Hort Innovation

Final Report

Industry-specific impact assessment program: Berries

Impact assessment report for project *Building resistance to drupelet disorder in rubus* (RB14003)

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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 *RB14003: Building resilience to drupelet disorder in Rubus.* The project was completed over the period May 2015 to January 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 2020/21 dollar terms and were discounted to the year 2020/21 using a discount rate of 5% to estimate the investment criteria.

Results/key findings

The investment in RB14003 has provided the Australian rubus industry (specifically blackberries) with increased knowledge of the causes of the disorder. This knowledge can contribute to improved management and associated profitability via increases in market acceptability and financial returns. Other beneficiaries of the project investment include consumers who will benefit from improved quality of the blackberries.

Investment Criteria

Total funding from all sources for the project was $0.28 million (present value terms). The investment produced estimated total expected benefits of $1.58 million (present value terms). This gave a net present value of $1.30 million, an estimated benefit-cost ratio of 5.71 to 1, an internal rate of return of 20.8% and a modified internal rate of return of 11.9%.

Based on the assumptions made in the economic analysis, the investment criteria estimated demonstrate a positive return to the investment in Project RB14003.

Conclusions

Project RB14003 was successful in that the investment provided the opportunity for commercial blackberry growers to reduce the impact of red drupelet disorder so improving profitability via improved market quality and acceptability.

Keywords

Impact assessment, benefit-cost analysis, RB14003, Rubus, blackberries, red drupelet reversion, RDR

Introduction

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

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

This impact assessment program addresses this requirement through conducting a series of industry-specific ex-post independent impact assessments of the berry (Rubus (RB) + Strawberry (BS)), mango (MG), turf (TU) and nursery (NY) RD&E investment funds.

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

- Four RB + BS projects were chosen worth $1.44 million (nominal Hort Innovation investment) from an overall population of 16 projects worth an estimated $8.59 million,
- Three MG projects worth $1.77 million (nominal Hort Innovation investment) from an overall population of 16 projects worth approximately $7.9 million,
- Four TU projects worth $0.66 million (nominal Hort Innovation investment) from a total population of 15 projects worth $4.81 million, and
- Three NY projects worth $0.96 million (nominal Hort Innovation investment) from an overall population of 19 projects worth $7.32 million.

The project population for each industry included projects where a final deliverable had been submitted in the five-year period from 1 July 2015 to 30 June 2020.

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

Project RB14003: *Building resilience to drupelet disorder in Rubus* was randomly selected as one of four unique RB + BS investments under MT20008 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

Australian rubus berries include raspberries, blackberries boysenberries and silvanberries. Most production occurs in Victoria and Tasmania. Raspberries and backberries are the major rubus berries grown on a conmmercial basis. Rubus production and value statistics for the past three years are provided in Table 1.

Table 1: Australian Rubus Production and Value for Years Ending June 2018 to 2020

Year ended June	Total Australian Production (tonnes)	Fresh Supply (tonnes)	Fresh Imports (tonnes)	Fresh Australian Supply (tonnes)	Fresh Supply Wholesale Value ($m)	Fresh Supply Wholesale Value ($/tonne)
2018	6,922	6,391	0	6,391	205.1	32,082
2019	9,478	8,825	0	8,825	243.2	27,588
2020	9,932	9,100	0	9,100	252.9	27,791
Average	8,777	8,105	0	8,105	233.7	29,154

Source: Australian Horticultural Statistics Handbook, 2019/20

The research and development activities associated with rubus berries are guided by the industry's Strategic Investment Plan (SIP). The activities are funded by levies payable on commercial rubus production in Australia, as well as by matching government funds.

The process of preparing the latest SIP was managed by Hort Innovation in consultation with the Raspberry and Blackberry industries and the Strategic Investment Advisory Panel. The current SIP has been driven by levy payers and addresses the Australian rubus industry's research and development (R&D) needs from 2017 to 2021.

There are approximatley 140 Rubus growers in Australia, with all states except the Northern Territory represented. It was reported that in 2010 there were 613 ha of commercially orientated rubus growing area in Australia (Edgley, 2019 It is likely that this area has expanded considerably since 2010.

Project Rationale

Some rubus berries (e.g. blackberries) are susceptible to drupelet disorder that affects the colouration of the drupelets, in turn affecting marketability and grower profitability. Drupelets then can become more vulnerale to irradiation leading to sunburn damage. Damaged fruit also can become more susceptible to pathogens. Apart from the impact on appearance, the disorder can lead to physiological changes developing that can then affect the taste of the fruit.

It has been reported that anwhere from 0% to upwards of 80% of fruit in commercially produced cultivars are affected by the disorder (Edgley, 2020). Rubus industry representatives have expressed strong suport for research to be undertaken into management techniques that may reduce the incidence and severity of the disorder afffecting commercial rubus berry varieties. Project RB14003 was funded to support this industry priority.

Project Details

Summary

Project Code: RB14003

Title: *Building Resilience to drupelet disorder in Rubus*

Research Organisation: Tasmanian Institute of Agriculture (TIA) and the University of Tasmania (UTAS)

Project Leader: Dugald Close, Associate Head Global, Tasmanian Institute of Agriculture

Period of Funding: May 2015 to January 2019

Objectives

The project aimed to build berry resistance to drupelet disorder via new knowledge gained to manipulate management practices including those at pre-harvest, harvest or post-harest stages. Within this broad aim, the specific objectives of Project RB14003 were:

- To identify and quantify the physicochemical changes occurrung in drupelets affected by Red Drupelet Reversion (RDR).
- To identify any physical or environmental factors involved in expression of RDR.
- To identify plant nutrition that may be contributing to an increase in RDR.
- To identify and develop potential pre- or postharvest techniques to reduce the incidence of RDR.

Logical Framework

Table 2 provides a brief description of Project RB14003 in a logical framework format, organised by project activities, outputs, outcomes and impacts.

Table 2: Logical Framework for Project RB14003

Activities	**Project Initiation**
	• Advertising for a PhD candidate to undertake research under the supervision of the the project team.
	• Subsequent selection of a PhD candidate (Max Edgley) to undertake RDR research under the supervision of the the project team.
	• Research planning, literature review, and development of the design of the research trials and laboratory analyses.
	• A survey of growers was conducted to assist with development of research priorities.
	• The project addressed drupelet disorder specifically in commercial blackberry production.
	
	Project Trials
	• A number of trials were undertaken to identify improved management of the disorder in blackberries, including:
	  ○ cooling management post-harvest,
	  ○ the environmental conditions at harvest (e.g temperature, humidity, and plant water status),
	  ○ nitrogen fertigation rates, and
	  ○ understanding the underlying physiology of the disorder.
	
	Ongoing communication activities

	• Early in the proeject, Max Edgley introduced himself and the project to the Rubus industry at the industry annual General Meeting in Victoria in October 2015. • Thereafer, the project involved various communications of key results and recommendations to industry.

Outputs	• Max Edgley was selected as the PhD candidate to work in the project and was successfully enrolled for postgraduate study at the University of Tasmania.
	• The literataure review on RDR was completed and provided the background and knowledge for the final design of the research trials.
	• A fact sheet on the project was developed to asssist further with industry communication.
	• Findings from the project trials included:
	  ○ Physical damage to the fruit during harvest and transport was a major cause of the disorder.
	  ○ High nitrogen rates used at harvest can signficantly increase the disorder post-harvest.
	  ○ High temperatures at harvest can exacerbate ths disorder.
	  ○ Improved management techniques (e.g. choice of harvest times, harvest techniques and transport conditions) can reduce the disorder.
	  ○ Management of cooling post-harvest can reduce disorder incidence.
	• Max Edgley was successful in being awarded his Ph D degree at the end of the project.
	• The rubus industry were kept well informed of the project findings via fact sheets, case studies, and via field days and presentations at industry meetings and conferences.

Outcomes	• The early presentation to industry, industry engagment RDR the fact sheets together raised awareness of the industry regarding the research project and its findings. • A wider appreciation by the blackberry industry has been achieved regarding the factors influencing/contributing to RDR. • A greater awareness of rubus growers (specifically blackberries) regarding management options to reduce the incidence/severity of RDR. • Identification of future R&D priorities addressing drupelet disorder affecting rubus growers.
Impacts	• A reduction in the incidence/severity of RDR for a proportion of Australian rubus growers (specifically blackberries) resulting in an increase in the gross margin per ha via one or more of increased yield, increased price and/or reduced costs. • Potential for reduced nitrogen fertiliser and chemical use, and hence a reduction in nutrient and chemical export to the off-farm environment. • Improved R&D resource allocation in future research and extension investment addressing RDR. • Increased future capacity to change across the Australian commercial blackberry growing industry. • Increased future research capacity via the successful PhD training and award. • Regional community spillover benefits from the a more productive blackberry industry.

Project Investment

Nominal investment

Table 3 shows the investment made in Project RB14003.

Table 3: Annual Investment in Project RB14003 (nominal $)

Year ended 30 June	Hort Innovation ($)	TIA UTAS ($)	TOTAL ($)
2015	36,169	8,526	44,695
2016	40,000	9,429	49,429
2017	30,000	7,071	37,071
2018	10,000	2,357	12,357
2019	29,042	6,846	35,888
Totals	**145,211**	**34,229**	**179,440**

Source: Project Research Agreement

Program management costs

For the Hort Innovation investment the cost of managing its funding was added to the Hort Innovation contribution in Table 3 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.

It was assumed that any funding management costs by TIA was already included in the contribution by TIA in Table 3.

Real investment and extension 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, 2021). No additional costs of extension were included as the project itself was largely centred on extension.

Impacts

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

Table 4: Triple Bottom Line Categories of Principal Impacts from Project RB14003

Economic	• A reduction in the incidence/severity of RDR for some Australian rubus growers resulting in an increase in the gross margin per ha via one or more benefits of increased yield, increased price and/or reduced costs.
Environmental	• Potential for reduced nitrogen fertiliser and chemical use and hence a reduction in nutrient and chemical export to the off-farm environment.
Social	• Improved R&D resource allocation in future research and extension investment addressing RDR. • Increased future capacity to change across the Australian rubus growing industry. • Regional community spillovers from the benefits of a more productive rubus industry.

Public versus private impacts

The impacts identified from the investment are predominantly private impacts accruing to the Australian rubus industry (specifically blackberries) through an increase in marketability and profitability. Some public benefits may be delivered via improved future research resource allocation addressing drupelet disorder.

Distribution of private impacts

The private impacts will be distributed throughout Australian blackberry growers including businesses involved in the blackberry input and output supply chains.

Impacts on other Australian industries

It is likely that most impacts will be largely confined to the Australian commercial blackberry industry.

Impacts overseas

It is possible that there could be spillover impacts from the project to overseas interests via the increased understanding of the physiology of the disorder and their potential management implications and strategies.

Match with national priorities

The Australian Government's Science and Research Priorities and Rural RD&E priorities are reproduced in Table 5. The project outcomes and related impacts will contribute primarily to Rural RD&E Priority 1 and 4, as well as 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 (2016)

Alignment with the Raspberry and Blackberry Strategic Investment Plan 2017-2021

The strategic outcomes and strategies of the Australian rubus industry are outlined in the Rasberry and Blackberry Industry's Strategic Investment Plan 2017-2021[1] (Hort Innovation, 2017). Project RB14003 addressed Outcome 3 through Strategy 3.3 (Establish the main constraints and influences for increasing raspberry and blackberry industry productivity) with some contribution to Outcome 4 via Strategy 4.1 (Develop an informed and cohesive industry through direct two-way communication with raspberry and blackberry businesses across Australia).

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

Valuation of Impacts

Impacts Valued

The impact valued in the assessment of RB14003 was the improved management changes likely by some commercial blackberry growers, potentially resulting in commercial gains associated with quality, price and costs.

Impacts Not Valued

Several other impacts were identified but not valued; they included:

- Potential for reduced nitrogen fertiliser and chemical use and hence a reduction in nutrient and chemical export to the off-farm environment. This impact was not valued due to the lack of data relating to past and likely future use of nutrients and chemicals.
- Improved R&D resource allocation in future research and extension investment addressing RDR. This impact was not valued due to a lack of available data on the next steps in R&D likely to be undertaken to address further improvement in management of RDR.
- Increased future capacity to change across the Australian rubus growing industry. This potential impact was not valued as any valuation would depend on the timing and nature of and ongoing and future impacts that might occur. Moreover, the capacity to change has already been accommodated to some extent in the improved management that has already been valued in this assessment.
- Regional community spillovers from the benefits of a more productive rubus industry. This impact was not valued due to the difficulty of making sound linkage assumptions between the project impact and an inability to accommodate the number of geographic locations involved in blackberry production in Australia.

Summary of Assumptions

The specific assumptions used to value the impact from Project RB14003 are provided in Table 6.

Table 6: Summary of Assumptions for Impact Valued for Project RB14003

Variable	Assumption	Source/Comment
Impact valued: Increased productivity and profitability of commercial blackberry production		
Area of commercial rubus production in Australia in 2010	613 ha	Keogh et al (2010) as cited in Project RB14003 Milestone Report no 1 (November, 2015).
Average annual wholesale value of rubus production in Australia (2018-2020)	$234 million	Table 1 (Hort Innovation, 2020)
Gross income per annum for raspberry production in Tasmania as a surrogate for rubus	$304,941 per ha	Department of Primary Industries, Parks, Water and Environment, Tasmania (2018) https://dpipwe.tas.gov.au/
Total variable costs per annum for raspberry production in Tasmania	$157,860 per ha	
Gross margin per annum for raspberry production	$147,081 per ha	

in Tasmania		
Estimate of rubus area in Australia in 2020	1,063 ha	$234 m/ $304,941
Area of commercial blackberry production in Australia as % total rubus	40%	Analyst assumption, based on 40% blackberry, 40% raspberry and 20% other
Estimate of commercial blackberry area in Australia	425 ha	40% of 1,063 ha
Assumed gross margin for Australian blackberry production	$147,081 per ha	A gross margin for commercial blackberry production is not publicly available due to the structure of the commercial blackberry industry (Celeste Cook, pers. comm., 2021). As an alternative, the gross margin for blackberries was based on the gross margin for raspberries, sourced from the Department of Primary Industries, Parks, Water and Environment, Tasmania (2018) (see above). The use of the raspberry gross margin is likely to result in a conservative estimate for the blackberry gross margin. This comment is supported by a retail price survey of berry prices in a major retail chain in August 2021, where Driscoll's blackberries were priced at $60 per kg compared to raspberries at $44 per kg.
Proportion of commercial blackberry growers that are currently significantly affected by the disorder	40%	Analyst assumption, based on references contained in Edgley, 2019
Maximum proportion of significantly affected growers benefiting from Project RB14003	20%	Analyst assumptions
First year of benefit	2019/20	
Year in which maximum benefit achieved	2023/24	
Period of maximum benefit	Period continues permanently for the 20% of growers	Analyst assumption
Increase in gross margin for growers benefiting	5%	Assumed to be a combination of cost increases, cost reductions, increased yields, and increased

		product quality and prices
Risk and attribution factors		
Probability of output	100%	Estimates by Analyst
Probability of outcome (proportion of industry affected making management changes due to the project)	75%	
Probability of impact (increase in gross margin due to management changes driven by the project	75%	
Attribution to Project RB14003	75%	Allows for costs of some further communication and extension input and any further input to assess potential management techniques to reduce incidence and provide benefits assumed

Counterfactual

It was assumed that without the investment in RB14003, the impact valued would not have occurred via other investments and strategies to better control drupelet disorder.

Results

All costs and benefits were discounted to 2020/21 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 (2018/19) as per the CRRDC Impact Assessment Guidelines (CRRDC, 2018).

Investment Criteria

Tables 7 and 8 show the investment criteria estimated for different periods of benefits for the total investment and the Hort Innovation investment alone.

Table 7: Investment Criteria for Total Investment in Project RB14003

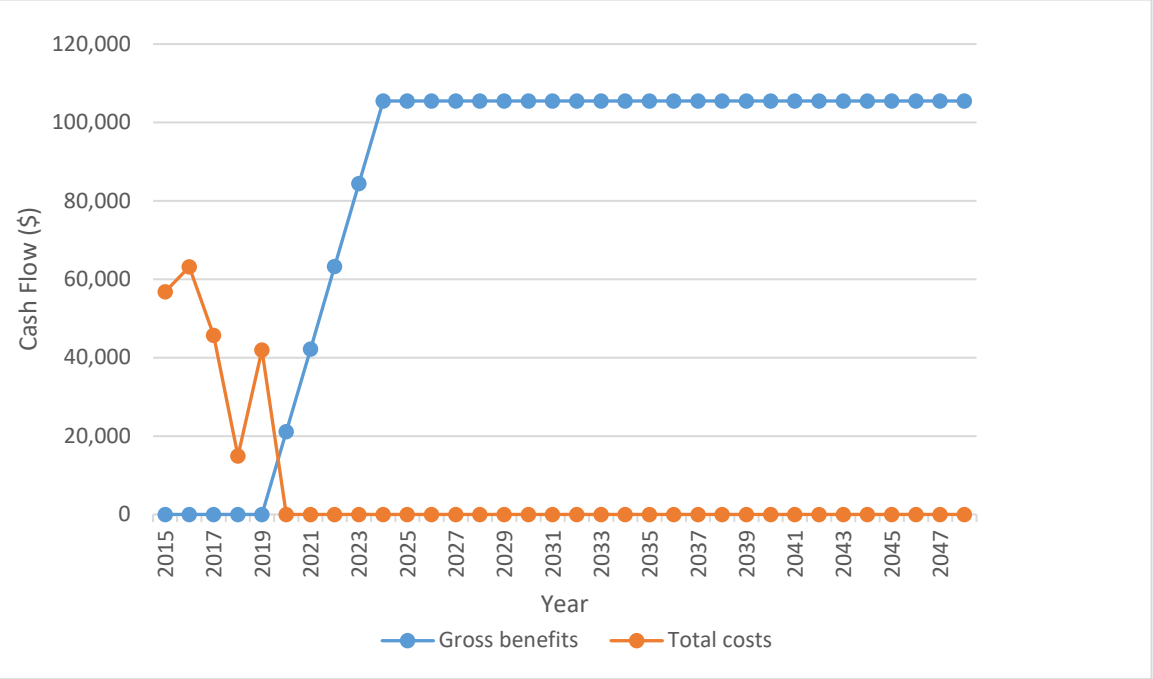
Investment Criteria	Years after Last Year of Investment						
	0	5	10	15	20	25	30
Present Value of Benefits ($m)	0.00	0.29	0.69	1.00	1.24	1.43	1.58
Present Value of Costs ($m)	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Net Present Value ($m)	-0.28	0.02	0.41	0.72	0.96	1.15	1.30
Benefit-Cost Ratio	0.00	1.06	2.49	3.61	4.49	5.18	5.71
Internal Rate of Return (%)	negative	6.0	17.3	19.7	20.4	20.7	20.8
MIRR (%)	negative	5.8	12.9	13.0	12.2	11.5	10.8

Table 8: Investment Criteria for Hort Innovation Investment in Project RB14003

Investment Criteria	Years after Last Year of Investment						
	0	5	10	15	20	25	30
Present Value of Benefits ($m)	0.00	0.24	0.57	0.83	1.03	1.19	1.31
Present Value of Costs ($m)	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Net Present Value ($m)	-0.23	0.01	0.34	0.60	0.80	0.96	1.08
Benefit-Cost Ratio	0.00	1.06	2.49	3.61	4.49	5.18	5.71
Internal Rate of Return (%)	negative	6.0	17.3	19.7	20.4	20.7	20.8
MIRR (%)	negative	15.0	20.8	17.8	15.5	13.8	12.6

The annual undiscounted benefit and cost cash flows for the total investment for the duration of the RB14003 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 Analysis

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 9 presents the results that show a moderate sensitivity to the discount rate.

Table 9: Sensitivity to Discount Rate
(Total investment, 30 years)

Investment Criteria	**Discount rate**		
	0%	5%	10%
Present Value of Benefits ($m)	2.95	1.58	0.99
Present Value of Costs ($m)	0.22	0.28	0.34
Net Present Value ($m)	2.73	1.30	0.65
Benefit-cost ratio	13.27	5.71	2.92

A sensitivity analysis was then undertaken for the maximum proportion of significantly affected blackberry growers benefiting from Project RB14003. Results are provided in Table 10.

Table 10: Sensitivity to Assumption of Proportion of Significantly Affected Blackberry Growers that Benefit
(Total investment, 30 years)

Investment Criteria	**Proportion of Significantly Affected Blackberry Growers Gaining from Project**		
	10%	20% (base)	30%
Present Value of Benefits ($m)	0.79	1.58	2.36
Present Value of Costs ($m)	0.28	0.28	0.28
Net Present Value ($m)	0.51	1.30	2.09
Benefit-cost ratio	2.86	5.71	8.57

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	Medium-Low

Coverage of benefits was assessed as Medium to High as the most important impact from the investment was valued, despite there being a number of other impacts that were identified but not valued in monetary terms. As a result, the investment criteria as provided by the valued benefit are likely to be underestimated.

Confidence in assumptions for the impact valued was rated as Medium-Low, as some of the key assumptions made were not supported directly by published data or other forms of evidence of change.

Conclusions

The investment in Project RB14003 focused on solutions for Australian rubus fruit growers (specifically blackberries) to reduce the impact of drupelet disorder. The current project RB14003 sought solutions to reducing the impact of the disorder via a series of trials and close communication with growers. The project produced a series of management strategies that could be implemented by growers suffering from the disorder, potentially resulting in benefits associated with fruit quality, price and costs.

Total funding from all sources for the project was $0.28 million (present value terms). Given the assumptions made, the investment could be expected to produce total expected benefits of $1.58 million (present value terms). This gave an estimated net present value of $1.30 million, an estimated benefit-cost ratio of 5.71 to 1, an internal rate of return of 20.8% and a modified internal rate of return of 11.9%.

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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Adam Briggs, Head of Data & Insights, Hort Innovation

Abbreviations

ABS	Australian Bureau of Statistics
CRRDC	Council of Research and Development Corporations
DAWR	Department of Agriculture and Water Resources (Australian Government)
MIRR	Modified Internal Rate of Return
OCS	Office of Chief Scientist Queensland
R&D	Research and Development
RD&E	Research, Development and Extension
SIP	Strategic Investment Plan
$m	Million dollars
RDR	Red Drupelet Reversion
UTAS	University of Tasmania
TIA	Tasmanian Institute of Agriculture