Hort Innovation

Final Report

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Horticulture Impact Assessment Program:

Appendix 11: Increasing consumption by developing community awareness and benefits of vegetables (VG16025 Impact Assessment)

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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 *VG16025: Increasing consumption by developing community awareness and benefits of vegetables.* The project was funded by Hort Innovation over the period February 2017 to July 2017.

Methodology

The investment was first analysed qualitatively within a logical framework that included activities and outputs, outcomes and impacts. Actual and/or potential impacts then were categorised into a triple bottom line framework. Principal impacts identified were then considered for valuation in monetary terms (quantitative assessment). Past and future cash flows were expressed in 2017/18 dollar terms and were discounted to the year 2018/19 using a discount rate of 5% to estimate the investment criteria and a 5% reinvestment rate to estimate the modified internal rate of return (MIRR).

Results/key findings

Longer term, the investment is likely to contribute to an increase in profitable sales for vegetable growers. To realise this impact further investment in longitudinal research and industry support for 'best bet' community interventions will be required. The investment is also likely to improve health outcomes for a section of the Australian community including high risk population groups. Capacity has been built in relation to understanding community interventions.

Investment Criteria

Total funding from all sources for the project was $0.11 million (present value terms). The investment produced estimated total expected benefits of $0.12 million (present value terms). This gave a net present value of $0.01 million, an estimated benefit-cost ratio of 1.1 to 1, an internal rate of return of 5.5% and a MIRR of 5.3%.

Conclusions

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

Keywords

Impact assessment, cost-benefit analysis, VG16025, vegetable, consumption, community interventions, community gardens, behaviours, attitudes, health

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).

The first series of impact assessments included 15 randomly selected Hort Innovation RD&E investments (projects) worth a total of approximately $9.31 million (nominal Hort Innovation investment). The investments were selected from an overall population of 85 Hort Innovation investments worth an estimated $50.38 million (nominal Hort Innovation investment) where a final deliverable had been submitted in the 2017/18 financial year.

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

Project VG16025: *Increasing consumption by developing community awareness and benefits of vegetables* was selected as one of the 15 investments and was analysed in this report.

General Method

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

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

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

Background & Rationale

Background

The Australian vegetable industry is large and diverse. There are approximately 1,675 vegetable-growing businesses paying the national vegetable levy accounting for 68% of all vegetable-growing farms. These farms are located in all regions of the country and represent more than 130 different vegetable crops. The gross value of vegetable production was approximately $4.35 billion in 2017/18. Per capita consumption of vegetables is static at approximately 88 kg per annum (Vegetable Industry SIP 2017-2021 and Horticulture Statistics Handbook, 2018).

More than 90% of Australians consume less than the recommended daily intake of vegetables. Particularly at risk are those of low socio-economic status (SES) and city dwellers. Low vegetable consumption is associated with multiple health and economic impacts including increased chronic disease and reduced sales of vegetables. It has been estimated that the community cost of low vegetable consumption is $978.5 million per year and that increasing vegetable consumption by 10% would add $22.3 million per year to vegetable grower income (VG15031 delivered by Deloitte Access Economics).

Rationale

Community interventions, such as community gardens, have the potential to promote increased vegetable consumption and lead to enhanced health and wellbeing. As a consequence, a scoping study was required to increase vegetable industry understanding of what community interventions exist and how these interventions may be used to increase vegetable consumption. A community intervention was defined as an intervention that particularly targets risk factors and introduces protective measures to promote a phenomenon.

A comprehensive review of existing literature and preliminary consultations with leaders of community interventions in Australia was required. A map of existing knowledge of the impact of community interventions was to be prepared and areas requiring further research and evaluation were to be identified.

The scoping study was a preliminary investment that was to provide recommendations for a longitudinal intervention-based research initiative that will measure the impact of a cross-section of community interventions on vegetable consumption, behaviours and attitudes.

Project Details

Summary

Project Code: VG16025

Title: Increase consumption by developing community awareness and benefits of vegetables

Research Organisation: Deakin University

Principal Investigator: Rebecca Patrick

Period of Funding: February 2017 to July 2017

Objectives

The aim of this scoping study was to increase the Australian vegetable industry's understanding of what community interventions exist and how these interventions can increase vegetable consumption: The project's objectives were to:

1. Determine which community interventions are being implemented in Australia and overseas to promote vegetable consumption.
2. Determine what (if any) impacts community interventions have had on vegetable consumption including the behaviours, attitudes, knowledge and skills that support vegetable consumption.
3. Identify which Australian community interventions require further research and evaluation to measure real and potential impacts on vegetable consumption.

Logical Framework

The focus of VG16025 was to complete a scoping study of community interventions that might be used to increase vegetable consumption. Table 1 provides a detailed description of the project in a logical framework.

Table 1: Logical Framework for Project VG16025

Activities and Outputs	• A review of the Australian and international literature including 180 peer reviewed journal articles and 200 grey literature documents from government and industry. • Ten interviews with community intervention leaders (community gardens, kitchen gardens, demonstration farms, farmers' markets) and organisations (Cultivating Communities, Foodwise). Data analysed to identify themes and develop findings. • Preliminary mapping of relevant community interventions, particularly those targeted toward high priority groups in Australia (i.e. low SES groups). The mapping exercise was based on the results of the literature review and expert stakeholder interviews. • The project delivered a map of community interventions in Australia that may be amenable to further research and evaluation. • The project did not deliver a sympathetic review of community interventions. However, promising interventions are possible and are characterised by a holistic approach to production, consumption and waste management, and by closer relationships between consumers and producers. Where producers and community have a joint investment in the outcome, the intervention is more likely to succeed. • Community-based food systems combined with policy/tax changes may be suitable to support vegetable consumption in low SES groups. In the United States where policy has supported coupons and subsidies for vulnerable populations, enabling people to shop at farmers markets, programs have increased vegetable intake. • Community interventions are more successful in the general population at increasing willingness to try a wider range of vegetables than increasing the number of serves. • A longitudinal study was recommended that examines the links between vegetable consumption, childhood experiences and adult behaviours/attitudes. • A final report was delivered that documents background to the issue (e.g. vegetable consumption patterns), findings from the literature review and interviews, a map of

	community interventions and recommendations for further research and evaluation. • Hort Innovation Vegetable Strategic Investment Advisory Panel (SIAP) was provided with project findings, findings were published in vegetable industry magazines (e.g. Vegetables Australia). • Research papers were prepared and published by the investigation team. • Vegetable industry is better informed about community interventions that can increase vegetable consumption – opportunities are somewhat limited in general population. • Information is available to inform future investments in community interventions to promote vegetable consumption – a longitudinal study was recommended.
Outcomes	• Vegetable industry has a new, if somewhat limited, 'tool' available to it to increase vegetable sales and improve community health.
Impacts	• Increase in profitable sales for vegetable growers - a longer term and somewhat marginal impact that may be realised following further investment in longitudinal research and industry support for 'best bet' community interventions. • Improved health outcomes for the Australian community including high risk population groups such as low SES. • Increased research capacity in relation to understanding community interventions. • Increased income in regional Australia associated with more profitable and sustainable vegetable industries (marginal long-term spill-over impact).

Project Investment

Nominal Investment

Table 2 shows the annual investment (cash and in-kind) in project VG16025 by Hort Innovation and others. The 'other' investor was Deakin University who provided in-kind access to their library.

Table 2: Annual Investment in the Project VG16025 (nominal $)

Year ended 30 June	Hort Innovation ($)	Other ($)	Total ($)
2017	63,600	3,875	67,475
2018	15,900	0	15,900
Totals	**79,500**	**3,875**	**83,375**

Program Management Costs

For the Hort Innovation investment the cost of managing the Hort Innovation funding was added to the Hort Innovation contribution for the project via a management cost multiplier (1.162). This multiplier was estimated based on the share of 'payments to suppliers and employees' in total Hort Innovation expenditure (3-year average) reported in the Hort Innovation's Statement of Cash Flows (Hort Innovation Annual Report, various years). This multiplier was then applied to the nominal investment by Hort Innovation shown in Table 2.

Real Investment and Extension Costs

For the purposes of the investment analysis, investment costs of all parties were expressed in 2017/18 dollar terms using the GDP deflator index. 'Extension' costs were included in budget totals – Hort Innovation and SIAP briefings, journal and industry media articles. Extension informed a second phase of community intervention research.

Impacts

Table 3 provides a summary of the principal types of impacts delivered by the project. Impacts have been categorised into economic, environmental and social impacts.

Table 3: Triple Bottom Line Categories of Principal Impacts from Project VG16025

Economic	• Increase in profitable sales for vegetable growers - a longer term and somewhat marginal impact that may be realised following further investment in longitudinal research and industry support for 'best bet' community interventions.
Environmental	• Nil.
Social	• Improved health outcomes for the Australian community including high risk population groups such as low SES. • Increased research capacity in relation to understanding community interventions. • Increased income in regional Australia associated with more profitable and sustainable vegetable industries (marginal long-term spill-over impact).

Public versus Private Impacts

Impacts from investment in VG16025 will be both public and private in nature. Public benefits will be realised through improved health outcomes. Private benefits will accrue to vegetable growers who may, in the longer term, increase profitable sales.

Distribution of Private Impacts

Economic benefits from any future increase in profitable sales by vegetable growers will be shared along the supply chain with input suppliers (e.g. seed, chemical, fertiliser), transporters, wholesalers, retailers and consumers all benefiting in the longer term. Specific benefit shares will depend on a combination of both short- and long-term supply and demand elasticities in both the domestic and export vegetable markets.

Impacts on Other Australian Industries

If the strategy to target community interventions to increase vegetable consumption is successful it will occur at the expense of other food suppliers – either other wholefoods (e.g. fresh fruit, meat) or the processed food sector (e.g. manufactured or convenience foods).

Impacts Overseas

The literature review completed and published as part of VG16025 will be relevant to policy interventions and marketing strategies in other countries.

Match with National Priorities

The Australian Government's Science and Research Priorities and Rural RD&E priorities are reproduced in Table 4. The project findings and related impacts will contribute primarily to Science and Research Priority 1 and 8.

Table 4: Australian Government Research Priorities

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

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

Match with Vegetable Strategic Investment Plan 2017-2021 Priorities

The strategic outcomes and strategies of the vegetabe industry are outlined in the Vegetable Strategic Investment Plan 2017-2021[1] (Hort Innovation, 2016). Project VG16025 addressed Vegetable Strategic Investment Plan (SIP) Outcome 1, Strategies 1.1 and 1.3.

Valuation of Impacts

Impacts Valued

Analyses were undertaken for total benefits that included future expected benefits. A degree of conservatism was used when finalising assumptions, particularly when some uncertainty was involved. Sensitivity analyses were undertaken for those variables where there was greatest uncertainty or for those that were identified as key drivers of the investment criteria.

A single key impact was valued – increase in profitable sales for vegetable growers. The impact is longer term and requires further investment in longitudinal research and industry support for 'best bet' community interventions.

Impacts Not Valued

Not all of the impacts identified in Table 3 could be valued in the assessment. The improved health impact could not be valued due to unclear links between additional vegetable consumption by community groups and the estimate of total community cost of low vegetable consumption prepared by Deloitte Access Economics (2016). Other social impacts were hard to value due to lack of evidence/data, difficulty in quantifying the causal relationship and pathway between VG16025 and the impact and the complexity of assigning monetary values to the impact.

The social impacts identified but not valued were:

- Improved health outcomes for the Australian community including high risk population groups.
- Increased research capacity in relation to understanding community interventions.
- Increased income in regional Australia associated with more profitable and sustainable vegetable industries.

Valuation of Impact: Increase in Profitable Sales for Vegetable Growers

The VG16025 investment provided improved understanding of successful community interventions that might be used to increase Australian vegetable consumption. Successful community interventions require further longitudinal study and no benefits would be realised by the Australian vegetable industry for an additional five years. At the completion of the longitudinal study, the vegetable industry will then be in a position to support individual community interventions with vegetable industry resources. Potentially, 100 community intervention groups might be supported and it is assumed that each group has 300 members. It is further assumed that additional investment in these groups is able to increase average per capita consumption by group members from 88kg to 101.2kg per annum – a 15% increase on the national average for vegetable consumption.

Attribution

A 30% attribution factor has been assumed for VG16025's contribution to increased vegetable sales targeted through community intervention groups. A low attribution factor has been assumed to allow for the cost of the longitudinal study and industry investment in community intervention groups.

Counterfactual

The scenario assumed if the investment had not been made is that the increase in profitable vegetable sales attributable to community intervention groups would not have occurred.

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

Summary of Assumptions

A summary of the key assumptions made for valuation of the impacts is shown in Table 5.

Table 5: Summary of Assumptions

Variable	Assumption	Source/Comment
Impact 1: Increase in Profitable Vegetable Sales		
Increase in vegetable sales attributable to community intervention groups.	112.5t/year	100 community intervention groups each with 300 members who each increase their vegetable consumption from 88kg to 101.2kg per annum.
Grower profit on increased vegetable sales.	$83.50/tonne	Farm gate value of vegetable production of $4,345.7 million divide production of 3,695,345 tonnes to give a gross value of $1,176/tonne (Hort Innovation, 2018). Grower profit is 7.1% of gross value (IBIS World, 2018).
Year of first impact.	2023/24	Consultant estimate that recognises no benefits will be realised until there is additional investment in longitudinal research.
Attribution.	30%	Consultant estimate made after considering additional investment required in longitudinal research and industry investment in community intervention groups.

Results

All costs and benefits were discounted to 2018/19 using a discount rate of 5%. A reinvestment rate of 5% was used for estimating the Modified Internal Rate of Return (MIRR). The base analysis used the best available estimates for each variable, notwithstanding a level of uncertainty for many of the estimates. All analyses ran for the length of the project investment period plus 30 years from the last year of investment (2017/18) as per the CRRDC Impact Assessment Guidelines (CRRDC, 2018).

Investment Criteria

Tables 6 and 7 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 7, has been estimated by multiplying the total PVB by the Hort Innovation proportion of real investment (96.0%). Because Hort Innovation's share of total investment is so large, both sets of investment criteria are the same.

Table 6: Investment Criteria for Total Investment in Project VG16025

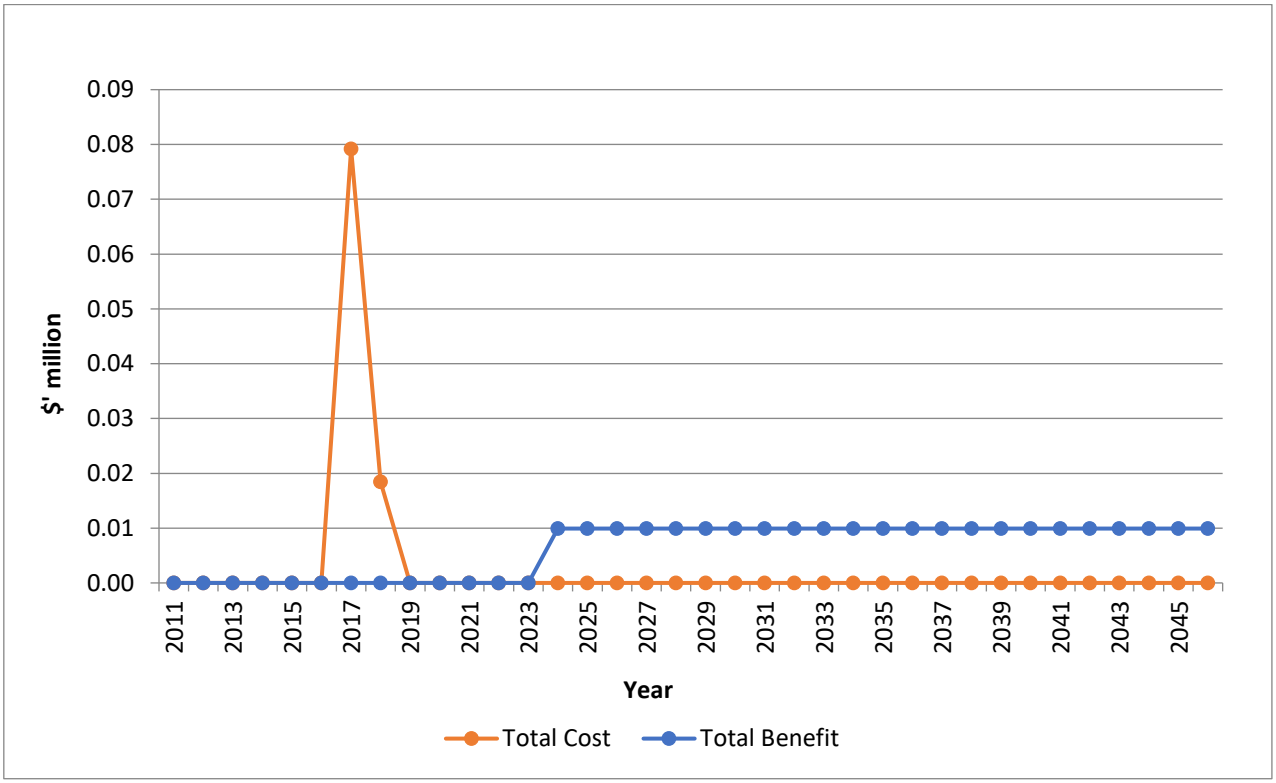
Investment Criteria	Years after Last Year of Investment						
	0	**5**	**10**	**15**	**20**	**25**	**30**
Present Value of Benefits ($m)	0	0	0.04	0.06	0.08	0.10	0.12
Present Value of Costs ($m)	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Net Present Value ($m)	-0.11	-0.11	-0.07	-0.04	-0.02	-0.01	0.01
Benefit-Cost Ratio	0	0	0.33	0.59	0.79	0.95	1.08
Internal Rate of Return (%)	negative	negative	negative	0.1	3.2	4.7	5.5
MIRR (%)	negative	negative	negative	1.6	3.9	4.8	5.3

Table 7: Investment Criteria for Hort Innovation Investment in Project VG16025

Investment Criteria	Years after Last Year of Investment						
	0	5	10	15	20	25	30
Present Value of Benefits ($m)	0	0	0.03	0.06	0.08	0.10	0.11
Present Value of Costs ($m)	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Net Present Value ($m)	-0.10	-0.10	-0.07	-0.04	-0.02	0	0.01
Benefit-Cost Ratio	0	0	0.33	0.59	0.79	0.95	1.08
Internal Rate of Return (%)	negative	negative	negative	0.1	3.2	4.7	5.5
MIRR (%)	negative	negative	negative	1.6	3.9	4.8	5.3

The annual undiscounted benefit and cost cash flows for the total investment for the duration of VG16025 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 8 present the results. The results are sensitive to the discount rate and this reflects the lag between project investment and the realisation of project benefits.

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

Investment Criteria	Discount rate		
	0%	5%	10%
Present Value of Benefits ($m)	0.25	0.12	0.06
Present Value of Costs ($m)	0.10	0.11	0.12
Net Present Value ($m)	0.15	0.01	-0.05
Benefit-cost ratio	2.54	1.08	0.53

A sensitivity analysis was then undertaken on the number of community intervention groups supported. With all other assumptions held the same and 50 community groups increasing vegetable consumption, project costs exceed project benefits – Table 9.

Table 9: Sensitivity to Number of Community Groups Supported
(Total investment, 30 years)

Investment Criteria	**Number of Community Groups Supported**		
	50	**100 (base)**	**150**
Present Value of Benefits ($m)	0.05	0.12	0.16
Present Value of Costs ($m)	0.11	0.11	0.11
Net Present Value ($m)	-0.06	0.01	0.05
Benefit-cost ratio	0.54	1.08	1.62

A final sensitivity analysis tested increase in vegetable consumption realised by members of community intervention groups. If vegetable consumption increase attributable to community intervention groups is only 10% then project costs will exceed project benefits – Table 10.

Table 10: Sensitivity to Increase in Vegetable Consumption
(Total investment, 30 years)

Investment Criteria	**Increase in Vegetable Consumption**		
	10%	**15% (base)**	**20%**
Present Value of Benefits ($m)	0.07	0.12	0.15
Present Value of Costs ($m)	0.11	0.11	0.11
Net Present Value ($m)	-0.04	0.01	0.04
Benefit-cost ratio	0.72	1.08	1.44

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-high. The key benefit, increase in profitable sales for vegetable growers, was quantified. Other benefits – improved health outcomes and increased research capacity, were not valued. Consequently, the investment criteria as provided by the valued benefits are likely to be underestimated to some degree.

Confidence in assumptions was rated as medium-low. Analysis is reliant on a number of assumptions.

Conclusion

Longer term, the investment in VG16025 is likely to contribute to an increase in profitable sales for vegetable growers. To realise this impact further investment in longitudinal research and industry support for 'best bet' community interventions will be required. The investment is also likely to improve health outcomes for a section of the Australian community including high risk population groups. Capacity has been built in relation to understanding community interventions.

Total funding from all sources for the project was $0.11 million (present value terms). The investment produced estimated total expected benefits of $0.12 million (present value terms). This gave a net present value of $0.01 million, an estimated benefit-cost ratio of 1.1 to 1, an internal rate of return of 5.5% and a modified internal rate of return of 5.3%.

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

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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Abbreviations

CRRDC	Council of Research and Development Corporations
DAWR	Department of Agriculture and Water Resources (Australian Government)
GDP	Gross Domestic Product
GVP	Gross Value of Production
IRR	Internal Rate of Return
MIRR	Modified Internal Rate of Return
OCS	Office of Chief Scientist Queensland
PVB	Present Value of Benefits
RD&E	Research, Development and Extension
SES	socio-economic status
SIAP	Strategic Investment Advisory Panel
SIP	Strategic Investment Plan