



## Impact assessment of the investment:

### Apple and pear export readiness and market access (AP17002)

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June 2024

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### *Funding statement:*

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

### *Publishing details:*

ISBN <Hort Innovation to add>

Published and distributed by: Horticulture Innovation Australia Limited  
ABN 71 602100149

Level 7  
141 Walker Street  
North Sydney NSW 2060

Telephone: (02) 8295 2300

[www.horticulture.com.au](http://www.horticulture.com.au)

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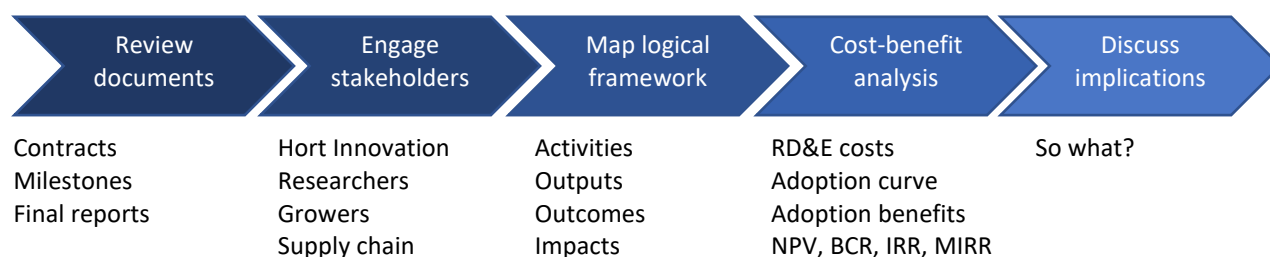
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## Executive summary

### What the report is about

Ag Econ conducted independent analysis determine the economic, social, and environmental impact resulting from delivery of the apple and pear project *Apple and pear export readiness and market access (AP17002)*. The project was funded by Hort Innovation over the period June 2018 to October 2022 using the apple and pear research and development levy and contributions from the Australian Government. The project was delivered by Apple and Pear Australia Limited (APAL).

The analysis applied a five step analytical process to understand the impact pathway and collect supporting data.



### Research background

AP17002 represented the first dedicated export development program for the apple and pear industry, which delivered market development intelligence, export capacity building, market access and market improvement initiatives. The delivery of AP17002 was aligned with the Apple and Pear Export Development Strategy (AP15009), and sought to increase industry capacity and facilitate market opportunities, resulting in export volume growth for the industry. With a heavy reliance on a mature domestic market, growing the share of apples and pears exported represented a potential pathway to facilitate a sustainable market supply/demand balance for the industry.

### Key findings

The nominal investment cost of \$1.56 million was adjusted for inflation (ABS, 2024) and discounted (using a 5% real discount rate) to a 2023-24 present value (PV) of costs equal to \$2.21 million.

The analysis conducted a detailed evaluation of the AP17002 impact pathway through a logical framework. From this process, economic and social impacts were identified as having the potential to be realised regarding increased industry capability to maintain an optimal domestic market supply balance through the apple and pear industry's investment in AP17002 (supported by subsequent investment).

A review of available data and discussions with stakeholders identified sufficient data to model the industry level benefits of improved domestic market supply balance.

This generated total PV benefits of \$17.94 million, with a benefit cost ratio (BCR) of 8.10:1. Given the relationship between AP17002 with preceding (AP15009) concurrent (AP21001) and follow on RD&E the analysis took a program approach that estimated the total benefits from the program, and apportioned these to individual investments based on their cost share.

Reflecting the underlying uncertainty for many variables, sensitivity testing showed a wide potential impact range with a BCR ranging from less than 1:1 and 23.37:1. The sensitivity testing also showed that 99% of the model simulations had a BCR greater than 1:1 (i.e. a positive impact), giving a high level of confidence that the AP17002 investment will generate a positive impact off the industry level benefits alone.

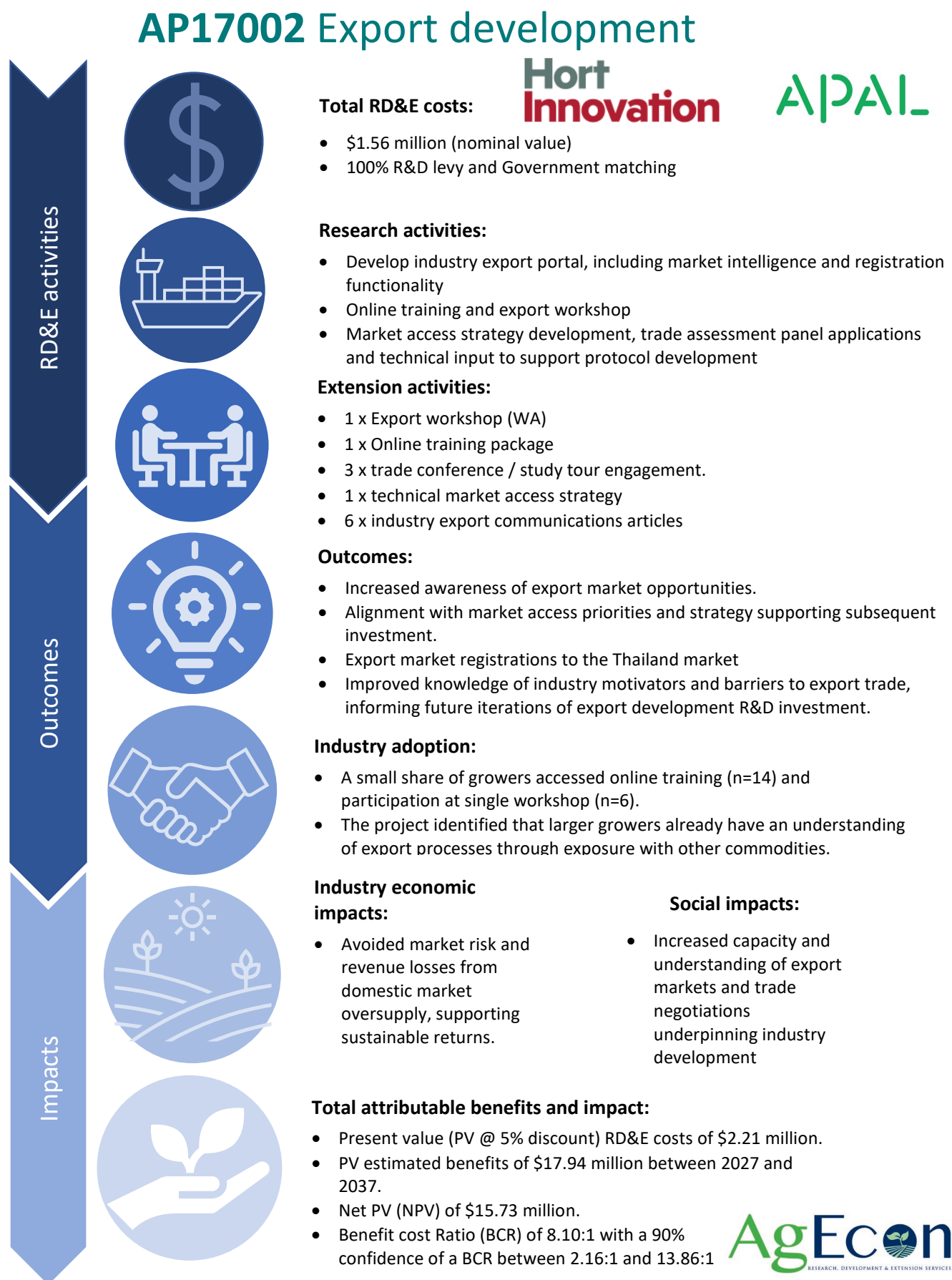
Despite the clear impact pathway for industry level benefits of reduced costs for protocol market registration (market access), there was insufficient data identified to confidently quantify the benefits. Improved data relating to these benefits, as outlined in this analysis, would support an estimate of benefit and likely further increase the RD&E impact quantified.

The key findings of the AP17002 impact assessment are summarized in Figure 1 below.

### Keywords

Impact assessment, cost-benefit analysis, apple; pear; export; industry development; market access

Figure 1. Summary of impact assessment findings



## Introduction

Evaluating the impacts of levy investments is important to demonstrate the economic, social and environmental benefits realised through investment to levy payers, Government and other industry stakeholders. Understanding impact is also an important step to inform the ongoing investment agenda.

Reflecting its commitment to continuous improvement in the delivery of levy funded research, development and extension (RD&E), Hort Innovation required a series of impact assessments to be carried out annually on a representative sample of investments of its RD&E portfolio. Commencing with MT18011 in 2017-18, the impact assessment program consisted of an annual impact assessment of up to 15 randomly selected Hort Innovation RD&E investments (projects) each year. In line with this ongoing program, Ag Econ was commissioned to deliver the *Horticulture Impact Assessment Program 2020-21 to 2022-23* (MT21015).

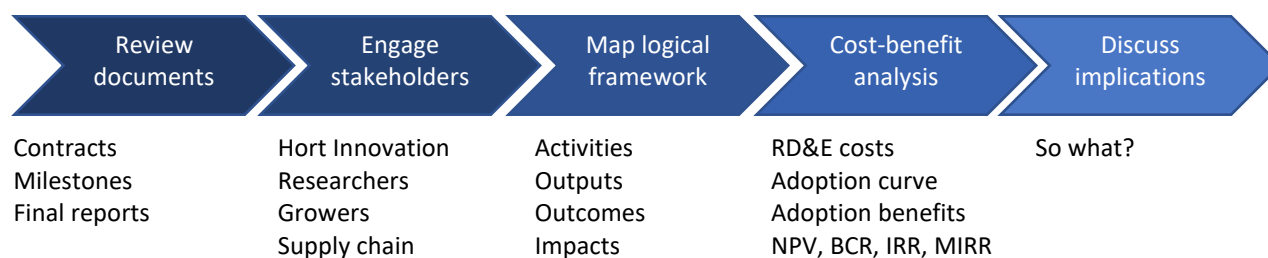
*Apple and pear export readiness and market access (AP17002)* was randomly selected in the 2022-23 sample. This report presents the analysis and findings of the project impact assessment.

The report structure starts with the general method of analysis used, followed by the RD&E background and an outline of the impact pathway in a logical framework, then describes the approach used to quantify the identified costs and benefits including any data gaps and limitations to the analysis, presents the results including from the sensitivity analysis, and finally discusses any implications for stakeholders.

## General method

The impact assessment built on the impact assessment guidelines of the CRRDC (CRRDC, 2018) and included both qualitative and quantitative analysis. The general method that informed the impact assessment approach is as follows:

1. Review project documentation including project plan, milestone reports, outputs and final report.
2. Discuss the project delivery, adoption and benefits with the Hort Innovation project manager, project researcher/consultant, growers and other relevant stakeholders (see *Stakeholder consultation*).
3. Through a logical framework, qualitatively map the project's impact pathway, including activities, outputs, and outcomes to identify the principal economic, environmental, and social impacts realised through the project
4. Collect available data to quantify the impact pathway and estimate the attributable impacts using cost-benefit analysis (over a maximum 30 years with a 5% discount rate), and then sensitivity test the results to changes in key parameters.
5. Discuss the implications for stakeholders.



The analysis identified and quantified (where possible) the direct and spillover impacts arising from the RD&E. The results did not incorporate the distributional effect of changes to economic equilibrium (supply and demand relationships) which was beyond the scope of the MT21015 impact assessment program. A more detailed discussion of the method can be found in the *MT21015 2021-22 Summary Report* on Hort Innovation project page [Horticulture Impact Assessment Program 2020/21 to 2022/23 \(MT21015\)](#).

## Project background

Apple and Pears is a mature industry with a strong reliance on the domestic market. Industry production volumes have been increasing as a result of increased plantings and production intensity, with a trend towards orchard redevelopment featuring high-density production systems. Increased volumes have placed increased pressure on the domestic market, impacting farm gate prices and grower returns.

While the export of apples and pears currently represent a small share of production (1% of apples, 7-10% of pears), historic

export volumes up to the early 2000's were much higher with up to 10% of apples and 12% of pears being exported, until the subsequent decline in volumes attributed to the removal of a free trade agreement with the UK. With ongoing production growth expected across the industry due to the adoption of new practices increasing orchard productivity, exports were identified as an important mechanism to drive industry growth, given the limited ongoing opportunity available within the mature domestic market.

AP17002 was undertaken to build the capability and market opportunity for growers to increase export volumes above and beyond the opportunities presented in the domestic market. While export market strategies, market access and export readiness activities had been pursued in previous industry programs, a dedicated export program with the necessary level of technical support had not been delivered.

The specific market opportunities were guided by the Apple and Pear Export Development Strategy (AP15009) which identified the long term goal of exporting 10% of marketable production by 2027. The methods for building capability and industry engagement were generally drawn from those used in other horticulture industries that have experienced successful export growth in recent years (e.g. Table Grapes, Citrus).

AP17002 aligned with the Apple and Pear Strategic Investment Plan (SIP) 2022-2026 through:

- Outcome 1: Demand creation. Strategy 4. Develop a targeted export market development plan to strengthen trade relationships in key export markets. Strategy 5. Monitor and record an apple and pear pests and diseases profile for the purpose of supporting market access and to continue to seek new market access and improvements to existing markets as outlined in the export strategy

## Project details

AP17002 was funded from 2018 to 2022 (Table 1).

**Table 1. Project details**

<b>Project code</b>	AP17002
<b>Title</b>	Apple and pear export readiness and market access
<b>Research organization(s)</b>	Apple and Pear Australia Limited (APAL)
<b>Project leader</b>	Justin Smith
<b>Funding period</b>	August 2018 to October 2022
<b>Objective</b>	Increase export readiness and market access opportunities for the apple and pear industry to support sustainable industry growth and achieve the long term goal of exporting 10% of marketable production by 2027.

## Logical framework

The impact pathway linking the project's activities and outputs, and their assessed outcomes and impacts have been laid out in a logical framework (Table 2).

**Table 2. Project logical framework detail**




**Market development intelligence and strategy**

- Industry Export Portal was designed and delivered via the APAL website, which provided information on priority market import requirements, retail pricing (Thailand, Singapore, UK), and market insights (Thailand).
- Participation at x3 international trade study tours/conferences to establish market opportunities and network with potential buyers.
- Developed industry communication articles on industry export opportunities and pathways.

**Export capacity building and readiness**

- Export grower/packhouse registration portal delivered (focus on Thailand market).
- Export pear development in Thailand – Rico and Goulburn River Gold varieties launch.
- Online export training modules prepared (core and industry specific).

## RD&E activities



- Regional export strategy workshop delivery and grower engagement.
- Supply and update MRL requirements to industry participants

### Market access and market improvement

- Market access assessment to identify 4 priority market access improvement priorities for industry – “Technical Market Access Strategy” for apples and pears.
- Engaging key stakeholders with the Technical Market Access Strategy
- Providing technical input to support trade market access protocol development and formation.
- Draft Trade Assessment Panel applications
- Input into Integrated Pest Management extension and biosecurity programs.

## RD&E outputs



- **1 x final report** submitted to Hort Innovation (not published online).
- **1 x online training package** supplied on the export portal (core and industry specific modules), accessed by 14 growers.
- **1 x export capability workshop** delivered in WA (n=6 grower attendees).
- **1 x published market import requirements** (n=11 markets), **retail pricing** (n=3 markets) and **market insights** (n=1 markets).
- **6 x industry export communications articles** (published in Australian Fruit Grower Magazine).
- **1 x Thailand registration audit guidance document annual update.**
- **1 x Technical market access strategy** including overview and industry preferences for future market access and market improvement.
- **3 x Market access applications** supplied to the Trade Assessment Panel.
- **1 x Import Risk Assessment response** for US apples imports to Australia.
- **1 x emergency industry response plan** (each for apples and pears).

## Outcomes



The key end of project outcome for AP17002 was in driving export readiness, export capacity and improving market opportunities for apple and pear industry stakeholders.

- **Increased awareness of export market opportunities.** The project delivered industry engagement through communications articles, access to online resources (>2,500 exporter page views) and direct grower engagement that raised the awareness of export trade opportunities.
- **Improved export capability.** Marginal change in industry capability influenced through the program, with the online training course accessed by n=14 growers and a single export workshop with n=6 grower attendees. General engagement with outputs and delivery areas was compromised by the COVID-19 pandemic. The project identified that larger growers already have the capability to export through experience with other commodities
- **Alignment with market access priorities and strategy.** Knowledge of the requirements to support market access outcomes for priority markets identified, supporting subsequent investment.
- **Export market registrations.** N=7 growers and n=6 packhouses applied for access to the Thailand market.
- **Strategic alignment.** New knowledge about the strategic direction of industry, including limited incentive for growers to export under current market conditions. This informed a refocus to export development that prioritises the production of export ready fruit, which can be exported when market conditions are favourable.





By delivering the first dedicated program to support apple and pear growers develop export capability and market opportunities, AP17002 has contributed to the long term capacity of industry to strategically coordinate export activities to maintain sustainable industry prices, specifically:

- [Economic] Avoided market risk and revenue losses from domestic market oversupply (increased plantings and productivity), supporting sustainable returns.
- [Economic] Avoided costs in protocol market registration.
- [Socio-economic] Increased industry spillovers including employment and economic stimulant to local communities (The CIE 2023).
- [Socio-economic] Increased capacity and understanding of export markets and trade negotiations underpinning industry development.
- [Socio-economic] Project delivery learnings inform new export levy funded RD&E investments, contributing towards more effective RD&E outcomes with improved longer term economic, social, and environmental impacts.

## Project costs

The project was funded by Hort Innovation, using the apple and pear research and development levy and contributions from the Australian Government.

### Nominal investment

The project funding period was 2019 to 2022 (Table 3). Hort Innovation overhead costs were added to the direct project cost to capture the full value nominal of the RD&E investment.

**Table 3. Project nominal investment**

Year end 30 June	Hort Innovation project costs (\$)	Hort Innovation overheads <sup>1</sup> (\$)	Total nominal cost (\$)
2019	544,843	75,093	619,976
2020	148,594	25,112	173,706
2021	414,188	67,278	481,466
2022	247,654	40,298	287,952
<b>Total</b>	<b>1,355,319</b>	<b>207,781</b>	<b>1,563,100</b>

1. The overhead and administrative costs were calculated from the Financial Operating Statement of the Apple and Pear Fund Annual Reports, averaging 15.8% for the AP17002 funding period (2018-2022).

### Present Value of investment

The nominal total investment cost of \$1.56 million identified in Table 3 was adjusted for inflation (ABS, 2024) into a real investment of \$1.84 million (2023-24 equivalent values). This was then further adjusted to reflect the time value of money using a real discount rate of 5% (CRRDC 2018), generating a present value (PV) of costs equal to \$2.21 million (2023-24 PV).

## Project impacts

The impact pathways identified in Table 2 were evaluated against available data to determine if their impact could be quantified with a suitable level of confidence.

### Impact pathway and available data

The logical framework identified a limited direct impact pathway for AP17002. This was primarily the result of limited industry engagement achieved by the project with smaller growers not already exporting that were seeking to become 'export ready' (the initial framing and focus of the project). Consultation with industry stakeholders indicated that only larger growers could be reasonably expected to materially impact overall export volumes for the industry and would derive a worthwhile commercial benefit from doing so. AP17002 identified that these growers have existing export capacity through their experiences with other horticultural products, reducing the relevance of export capacity building initiatives specifically for apples and pears.

AP17002 was therefore identified as contributing foundational learnings to the future export development strategy for the apple and pear industry. The current strategic focus, as evolved and informed by AP17002, is focused towards delivering 'industry wide' initiatives including market access applications, protocol improvement negotiation. The priority for industry has also moved to focusing on the capacity to produce and supply 'export ready' fruit to ensure sufficient export opportunity is available when it makes economic sense for growers to do so, in support of maintaining a balanced domestic supply in years of high production. Available data from industry regarding benchmarked industry returns, forecast production volume growth and the associated supply/demand price relationship were used to inform the opportunity for maintaining a balanced domestic market through subsequent iterations of export development investment that were ultimately informed by AP17002.

### Impacts valued and valuation framework

In line with the above, a model was developed to estimate:

- [Economic] Avoided market risk and revenue losses from domestic market oversupply (increased plantings and productivity), supporting sustainable returns.

Without investment in export development (including AP17002), forecasted industry production volume growth was calculated to generate a level of industry value for class 1 fruit to 2040 as determined by existing price relationships and supply informed by processing/export/ import shares. The combined nominal average annual (farmgate) industry class 1 revenue return (domestic and export) from 2025-2040 was calculated at \$482.96 million (2023-24 dollars) without the investment.

With the investment AP17002, supporting investments AP21001 and anticipated future investments in export development for the apple and pear industry informed by learnings from AP17002, the capacity to maintain an optimal domestic supply balance to achieve favourable domestic market returns will be supported. Analysis of industry production forecast data supplied up to the 2029 season<sup>1</sup> identified that increased production volumes will increase the supply per capita of class 1 fruit, and reduce the farmgate price received by growers relative to the optimal farmgate price of \$2.87/kg for apples and \$1.90/kg for pears. Compared to baseline export volumes calculated in line with the average export share of production, a target export volume was identified that would be required to achieve the optimal farmgate price (annual average of 11,899 tonnes of apples; 906 tonnes of pears beyond baseline export volumes for years where exports will support a stronger domestic price). The farmgate price received for exported fruit was assumed to be at least as great as the domestic price. Ensuring that export fruit can achieve at least the return of domestic fruit is a key assumption and requirement to ensure export is a viable pathway for the industry.

The valuation framework anticipates that industry capacity to utilise export markets in pursuit of an optimal domestic volume balance will commence from the 2028 season, which aligns with the conclusion of the next iteration of investment post-AP21001. The extent to which industry will adopt actions in support of achieving a domestic supply balance will initially be low (25% of production volume in 2028), but will steadily climb to 100% of production volume by 2030 as growers recognise the benefits of export for maintaining a balanced domestic market and the associated favourable returns. The actual export volume is assumed to be 75% of the optimal export volume, reflecting factors that impact the commercial realities of export. Finally, the proportion of the total benefits attributed to AP17002 was estimated based on the investment cost of AP17002 relative to the whole program of investment, which includes ongoing annual investment beyond the current AP21001 iteration assumed as an average annual amount of the investment to-date (AP15009, AP17002, AP21001) and guidance from Hort Innovation on future investment commitments.

### Impacts unable to be valued

The following impacts were unable to be valued:

- [Economic] Avoided costs in protocol market registration. The extent to which costs being incurred by growers to undertake activities in support of market registration were not available, and therefore the savings realised through improved registration capacity could not be determined. This impact area would otherwise represent a small share of the overall impact, given the low number of growers (n=7) and packhouses (n=6) registering over the AP17002 term.
- [Socio-economic] Increased industry spillovers including employment and economic stimulant to local communities (The CIE 2023). Increased apple and pear industry revenue, and profitability would generate flow on benefits to the

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<sup>1</sup> Supplied confidentially by APAL to Ag Econ for the purposes of completing this impact assessment. Beyond 2029, no additional production growth was assumed to occur (reflecting uncertainty around new industry plantings and productivity outcomes), so the analytical period was limited to 2040.

regional communities in which the industry operates. While this analysis quantified the direct impacts for apple and pear industry value, the flow-on effects require additional analysis using economic models that capture regional and national linkages, which are beyond the scope of the R&D impact assessment program (CRRDC 2018).

- [Socio-economic] Increased understanding of export markets and trade negotiations underpinning industry confidence and development. The increased understanding of factors informing a strategic approach to export growth can have an impact on the broader industry capacity, including knowledge, professionalism and ‘know how’ which will contribute positively to industry sentiment, including willingness to invest. A reliable non-market valuation method was not available to estimate these impact areas.
- [Socio-economic] Project delivery learnings inform new export levy funded RD&E investments, contributing towards more effective RD&E outcomes with improved longer term economic, social, and environmental impacts. A range of learnings were supported by AP17002 that have directly informed the delivery strategy of the subsequent investment AP21001. While the cumulative impact of these ongoing and future investments have been reflected in the overall impact pathway, the direct value of the AP17002 learnings informing this approach could not be determined.

## Data and assumptions

The required data relating to the impact pathway was collected from the project documents and other relevant resources (Table 4). Where available, actual data was applied to the relevant years, with estimates applied for any data gaps and projections into the future based on analytical techniques (for example correlations and trend analysis), or stakeholder estimates, or both. A data range was incorporated to reflect underlying risk and uncertainty. This was particularly relevant where estimates were needed due to data gaps, and where projections were made into the future. These ranges were then analysed through sensitivity testing (see *Results*).

**Table 4. Summary of data and assumptions for impact valuation**

Variable	Value	Source & comment
<b>General data and assumptions</b>		
Discount rate	5% (± 50%)	CRRDC Guidelines (2018)
Apple baseline export share of production	0.95%	5 year average (Hort Stats 2024), tested for sensitivity at a standard deviation.
Pear baseline export share of production	7.50%	5 year average (Hort Stats 2024), tested for sensitivity at a standard deviation.
Apple forecast CAGR 2024-2029 (%)	2.3%	APAL apple production forecast (confidential). After 2029, production growth was assumed to flatline.
Pear forecast CAGR 2024-2029 (%)	2.4%	APAL apple production forecast (confidential). After 2029, production growth was assumed to flatline.
Margin farmgate to wholesale price	-16.38%	5 year average difference between farmgate class 1 return (Orchard Business Analysis) and weighted average wholesale price (Hort Stats Handbook) for apples and pears.
Target apple farmgate price (\$/kg)	2.87 (-2.54, 3.06)	Three year average (2021-2023) calculated using farmgate/wholesale price margin and Hort Stats Handbook wholesale price. Tested for sensitivity across a range of target prices, informed by the percentage difference from the high (\$3.06/kg) and low (\$2.54/kg) price compared to the baseline price (\$2.87/kg).
Forecast average apple farmgate price (\$/kg)	2.68	Average 15 year forecast price based on supplied production forecast data and historical industry returns.
Target pear farmgate price (\$/kg)	1.90 (1.79, 2.03)	Three year average (2021-2023) calculated using farmgate/wholesale price margin and Hort Stats Handbook wholesale price. Tested for sensitivity across a range of target prices, informed by the percentage difference from the high (\$2.03/kg) and low (\$1.79/kg) price compared to the baseline price (\$1.90/kg).
Forecast average pear farmgate price (\$/kg)	1.84	Average 6 year forecast price based on supplied production forecast data and historical industry returns. After 6 years, the domestic price was estimated to increase beyond the 2021-2023 average, driven by flat industry production growth and increasing population.
Apple price/supply relationship (\$/kg per kg capita)	-0.67	Line of best fit calculation for 10 year relationship between wholesale price and supply per capita (Hort Stats). For every 1kg of supply per capita, the apple price will reduce by \$0.67/kg.

Pear price/supply relationship (\$/kg per kg capita)	-1.16	Line of best fit calculation for 10 year relationship between wholesale price and supply per capita (Hort Stats). For every 1kg of supply per capita, the pear price will reduce by \$1.16/kg.
Year of first benefit	2027	As there has been marginal widescale change in export volumes of apples and pears, an additional time allowance is provided before adoption of targeted and strategic export action to support a balanced domestic price.
R&D Outcome attribution	50% (±60%)	The majority of large growers were noted as having existing export capacity as influenced by experience with other horticultural products. Therefore while export activity would be expected to continue in the absence of AP17002 a 50% share of specific outcome of maintaining the domestic supply balance was assumed given the contributions of broader industry support services (e.g. improved market access conditions). The actual outcome attribution was highly uncertain so has been tested at a wide range.
R&D Counterfactual attribution	50% (± 33%)	It is possible that export activity to maintain the domestic supply balance could have been realised without levy funding for the period covered by AP17002. However the cumulative contribution of AP17002 learnings to informing subsequent investment illustrates the value of the levy research program, impacting the counterfactual attribution.
Maximum potential export volume and adoption profile	75% (±33%)	As a range of commercial realities impact export activities a share of the total optimal export volume is assumed to be secured through targeted strategic action, tested for sensitivity. The share of industry initially adopting strategic export actions is assumed to be 25% in 2027, steadily rising to 100% by 2030.
AP17002 cost attribution	31% (2027) to 16% (2040)	The proportion of the total benefits attributed to AP17002 was estimated based off the project specific investment amount relative to ongoing investment expected to maintain and further refine export development for the industry. In the first year of impact (2027), attribution peaked at 31%, before declining to 16% as additional investment occurs out to 2040.

## Results

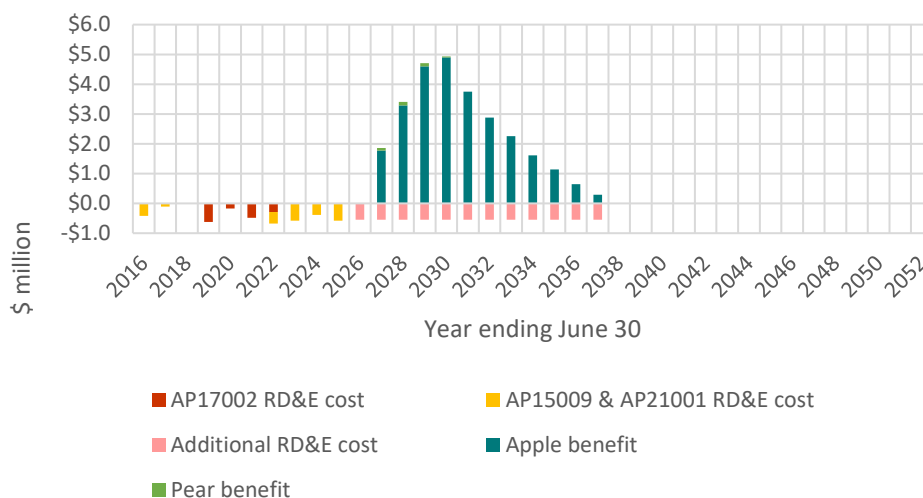
The analysis identified PV costs (PVC) of \$2.21 million (2023-24 PV) between 2018-19 and 2022-23, and estimated PV benefits (PVB) of \$17.94 million (2023-24 PV) accruing between 2027 and 2037 (Table 5). When combined, these costs and benefits generate a net present value (NPV) of \$15.73 million, an estimated benefit-cost ratio (BCR) of 6.78 to 1, an internal rate of return (IRR) of 28% and a modified internal rate of return (MIRR) of 12%.

**Table 5. Impact metrics for the total investment in project AP17002**

Impact metric	Years after last year of investment						
	0	5	10	15	20	25	30
<b>PVC (\$m)</b>	2.21	2.21	2.21	2.21	2.21	2.21	2.21
<b>PVB (\$m)</b>	0.00	1.13	12.58	17.12	17.94	17.94	17.94
<b>NPV (\$m)</b>	-2.21	-1.09	10.36	14.91	15.73	15.73	15.73
<b>BCR</b>	0.00	0.51	5.68	7.73	8.10	8.10	8.10
<b>IRR</b>	Negative	18%	28%	28%	28%	28%	28%
<b>MIRR</b>	Negative	16%	19%	17%	15%	13%	12%

Figure 2 shows the annual undiscounted benefit and cost cash flows attributed to AP17002.

**Figure 2. Annual cash flow of undiscounted total benefits and total investment costs**

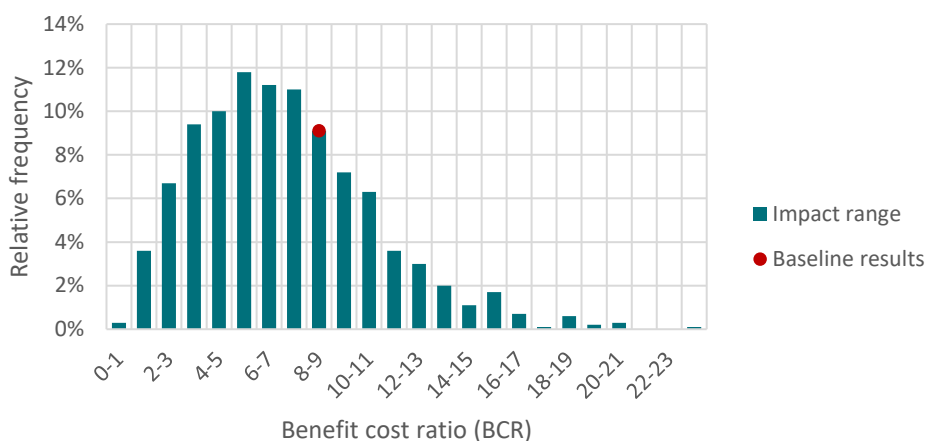


### Sensitivity analysis

Given the risk and uncertainty associated with a number of underlying modelling variables, the potential model variation was estimated and drivers of variation identified. The sensitivity testing used @Risk stochastic modelling to incorporate the combined effect of changing all variables across their full ranges over 1000 simulations.

**Impact variation (Figure 3).** Compared to the baseline BCR of 8.10:1, the 1000 simulation showed a potential BCR range of between 0.30:1 and 23.37:1, with 90% of results falling between 2.16:1 and 13.86:1 (i.e. excluding the low probability tails), and a simulation average of 7.17:1 (below the baseline results). Of the 1000 simulations, 99.7% had a BCR greater than 1:1 (benefits greater than RD&E costs), giving a high level of confidence that the investment will generate a positive impact.

**Figure 3. Impact variation over 1000 simulations**

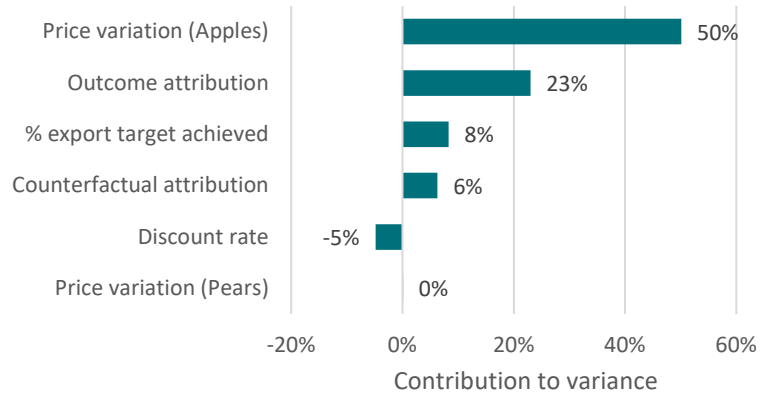


**Contribution to variance (Figure 4).** Contribution to variance is a measure of how much a variable contributes to the total variance of an output. Contribution to variance also shows whether a variable is positively or negatively correlated with impact. A negative contribution to variance, with bar extending to the left, indicates that this input has a negative effect on BCR: increasing this input will decrease the impact.

- **Variation in the target apple export price** showed the largest contribution to variance (50%), which is to be expected given that the target domestic apple price for industry contributes significantly to the associated volume required for export and the overall opportunity for value to be optimised.
- **Export outcome attribution** resulting from activities of the levy-funded trade development program had the second highest contribution to total variance (23%), reflecting the potentially wide range of other factors (economic, market, geopolitical, commercial) that will also influence the extent to which export is pursued.

- Less significant variance effects were identified for the **discount rate** (5%) and the variation in the **target price for pears** (<1%).

Figure 4. Contribution to variance



## Implications and learnings

The analysis identified that while there was no clear pathway to impact over the AP17002 delivery period, the investment still supported broad industry learnings that have informed a refined approach to industry export development that is expected to generate industry impact. As the first dedicated export development investment, AP17002 sought to improve market access opportunities and build export capability for growers not currently exporting, to support a material shift in the share of production volume sent to export markets through targeted activity including the provision of online information resources, grower workshops and direct engagement. While the AP17002 delivery model was aligned to RD&E investment approaches used in other horticultural industries that have made the successful transition to an export-orientated culture, several learnings were realised through the project that have supported a transition in investment strategy through future project iterations.

A key learning from AP17002 was the understanding that large commercial growers, who have the most significant capacity to influence export volumes, already had existing export knowledge and capacity through experience gained with other commodities (e.g. stonefruit). Furthermore, at the time of the investment the export price in key markets was comparable, or even below possible returns on the domestic market (influenced by a highly competitive global market), reducing the incentive to export fruit.

Industry feedback generated through AP17002 and the subsequent AP21001 investment (which was further informed through the AP17002 delivery pathway) indicated that instead of growing the overall share of industry production sent to export markets (the original strategic approach identified through AP15009), a focus on maintaining an optimal domestic supply balance would be prioritised. This approach features the opportunistic use of exports to ensure that in years of strong supply, returns on the domestic market would not be compromised. This reflects the impact pathway quantified in this impact assessment, whereby AP17002 has informed a refined approach to export R&D for the apple and pear that will facilitate balanced domestic supply. Integral to realising the outcome of opportunistic export activity is the availability of viable markets. The Market Access Strategy delivered through AP17002 has served as a foundational resource in guiding and prioritising market access negotiations and technical input in this regard.

Based on forecast production volumes for the 2024-2029 seasons, the total supply per capita was identified to increase as a result of increased supply, associated with a decline in industry returns relative to a target return. Analysis of the supply/price relationship for both apples and pears was used to inform the potential domestic market price in response to increased export volumes. Without exports, the domestic price was estimated to fall by \$0.19/kg (6.6%) for apples and \$0.06/kg (3.2%) for pears. A target export volume was modelled to represent the maximum domestic market return over a 10 year period (2027-2037). This model identified an annual average increase of 11,899 tonnes of apples and 908 of pears would need to be exported (in years where the forecast supply exceeded resulted in a sub-optimal farmgate return from 2027 onwards) above the baseline export volume. The analysis found the majority (98%) of returns would be achieved through apple exports compared to pear exports, driven by the comparatively lower baseline apple export share and a stronger apple production forecast relative to pears. The anticipated capacity of industry to realise optimal domestic market returns through increasing export volumes is assumed to reflect the cumulative influence of export capability investment, which commenced with AP17002, but will be subject to ongoing investment.

Beyond the impacts to farmgate returns through an optimised domestic supply, additional economic and social impacts were identified that could also not be quantified due to data limitations. These included the reduced costs for growers registering to access protocol market, support for regional community resilience from a more sustainable apple and pear industry, broader industry development stimulated and the contribution to more effective and informed RD&E.

Through the analysis of this impact pathway, moderate benefits relative to the RD&E costs were quantified with a baseline BCR of 8.10:1. In addition, sensitivity testing was undertaken to understand the potential variation in the results given changes in the underlying variables. This identified a potential impact range of between 0.30:1 and 23.37:1, with 90% of results falling between 2.16:1 and 13.86:1 giving a high level of confidence that the investment will generate a positive impact. The variation was driven primarily by the variation in the target farmgate domestic price for apples relative to estimated baseline levels, and the attribution of export outcomes to the AP17002 investment.

## Stakeholder consultation

Where possible, Ag Econ sought to engage multiple stakeholders across key areas of the logical framework and impact pathway to augment existing information and data sources, and reduce any uncertainty or bias from individual stakeholders. All stakeholders were engaged through telephone or online meetings, with follow up emails as necessary. Consultation followed a semi-structured approach in line with broad topics relating to the impact pathway and associated data requirements. Table 6 outlines the stakeholders consulted as part of this impact assessment and the topics on which they were consulted.

**Table 6. Stakeholder consultation by theme**

Stakeholder details		Consultation topics						
Stakeholder and organisation	Stakeholder type	Related research	Research inputs	Research outputs	Research immediate outcomes	Follow on research	Stakeholder adoption	Impact areas and data
Mimi Doan, Hort Innovation International Trade Manager Export Capability	RD&E process owner / manager	✓	✓	✓	✓	✓	✓	✓
Jenny Meeberg, APAL Head of Trade	RD&E practitioner	✓	✓	✓	✓	✓	✓	✓
Lauren Mann, APAL Industry data manager	RD&E practitioner	✓	✓	✓	✓	✓	✓	✓
Justin Smith APAL, Head of Industry services	RD&E practitioner	✓	✓	✓	✓	✓	✓	✓
Joe Ceravolo, Ceravolo Orchards	Grower				✓	✓	✓	✓
Andrew Maughan, Pomona Valley Orchards	Grower				✓	✓	✓	✓



## Glossary of economic terms

Benefit-cost ratio (BCR)	The ratio of the present value of investment benefits to the present value of investment costs.
Cost-benefit analysis (CBA)	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.
Direct Effects	Impacts generated for the funding industry as a result of adoption of the RD&E outputs and recommendations, typically farm level outcomes relating to productivity and risk.
Discounting and Present Values	The process of relating the costs and benefits of an investment to a base year to reflect the time value of money or opportunity cost of RD&E investment. The analysis applies a real discount rate of 5% in line with CRRDC Guidelines (CRRDC 2018) with results sensitivity tested at discount rates of 2.5% and 7.5%.
Economic Equilibrium	Due to a market's underlying supply and demand curves, changes in supply will have an impact on price and vice-versa. The Economic Equilibrium is the point at which market supply and price are balanced. Estimating the magnitude of market response to changes in supply or demand is a complex and demanding task that is considered beyond the scope of most CRRDC Impact Assessments (CRRDC 2018).
Gross Margin (GM)	The difference between revenue and cost of goods sold, applied on a per hectare basis and excluding fixed or overhead costs such as labour and interest payments.
Internal rate of return (IRR)	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.
Modified internal rate of return (MIRR)	The internal rate of return of an investment that is modified so that the cash inflows generated from an investment are re-invested at the rate of the cost of capital (in this case the discount rate).
Net present value (NPV)	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.
Nominal and real values	Nominal values reflect the actual values in a given year (e.g. contracted RD&E expenses). These are converted to real (inflation adjusted) values to make them comparable across time.
Spillover Effects	Impacts generated for stakeholders who did not fund the RD&E, including other agricultural industries, consumers, communities, and the environment.

## Abbreviations

APAL Apple and Pear Australia Limited

CRRDC Council of Rural Research and Development Corporations

RD&E Research, Development and Extension

SIP Strategic Investment Plan

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## Appendix A. Total Program costs

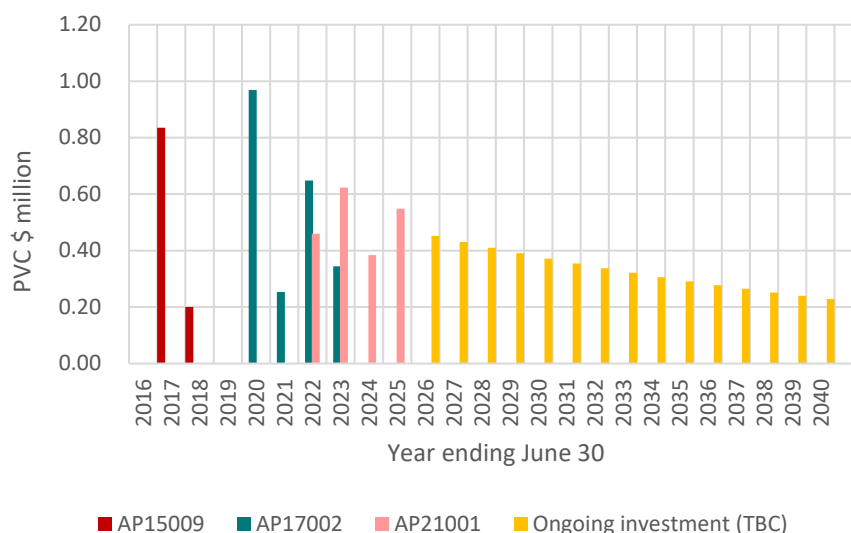
Three investment stages were identified realised to date, in support of providing industry export development to the apple and pear industry. Additional investment is assumed beyond what is currently contracted in order to providing ongoing export development. The cost share of AP17002 (in present value (PV) terms) was used to attribute a share of the total program benefits to the project (Table 7 and Figure 5).

- **Export strategy.** AP15009 *Australian Apple and Pear Industry Market Development Program*
- **First iteration export development.** AP17002 *Apple and pear export readiness and market access*
- **Second iteration export development.** AP21001 *Apple and pear market access and trade development*
- **Ongoing investment in export development.** (TBC) Ongoing investment to support market access and trade development for the apple and pear industry is assumed to continue, with benefits being attributed to AP17002 in accordance with a cost share model.

Table 7. Total program cost by investment stage

Investment stage	Total PVC (\$m)	% Total PVC	Years	Annual PVC
AP15009	1.04	10%	2	0.52
AP17002	2.21	22%	4	0.55
AP21001	2.02	20%	4	0.51
Ongoing investment	4.59	47%	12	0.38
Total program	9.86	100%		

Figure 5. Total present value of program cost by investment stage



Ends.