



**FRDC**

FISHERIES RESEARCH &  
DEVELOPMENT CORPORATION

DRAFT

# **Evaluation of R&D projects completed in years ending June 2016 to June 2020**

**2018/19 FRDC Evaluations (Year 4)**

**Aggregate Summary Report**

**Agtrans Research**

**November 2021**

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**Evaluation of R&D projects completed in years ending June 2016 to June 2020: 2018-19 FRDC Evaluations (Year 4) – Aggregate Summary Report  
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**Researcher Contact Details**

Name: Talia Hardaker  
Address: Suite 36, Benson House,  
Toowong QLD 4066  
Phone: 07 3870 4047  
Fax: Nil  
Email: [talia.hardaker@outlook.com](mailto:talia.hardaker@outlook.com)

**FRDC Contact Details**

Address: 25 Geils Court  
Deakin ACT 2600  
Phone: 02 6285 0400  
Fax: 02 6285 0499  
Email: [frdc@frdc.com.au](mailto:frdc@frdc.com.au)  
Web: [www.frdc.com.au](http://www.frdc.com.au)

In submitting this report, the researcher has agreed to FRDC publishing this material in its edited form.

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## Abbreviations & Acronyms

BCR	Benefit-Cost Ratio
CBA	Cost-Benefit Analysis
CRRDC	Council of Rural Research and Development Corporations
FRDC	Fisheries Research and Development Corporation
IRR	Internal Rate of Return
MIRR	Modified Internal Rate of Return
n.c.	Not Calculable
NPV	Net Present Value
NR	Not Reported
PVB	Present Value of Benefits
PVC	Present Value of Costs
R&D	Research and Development
RDC	Research and Development Corporation
RD&E	Research, Development and Extension

# Glossary of Economic Terms

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

# Introduction

The following summary report presents an overview and aggregate results of the fourth year (2018/19) of an annual series of economic evaluations (impact assessments) of research, development and extension (RD&E) investments carried out for the Fisheries Research and Development Corporation (FRDC) that commenced in 2015/16.

## Background

The FRDC undertakes a range of performance reporting across all aspects of its business. FRDC reporting is driven by a range of legislative and mandatory reporting requirements but in particular the Primary Industries Research and Development Act 1989 and the Public Governance, Performance and Accountability Act 2013.

Performance reporting also is undertaken at different time intervals ranging from monthly financial statements through to annual whole of agency reporting. FRDC reporting includes:

- Annual Reports
- Investment Impact Assessment (including Cost-Benefit Analysis (CBA)) Reports
- Financial statements
- FRDC Stakeholder Surveys
- Senate Orders
- Reporting under the FRDC's Statutory Funding Agreement with the Commonwealth Government

The FRDC's performance assessment methods aim to:

1. Ensure the FRDC's RD&E investments deliver economic, social and environmental impacts for fishing and aquaculture in Australia.
2. Inform decision making for the FRDC board and other stakeholders when evaluating future RD&E investments.
3. Demonstrate to the Commonwealth Government and investors the benefits of investing in fishing and aquaculture RD&E.
4. Inform the FRDC's extension approach to maximise the adoption by end users.

One key assessment approach undertaken by the FRDC is investment impact assessments (including CBA). Impact assessments are undertaken annually on a number of randomly selected FRDC investments from within the FRDC's RD&E portfolio.

Agtrans Research was contracted to complete the annual impact assessments under FRDC project 2016-134: *Evaluation of Research and Development (R&D) projects completed in years ending June 2016 to June 2018* with a variation that extended to project agreement to include evaluation of FRDC R&D projects completed in years ending June 2019 and June 2020.

The first, second and third series of impact assessments each included 20 randomly selected FRDC investments and were completed in August of [2017](#), November of [2018](#), and October 2019 respectively<sup>1</sup>.

### **RDC impact assessment and performance reporting**

The annual evaluation program being undertaken by the FRDC also is part of the Council of Rural Research and Development Corporations (CRRDC) work to collaboratively implement a framework of impact assessment and CBA to evaluate RD&E activities.

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<sup>1</sup> The published reports for the first (2017) and second (2018) series of evaluations can be found at: <https://frdc.com.au/frdc-project-impact-assessments-benefits-research>. For information regarding final reports associated with the third year of evaluations (2019), please contact FRDC.

The FRDC assessment uses the methodology developed by the [CRRDCs impact assessment framework](#) which is based on the work of the Department of Finance in *Introduction to Cost-Benefit Analysis and Alternative Evaluation Methodologies* (Commonwealth of Australia, 2006), and subsequent discussions with the Department to refine the methodology.

Generating and documenting evidence of impact and demonstrating performance of the Research and Development Corporations (RDCs) as a collective is also a key objective for the CRRDC.

## General Evaluation Method

The economic 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 descriptions that are in accord with the [impact assessment guidelines](#) of the CRRDC (CRRDC, 2018).

The evaluation process involved identifying and briefly describing project objectives, activities and outputs, outcomes, and impacts. The principal economic, environmental and social impacts were then summarised in a triple bottom line framework.

Some, but not all, of the impacts identified were then valued in monetary terms. Where impact valuation was exercised, the impact assessment uses CBA as its principal tool. The decision not to value certain impacts was due either to a shortage of necessary evidence and/or 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 may represent an underestimate of the performance of that investment.

## Sample Selection

### Brief Description of the Selection Process

As in previous series of FRDC impact assessments, the fourth series of impact assessments included 20 randomly selected FRDC RD&E investments and was completed in calendar 2021. The investments had a total estimated value of \$5.81 million (nominal FRDC investment) and were selected from an overall population of 119 FRDC RD&E investments worth an estimated \$23.39 million (nominal FRDC investment) where a final deliverable had been submitted in the 2018/19 financial year.

The 20 investments were selected through a stratified, random sampling process. The RD&E investments selected spanned all five FRDC Programs under the FRDC RD&E Plan 2015-20 (Environment, Industry, Communities, People and Adoption) (FRDC, 2015), represented approximately 24.86% of the total FRDC RD&E investment in the overall population (in nominal terms) and included a selection of small, medium and large FRDC RD&E investments.

### The 2018/19 Evaluation Sample

From the initial population of 119 projects the following 20 RD&E project investments were randomly selected for evaluation (Table 1).



Table 1: Stratified random sample of 20 projects for economic evaluation as part of the FRDC's annual evaluation program 2018/19 (by Project Code)

<b>Project Code</b>	<b>Project Title</b>	<b>FRDC Program Allocation(s)</b>	<b>Total FRDC Investment (nominal \$)</b>
2011-201	Implementing a spatial assessment and decision process to improve fishery management outcomes using geo-referenced diver data	Industry (50%) Environment (25%) Adoption (25%)	\$864,251
2013-006	The impact of habitat loss and rehabilitation on recruitment to the NSW eastern king prawn fishery	Environment (100%)	\$421,928
2013-009	Shark Futures: A report card for Australia's sharks and rays	Environment (80%) Adoption (20%)	\$199,997
2013-201	Development of a harvest management, governance and resource sharing framework for a complex multi-sector, multi-jurisdiction fishery: the south-east Australian 'western' snapper stock	Industry (60%) Environment (40%)	\$598,685
2013-218	Indigenous fishing subprogram: Building the Capacity and Performance of Indigenous Fisheries	Industry (55%) Communities (45%)	\$230,000
2014-004	Mitigation measures to reduce entanglements of migrating whales with commercial fishing gear	Environment (100%)	\$499,999
2014-039	Review and assess stock assessment methods used in Australia	Environment (100%)	\$152,339
2014-045	Tassal: Amoeba biology diagnostics and farm management strategies for Amoebic Gill Disease (AGD)	Industry (100%)	\$956,427
2015-202	Maximising net economic returns from a multispecies fishery	Industry (75%) Environment (25%)	\$229,305
2015-405	Establishment of a Professional Association of Australian Fisheries Managers	People (100%)	\$49,961
2015-506	Ralf Yorke Symposium and Ecopath with Ecosim Training Course	Environment (100%)	\$15,000
2016-400	Sustainable Fishing Families: Developing industry human capital through health, wellbeing, safety and resilience	Communities (100%)	\$112,124
2017-050	Waste to profit in urchin fisheries: developing business opportunities to ensure fishery sustainability and safeguard reef dependent fisheries from destructive urchin grazing	Industry (80%) Environment (20%)	\$45,153
2017-100	Status of Australian Fish Stocks (SAFS) reports 2018, and further development of the SAFS production and dissemination system	Environment (100%)	\$1,125,050
2017-106	Communicating the research, management and performance of Tasmanian marine resource industries by video	Adoption (100%)	\$84,800
2017-124	Developing a new five-year Strategic Plan for RD&E Investment in the Australian wild harvest abalone industry	Industry (100%)	\$42,828
2017-133	The right conversations - Identifying optimal stakeholder engagement and evaluation practices for fisheries	Adoption (100%)	\$69,250
2017-185	A review of projects concerned with improved exploitation of underutilised species	Industry (80%) Adoption (20%)	\$36,729
2017-196	2018 marketing symposium to showcase innovative communication methods	People (50%) Industry (50%)	\$46,000
2017-221	Raise awareness of the guidelines developed by the AAWWG (Aquatic Animal Welfare Working Group) with industry and review their adoption, uptake rates and utility	Environment (50%) Adoption (50%)	\$34,771
<b>Total<sup>(a)</sup></b>			<b>5,814,598</b>

(a) Individual total may be subject to minor rounding errors.

Tables 2 and 3 present some key descriptive statistics about the sample in relation to the sample selection criteria.

Table 2: Key sample statistics for fourth year of annual FRDC economic evaluations

<b>FRDC Program Area</b>	<b>No. of Projects in Sample</b>	<b>Total FRDC Investment<sup>(a)</sup> (nominal \$)</b>	<b>Proportion of Total Sample Investment (%)</b>
Environment	7	2,449,085	42.1
Industry	8	3,003,378	51.7
Communities	1	112,124	1.9
People	2	95,961	1.7
Adoption	2	154,050	2.6
<b>Total</b>	<b>20</b>	<b>5,814,598</b>	<b>100.0</b>

(a) Total FRDC investment for each project categorised by Program based on the project's dominant/ primary Program allocation.

Table 3: Number of projects in each project size category<sup>(a)</sup> within the random stratified sample

<b>Program</b>	<b>Small (<math>\leq</math> \$50,000)</b>	<b>Medium (\$50,001 to \$250,000)</b>	<b>Large (<math>&gt;</math> \$250,000)</b>	<b>Totals</b>
Environment	2	2	3	7
Industry	4	3	1	8
Communities	0	1	0	1
People	2	0	0	2
Adoption	0	2	0	2
<b>Totals</b>	<b>8</b>	<b>8</b>	<b>4</b>	<b>20</b>

(a) Project size categories determined by FRDC and based on the total nominal FRDC investment only.

## Aggregate Results

### Overview

The following section presents estimated investment criteria for each of the 20 FRDC RD&E investments evaluated, for all 20 investments in aggregate, and for the aggregate investment by Program under the fourth series of annual FRDC impact assessments (the 2018/19 evaluation sample). For each set of investment criteria, the criteria were estimated for the total investment and for the FRDC investment alone.

Of the 20 randomly selected RD&E investments evaluated, seven included identified impacts that were not valued in monetary terms. This is consistent with the previous FRDC annual evaluation samples. Based on the 13 project investments where impacts were valued, upper and lower bound investment criteria were generated for the total investment and for the FRDC investment alone. First, the estimated total aggregate Present Value of Benefits (PVB) from the 13 projects valued was compared to the total aggregate Present Value of Costs (PVC) of all 20 projects evaluated. Investment criteria estimated through this process are expected to represent a lower bound for the results. The estimated total aggregate PVB from the 13 projects valued then was compared to the aggregate PVC of the same set of valued projects (13 projects). The investment criteria estimated for only the 13 projects valued are expected to represent the upper bound investment criteria for the FRDC 2018/19 evaluation sample.

For the purposes of the investment analyses, the investment costs of all parties were expressed in 2019/20 dollar terms using the Implicit Price Deflator for Gross Domestic Product (Australian Bureau of Statistics, 2020). All benefits after 2019/20 also were expressed in 2019/20 dollar terms. All costs and benefits were discounted to 2019/20 using a discount rate of 5% and using a reinvestment rate of 5% for calculating the Modified Internal Rate of Return (MIRR). The base analyses used the best available estimates for each

variable, notwithstanding a level of uncertainty for many of the estimates. All individual analyses ran for the length of the project investment period plus 30 years from the last year of investment.

Investment criteria reported include the PVC, PVB, Net Present Value (NPV), Benefit-Cost Ratio (BCR), Internal Rate of Return (IRR) and MIRR. Definitions for these terms may be found in the Glossary of Economic Terms at the beginning of this summary report.

For some projects, none of the impacts identified were able to be quantified. Detailed reasoning behind the decision not to value the impacts can be found in the individual project impact assessment reports submitted to FRDC. For projects where no impacts were valued, only the PVC was explicitly reported, all other investment criteria appear as NR (not reported). However, the cost cash flows for projects with no impacts valued were still taken into account for the calculation of the aggregate investment criteria for all 20 project investments.

For the Program level analysis, the estimated total PVB and PVC for each individual project were weighted by FRDC Program according to the Program allocation percentages shown in Table 1. The weighted PVB and PVC cash flows then were aggregated by Program and Program level investment criteria were estimated.

## Investment Criteria: Aggregate (all 20 projects)

Table 4 and Table 5 show the estimated lower bound, aggregate investment criteria for all 20 project investments evaluated as part of the 2018/19 FRDC sample for the total investment and for the FRDC investment respectively. The lower bound investment criteria were estimated by comparing the total estimated aggregate PVB to the total aggregate PVC across all 20 projects in the sample.

Table 4: Aggregate investment criteria – total investment, lower bound  
(2018/19 Sample, 5% discount rate)

Aggregate Investment Criteria	Years after last year of aggregate investment						
	0	5	10	15	20	25	30
PVB (\$m)	42.63	102.47	110.04	112.62	113.55	114.27	114.66
PVC (\$m)	15.26	15.26	15.26	15.26	15.26	15.26	15.26
NPV (\$m)	27.37	87.20	94.78	97.36	98.28	99.01	99.39
BCR	2.79	6.71	7.21	7.38	7.44	7.49	7.51
IRR (%)	43.43	59.63	59.75	59.75	59.75	59.75	59.75
MIRR (%)	negative	72.87	29.01	18.12	13.17	10.37	8.55

Table 5: Aggregate Investment Criteria – FRDC Investment, Lower Bound  
(2018/19 Sample, 5% discount rate)

Aggregate Investment Criteria	Years after last year of aggregate investment						
	0	5	10	15	20	25	30
PVB (\$m)	23.41	56.42	62.06	63.66	64.10	64.44	64.62
PVC (\$m)	8.15	8.16	8.16	8.16	8.16	8.16	8.16
NPV (\$m)	15.26	48.26	53.91	55.50	55.94	56.28	56.47
BCR	2.87	6.92	7.61	7.80	7.86	7.90	7.92
IRR (%)	negative	62.21	62.35	62.35	62.36	62.36	62.36
MIRR (%)	negative	76.90	30.84	19.22	13.92	10.94	9.01

Table 6 and Table 7 show the estimated upper bound, aggregate investment criteria for all 20 project investments evaluated as part of the 2018/19 FRDC sample for the total investment and for the FRDC investment respectively. The upper bound investment criteria were estimated by comparing the total estimated aggregate PVB to the aggregate PVC across the 13 projects where impacts were valued.

Table 6: Aggregate Investment Criteria – Total Investment, Upper Bound  
(2018/19 Sample, 5% discount rate)

Aggregate Investment Criteria	Years after last year of aggregate investment						
	0	5	10	15	20	25	30
PVB (\$m)	42.63	102.47	110.04	112.62	113.55	114.27	114.66
PVC (\$m)	11.44	11.44	11.44	11.44	11.44	11.44	11.44
NPV (\$m)	31.19	91.03	98.60	101.18	102.11	102.83	103.21
BCR	3.73	8.96	9.62	9.84	9.92	9.99	10.02
IRR (%)	negative	69.96	70.04	70.04	70.04	70.04	70.04
MIRR (%)	negative	88.60	34.09	21.10	15.26	11.98	9.86

Table 7: Aggregate Investment Criteria – FRDC Investment, Upper Bound  
(2018/19 Sample, 5% discount rate)

Aggregate Investment Criteria	Years after last year of aggregate investment						
	0	5	10	15	20	25	30
PVB (\$m)	23.41	56.42	62.06	63.66	64.10	64.44	64.62
PVC (\$m)	6.57	6.57	6.57	6.57	6.57	6.57	6.57
NPV (\$m)	16.85	49.85	55.50	57.09	57.53	57.87	58.06
BCR	3.57	8.59	9.45	9.69	9.76	9.81	9.84
IRR (%)	negative	68.65	68.75	68.76	68.76	68.76	68.76
MIRR (%)	negative	88.60	34.09	21.10	15.26	11.98	9.86

## Investment Criteria: by Project

Table 8 (total investment) and Table 9 (FRDC investment) show the estimated investment criteria by individual project for the 2018/19 FRDC evaluation sample. As reported earlier, there were seven projects where no impacts were valued and therefore no PVB was reported.

Table 8: Investment Criteria by Project (2018/19 Sample)  
(Total Investment, 30 years, 5% discount rate)

Project Code	Project Title	PVB (\$m)	PVC (\$m)	NPV (\$m)	BCR	IRR (%)	MIRR (%)
2011-201	Implementing a spatial assessment and decision process to improve fishery management outcomes using geo-referenced diver data	5.87	2.98	2.89	1.97	9.79	7.66
2013-006	Understanding the impact of habitat loss and rehabilitation on the NSW eastern king prawn (EKP) fishery	NR	1.44	NR	NR	NR	NR
2013-009	Shark Futures: A report card for Australia's sharks and rays	1.26	0.37	0.88	3.38	24.70	10.00
2013-201	Developing tools to inform management risk and improve recreational, fishery monitoring for a complex multi-sector, multi-jurisdiction fishery: the Western Victorian Snapper Stock	4.22	0.91	3.31	4.63	19.10	10.70
2013-218	Building the Capacity and Performance of Indigenous Fisheries	NR	1.30	NR	NR	NR	NR
2014-004	Mitigation measures to reduce entanglements of migrating whales with commercial fishing gear	90.41	1.39	89.02	64.95	n.c.	22.55
2014-039	Stock Assessment Integration: A review	1.46	0.43	1.03	3.37	16.70	8.82

2014-045	TSGA IPA: Amoeba biology diagnostics and farm management strategies for Amoebic Gill Disease (AGD)	4.01	2.28	1.72	1.75	19.58	7.13
2015-202	Maximising net economic returns from a multispecies fishery	NR	0.64	NR	NR	NR	NR
2015-405	Establishment of a Professional Association of Australian Fisheries Managers	NR	0.21	NR	NR	NR	NR
2015-506	Ralph Yorke Symposium and Ecopath with Ecosim Training Course	NR	0.09	NR	NR	NR	NR
2016-400	Sustainable Fishing Families: Developing industry human capital through health, well-being, safety and resilience	1.18	0.23	0.95	5.13	60.90	12.3
2017-050	Waste to profit in urchin fisheries: developing business opportunities to ensure fishery sustainability and safeguard reef dependent fisheries from destructive urchin grazing	NR	0.10	NR	NR	NR	NR
2017-100	Status of Australian Fish Stocks (SAFS) reports 2018, and further development of the SAFS production and dissemination system	4.26	2.30	1.96	1.85	60.83	7.86
2017-106	Communicating the research, management and performance of Tasmanian marine resource industries by video	0.70	0.16	0.55	4.54	20.10	10.80
2017-124	Developing a new five-year Strategic Plan for RD&E investment in the Australian wild harvest abalone industry	0.34	0.08	0.26	4.05	18.20	10.20
2017-133	The Right Conversations: Building industry engagement capacity for socially supported fisheries and aquaculture	0.26	0.09	0.17	2.86	12.47	9.02
2017-185	A review of projects concerned with improved exploitation of underutilised species	NR	0.04	NR	NR	NR	NR
2017-196	Seafood Marketing Symposium 2018 Showcasing Our Seafood – A Spectrum of Opportunities	0.20	0.06	0.14	3.34	26.70	9.50
2017-221	A Review of Industry Adoption of the Guidelines Developed by the AAWWG (Aquatic Animal Welfare Working Group) through an Industry Workshop and Determine if any Gap Exists in the Guidelines or their Adoption	0.48	0.15	0.33	3.28	13.77	9.39

(a) NR: Not Reported

n.c.: not calculable - the internal rate of return is defined as the discount rate where the net present value equals zero. The benefit and cost cash flows for the evaluation of Project 2014-004 were such that either no such rate existed or there were multiple mathematical solutions.

Table 9: Investment Criteria by Project (2018/19 Sample)  
(FRDC Investment, 30 years, 5% discount rate)

Project Code	Project Title	PVB (\$m)	PVC (\$m)	NPV (\$m)	BCR	IRR (%)	MIRR (%)
2011-201	Implementing a spatial assessment and decision process to improve fishery management outcomes using geo-referenced diver data	2.7	1.38	1.33	1.96	9.73	7.65
2013-006	Understanding the impact of habitat loss and rehabilitation on the NSW eastern king prawn (EKP) fishery	NR	0.63	NR	NR	NR	NR

2013-009	Shark Futures: A report card for Australia's sharks and rays	1.09	0.32	0.77	3.38	24.8	9.4
2013-201	Developing tools to inform management risk and improve recreational, fishery monitoring for a complex multi-sector, multi-jurisdiction fishery: the Western Victorian Snapper Stock	4.17	0.9	3.27	4.62	19.1	10.7
2013-218	Building the Capacity and Performance of Indigenous Fisheries	NR	0.37	NR	NR	NR	NR
2014-004	Mitigation measures to reduce entanglements of migrating whales with commercial fishing gear	49.38	0.76	48.61	64.71	n.c.	22.54
2014-039	Stock Assessment Integration: A review	0.77	0.23	0.55	3.41	17.06	9.71
2014-045	TSGA IPA: Amoeba biology diagnostics and farm management strategies for Amoebic Gill Disease (AGD)	1.85	1.05	0.8	1.75	19.58	7.13
2015-202	Maximising net economic returns from a multispecies fishery	NR	0.38	NR	NR	NR	NR
2015-405	Establishment of a Professional Association of Australian Fisheries Managers	NR	0.09	NR	NR	NR	NR
2015-506	Ralph Yorke Symposium and Ecopath with Ecosim Training Course	NR	0.02	NR	NR	NR	NR
2016-400	Sustainable Fishing Families: Developing industry human capital through health, well-being, safety and resilience	0.95	0.19	0.77	5.13	60	12.5
2017-050	Waste to profit in urchin fisheries: developing business opportunities to ensure fishery sustainability and safeguard reef dependent fisheries from destructive urchin grazing	NR	0.06	NR	NR	NR	NR
2017-100	Status of Australian Fish Stocks (SAFS) reports 2018, and further development of the SAFS production and dissemination system	2.67	1.44	1.23	1.85	60.66	7.85
2017-106	Communicating the research, management and performance of Tasmanian marine resource industries by video	0.25	0.05	0.19	4.54	20	11.1
2017-124	Developing a new five-year Strategic Plan for RD&E investment in the Australian wild harvest abalone industry	0.22	0.05	0.16	4.04	47	11.7
2017-133	The Right Conversations: Building industry engagement capacity for socially supported fisheries and aquaculture	0.26	0.09	0.17	2.86	12.47	9.02
2017-185	A review of projects concerned with improved exploitation of underutilised species	NR	0.04	NR	NR	NR	NR
2017-196	Seafood Marketing Symposium 2018 Showcasing Our Seafood – A Spectrum of Opportunities	0.17	0.05	0.12	3.33	26.2	9.4
2017-221	A Review of Industry Adoption of the Guidelines Developed by the AAWWG (Aquatic Animal Welfare Working Group) through an Industry Workshop and Determine if any Gap Exists in the Guidelines or their Adoption	0.15	0.05	0.1	3.28	13.71	9.34

(a) NR: Not Reported

n.c.: not calculable – the internal rate of return is defined as the discount rate where the net present value equals zero. The benefit and cost cash flows for the evaluation of Project 2014-004 were such that either no such rate existed or there were multiple mathematical solutions.

## Investment Criteria: by Program

Table 10 (total investment) and Table 11 (FRDC investment) shows the estimated investment criteria by FRDC Program for the 2018/19 FRDC sample.

Table 10: Investment Criteria by FRDC Program (2018/19 Sample)  
(Total Investment, 30 years, 5% discount rate)

<b>Program</b>	<b>PVB (\$m)</b>	<b>PVC (\$m)</b>	<b>NPV (\$m)</b>	<b>BCR</b>	<b>IRR (%)</b>	<b>MIRR (%)</b>
Environment	100.48	7.30	93.19	13.77	94.65	11.38
Industry	9.92	5.75	4.18	1.73	11.52	3.30
Communities	1.27	0.85	0.43	1.51	10.93	2.43
People	0.15	0.26	-0.11	0.58	0.18	Negative
Adoption	2.83	1.12	1.71	2.53	12.37	5.49
Aggregate Results <sup>(a)</sup>	114.66	15.26	99.39	7.51	59.75	8.55

(a) Taken from Table 4

Table 11: Investment Criteria by FRDC Program (2018/19 Sample)  
(FRDC Investment, 30 years, 5% discount rate)

<b>Program</b>	<b>PVB (\$m)</b>	<b>PVC (\$m)</b>	<b>NPV (\$m)</b>	<b>BCR</b>	<b>IRR (%)</b>	<b>MIRR (%)</b>
Environment	56.09	4.17	51.92	13.46	93.89	11.58
Industry	6.01	2.93	3.07	2.05	13.28	4.08
Communities	0.98	0.36	0.62	2.72	24.69	4.69
People	0.10	0.12	-0.02	0.85	3.07	0.87
Adoption	1.45	0.58	0.87	2.51	12.53	5.53
Aggregate Results <sup>(a)</sup>	64.62	8.16	56.47	7.92	62.36	9.01

(a) Taken from Table 5

## FRDC RD&E Leverage Ratios

Leverage ratios for the FRDC RD&E investment were estimated at a project, Program and whole of sample (aggregate) level for the 2018/19 evaluation sample. Leverage was calculated as the ratio non-FRDC investment to FRDC investment in undiscounted, real dollar terms. Table 12 shows the leverage ratios by project and Table 13 shows the leverage ratios by Program and for the aggregate investment in the 2018/19 sample.

The overall average leverage ratio for the 2018/19 project sample was estimated to be 0.85. That is, for every dollar that FRDC invested in the 20 projects, funding partners contributed 0.85 dollars. Leverage ratios for the individual project investments ranged from zero (projects 2017-133 and 2017-185) to 3.66 (project 2015-506: Ralph Yorke Symposium and Ecopath with Ecosim Training Course). At a Program level, the Communities Program had the highest leverage with a ratio of 1.24 to 1, closely followed by the People Program at 1.22 to 1.

Table 12: Leverage ratios by project (2018/19 sample)

<b>Project Code</b>	<b>Project Title</b>	<b>Leverage Ratio</b>
2011-201	Implementing a spatial assessment and decision process to improve fishery management outcomes using geo-referenced diver data	1.17
2013-006	Understanding the impact of habitat loss and rehabilitation on the NSW eastern king prawn (EKP) fishery	1.24
2013-009	Shark Futures: A report card for Australia's sharks and rays	0.16
2013-201	Developing tools to inform management risk and improve recreational, fishery monitoring for a complex multi-sector, multi-jurisdiction fishery: the Western Victorian Snapper Stock	0.01
2013-218	Building the Capacity and Performance of Indigenous Fisheries	2.43
2014-004	Mitigation measures to reduce entanglements of migrating whales with commercial fishing gear	0.83
2014-039	Stock Assessment Integration: A review	0.89
2014-045	TSGA IPA: Amoeba biology diagnostics and farm management strategies for Amoebic Gill Disease (AGD)	1.17
2015-202	Maximising net economic returns from a multispecies fishery	0.66
2015-405	Establishment of a Professional Association of Australian Fisheries Managers	1.47
2015-506	Ralph Yorke Symposium and Ecopath with Ecosim Training Course	3.66
2016-400	Sustainable Fishing Families: Developing industry human capital through health, well-being, safety and resilience	0.24
2017-050	Waste to profit in urchin fisheries: developing business opportunities to ensure fishery sustainability and safeguard reef dependent fisheries from destructive urchin grazing	0.70
2017-100	Status of Australian Fish Stocks (SAFS) reports 2018, and further development of the SAFS production and dissemination system	0.60
2017-106	Communicating the research, management and performance of Tasmanian marine resource industries by video	1.83
2017-124	Developing a new five-year Strategic Plan for RD&E investment in the Australian wild harvest abalone industry	0.57
2017-133	The Right Conversations: Building industry engagement capacity for socially supported fisheries and aquaculture	0.00
2017-185	A review of projects concerned with improved exploitation of underutilised species	0.00
2017-196	Seafood Marketing Symposium 2018 Showcasing Our Seafood – A Spectrum of Opportunities	0.22
2017-221	A Review of Industry Adoption of the Guidelines Developed by the AAWWG (Aquatic Animal Welfare Working Group) through an Industry Workshop and Determine if any Gap Exists in the Guidelines or their Adoption	2.20

Table 13: Leverage ratios by FRDC Program (2018/19 sample)

<b>Program</b>	<b>Leverage Ratio</b>
Environment	0.74
Industry	0.94
Communities	1.24
People	1.22
Adoption	0.93
<b>Aggregate</b>	<b>0.85</b>



# Summary of Past Results

The results reported for the 2018/19 FRDC evaluation sample represent the fourth annual impact assessment series in a five-year project 2016-134: *Evaluation of R&D projects completed in years ending June 2016 to June 2020*<sup>2</sup>. The following section presents a summary of the results across all four years and demonstrates the diversity and range of results estimated for FRDC's RD&E portfolio over time. However, comparisons of these results should be made with caution as each sample was estimated using real dollar terms based on the year of evaluation.

## **Aggregate Results: 2015/16, 2016/17, 2017/18 and 2018/19 evaluation samples**

Table 14 shows the aggregate investment criteria for each year of the FRDC's annual impact assessment program. The results reported are for the 2015/16, 2016/17, 2017/18, and the current 2018/19 samples.

Table 14: Aggregate Investment Criteria Across Four Evaluation Years  
(Total Investment, 5% Discount Rate, 30 years)

FRDC Evaluation Sample	PVB (\$m)	PVC (\$m)	NPV (\$m)	BCR	IRR (%)	MIRR (%)
2015/16 <sup>(a)</sup>	94.95	21.23	73.72	4.47	23.8	12.0
2016/17 <sup>(b)</sup>	92.21	16.15	76.07	5.71	21.7	10.8
2017/18 <sup>(c)</sup>	61.18	12.54	48.65	4.88	10.8	1.6
2018/19 <sup>(d)</sup>	114.66	15.26	99.39	7.51	59.75	8.55

- (a) Final population: 136 RD&E investments; 13 of 20 projects valued in monetary terms; results reported in 2016/17 dollar terms.
- (b) Final population: 72 RD&E investments; 14 of 20 projects valued in monetary terms; results reported in 2017/18 dollar terms.
- (c) Final population: 68 RD&E investments; 13 of 20 projects valued in monetary terms; results reported in 2018/19 dollar terms.
- (d) Final population: 119 RD&E investments; 13 of 20 projects valued in monetary terms; results reported in 2019/20 dollar terms.

## **Results by FRDC Program: 2015/16, 2016/17, 2017/18, and 2018/19 sample**

Table 15 shows the investment criteria for each year of evaluation (2015/16, 2016/17, 2017/18 and 2018/19) by FRDC Program as described in the FRDC RD&E Plan 2015-20 (FRDC, 2015). Results should be compared with caution as the sample selection criteria associated with the allocation of RD&E investments to a program area varied across the four years of the FRDC impact assessment program and, as noted above, results for each sample are reported in the dollar terms of the year of evaluation.

Table 15: Aggregate Investment Criteria by FRDC Program by Year  
(Total Investment, 5% Discount Rate, 30 years)

Program	FRDC Evaluation Sample	PVB (\$m)	PVC (\$m)	NPV (\$m)	BCR	IRR (%)	MIRR (%)
Environment	2015/16	19.79	10.66	9.12	1.86	12.3	7.6
	2016/17	14.45	6.35	8.09	2.27	13.6	7.8
	2017/18	17.97	5.49	12.48	3.27	9.7	NC
	2018/19	100.48	7.30	93.19	13.77	94.65	11.38
Industry	2015/16	59.61	6.13	53.48	9.72	28.2	13.9
	2016/17	74.50	8.39	66.11	8.88	26.1	12.1

<sup>2</sup> Agtrans Research was originally contracted to complete the annual impact assessments under FRDC project 2016-134: *Evaluation of Research and Development (R&D) projects completed in years ending June 2016 to June 2018*. A variation in 2018 extended the project agreement to include evaluation of FRDC R&D projects completed in years ending June 2019 and June 2020.

	2017/18	34.27	5.92	28.36	5.79	10.3	NC
	2018/19	9.92	5.75	4.18	1.73	11.52	3.30
Communities	2015/16	0.00	0.61	NR	NR	NR	NR
	2016/17	2.75	1.05	1.70	2.62	11.5	8.2
	2017/18	1.04	0.09	0.95	11.85	67.1	NC
	2018/19	1.27	0.85	0.43	1.51	10.93	2.43
People	2015/16	12.96	2.57	10.40	5.05	40.9	12.3
	2016/17	0.14	0.16	-0.03	0.84	4.3	4.7
	2017/18	1.45	0.14	1.31	10.52	51.5	NC
	2018/19	0.15	0.26	-0.11	0.58	0.18	negative
Adoption	2015/16	2.58	1.26	1.32	2.05	NC	10.3
	2016/17	0.38	0.20	0.19	1.95	26.2	7.9
	2017/18	6.45	0.91	5.55	7.13	37.9	NC
	2018/19	2.83	1.12	1.71	2.53	12.37	5.49

NR: Not reported.

NC: Not calculable

## Discussion

At the individual project level, the impacts from seven of the 20 project investments subjected to assessment in the 2018/19 evaluation sample were not valued in monetary terms. This was consistent with evaluations in previous years and was generally expected given the FRDC's mandate to invest in environmental and social RD&E where impacts are sometimes difficult to value in monetary terms. The total investment across all 20 individual RD&E projects (from all sources) ranged from \$42,733 (project 2017-185) to \$2.98 million (project 2011-201) (present value terms) with FRDC contributions ranging from 22.2% (project 2015-506) to 100% (projects 2017-133 and 2017-185) of the total investment in each project.

Estimated benefits for each project ranged from zero to \$90.41 million (present value terms) (project 2014-004). The weighted average BCR for all 20 projects was approximately 7.5 to 1. The simple average BCR for only those projects where investment criteria were reported (13 projects) was approximately 8.1 to 1, whereas the weighted average BCR for only the 13 projects where impacts were valued was estimated at 10.0 to 1. All aggregate investment criteria were positive from a period of five years after the last year of investment (2018/19) indicating that positive aggregate benefits were delivered from the investments over a relatively short timeframe.

The overall average leverage ratio for the 2018/19 project sample, defined as the ratio of investment from non-FRDC sources to FRDC investment, was estimated to be 0.85. That is, for every dollar that FRDC invested in the 20 projects, funding partners contributed 0.85 dollars. Leverage ratios for the individual project investments ranged from zero (projects 2017-133 and 2017-185) to 3.66 (project 2015-506: Ralph Yorke Symposium and Ecopath with Ecosim Training Course). At a Program level, the Communities Program had the highest leverage with a ratio of 1.24 to 1, closely followed by the People Program at 1.22 to 1.

At the Program level, four of the five FRDC Program areas reported a positive BCR (greater than, or equal to, one). For the 2018/19 sample, the estimated investment criteria for the FRDC People Program were negative. This was largely because, of the three individual projects at least partially allocated to the People Program (projects 2015-405: 100% allocation, 2017-196: 50% allocation, and 2017-221: 10% allocation), one was not valued in monetary terms, and the other two projects only had low PVBs relative to the overall project results.

The Environment Program reported the best performance with an estimated BCR of 13.8 to 1. This positive result was influenced strongly by the high total PVB (\$90.41 million) estimated for project 2014-004 (Mitigation measures to reduce entanglements of migrating whales with commercial fishing gear). This project had a 100% attribution to the Environment Program (see Table 1).

Reviewing the Program level investment criteria over time (Table 15), there do not appear to be any consistent differences between programs over the four years of analysis. This may be due to the characteristics of the randomly selected projects in each program category in each year. It may be tentatively concluded, therefore, that all five FRDC Programs are performing satisfactorily and contributing to FRDC's overall positive RD&E investment performance.

In the aggregate analysis for the 2018/19 FRDC impact assessment program, total funding from all sources across all 20 RD&E project investments totalled \$15.26 million (present value terms) with FRDC funding totalling \$11.44 million (present value terms). The investment produced estimated total expected benefits of \$114.66 million (present value terms). The estimated benefits in the 2018/19 sample were largely attributable to one individual project, Project 2014-004 (Mitigation measures to reduce entanglements of migrating whales with commercial fishing gear ) with a PVB of \$90.41 million.

The aggregate PVB and PVC gave an estimate aggregate NPV of \$99.39 million, a weighted average BCR of approximately 7.5 to 1, an IRR of 59.8% and an MIRR of 8.6%. The overall positive results should be viewed positively by FRDC, the various fisheries and aquaculture industries, and policy personnel responsible for allocation of public funds.

## Recommendations

This report represents the fourth year of a five-year period of annual impact assessments of FRDC RD&E under Project 2016-134. As part of a continuous improvement process, the impact assessment project team assess the evaluation process at the end of each year to identify areas for improvement and to make any reasonable recommendations, to be considered by FRDC management personnel, for any subsequent evaluations of FRDC RD&E investments. The following recommendations have been made within this context.

### ***Recommendation 1: Economist input to future monitoring and evaluation processes***

FRDC maintains a monitoring and evaluation (M&E) framework that supports the current FRDC RD&E Plan<sup>3</sup>. The current Plan and associated M&E framework cover the 2020-25 period. The current M&E framework includes a description of the key processes and tools that FRDC implements to measure the organisations impact and performance of its RD&E investments.

It is recommended that FRDC seek input from an economic consultant familiar with RD&E impact assessment requirements when FRDC next updates, amends and/or revises the M&E framework. Economist input to the M&E framework would ensure that the organisation's performance measures (i.e. key performance indicators) and data collection procedures appropriately contribute to future assessment of impacts and/or evaluation of FRDC's RD&E investment performance.

This may involve development of a specific Impact M&E Framework within the overall FRDC M&E framework that explicitly addresses assessment of impacts and/or end-of-project evaluation data and information requirements. Such an impact M&E framework then could be incorporated into RD&E project planning and reporting requirements.

### ***Recommendation 2: Improved communication of end-of-project evaluation requirements***

FRDC includes information on its website, and in other researcher communications, that describes the organisation's RD&E project application, evaluation and approval processes (for example: <https://frdc.com.au/project-evaluation>).

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<sup>3</sup> FRDC RD&E Plan 2020-25: <http://rdplan.frdc.com.au/>

FRDC 2020-25 M&E Framework: (see: <https://www.frdc.com.au/sites/default/files/inline-files/Approved%20Monitoring%20and%20Evaluation%20Framework%202020-25.pdf>)

It is recommended that FRDC include a description of end-of-project evaluation processes and requirements during the pre-contracting phase of the RD&E investment process. This may include communications items such as:

- A statement about the FRDC's annual impact assessment program on the FRDC website to ensure researchers are aware that their project may be subjected to impact assessment in the future and that they would be requested to provide input to the impact assessment process.
- Information about the FRDC's annual impact assessment program in RD&E project proposal and/or final reporting guidelines to encourage researchers to consider evidence of outcomes and impacts as part of their RD&E project planning and reporting processes.

Improving researcher awareness and understanding of the FRDC's annual impact assessment process and requirements would potentially improve researcher participation and feedback during the impact assessment process and may support the future measurement of the actual and expected outcomes and impacts of FRDC RD&E investments.

### ***Recommendation 3: Support for periodic collection of industry data and benchmarking studies***

Effective and robust estimation of the benefits of fisheries and aquaculture RD&E investments is highly dependent on the availability of credible data associated with the industries targeted and the expected outcomes and impacts of the RD&E.

It is recommended that FRDC make an increased effort to be involved in, or co-fund, new and/or up-to-date studies that collect industry production data and/or provide quantitative benchmarks for key industry information and data. Such studies would be particularly relevant for industries where data are particularly scarce and/or where demonstration of the impacts of RD&E investments would be highly valuable. Benchmarking studies may also contribute to the increased adoption of best management practices through increased industry awareness of what high-performing producers are doing differently.

The information elicited can be presented as aggregate data to maintain producer privacy and ensure that commercially sensitive industry information will be protected. Further, the studies could be conducted across multiple industries periodically to maximise data generated and increase the efficiency of information and data gathering processes.

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