberry_GMs.xlsx

DPIPWE (2018) Raspberry Gross Margin Budgets – On Substrata. Retrieved at https://dpipwe.tas.gov.au/.../Raspberry%20-%20Investment%20Analysis%20and%20...

Hort Innovation (2016) Strawberry Strategic Investment Plan 2017-2021. Retrieved from https://www.horticulture.com.au/globalassets/hort-innovation/levy-fund-financial-and-management-documents/sip-pdfs-new/hortinnovation-sip-strawberry-2017-2021.pdf

Hort Innovation (2016a) Raspberries and Blackberries Strategic Investment Plan 2017-2021. Retrieved from https://www.horticulture.com.au/globalassets/hort-innovation/levy-fund-financial-and-management-documents/sip-pdfs-new/hortinnovation-sip-raspberry-blackberry-2017-2021.pdf

Hort Innovation (2018) Australian Horticulture Statistics Handbook. Retrieved from https://www.horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/australian-horticulture-statistics-handbook/.

Office of the Chief Scientist. (2015). Strategic Science and Research Priorities. Canberra: Commonwealth of Australia. Retrieved from http://www.chiefscientist.gov.au/wp-content/uploads/STRATEGIC-SCIENCE-AND-RESEARCH-PRIORITIES_181214web.pdf

Acknowledgements

AgEconPlus and Agtrans Research would like to thank all the project and program personnel associated with Horticulture Innovation Australia Limited that were involved in the evaluation process. Their cooperation and feedback throughout the evaluation process contributed significantly to this report.

Specific acknowledgements:
Luigi Coco Strawberry Grower QLD and SIAP Member
Mark Conroy, Driscoll's of Australia, Victoria – Strawberry, Raspberry and Blackberry
Vincent Hudson, Auspex Strategy Advisory – principal investigator MT17001
Richard McGruddy strawberry and raspberry grower QLD and SIAP 0408 763 804
Brad Mills, Relationship Manager – Strawberry, Raspberry and Blackberry, Hort Innovation
Anthony Yewers – strawberry and raspberry grower, Western Australia

Abbreviations

CRRDC	Council of Research and Development Corporations
DAWR	Department of Agriculture and Water Resources (Australian Government)
DPIPWE	(Tasmanian) Department of Primary Industries, Parks, Water and Environment
GDP	Gross Domestic Product
IRR	Internal Rate of Return
MIRR	Modified Internal Rate of Return
NSW	New South Wales
OCS	Office of Chief Scientist Queensland
PVB	Present Value of Benefits
QLD	Queensland
RD&E	Research, Development and Extension
SIAP	Strategic Investment Advisory Panel
SIP	Strategic Investment Plan