

Final Report

Fund Impact Assessment 2020/21 for cherry, vegetables and small tropicals: Evaluation of LY16005

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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 *LY16005 Australian lychee industry communication programme*. The project was funded by Hort Innovation over the period Aug 2017 to Nov 2020.

Methodology

The investment was analysed qualitatively within a logical framework that included activities and outputs, outcomes, and impacts. Actual and potential impacts 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 2021-22 dollar terms and were discounted to the year 2021-22 using a real (inflation-adjusted), risk free, pre-tax discount rate of 5% to estimate the investment criteria.

Key findings

The Hort Innovation investment in project LY16005 delivered a tri-annual industry newsletter *Living Lychee*, and maintained and updated the Lychee Australia website covering a wide range of topics including updates on general industry news, as well as for completed, ongoing and proposed levy investments in orchard management, post-harvest management, supply chain management, and marketing and consumer insights.

From these outputs, the following potential impacts were identified:

- Increased grower awareness of research results and outputs, supporting earlier grower adoption of innovations and best practices. In turn supporting the following impacts:
 - [Economic] Increased orchard productivity (yield per unit of inputs)
 - [Economic] Increased market access (demand) supporting higher prices and sustainable industry expansion.
 - [Social] Increased contribution to regional community wellbeing from more profitable lychee growers as a result of adoption of new levy research outputs.
 - [Social] Increased sustainability of quality and affordable lychee supply, supporting increased consumption of lychees with associated health and wellbeing benefits.
 - [Environmental] Increased environmentally sustainable production from adoption of industry best practice.
- [Economic, social, environmental] Increased grower understanding of and engagement with the lychee levy investment process and industry level activities, potentially supporting greater industry involvement and improved future RD&E outcomes.
- [Economic, social] Increased demand for lychees as a result of greater consumer understanding (through the website) of the Australian lychee industry; and how to store, use and buy lychees, providing price support for Australian lychees and supporting economically sustainable increases in production levels.

The direct industry impact of communications (as part of a broader extension and communication program) is best quantified by the extent to which it changes the diffusion and adoption of practice change within the industry. The degree to which communication and extension can shift the adoption curve will in part depend on the specifics of the innovations being communicated, so the impact pathway should be quantified for each specific topic that was communicated. A review of LY16005 outputs and discussions with industry stakeholders indicated that while the communication topics were valued by stakeholders, the impact on farm-level practice change could not be confidently attributed and therefore quantified. At the same time, for the broader industry and social impacts, a lack of reliable data prevented valuation. As a result, no impacts were quantified for LY16005.

Investment criteria

Total funding from all sources for the project was \$0.17 million (2021-22 equivalent value). As potential project impacts could not be quantified, a full set of investment criteria could not be produced.

Keywords

Impact assessment, cost-benefit analysis, lychee, communication, extension.

Introduction

Evaluating the impacts of levy investments is important to demonstrate to levy payers, Government and other industry stakeholders the economic, social and environmental outcomes of investment for industry, as well as being an important step to inform the ongoing investment agenda.

The importance of ex-post evaluation was recognised through the Horticulture Innovation Australia Limited (Hort Innovation) independent review of performance completed in 2017, and was incorporated into the Organisational Evaluation Framework.

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 across a cohort of Funds in its RD&E portfolio. The assessments were required to meet the following Hort Innovation evaluation reporting requirements:

- Reporting against the Hort Innovation's Strategic Plan and the Evaluation Framework associated with Hort Innovation's Statutory Funding Agreement with the Commonwealth Government.
- Reporting against strategic priorities set out in the Strategic Investment Plan for each Hort Innovation industry fund.
- Annual Reporting to Hort Innovation stakeholders.
- Reporting to the Council of Rural Research and Development Corporations (CRRDC).

As part of its commitment to meeting these reporting requirements, Ag Econ was commissioned to deliver the *Fund Impact assessment 2020/21: Cherry, Sweetpotato, Vegetables, Small Tropicals (MT21013)*. This program consisted of a once-off impact assessment series of randomly selected Hort Innovation RD&E investments (projects) within each of the nominated Funds.

Project *LY16005 Australian lychee industry communication programme* was randomly selected as one of the 3 investments in the 2020-21 sample for the small tropicals funds. This report presents the analysis and findings of the project impact assessment.

General method

Hort Innovation's small tropicals levy funds include lychee, papaya, passionfruit, persimmon, and pineapple. The 2020-21 population of projects for the small tropicals was defined as an RD&E investment where a final deliverable had been submitted in the five-year period from 1 July 2016 to 30 June 2021. This generated an initial population of 140 Hort Innovation small tropical investments, worth an estimated \$27.1 million (nominal Hort Innovation investment). Projects in the Frontiers Fund, those of less than \$80,000 Hort Innovation investment, multi-industry projects where levy funds were less than 50% of total Hort Innovation investment, enabler projects that didn't directly support a small tropicals 2017-2021 Strategic Investment Plan (SIP) outcome, and projects that have had a previous impact assessment completed were removed from the sample. A total of 7 projects with a combined value of \$1.93 million satisfied these criteria and formed the eligible population. The 7 eligible projects were then stratified using:

- A consolidated set of small tropical 2017-2021 SIP outcomes
 - Supply/productivity
 - Demand
 - Capacity/comms/extension
 - Business insights (data).
- Three project value ranges
 - \$80,000 to \$160,000
 - \$160,000 to \$280,000
 - Above \$280,000.

A random sample of 3 projects (one each for lychee, persimmon, and pineapple) was selected worth a total of \$0.94 million (nominal Hort Innovation investment), equal to 47% of the eligible small tropicals RD&E population (in nominal terms).

The impact assessment followed 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 included both qualitative and quantitative descriptions that are in accord with the impact assessment guidelines of the CRRDC (CRRDC, 2018).

The evaluation process involved reviewing project contracts, milestones, and other documents; interviewing stakeholders including Hort Innovation staff, project delivery partners, growers and other industry stakeholders where appropriate (see *Acknowledgements*); and collating additional industry and economic data where necessary. Through this process, the project activities, outputs, outcomes, and impacts were identified and briefly described; and the principal economic, environmental, and social impacts were summarised in a triple bottom line framework.

The impact assessment used 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 and rationale

Industry background

The Australian lychee industry included approximately 250 growing businesses in 2022 (Hort Innovation 2022a). The lychee industry recorded a five-year average production of 2,500 tonnes (to year ending June 2021) decreasing by an average 1.9% per year (Hort Innovation 2022b). The industry recorded a nominal production value of \$32 million in 2020-21 which had increased at an average 6.4% per year from 2016-7. In 2020-21, Queensland accounted for 99% of production and New South Wales (NSW) 1%. Over the five years to 2020-21, approximately 92% of production went to the domestic fresh market, and 18% to the domestic market (Hort Innovation 2022b).

Lychee growers pay levies to the Department of Agriculture, Fisheries and Forestry (DAFF), which is responsible for the collection, administration and disbursement of levies and charges on behalf of Australian agricultural industries. Levy is payable on lychees that are produced in Australia and either sold by the producer or used by the producer in the production of other goods. Hort Innovation manages the lychee levy funds which are collected for both R&D and marketing purposes.

Rationale

The lychee industry, led by the Australian Lychee Growers Association (ALGA), has had a long-standing communications program to increase grower awareness of the levy RD&E program and disseminate RD&E outputs to facilitate the update of new innovations and best practices.

The communications program included a trade journal, *Living Lychee*, and the industry website with separate portals for casual visitors and for growers.

Alignment with the Lychee Strategic Investment Plan 2017-2021

The lychee levy investments are guided by a Strategic Investment Plan (SIP). Industry communications aligned with Strategy 4 of Outcome 1 of the Lychee SIP 2017-2021 (Hort Innovation 2017): *Build uptake of research, development and better management practices amongst lychee growers, so that Increased capacity and productivity meets growing international and domestic demand.*

Alignment with national priorities

The Australian Government's National RD&E priorities (2015a) and Science and Research Priorities (2015b) are reproduced in Table 1. The LY16005 project outcomes and related impacts will contribute to RD&E Priority 4, and to Science and Research Priority 1.

Table 1. National Agricultural Innovation Priorities and Science and Research Priorities

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

Project details

Summary

Table 2. Project details

Project code	LY16005
Title	Australian lychee industry communication programme
Research organization	Fruit Tree Media
Project leader	Nick Morenos
Funding period	Aug 2017 to Nov 2020

Logical framework

A logical framework is shown in Table 3 to highlight the connection between the project activities, outputs, outcomes, and impact.

Table 3. Project logical framework

Activities	Fruit Tree Media conducted the following communications activities: <ul style="list-style-type: none"> • Engage with ALGA to understand relevant industry issues, news and updates for extension and communication • Engage with Hort Innovation and industry researchers to understand and receive relevant R&D and marketing reports and updates for extension and communication. • In coordinating with ALGA: <ul style="list-style-type: none"> ○ publish and disseminate (hardcopy to 250 growers in QLD and NSW representing most lychee growers) the Living Lychee industry journal in July, October and March each year. ○ maintain and update the industry website australianlychee.com.au. ○ conduct a stakeholder survey of 30 growers (from an online database of 200 growers) to evaluate project outcomes.
Outputs	<ul style="list-style-type: none"> • <i>Living Lychee</i> hard copy and online publications (11 publications Sep 2017 to Oct 2020). Including: <ul style="list-style-type: none"> ○ ALGA presidents report; ALGA EO report ○ Regional Reports from SE Qld, Tablelands and Nth Qld, Bundaberg and Childers area, Central Qld, Far North Qld. Northern NSW. ○ Research and other reports as they became available including: <ul style="list-style-type: none"> ▪ Protecting Aussie bees/Pollination project/stingless bees as pollinators ▪ Lychee minor use permits list ▪ Lychee industry grading guide; Lychee field guide ▪ Harmonised Australian Retailer Produce Scheme (HARPS) ▪ Mite disinfestation for improved market access ▪ Lychee tree slow decline ▪ ALGA grower meeting presentation highlights ▪ Communication program evaluation results

	<ul style="list-style-type: none"> ○ Other ALGA/ Hort Innovation reports as they became available including: <ul style="list-style-type: none"> ▪ Lychee marketing programs, updates and results ▪ Lychee export market development strategy ▪ Across industry project summaries (COVID-19 & consumer behaviour; Consumer behaviour and retail data; pollination fund projects). ● Industry website <ul style="list-style-type: none"> ○ News articles ○ Research reports ○ Living Lychee issues ○ ALGA committee members section ○ Practical information extracted from past and future issues of <i>Living Lychee</i> to be available for download.
Outcomes	<ul style="list-style-type: none"> ● Growers had an increased awareness and understanding of: <ul style="list-style-type: none"> ○ The Australian lychee industry ○ Industry activities and programs, including the strategic plan ○ R&D projects, results and outputs ○ Industry promotions and marketing programs ○ How and where the lychee industry levy is being spent ○ The relationship between ALGA, Hort Innovation and the Australian government. ● Broader stakeholders (consumers and supply chain partners) had an increased understanding of the Australian lychee industry; and how to store, use and buy lychees. <ul style="list-style-type: none"> ○ The industry website received about 4000 visits each month (up from 3000 pre-project). Across the project period, the top articles for public access were: <ul style="list-style-type: none"> ▪ Popular varieties (66,500 hits) ▪ Helpful hints for retailers (38,000 hits) ▪ Buying and storing lychees (34,000 hits) ▪ Preparing to eat (33,500 hits) ▪ Industry background (15,000 hits)
Impacts	<ul style="list-style-type: none"> ● Increased grower awareness of research results and outputs, supporting earlier grower adoption of innovations and best practices. Supporting: <ul style="list-style-type: none"> ○ [Economic] Increased orchard productivity (yield per unit of inputs) ○ [Economic] Increased market access (demand) supporting higher prices and sustainable industry expansion. ○ [Social] Increased contribution to regional community wellbeing from more profitable lychee growers as a result of adoption of new levy research outputs. ○ [Social] Increased sustainability of quality and affordable lychee supply, supporting increased consumption of lychees with associated health and wellbeing benefits. ○ [Environmental] Increased environmentally sustainable production from adoption of industry best practice. ● Areas of impact identified in the project grower surveys included orchard productivity relating to: <ul style="list-style-type: none"> ○ Improved flowering and fruit production in Fay Zee Siu variety. ○ More efficient use of resources. Overheads managed better. ○ Types and application rates of sprays, fertilisers, pruning. ○ Improved pruning and varietal selection/management. ○ Marketing, packaging, tree management. ● In addition to supporting the adoption of R&D recommendations and outputs, the industry communications supports: <ul style="list-style-type: none"> ○ [Economic, social, environmental] Increased grower understanding of and engagement with the lychee levy investment process and industry level activities, potentially supporting greater industry involvement and improved future outcomes. ○ [Economic, social] Increased demand for lychees as a result of greater understanding (through the website) of the Australian lychee industry; and how to store, use and buy lychees, providing price support for Australian lychees and supporting economically sustainable increases in production levels.

Project costs

Nominal investment

Table 4. Project nominal investment

Year end 30 June	Hort Innovation (\$)	Total (\$)
2018	25,008	25,008
2019	33,344	33,344
2020	25,008	25,008
2021	33,974	33,974
Total	117,334	117,334

Program management costs

R&D costs should also include the administrative and overhead costs associated with managing and supporting the project. The Hort Innovation overhead and administrative costs were calculated for each project funding year based on the data presented in the *Statement of Comprehensive Income* in the *Hort Innovation Annual Report* for the relevant year. Where the overhead and administrative costs were equal to the total expenses, less the research and development and marketing expenses. The overhead and administrative costs were then calculated as a proportion of combined project expenses (RD&E and marketing), averaging 16.1% for the LY16005 funding period (2018-2021). This figure was then applied to the nominal Hort Innovation investment shown in Table 4.

Real Investment costs

For purposes of the investment analysis, the investment costs of all parties were expressed in 2021-22 dollar terms using the Implicit Price Deflator for Gross Domestic Product (ABS, 2022).

Extension costs

LY16005 was an extension and communication project. Some of the underlying R&D communicated through LY16005 included separate communication and extension activities. As such, communications through LY16005 reinforced existing channels to increase awareness above that which would otherwise have occurred.

Project impact valuation

None of the impacts identified through the logical framework process were able to be valued for LY16005. The industry economic impact of communication projects (as part of a broader extension and communication program) is best quantified by the extent to which it changes the diffusion and adoption of practice change within the industry. The degree to which a communication program can shift the adoption curve will in part depend on the specifics of the innovations being communicated, so the impact pathway should be quantified for each specific topic that was communicated.

A review of LY16005 outputs, individual communicated topics and discussions with stakeholders was conducted to establish a clear impact pathway and enable impact valuation. While areas of impact were identified in the end of project stakeholder survey (see impacts in Table 3) these could not readily be aligned with communicated topics, or were too general in nature to determine the on-farm impacts (such as decreased costs, or increased revenue). The review of documents and stakeholder consultation further indicated that while the project provided the lychee industry with valuable updates regarding levy investments and broader industry news, a clear attribution of impact could not be confidently established and quantified. Reasons included topics relating to ongoing R&D with outputs not yet available; topics relating to industry level planning and activities with limited on-farm application; and topics relating to R&D where outputs were also communicated directly to growers through the R&D process or other channels.

As a result, while earlier adoption of R&D remains a possible impact of LY16005, the high level of uncertainty made it too difficult to quantify with confidence. A lack of reliable data also prevented the valuation of other impacts identified such as improved industry engagement in the RD&E process improving longer term outcomes, and social and environmental benefits from the adoption of best practice.

Public versus private impacts

The potential impacts identified from the investment included private impacts accruing to lychee growers and supply chain participants as well as public benefits in the form of spill-overs to regional communities from improved lychee industry economic and environmental sustainability.

Distribution of private impacts

The identified potential private impacts of LY16005 would include direct and flow-on (spill-over) impacts. Spill-over impacts would include:

- Production-induced effects, which reflect the flow-on changes to the supply chain (upstream and downstream) that result from farm level changes in inputs (chemicals, labour, packaging, transport, marketing) associated with practice change.
- Consumption-induced effects, which reflect the flow-on changes generated through the payments of wages and salaries to households and the subsequent expenditure of those incomes of purchasing household goods and services.

Furthermore, the true impact would also be influenced by the equilibrium (price) effect, which reflects changes in prices (of inputs and outputs) as a result in changes in supply and demand of those inputs and outputs. The price effect, essentially shifts benefits along the supply chain and between producers to consumers. The extent to which this would occur would depend on the slope of the short and long-term supply and demand curves.

Impacts on other Australian industries

The project impacts primarily focused on the lychee industry, but have the potential to inform related tree crop industries.

Impacts overseas

LY16005 was focused on communication to Australian lychee growers, with limited potential for international impact.

Results

All costs were discounted to 2021-22 using a real discount rate of 5%. While no identified impacts were able to be quantified, the results are shown for the length of the project investment period plus 30 years from the last year of investment (2020-21) as per the CRRDC Impact Assessment Guidelines (CRRDC, 2018).

Investment criteria

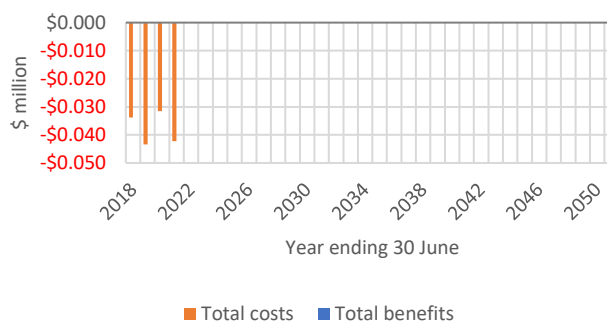
Table 6 shows the impact metrics estimated for different periods of benefit for the total investment. Hort Innovation was the only investor in LY16005.

Table 6. Impact metrics for the total investment in project LY16005

Impact metric	Years after last year of investment						
	0	5	10	15	20	25	30
PVC (\$m)	-0.170	-0.170	-0.170	-0.170	-0.170	-0.170	-0.170
PVB (\$m)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NPV (\$m)	-0.170	-0.170	-0.170	-0.170	-0.170	-0.170	-0.170
BCR	NA	NA	NA	NA	NA	NA	NA
IRR	NA	NA	NA	NA	NA	NA	NA
MIRR	NA	NA	NA	NA	NA	NA	NA

Figure 1 shows the annual undiscounted cash flows for LY16007. Cash flows are shown for the duration of the investment plus 30 years from the last year of investment.

Figure 1. Annual cash flow of undiscounted total benefits and total investment costs



Conclusions

Through a logical framework, a number of potential impacts were identified for PR16005, including earlier adoption of RD&E as a result of increased grower awareness and knowledge of RD&E outputs and recommendation, as well as increased demand from improved consumer awareness of the lychee industry and how to select, store, and consume lychees.

In particular, extension is recognised as a key step in the impact pathway of R&D and can make the difference between rapid or slow industry adoption and impact. The industry economic impact of communications (as part of a broader extension and communication program) is best quantified by the extent to which it changes the diffusion and adoption of practice change within the industry. The degree to which a communication and extension program can shift the adoption curve will in part depend on the specifics of the innovations being communicated, so the impact pathway should be quantified for each specific topic that was communicated.

For LY16005, a range of innovations were communicated through *Living Lychee* and the industry website, including R&D levy investments into pollination, pest and disease management, exports and supply chains, as well as marketing levy investments. These were individually assessed to determine the extent to which adoption and therefore impact could be attributed to communication through LY16005. This process showed that while the underlying news and R&D and marketing updates were valued by industry, the extent to which the LY16005 contributed to practice change was uncertain. Reasons included the R&D being ongoing with outputs not yet available; the R&D relating to industry level planning and activities with limited on-farm application; and the R&D outputs being communicated directly to growers through separate channels such as directly through RD&E projects. While earlier adoption of R&D remains a possible impact of LY16005, the high level of uncertainty makes it difficult to quantify with confidence. Indeed, grower responses to the LY16005 survey did highlight the success of LY16005 in increasing industry knowledge and awareness, and in generating practice change in areas including improved flowering and fruit production; more efficient use of resources; types and application rates of sprays and fertilisers; improved pruning and varietal selection; and packaging and marketing. However, these areas of practice change were not able to be quantified as they were not clearly aligned to communication topics, or were not specific enough to support analysis of the farm impact (such as a change in costs or revenue). Future efforts to link outcomes (changes in knowledge, skills, awareness, and actual or intended practice changes) to specific communications topics would support the ability to develop a more precise quantified measure of impact.

It is important to note that LY16005 was also identified as potentially generating broader impact beyond farm productivity. These included an increased demand for lychees as a result of a greater understanding (through the website) of the Australian lychee industry; and how to store, buy and use lychees, thereby providing price support for Australian lychees and supporting economically sustainable increases in production levels. While the change in demand and price cannot be attributed without detailed consumer data, the metrics from the website indicate the high level of reach in supporting this impact, with 4000 visits each month (an improvement from 3000 pre-project), and up to 66,500 hits for popular topics posted to the website.

Finally, the analysis also highlighted the extent to which the project supported grower understanding of and engagement with the lychee levy investment process and industry level activities, potentially supporting greater industry involvement and improved future levy investment outcomes.

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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.
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.

Abbreviations

CRRDC Council of Rural Research and Development Corporations

DAFF Department of Agriculture, Fisheries and Forestry (Australian Government)

GDP Gross Domestic Product

GVP Gross Value of Production

IRR Internal Rate of Return

MIRR Modified Internal Rate of Return

PVB Present Value of Benefits

PVC Present Value of Costs

RD&E Research, Development and Extension

SIP Strategic Investment Plan

Ends.