Horticulture Impact Assessment Program:

Appendix 8: Where should all the trees go? Investigating the impact of tree canopy cover on socio-economic status and wellbeing in LGAs (NY16005 Impact Assessment)

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Project code:

MT18011

Date:

19 September 2019

Funding statement:

This project has been funded by Hort Innovation, using research and development levies and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

Publishing details:

Published and distributed by: Hort Innovation

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Contents

Tables

Figures

Executive Summary

What the report is about

This report presents the results of an impact assessment of a Horticulture Innovation Australia Limited (Hort Innovation) investment in *Where should all the trees go? Investigating the impact of tree canopy cover on socio-economic status and wellbeing in LGAs (NY16005).* The project was funded by Hort Innovation over the period November 2016 to May 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

The investment in this nursery industry project produced data associated with relationships between the extent of tree canopy cover and socio-economic variables including health, economic status and exposure to temperature in 139 local government areas (LGAs) across Australia.

Investment Criteria

Total funding from all sources for the project was $0.21 million (present value terms). The investment produced an estimated total expected benefit of $0.67 million (present value terms). This gave a net present value of $0.46 million, an estimated benefit-cost ratio of 3.17 to 1, an internal rate of return of 10.8% and a MIRR of 9.6%.

Conclusions

The investment in NY16005 will likely contribute to improved allocation of resources for new tree plantings across a number of Australian LGAs.

Keywords

Impact assessment, cost-benefit analysis, nursery industry, tree canopy cover, LGAs, socioeconomic status, heat exposure

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 were representative of the Hort Innovation investment across six, pre-defined project size classes.

Project *NY16005: Where should all the trees go? Investigating the impact of tree canopy cover on socio-economic status and wellbeing in LGAs* was randomly 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 nursery industry produces live plants for various uses such as production of forestry products, fruit, vegetables as well as landscaping for households and community areas. It is a very large horticultural industry with value of production of $2.33 billion for the year ending June 2018; wholesale value was higher at $2.45 billion in the same year (Australian Horticulture Statistics Handbook 2017/18).

The marketing and research and development activities of the nursery industry are guided by the industry's Strategic Investment Plan (SIP) developed by Hort Innovation. The activities are funded by levies payable on nursery plants produced in Australia; the marketing and R&D levy funds are managed by Hort Innovation. The current SIP has been driven by levy payers and addresses the Australian nursery industry's needs from 2017 to 2021.

The 202020 Vision is a national collaborative campaign to increase urban green space in Australia by 20% by the year 2020. The campaign commenced in 2013. The simple rationale for the campaign is that plants and trees cool down cities, reduce pollution, get people out and about and make us healthier, happier and more productive (202020 vision, 2019).

Rationale

The project was developed to inform the nursery industry and the 202020 vision about priority areas for canopy cover planting. More specifically, the project set out to identify Australian Local Government Areas (LGAs) where residents have a high chance of poor health outcomes, reduced capacity to pay for essentials such as medical care, a high exposure to temperature and a low canopy cover.

The approach was to provide updated information for canopy cover for each of the 139 metropolitan LGAs and then examine various relationships including canopy cover and socioeconomic variables, health data and heat island intensity from satellite imagery.

Project Details

Summary

Project Code: NY16005

Title: Investigating the impact of tree canopy cover on socio-economic status and wellbeing in LGAs (NY16005)

Research Organisation: Royal Melbourne Institute of Technology

Project Leader: Marco Amati

Period of Funding: November 2016 to May 2017

Objectives

The objective of the project was to identify and inform the nursery industry and the 202020 Vision of the areas for priority cover planting. More specifically, the objective was to identify the LGAs where people have a high chance of poor health outcomes, limited ability to meet basic expenses (e.g. medical care), a high exposure to temperature, and low canopy cover.

Logical Framework

Table 1 following provides a detailed description of the project in a logical framework.

Table 1: Logical Framework for Project NY16005

Activities	Major project activities undertaken throughout the project included:
	• Personnel at the University of Western Australia and CSIRO were engaged as subcontractors.
	• A monitoring and evaluation plan was developed by the project team.
	• There followed the design and application of an i-Tree sampling method that incorporates Nearmap images to more accurately estimate urban tree canopy cover using the latest available images for the 139 LGAs.
	• Identifying and assembling socioeconomic and health data was carried out so that such data could be compared with the urban tree canopy estimates. The data included:
	  • Self-assessed health from the Australian Health Survey, Chronic diseases modelled estimates, and Health Risk actors (Specifically weight).
	  • Indices of Relative Socio-Economic Disadvantage, Relative Socio-Economic Advantage and Disadvantage, Education and Occupation, and Index of Economic Resources.
	• Identifying and assembling information on heat data was effected; heat Islands (HI) are the difference in temperature between an urban and a corresponding rural area.
	• A multivariate statistical technique was used to identify relationships between the variables assembled and an index of vulnerability was developed.
	• Processes were developed by the team and relevant literature to justify how trees can interact with the index to reduce vulnerability; this produced a new and synthetic index of vulnerability adjusted for Green Space for all 139 LGAs.
	• Communication with stakeholders was undertaken to inform them of the findings of the study.

	• For example, the project team visited every urban LGA involved and offered them details of the report that were specific to their specific LGA.
Outputs	• An improved i-Tree sampling method that more accurately estimates urban tree canopy cover • Vulnerability indices for LGAs and maps for the different States were produced. • The project team interacted with key industry stakeholders and the Republic of Everyone to explain the approach and findings of the project. • The project findings formed the centrepiece of the 201 202020 Vision tour and appears prominently on the website; the Republic of Everyone team continues to showcase the findings at event speaking opportunities where the graphs draw significant interest from all levels of government and other stakeholders (Anthony Kachenko, pers. comm., August 2019). • Findings were presented at a state level in Victoria, South Australia, Western Australia and New South Wales and feedback was received from councils stating that they refer to the report (Anthony Kachenko, pers. comm., 2019).
Outcomes	• The number of urban LGAs with an urban forest strategy (or equivalent) in place rose from 15 of 139 in 2013 to 84 in 2017. The 2017 number is an official measure that was based on another Hort Innovation project (NY17005). As of August 2019, it is estimated that 120 of the 139 LGAs now have an urban forest strategy (Anthony Kachenko, pers. comm., August 2019). • Also, State Governments now have urban greening targets. The R&D has been shared with State Government Departments to support their efforts including the establishment of greening targets (Anthony Kachenko, pers..comm., August 2019). • A range of stakeholders in the 202020 Vision are now more informed of the extent of canopy cover across Australian LGAs in urban areas. • An increase has occurred in the evidence base concerning the provision of tree canopy cover for LGAs, particularly those with high vulnerability indices. • A potential increase in canopy cover has occurred in some LGAs with high vulnerability indices.
Impacts	• A potential increase in quality of life and wellbeing for a proportion of people in some LGAs. • A potential increase in biodiversity in some LGAs.

Project Investment

Nominal Investment

Table 2 shows the annual investment made in Project NY16005 by Hort Innovation. All funding was provided by Hort Innovation.

Table 2: Annual Investment in Project NY16005 (nominal $)

Year ended 30 June	HORT INNOVATION ($)	TOTAL ($)
2017	147,771	147,771

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 purposes of the investment analysis, the investment costs of all parties were expressed in 2017/18 dollar terms using the Implicit Price Deflator for Gross Domestic Product (ABS, 2018). No additional costs of extension were included as the project communicated findings to 202020 Stakeholders within the project activities.

Impacts

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

Table 3: Triple Bottom Line Categories of Principal Impacts from Project NY16005

Economic	• Nil
Environmental	• Potential increase in the value of biodiversity in some LGAs.
Social	• Health and wellbeing improvement in some urban LGAs due to the identification of priority areas and associated actions, compared to what otherwise would have been delivered by the 202020 vision without the project investment.

Public versus Private Impacts

The major impact identified from the investment is predominantly a social impact due to total health and wellbeing improvements across LGAs due to the identification of priority areas and associated action by stakeholders.

Distribution of Private Impacts

No private impacts were delivered.

Impacts on Other Australian Industries

It is likely that most impacts will be confined to the population in priority LGAs.

Impacts Overseas

There are assumed to be no impacts to overseas interests.

Match with National Priorities

The Australian Government's Science and Research Priorities and Rural RD&E priorities are reproduced in Table 4. The project outcomes and related impacts will contribute primarily to Rural RD&E Priority 4, and to Science and Research Priority 7 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)

Alignment with the Nursery Strategic Investment Plan 2017-2021

The strategic outcomes and strategies of the nursery industry are outlined in the Nursery Strategic Investment Plan 2017-2021[1] (Hort Innovation, 2017). Project NY16005 primarily addressed Outcome 1 (Strategy 1.5) with some contribution to Outcome 4 (through Strategy 4.1).

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.

Impact Not Valued

Not all of the impacts identified in Table 3 could be valued in the assessment. The impact not valued was:

- A potential increase in the value of biodiversity. This impact was not valued, again largely due to a lack of data to support credible assumptions. Also, to some extent, this impact may have contributed to the health and wellbeing impact that was valued.

Summary of Assumptions for Valuation

The impact that was valued was the health and wellbeing improvement of part of the population in some urban LGAs with high vulnerability.

An initial basis for making specific assumptions

An accepted method for valuation of improved health and wellbeing can be based on an estimate of the value of a statistical life (VSL) from which in turn can be derived the value of a statistical life year (VSLY). Reduced morbidity and/or increased well-being can be valued through the VSLY by adjusting subjectively for the reduced severity or the health severity and period of the injury/ailment.

VSL is usually assumed to be the life of a young adult with at least 40 years of life ahead (Abelson, 2008). The VSL is the willingness to pay for avoiding an immediate death of a healthy individual in middle age. International research using willingness to pay studies usually place the value of life at somewhere between $AUD1.8 and $AUD4.3 million (Applied Economics, 2003). The Abelson (2003) figure of $2.5 million for a VSL has been used as a standard value in several studies by Agtrans Research (Chudleigh and Simpson, 2008; Chudleigh et al., 2012).

Quality of a life year

Improvements in health or increases in wellbeing can be valued through a VSLY adjusted by a quality of life year (QALY) index (a well-being index covering a scale of 0 to 1 where 0 = death and 1 = a year of perfect health).

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

Alternatively, the value of a statistical life year can be adjusted by disability weights to give a disability adjusted life year (DALY) index, covering a scale of 0 to 1 where 0 is perfect health and 1 is death. Reduced health and wellbeing, mental illness, stress and anxiety can also be valued via QALY or DALY indices.

Assumptions required for valuing impact of NY16005

The key data (apart from research costs) required to carry out impact valuation using such indices include:

Cost of tree planting in highly vulnerable areas: The simplest assumption for the cost of tree planting in areas with higher vulnerability is that the cost would be the same with and without project NY16005. The principal impact the project is assumed to make is that more the trees will be planted in areas with higher vulnerability to health and socioeconomic disadvantage and less in areas with less vulnerability.

The value of a statistical life (VSL) (for mortality): The Abelson (2003) figure of $2.5 million can be used as a standard value. This is the Willingness to Pay for avoiding an immediate death of a healthy individual in middle age (life expectancy of 40 additional years. Given a discount rate of 5%, this equates to a value of a statistical life year (VSLY) of $150,000.

Improvement in the (QALY) index due to Project NY16005

(a) First, an assumption must be made as to the improvement offered by the project as measured by the QALY index.

(b) Using the QALY index, it is assumed that on average, the index increases from 0.20 to 0.21 due to the project for each individual affected. Assuming the VSLY is $150,000 per annum, the value of improvement gained by each individual affected would be $1,500 per person per annum

Number of people subject to an improvement in the QALY index

The 139 LGAs subject to the canopy analysis cover 68% of the Australian population (Jacobs et al., 2014). The population of Australia is currently estimated at just over 25 million (ABS, 2018b).

The average population of the LGAs therefore is estimated at 68% of 25 million, or 17 million. The average population per LGA is estimated at 122,000. Assuming 2 vulnerable LGAs are affected by the prioritisation by vulnerability, and that 1% of those populations experience some lift in health and wellbeing, the number of people that may gain from the project would be estimated at 2,446 (122,000 x 2 x 1%).

First year of improvement

The first year of improvement in health and wellbeing for those affected is assumed to be 2030, rising to the maximum improvement in health and wellbeing in 2034.

A summary of the key assumptions made for valuation of the improvement in health and wellbeing due to the project is provided in Table 5.

Table 5: Summary of Assumptions for Impact Valued

Variable	Assumption	Source/Comment
Impact 1: Improved health and wellbeing of some LGA populations		
Value of a Statistical Life (VSL)	$2.5 million	Abelson (2003)
Value of a Statistical Life Year (VSLY)	$150,000	VSL, discount rate 5%, 40 years
Average QLFY before change	0.20	Agtrans Research
Average QLFY after canopy increase	0.21	Agtrans Research
Increase in QLFY	0.01	0.21-0.20
Value of increase per person	$1,500	0.01 x $150,000
Population in 139 LGAs as % Australia	68%	Jacobs et al (2014)
Australian population	25 million	ABS, 2018b
Population in LGAs	17,000,000	68% x 25 million
Number of LGAs	139	Project proposal
Average population per LGA	122,302	25 million / 139
Number of highly vulnerable LGAs affected by prioritisation change	2	Agtrans Research
Potential target population who could potentially benefit	244,604	122,302 x 2

Attribution to realisation of benefit	50%	Agtrans Research (an attribution factor has been applied as factors other than the impact of the project will contribute to the estimated benefits)
Actual number of people who may benefit within a single LGA	1%	Agtrans Research
Number of people that may benefit from the 2 LGAs	2,446	244,604 x 1%
Probability of outcome	25%	Agtrans Research
Probability of impact given outcome	25%	
Year in which improvement commences	2030	
Year of maximum improvement	2034	
Counterfactual		
Without the NY 16005 project, it is assumed that the same number of trees will be planted due to 202020. This counterfactual does not result in any major difference to the cost of tree planting between the with and without project scenarios. The major difference due to the NY 16005 investment will be a change in prioritisation by stakeholders so that more trees may be planted, and may be planted sooner, in LGAs with higher vulnerability and less in LGAs with lower vulnerabilities.		

Results

All costs and benefits were discounted to 2017/18 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 benefits for the total investment and the Hort Innovation investment alone.

Table 6: Investment Criteria for Total Investment in Project NY16005

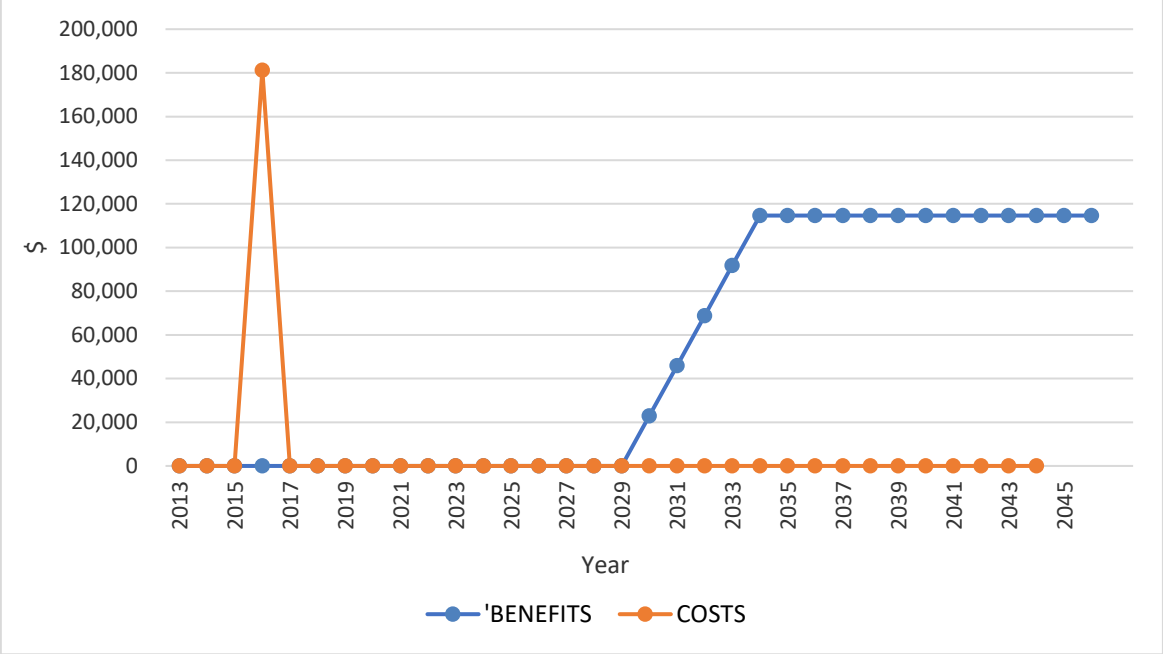
Investment Criteria	**Years after Last Year of Investment**						
	0	**5**	**10**	**15**	**20**	**25**	**30**
Present Value of Benefits ($m)	0.00	0.00	0.00	0.04	0.28	0.50	0.67
Present Value of Costs ($m)	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Net Present Value ($m)	-0.21	-0.21	-0.21	-0.17	0.07	0.29	0.46
Benefit-Cost Ratio	0.00	0.00	0.00	0.19	1.33	2.36	3.17
Internal Rate of Return (%)	negative	negative	negative	negative	6.7	9.7	10.8
MIRR (%)	negative	negative	negative	negative	6.8	9.2	9.6

Table 7: Investment Criteria for Hort Innovation Investment in Project NY16005

Investment Criteria	**Years after Last Year of Investment**						
	0	**5**	**10**	**15**	**20**	**25**	**30**
Present Value of Benefits ($m)	0.00	0.00	0.00	0.12	0.37	0.57	0.67
Present Value of Costs ($m)	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Net Present Value ($m)	-0.21	-0.21	-0.21	-0.09	0.16	0.36	0.46
Benefit-Cost Ratio	0.00	0.00	0.00	0.58	1.78	2.71	3.17
Internal Rate of Return (%)	negative	negative	negative	negative	6.7	9.7	10.8
MIRR (%)	negative	negative	negative	negative	6.8	9.2	9.6

The annual undiscounted benefit and cost cash flows for the total investment for the duration of the NY16005 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 presents the results. The results show a high sensitivity to the discount rate due to the extended gap between the project investment and the potential impacts being realised.

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

Investment Criteria	**Discount rate**		
	0%	**5%**	**10%**
Present Value of Benefits ($m)	1.72	0.67	0.28
Present Value of Costs ($m)	0.18	0.21	0.24
Net Present Value ($m)	1.54	0.46	0.04
Benefit-cost ratio	9.49	3.17	1.17

A sensitivity analysis was then undertaken for optimistic and pessimistic scenarios regarding two important assumptions that drive the impact. Results are provided in Table 9. The pessimistic scenario is very close to a break-even result.

Table 9: Sensitivity to Optimistic and Pessimistic Assumptions
(Total investment, 30 years)

Investment criteria	**Pessimistic**	**Base**	**Optimistic**
	QLFY change (half Base); % target population benefitting (0.5%)	QLFY change (0.01); % target population benefitting (1%)	QLFY change (double Base); % target population benefitting (2%)
Present Value of Benefits ($m)	0.17	0.67	2.66
Present Value of Costs ($m)	0.21	0.21	0.21
Net Present Value ($m)	-0.04	0.46	2.45
Benefit-cost ratio	0.79	3.17	12.69

Confidence Rating

The results produced are highly dependent on the assumptions made, some of which are especially 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 10). 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 10: Confidence in Analysis of Project

Coverage of Benefits	Confidence in Assumptions
Medium-High	Low

Coverage of benefits was assessed as Medium-High. The most important impact (health and wellbeing improvement in some LGA areas) was valued. Any impact related to an increase in tree nursery profits was not valued. The impact relating to improved biodiversity in some LGA areas with high vulnerability was not valued but could be considered as part of the wellbeing improvement and would be offset to some extent by reduced biodiversity in other low vulnerability areas.

Confidence in assumptions for valuation of impacts was rated as Low as the assumptions made were not supported by surveys or other forms of evidence.

Conclusion

The investment in NY16005 is likely to contribute to improved health and wellbeing of individuals in some LGA areas of Australia due to the identification of LGAs with high vulnerability and the increased likelihood of favourable canopy cover outcomes being delivered via prioritisation of tree planting in some LGAs with high vulnerability.

Total funding from all sources for the project was $0.21 million (present value terms). The investment produced estimated total expected benefits of $0.67 million (present value terms). This gave a net present value of $0.46 million, an estimated benefit-cost ratio of 3.17 to 1, an internal rate of return of 10.8% and a modified internal rate of return of 9.6%.

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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Acknowledgements

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

Specific acknowledgments:
Marco Amati, Royal Melbourne Institute of Technology
Adam Briggs, Head of Data & Insights, Hort Innovation
Anthony Kachenko, General Manager - Extension and Adoption, Hort Innovation

Abbreviations

ABS	Australian Bureau of Statistics
CRRDC	Council of Research and Development Corporations
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DALY	Disability Adjusted Life Year
DAWR	Department of Agriculture and Water Resources (Australian Government)
GDP	Gross Domestic Product
GVP	Gross Value of Production
IRR	Internal Rate of Return
LGA	Local Government Area
MIRR	Modified Internal Rate of Return
OCS	Office of Chief Scientist Queensland
PVB	Present Value of Benefits
QALY	Quality of Life Year
RD&E	Research, Development and Extension
SIP	Strategic Investment Plan
VSL	Value of Statistical Life
VSLY	Value of a Statistical Life year