

Industry-specific impact assessment program: table grape

Impact assessment report for project *Export market access, biosecurity and developing export markets for the Australian table grape industry (TG14000)*

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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 *TG14000: Export market access, biosecurity and developing export markets for the Australian table grape industry*. The project was funded by Hort Innovation over the period October 2014 to June 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 has contributed to table grape export market development and the re-opening of an export market. The profitable trade in the export of Australian table grapes to China, Japan and South Korea was expanded during TG14000 and the market in Vietnam was reopened. While not all of this export market success is attributable to TG14000, the project has made an important contribution. Consequently TG14000 is likely to have contributed additional profitable export sales for Australian table grape growers. Additional unquantified economic and social impacts are also anticipated. Unquantified economic impacts may include improved industry biosecurity and cost savings associated with export. Unquantified social impacts include increased capacity in trade negotiating and exporting and increased income in regional Australia where table grapes are grown.

Investment Criteria

Total funding from all sources for the project was \$0.70 million (present value terms). All project funding was provided by Hort Innovation. The investment produced estimated total expected benefits of \$2.82 million (present value terms). This gave a net present value of \$2.11 million, an estimated benefit-cost ratio of 4.0 to 1, an internal rate of return of 20% and a MIRR of 10%.

Conclusions

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

Keywords

Impact assessment, cost-benefit analysis, TG14000, table grape, export, market access, biosecurity, market development, maintenance.

Introduction

All research and development (R&D) and marketing levy investments undertaken by Horticulture Innovation Australia Limited (Hort Innovation) are guided 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 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 apple & pear (AP), avocado (AV), mushroom (MU) and table grape (TG) RD&E investment funds.

Twenty-seven RD&E investments (projects) were selected through a stratified, random sampling process. The industry samples were as follows:

- Nine AP projects were chosen worth \$15.46 million (nominal Hort Innovation investment) from an overall population of 19 projects worth an estimated \$33.31 million,
- Seven AV projects worth \$1.91 million (nominal Hort Innovation investment) from an overall population of 27 projects worth approximately \$9.97 million,
- Five MU projects worth \$1.75 million (nominal Hort Innovation investment) from a total population of 20 projects worth \$7.94 million, and
- Six TG projects worth \$2.84 million (nominal Hort Innovation investment) from an overall population of 11 projects worth \$5.0 million.

The project population for each industry included projects where a final deliverable had been submitted in the five-year period from 1 July 2013 to 30 June 2018.

The projects for each industry sample were chosen such that 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.

Project *TG14000: Export market access, biosecurity and developing export markets for the Australian table grape industry* was randomly selected as one of the 22 unique MT18009 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 table grape industry consists of approximately 1,000 growers producing 175,900 tonnes of fresh table grapes per year (3 year average 2016 to 2018). Most table grapes are grown in the Sunraysia Region of Victoria on small to medium sized farms. Major varieties include white Menindee and Thompson, red Crimson, Flame and Globe and black Autumn Royal and Pione. Table grapes are harvested December to May and imports, mainly from the United States (US), are available July to November (Hort Innovation, 2018).

The Australian Table Grape Association (ATGA) represents growers nationally. ATGA provides a platform for industry members to collectively respond to industry wide issues, deliver research and marketing, share knowledge, and interact with government and other stakeholders (ATGA website, accessed May 2019).

Growers pay a levy of one cent per kilogram for table grapes produced in Australia. The levy is managed by Hort Innovation which directs funds to table grape R&D (50% of collected levies) and marketing programs (50% of collected levies). Typically the levy raises \$1.8 million per annum. Funds allocated to R&D are matched by the Australian Government.

Rationale

A project was required to actively progress market access and maintenance for key Australian table grape export destinations. The project was to also ensure appropriate biosecurity was in place for table grape imports and industry had capacity to engage with the market in key export destinations.

TG14000 was a continuation of previous R&D investment projects including TG07006, TG09508 and TG11007 Table Grape Market Access and Maintenance and TG1101 Biosecurity Establishment. The outcomes of these projects have assisted with:

- Market access into mainland China
- Establishing table grapes as the number one negotiating priority for market access, Japan and South Korea
- Receiving a draft protocol from South Korea
- Compliance of phytosanitary requirements for Thailand, Indonesia and New Zealand
- Re-negotiating the US protocol
- Support for recognition by overseas countries of cold tolerance work on Qfly and Medfly
- Continued work on Maximum Residue Limits (MRLs) for Vietnam
- Submission of documentation for non-phytosanitary countries becoming phytosanitary compliant
- Support for cold treatment verification for the Japanese
- Support for fruit fly area freedom submissions to Japan, South Korea and China
- Submission on Free Trade Agreements (FTAs) to reduce tariffs on Australian table grapes
- Reinforcing table grape access priorities for official bilateral negotiations
- Providing Australian table grape growers with improved biosecurity preparedness against invasive plant pests that could destroy the viability and sustainability of the Australian table grape industry.

TG14000 which ran from 2014 to 2017 was followed by *TG17000 Table Grape Export Readiness and Market Access* (commenced 2018).

The rapid growth in Australian table grape exports and key countries targeted as part of TG14000 is shown in Table 1.

Table 1: Australian Table Grape Exports 2009 to 2018 (tonnes)

	Total	China	HK	Japan	Korea	Taiwan	Thailand	Vietnam	Indonesia	Philippines	US
2009	70,012	0	25,701	0	0	1,194	8,267	4,271	8,842	0	0
2010	32,034	0	7,508	0	0	150	3,592	1,545	7,699	0	0
2011	30,725	21	9,863	0	0	403	2,760	2,539	5,751	0	0
2012	40,500	215	17,350	0	0	187	2,730	3,761	6,246	0	0
2013	72,409	3,917	22,265	0	0	166	5,156	7,194	11,111	99	0
2014	80,164	9,864	27,681	235	6	902	3,912	10,257	11,405	1,033	0
2015	84,102	14,330	29,659	2,394	588	794	4,968	5	13,204	3,079	0
2016	110,007	29,936	13,097	9,383	256	1,946	6,219	4,285	17,363	4,446	0
2017	106,666	41,114	8,013	8,397	162	1,394	4,640	5,287	15,586	3,684	0
2018	110,280	41,668	8,074	10,882	776	1,424	5,106	4,601	16,149	5,310	0

Source: Australian Horticulture Statistics Handbook, various additions

Project Details

Summary

Project Code: TG14000

Title: *Export market access, biosecurity and developing export markets for the Australian table grape industry*

Research Organisation: ATGA

Principal Investigator: Jeff Scott

Period of Funding: October 2014 to June 2017

Objectives

TG14000 had the following objectives:

1. To actively progress table grape market access and maintenance issues for key export markets including China, Japan, South Korea, Taiwan, Thailand, Vietnam, Indonesia, Hong Kong, Philippines, New Zealand, Singapore, Malaysia and the US.
2. To actively progress export trade through improvements in quarantine and non-quarantine protocols and barriers.
3. To maintain strict adherence to all biosecurity issues affecting import and export of products and for the table grape industry to be active contributors to relevant Plant Health Australia (PHA) programs.
4. To ensure the Australian table grapes industry has the capacity to visit, study and learn firsthand from importers, trade officials and market analysts/researchers in priority export markets.
5. To ensure the most favourable market access conditions are in place and Australian table grapes are tailored to the market in key export countries.

Logical Framework

Table 2 provides a description of TG14000, *Export market access, biosecurity and developing export markets for the Australian table grape industry* activities, in a logical framework.

Table 2: Logical Framework for Project TG14000

<p>Activities and Outputs</p>	<ul style="list-style-type: none"> • The reconvening of a skills-based export advisory committee to assist with the development of priorities and annual market access/maintenance work plans. • The export advisory committee, its support staff and the ATGA worked closely with Hort Innovation, the Office of Horticulture Market Access (OHMA), and the Department of Agriculture and Water Resources (DAWR) between 2014 and 2017. • Convening of export readiness workshops for growers in key production regions including Mildura, Robinvale, St George, Emerald and the Swan Valley. Workshops were well attended with an increasing number of growers interested in exporting. • Participation by industry representatives in overseas delegations (official and industry) to progress market access/maintenance issues and to forge and maintain working relationships with trade partners. For example, an Australian ministerial delegation to China included table grape industry representatives in December 2015. • Participation in relevant Australian Government agency meetings including meetings with the Department of Foreign Affairs and Trade (DFAT), DAWR – Plant Export Department (previously the Australian Quarantine Inspection Service) and Austrade. • Hosting of international trade, technical delegations and inspectors to establish new export protocols, progress improvements in existing protocols and sustain the existing trade. Importer delegations hosted from China, Japan, Korea, Philippines, Vietnam and Indonesia. Chinese and Korean inspectors hosted during the Australian harvest. • Funding and technical contributions to the PHA National Vine Biosecurity Committee and the Victorian Biosecurity Committee including attendance at relevant meetings and workshops on exotic disease threats. Exotic disease threats known, analysed and prioritised according to risk via the relevant Emergency Plant Pest Response Deed. • ATGA participation in Victorian government technical/policy fruit fly meetings. • Meetings with the Xinjiang Table Grape Association in China – to ensure potential imports from this region meet Australian biosecurity and market requirements. • Development of an online export manual with DAWR that includes farm mapping and grower registration. System will encourage growers to export and save export costs. • Desk-based research into priority Asian markets for Australian table grapes. • R&D to understand language and cultural opportunities/barriers in Asian countries. • Exploration of Middle East markets with importers from the UAE and Iran. • Development of relationships with appropriate importers and traders in developing Asian markets to determine consumer preferences by table grape variety. • Protocol improvement for Thailand with an onshore cold treatment facility approved. • Rebranding of Australian Thompson Seedless grapes as “Tams Gold” in Korea. • Negotiation to ensure future Australia-Japan bilateral negotiations include consideration of additional grape varieties under a revised protocol. • Improvements in airfreight protocols and recognition of differences in fruit fly status between Australia’s east and west coasts by China and Thailand. • China recognition of the South Australian Riverland as a pest free area (PFA). • The Riverland and Sunraysia recognised by Thailand as a PFA. • Onshore foreign inspections of Australian table grapes no longer required by China. • Development of a marketing strategy for the supermarket sectors in China, Japan, and South Korea. Strategy included the development of product lines, distribution channels and the logistics of participation in those channels.
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	<ul style="list-style-type: none"> • ATGA worked with DAWR to re-establish table grape exports to Vietnam in 2015. New superior protocol with irradiation, fumigation and the recognition of PFAs. • Stronger links with Chinese authorities, importers and the local table grape industry. • Australian table grape trade delegation visits to and from China, Japan, South Korea, Philippines, Indonesia, Thailand, Vietnam and Taiwan. • Attendance at trade fairs in Hong Kong, Beijing, Shanghai, Taipei, Manilla, Seoul and Jakarta during 2015, 2016 and 2017. Key trade shows included Asia Fruit Logistica (80 Australian table grape growers attended in 2016), Asia Fruit Congress, Foodex, Seoul Foods, Gulfoods, Taste of Australia and China World Fruit and Vegetable Trade Fair. Participation in “Australia Fresh” and “Now in Season” market development activities. Trade shows and initiatives used to showcase grapes and encourage additional sales. • Industry workshops to communicate research findings and to fine tune the strategic plan for export table grape markets. • Delivery of an up-to-date International Marketing Plan for key Asian markets. • Preparation and distribution of a grower and exporter information pack for emerging Australian table grape markets including market intelligence and export statistics. • Information communicated to the Table Grape R&D Program to inform investments. • Table grape grower input into biosecurity matters affecting vine health and table grape production. • Stronger links established with authorities and officials in key export markets through the provision of appropriate information and technology transfer. A deeper understanding of safety and structure of the Australian industry was communicated. • The project delivered improved market access, market development and growth for Australian table grape exports to China, Japan, and Korea. The project contributed to the reopening of the Vietnamese market for Australian table grapes. • An annual status report presented by ATGA to the table grapes conference. • Articles prepared and published in the industry magazine ‘The Vine’ as well as Asia Fruit Magazine, Fruit Net Daily News and ABC radio.
Outcomes	<ul style="list-style-type: none"> • Further growth in the profitable export of Australian table grapes to China, Japan, and South Korea. Reopening of the table grape trade with Vietnam. • Stronger biosecurity barriers in place for table grape growers with less risk of production loss due to exotic pest incursion. • Development and use of an online export registration system for growers with resulting efficiencies and audit cost savings.
Impacts	<ul style="list-style-type: none"> • Additional profitable sales for table grape growers in China, Japan, South Korea and Vietnam. • Improved industry biosecurity with reduced risk and hence cost associated with exotic pest incursions. • Cost savings for grower exporters making use of project developed online registration. • Increased capacity in trade negotiation and exporting – ATGA, DAWR and table grape growers. • Increased income in regional Australia associated with a more profitable and sustainable table grape industry.

Project Investment

Nominal Investment

Table 3 shows the annual investment (cash and in-kind) in project TG14000 by Hort Innovation. There were no ‘other’ investors in this project.

Table 3: Annual Investment in the Project TG14000 (nominal \$)

Year ended 30 June	Hort Innovation (\$)	Other (\$)	Total (\$)
2015	150,000	0	150,000
2016	150,000	0	150,000
2017	150,000	0	150,000
Totals	450,000	0	450,000

Program Management Costs

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

Real Investment and Extension Costs

For the purposes of the investment analysis, investment costs of all parties were expressed in 2017/18 dollar terms using the GDP deflator index. There were no additional costs associated with project extension. Progress with table grape market access, maintenance, development and biosecurity was reported to industry through the relevant industry magazines, the mainstream press and the industry’s annual conference.

Impacts

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

Table 4: Triple Bottom Line Categories of Principal Impacts from Project TG14000

Economic	<ul style="list-style-type: none"> • Additional profitable sales for table grape growers in China, Japan, South Korea and Vietnam. • Improved industry biosecurity with reduced risk and hence cost associated with exotic pest incursions. • Cost savings for grower exporters making use of project developed online registration.
Environmental	<ul style="list-style-type: none"> • Nil.
Social	<ul style="list-style-type: none"> • Increased capacity in trade negotiation and exporting – ATGA, DAWR and table grape growers. • Increased income in regional Australia associated with a more profitable and sustainable table grape industry.

Public versus Private Impacts

Impacts identified in this evaluation are mostly private in nature. Private benefits will be realised by table grape growers via additional profitable sales to China, Japan, South Korea and Vietnam. Additional private benefits will include improved industry biosecurity and export cost savings. Public benefits will include increased capacity (ATGA, DAWR and table grape growers) as well as increased income in regional Australia associated with a more profitable and sustainable industry.

Distribution of Private Impacts

The impacts on the table grape industry from investment in this project will be shared along the supply chain with input suppliers, growers, transporters and exporters all sharing impacts produced by the project. It is noted that, at least in the short term, consumers will pay more for table grapes with increased competition from export markets.

Impacts on Other Australian Industries

Impacts on industries other than the table grape industry may include potential gains in other industries via any future spillovers from the increase in trade negotiation and exporting capacity.

Impacts Overseas

Impacts overseas will include additional supply of Australian table grapes and increased competition for alternative suppliers.

Match with National Priorities

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

Table 5: Australian Government Research Priorities

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

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

Match with Table Grape Strategic Investment Plan 2017-2021 Priorities

The strategic outcomes and strategies of the table grape industry are outlined in the Table Grape Strategic Investment Plan 2017-2021¹ (Hort Innovation, 2016). Project TG14000 addressed Table Grape SIP Outcome 1, Strategy 1.1 and Outcome 3, Strategy 3.2.

Valuation of Impacts

Impacts Valued

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

A single impact type was valued – additional table grape sales in export markets whose further development was facilitated TG14000.

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

Impacts Not Valued

Not all of the impacts identified in Table 3 could be valued in the assessment. Two economic and two social impacts were hard to value due to a lack of data on changed export costs and exotic pest incursion risks, difficulty in quantifying the causal relationship and pathway between TG14000 and the impact and the complexity of assigning monetary values to the impact.

The impacts identified but not valued were:

- Improved industry biosecurity with reduced risk and hence cost of exotic pest incursions.
- Cost savings for grower exporters making use of project developed online registration.
- Increased capacity in trade negotiation and exporting – ATGA, DAWR and table grape growers.
- Increased income in regional Australia associated with a more profitable and sustainable table grape industry (spillover impact).

Valuation of Impact: Additional Table Grape Sales in Export Markets

TG14000 built on previous Hort Innovation funded table grape export market development projects. TG14000 activities were completed alongside DAWR investments and a willingness and goodwill by industry and government in importing countries targeted by Australia. Against this background the project was instrumental in delivering improved market outcomes for Australian table grape growers. Additional profitable sales of Australian table grapes were achieved in China, Japan and South Korea. Exports to Vietnam were re-established, with a more favourable protocol, as a result of both this project and DAWR investments. Reference to Table 1 shows how the importance of these markets to Australian table grape growers has grown over time.

Attribution

A modest attribution factor has been used for TG14000’s contribution to profit in export markets that have grown or where Australia has regained market access. Many other investments made over a long period of time have contributed to profitable Australian table grape sales in these destinations. For example the Horticulture Australia/Hort Innovation, Office of Horticultural Market Access has been working on market access for China, Japan and Korea since 2002. Furthermore, once these markets are already established, as was the case prior to TG14000, private sector exporters responding to profitable opportunity will be mostly responsible for trade growth.

Counterfactual

If project TG14000 had not been completed it is possible that actions completed as part of the project would have been completed by others with an interest in table grape export development e.g. ATGA, Australian Horticultural Exporters Association and DFAT. An attribution factor of 35% has been assigned to the TG14000 investment.

Summary of Assumptions

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

Table 6: Summary of Assumptions

Variable	Assumption	Source/Comment
Impact: Additional Table Grape Sales in Export Markets		
Table grape exports to China, Japan, South Korea and Vietnam – average of three year’s data 2016 to 2018.	52,249 t/year	Data sourced from Australian Horticulture Statistics Handbook, various additions.
Table grape grower profit on additional export sales.	\$228/t	Gross value per tonne derived from Australian Horticulture Statistics Handbook (various editions) with profit sourced from IBIS World (2018) and cross checked with Sinnett et al. 2012. Profit adjusted downward by 40% to allow for extra costs and low margins associated with exporting (e.g. additional packaging, disinfestation, inspection, certification, freight, brokerage, etc.).

Attribution of market growth – China, Japan, South Korea and Vietnam to TG14000.	2.5%	A modest attribution factor has been used for TG14000's contribution to profit in export markets that have grown or where Australia has regained market access (e.g. Vietnam where 1,537 tonnes of table grapes were exported in 2001 – HAL 2003). Many other investments made over a long period of time have contributed to profitable Australian table grape sales in these destinations. For example the Horticulture Australia/Hort Innovation, Office of Horticultural Market Access has been working on market access for China, Japan and Korea since 2002. Furthermore, once these markets are already established, as was the case prior to TG14000, private sector exporters responding to profitable opportunity will be mostly responsible for trade growth.
Year of first impact.	2015/16	One year after TG14000 commencement due to an already active table grape export trade in targeted markets.
Counterfactual	65%	If project TG14000 had not been completed it is 35% likely that actions completed as part of the project would have been completed by others with an interest in table grape export development e.g. ATGA, Australian Horticultural Exporters Association and DFAT.

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 (2015/16) as per the CRRDC Impact Assessment Guidelines (CRRDC, 2018).

Investment Criteria

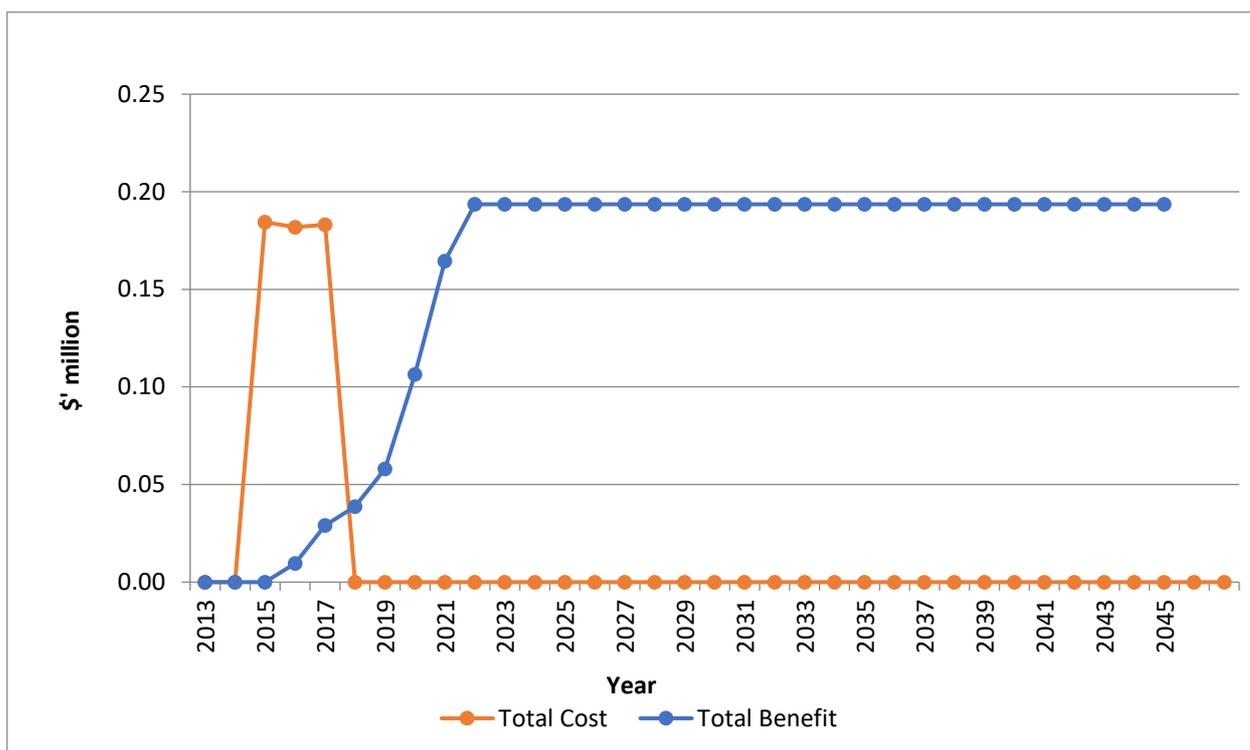
Tables 7 shows the investment criteria estimated for different periods of benefit for the total investment. Hort Innovation was the only contributor to this project so there is no second set of analyses showing results for Hort Innovation.

Table 7: Investment Criteria for Total Investment in Project TG14000

Investment Criteria	Years after Last Year of Investment						
	0	5	10	15	20	25	30
Present Value of Benefits (\$m)	0	0.24	1.02	1.64	2.13	2.51	2.82
Present Value of Costs (\$m)	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Net Present Value (\$m)	- 0.70	- 0.46	0.31	0.94	1.43	1.81	2.11
Benefit-Cost Ratio	0	0.35	1.45	2.34	3.04	3.58	4.01
Internal Rate of Return (%)	negative	negative	11.1	17.8	19.5	20.1	20.3
MIRR (%)	negative	negative	8.8	11.5	11.3	10.7	10.1

The annual undiscounted benefit and cost cash flows for the total investment for the duration of TG14000 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 moderately sensitive to the discount rate.

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

Investment Criteria	Discount rate		
	0%	5%	10%
Present Value of Benefits (\$m)	5.05	2.82	1.82
Present Value of Costs (\$m)	0.55	0.70	0.89
Net Present Value (\$m)	4.50	2.11	0.93
Benefit-cost ratio	9.20	4.01	2.05

A sensitivity analysis was then undertaken for the assumed attribution of market development to TG14000. Even if the assumed attribution rate is a low 1%, the project produces a positive return on investment – Table 9.

Table 9: Sensitivity to Attribution of Market Development to TG14000
(Total investment, 30 years)

Investment Criteria	Attribution of Market Development to TG14000		
	1%	2.5% (base)	5.0%
Present Value of Benefits (\$m)	1.13	2.82	5.63
Present Value of Costs (\$m)	0.70	0.70	0.70
Net Present Value (\$m)	0.42	2.11	4.93
Benefit-cost ratio	1.60	4.01	8.02

A final sensitivity test examined the assumed profit earned by table grape growers in new export markets. Halving assumed profit continues to deliver benefits that exceed investment cost – Table 10.

Table 10: Sensitivity to Profit Earned by Table Grape Growers in Export Markets
(Total investment, 30 years)

Investment Criteria	Profit Earned by Grape Growers in New Markets		
	\$114/tonne	\$228/tonne (base)	\$456/tonne
Present Value of Benefits (\$m)	1.41	2.82	5.63
Present Value of Costs (\$m)	0.70	0.70	0.70
Net Present Value (\$m)	0.71	2.11	4.93
Benefit-cost ratio	2.01	4.01	8.02

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-high

Coverage of benefits was assessed as high – the major benefit, market development was quantified. However, secondary benefits including improved biosecurity and export cost saving were not quantified.

Confidence in assumptions was rated as medium-high. Data were mostly drawn from Hort Innovation.

Conclusion

The investment has contributed to table grape export market development and the re-opening of an export market. The profitable trade in the export of Australian table grapes to China, Japan and South Korea was expanded during TG14000 and the market in Vietnam was reopened. While not all of this export market success is attributable to TG14000, the project has made an important contribution. Consequently TG14000 is likely to have contributed additional profitable export sales for Australian table grape growers. Additional unquantified economic and social impacts are also anticipated. Unquantified economic impacts may include improved industry biosecurity and cost savings associated with export. Unquantified social impacts include increased capacity in trade negotiating and exporting and increased income in regional Australia where table grapes are grown.

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

Glossary of Economic Terms

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

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Abbreviations

ATGA	Australian Table Grape Association
CRRDC	Council of Research and Development Corporations
DAWR	Department of Agriculture and Water Resources (Australian Government)
DFAT	Department of Foreign Affairs and Trade
FTA	Free Trade Agreement
GDP	Gross Domestic Product
GVP	Gross Value of Production
HAL	Horticulture Australia Limited
IRR	Internal Rate of Return
MIRR	Modified Internal Rate of Return
OCS	Office of Chief Scientist Queensland
OHMA	Office of Horticultural Market Access
PFA	Pest Free Area
PHA	Plant Health Australia
PVB	Present Value of Benefits
RDC	Research and Development Corporation
R&D	Research and Development
RD&E	Research, Development and Extension
SHAFFE	Southern Hemisphere Association of Fresh Fruit Exporters
SIP	Strategic Investment Plan
US	United States of America