



**FRDC**

FISHERIES RESEARCH &  
DEVELOPMENT CORPORATION

FINAL REPORT

# **An Impact Assessment of Investment in FRDC Project 2016-417:**

**National People Development: Membership of PIEFA to  
support and encourage the teaching and learning in  
Australian schools of information related to the Australian  
Fishing Industry - Improving Food and Fibre Literacy**

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**An Impact Assessment of Investment in FRDC Project 2016-417: National People Development: Membership of PIEFA to support and encourage the teaching and learning in Australian schools of information related to the Australian Fishing Industry - Improving Food and Fibre Literacy**  
FRDC Project 2016-134

2022

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- Ben Stockwin, Chief Executive Officer, Primary Industries Education Foundation Australia

## Abbreviations

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
CBA	Cost-Benefit Analysis
CRRDC	Council of Rural Research and Development Corporations
FRDC	Fisheries Research and Development Corporation
GVP	Gross Value of Production
NSW	New South Wales
PIEFA	Primary Industries Education Foundation Australia
PVB	Present Value of Benefits
QLD	Queensland
RD&E	Research, Development and Extension

# Executive Summary

This report presents an impact assessment of investment in Fisheries Research and Development Corporation (FRDC) investment in Project 2016-417: *National People Development: Membership of PIEFA to support and encourage the teaching and learning in Australian schools of information related to the Australian Fishing Industry, Improving Food and Fibre Literacy*. The assessment was completed as part of a fifth annual series of impact assessments under the FRDC 2015-2020 Research, Development and Extension Plan. The fifth series of assessments included 20 randomly selected FRDC investments worth a total of approximately \$5.30 million (nominal FRDC investment) and that were selected from an overall population of 81 FRDC investments worth an estimated \$17.66 million (nominal FRDC investment) where a final deliverable had been submitted in the 2019/20 financial year.

The impact assessments 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 includes both qualitative and quantitative assessment components that are in accord with the impact assessment guidelines of the Council of Rural Research and Development Corporations.

FRDC and the Primary Industries Education Foundation Australia's (PIEFA) active collaboration funded under Project 2016-417 facilitated a range of new and improved fisheries education resources and professional development opportunities for teachers, government and industry. The investment further enabled fisheries specific content to be incorporated into school curriculum at various levels, including Marine Science in a revised year 11/12 subject in QLD.

The Project outputs led to improved networks and professional development opportunities associated with primary industries education for teachers, industry and government and also has contributed to students, teachers and the broader Australian public being better educated about Australia's primary industries, including fisheries, and the career opportunities they offer. A student survey demonstrated this improvement, showing that students now are more informed and aware of the origins of various agricultural products which may lead to increased interest among curriculum recipients in joining the fishing and aquaculture workforce (supporting future workforce capacity resilience).

The investment is likely to have generated positive impacts, including increased capacity and capability associated with Australian primary industries education and fisheries education in particular, as well as maintained social licence to operate for Australian fisheries and other primary industries through increased student, teacher and community awareness and understanding of Australian primary industries' sustainability, and scientific and innovation credentials.

Total funding for the Project was \$3.61 million (present value terms). One impact, reduced risk of a loss of social licence for Australian fisheries, was valued and generated estimated total expected net benefits of \$6.31 million (present value terms). This produced an estimated net present value of \$2.70 million, a benefit-cost ratio of 1.75 to 1, an internal rate of return of 19.8%, and a MIRR of 7.4% (over 30 years, using a 5% discount rate and 5% finance rate).

Given the conservative assumptions made and the fact that two impacts were not valued in monetary terms, the investment criteria reported are likely to be an underestimate of the true performance of the investment in Project 2016-417 and the positive results should be viewed favourable by FRDC, the Australian Government, industry, and other RD&E stakeholders.

## Keywords

Project 2016-417, education, fisheries education, primary industries education, Primary Industries Education Foundation Australia, PIEFA, impact assessment, evaluation, cost-benefit analysis

# Introduction

The Fisheries Research and Development Corporation (FRDC) required an annual series of impact assessments to be carried out on a sample of completed investments from the FRDC research, development, and extension (RD&E) portfolio. The assessments were required to meet the following FRDC evaluation reporting requirements:

- Reporting against the FRDC 2015-2020 RD&E Plan and the Evaluation Framework associated with FRDC's Statutory Funding Agreement with the Commonwealth Government.
- Annual Reporting to FRDC funding partners and other stakeholders.
- Reporting to the Council of Rural Research and Development Corporations (CRRDC).
- Reporting RD&E impact and performance to FRDC levy payers and other fisheries and aquaculture stakeholders as well as the broader Australian community.

In April 2017, FRDC commissioned Agtrans Pty Ltd (Agtrans) to undertake the annual impact assessments for RD&E projects funded under the FRDC 2015-2020 RD&E Plan and completed in the years ended 30 June 2016 to 2020 (FRDC Project 2016-134). Between 2016/17 and 2020/21, four series of annual impact assessments were completed. Each of the four series of assessments included a set of 20 randomly selected FRDC RD&E investments as well as an aggregate analysis across all 20 investments evaluated in each year. Published reports for the annual FRDC evaluations can be found at: <https://www.frdc.com.au/frdc-project-impact-assessments-benefits-research>.

The fifth and final series of impact assessments under Project 2016-134 was for a set of FRDC RD&E investments completed in the year ended 30 June 2020, the final year of the FRDC 2015-2020 RD&E Plan. As in previous years, the fifth series of impact assessments included 20 randomly selected FRDC RD&E investments. The 20 investments had a total value of approximately \$5.30 million (nominal FRDC investment) and were selected from an overall population of 81 FRDC investments worth an estimated \$17.66 million (nominal FRDC investment) where a final deliverable had been submitted in the 2019/20 financial year.

The 20 RD&E investments were selected through a stratified, random sampling process such that investments chosen spanned all five FRDC Programs (Environment, Industry, Communities, People and Adoption), represented approximately 30.0% of the total FRDC RD&E investment in the overall population (in nominal terms), and included a selection of small, medium, and large FRDC investments (total nominal FRDC investment of  $\leq$  \$50,000, \$50,001 to \$250,000, and  $>$  \$250,000 respectively).

Project 2016-417: *National People Development: Membership of PIEFA to support and encourage the teaching and learning in Australian schools of information related to the Australian Fishing Industry, Improving Food and Fibre Literacy* was randomly selected as one of the 20 RD&E investments completed in 2019/20 for evaluation in the fifth series of annual impact assessments (2019/20 sample). The current report presents the Project 2016-417 analysis and findings.

# Method

The annual impact assessments of FRDC RD&E investments 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 includes both qualitative and quantitative assessment components that are in accord with the current [guidelines for impact assessment](#) published by the CRRDC (CRRDC, 2018).

The evaluation process utilised an input to impact continuum RD&E project inputs (costs), objectives, activities, and outputs were briefly described and documented. Actual and expected outcomes, and any actual and/or potential future impacts (positive and/or negative) associated with project outcomes then were identified and described. The principal economic, environmental, and social impacts were then summarised in a triple bottom line framework and validated through consultation with expert personnel and review of published literature.

Once impacts were identified and validated, an assessment then was made about whether to quantify/value any of the impacts in monetary terms as part of the project-level analysis. The decision to value an impact identified was based on:

- Data availability and information necessary to form credible valuation assumptions,
- The complexity of the relevant valuation methods applicable given project resources,
- The likely magnitude of the impact and/or the expected relative value of the impact compared to other impacts identified, and
- The strength of the linkages between the RD&E investment and the impact identified.

Where one or more of the identified impacts were selected for valuation, the impact assessment used cost-benefit analysis (CBA) as a principal tool. The impacts valued therefore were deemed to represent the principal benefits delivered by the project investment. However, as not all impacts were valued (based on the selection criteria), the investment criteria estimated for the project investment evaluated are likely to represent an underestimate of the true performance of the FRDC project.

The qualitative and quantitative analysis processes, data sources, assumptions, specific valuation frameworks (where applicable), and evaluation results were clearly documented and then integrated into a written report.



# Project Background

## Background

The Primary Industries Education Foundation Australia (PIEFA) is a unique collaboration between industry, government, and education organisations. The PIEFA vision is an Australian community that understands and values its primary industries sector. To achieve this PIEFA engages with schools, teachers, students, and the broader community to educate them about the primary industries and the career opportunities they offer.

A 2012 PIEFA survey indicated that 75% of Australian primary students believed cotton was an animal product, 25% believed yoghurt was a vegetable product while only 27% of students were able to identify Salmon as a farmed product. In addition, 40% believed primary production (including fishing) damaged the environment, 43% of students did not link science to production and 55% did not believe the industry was innovative. However, 100% of primary school teachers and 91% of secondary teachers believed it was important to teach students about food and fibre production.

## Rationale for Project 2016-417

The FRDC had been a member of PIEFA since 2010. The general membership of PIEFA supported the FRDC national priority of "Ensuring the Australian fishing and aquaculture products are sustainable and acknowledged to be so." Partnership with PIEFA represented an opportunity to provide generational change to primary industry's social licence to operate through the education of students about the fishing industry and its sustainability, scientific and innovative credentials.

FRDC Project 2016-417 was funded to support a whole of industry programme that supports teachers to embed food and fibre resources within their teaching and learning.

# Project Details

## Summary

Project Code: 2016-417
Title: <i>National People Development: Membership of PIEFA to support and encourage the teaching and learning in Australian schools of information related to the Australian Fishing Industry, Improving Food and Fibre Literacy</i>
Research Organisation: Primary Industries Education Foundation Australia
Principal Investigator: Ben Stockwin, Chief Executive Officer
Period of Funding: July 2016 to June 2019
FRDC Program Allocation: Communities 100%, People 25%, Environment 25%

## Objectives

The specific objectives of the project were to:

1. Objective one had five components:
  - a. Provide national leadership and coordination of initiatives to encourage Primary Industries education in schools through a partnership between industry, government and educators;
  - b. Commission, co-ordinate, facilitate and manage national projects to encourage Primary Industries education in schools;
  - c. Provide a source of credible, objective and educational resources for schools to maintain and improve community confidence in Australia’s Primary Industries;
  - d. Communicate Primary Industries research and development outcomes in a format accessible for schools and encourage interest within schools in Primary Industries related careers; and
  - e. Operate and administer a scholarship fund for the provision of scholarships, bursaries and prizes to encourage and further Primary Industries education.
2. Develop, promote and extend specific resources for the Australian Fishing industry with a focus upon sustainability, science and innovation practices.

## Logical Framework

Table 1: Logical Framework for FRDC Project 2016-417

Activities	Policy Development
	<ul style="list-style-type: none"> <li>• PIEFA maintained and led national oversight of the development and implementation of the national curriculum, including its roll out at a state-based level. This ensured that there was appropriate content that related to Australia’s primary industries sector, particularly fisheries and fisheries related content.</li> <li>• For example, teachers have the opportunity to embed fisheries content with their teaching and learning programs at a range of levels, such as:           <ul style="list-style-type: none"> <li>○ Year 1 Science: Living Things have a variety of external features. Describing the features and use of animals such as fish. (ACSSU017)</li> <li>○ Year 2 Geography: The similarities and differences between places in terms of their type of settlement and the lives of the people who live there. Discussing the similarities and difference in the types of work people do in their own place with a different type of place in Australia. (ACHGK019)</li> <li>○ Year 7 Economics and Business: Characteristics of entrepreneurs and successful businesses (ACHEK019)</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ Year 9 Geography: Biomes and Food Security. The capacity of the world’s environment to sustainably feed the projected future global population (ACHGK064)</li> <li>● A major achievement for PIEFA within the reporting period was the inclusion of Marine Science in the revised year 11/12 subject in Queensland (QLD).</li> </ul> <p><b>Resource Access and Development</b></p> <ul style="list-style-type: none"> <li>● PIEFA curated 56 fishing industry specific resources, with another 42 referencing fish production in an integrated context on the web portal <a href="http://www.primezone.edu.au">www.primezone.edu.au</a></li> <li>● This represents approximately 15% of the total resources discoverable on the site. However, PIEFA acknowledged that there was a lack of industry specific content available and made steps to rectify this.</li> <li>● The first step was development of a suite of resources outlining the production of Atlantic Salmon in relation to Tassal. The suite comprised classroom specific resources and videos viewable via virtual reality headsets that allowed students to closely observe the egg to plate story.</li> <li>● PIEFA also supported the development of a comprehensive set of resources for the year 11 and 12 Marine Science curriculum that were launched in late 2019 and are available state-wide and nationally.</li> </ul> <p><b>Teacher Professional Learning</b></p> <ul style="list-style-type: none"> <li>● PIEFA ran a bi-annual national conference that brought together educators, industry, and government from around the country and overseas.</li> <li>● The conferences were conducted over two days and teachers shared practices, engaged with industry and networked with colleagues.</li> <li>● Conferences were held in 2016 and 2018 with fisheries content delivered via workshops and lightning presentations.</li> <li>● PIEFA representatives attended and presented content at the national educator conferences on behalf of members including trade display tables where teachers could explore content via PIEFA websites and receive member collateral such as complimentary copies of FRDC’s Fish magazine.</li> <li>● PIEFA also played a role in supporting the Marine Teachers Association of QLD at the conferences in 2016 and 2018 including speakers and field trips.</li> <li>● Toward the end of the project, PIEFA signed a Memorandum of Understanding with the New South Wales (NSW) Department of Primary Industries and the Royal Agricultural Society of NSW to form a partnership entitled ‘Knowing and Growing’. The idea was to collaboratively deliver Professional Learning to teachers in NSW in a coordinated fashion.</li> <li>● The first event was held on Monday the 4th of June 2019 and more events were planned throughout regional and rural NSW.</li> </ul> <p><b>National Network</b></p> <ul style="list-style-type: none"> <li>● PIEFA maintained and operated a national network which serves as the connection between industry, educators, and government in relation to food and fibre education.</li> <li>● PIEFA produced a national newsletter that was published monthly to an audience of over 7,500 recipients. Readers range from teachers, producers to state and federal ministers.</li> <li>● The newsletter contained information and articles related to resources, news, scholarships, events, and careers information. PIEFA included fisheries information sourced directly from FRDC and from other sources from whom PIEFA is connected.</li> <li>● PIEFA also promoted activities and news through social media accounts on Twitter, Instagram, and Facebook that each have approximately 2,500 followers.</li> </ul>
Outputs	<ul style="list-style-type: none"> <li>● The active collaboration between FRDC and PIEFA funded through Project 2016-417 enabled the development of new and improved fisheries related educational content and training.</li> <li>● The inclusion of Marine Science in the revised year 11/12 subject in (QLD).</li> </ul>

	<ul style="list-style-type: none"> <li>• 56 fishing industry specific resources, with 42 referencing fish production in an integrated context on the web portal</li> <li>• In 2018/19, the website <a href="http://www.primezone.edu.au">www.primezone.edu.au</a>, was accessed by roughly 25,000 unique users who downloaded nearly 300,000 separate resources.</li> <li>• Since the upgrade to the PIEFA website in April 2017, fisheries related resources have been accessed 61,538 times, with 30,854 coming in the last 12 months of the project.</li> <li>• The resource 'Exploring the production and marketing of seafood' was the most popular with 2,298 downloads.</li> <li>• Since 2016 PIEFA has interacted with over 10,000 teachers through the national conferences.</li> <li>• Regular extension of PIEFA information, including fisheries content, through the monthly newsletter and social media content.</li> <li>• A follow up student survey completed in 2020 showed progress in primary industries education. Compared to 2012, 63% of Australian primary students believed cotton was and animal product (75% in 2012), 10% believed yoghurt was a plant product (25% in 2012), and around 40% of students understood that Atlantic salmon was a farmed product (27% in 2012).</li> </ul>
Outcomes	<ul style="list-style-type: none"> <li>• New and improved fisheries and other primary industries content has been incorporated into primary and secondary education curriculums around Australia.</li> <li>• In particular, Marine Science has been included in a revised year 11/12 subject in QLD.</li> <li>• Students and teachers now have improved access to fisheries related resources and educational material through the PIEFA portal and other extension materials.</li> <li>• Teachers, industry, and government have improved networks and professional development opportunities associated with primary industries education and fisheries in particular.</li> <li>• Students, teachers, and the broader Australian public are better educated about Australia's primary industries, including fisheries, and the career opportunities they offer.</li> <li>• The improved content and engagement may also lead to an increased interest among curriculum recipients in joining the fishing and aquaculture workforce (supporting future workforce capacity resilience) (Jennifer Marshall, pers. comm., 2022).</li> </ul>
Impacts	<ul style="list-style-type: none"> <li>• Increased capacity and capability associated with Australian primary industries education and fisheries education in particular.</li> <li>• Contribution to maintained social licence to operate for Australian fisheries and other primary industries through increased student, teacher and community awareness and understanding of Australian primary industries' sustainability, and scientific and innovation credentials.</li> <li>• Potentially, some contribution to maintained or increased long-term productivity and profitability for Australian primary industries, and fisheries in particular, through increased student interest in fisheries careers.</li> </ul>

Source: FRDC project documentation

## Nominal Investment

Table 2 shows the total annual investment made in project 2016-417 by FRDC and the CSIRO.

Table 2: Total Investment in FRDC Project 2016-417  
(nominal dollar terms)

Year ended 30 June	FRDC (\$)	PIEFA <sup>(a)</sup> (\$)	Total (\$)
2017	50,000	810,108	860,108
2018	40,000	810,108	850,108
2019	50,000	810,108	860,108
2020	10,000	0	0
<b>Totals</b>	<b>150,000</b>	<b>2,430,325</b>	<b>2,580,325</b>

Source: FRDC project 2016-417 project agreement and financial acquittal

(a) Based on contracted contributions of \$300,000 over three years plus data in the project financial acquittal indicating additional resources of \$1,530,325 expended between 2016/17 and 2018/19.

## Management and Administration Costs

For the FRDC investment, the cost of managing the FRDC funding was added to the FRDC contribution for the project via a management cost multiplier (x1.179). This multiplier was estimated based on a five-year average of the ratio of total FRDC cash expenditure to project expenditure reported in the FRDC's Cash Flow Statement (FRDC Annual Reports, 2017-2021). This multiplier then was applied to the nominal investment by FRDC shown in Table 2.

For the other contributors to project 2016-417 (PIEFA), it was assumed that any management and administration costs were already included in the cost data presented in Table 2. A multiplier of 1.0 was applied to the nominal investment by PIEFA shown in Table 2.

## Real Investment and Extension Costs

For the purposes of the impact analysis, the investment costs of all parties were expressed in 2020/21-dollar terms using the Implicit Price Deflator for Gross Domestic Product (ABS, 2020).

No additional costs of extension were included as the activities undertaken during Project 2016-417 were focused on stakeholder engagement, direct extension to end-users, and other communication and extension resources and activities.

# Impacts

Table 3 provides a summary of the principal types of potential impacts from Project 2016-417. Impacts have been taken, and potentially expanded, from those listed in Table 1 and categorised using a triple bottom line framework into economic, environmental and social impact types.

Table 3: Principal Potential Impact Types from Investment in FRDC Project 2016-417

Economic	<ul style="list-style-type: none"><li>• Potentially, some contribution to maintained or increased long-term productivity and profitability for Australian primary industries, and fisheries in particular, through increased student interest in fisheries careers.</li></ul>
Environmental	<ul style="list-style-type: none"><li>• Nil.</li></ul>
Social	<ul style="list-style-type: none"><li>• Increased capacity and capability associated with Australian primary industries education and fisheries education in particular.</li><li>• Contribution to maintained social licence to operate for Australian fisheries and other primary industries through increased student, teacher and community awareness and understanding of Australian primary industries' sustainability, and scientific and innovation credentials.</li></ul>

## Public versus Private Impacts

The key impacts from Project 2016-417 were public impacts. Public impacts were delivered through increased capacity and capability associated with fisheries education and maintained social licence to operate for Australian fisheries.

Some private impacts also may be delivered in the longer-term. Private impacts are likely to be delivered through maintained or improved productivity/profitability for Australian fisheries in the future from increased interest in fisheries careers.

## Distribution of Private Impacts

Any private impacts from the investment in Project 2016-417 will primarily accrue to Australian fisheries that benefit from increased awareness and understanding of Australian primary industries' sustainability, and scientific and innovation credentials, and increased interest in fisheries careers.

## Impacts on other Australian industries

PIEFA activities undertaken over the duration of Project 2016-417 included education and resources for other Australian primary industries as well as fisheries. Therefore, the impacts identified are likely to also be relevant to the Australian primary industries sector more generally.

## Impacts Overseas

No direct impacts to overseas parties were identified.

## Match with National Priorities

### Australian Agriculture, Science, and Research Priorities

The Australian Government’s National Science and Research Priorities and Agricultural Innovation Priorities are reproduced in Table 4. Project 2016-417 indirectly contributed to National Science and Research Priority 1. Further, the RD&E investment may contribute indirectly to all four Agricultural Innovation Priorities because of increased capacity and capability associated with Australian primary industries education and fisheries education in particular.

Table 4: Australian R&D Priorities

Australian Government	
National Science and Research Priorities <sup>1</sup>	National Agricultural Innovation Priorities <sup>2</sup>
<ol style="list-style-type: none"> <li>1. <b>Food</b> – optimising food and fibre production and processing; agricultural productivity and supply chains within Australia and global markets.</li> <li>2. <b>Soil and Water</b> – improving the use of soils and water resources, both terrestrial and marine.</li> <li>3. <b>Transport</b> – boosting Australian transportation: securing capability and capacity to move essential commodities; alternative fuels; lowering emissions.</li> <li>4. <b>Cybersecurity</b> – improving cybersecurity for individuals, businesses, government, and national infrastructure.</li> <li>5. <b>Energy and Resources</b> – supporting the development of reliable, low cost, sustainable energy supplies and enhancing the long-term viability of Australia’s resources industries.</li> <li>6. <b>Manufacturing</b> – supporting the development of high value and innovative manufacturing industries in Australia.</li> <li>7. <b>Environmental Change</b> – mitigating, managing, or adapting to changes in the environment.</li> <li>8. <b>Health</b> – improving the health outcomes for all Australians.</li> </ol>	<p>On 11 October 2021, the National Agricultural Innovation Policy Statement was released. It highlights four long-term priorities for Australia’s agricultural innovation system to address by 2030. These priorities replace the Australian Government’s Rural Research, Development and Extension Priorities which were published in the 2015 Agricultural Competitiveness White Paper.</p> <ol style="list-style-type: none"> <li>1. Australia is a trusted exporter of premium food and agricultural products by 2030.</li> <li>2. Australia will champion climate resilience to increase the productivity, profitability, and sustainability of the agricultural sector by 2030.</li> <li>3. Australia is a world leader in preventing and rapidly responding to significant incursions of pests and diseases through futureproofing our biosecurity system by 2030.</li> <li>4. Australia is a mature adopter, developer, and exporter of digital agriculture by 2030.</li> </ol>

<sup>1</sup> Source: 2015 Australian Government *Science and Research Priorities*. <https://www.industry.gov.au/data-and-publications/science-and-research-priorities>.

<sup>2</sup> Source: 2021 National Agriculture Innovation Policy Statement. [https://www.awe.gov.au/agriculture-land/farm-food-drought/innovation/research\\_and\\_development\\_corporations\\_and\\_companies#government-priorities-for-investment](https://www.awe.gov.au/agriculture-land/farm-food-drought/innovation/research_and_development_corporations_and_companies#government-priorities-for-investment).

## **FRDC National RD&E Priorities**

Through extensive consultation, the FRDC 2015-2020 RD&E Plan identified three national RD&E priorities to focus and direct FRDC investments. The three FRDC national RD&E priorities were:

1. Ensuring that Australian fishing and aquaculture products are sustainable and acknowledged to be so.
2. Improving productivity and profitability of fishing and aquaculture.
3. Developing new and emerging aquaculture growth opportunities.

Project 2016-517 indirectly addressed all three FRDC national RD&E priorities by contributing to increased capacity and capability associated with Australian primary industries education and fisheries education in particular.



# Valuation of Impacts

The valuation of impacts generally focused on the most important and direct impacts of the investment in project 2016-417. The decision to value any of the impacts identified in Table 3 was based on:

- Data availability and information necessary to form credible valuation assumptions,
- The complexity of the relevant valuation methods applicable given project resources,
- The likely magnitude of the impact and/or the expected relative value of the impact compared to other impacts identified, and
- The strength of the linkages between the RD&E investment and the impact identified.

## Impacts Valued

One impact was valued for the assessment of Project 2016-417. The impact valued was:

- A contribution to maintained social licence to operate for Australian fisheries and other primary industries.

### Valuation of Impact 1: Maintained social licence to operate for some Australian fisheries

The average annual total gross value of production (GVP) for Australian State and Commonwealth wild-catch fisheries was estimated at \$1.73 billion (five-year average) (Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), 2022). The investment in Project 2016-417 was assumed to have contributed to improved education and community awareness about Australian fisheries' sustainability, science and innovation credentials leading to a reduced risk of the loss of the social licence to operate for a proportion of the Australian fisheries sector and therefore a reduced risk of loss of profits.

Specific assumptions for the valuation of Impact 1 are reported in Table 5.

### *Attribution*

The specific assumptions used to value Impact 1 were such that 100% of the estimated benefits were assumed to be attributable to the investment in Project 2016-417.

### *Counterfactual*

It was assumed that, without the investment in FRDC Project 2016-417, PIEFA and its members would have continued to engage with schools, teachers, students and the broader community to educate them about the primary industries and the career opportunities they offer at that this would have included information and resources about the fisheries sector. However, without the involvement of FRDC, it is likely that any fisheries activities would have been less effective or efficient. Thus, it was assumed that only 60% of the estimated benefits would have occurred without the Project 2016-417 investment.

## Impacts Not Valued

The impacts not valued included:

- Increased capacity and capability associated with Australian primary industries education and fisheries education in particular. This impact was not valued due to the difficulty in placing monetary value on capacity building and uncertainty about the change in capacity and capability attributable to the investment.
- Potentially, some contribution to maintained or increased long-term productivity and profitability for Australian primary industries, and fisheries in particular, through increased student interest in fisheries careers. This impact was not valued because of a lack of evidence of long-term changes in primary industries' productivity/profitability and employment as well as uncertainty regarding the pathways to impact and the industries that may be affected.

## Summary of Assumptions

The following tables present the specific assumptions used in the valuation of Impact 1.

Table 5: Summary of Assumptions for the Valuation of Impact 1

<b>Impact 1: Maintained social license to operate for some Australian fisheries</b>		
<b>Variable</b>	<b>Assumption</b>	<b>Source</b>
<b>WITHOUT investment in Project 2016-417</b>		
Average annual total GVP of Australian State and Commonwealth wild-catch fisheries	\$1.73 billion	Five-year average, derived from ABARES (2022) – Gross value of fisheries and aquaculture production, Australia (time series) – Australian fisheries and aquaculture statistics 2020
Fisheries net profit as a proportion of GVP	10%	Standard estimate of average economic profit for Australian industries - Analyst assumption
Average annual net profit of Australian fisheries	\$173.22 million	10% x \$1.73 billion p.a.
Proportion of fisheries profit at risk from a loss of social license in any given year	20%	Analyst assumption – conservative estimate
Net profit at risk of loss	\$34.64 million p.a.	20% x \$173.22 million p.a.
<b>WITH investment in Project 2016-417</b>		
Reduction in risk of loss of social license attributable to improved community education and awareness of fisheries sustainability, science and innovation delivered through Project 2016-417	10% risk reduction in any given year	Analyst assumption
Maximum annual value of net profits saved through reduced risk	\$3.46 million	10% x \$34.64 million p.a.
First year of impact	2017/18	Based on project activities undertaken over the period 2016/16 to 2018/19
Year of maximum impact	2019/20	Based on completion of the Project 2016-417 final report in June 2019
Last year of impact	2026/27	Assumes no further specific investment like Project 2016-417 and therefore gradual decline in the relevance and use of the fisheries specific educational information
<b>Risk Factors</b>		
Probability of output	100%	Based on successful completion of Project 2016-417 and evidence of new and improved fisheries education resources being accessed and adopted
Probability of outcome	90%	The probability of outcome refers to the likelihood that the project outputs are adopted/implemented at the level assumed. Based on evidence of adoption of fisheries specific educational materials in Australian school curriculums as well as engagement with teachers and government through other extension activities throughout the project.

<b>Impact 1: Maintained social license to operate for some Australian fisheries</b>		
<b>Variable</b>	<b>Assumption</b>	<b>Source</b>
Probability of impact	90%	Refers to the probability that, given adoption (outcome), the impact as estimated will be realised. This allows for exogenous factors that may affect the estimated benefits being achieved (e.g. global pandemic)
Attribution of benefits to investment in Project 2016-417	100%	See valuation of impact 1 description reported previously.
Counterfactual	60% of the estimated benefits would have occurred without the Project 2016-417 investment.	

# Results

All past costs and benefits were expressed in 2020/21-dollar terms. All costs and benefits were discounted to 2021/22 using a discount rate of 5%. A reinvestment rate of 5% was used for estimating the modified internal rate of return (MIRR). The base analysis used the best available estimates for each variable, notwithstanding a level of uncertainty for many of the estimates. All analyses ran for the length of the investment period plus 30 years from the last year of investment (2019/20) to the final year of benefits assumed.

## Investment Criteria

Tables 6 and 7 show the investment criteria estimated for different periods of benefits for the total investment and FRDC investment respectively. The present value of benefits (PVB) for the FRDC investment was estimated by multiplying the total PVB cash flow by the proportion of FRDC investment in real, undiscounted dollar terms (6.8%).

Table 6: Investment Criteria for Total Investment in Project 2016-417

Investment criteria	Number of years from year of last investment						
	0	5	10	15	20	25	30
Present value of benefits (\$m)	2.56	5.97	6.31	6.31	6.31	6.31	6.31
Present value of costs (\$m)	3.61	3.61	3.61	3.61	3.61	3.61	3.61
Net present value (\$m)	-1.06	2.36	2.70	2.70	2.70	2.70	2.70
Benefit-cost ratio	0.71	1.65	1.75	1.75	1.75	1.75	1.75
Internal rate of return (%)	negative	18.8	19.8	19.8	19.8	19.8	19.8
MIRR (%)	negative	13.6	11.0	9.4	8.5	7.9	7.4

Table 7: Investment Criteria for FRDC Investment in Project 2016-417

Investment criteria	Number of years from year of last investment						
	0	5	10	15	20	25	30
Present value of benefits (\$m)	0.17	0.40	0.43	0.43	0.43	0.43	0.43
Present value of costs (\$m)	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Net present value (\$m)	-0.07	0.16	0.18	0.18	0.18	0.18	0.18
Benefit-cost ratio	0.71	1.66	1.76	1.76	1.76	1.76	1.76
Internal rate of return (%)	negative	19.9	20.8	20.8	20.8	20.8	20.8
MIRR (%)	negative	14.4	11.5	9.8	8.8	8.1	7.6

The annual undiscounted benefit and cost cash flows for the total investment for the duration of investment period plus 30 years from the last year of investment are shown in Figure 1.

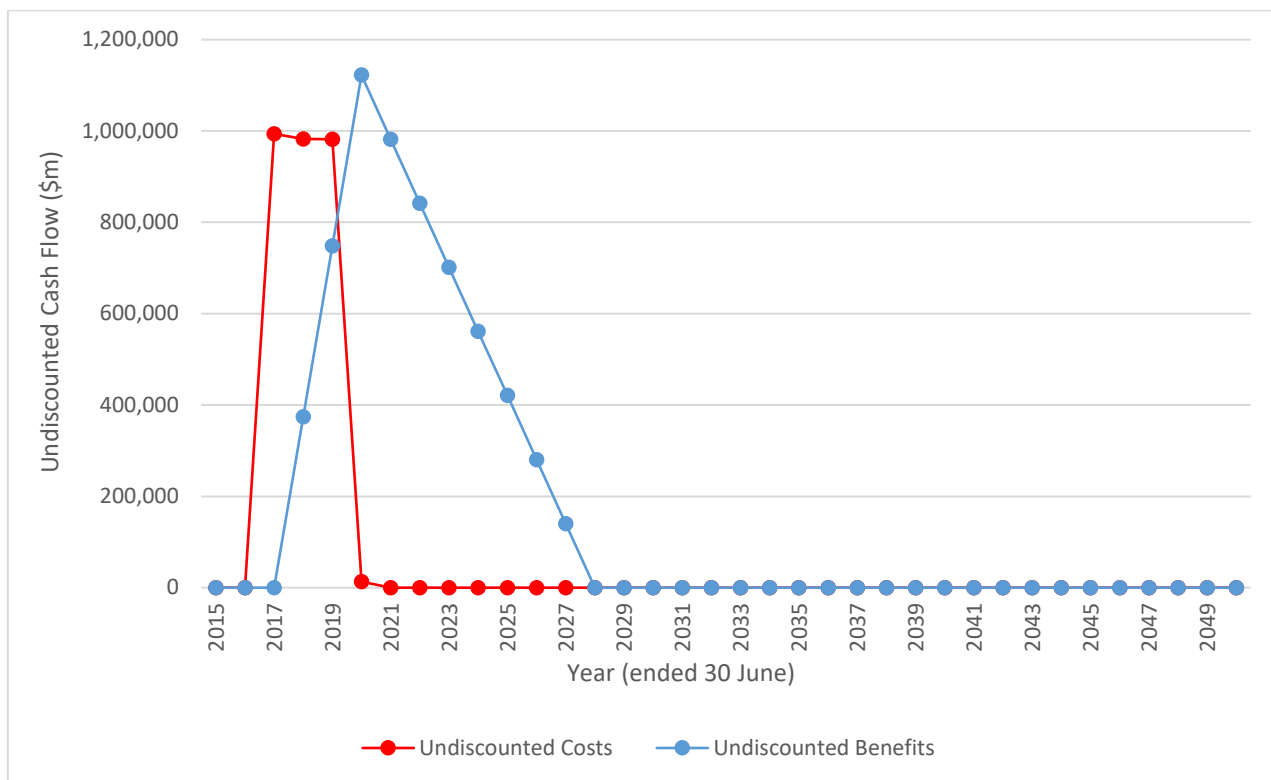


Figure 1: Annual Cash Flow of Undiscounted Total Benefits and Total Costs

## Sensitivity Analyses

Sensitivity analyses were performed for variable that were considered (a) key drivers of the investment criteria, and/or (b) uncertain. Each sensitivity analysis was performed for the total investment and with benefits taken over the life of the investment plus 30 years from the last year of investment. All other parameters were held at their base values.

A sensitivity analysis was carried out on the discount rate. The results, shown in Table 8, showed a low sensitivity to the discount rate. This was largely due to the benefit cash flows occurring over the short-term after the last year of investment in the project and therefore being subject to relatively less severe discounting.

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

Investment Criteria	Discount rate		
	0%	5% (base)	10%
Present value of benefits (\$m)	6.17	6.31	6.52
Present value of costs (\$m)	2.97	3.61	4.36
Net present value (\$m)	3.20	2.70	2.16
Benefit-cost ratio	2.08	1.75	1.49

A sensitivity analysis then was carried out on proportion of fisheries net profits assumed to be at risk from a loss of social licence as this was uncertain. Table 9 shows the results. The investment criteria showed a moderate sensitivity to the proportion of fisheries net profits at risk. A break-even analysis indicated that the proportion of fisheries net profits at risk of loss of social licence could decline to 11.4% and the investment criteria would remain positive (benefit-cost ratio of at least 1 to 1) with all other assumptions held at their base values.

Table 9: Sensitivity to the Proportion of Fisheries Net Profits at Risk from Loss of Social Licence  
(Total investment, 5% discount rate, 30 years)

Investment Criteria	Proportion of Fisheries Net Profits at Risk from Loss of Social Licence		
	5%	20% (base)	35%
Present value of benefits (\$m)	1.58	6.31	11.05
Present value of costs (\$m)	3.61	3.61	3.61
Net present value (\$m)	-2.04	2.70	7.43
Benefit-cost ratio	0.44	1.75	3.06

A final sensitivity analysis was undertaken on the reduction in the risk of loss of social licence attributable to the investment. The results, presented in Table 10, showed a moderate sensitivity to assumed reduction in risk of a loss of social licence for Australian fisheries. This was expected as the change in risk was a key driver in the estimation of the impact valued. A break-even analysis showed that, with all other assumptions at base values, the investment criteria remained positive with a 5.7% reduction in risk attributable to the Project 2016-417 investment.

Table 10: Sensitivity to the Reduction in Risk of Loss of Social Licence  
(Total investment, 5% discount rate, 30 years)

Investment Criteria	Reduction in Risk of Loss of Social Licence		
	5%	10% (base)	20%
Present value of benefits (\$m)	3.16	6.31	12.63
Present value of costs (\$m)	3.61	3.61	3.61
Net present value (\$m)	-0.46	2.70	9.01
Benefit-cost ratio	0.87	1.75	3.49

## Confidence Rating and Other Findings

The results produced are highly dependent on the assumptions made, some of which are uncertain. There are two factors that warrant recognition. The first factor is the coverage of benefits. Where there are multiple types of benefits it is often not possible to quantify all the benefits that may be linked to the investment. The second factor involves uncertainty regarding the assumptions made, including the linkage between the research and the assumed outcomes.

A confidence rating based on these two factors has been given to the results of the investment analysis (Table 11). The rating categories used are High, Medium and Low, where:

- High: denotes a good coverage of benefits or reasonable confidence in the assumptions made
- Medium: denotes only a reasonable coverage of benefits or some uncertainties in assumptions made
- Low: denotes a poor coverage of benefits or many uncertainties in assumptions made

Table 11: Confidence in Analysis of Investment

<b>Coverage of Benefits</b>	<b>Confidence in Assumptions</b>
Medium-High	Low

The coverage of benefits was assessed as Medium to High. One of three impacts was valued and the impact valued was considered an important and direct benefit of the investment.

Confidence in assumptions was rated as Low. Changes to social licence are very difficult to measure and, though evidence of change through education was apparent from project data, many of the assumptions used in the valuation framework were uncertain. However, sensitivity analyses showed that, even at more conservative values, the investment criteria were positive.

# Conclusions

FRDC and PIEFA's active collaboration funded under Project 2016-417 facilitated a range of new and improved fisheries education resources and professional development opportunities for teachers, government and industry. The investment further enabled fisheries specific content to be incorporated into school curriculum at various levels, including Marine Science in a revised year 11/12 subject in QLD.

The Project outputs led to improved networks and professional development opportunities associated with primary industries education for teachers, industry and government and also has contributed to students, teachers and the broader Australian public being better educated about Australia's primary industries, including fisheries, and the career opportunities they offer. A student survey demonstrated this improvement, showing that students now are more informed and aware of the origins of various agricultural products which may lead to increased interest among curriculum recipients in joining the fishing and aquaculture workforce (supporting future workforce capacity resilience).

The investment is likely to have generated positive impacts, including:

- Increased capacity and capability associated with Australian primary industries education and fisheries education in particular.
- Contribution to maintained social licence to operate for Australian fisheries and other primary industries through increased student, teacher and community awareness and understanding of Australian primary industries' sustainability, and scientific and innovation credentials.
- Potentially, some contribution to maintained or increased long-term productivity and profitability for Australian primary industries, and fisheries in particular, through increased student interest in fisheries careers.

Total funding for the Project was \$3.61 million (present value terms). One impact, reduced risk of a loss of social licence for Australian fisheries, was valued and generated estimated total expected net benefits of \$6.31 million (present value terms). This produced an estimated net present value of \$2.70 million, a benefit-cost ratio of 1.75 to 1, an internal rate of return of 19.8%, and a MIRR of 7.4% (over 30 years, using a 5% discount rate and 5% finance rate).

Given the conservative assumptions made and the fact that two impacts were not valued in monetary terms, the investment criteria reported are likely to be an underestimate of the true performance of the investment in Project 2016-417 and the positive results should be viewed favourable by FRDC, the Australian Government, industry, and other RD&E stakeholders.



# Glossary of Economics Terms

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

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