Hort Innovation

Final Report

Industry-specific impact assessment Program: Nursery

2021 Aggregated Report

Impact analyst

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AgEconPlus and Agtrans Research

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Executive Summary

What the report is about

This report describes a process for evaluating a series of project investments in research, development, and extension (RD&E) by Horticulture Innovation Australia Limited (Hort Innovation) through the Nursery (NY) Industry Fund. The process has been used to identify and report the impacts from, and economic performance of, six individual project investments. Three of the project investments were drawn at random from a population of completed projects that was defined as projects that (1) had a final deliverable submitted during the period 1 July 2015 to 30 June 2020, (2) included Hort Innovation levy funds, (3) had at least 50% of the total investment sourced from the named industry (NY), and (4) had a total project value greater than, or equal to, $80,000 over each project's lifetime. The remaining three projects also were drawn at random and completed in the five year period to 30 June 2020 with a total project value greater than, or equal to, $80,000 but were previously evaluated under a separate Hort Innovation impact assessment program.

Methodology

Hort Innovation specified that three new individual RD&E projects were to be selected and evaluated for the NY industry impact assessments under Project MT20008 in addition to three NY RD&E projects that had previously been evaluated under a separate Hort Innovation impact assessment program.

First, a stratified random sampling approach was used to select the three new RD&E projects for evaluation from a total population of 19 NY RD&E projects. The random sample was stratified across two of five NY industry investment priority areas defined by the Nursery Industry Strategic Investment Plan 2017-2021. The stratified random sample also was constructed to represent at least 10% (by value) of the total investment in the project population (Hort Innovation managed investment only, in nominal dollar terms).

The three projects that had been previously evaluated under a separate Hort Innovation impact assessment program then were updated and added to the current NY sample. The update involved revising the benefit and cost cash flows to real dollar terms and updating the discounting to ensure that the cash flows would be consistent with the new NY project evaluations. Thus, the overall sample of six projects, including the three new projects and three previously evaluated projects, was selected to be loosely representative of the spectrum of RD&E investments under the Hort Innovation NY levy fund for investments completed in the five-year period ending June 2020.

Each of the six projects was evaluated using a logical framework approach that reported project objectives, activities and outputs, outcomes, and impacts. Impacts for each project were categorised and described in a triple bottom line framework. Some of the impacts identified were then valued in monetary terms. Project Principal Investigators, Hort Innovation personnel and industry personnel were consulted and assisted with information relevant to the project descriptions as well as to assumptions relevant to the impact valuations.

The investment criteria reported for the individual projects included the present value of costs, the present value of benefits, Net Present Value (NPV), Benefit-Cost Ratio (BCR), Internal Rate of Return (IRR) and Modified IRR. The investment criteria that were estimated and reported include the investment criteria for each project investment and the aggregate investment criteria for all six projects.

Results/key findings

The six RD&E projects subjected to impact assessment were found to have produced a range of economic, environmental and social impacts. Across all six projects assessed there were 28 individual impact types identified. Of these, approximately 46% were identified as economic (13), 25% environmental (7) and 29% social (8).

Aggregate investment criteria

Total funding from all sources for the six project investments totalled $2.21 million (present value terms) and produced estimated total expected benefits of $12.85 million (present value terms). This gave an aggregate weighted average BCR of approximately 5.83 to 1 after 30 years at a 5% discount rate. The results are consistent with other, similar evaluations of agricultural RD&E investments conducted by the evaluation team where average BCRs have been estimated between 2 and 6 to 1.

Conclusions

The 2021 NY sample was considered loosely representative of the investment in Hort Innovations overall NY industry RD&E porfolio for the 2015/16 to 2019/20 period. Therefore, the impacts and aggregate investment criteria estimated are broadly indicative of impacts and performance across the broader suite of NY RD&E undertaken by Hort Innovation.

Thus, the results reported should be viewed positively but interpreted with some caution by Hort Innovation, the Australian nursery industry, and policy personnel responsible for allocation of public funds.

Keywords

MT20008, impact assessment, cost-benefit analysis, nursery industry, aggregate assessment, investment criteria, RD&E performance

Introduction

All research and development (R&D) and marketing levy investments undertaken by Horticulture Innovation Australia Limited (Hort Innovation) are guided by, and aligned to, specific investment outcomes, defined through a Strategic Investment Plan (SIP). The SIP guides investment of the levy to achieve each industry's vision. The current industry SIPs[1] apply for the financial years 2016/17 – 2020/21.

In accordance with the Organisational Evaluation Framework, Hort innovation has the obligation to evaluate the performance of its investment undertaken on behalf of industry. This impact assessment program addresses this requirement through conducting a series of industry-specific ex-post independent impact assessments of the berries (RB + BS), mango (MG), turf (TU), and nursery (NY) research, development, and extension (RD&E) investment funds.

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

- Four RB + BS projects were chosen worth $1.44 million (nominal Hort Innovation investment) from an overall population of 16 projects worth an estimated $8.59 million,
- Three MG projects worth $1.77 million (nominal Hort Innovation investment) from an overall population of 16 projects worth approximately $7.9 million,
- Four TU projects worth $0.66 million (nominal Hort Innovation investment) from a total population of 15 projects worth $4.81 million[2], and
- Three new NY projects worth $0.96 million (nominal Hort Innovation investment) from an overall population of 19 projects worth $7.32 million.

The project population for each industry included projects where a final deliverable had been submitted in the five-year period from 1 July 2015 to 30 June 2020. The projects for each industry sample were chosen such that, where possible given the small sample size required, the investments represented (1) at least 10% of the total Hort Innovation RD&E investment expenditure for each industry, and (2) the SIP outcomes (proportionally) for each industry.

This report presents a summary and the aggregate results for six impact assessment of RD&E investments made by Hort Innovation from the nursery industry fund. Three of the assessments were updated based on evaluations of NY RD&E investments carried out in previous years under a separate Hort Innovation Impact Assessment Program (Project MT18011) and an additional three new assessments were carried out under the current project, MT20008. The total sample of six NY RD&E impact assessments is hereafter referred to as the 2021 NY sample.

[1] The current Hort Innovation industry SIPs can be found at: https://www.horticulture.com.au/hort-innovation/funding-consultation-and-investing/investment-documents/strategic-investment-plans/

[2] One project (TU13026) was subsequently excluded from the TU aggregate analysis when it was identified that it did not include Hort Innovation levy funding. As a result, the TU13026 results are not reported in the TU aggregate analysis but the individual impact assessment report for TU13026 is included as a stand-alone evaluation in the TU aggregate report appendix.

Population & Sample Selection

Defining the Population

The population of NY Hort Innovation projects from which the 2021 NY impact assessment sample was drawn was defined as all Hort Innovation projects that had the following characteristics:

(a) Were completed during the period 1 July 2015 to 30 June 2020 (5-year period). A completed project was defined as a project where the final deliverable was submitted and accepted by Hort Innovation between 1 July 2015 and 30 June 2020,
(b) Included Hort Innovation R&D levy funds (e.g. this will exclude projects funded solely through grants and/or the Hort Innovation Frontiers fund),
(c) For multi-industry projects (MT project code), the projects must have included levy funds from the named industry (i.e. NY) representing at least 50% of the total investment in each project,
(d) Had a total Hort Innovation managed investment value of > $80,000 (excludes 'trivial' projects), and
(e) Excludes 'enabler projects' not suitable for evaluation (e.g. minor use permit, mid-term review/evaluation, consultation, and SIP development type projects).

Based on this population definition, Hort Innovation personnel provided the evaluation team (AgEconPlus and Agtrans Research) with an NY population dataset that contained 19 individual project investments with a total Hort Innovation investment value of approximately $7.3 million (whole population, Hort Innovation managed funds only, nominal dollar terms) representing all five of the potential NY SIP outcome areas.

For each project in the population a suite of project data was captured to support selection of the stratified random sample. Data included the project code, project title, project fund code, start date, and completion date. The data for each project also included financial data (total investment over each project's life) for Hort Innovation and its funding partners.

The data were integrated and rationalised by the evaluation team so that all relevant information (e.g. project code, completion date, and total Hort Innovation managed investment) could be observed and used in the sampling process.

Sample Selection Criteria

Hort Innovation specified that three individual RD&E projects were to be selected and evaluated for the NY industry impact assessments in addition to three NY RD&E projects previously evaluated under a separate Hort Innovation impact assessment program (Project MT18011).

First, a stratified random sampling approach was used to select the three RD&E projects for evaluation from a total population of 19 NY RD&E projects. The random sample was stratified across two of five NY industry investment priority areas defined by the Nursery Industry Strategic Investment Plan 2017-2021. Table 1 (below) shows the total proportion of Hort Innovation managed investment by NY SIP Outcome that was used to assess the stratification of the random sample. Finally, the stratified random sample also was constructed to represent at least 10% (by value) of the total investment in the project population (Hort Innovation managed investment only, in nominal dollar terms).

The three projects that had been previously evaluated under a separate Hort Innovation impact assessment program then were updated and added to the current NY sample. The update involved revising the benefit and cost cash flows to real dollar terms and updating the discounting to ensure that the cash flows would be consistent with the new NY evaluations. Thus, the overall sample of six projects, including the three new projects and three previously evaluated projects, was selected to be loosely representative of the spectrum of RD&E investments under the Hort Innovation NY levy fund for investments completed in the five-year period ending June 2020.

Table 1: Hort Innovation RD&E Investment by NY SIP Outcome Area for the NY Project Population

NY SIP Outcome Area Identifier	NY SIP Outcome Area	Total Project Value[(a)] in each SIP Outcome area ($)	SIP Outcome Area as a Proportion of NY Population (%)	No. of Projects to be Selected for Evaluation[(b)]
1	Increased demand and sales of green life products by four per cent per annum plus CPI (consumer price index)	1,106,188	15.1	1 (1)
2	Increased marketing effectiveness and efficiency and better decision-making based on increased industry knowledge	510,940	7.0	0 (1)
3	Improved industry protection from exotic, emerging and endemic pests and diseases	555,842	7.6	0 (0)
4	Improved productivity, profitability and professionalism through the creation and adoption of innovation and industry best management practices	4,370,518	59.7	2 (1)
5	Better career development	379,467	5.2	0 (0)
All	Note: One NY project in the population (NY12014) was categorised as aligning with all five NY SIP Outcomes	400,138	5.5	0 (0)
Total		7,323,093	100.0	3 (3)

(a) Hort Innovation managed investment.
(b) Number in brackets represent the SIP Outcome areas represented by the three projects previously evaluated and included in the 2021 NY sample.

Sample Selection Process

The sample selection for the three new RD&E investments to be evaluated was initiated using a spreadsheet that utilised only the project code, SIP code, and total Hort Innovation managed investment for each of the projects in the population. A random number technique then was applied to the 19 unique Hort Innovation RD&E projects in the NY population to generate the first random sample of three projects for the 2020/21 evaluations.

The first set of three randomly selected projects was checked against the sample selection criteria (described previously). Where a criterion was not met (for example, the total Hort Innovation investment in the sample did not meet the 10% minimum value hurdle), individual projects were progressively removed based on the sample criteria required and then replaced with alternative, randomly drawn projects until all stratification criteria were met.

Once the set of three randomly selected projects met the sample criteria, the three projects that were previously evaluated under a separate Hort Innovation impact assessment program (also randomly selected, completed in the five year period to 30 June 2020 and with a total value greater than, or equal to, $80,000) were added to the sample. The final sample of six NY RD&E projects for evaluation is shown in Table 2.

The final stratified, random sample of six Hort Innovation NY RD&E projects had a total Hort Innovation managed investment value of approximately $1.46 million (nominal dollars). The three new projects selected from the population of 19 NY projects had a total Hort Innovation managed investment of $0.96 million representing approximately 13.1% of the overall Hort Innovation managed investment in the population ($7.3 million). Further, for the SIP Outcome area criterion, one was selected for SIP Outcome area 1 and two for Outcome area 4.

Of the three projects previously evaluated, one was aligned with SIP Outcome area 1, one with SIP Outcome area 2 and one with SIP Outcome area 4. As two of these Outcome areas made up the largest proportions of the NY population (Table 1), the final sample of six projects could be considered largely representative of the population.

Table 2: Stratified Random Sample of Six NY RD&E Projects Selected for Impact Assessment (by Project Code)

No.	Project Code	Project Title	Total Hort Innovation Investment ($)	Start Date	End Date	SIP Outcome Area
New 2021 NY projects selected for evaluation						
1	NY12011	Nursery and Garden Industry Communications 2013-2015	233,300	April 2013	November 2015	4
2	NY15006	Communication program for the Australian Nursery Industry 2015-2018	582,749	February 2016	November 2018	4
3	NY18003	How to budget for the successful establishment of trees in the urban landscape	143,922	January 2019	December 2019	1
Projects previously evaluated under a separate Hort Innovation impact assessment program						
4	NY15001	Evaluation of Nursery Tree Stock Balance Parameters	143,700	July 2017	June 2018	4
5	NY16004	Nursery Turf Statistics and Research	173,953	January 2017	November 2017	2
6	NY16005	Where should all the trees go? An investigation of the impact of tree canopy coverage on socio-economic status	185,868	November 2016	May 2017	1
Total Hort Innovation Investment			**1,463,492**			

General Evaluation Method

The individual impact assessments followed general evaluation guidelines that are well entrenched within the Australian primary industry research sector including Research and Development Corporations, Cooperative Research Centres, State Departments of Agriculture, and some universities. The approach included both qualitative and quantitative assessments that are in accord with the impact assessment guidelines of the Council of Rural Research and Development Corporations (CRRDC) (CRRDC, 2018). The quantitative assessments used cost-benefit analysis as its principal tool.

For all six project included in the 2021 NY sample, the evaluation process involved identifying and briefly describing project objectives, activities and outputs, outcomes, and impacts for each RD&E investment selected. 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. 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.

Impacts

Summary of Project Impacts

The following section summarises the key qualitative results for the six randomly selected NY projects that were subjected to impact assessment as part of the 2021 Hort Innovation industry-specific impact assessment program (three evaluated in 2021 and three evaluated in previous years). The impacts and potential impacts from each project investment were identified, described, and then classified into economic, environmental, and social impacts, on an individual project basis. The principal impacts and potential impacts for each project are shown in Table 3 (economic impacts), Table 4 (environmental impacts), and Table 5 (social impacts).

Table 3: Principal Economic Impacts by Project

Economic	NY12011	• Improved business and technical management by some nursery and garden industry participants. • Increased sales, income and/or reduced costs of some nursery and garden industry businesses.
	NY15006	• Improved business and technical management of some nursery and garden industry participants. • Increased sales and gross income and/or reduced costs of some nursery and garden industry businesses.
	NY18003	• A potential increase in N&G industry sales.
	NY15001	• Increased quantity and value of landscape container-grown trees supplied to nursery customers.
	NY16004	• Cost reduction for a portion of nursery businesses utilising project generated data to make more informed decisions. • Increased demand for nursery products and services which are better targeted to prevailing market conditions. • Improved resource allocation – industry research, marketing and biosecurity budgets that better reflect the 'real world' situation (and realise an efficiency dividend). • Improved policy development for the nursery industry based on sound statistical data. • More efficient formation of government economic policies from improved statistical data on the industry (spillover).
	NY16005	• Nil.

Table 4: Principal Environmental Impacts by Project

Environmental	NY12011	• Reduced incidence of external negative impacts to nearby non-nursery and garden industries and land users, including a potential increase in biodiversity.
	NY15006	• Reduced incidence of any external negative impacts to nearby nursery and garden and non-nursery and garden industries and communities.
	NY18003	• A potential increase in the value of biodiversity in some local government areas.
	NY15001	• Potential for improved environmental amenities by both private interests and all tiers of public government agencies. • Potential increase in the value of biodiversity in some local government areas.
	NY16004	• Nil.
	NY16005	• Potential increase in the value of biodiversity in some local government areas.

Table 5: Principal Social Impacts by Project

Social	NY12011	• Greater appreciation of the nursery and garden industry as a respected and responsible industry, leading potentially to a strengthening of the industry's future social licence to operate.
	NY15006	• Greater appreciation of the nursery and garden industry as a respected and responsible industry, leading potentially to a strengthening of the industry's future social licence to operate.
	NY18003	• An increase in the total health and wellbeing status of the population across some local government areas compared to what otherwise would have been delivered without the project investment. • A positive contribution to the realisation of the 202020 vision.
	NY15001	• Potential health and well-being improvements in some urban local government areas from increased tree cover.
	NY16004	• Higher utility gained by consumers of nursery products and services. • Capacity built in industry and capacity built in researchers in the collection and interpretation of data.
	NY16005	• Health and wellbeing improvement in some urban local government areas 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.

Overview of Impact Types

The specific, project level impacts then were generalised into broad impact categories/types to describe the overall economic, environmental, and social impacts of the total Hort Innovation RD&E portfolio, as represented by the stratified, random sample of projects assessed. The identification and classification of impact types is provided in Tables 6, 7 and 8 (below).

Each individual project impact is represented by one tick mark (✓) in 3 (broad economic impact types), 2 (broad environmental impact types) and 4 (broad social impact types). Some projects have multiple ticks in the one category; this is because these impacts were different to one another but fell into the same category.

Across all six projects assessed there were 28 individual impact types identified. Of these, approximately 46% were identified as economic (13), 25% environmental (7) and 29% social (8).

Table 6: Impacts by Broad Economic Impact Type for each Project in the Hort Innovation 2021 NY Impact Assessment Sample

Project Code	**Economic Impact Type**			
	Increased sales and/or gross income for the nursery and garden industry	Increased profitability through reduced costs	Improved business and technical management	Increased efficiency and/or effectiveness of resource allocation and/or policy development
NY12011	✓	✓	✓	
NY15006	✓	✓	✓	
NY18003	✓			
NY15001	✓			
NY16004	✓	✓		✓✓✓
NY16005				
Impact Count	**5**	**3**	**2**	**3**

Table 7: Impacts by Broad Environmental Impact Type for each Project in the 2021 NY Impact Assessment Sample

Project Code	**Environmental Impact Type**		
	Increased biodiversity	Reduced incidence of external negative impacts to adjacent industries/ land-users/ communities	Improved environmental amenity for private and public interests
NY12011	✓	✓	
NY15006		✓	
NY18003	✓		
NY15001	✓		✓
NY16004			
NY16005	✓		
Impact Count	**4**	**2**	**1**

Table 8: Impacts by Broad Social Impact Type for each Project in the 2021 NY Impact Assessment Sample

Project Code	**Social Impact Type**			
	Enhanced or maintained social licence to operate	Increased average community health and wellbeing	Increased industry and/or researcher capability and capacity	Other/ miscellaneous
NY12011	✓			
NY15006	✓			
NY18003		✓		✓
NY15001		✓		
NY16004			✓	✓
NY16005		✓		
Impact Count	**2**	**3**	**1**	**2**

Results

Overview

The following sections present the estimated investment criteria for each of the six Hort Innovation NY RD&E project investments evaluated and for all six projects in aggregate. The total investment for each project was typically a combination of resources from Hort Innovation and other funding partners, for example from State Government departments or other research/industry organisations. The investment criteria for each project investment are reported for both the total investment (including that of Hort Innovation) and for the Hort Innovation investment alone.

The investment costs for all resources (cash and in-kind) were expressed in 2020/21 dollar terms using the Implicit Price Deflator for Gross Domestic Product (ABS, 2021). All benefits after 2020/21 also were expressed in 2020/21 dollar terms. All costs and benefits were discounted to 2020/21 (year of evaluation) using a discount rate of 5% and using a reinvestment rate of 5% for calculating the Modified Internal Rate of Return (MIRR) as per the CRRDC Impact Assessment Guidelines[3]. The base analyses used the best available estimates for each variable, notwithstanding a level of uncertainty for many of the estimates. All individual analyses ran for the length of the individual project investment period plus 30 years from the last year of investment.

Results presented include the Present Value of Costs (PVC), estimated Present Value of Benefits (PVB), Net Present Value (NPV), Benefit-Cost Ratio (BCR), Internal Rate of Return (IRR) and MIRR. Definitions for these terms may be found in the Glossary of Economic Terms at the end of this report. Impacts from all six projects were valued in monetary terms.

Investment Criteria by Project

The individual project investment criteria for the total investment and the Hort Innovation investment for the 2021 NY sample are reported in Table 9 and Table 10 respectively. Hort Innovation contributed 100% of the funding for all but one of the six projects (NY15001), therefore, only the investment criteria for NY15001 are different in Tables 9 and 10.

Table 9: Investment Criteria for Total Investment by Individual NY Project (30 years, 5% discount rate)

Project Code	Project Title	PVB ($m)	PVC ($m)	NPV ($m)	BCR	IRR (%)	MIRR (%)
NY12011	Nursery and Garden Industry Communications 2013-2015	1.27	0.41	0.86	3.08	31.44	8.84
NY15006	Communication program for the Australian Nursery Industry 2015-2018	3.67	0.89	2.78	4.14	35.85	9.78
NY18003	How to budget for the successful establishment of trees in the urban landscape	4.86	0.18	4.68	26.51	8.56	6.82
NY15001	Evaluation of Nursery Tree Stock Balance Parameters	1.33	0.20	1.13	6.72	28.40	12.70
NY16004	Nursery Turf Statistics and Research	0.98	0.27	0.71	3.58	31.40	9.40
NY16005	Where should all the trees go? An investigation of the impact of tree canopy coverage on socio-economic status	0.73	0.25	0.49	2.96	10.40	9.70

[3] The current CRRDC Impact Assessment Guidelines can be found at: http://www.ruralrdc.com.au/wp-content/uploads/2018/08/201804_RDC-IA-Guidelines-V.2.pdf

Table 10: Investment Criteria for the Hort Innovation Investment by Individual NY Project (30 years, 5% discount rate)

Project Code	Project Title	PVB ($m)	PVC ($m)	NPV ($m)	BCR	IRR (%)	MIRR (%)
NY12011	Nursery and Garden Industry Communications 2013-2015	1.27	0.41	0.86	3.08	31.44	8.84
NY15006	Communication program for the Australian Nursery Industry 2015-2018	3.67	0.89	2.78	4.14	35.85	9.78
NY18003	How to budget for the successful establishment of trees in the urban landscape	4.86	0.18	4.68	26.51	8.56	6.82
NY15001	Evaluation of Nursery Tree Stock Balance Parameters	0.98	0.15	0.83	6.72	28.40	13.30
NY16004	Nursery Turf Statistics and Research	0.98	0.27	0.71	3.58	31.40	9.40
NY16005	Where should all the trees go? An investigation of the impact of tree canopy coverage on socio-economic status	0.73	0.25	0.49	2.96	10.40	9.70

The total investment per project (PVC) across all six NY RD&E investments (Table 9) ranged from $0.18 million to $0.89 million (present value terms). Estimated benefits (PVB) ranged from $0.73 million to $4.86 million (present value terms). The highest NPV ($4.68 million) was reported for project NY18003 (*How to budget for the successful establishment of trees in the urban landscape*). Project NY18003 also recorded the highest BCR at 26.51 to 1.

Aggregate Investment Criteria (6 Projects)

Table 11 and Table 12 provide the aggregate investment criteria for all six projects for both total investment and the Hort Innovation investment only.

Table 11: Aggregate Investment Criteria for Total Investment in all Six Projects (5% discount rate)

Investment Criteria	Years after last year of investment						
	0	5	10	15	20	25	30
PVB ($m)	1.27	0.01	-0.71	4.08	7.81	10.73	12.85
PVC ($m)	2.21	2.21	2.21	2.21	2.21	2.21	2.21
NPV ($m)	-0.94	-2.20	-2.91	1.88	5.60	8.52	10.65
BCR	0.57	0.00	-0.32	1.85	3.54	4.86	5.83
IRR (%)	negative	n.s.	n.s.	9.41	13.19	14.42	14.88
MIRR (%)	131.63	negative	negative	5.76	7.16	7.16	6.77

n.s.: no solution

Table 12: Aggregate Investment Criteria for Hort Innovation Investment in all Six Projects (5% discount rate)

Investment Criteria	Years after last year of investment						
	0	5	10	15	20	25	30
PVB ($m)	1.26	-0.09	-0.89	3.84	7.52	10.40	12.50
PVC ($m)	2.15	2.15	2.15	2.15	2.15	2.15	2.15
NPV ($m)	-0.89	-2.24	-3.04	1.69	5.36	8.24	10.35
BCR	0.59	-0.04	-0.41	1.78	3.49	4.83	5.81
IRR (%)	negative	n.s.	n.s.	9.01	12.92	14.18	14.66
MIRR (%)	126.27	negative	negative	5.56	7.02	7.05	6.68

n.s.: no solution

The results in Table 11 show that the weighted average BCR for all six projects was approximately 5.83 to 1 for the total investment after 30 years. The simple average BCR was approximately 7.83 to 1 (derived from Table 9). The aggregate investment criteria were positive after 15 years (BCR of 1.85).

The PVB for the Hort Innovation investment (Table 12) was estimated by multiplying the total PVB for each individual project by the Hort Innovation proportion of real investment in each project and then aggregating the Hort Innovation benefit cash flows for all six projects. Hort Innovation contributed 100% of the funding for all but one of the six projects (NY15001). Hort Innovation contributed 73.6% of the total, undiscounted investment costs for project NY15001.

Source of Benefits

Table 13 shows the contribution of each project to the total PVB (Total Investment)

Table 13: Contribution of Benefits by Source

Project Code	Project Title	PVB ($m)	Proportion of Total PVB (%)
NY12011	Nursery and Garden Industry Communications 2013-2015	1.27	9.9
NY15006	Communication program for the Australian Nursery Industry 2015-2018	3.67	28.6
NY18003	How to budget for the successful establishment of trees in the urban landscape	4.86	37.8
NY15001	Evaluation of Nursery Tree Stock Balance Parameters	1.33	10.4
NY16004	Nursery Turf Statistics and Research	0.98	7.6
NY16005	Where should all the trees go? An investigation of the impact of tree canopy coverage on socio-economic status	0.73	5.7
Total[(a)]		12.85	100.0

(a) Aggregate total may not be exactly equal to the sum total of the individual project PVBs due to minor rounding errors.

Leverage

Leverage is expressed here as the ratio of non-Hort Innovation investment to Hort Innovation investment. Only one project, NY15001, included any non-Hort Innovation managed investment. Project NY15001 had a leverage ratio of 0.36 to 1. That is, for every $1 of Hort Innovation managed funds, co-contributors/ partners contributed $0.36. A summary of the leverage ratio findings for the 2021 NY sample are provide in Table 14 below.

Table 14: Leverage Ratio by Project

Project Code	Project Title	Leverage Ratio[(a)]
NY12011	Nursery and Garden Industry Communications 2013-2015	0.00
NY15006	Communication program for the Australian Nursery Industry 2015-2018	0.00
NY18003	How to budget for the successful establishment of trees in the urban landscape	0.00
NY15001	Evaluation of Nursery Tree Stock Balance Parameters	0.36
NY16004	Nursery Turf Statistics and Research	0.00
NY16005	Where should all the trees go? An investigation of the impact of tree canopy coverage on socio-economic status	0.00
Aggregate leverage ratio		0.03

(a) Ratio of non-Hort Innovation managed investment to Hort Innovation investment

Conclusions

Impact assessments were carried out on six randomly selected Hort Innovation NY industry RD&E investments that were completed with a final deliverable submitted in the five year period ended June 2020. These investments produced a range of economic, environmental and social impacts. Across all six projects assessed there were 28 individual impact types identified. Of these, approximately 46% were identified as economic (13), 25% environmental (7) and 29% social (8).

Total funding from all sources for the six project investments totalled $2.21 million (present value terms) and produced estimated total expected benefits of $12.85 million (present value terms). This gave an aggregate weighted average BCR of approximately 5.83 to 1 after 30 years at a 5% discount rate. The results are consistent with other, similar evaluations of agricultural RD&E investments conducted by the evaluation team where average BCRs have been estimated between 2 and 6 to 1. For example, an aggregate assessment of some 111 evaluations of RD&E investments across all 15 Australian Research and Development Corporations (RDCs) funded by the CRRDC generated a weighted average BCR of approximately 5.5 to 1 (Agtrans Research, 2019).

The sample of projects evaluated:

- represented more than 10% of the total Hort Innovation lifetime funding of projects with a final deliverable submitted in the five year period ended 30 June 2020,
- was loosely representative across the specific industry SIP outcomes given the small sample size, and
- was drawn at random.

Some, but not all, of the impacts identified for each project investment were valued as part of the evaluation process. The decision not to value certain impacts was, in general, 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 RD&E project investments. As not all impacts were valued, it is likely that the estimated investment criteria reported are an underestimate of the performance of the Hort Innovation nursery industry RD&E investment evaluated.

The 2021 NY sample was considered largely representative of the investment in Hort Innovation's overall NY industry RD&E portfolio for projects completed in the 2015/16 to 2019/20 period. Therefore, the impacts and aggregate investment criteria estimated can be considered broadly indicative of impacts and performance across the broader suite of NY RD&E undertaken by Hort Innovation.

Thus, the results reported should be viewed positively by Hort Innovation, the Australian nursery and garden industry, and policy personnel responsible for allocation of public funds.

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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Appendices

The following table lists the titles of the individual impact assessment reports that form the appendices to the NY 2021 aggregate report.

Table 15: Individual Impact Assessment Report Titles: Nursery 2021 Sample

Project Code	Project Title
NY12011	Appendix 1: Nursery and Garden Industry Communications 2013-2015
NY15006	Appendix 2: Communication program for the Australian Nursery Industry 2015-2018
NY18003	Appendix 3: How to budget for the successful establishment of trees in the urban landscape
NY15001	Appendix 4: Evaluation of Nursery Tree Stock Balance Parameters (updated)
NY16004	Appendix 5: Nursery Turf Statistics and Research (updated)
NY16005	Appendix 6: Where should all the trees go? An investigation of the impact of tree canopy coverage on socio-economic status (updated)

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Abbreviations

BCR	Benefit-Cost Ratio
CRRDC	Council of Rural Research and Development Corporations
Hort Innovation	Horticulture Innovation Australia Ltd
IRR	Internal Rate of Return
MG	Mango
MIRR	Modified Internal Rate of Return
NPV	Net Present Value
NY	Nursery
PVB	Present Value of Benefits
PVC	Present Value of Costs
R&D	Research and Development
RB + BS	Berries
RD&E	Research, Development and Extension
SIP	Strategic Investment Plan
TU	Turf