Hort Innovation

Final Report

Project title:

Horticulture Impact Assessment Program:

Appendix 15: National Industry Development for the Vegetable Industry (VG18003 Impact Assessment)

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Delivery partner:

AgEconPlus and Agtrans Research

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Executive Summary

What the report is about

This report presents the results of an impact assessment of a Horticulture Innovation Australia Limited (Hort Innovation) investment in *VG18003: National Industry Development for the Vegetable Industry.* The project was funded by Hort Innovation over the period July 2019 and March 2020.

Methodology

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

Results/key findings

VG18003 delivered continuity of vegetable industry extension services and a comprehensive strategic plan for extension delivery for the 5-year period starting July 2020. Extension continuity followed by well-planned extension has the potential to positively impact vegetable grower decision-making, and the adoption of R&D findings. R&D findings targeting business efficiency have the potential to lower production costs or increase crop yields (lowering the average cost of supply). Adoption of other R&D outputs have the potential to enhance vegetable farm environmental sustainability.

Investment Criteria

Total funding from all sources for the project was $1.5 million (present value terms). The investment produced estimated total expected benefits of $3.3 million (present value terms). This gave a net present value of $1.8 million, an estimated benefit-cost ratio of 2.2 to 1, an internal rate of return of 33.7% and a modified internal rate of return of 7.5%.

Conclusions

Four environmental and social impacts were not valued. When inability to value all impacts is combined with conservative assumptions for the principal economic impacts valued, it is reasonable to conclude that the valuation may be an underestimate of the actual performance of the investment.

Keywords

Impact assessment; cost-benefit analysis; VG18003; industry development; vegetable; extension; regional delivery; systems.

Introduction

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

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

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

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

Project *VG18003: National Industry Development for the Vegetable Industry* was randomly selected as one of the 15 investments under MT18011 and was analysed in this report.

General Method

The impact assessment follows general evaluation guidelines that are now well entrenched within the Australian primary industry research sector including Research and Development Corporations, Cooperative Research Centres, State Departments of Agriculture, and some universities. The approach includes both qualitative and quantitative descriptions that are in accord with the impact assessment guidelines of the CRRDC (CRRDC, 2018).

The evaluation process involved identifying and briefly describing project objectives, activities and outputs, outcomes, and impacts. The principal economic, environmental, and social impacts were then summarised in a triple bottom line framework.

Some, but not all, of the impacts identified were then valued in monetary terms. Where impact valuation was exercised, the impact assessment uses cost-benefit analysis as its principal tool. The decision not to value certain impacts was due either to a shortage of necessary evidence/data, a high degree of uncertainty surrounding the potential impact, or the likely low relative significance of the impact compared to those that were valued. The impacts valued are therefore deemed to represent the principal benefits delivered by the project. However, as not all impacts were valued, the investment criteria reported for individual investments potentially represent an underestimate of the performance of that investment.

Background & Rationale

Background

The Australian vegetable industry is one of Australia's largest horticultural industries with a five-year estimated annual production value for levied vegetables of $2.9 billion and a production volume of 1.7 million tonnes – Table 1.

Table 1: Levied Australian Vegetable Production and Value 2015/16 to 2019/20

Year Ended 30 June	Production (tonnes)	Gross Value of Production ($m)	Farmgate Value of Production ($m)
2016	1,627,149	2,462.1	2,339.0
2017	1,638,539	2,762.5	2,624.4
2018	1,709,198	2,792.2	2,652.6
2019	1,752,690	3,092.5	2,937.9
2020	1,749,935	3,330.9	3,164.4
Average	1,695,502	2,888.0	2,743.6

Source: Horticulture Statistics Handbook 2018/19 and 2019/20 total vegetable production less estimates for potato, tomato, onion, mushroom, asparagus, sweetpotato, garlic, and ginger. Farmgate value estimated by AgEconPlus.

Australian vegetable growers grow more than 130 different vegetable crops. Most growers are located in New South Wales, followed by Queensland and Victoria. The top three states by value of production are Queensland, Victoria, and South Australia.

The vegetable industry has a research and development (R&D) levy that is used for vegetable RD&E activities across a range of disciplines targeting both on-farm and supply chain sectors in accordance with industry priorities. The levy is collected on most vegetable commodities, with exceptions of particular note being potato, onion, and tomato, and is matched by Hort Innovation with funding from the Australian Government. Some 1,676 growers pay the vegetable levy each year (Hort Innovation, 2017).

Vegetable R&D levy investment is guided by the Vegetable industry's Strategic Investment Plan (SIP). The current SIP has been driven by levy payers and addresses the Australian vegetable industry's needs from 2017 to 2021. Strategies and priorities in the Plan have been driven by a set of five desired outcomes (Hort Innovation, 2017):

1. Growth in the domestic market
2. Growth in export markets
3. Improved farm productivity
4. Increased levels of post-farmgate integration
5. Improved industry capabilities for adoption and innovation.

The peak industry body representing levy-paying vegetable growers is AUSVEG. AUSVEG has responsibilities in advocacy and industry service provision. Services provided by AUSVEG include biosecurity, crop protection, environmental protection, export development, industry development, and industry communication. Effective communication of R&D results is essential to ensure awareness and adoption of R&D outcomes by levy payers.

Rationale

The National Vegetable Extension Network (VegNet) Phase 1 was delivered between April 2016 and April 2019 and included ten regionally-based extension projects for the Australian vegetable industry. Each project employed an Industry Development Officer (IDO). The ten regions covered were (https://ausveg.com.au/resources/development-extension/vegnet/):

- Bowen Gumlu and Far North Queensland
- Wide Bay Burnett
- Lockyer Valley
- New South Wales
- Western Australia
- Northern Territory
- South Australia
- Tasmania
- East Gippsland
- Victoria – Northern, Western, and South Eastern.

Building on the national network developed during VegNet Phase 1, an 'Extension strategy for the Australian vegetable industry' was completed in late 2019 (Coutts et al. 2020). VegNet Phase 2 commenced in April 2020 and was informed by the strategy and implementation plan. This project (VG18003) provided an opportunity to ensure continuity of service delivery for vegetable levy payers through to March 2020 via continuity of VegNet Phase 1 activities and planning for Phase 2 rollout.

Project Details

Summary

Project Code: VG18003.

Title: *National Industry Development of the Vegetable Industry.*

Research Organisation: Various - project managers appointed for each regionally-based extension project, National Coordination provided by Hort Innovation, and the extension strategy was prepared by Coutts J&R; Rural Consulting Group; and Neels Botha Limited.

Principal Investigator: 10 Industry Development Officers discharged the project. Dr Jeff Coutts led the strategy preparation team.

Period of Funding: July 2019 to March 2020.

Objectives

The objective of this project was to provide continuity of extension and capacity building support to levy-paying vegetable growers between VegNet Phase 1 (2016 to 2019) and VegNet Phase 2. The project also supported development of the 'Extension strategy for the Australian vegetable industry'. The strategy was to be rolled out for a 5-year period from 1 July 2020.

The project was to:

- Deliver regional capacity building services to the vegetable industry.
- Increase knowledge of R&D and facilitate the adoption of R&D by vegetable businesses.
- Increase the reach of the vegetable R&D program by engaging stakeholders in the vegetable value chain and developing trusted networks at a regional level.
- Provide linkages to the national industry communications services (delivered by AUSVEG).
- Provide linkages to the National vegetable training initiative.

Logical Framework

Table 2 provides a description of VG18003 in a logical framework.

Table 2: Logical Framework for Project VG18003

Activities	VegNet delivery 2019-20: • Project management, administration, and governance including completion of National VegNet teleconferences, project team meetings, and VG18003 work plan preparation and reporting. Project management provided by Hort Innovation. • Management activities included maintenance of the industry contact database, grower and stakeholder engagement log and partner collaboration. • Stakeholder engagement including growers, advisors, agribusiness service providers, industry associations, researchers, state government agencies, supply chain participants and project delivery partners. • Review of levy-funded R&D activities and materials including, but not limited to, Hort Innovation final project reports. • Packaging of R&D outputs and innovation into a form suitable for growers, advisors, and other vegetable industry stakeholders.

	• Delivery of training workshops, webinars, targeted one-on-one farm visits, linking with other industry events, regional extension strategy stakeholder events and regional R&D forums. • Preparation and distribution of fact sheets, case studies, videos, the e-newsletter, industry articles, and posting of updates on the AUSVEG website and through relevant social media (e.g., Twitter). • Support development of the 'Extension strategy for the Australian vegetable industry' through relevant stakeholder workshops. • Attendance at, and contributions to, Hort Connections, and the Australasian-Pacific Extension (APEN) Conference. Extension strategy preparation: • Situation analysis and environmental scan. • Industry engagement, consultation through regional networks and data collection. • Development of the extension strategy and implementation plan.
Outputs	VegNet delivery 2019-20: • Up-to-date grower and other stakeholder contact resources. • Advice on future vegetable industry extension best practice. • Extension, training, and communication material delivered to growers and other industry stakeholders. Extension strategy preparation: • Definition of extension needs drawn from vegetable industry consultation. • Strategic direction for extension services beyond March 2020. • A plan for improving industry capability for innovation and adoption of R&D.
Outcomes	• Extension delivered in an efficient and effective way through to June 2025. • Increased reach and knowledge of R&D outputs by vegetable growers. • The potential for a positive impact on vegetable grower decision-making, and the adoption of R&D findings. • Adoption of R&D findings targeting business efficiency have the potential to lower production costs or increase crop yields (lowering the average cost of supply). • Adoption of other R&D outputs have the potential to enhance the environmental sustainability of vegetable farms.
Impacts	• [Economic] Lower costs of production for vegetable growers as a result of increased R&D adoption. • [Environmental] An improved farm environment with adoption of research findings that facilitate sustainable vegetable production. • [Social] Additional grower capacity and understanding of innovation and the role of R&D outputs in their businesses. • [Social] Additional extension capacity – project researchers, managers and IDOs. • [Social] Future contribution to improved regional community wellbeing with more profitable and sustainable vegetable growers.

Project Investment

Nominal Investment

Table 3 shows the annual investment (cash and in-kind) in project VG18003 by Hort Innovation and project partners. Project partner investment was made up of in-kind contributions from the regions in which extension projects were focussed. The Hort Innovation total includes funds invested in development of the extension strategy.

Table 3: Annual Investment in the Project VG18003 (nominal $)

Year ended 30 June	Hort Innovation ($)	Other ($)	Total ($)
2020	1,350,595	176,665	1,527,260
Totals	**1,350,595**	**176,665**	**1,527,260**

Source: Individual project agreements including 10 regionally-based extension projects and the strategy development contract.

Program Management Costs

For the Hort Innovation investment the cost of managing the Hort Innovation funding was added to the Hort Innovation contribution for the project via a management cost multiplier (1.162). This multiplier was estimated based on the share of 'payments to suppliers and employees' in total Hort Innovation expenditure (3-year average) reported in the Hort Innovation's Statement of Cash Flows (Hort Innovation Annual Report, various years). This multiplier was then applied to the nominal investment by Hort Innovation shown in Table 3.

Real Investment and Extension Costs

For the purposes of the investment analysis, investment costs of all parties were expressed in 2019/20 dollar terms using the GDP deflator index. No additional costs of extension were included; the project was focussed on the extension of research to growers.

Impacts

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

Table 4: Triple Bottom Line Categories of Principal Impacts from Project VG18003

Economic	• Lower costs of production for vegetable growers as a result of increased R&D adoption.
Environmental	• An improved farm environment with adoption of research findings that facilitate sustainable vegetable production.
Social	• Additional grower capacity and understanding of innovation and the role of R&D outputs in their businesses. • Additional extension capacity – project researchers, managers and IDOs. • Future contribution to improved regional community wellbeing with more profitable and sustainable vegetable growers.

Public versus Private Impacts

Impacts identified in this evaluation are primarily private in nature - lower production costs for vegetable growers and additional grower capacity and understanding of innovation and the role of R&D outputs in their businesses. Public benefits are also created, and these included the potential for an improvement in the farm environment, additional project researcher, manager and IDO capacity and a contribution to regional community wellbeing with more profitable and sustainable vegetable growers.

Distribution of Private Impacts

The impacts on the vegetable industry from investment in this project will be shared along the vegetable supply chain with input suppliers, growers, transporters, wholesalers, exporters, and retailers all capturing a share of the impact. The share of total impact retained by each link in the supply chain will be dependent on a combination of both short and long-term supply and demand elasticities.

Impacts on Other Australian Industries

Impacts on other Australian industries are unlikely – the project generated knowledge targeted specifically at the Australian vegetable industry.

Impacts Overseas

Impacts overseas are unlikely. While some of the knowledge may have relevance to overseas vegetable industries, most of the material was specifically targeted to the Australian vegetable industry and delivered by regionally-based IDOs.

Match with National Priorities

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

Table 5: Australian Government Research Priorities

Australian Government	
Rural RD&E Priorities (est. 2015)	**Science and Research Priorities (est. 2015)**
1. Advanced technology 2. Biosecurity 3. Soil, water and managing natural resources 4. Adoption of R&D	1. Food 2. Soil and Water 3. Transport 4. Cybersecurity 5. Energy and Resources 6. Manufacturing 7. Environmental Change 8. Health

Sources: (DAWR, 2015) and (OCS, 2015)

Alignment with the Vegetable Strategic Investment Plan 2017-2021

The strategic outcomes and strategies of the Vegetable industry are outlined in the Vegetable Industry's SIP 2017-2021 (Hort Innovation 2017). Project VG18003 addressed Outcome 5 ('Improved industry capabilities for adoption and innovation').

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.

A single impact was valued – lower costs of production for vegetable growers as a result of increased research adoption.

Impacts Not Valued

Not all of the impacts identified in Table 4 could be valued in the assessment. Environmental and social impacts were hard to value due to lack of evidence/data, difficulty in quantifying the causal relationship and pathway between VG18003 and the impact and the complexity of assigning monetary values to the impact.

The environmental and social impacts identified but not valued were:

- An improved farm environment with adoption of research findings that facilitate sustainable vegetable production.
- Additional grower capacity and understanding of innovation and the role of R&D outputs in their businesses.
- Additional extension capacity – project researchers, managers and IDOs.
- Future contribution to improved regional community wellbeing with more profitable and sustainable vegetable growers.

Valuation of Impact: Lower costs of production for vegetable growers as a result of increased research adoption

VG18003 delivered continuity of vegetable industry extension services and a comprehensive strategic plan for extension delivery for the 5-year period starting 1 July 2020. Extension continuity followed by well-planned extension has the potential to positively impact vegetable grower decision-making, and the adoption of R&D findings. R&D findings targeting business efficiency have the potential to lower production costs or increase crop yields (lowering the average cost of supply). Adoption of other R&D outputs have the potential to enhance vegetable farm environmental sustainability.

Attribution

Information with the potential to lower production costs is also available through other channels including, but not limited to, AUSVEG delivered communications services, the National vegetable training initiative and extension completed as part of levy-funded research projects. For this reason, a relatively modest attribution factor of 50% has been assumed.

Counterfactual

It is further assumed that in the absence of Hort Innovation investment in VG18003, it is only 10% likely that the project benefits would have been generated from another source.

Summary of Assumptions

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

Table 6: Summary of Assumptions

Variable	Assumption	Source/Comment
Impact: Lower costs of production for vegetable growers as a result of increased research adoption		
Average cost of vegetable production without VG18003.	$1,067/tonne	Farm gate value of vegetable production of $4,182.9 million divide production of 3,645,684 tonnes to give a gross value of $1,147/tonne (See Table 1 above). Typically, profit averages somewhere between 2% and 10% in established horticultural industries and 7% has been used in this analysis to reflect higher value crops covered by the vegetable levy. Therefore, cost of production is $1,067/tonne ($1,147 X 0.93).
Saving in cost of production due to VG18003.	0.25%	A total saving of 2% is assumed by the analyst. However, 1.75% of this gain is attributable to the research rather than extension and extension planning via VG18003.
Annual production of vegetables.	1,695,502 tonnes.	See Table 1 above.
Proportion of vegetable production achieving cost reduction.	75%	Analyst estimate reflecting the comprehensive coverage achieved by IDOs in ten regions.
Year of first impact.	2019/20.	Simultaneous with VG18003 completion – some adoption taking place during the project.
Attribution of impacts to VG18003.	50%	See above text.
Counterfactual.	10%	See above text.
Probability of valuable outputs.	90%	Valuable outputs have been created.
Probability of valuable outcome.	90%	Analyst assumption.
Probability of valuable impact.	90%	Analyst assumption.

Results

All costs and benefits were discounted to 2019/20 using a discount rate of 5%. A reinvestment rate of 5% was used for estimating the Modified Internal Rate of Return (MIRR). The base analysis used the best available estimates for each variable, notwithstanding a level of uncertainty for many of the estimates. All analyses ran for the length of the project investment period plus 30 years from the last year of investment (2019/20) as per the CRRDC Impact Assessment Guidelines (CRRDC, 2018).

Investment Criteria

Tables 7 and 8 show the investment criteria estimated for different periods of benefit for the total investment and the Hort Innovation investment, respectively. The present value of benefits (PVB) attributable to Hort Innovation investment only, shown in Table 8, has been estimated by multiplying the total PVB by the Hort Innovation proportion of real investment (88.4%).

Table 7: Investment Criteria for Total Investment in Project VG18003

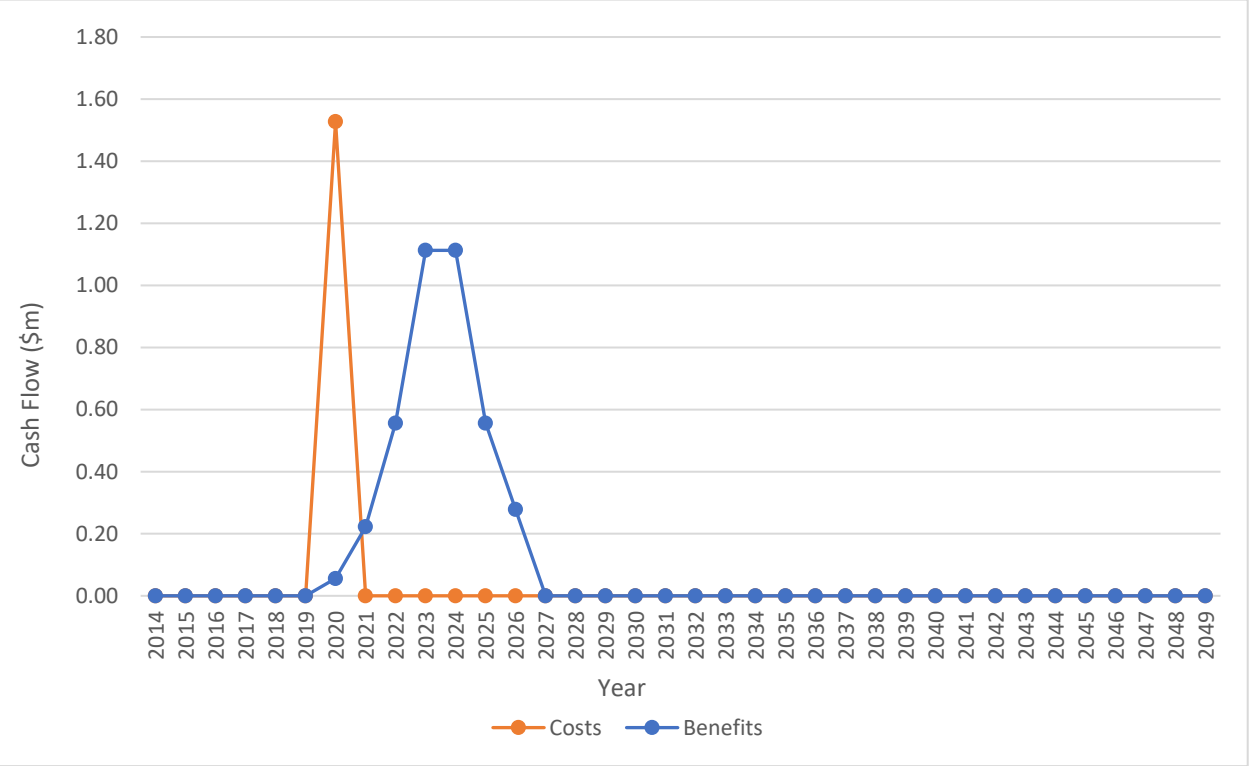
Investment Criteria	Years after Last Year of Investment						
	0	5	10	15	20	25	30
Present Value of Benefits ($m)	0.06	3.08	3.29	3.29	3.29	3.29	3.29
Present Value of Costs ($m)	1.53	1.53	1.53	1.53	1.53	1.53	1.53
Net Present Value ($m)	-1.47	1.56	1.77	1.77	1.77	1.77	1.77
Benefit-Cost Ratio	0.04	2.02	2.16	2.16	2.16	2.16	2.16
Internal Rate of Return (%)	Negative	32.2	33.7	33.7	33.7	33.7	33.7
MIRR (%)	Negative	13.8	11.1	9.4	8.5	7.9	7.5

Table 8: Investment Criteria for Hort Innovation Investment in Project VG18003

Investment Criteria	Years after Last Year of Investment						
	0	5	10	15	20	25	30
Present Value of Benefits ($m)	0.05	2.73	2.91	2.91	2.91	2.91	2.91
Present Value of Costs ($m)	1.35	1.35	1.35	1.35	1.35	1.35	1.35
Net Present Value ($m)	-1.30	1.38	1.56	1.56	1.56	1.56	1.56
Benefit-Cost Ratio	0.04	2.02	2.16	2.16	2.16	2.16	2.16
Internal Rate of Return (%)	Negative	32.2	33.7	33.7	33.7	33.7	33.7
MIRR (%)	Negative	13.8	11.1	9.4	8.5	7.9	7.5

The annual undiscounted benefit and cost cash flows for the total investment for the duration of VG18003 investment plus 30 years from the last year of investment are shown in Figure 1.

Figure 1: Annual Cash Flow of Undiscounted Total Benefits and Total Investment Costs



Sensitivity Analyses

A sensitivity analysis was carried out on the discount rate. The analysis was performed for the total investment and with benefits taken over the life of the investment plus 30 years from the last year of investment. All other parameters were held at their base values. Table 9 present the results. The results are moderately sensitive 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 ($m)	3.89	3.29	2.82
Present Value of Costs ($m)	1.53	1.53	1.53
Net Present Value ($m)	2.37	1.77	1.29
Benefit-cost ratio	2.55	2.16	1.84

A sensitivity analysis was then undertaken for the assumed share of vegetable production adopting research findings. Results are provided in Table 10. The table shows that if only 35% of production adopts extension recommendations, then the project will approach breakeven.

Table 10: Sensitivity to Share of Vegetable Production Adopting Extension Recommendations
(Total investment, 30 years)

Investment Criteria	Share of Vegetable Production Adopting Communication Plan Content		
	35%	50%	75% (base)
Present Value of Benefits ($m)	1.54	2.20	3.29
Present Value of Costs ($m)	1.53	1.53	1.53
Net Present Value ($m)	0.01	0.67	1.77
Benefit-cost ratio	1.01	1.44	2.16

A final sensitivity analysis tested the sensitivity of the investment criteria to production cost saving. The results (Table 11) show that if the decrease in production cost is only 0.1%, and all other assumptions are held the same, then the project will not breakeven.

Table 11: Sensitivity to Decrease in Vegetable Production Cost with Adoption of Extension Recommendations (Total investment, 30 years)

Investment Criteria	**Decrease in Vegetable Production Cost with Vegetable Communication Plan**		
	0.1%	**0.125%**	**0.25% (base)**
Present Value of Benefits ($m)	1.32	1.65	3.29
Present Value of Costs ($m)	1.53	1.53	1.53
Net Present Value ($m)	-0.21	0.12	1.77
Benefit-cost ratio	0.86	1.08	2.16

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 12). 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 12: Confidence in Analysis of Project

Coverage of Benefits	**Confidence in Assumptions**
Medium-high	Medium-Low

Coverage of benefits was assessed as medium-high – the key economic benefit was valued. Confidence in assumptions was rated as Medium-Low – a number of key assumptions were made by the analyst.

Conclusion

VG18003 delivered continuity of vegetable industry extension services and a comprehensive strategic plan for extension delivery for the 5-year period starting July 2020. Extension continuity followed by well-planned extension has the potential to positively impact vegetable grower decision-making, and the adoption of R&D findings. R&D findings targeting business efficiency have the potential to lower production costs or increase crop yields (lowering the average cost of supply). Adoption of other R&D outputs have the potential to enhance vegetable farm environmental sustainability.

Four environmental and social impacts were not valued. When inability to value all impacts is combined with conservative assumptions for the principal economic impacts valued, it is reasonable to conclude that the valuation may be an underestimate of the actual performance of the investment.

Glossary of Economic Terms

Cost-benefit analysis:	A conceptual framework for the economic evaluation of projects and programs in the public sector. It differs from a financial appraisal or evaluation in that it considers all gains (benefits) and losses (costs), regardless of to whom they accrue.
Benefit-cost ratio:	The ratio of the present value of investment benefits to the present value of investment costs.
Discounting:	The process of relating the costs and benefits of an investment to a base year using a stated discount rate.
Internal rate of return:	The discount rate at which an investment has a net present value of zero, i.e. where present value of benefits = present value of costs.
Investment criteria:	Measures of the economic worth of an investment such as Net Present Value, Benefit-Cost Ratio, and Internal Rate of Return.
Modified internal rate of return:	The internal rate of return of an investment that is modified so that the cash inflows from an investment are re-invested at the rate of the cost of capital (the re-investment rate).
Net present value:	The discounted value of the benefits of an investment less the discounted value of the costs, i.e. present value of benefits - present value of costs.
Present value of benefits:	The discounted value of benefits.
Present value of costs:	The discounted value of investment costs.

References

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

Coutts J&R; Rural Consulting Group; Neels Botha Limited (2020) Extension strategy for the Australian vegetable industry'. Report prepared for Hort Innovation.

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

Hort Innovation (2017) Vegetable Industry Strategic Investment Plan 2017-2021. Retrieved from https://www.horticulture.com.au/hort-innovation/funding-consultation-and-investing/investment-documents/strategic-investment-plans/

Hort Innovation (2020) Australian Horticulture Statistics Handbook, 2019/20. 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

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Abbreviations

APEN	Australasian-Pacific Extension Network
CRRDC	Council of Research and Development Corporations
GDP	Gross Domestic Product
GVP	Gross Value of Production
IDO	Industry Development Officer
IRR	Internal Rate of Return
MIRR	Modified Internal Rate of Return
OCS	Office of Chief Scientist Queensland
PVB	Present Value of Benefits
R&D	Research and Development
RD&E	Research, Development and Extension
SIP	Strategic Investment Plan