



FINAL REPORT

An Impact Assessment of Investment in FRDC Project 2017-188 and Project 2017-175:

**Rural R&D for Profit Project – Increasing farm gate profits,
the role of natural capital accounts (RnD4Profit-16-03-003)**

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**An Impact Assessment of Investment in FRDC Project 2017-188 and Project 2017-175: Rural R&D for Profit Project – Increasing farm gate profits, the role of natural capital accounts (RnD4Profit-16-03-003)
FRDC Project 2016-134**

2022

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- Ian Cresswell, Research Director, CSIRO Oceans and Atmosphere
- Becky Schmidt, Scientist, CSIRO Land and Water

Abbreviations

ABS	Australian Bureau of Statistics
ACPF	Australian Council of Prawn Farmers
BoM	Bureau of Meteorology
CBA	Cost-Benefit Analysis
CRDC	Cotton Research and Development Corporation
CRRDC	Council of Rural Research and Development Corporations
DAFF	Department of Agriculture, Fisheries and Forestry (Commonwealth)
FRDC	Fisheries Research and Development Corporation
FWPA	Forest & Wood Products Australia
GDP	Gross Domestic Product
ha	Hectare
NCA	Natural Capital Accounting
NSW	New South Wales
PVC	Present Value of Costs
R&D	Research and Development
RD&E	Research, Development and Extension
RDC	Research and Development Corporation
RnD4P	Research and Development for Profit
TVP	Total Value of Product

Executive Summary

This report presents an impact assessment of investment in Fisheries Research and Development Corporation (FRDC) investment in *the Rural R&D for Profit Project: Increasing farm gate profits, the role of natural capital accounts (RnD4Profit-16-03-003)*, through FRDC Project 2017-188 and linked Project 2017-175. 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.

The investment in Project 2017-188 and linked Project 2017-175 enabled the development of a fisheries specific case study that linked the profitability of prawn fisheries in NSW to the ecosystem services provided by natural assets for the prawn-fishing industry in Wallis Lake estuary in NSW. The case study formed part of a much broader investment to apply natural capital accounting to the forestry, cotton and fisheries industries through the Rural Research and Development for Profit (RnD4P) Project 16-03-003 *'Increasing farm gate profits, the role of natural capital accounts'* led by Forest & Wood Products Australia.

The case study demonstrated the usefulness of producing natural capital accounts for commercial fisheries and identified a number of key limitations that would limit easy uptake of natural capital accounts by Australian fishers. Stakeholder engaged throughout the case study noted that the approach would not only be valuable for fisheries, but also of interest to other local stakeholders in both government and the public. Further, the approach could be useful to support targeted rehabilitation within estuarine systems given the link between habitats and fishery productivity and profitability.

Application of natural capital accounting still is in its infancy in Australia. Nonetheless, the Wallis Lake prawn-fishery case study and other outputs of the broader RnD4P project have led to improved understanding of the objectives and value propositions for natural capital accounting across fisheries and other primary industries and provided a framework for standardised industry-specific accounting with a pathway for individual enterprises to trial accounts, using the conceptual models and shell accounts developed.

In the longer-term, where natural capital accounting is implemented by primary producers in the future, it is likely to lead to better management of natural resources to improve certainty of supply, sustainable development of new production areas, and improved resilience of existing production to potential future shocks associated with factors such as climate change.

Total funding for the two FRDC Projects was \$0.53 million (present value terms) with an FRDC component of \$0.44 million (present value terms). Though some long-term potential impacts from the FRDC project investments were identified, no impacts were valued in monetary terms within the scope of the assessment.

Keywords

Project 2017-188, Project 2017-175, RnD4P Project 16-03-003, natural capital accounting, Wallis Lake estuary, prawn fishery, 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 2017-188: *Rural R&D for Profit Project: Increasing farm gate profits, the role of natural capital accounts (RnD4Profit-16-03-003)* 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 2017-188 analysis and findings. FRDC Project 2017-175: *Linking ecosystem services to the profitability of prawn fisheries* was identified as an important linked project and was combined with Project 2017-188 for the purpose of the assessment.

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. No impacts were valued for Project 2017-188 and Project 2017-175.

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 Australian Government's Rural Research and Development (R&D) for Profit program (RnD4P) boosts funding to the rural research and development corporations (RDCs) for nationally coordinated, strategic research that aims to improve farm-gate productivity and profitability and deliver real outcomes for Australian farmers. The program is co-ordinated by the Department of Agriculture, Fisheries and Forestry (DAFF). Total funding for the program is \$157 million over eight years with all projects expected to be completed by June 2023 (DAFF, 2022).

Program funding has been delivered through four funding rounds. Under Round 3, Forest & Wood Products Australia (FWPA) received approval for RnD4P Project 16-03-003 titled '*Increasing farm gate profits, the role of natural capital accounts*'. The project was a collaboration between FWPA, FRDC, the Cotton RDC (CRDC), the Bureau of Meteorology (BoM), the Australian Bureau of Statistics (ABS), One Forty One Plantations Ltd, Eco Logical Australia Pty Ltd, Hancock Victorian Plantations Pty Ltd, the CSIRO, VicForests, the New South Wales (NSW) Department of Primary Industries, and the University of Newcastle.

The objectives of the Commonwealth's Rural RnD4P program that underpinned the FWPA led project: *Increasing farm gate profits, the role of natural capital accounts (RnD4Profit-16-03-003)* were to realise productivity and profitability improvements for primary producers, through:

- a) generating knowledge, technologies, products or processes that benefit primary producers,
- b) strengthening pathways to extend the results of rural R&D, including understanding the barriers to adoption, and
- c) establishing and fostering industry and research collaborations that form the basis for ongoing innovation and growth of Australian agriculture.

Specific to RnD4Profit-16-03-003, natural capital is the soil, air, water and biodiversity-the natural resources used for food and fibre production. The project aimed to apply Natural Capital Accounting (NCA) to the forestry, cotton and fisheries industries allowing producers to:

- Incorporate natural assets into farm business systems to help identify risks and costs associated with using, and opportunities from improving, these assets and manage accordingly
- Access cheaper finance, drawing on opportunities from finance organisations who explicitly incorporate natural capital in the credit risk calculations and offer lower interest rates for landholders who manage these assets
- Demonstrate best practice management of natural assets and increase profitability by accessing premium markets.

Rationale for Project 2017-188 and 2017-176

FRDC Project 2017-188 was initially funded to support FRDC's involvement in the broader Rural RnD4P project and to develop a fisheries specific case study focused on the prawn-fishing industry in Wallis Lake estuary in NSW. Linked FRDC Project 2017-175 then was funded to extend the case study within the RnD4P project.

Project Details

Summary

Project Code(s): 2017-188 and 2017-175

Title(s):

2017-188: *Rural R&D for Profit Project: Increasing farm gate profits, the role of natural capital accounts (RnD4Profit-16-03-003)*

2017-175: *Linking ecosystem services to the profitability of prawn fisheries*

Research Organisation(s):

2017-188: Forest & Wood Products Australia (FWPA)

2017-175: CSIRO Land and Water

Principal Investigator(s):

2017-188: Jim Houghton, Manager – Statistics and Economics Manager (FWPA)

2017-175: Ian Cresswell, Research Director (CSIRO Oceans and Atmosphere)

Period(s) of Funding:

2017-188: July 2016 to June 2020

2017-175: March 2018 to June 2020

FRDC Program Allocation(s):

2017-188: Environment 100%

2017-175: Environment 40%, Industry 40%, Adoption 20%

Objectives

Project 2017-188

FRDC funding under Project 2017-188 was provided to support FRDC's involvement in the broader Rural RnD4P project and to develop a fisheries specific case study focused on the prawn-fishing industry in Wallis Lake estuary in New South Wales (NSW).

Project 2017-175

FRDC Project 2017-175 contributed to the fisheries case study in the broader RnD4P project by:

- Compiling data for experimental natural capital accounts
- Identifying, interviewing and engaging stakeholders
- Providing input and feedback on results and outputs from the broader project.

The specific objectives of linked FRDC Project 2017-175 were to:

- 1) Link the profitability of prawn fisheries in NSW to the ecosystem services provided by natural assets
- 2) Identify and engage stakeholders related to prawn fisheries in NSW
- 3) Increase stakeholders' awareness of and skills in natural capital accounting

Logical Framework

The scope of the assessment was the specific investment by FRDC and others in Project 2017-188 and 2017-175 and not the broader RnD4P project. However, the FRDC project investments were evaluated within this broader context. A logical framework for the investment in Projects 2017-188 and 2017-175 was developed (Table 1). The logical framework focused on the fisheries case study activities supported by FRDC project funding.

Table 1: Logical Framework for FRDC Project 2017-188 and 2017-175

Activities	<ul style="list-style-type: none"> • Australia lacked the ability to effectively capture revenue generated from its natural capital in the national accounts. • Natural capital generally refers to the economic value of natural assets (e.g. estuarine habitats, clean water) through the ecosystem services that they support. • National accounts capture information on the functioning of the economy; however, much of the annual Gross Domestic Product (GDP) is generated from natural capital that is not currently measured. • The case study undertaken through Project 2017-188 and 2017-175 used methods and data developed in a previous FRDC project (Project 2013-006). • Stakeholder groups with an interest in wild-harvest fisheries in NSW were interviewed. • A total of 36 interviews were conducted to determine how stakeholder groups with an interest in wild-harvest fisheries in NSW understand (and/or use) natural capital accounting – specifically, the commercial prawn-fishing industry in Wallis Lake estuary. • Interviews were targeted to ascertain interviewees’ level of knowledge of natural capital accounting and understanding of the ecosystem services the prawn-fishing industry relies upon. • Based on the initial stakeholder interviews, a conceptual model of the Wallis Lake prawn fishery and the ecosystem it was associated with was designed. • All stocks of assets and flows, as well as the interlinked flows to, within and from, the combined ecosystem and enterprise system, were systematically identified and illustrated. • The conceptual models were subsequently tested with stakeholders via two workshops with the Wallis Lake Estuary Management Committee and revised to reflect local understanding of the systems. • The workshops were held on 28 February 2019 and 29 May 2019 • Samples of all primary producers found in various sites within Wallis Lake were obtained for biophysical modelling to capture the variation in stable isotope values. • Samples included mangroves, riparian vegetation, saltmarsh species (succulents and grasses), seagrasses, particulate organic matter, and fine benthic organic matter. • Five species of commercial interest in Wallis Lake were targeted, that were chosen according to their total landings value for the estuary: blue swimmer crab, sea mullet, dusky flathead, yellowfin bream, and school prawn. • Samples were processed at the University of Newcastle and an initial biophysical model was developed. • Outputs from the initial model then were combined with known habitat extent and historical catch records of the targeted commercial species in Wallis Lake. • Using a Monte Carlo Markov Chain approach that accounts for uncertainty, the likely value of estuarine habitats were assessed based on the value of the landings and the modelled contribution of diet of estuarine habitats. • On 25 November 2020 a further meeting was held with the committee via Zoom (due to COVID-19 travel restrictions) to: <ul style="list-style-type: none"> (a) present and test these proposed natural accounts, and (b) share the final technical reports and the public-audience summary in advance of publication. • At the final presentation of these natural capital accounts to the Wallis and Smiths Coast and Estuaries Committee, stakeholders gave positive feedback, describing it as an ‘excellent presentation’ of interesting information that would be useful in cost-benefit analyses, and also to aid planning to mitigate climate change. • Committee members requested additional analysis of other species (whiting, mud crab) and emphasised the importance of seagrass for the greasyback prawn.
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Outputs	<ul style="list-style-type: none"> • A wide range of ‘value propositions’ for the use of natural capital accounting in the wild-caught fishing industry were identified by stakeholders through the consultation process. • Stakeholders prioritised the following major activities and events for natural capital accounting: <ul style="list-style-type: none"> (i) freshwater pulses (ii) agriculture (iii) commercial fisheries. • These priorities guided the selection of the following accounts that were compiled by the broader RnD4P project: <ul style="list-style-type: none"> (i) precipitation in the catchment (ii) freshwater pulses in the catchment (iii) land use in the catchment (iv) terrestrial and riparian vegetation in the catchment (v) aquatic prawn habitat (vi) water quality in the prawn habitat (vii) landed prawn biomass in the fishable area. • A conceptual model of the prawn-fishing industry’s interaction with natural capital was developed. • A biophysical model of the Wallis Lake estuary was developed and showed that an isotopic group comprising mangroves and other sources was the most important source for both <i>Portunus armatus</i> (blue swimmer crab) and <i>Metapenaeus macleayai</i> (school prawn), followed by seagrasses. • The valuation of habitats across five species commercially fished in Wallis Lake showed that the relative value of the three estuarine habitats varied considerably among species. • Blue swimmer crabs (<i>Portunus armatus</i>) had the highest associated value for each estuarine habitat, with medians of over AUD \$50,000 per year per habitat (all values expressed as 2018 values), driven by the volume of harvest combined with the species per-kg value. • For four of the five consumer species, saltmarshes had the highest value, while mangroves had the lowest value. The exception being blue swimmer crabs, where seagrasses were of the highest value, followed by saltmarshes and then mangroves. • Using the current areal extent of each habitat type in the Wallis Lake estuary, the per-hectare (ha) value of saltmarshes was also highest (AUD \$621 ±191 per ha per year), followed by mangroves (AUD \$227 ±66 per ha per year) and seagrasses with the lowest value (AUD \$63 ± 29 per ha per year). • These patterns were mirrored in the total economic value of habitats (extrapolating the broader value of product to the economy), also known as ‘Total Value of Product’ (TVP), which was highest for saltmarshes (AUD \$1.7 million per year). • Overall, the cumulative TVP for fisheries production derived from the habitats and species described for the Wallis Lake case study was ~AUD \$3.4 million per year.
Outcomes	<ul style="list-style-type: none"> • The project demonstrated the usefulness of producing natural capital accounts for primary industries, and in particular, commercial fisheries. • It also identified a number of key limitations that would limit easy uptake of natural capital accounts by fishers. • Stakeholder engagement identified that the approach was not only valuable for fisheries, but also of great interest to local stakeholders in both government and the public. • Stakeholders agreed the approach would be useful for supporting targeted rehabilitation within estuarine systems given the inextricable link between habitats, productivity, and profitability. • The study confirmed that conceptualising, defining, and quantifying the biophysical aspects of a business’s interactions with natural capital provides the necessary basis for businesses and managers to assess the risks and opportunities associated with their impacts and dependencies.

	<ul style="list-style-type: none"> • These potentially included operational, legal, regulatory, reputational, financial, and social risks as well as additional business opportunities. • The issue of who might be best placed to operationalise ongoing natural capital accounts still needs to be addressed. • Stakeholder engagement revealed that small-scale fishery enterprises are unlikely to develop natural capital accounts by themselves. This suggested that a different organisation may be better placed to develop the accounts, potentially a local or state government; or consultants commissioned jointly by several industries that share the resources of the estuary; or a research agency or peak body tasked with supporting the viability of local industries. • Application of natural capital accounting still is in its infancy in Australia, and capacity and capability for natural capital accounting remains low. • The fisheries Wallis Lake case study and other outputs of the broader RnD4P project have led to the following key outcomes: <ul style="list-style-type: none"> (a) An improved understanding of the objectives and value propositions for natural capital accounting across the primary industries that highlight a broader range of benefits than originally hypothesised, particularly in relation to reporting environmental performance, management, and risk disclosure. (b) A framework for standardised industry-specific accounting and a pathway for individual enterprises to trial accounts, using the conceptual models and shell accounts developed. (c) Methods and examples of biophysical accounts, which are directly useful, and provide the foundation for future valuation of the stocks and flows in monetary terms. (d) Raising of the profile of natural capital accounting, and its associated benefits, through extensive engagement with stakeholders across diverse primary industries. There has been growing interest and increased evidence of adoption by leading enterprises and land managers across the primary industries.
Impacts	<p>Application of natural capital accounting still is in its infancy in Australia, and capacity and capability for natural capital accounting remains low. However, where natural capital accounting is implemented by primary producers in the future it is likely to lead to:</p> <ul style="list-style-type: none"> • Better management of natural resources to improve certainty of supply, sustainable development of new production areas, and improved resilience of existing production to potential future shocks associated with factors such as climate change. • Increase farm gate profitability for fisheries and other primary industries driven by: <ul style="list-style-type: none"> (i) increased sustainability credentials and access to premium markets, (ii) discounted finance associated with reduced natural capital risk, (iii) improved capacity to engage in emerging environmental markets.

Source: FRDC project documentation and the FWPA RnD4Profit-16-03-003 Final Report¹

¹ The FWPA RnD4Profit-16-03-003 Final Report can be found at:
https://www.fwpa.com.au/images/resources/2021/Lifting_farm_gate_profits_the_role_of_natural_capital_accounts_-_Final_Report_RRD030-1617_.pdf

Nominal Investment

Table 2 shows the total annual investment made in Project 2017-188 and Project 2017-175.

Table 2: Total Investment in FRDC Project 2017-188 and 2017-175
(nominal dollar terms)

Year ended 30 June	FRDC (\$)	Others ^(a) (\$)	Total (\$)
2018	71,000	15,000	86,000
2019	116,000	30,000	146,000
2020	66,000	30,000	96,000
2021	30,000	0	0
Totals	283,000	75,000	358,000

Source: FRDC project 2017-188 and 2017-175 project agreement and financial acquittals

(a) Other contributors to Project 2017-175 including the Australian Council of Prawn Farmers (ACPF) and the University of Newcastle

Table 2 shows only the specific investment in FRDC Project 2017-188 and Project 2017-175. The broader RnD4P project had a total nominal investment of approximately \$2.26 million over three years (including 2017-188 but excluding linked Project 2017-175).

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 2017-175 (ACPF and University of Newcastle), 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 others 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 the projects including significant stakeholder engagement and other extension and communication activities.

Impacts

Table 3 provides a summary of the principal types of potential impacts from Project 2017-188 and linked Project 2017-175. 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 2017-188 and Project 2017-175

Economic	<ul style="list-style-type: none"> • Where natural capital accounting is implemented by primary producers in the future it is likely to lead to better management of natural resources to improve certainty of supply, sustainable development of new production areas, and improved resilience of existing production to potential future shocks associated with factors such as climate change. • Future implementation of natural capital accounting could potentially increase farm gate profitability for fisheries and other primary industries through: <ol style="list-style-type: none"> (i) increased sustainability credentials and access to premium markets, (ii) discounted finance associated with reduced natural capital risk, (iii) improved capacity to engage in emerging environmental markets.
Environmental	<ul style="list-style-type: none"> • Potentially, some contribution to more sustainable management of natural resources by primary producers in the future.
Social	<ul style="list-style-type: none"> • Potentially, some contribution to maintained social licence to operate for some primary producer through future improvements to their sustainability credentials. • Potentially, some contribution to maintained food resource security and associated amenity. • Potentially, some contribution to amenity associated with more sustainable management of natural resources.

Public versus Private Impacts

The potential future impacts attributable to Projects 2017-188 and 2017-175 are likely to include both public and private impacts. Private impacts may be delivered through increased farm gate profitability for fisheries and other primary industries.

Public impact may be achieved through improved management of natural resources and environmental sustainability.

Distribution of Private Impacts

Any future private impacts attributable to the investment in Projects 2017-188 and 2017-175 would accrue primarily to Australian fishers using natural capital accounting to better manage natural resources to improve certainty of supply, sustainable development of new production areas, and improve resilience of existing production to potential future shocks associated with factors such as climate change. In the longer-term, such private impacts would be shared along fishery supply chains according to relevant short- and long-term supply and demand elasticities.

Impacts on other Australian industries

The broader RnD4P project included research outputs for the cotton and forestry industries as well as fisheries. The impacts identified in Table 3 likely would also apply to any primary industry that adopts natural capital accounting that is, in part, because of the investment in the project.

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 2017-188 and Project 2017-175 indirectly contributed to National Science and Research Priorities 1 and 2. Further, the RD&E investment may contribute indirectly to Agricultural Innovation Priorities 1 and 2 where natural capital accounting systems are implemented in the future and contribute to improved management and sustainability of Australian fisheries.

Table 4: Australian R&D Priorities

Australian Government	
National Science and Research Priorities ²	National Agricultural Innovation Priorities ³
<ol style="list-style-type: none"> 1. Food – optimising food and fibre production and processing; agricultural productivity and supply chains within Australia and global markets. 2. Soil and Water – improving the use of soils and water resources, both terrestrial and marine. 3. Transport – boosting Australian transportation: securing capability and capacity to move essential commodities; alternative fuels; lowering emissions. 4. Cybersecurity – improving cybersecurity for individuals, businesses, government, and national infrastructure. 5. Energy and Resources – supporting the development of reliable, low cost, sustainable energy supplies and enhancing the long-term viability of Australia’s resources industries. 6. Manufacturing – supporting the development of high value and innovative manufacturing industries in Australia. 7. Environmental Change – mitigating, managing, or adapting to changes in the environment. 8. Health – improving the health outcomes for all Australians. 	<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"> 1. Australia is a trusted exporter of premium food and agricultural products by 2030. 2. Australia will champion climate resilience to increase the productivity, profitability, and sustainability of the agricultural sector by 2030. 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. 4. Australia is a mature adopter, developer, and exporter of digital agriculture by 2030.

² Source: 2015 Australian Government *Science and Research Priorities*. <https://www.industry.gov.au/data-and-publications/science-and-research-priorities>.

³ 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.

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 2017-188 and Project 2017-175 indirectly addressed primarily FRDC national RD&E priority 1 because, where natural capital accounting is implemented in the future, the investment is likely to have contributed to the resulting improvements to the management and sustainability of Australian fisheries.

Valuation of Impacts

Impacts Not Valued

Based on the scope of the assessment of the investment in Project 2017-188 and linked Project 2017-175 none of the impacts identified were valued in monetary terms. Table 5 describes the reasoning for non-valuation of each of the impacts identified (Table 3).

Table 5: Reasons for Non-Valuation of Impacts

Impact Identified	Reason(s) for Non-Valuation
Where natural capital accounting is implemented by primary producers in the future it is likely to lead to better management of natural resources to improve certainty of supply, sustainable development of new production areas, and improved resilience of existing production to potential future shocks associated with factors such as climate change.	<p>The impacts identified were all related to the adoption and practical application of natural capital accounting by fishers, fisheries managers, and other primary producers. The case study on the prawn-fishing industry in Wallis Lake estuary in NSW developed through the investment was geographically specific.</p> <p>No specific evidence of practical use of natural capital accounting by prawn farmers at Wallis Lake leading was available.</p> <p>Further, the contribution of the investment in Project 2017-188 and 2017-175 to the furtherance of natural capital accounting in other primary industries through the broader RnD4P project led by FWPA was highly uncertain. The FWPA project final report noted that significantly more investment and work needs to be done before natural capital accounting is able to be applied across Australian primary industries.</p>
<p>Future implementation of natural capital accounting could potentially increase farm gate profitability for fisheries and other primary industries through:</p> <ul style="list-style-type: none"> (i) increased sustainability credentials and access to premium markets, (ii) discounted finance associated with reduced natural capital risk, (iii) improved capacity to engage in emerging environmental markets. 	
Potentially, some contribution to more sustainable management of natural resources by primary producers in the future.	
Potentially, some contribution to maintained social licence to operate for some primary producer through future improvements to their sustainability credentials.	
Potentially, some contribution to maintained food resource security and associated amenity.	
Potentially, some contribution to amenity associated with more sustainable management of natural resources.	

Results

All costs were expressed in 2020/21-dollar terms and were discounted to 2021/22 using a discount rate of 5%. Though no impacts were valued, in the interests of consistency with other project analyses and reporting, the Present Value of Costs (PVC) was reported for the length of the investment period plus for different periods up to 30 years from the last year of investment (2020/21).

Investment Criteria

Tables 6 and 7 show the investment criteria estimated for different periods of costs for the total investment and FRDC investment respectively. As no impacts were valued, the investment criteria reporting is restricted to the PVC.

Table 6: Investment Criteria for Total Investment in Projects 2017-188 and 2017-175

Investment criteria	Number of years from year of last investment						
	0	5	10	15	20	25	30
Present value of costs (\$m)	0.53	0.53	0.53	0.53	0.53	0.53	0.53

Table 7: Investment Criteria for FRDC Investment in 2017-188 and 2017-175

Investment criteria	Number of years from year of last investment						
	0	5	10	15	20	25	30
Present value of costs (\$m)	0.44	0.44	0.44	0.44	0.44	0.44	0.44

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.

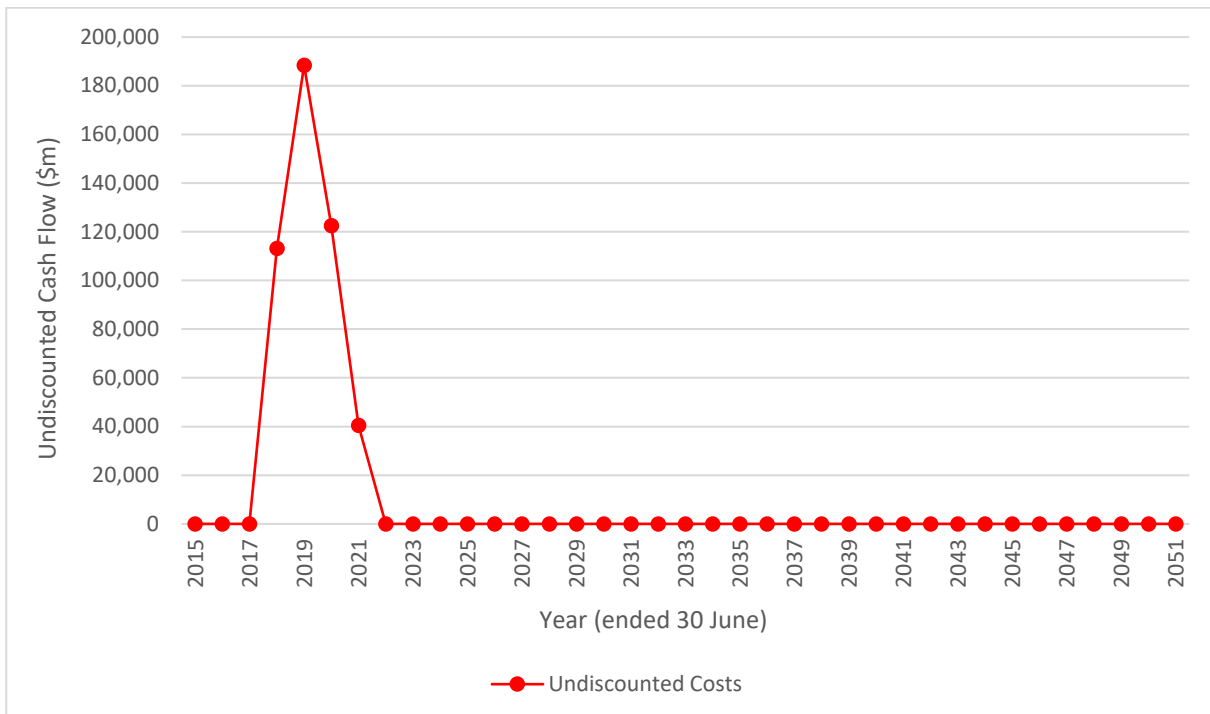


Figure 1: Annual Cash Flow of Undiscounted Total Costs

Conclusions

The investment in Project 2017-188 and linked Project 2017-175 enabled the development of a fisheries specific case study that linked the profitability of prawn fisheries in NSW to the ecosystem services provided by natural assets for the prawn-fishing industry in Wallis Lake estuary in NSW. The case study formed part of a much broader investment to apply natural capital accounting to the forestry, cotton and fisheries industries through RnD4P Project 16-03-003 *'Increasing farm gate profits, the role of natural capital accounts'* led by FWPA.

The case study demonstrated the usefulness of producing natural capital accounts for commercial fisheries and identified a number of key limitations that would limit easy uptake of natural capital accounts by Australian fishers. Stakeholders engaged throughout the case study noted that the approach would not only be valuable for fisheries, but also of interest to other local stakeholders in both government and the public. Further, the approach could be useful to support targeted rehabilitation within estuarine systems given the link between habitats and fishery productivity and profitability.

The study also confirmed that conceptualising, defining and quantifying the biophysical aspects of a business's interactions with natural capital could provide the necessary basis for businesses and managers to assess the risks and opportunities associated with their impacts and dependencies. However, the issue of who might be best placed to operationalise ongoing natural capital accounts still needs to be addressed.

Application of natural capital accounting still is in its infancy in Australia, and capacity and capability for natural capital accounting remains low. Nonetheless, the Wallis Lake prawn-fishery case study and other outputs of the broader RnD4P project have led to the following key outcomes:

- a. An improved understanding of the objectives and value propositions for natural capital accounting across the primary industries that highlight a broader range of benefits than originally hypothesised, particularly in relation to reporting environmental performance, management and risk disclosure.
- b. A framework for standardised industry-specific accounting and a pathway for individual enterprises to trial accounts, using the conceptual models and shell accounts developed.
- c. Methods and examples of biophysical accounts, which are directly useful, and provide the foundation for future valuation of the stocks and flows in monetary terms.
- d. Raising of the profile of natural capital accounting, and its associated benefits, through extensive engagement with stakeholders across diverse primary industries. There has been growing interest and increased evidence of adoption by leading enterprises and land managers across the primary industries.

Where natural capital accounting is implemented by primary producers in the future it is likely to lead to better management of natural resources to improve certainty of supply, sustainable development of new production areas, and improved resilience of existing production to potential future shocks associated with factors such as climate change. Further, practical application of natural capital accounting in the future could potentially increase farm gate profitability for fisheries and other primary industries through:

- (i) increased sustainability credentials and access to premium markets,
- (ii) discounted finance associated with reduced natural capital risk,
- (iii) improved capacity to engage in emerging environmental markets.

Total funding for the two FRDC Projects was \$0.53 million (present value terms) with an FRDC component of \$0.44 million (present value terms). Though some long-term potential impacts from the FRDC project investments were identified, no impacts were valued in monetary terms within the scope of the assessment.

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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