



Impact assessment of the investment: Program approach for pest and disease potato industry investments (PT17002)

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Previous page image courtesy of PT17002 project reporting.

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Contents

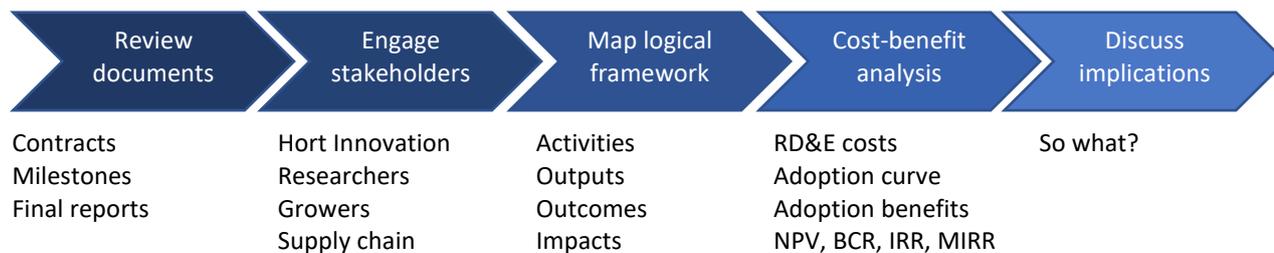
Executive summary.....	4
<i>What the report is about</i>	4
<i>Research background</i>	4
<i>Key findings</i>	4
<i>Keywords</i>	4
Introduction	6
General method.....	6
Project background.....	6
Project details	7
<i>Logical framework</i>	7
Project costs	9
<i>Nominal investment</i>	10
<i>Present Value of investment</i>	10
Project impacts.....	10
Implications and learnings	10
Glossary of economic terms	13
Abbreviations	13
References.....	14

Executive summary

What the report is about

Ag Econ conducted independent analysis to determine the economic, social, and environmental impact resulting from delivery of the potato project *PT17002 Program approach for pest and disease potato industry investments*. Delivered by RM Consulting Group (RMCG) over the period August 2018 to August 2021, the project was funded by Hort Innovation using the fresh potato and processing potato research and development levy and contributions from the Australian Government.

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



Research background

From 2017, the fresh and processing potato industries invested in a comprehensive R&D program focussing on improved pest and disease management. To ensure that the benefits from the six individual R&D investments were fully realised, project PT17002 Program approach for pest and disease potato industry investments sought to provide overarching investment coordination targeted at both research providers and growers.

Key findings

The nominal investment cost of \$0.29 million was adjusted for inflation (ABS, 2023) and discounted (using a 5% real discount rate) to a present value (PV) of costs equal to \$38 million (2022-23 PV).

The impact pathway linking the project's activities and outputs, and their assessed outcomes and impacts was laid out in a logical framework. This process highlighted the potential for PT17002 to generate improved research and extension outcomes for the portfolio of six potato pest and disease projects. This was evident through well attended research forums and research leader meetings, and the dissemination of project-specific material through industry communication channels.

Coordination to drive improved research and extension outcomes has the potential to deliver improved economic, social and environmental impacts associated with the underlying research projects. However, while a monitoring and evaluation process was completed as part of PT17002, this gave only high-level statements of achievement, with little evidence to support an evaluation of success in achieving a marginal benefit for the program of research.

This absence of evidence relating to marginal impact was the key limitation in enabling a quantitative assessment of PT17002 impact. The future delivery of R&D coordination projects should prioritise and plan appropriate data collection through the monitoring and evaluation process as the basis for informing project success.

The key findings of the PT17002 impact assessment are summarized in Figure 1 below.

Keywords

Impact assessment, cost-benefit analysis, fresh potato, processing potato, R&D coordination, pest and disease

Figure 1. Summary of impact assessment findings

PT17002 Pest and disease R&D coordination



Total RD&E costs:

- \$0.29 million (nominal value).
- 100% R&D levy and Government matching.

Coordination and extension activities:

- From 2018 to 2021, coordinate potato pest and disease RD&E:
 - *Mechanisms and manipulation of resistance to powdery scab in potato roots* (PT17003)
 - *Exploring Spongospora suppressive soils in potato production* (PT16002)
 - *Extension of the PreDicta Pt potato diagnostic service* (PT15008)
 - *Review of the national biosecurity plan for the potato industry and development of a biosecurity manual for potato producers* (PT16004)
 - *An integrated pest management (IPM) extension program for the potato and onion industries* (MT16009)
 - *National tomato potato psyllid (TPP) program coordinator* (MT16018)
- Achieved through the delivery of 30 coordination and extension activities, including: 2 x pest and disease R&D forums, 3 x researcher forums, 5 x regional engagement forums, and 8 x communications articles for the Potatoes Australia magazine.

Outcomes:

- Better strategic alignment of research to industry pest and disease issues, supporting increased R&D adoption and impact (see below)
- Increased pest and disease RD&E coordination across stakeholders, thereby reducing duplication and improving the efficiency of research delivery.
- Increased awareness by the Australian potato growers of relevant pest and disease research, supporting faster and more widespread adoption and impact (see below).

Economic impacts:

- Reduced pest and disease management costs
- Improved saleable yield and reliability
- Reduced on-farm and area wide biosecurity management costs.

Socio-environmental impacts:

- A more sustainable and affordable supply of Australian potatoes, supporting increased consumption with associated health and wellbeing effects.
- Improved environmental outcomes from adoption of IPM practices including improved soil health and reduced off-target chemical impacts.

Quantified impact:

- A quantitative impact assessment was not performed due to insufficient data to attribute a marginal benefit to program coordination.



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 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).

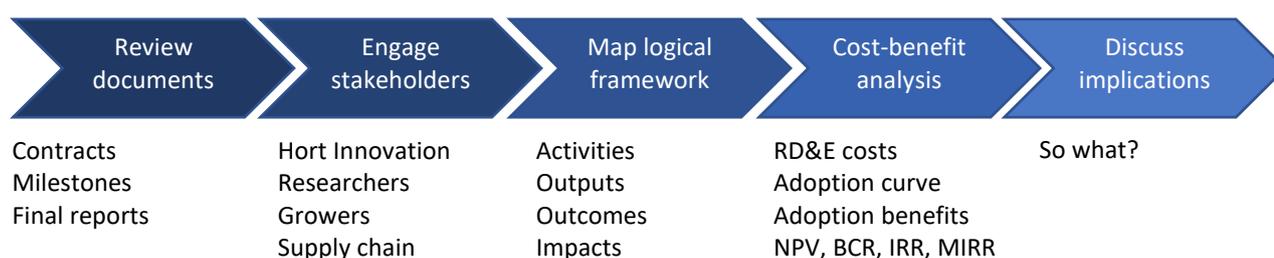
Project *PT17002 Program approach for pest and disease potato industry investments* was randomly selected as one of the 15 investments in the 2021-22 sample. This report presents the analysis and findings of the project impact assessment.

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 Council of Rural Research and Development Corporations (CRRDC, 2018) and included both qualitative and quantitative analysis. The general method that informed the impact assessment approach was 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 stakeholders (see *Stakeholder Consultation*)
3. Through a logical framework, qualitatively map the project's impact pathway, including activities, outputs, 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 change 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 the Hort Innovation project page [Horticulture Impact Assessment Program 2020/21 to 2022/23 \(MT21015\)](#).

Project background

The Australian potato industry supplies product for both fresh and processing markets. While Australian production supplies the entire domestic fresh market, the processing market has faced strong pressure from low cost imported product, evidenced by the volume of processed potato imports increasing from 133,681 tonnes of total market volume in 2014-15 to 155,511 tonnes in 2021-22 (Hort Innovation 2023). The potato industry identified that while domestic production costs may remain higher than global producers impacting the ability to remain competitive with low cost producers, opportunities to

drive productivity through improving saleable yield exist. The 2017-2021 Fresh and Processing Potato Strategic Investment Plans (SIPs) specifically recognised the importance of R&D investment to support growers to manage pests and diseases, which can have a significant influence on yield variability and therefore overall cost of production: *Average yields have significantly improved, resulting in reduced cost of production* (Outcome 3 – fresh potato); *Losses from pest and disease are reduced, resulting in improved quality and increased marketable yield* (Outcome 3 – processing potato).

As a result, the fresh and processing potato levies invested in a comprehensive R&D program commencing in 2017 that focused on pest and disease management. The key pest and disease areas of focus were delivered across the following six levy-funded investments:

- *Mechanisms and manipulation of resistance to powdery scab in potato roots* (PT17003)
- *Exploring Spongospora suppressive soils in potato production* (PT16002)
- *Extension of the PreDicta Pt potato diagnostic service* (PT15008)
- *Review of the national biosecurity plan for the potato industry and development of a biosecurity manual for potato producers* (PT16004)
- *An integrated pest management (IPM) extension program for the potato and onion industries* (MT16009)
- *National tomato potato psyllid (TPP) program coordinator* (MT16018)

To ensure that the benefits from these investments were fully realised, project PT17002 *Program approach for pest and disease potato industry investments* sought to provide overarching investment coordination targeted at both research providers and growers. The specific objectives of project PT17002 were as follows:

- Industry is informed of pest and disease research outcomes.
- Pest and disease R&D program is coordinated and collaborative.
- Investment in potato pest and disease R&D program is effective and efficient.

Project PT17002 delivered a range of initiatives and resources to drive grower and researcher engagement with the pest and disease research program, in turn supporting the potato industry mitigate the cost impacts of yield variability in support of improved production cost efficiencies and overall productivity.

Project details

RM Consulting Group was selected as the lead delivery partner, with the project running from 2018 to 2021 (Table 1)

Table 1. Project details

Project code	PT17002
Title	Program approach for pest and disease potato industry investments
Research organization(s)	RM Consulting Group
Project leader	Kristen Stirling Doris Blaesing
Funding period	August 2018 to August 2021
Objective	Coordination of pest and disease R&D for the fresh and processing potato industries that builds awareness of research outputs amongst industry stakeholders and supports collaboration between program researchers.

Logical framework

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

Table 2. Project logical framework detail

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">RD&E activities</p>	 	<ul style="list-style-type: none"> • Engaged and outreach with key stakeholders and delivery partners across the five research projects: <ul style="list-style-type: none"> ○ Reduced management costs through targeted monitoring and management of soilborne disease risks at planting (PT15008). ○ Exploring Spongospora suppressive soils in potato production (PT16002) ○ Reduced biosecurity risk incursions and associated production losses and management costs (PT16004). ○ Improved management of tomato-potato psyllid (TPP), reduced risk of spread and grower management costs (MT16018). ○ Increased awareness and adoption of integrated pest management (IPM) practices supporting cost-effective productivity (MT16009). ○ Mechanisms and manipulation of resistance to powdery scab in potato roots (PT17003). • Identified preferred communication pathways. • Convened Project Reference Group (PRG) and develop Terms of Reference. • Liaised with industry members through regular PRG meetings. • Updated and engaged Strategic Investment Advisory Panel (SIAP) members on pest and disease research activities, plans and challenges. • Engaged with researchers, state and sector associations through workshops and research meetings to understand research progress, results, R&D opportunities and priorities. • Developed, planed and facilitated the annual Potato R&D Forum. • Performed international R&D scan. • Coordinated schedule and contribute articles on the potato R&D program for the Potatoes Australia magazine. • Delivered R&D program updates at regional events.
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">RD&E outputs</p>		<ul style="list-style-type: none"> • 2 potato R&D forums delivered (2019, 2021). • 5 PRG meetings convened. • 3 SIAP presentations delivered on R&D program performance and opportunities. • 3 annual research leader meetings convened (2019, 2020, 2021). • 8 pest and disease R&D articles produced for the Potatoes Australia magazine. • Developed and distributed of a review of international pest and disease potato R&D. • 5 regional forum updates delivered. • 3 pest and disease management fact sheets. • 1 webinar for McCain potato producers organised. • Identified future R&D priorities for pest and disease management in the Australian potato industry.

Outcomes



- Improved research outcomes for the potato pest and disease research program, including:
 - Improved understanding of RD&E needs in the areas of pest and disease management and biosecurity in the potato industry, enabling a more effective strategic alignment of pest and disease R&D, and further supporting increased R&D adoption and impact.
 - Increased pest and disease RD&E coordination with state and national peak industry bodies, researchers, service providers, agribusinesses, agronomists, and individual growers, thereby reducing duplication and improving the efficiency of research delivery.
 - Improved collaboration between researchers and service providers currently conducting research of relevance to the Australian potato industry and understanding of activity, supporting improved outcomes for future potato pest and disease RD&E.
 - Increased awareness by the Australian potato growers of relevant pest and disease research and on-farm application pathways (levy funded, non-levy funded and international R&D).
 - Increased awareness of biosecurity threats, activities by researchers and service providers and resources to help preparedness and control in case of incursions.

Impacts



By driving improved research and extension outcomes for the underlying projects (PT17003, PT16002, PT15008, PT16004, MT16009, MT16018), PT17002 had the potential to support:

- [Economic] Levy investment savings from reduced RD&E duplication and more coordination across stakeholders.
- [Economic, social, and environmental] Increased research impact, through improved research and extension outcomes. Impact areas from the pest and disease program may include:
 - [Economic] Reduced pest and disease management costs supporting production cost efficiencies.
 - [Economic] Improved saleable yield and reliability supporting production cost efficiencies.
 - [Economic] Increased awareness of biosecurity incursion risks and surveillance capability reduces on-farm and area wide management costs through improved preparedness and management capacity.
 - [Socio-economic] Greater potato industry productivity and production security means a more sustainable and affordable supply of Australian potatoes, supporting increased potato and overall vegetable consumption with associated health and wellbeing effects (Beals 2019).
 - [Socio-economic] Avoided health and wellbeing costs to farm staff including psychological stress and strains on business and community relationships related to pest and disease management (CSIRO 2020 and CSIRO 2021).
 - [Socio-economic] Increased contribution to regional community wellbeing from more profitable and resilient potato growers.
 - [Environmental] Improved environmental outcomes from adoption of IPM practices, including improved soil health (through controlled traffic, organic amendments, better root health) (Lehmann 2020), and an increased use of “soft” chemical options with reduced off-target impacts (Australian Gov, 2021).

Project costs

The project was funded by Hort Innovation, using the fresh and processing potato research and development levy and contributions from the Australian Government. Overhead costs were added to the direct project cost to capture the full value of the RD&E investment.

Nominal investment

Table 3. Project nominal investment

Year end 30 June	Hort Innovation project costs (\$)	Hort Innovation overheads ¹ (\$)	Total nominal (\$)
2019	62,763	15,824	78,586
2020	62,763	13,872	76,635
2021	92,568	15,771	108,339
2022	24,428	4,226	28,654
Total	\$242,521	\$49,693	292,214

1. The overhead and administrative costs were calculated from the fresh potato and processing potato industry's Fund Annual Report 2018-19 to 2021-22, averaging 20.4% for the PT17002 funding period (2019-2022).

Present Value of investment

The nominal total investment cost of \$0.29 million identified in Table 3 was adjusted for inflation (ABS, 2023) into a real investment of \$0.33 million (2022-23 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 \$0.38 million (2022-23 PV).

Project impacts

The impact pathways identified in Table 2 was evaluated against available data to determine if their impact could be quantified with a suitable level of confidence. None of the economic or social impacts identified through the logical framework process were able to be quantified due to limitations in available data demonstrating the extent to which PT17002 achieved improved research or extension outcomes. While PT17002 did completed a monitoring and evaluation process, this gave only high-level statements of achievement, with little evidence to support an evaluation of PT17002 success in achieving a marginal benefit for the program.

Discussions with researchers involved in the projects coordinated by PT17002 commented that the project activities were well attended and helpful in supporting regular engagement with researchers and industry. However when asked to comment on the extent to which the activities supported a marginal improvement in research or extension outcomes, they were not confident in providing an estimate.

As a result, while improved research or extension outcomes and thereby improved impact remains a possibility for PT17002, the high level of uncertainty regarding the marginal benefit of coordination made it too difficult to quantify with confidence.

Implications and learnings

As a program coordination project, PT17002 sought to improve the research and extension outcomes of the underlying research projects (PT17003, PT16002, PT15008, PT16004, MT16009, MT16018). Quantifying the impact of PT17002 individually therefore requires a program approach, and a focus on the marginal effect of PT17002 on the whole program. Alternatively, R&D enabler activities such as coordination (along with communication and extension) could be evaluated as part of the underlying R&D impact assessment rather than separately. These three considerations are discussed below.

A program or cluster approach to impact assessment.

To understand the marginal effect of a program coordination investment, an impact assessment needs to undertake a full impact assessment for each of the six underlying projects. However, a program approach was not consistent with the sampling method applied in this impact assessment program (MT21015 and the predecessor project MT18011), which randomly selected 15 individual projects so that the total sample was representative of Hort Innovation's total R&D investment portfolio. A sample that included seven projects from the potato industry pest and disease portfolio would not fit in with this representative sample approach. This potentially highlights a weakness of the sampling process for the Horticulture Impact Assessment Program. This could be resolved by 1) increasing the size of the total sample to allow the inclusion of clusters without affecting the representative nature of the sample, 2) removing the requirement of the sample to be representative, or 3) evaluating large clusters separately, such as through the industry specific impact assessment program (most recently delivered through MT21013).

A focus on the marginal effect of PT17002

Even with a program approach, attempting to estimate the marginal effect of coordination is inherently difficult given the difficulty in measuring the marginal change in outcomes and impact, which was highlighted during this analysis with researchers were not confident providing a direct “value estimate” for the marginal change in research and extension outcomes due to PT17002. This is understandable given the time that has passed since project completion and the lack of focus on this as part of the project M&E.

Future M&E for coordination projects such as PT17002 would be supported by incorporating evaluation questions on marginal benefit such as:

- **Relevance.** To what extent was the research focus of underlying projects (PT17003, PT16002, PT15008, PT16004, MT16009, MT16018) improved through the delivery of PT17002 activities?
- **Relevance.** To what extent were research and extension methods of underlying projects improved through the delivery of PT17002 activities?
- **Effectiveness:** To what extent were the research outcomes (e.g. findings, recommendations) of underlying projects improved through the delivery of PT17002 activities?
- **Effectiveness:** To what extent was industry engagement and adoption was improved through the delivery of PT17002 activities?
- **Efficiency:** To what extent was research resource (e.g. people, time, funding) allocation improved as a result of PT17002 activities?

These areas of focus would ideally be identified before project initiation to allow stakeholders to consider the benefits of PT17002 throughout project delivery.

Focus impact assessments on adoptable outputs or recommendations

While the above approach provides greater insight into the marginal benefit of coordination projects (which is useful in a broader evaluation perspective: i.e. what worked well, what didn't, etc) that would enable an impact assessment, there remains a high level of uncertainty in assigning value to the marginal benefit of an “enabler” activity such as coordination. This is similar to other enabler activities such as communication and extension, which do not have in impact in and of themselves, but rather are intended to support and enhance the impact generated by core R&D (i.e. R&D that develops innovations such as new technology or best management practices). As noted in previous impact assessments (e.g. MT21015 year 1 Final Report (Ag Econ 2022)), the ability to generate a robust impact assessment would be supported by a focus on R&D innovations with enabler costs (coordination, communication, extension) included within the total investment costs.

Overall, the delivery of PT17002 had the potential to generate improved research and extension outcomes for the portfolio of six potato pest and disease projects. This was evident through well attended research forums, research leader meetings and dissemination of other project-specific material through industry communication channels. Improved research and extension outcomes have the potential to deliver improved economic, social and environmental impacts associated with the underlying research projects. The absence of evidence to support the marginal benefit of PT17002 activities for the program as a whole was the key limitation in enabling a quantitative the projects impact. The future delivery of R&D coordination projects should prioritise and plan appropriate data collection through the monitoring and evaluation process, as the basis for informing project success.

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 4 outlines the stakeholders consulted as part of this impact assessment and the topics on which they were consulted.

Table 4. 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
Kathryn Young, Hort Innovation, Head of Sustainability R&D	RD&E process owner / manager	✓	✓	✓	✓	✓	✓	✓
Doris Blaesing, RM Consulting Group	RD&E practitioner (PT17002)	✓	✓	✓	✓	✓	✓	✓
Kirsten Stirling, RM Consulting Group	RD&E practitioner (PT17002)	✓	✓	✓	✓	✓	✓	✓
Michael Rettke, South Australian Research and Development Institute	RD&E practitioner (PT15008)	✓	✓	✓	✓	✓	✓	✓

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).
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

PRG Project Reference Group
RD&E Research, Development and Extension
SIAP Strategic Investment Advisory Panel
SIP Strategic Investment Plan

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