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

Annex 12: Impact assessment for the project *Integrated Pest Management of redberry mite, Acalitus essigi, on blackberries* (RB17000)

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Date:

28 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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Contents

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 *RB17000 Integrated Pest Management of redberry mite, Acalitus essigi, on blackberries.* The project was funded by Hort Innovation over the period December 2017 to October 2020.

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 RB17000 increased the knowledge, skills and understanding of Red Berry Mite (RBM), which is a pest of the blackberry industry that was not well understood. The project outputs aimed to develop integrated pest management (IPM) approaches for the control of RBM and its impact on the blackberry industry in Australia. From these outputs, RB17000 was assessed to have supported a range of impacts. These were quantified where possible based on available data:

Quantified

- [Economic] – Reduced overall crop RBM damage and increase packout yields as a result of:
  - Varietal change to lower RBM susceptibility cultivars.
  - Increased grower adoption of RBM IPM.
  - Increased and more time-and-cost effective RBM monitoring.

Not all of the identified impacts could be valued in the assessment, particularly where there was a lack of credible data. These additional economic, social and environmental impacts have the potential to provide additional industry impact above what has been identified.

Investment criteria

Total funding from all sources for the project was $0.37 million (present value terms). The investment produced estimated total expected benefits of $1.01 million (present value terms). This gave a net present value of $0.64 million, an estimated benefit-cost ratio of 2.72 to 1, an internal rate of return of 47%, and a MIRR of 10%.

Conclusions

The benefits of Hort Innovations investment in RB17000 were to increase the knowledge and skill within the blackberry industry relating to RBM management. This reflects the benefit of reduced damage of RBM through a new monitoring technique developed, various cultural control options identified, and in particular, supporting a shift in variety selection to less RBM sensitive cultivars.

Keywords

Impact assessment, cost-benefit analysis, berry, blackberry, redberry mite (Acalitus essigi), RBM

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 *RB17000 Integrated Pest Management of redberry mite, Acalitus essigi, on blackberries* 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

The combined raspberry and blackberry industries have been growing rapidly in recent years with a production increase of 87% in the five years to 2020-21, a combined value of $233 million in 2020-21 (Hort Innovation 2022a) and 120 growers (Hort Innovation 2022b). The Blackberry share of this production is approximately 25% with Victoria and Tasmania accounting for most of it.

Producers in the raspberry and blackberry 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 raspberries and blackberries 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 raspberry and blackberry levy funds which are directed to R&D and marketing.

Rationale

The Blackberry industry's levy investments are guided by a Strategic Investment Plan (SIP). The Raspberry and Blackberry SIP 2017-21 (under which RB17000 was delivered) identified increasing farm productivity as a priority outcome for the sector, and moving towards integrated pest management (IPM) as a key element to achieve this.

Commercial blackberry production in Australia is expanding rapidly but an impediment to this expansion is the reliable production of high-quality fruit. RBM, *Acalitus essigi*, are a minute plant-feeding mite in the superfamily Eriophyoidea that infests blackberries in many growing regions. RBM feeding results in the incomplete and/or uneven ripening of blackberry fruit. The damaged fruit is unmarketable with very high RBM populations resulting in significant crop losses.

This project's aims were to identify and assess the impact of IPM strategies including cultural, biological, and chemical controls to enable the sustainable control of RBM in commercial blackberry production systems in Australia. As part of this process the project developed optimised RBM monitoring protocols to enable blackberry producers and agronomists with the ability to develop a more predictive approach to their management of RBM.

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

With a focus on reducing the impacts of RBM to the Australian blackberry industry through new IPM strategies the project's outcomes were aligned with the Raspberry and Blackberry Strategic Plan's Outcome 3: *By 2021, the industry will increase farm productivity (marketable yield per hectare) by an average 10 percent*.

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 project outcomes and related impacts will contribute to RD&E Priority 2 & 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	RB17000
Title	*Integrated Pest Management of redberry mite, Acalitus essigi, on blackberries*
Research organization	University of Tasmania (UTas)
Project leader	Dr Stephen Quarrell
Funding period	December 2017 to October 2020

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	• A series of grower interviews examining their management of RBM's • Industry Interview of 13 growers, 3 agronomists, 2 Integrated Pest Management specialists and 1 berry consultant. In January 2018 (most recent data), Australian blackberry production came from 81 ha and 11 different varieties with 47 ha under tunnels. The bulk of production was from Tasmania and Victoria with small inputs from NSW, Qld and WA. • Physical monitoring and surveys of RBM • Analysis of data to assess distribution and prevalence of RBM. • IPM field trials conducted in commercial production sites in Victoria's Yarra Valley and Tasmania. These trials consisted of both predatory mite releases and a '*spray reduction trial*' with RBM and predatory mite populations monitored on both blackberry fruit and within winter buds.

Outputs	• A rapid mite extraction protocol was developed and employed. This new method required immersing and agitating the fruit in a vial of ethanol and quantifying the mites under a microscope. This method takes ca. 10 minutes per fruit rather than the 4 weeks required using the old method.
	• Updates to growers and industry representatives regarding the outcomes of the fruit surveys were delivered to each of the growers throughout the project.
	• Updates to the Berry Plant Protection Guide. The updates included mite monitoring, cultural, biological and chemical controls for pestiferous mites.
	• Extension outputs across multiple formats including but not limited to, online communications, workshops and articles in industry magazines.
	• Honours thesis and presentation. Honours student Hui Law completed Honours thesis on RBM has completed her thesis achieving First Class Honours. As part of her Honours year, Hui was required to present her research findings. Approximately, 60 people attended the event held on 12th October 2018 at the University of Tasmania. The event was attended by a combination of academics and industry representatives including Costa Group employees and several members of the Ag Institute of Australia.
	• Recommendations for further research into:
	  ○ The development of IPM strategies targeting sucking bugs including mirids and pentatomids (i.e. green vegetable bugs) to enable a more holistic approach to blackberry IPM.
	  ○ The efficacy of *Typhlodromus doreenae* and *Typhlodromus dossei* to determine the ability to control RBM and other pestiferous Eriophyid species.
	  ○ The potential impact of poor pollination and climatic effects on blackberry fruit quality.

Outcomes	• The rapid mite extraction protocol developed is now being utilised across the industry with increased RBM monitoring and evaluation.

	• The spray reduction trial confirmed that the spray program currently used by many Australian producers successfully reduces RBM populations but also has severe impacts on predatory mite populations. It was found that the adoption of a 'softer' chemical management program reduces RBM populations without impacting on predator populations or fruit quality. • The project has increased grower knowledge and understanding of management practices to reduce the impact on RBM infestation. Particularly wild blackberry removal, the adoption of softer chemical management strategies, increased RBM monitoring and the movement away from the recognised RBM susceptible varieties including 'BL454' and 'Chester'. • Increased industry research capacity relating to RBM. • RB17000 highlighted that industry remains limited in its ability to take a more holistic approach to implementing IPM due to ongoing issues with other sucking bugs not being controlled.
Impacts	• [Economic] – Reduced overall crop RBM damage and increase packout yields as a result of: ○ Varietal change to lower RBM susceptibility cultivars. ○ Increased grower adoption of RBM IPM. ○ Increased and more time-and-cost effective RBM monitoring. • [Social] – Benefits to buyers and final consumers of blackberries from improved product price and reliability, including improved health and wellbeing associated with increased fruit consumption. • [Environmental] – Reduced impact on non-target insects from a reduced spray regime and the use of softer chemicals. • [Economic, social, and environmental] – Longer-term improvement in industry RBM IPM research likely to benefit future levy-payers and stakeholders.

Project costs

Nominal investment

Table 4. Project nominal investment

Year end 30 June	Hort Innovation ($)	UTas ($)	Total ($)
2018	$61,604	$9,642	$71,246
2019	$59,051	$9,178	$68,229
2020	$59,051	$8,879	$67,930
2021	$75,767	$11,242	$87,009
Total	$255,473	$38,940	$294,413

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 16.1% for the RB17000 funding period (2018-2021). 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

There were no additional costs associated with RB17000 for project extension. Results were communicated to other growers and stakeholders as part of the project.

Project impacts

Impacts valued

The following impacts were valued.

- [Economic] – Reduced overall crop RBM damage and increase packout yields as a result of:
  - Varietal change to lower RBM susceptibility cultivars
  - Increased grower adoption of RBM IPM
  - Increased and more time-and-cost effective RBM monitoring.

Impacts not valued

The following impacts were unable to be valued in monetary terms due to a lack of underlying data:

- [Social] Benefits to buyers and final consumers of blackberries from improved product price and reliability, including improved health and wellbeing associated with increased fruit consumption.
- [Environmental] Reduced impact on non-target insects from a reduced spray regime and the use of softer chemicals.
- [Economic, social, and environmental] Longer-term improvement in industry IPM research likely to benefit future levy-payers and stakeholders.

Public versus private impacts

The impacts identified from the investment in RB17000 are predominantly private impacts accruing to blackberry growers in Australia. However, some public benefits have also been produced in the form of capacity built and spill-overs to regional communities from improved environmental outcomes and enhanced grower yield and income, and increased affordability of blackberries to incorporate into a healthy diet.

Impacts on other Australian industries

As RBM is specific to the blackberry industry it is unlikely any other Australian industries will benefit from the investment in RB17000 although findings and practices developed from the project may in some way become relevant in developing IPM strategies for similar pests in other industries.

Impacts overseas

No specific overseas impacts were identified, although if RBM affects blackberry industries overseas it is possible that the project findings may be adopted to some extent overseas.

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
Discount rate	5% (± 50%)	CRRDC Guidelines (2018)
Annual production (t)	2,545 (± 8%)	3 Year average from Australian Horticultural Statistics Handbook (Hort Innovation 2022a), 2020-21 with Blackberries being assumed at 25% of Rubus Berry Production (SIP 2022-26). Production sensitivity tested at 1 Standard Deviation of 8%.
Farmgate price $/kg	$22.07/kg (± 19%)	3 year average data from Australian Horticultural Statistics Handbook (Hort Innovation 2022a), 2020/21: 3 year average used as industry volumes have increased significantly over this time giving greater weighting to recent pricing and volumes. Sensitised at 1 Standard Deviation of 19%.
Adoption start	2019	See adoption commentary below
Peak adoption	2022	
Adoption (industry %)	80% (± 10%)	See adoption commentary below

Redberry Mite Damage (% of production)	5% (± 50%)	Assumption based on figures from the Berry Journal Summer 2020, RB17000 Milestone Report 104: Grower Survey Results and further discussion with industry with individual varieties and growing regions varying significantly around this figure.
Reduced damage from RBM control	75% (± 20%)	RB17000 final report notes that with appropriate management in place including improved crop hygiene and frequent pesticide applications, crop losses could be reduced to low (1-5%) levels. Discussion with grower indicates that RBM damage has been reduced to currently very low levels with varietal change being the primary driver of this supported by some IPM changes such as a reduced/ softer spray program.
Peak attribution of impact to RB17000	25% (± 25%)	See commentary below
R&D counterfactual	50% (± 25%)	Blackberries are a small industry that is dominated by large corporates who may undertake independent R&D to achieve similar outcomes to project RB17000.

Adoption

The impacts of RB17000 were already apparent in 2021 with a shift in the variety profile grown in Australia. 70% of growers and industry participants surveyed at the end of the project confirmed that they had already changed cultivars (or recommended changing cultivars) to move away from RBM sensitive cultivars such as 'BL454' or 'Chester'. Adoption was assumed to start in 2019 with the first findings of the project, with peak adoption reached in 2022.

Another key element of RB17000 highlighting strong adoption and impact were an increased skill and confidence in recognizing RBM symptoms. In a survey conducted as part of RB17000 70% of respondents noted an increase in the skill and confidence to recognise RBM symptoms with 60% of these now actively monitoring crops for RBM. In addition, 80% of growers interviewed were removing or had removed wild blackberries from their farm. With key project outputs and findings being extended to industry throughout the life of the project, production changes were starting to be implemented before the project was finalised.

Costa/Driscoll's, who are estimated to have over 70% of national production share through owned or contracted growers, was actively involved with RB17000 trials being conducted on their orchards and identified some changes that were adopted during and following these trials.

Due to the active participants large market share, numbers from the industry survey and expectation that other growers are likely to follow these main production trends an industry adoption figure of 80% has been utilised for this impact analysis and sensitised at +/- 10%.

Attribution of impacts

While there were many successful outcomes from RB17000 the attribution of the impacts in this assessment are considered low due to the industry dynamics already shifting away from RBM sensitive cultivars. Grower discussions have indicated that varietal changes had the largest contribution to reducing the impact of RBM.

Attribution of this change to RB17000 is low due to these varietal changes already being driven by many production, quality and flavour factors meaning that the Driscoll's variety BL454 was highly likely to be phased out regardless of RB17000 (BL454 was removed from commercial production by 2019).

By confirming varietal relationships to RBM losses and extended this knowledge to the industry, RBM findings contributed to the pre-existing shift in the variety profile grown in Australia. When this is combined with RB17000's contribution to the increased knowledge and skill of managing RBM, the impact of this project is assessed to have already yielded benefits to the industry by the time of assessment.

Attribution is considered to peak at 25% in 2021 and reduces by 20% each year as the shift to RBM resistant varieties has largely occurred which minimises the ongoing impact of RB17000 findings in overall berry production. There is also likely to be continued industry development of RBM management through on farm learnings and other external factors.

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, and Table 7 shows the impact metrics for the Hort Innovation investment based on a benefit attribution equal to the total Hort funding share of 88%.

Table 6. Impact metrics for total Investment in project RB17000

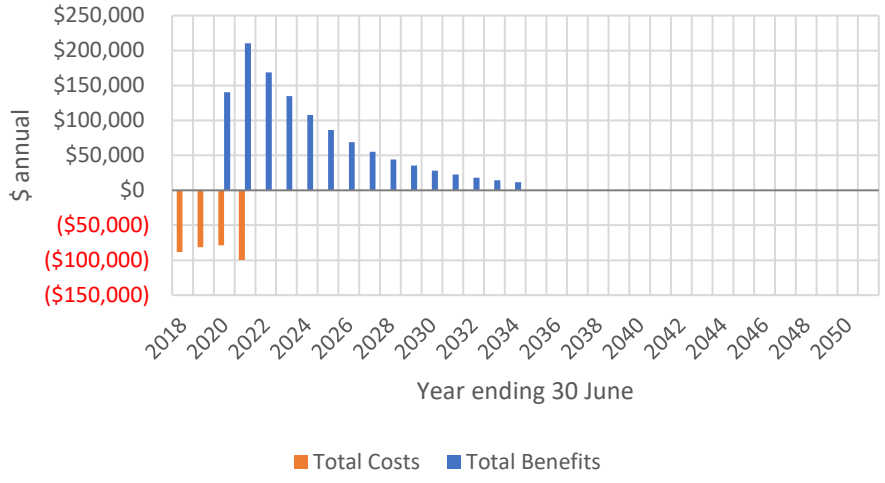
Impact metric	Years after last year of investment						
	0	5	10	15	20	25	30
PVC	0.37	0.37	0.37	0.37	0.37	0.37	0.37
PVB	0.36	0.86	0.99	1.01	1.01	1.01	1.01
NPV	-0.02	0.48	0.61	0.64	0.64	0.64	0.64
BCR	0.96	2.30	2.64	2.71	2.71	2.71	2.71
IRR	1%	46%	47%	47%	47%	47%	47%
MIRR	2%	23%	17%	14%	12%	11%	10%

Table 7. Impact metrics for the Hort Innovation Investment in project RB17000

Impact metric	Years after last year of investment						
	0	5	10	15	20	25	30
PVC	0.33	0.33	0.33	0.33	0.33	0.33	0.33
PVB	0.32	0.76	0.87	0.89	0.89	0.89	0.89
NPV	-0.01	0.43	0.54	0.56	0.56	0.56	0.56
BCR	0.96	2.30	2.64	2.71	2.71	2.71	2.71
IRR	1%	46%	47%	47%	47%	47%	47%
MIRR	2%	23%	17%	14%	12%	11%	10%

Figure 1 shows the annual undiscounted benefit and cost cash flows for the total investment of RB17000. Cash flows are shown for the duration of the investment plus 30 years from the last year of investment.

Figure 1. 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.

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

Variable		Low	Baseline	High
Discount rate	Variable range	2.5%	5.0%	7.5%
	BCR range	2.98	2.71	2.48
Annual production (t)	Variable range	2341	2545	2748
	BCR range	2.49	2.71	2.92
Blackberry farmgate price ($/kg)	Variable range	$17.88	$22.07	$26.27
	BCR range	2.19	2.71	3.22
RBM Damage (% of Production)	Variable range	2.50%	5.00%	7.50%
	BCR range	1.35	2.71	4.06
Reduced RBM Damage	Variable range	50%	75%	90%
	BCR range	1.80	2.71	3.25
Adoption	Variable range	72%	80%	88%
	BCR range	2.44	2.71	2.98
Peak attribution of impact to RB17000	Variable range	18.8%	25.0%	31.3%
	BCR range	2.03	2.71	3.39
R&D counterfactual	Variable range	37.50%	50%	75%
	BCR range	1.35	2.71	4.06

Discussion and conclusions

The long-term impacts of project RB17000 are already apparent with a shift in the variety profile grown in Australia underway which on its own will have a positive effect on reducing RBM damage. The increased knowledge and skill within the industry also bodes well for the impact of this project to be sustained in the longer term.

However, the RB17000 Final Report also highlighted a serious impediment to the long-term sustainability of the IPM strategies proposed in that they only address one pest (RBM). The impact of the more serious pests, the sucking bugs including mirids and green vegetable bugs, threatens the longevity of this research and its practical implications. Seventy percent of growers surveyed as part of the project indicated that the sucking bugs expose their crops to higher risk than RBM and their IPM is compromised by this. Some growers also indicated that the RBM program needed to be extended to provide them with more evidence and confidence with using predators for RBM.

Despite these impediments the analysis showed that the quantified benefits were substantially higher than the investment cost for RB17000, with a BCR 2.71. The results reflect the benefit of reduced damage of RBM mite through the various cultural control options identified and new monitoring technique developed.

Sensitivity testing showed that changes in the underlying variables resulted in a BCR ranging from 1.35 to 4.06. The sensitivity analysis showed that a positive impact was maintained with changes to all eight of these variables and the results were most sensitive to the tested changes in the RBM Damage (% of production), the R&D counterfactual, the level of RBM damage reduction supported by the project, and the extent to which these reductions could be attributed to RB17000. Given the blackberry industry is relatively young and growing rapidly, investments in the industry such as RB17000 do have the potential to produce large impacts relative to their investment.

Acknowledgements

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

Kathryn Young, Hort Innovation; Sarah Cumpston, Hort Innovation; Dr Stephen Quarrell, Tasmanian Institute of Agriculture; Nandita Sharma, Costa Group

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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