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FISHERIES RESEARCH &
DEVELOPMENT CORPORATION

FINAL REPORT

An Impact Assessment of Investment in FRDC Project 2018-153:

**AgriFutures Australia Project PRJ-011482 Phase II -
\$100bn growth strategy**

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**An Impact Assessment of Investment in FRDC Project 2018-153: AgriFutures Australia Project PRJ-011482 Phase II - \$100bn growth strategy
FRDC Project 2016-134**

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- ACIL Allen Consulting Pty Ltd

Abbreviations

APL	Australian Pork Ltd
AWI	Australian Wool Innovation
CRDC	Cotton Research and Development Corporation
CRRDC	Council of Rural Research and Development Corporations
FRDC	Fisheries Research and Development Corporation
GRDC	Grains Research and Development Corporation
IRR	Internal Rate of Return
NFF	National Farmers' Federation
RD&E	Research, Development and Extension
SRA	Sugar Research Australia

Executive Summary

This report presents an impact assessment of investment in Fisheries Research and Development Corporation (FRDC) investment in Project 2018-153: *AgriFutures Australia project PRJ-011482 Phase II - \$100bn growth strategy*. 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 FRDC contribution to AgriFutures Project PRJ-011482 through Project 2018-053 contributed to the development of an approach for conceptualising the opportunities and risks, against the backdrop of uncertainty, facing agriculture and presented as well as a range of possible offensive and defensive strategies/investments for delivering enduring profitability by the Australian agricultural sector.

The four key drivers of and four key risks to net farm performance identified through the project are likely to have been taken on board by research bodies, Government and industry to improve the efficiency and effectiveness of strategies and investments targeted at achieving the NFF's \$100 billion by 2030 target.

Total FRDC funding for the Project was \$13,077 (present value terms). The primary impact was valued which was a contribution to improved effectiveness and/or efficiency of resource allocation on RD&E for the rural RDCs. The impact was estimated to give total expected net benefits attributable to the FRDC investment of \$50,056 (present value terms). This produced an estimated net present value of \$36,979, a benefit-cost ratio of 3.83 to 1, an internal rate of return (IRR) of 35.8%, and a modified IRR of 9.4% (over 30 years, using a 5% discount rate and 5% finance rate).

The estimated average annual investment by the RDCs in agricultural RD&E used in the valuation does not include other investment by other stakeholders that may be influenced by the findings of AgriFutures Project PRJ-011482 and therefore partially attributable to the FRDC investment. Given the conservative assumptions made and the fact that the valuation did not include all relevant investment benefiting from the project, the investment criteria reported are likely to be an underestimate of the true performance of the investment in Project 2018-153. The positive results should be viewed favourable by FRDC, the Australian Government, industry, and other RD&E stakeholders and demonstrates the value of cross-RDC collaboration.

Keywords

Project 2018-153, AgriFutures Project PRJ-011482, \$100 billion industry, National Farmers' Federation vision, agricultural sector growth project, 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 2018-153: *AgriFutures Australia project PRJ-011482 Phase II - \$100bn growth strategy* 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 2018-153 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

In 2017, the National Farmers' Federation (NFF) announced a bold vision for Australia's agricultural industry to achieve \$100 billion in farm gate output by 2030. The vision and target were designed to kickstart a national dialogue on the support needed to ensure Australian agriculture reaches its full potential.

Following this catalysing announcement, AgriFutures Australia initiated a collaborative 'agricultural sector growth project' project with several other Australian rural Research and Development Corporations (RDCs) through the organisations National Rural Issues Program (AgriFutures Australia Ltd, 2018). The project was a joint initiative between AgriFutures Australia, the Cotton Research and Development Corporation (CRDC), FRDC, Wine Australia, Sugar Research Australia (SRA), Dairy Australia, Australian Wool Innovation (AWI), Australian Pork Ltd (APL), and the Grains Research and Development Corporation (GRDC).

ACIL Allen Consulting was commissioned to undertake the overall project which was delivered in two phases. Phase I of the project was designed to understand the current growth trajectory of the whole agricultural sector and evaluate whether the \$100 billion target was realistic or whether a new aspirational target was needed to advance the growth of Australian agriculture. Phase I was completed in May 2018. Analysis from first phase of the project found that the current growth trajectory of the Australian agricultural sector will likely reach \$84.3 billion by 2030 (AgriFutures Australia Ltd, 2019).

Rationale for Project 2018-153

A second phase of the 2019 study was required to identify pathways to accelerate the agricultural sector's growth and understand the opportunities and barriers to achieve the \$100 billion target. The aim was to provide details about the opportunities that would have the greatest potential impact on the sector and explore barriers that will need to be overcome to maximise them.

FRDC Project 2018-153 represents the FRDC's funding contribution Phase II of the cross-RDC 'agricultural sector growth project' led by AgriFutures Australia.

Project Details

Summary

Project Code: 2018-153

Title: *AgriFutures Australia project PRJ-011482 Phase II - \$100bn growth strategy*

Research Organisation: AgriFutures Australia Ltd

Principal Investigator: Alex Gash, ACIL Allen Consulting Pty Ltd

Period of Funding: January 2019 (Final Report delivered August 2019)

FRDC Program Allocation: Industry 100%

Objectives

For the Phase II project, the objective was:

- To identify factors that will likely propel agriculture above the forecasted base growth trajectory of \$84.3 billion by 2030. Those factors are shown to be economy-wide, industry specific and involve fundamental considerations of economic growth—competition, innovation, resource allocation, supply chain efficiencies, product development and utilisation.

Logical Framework

Table 1: Logical Framework for FRDC Project 2018-153

Activities	<ul style="list-style-type: none">• Following on from the first phase of the project, the first stage of Phase II involved developing a more detailed interpretation of the NFF \$100 billion target.• ACIL Allen used a number of specific assumptions about the way the vision should be interpreted for the purpose of the study.• Against the backdrop of the assumptions, ACIL Allen sought to probe the plausibility and sense in planning for the vision by 2030 through three key questions:<ol style="list-style-type: none">1) Does the base-case, and its trend value estimate of \$84.3 billion, seriously underestimate the profitable opportunities that now exist for Australian agriculture? Or that could plausibly be created?2) What are likely to be the drivers if stronger performance can be delivered?3) What can be concluded about the balance between cost reductions and production value increases that should lie at the heart of the strategy?• A framework was then developed to understand the market, environmental, and other factors that would contribute to future agricultural outcomes over the next decade.• The framework was developed and applied using a combination of desktop analysis and stakeholder consultation.• A desktop review of key government policy documents and industry reports informed the framework's development.• A wide range of complex factors that would drive or impede net farm performance over the long-term were identified• These factors were assembled into a form of typology and then presented in a Discussion Paper for use during consultations.• Consultations with RDCs, agricultural peak industry bodies, the Australian Government, and other organisations who are stakeholders to the vision were then undertaken and used to test and refine the framework.• Stakeholders were asked to identify the most important opportunities and constraints facing their industry sectors, and why they were important.
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	<ul style="list-style-type: none"> • Consultations also were used to identify individual datasets and documentation that could be used as underpinning evidence in the study. • The various factors identified during consultations were then analysed against the framework, using a filtering approach to arrive at a small number of “drivers” of net farm performance and “risks” to this performance being delivered.
Outputs	<ul style="list-style-type: none"> • The assumptions used around the interpretation of the \$100 billion target included: <ol style="list-style-type: none"> 1) First, the \$100 billion vision is interpreted as something that it is reasonable to expect if the ‘average’ trend assumptions in external conditions (normal international prices, long-term trends in exchange rates, etc) and climate conditions hold until 2030. It is also reasonable to expect Australian agriculture to take advantage of profitable opportunities (while ensuring sustainability) between now and 2030. In other words, the fundamental structure of Australian agriculture could be moved to a point where a \$100 billion (plus) outcome is likely to occur in an average year if sound strategy is developed and implemented by, and for, agriculture. 2) Second, the \$100 billion vision is not interpreted as a target in itself, but rather as a realistic interpretation of the outcome that could be achieved if agriculture builds sustainable net performance quickly and efficiently. This vision can then be used as a valuable, readily understood focus for industry and government planning, to ensure that high value opportunities are not missed and strategies at the farm, sector and government levels do justice to the opportunities as they arise. The vision can also be used to develop strategies for managing the major risks to agriculture when they emerge or change. 3) Third, ACIL Allen assumes that the strategy process will be highly adaptive—constantly monitoring opportunities, risks, progress, and outcomes—and that the figure of \$100 billion will not be retained if the emerging information suggests it is no longer appropriate. If the analysis starts to suggest that moving to a structure for agriculture which would, on average, deliver production value of \$90 billion, rather than \$100 billion, with this implying higher net incomes or stronger and more sustainable future net incomes, then the vision should of course be adapted. • The desktop review to develop the framework underpinning the study identified a wide range of complex factors that would drive or impede net farm performance over the long-term. • After stakeholder consultation and analysis against the framework, four key drivers of and four key risks to net farm performance were identified. The four drivers and four risks were documented to provide a basis on which strategies could be designed and implemented to achieve the \$100 billion by 2030 target. • The study acknowledged that the drivers and risks applied to Australian agriculture but the degree to which they potentially benefit/cost individual industries will vary. • The four key drivers of future net farm performance identified were: <ol style="list-style-type: none"> 1) Technology and data – getting more from adoption 2) Off-farm R&D – creating value up the supply chain 3) Off-farm infrastructure – efficiency & capital attraction 4) Markets – accelerating access and development • The four key risks to future net farm performance identified were: <ol style="list-style-type: none"> 1) Climate and water – adapting farming & infrastructure 2) Biosecurity – sharing responsibility to sustain integrity 3) Regulation – sustained reform for efficiency & integrity 4) Consumers – meeting/exceeding changing preferences • The final report for Phase II also described a number of areas that would be necessary to develop and implement strategies toward achieving the \$100 billion target. The report stated that it would be necessary:

	<ol style="list-style-type: none"> 1) To address the immediate opportunities and risks with a targeted program of investments 2) For industry and government to co-invest in the design of strategies/investments that meet the requirements of each industry and agriculture as they emerge. These strategies/investments may not be the same as those recommended and could include industry-wide investments. If the risks become severe it is anticipated that the costs of developing these strategies/investments will be insignificant compared to the costs of implementing structural adjustment policies and industry support mechanisms that are either insufficient or overly engineered. 3) To build the institutional framework which will provide clarity for the roles and responsibilities of parties to the vision and to provide a platform for coordination, and investment. 4) To build the analytical and research capabilities of institutions required to monitor the economic, social and environmental costs and benefits associated with prosecuting the \$100 billion vision.
Outcomes	<ul style="list-style-type: none"> • The project provided an approach for conceptualising the opportunities and risks, against the backdrop of uncertainty, facing agriculture and presented a range of possible offensive and defensive strategies/investments for delivering enduring profitability by the Australian agricultural sector. • The findings from the study were shared with relevant stakeholders including the Australian rural RDCS, Commonwealth and State Government, industry and others. • The key drivers of and risks to net farm performance have been taken on board by research bodies, Government and industry to improve the efficiency and effectiveness of strategies and investments targeted at achieving the NFF's \$100 billion by 2030 target.
Impacts	<ul style="list-style-type: none"> • Contribution to increased efficiency and/or effectiveness of resource allocation for investments and strategies contributing to the Australian agricultural sector working toward the NFF target of a \$100 billion industry by 2030. • Where increased efficiency/effectiveness is achieved, the project also may have some contribution to increased productivity and profitability of the Australian agricultural industry in the long-term.

Source: AgriFutures Australia project PRJ-011482 final report

Nominal Investment

Table 2 shows the total investment made in Project 2018-153 by FRDC and in the broader AgriFutures Australia Project PRJ-011482. The project was funded over a single financial year, 2018/19.

Table 2: Total Investment in AgriFutures Australia Project PRJ-011482 in 2018/19
(nominal dollar terms)

Funding Contributor	2018/19 Investment (\$)
FRDC	10,000
AgriFutures Australia	56,068
CRDC	10,000
Wine Australia	10,000
SRA	10,000
Dairy Australia	10,000
AWI	10,000
APL	10,000
GRDC	10,000
Totals	136,068

Management and Administration Costs

In this case, FRDC was not the manager of the project funding. Therefore, the for the total investment, AgriFutures' cost of managing the funding, including the FRDC contribution, was added to the contributions for the project via a management cost multiplier (x1.316). This multiplier was estimated based on a three-year average of the ratio of total AgriFutures cash expenditure on employees and suppliers to research project expenditure reported in the AgriFutures' Cash Flow Statement (AgriFutures Australia Annual Reports, 2020 and 2021). This multiplier then was applied to the total nominal investment 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 2018-153 included significant stakeholder consultation and engagement.

Impacts

Table 3 provides a summary of the principal types of potential impacts from Project 2018-153. 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 2018-153

Economic	<ul style="list-style-type: none"> • Contribution to increased efficiency and/or effectiveness of resource allocation for investments and strategies contributing to the Australian agricultural sector working toward the NFF target of a \$100 billion industry by 2030. • Where increased efficiency/effectiveness is achieved, the project also may have some contribution to increased productivity and profitability of the Australian agricultural industry in the long-term.
Environmental	<ul style="list-style-type: none"> • Nil. Although no direct environmental impacts were identified, improved investments and strategies implemented by the Australian agricultural sector underpinned by the drivers and risks identified in the project may indirectly contribute to improved environmental sustainability for the sector over the long-term.
Social	<ul style="list-style-type: none"> • Nil. Although no social environmental impacts were identified, improved investments and strategies implemented by the Australian agricultural sector underpinned by the drivers and risks identified in the project may indirectly contribute to regional community wellbeing through increased future productivity and profitability of the Australian agricultural sector.

Public versus Private Impacts

The impacts identified from the investment in Project 2018-053 were both public and private in nature. Private impacts may be delivered through increased efficacy of private resource allocation (e.g. through industry levies to the RDCs) and long-term improvements in productivity and/or profitability for the Australian agricultural industry.

Public impacts may be achieved through increased efficacy of public resource allocation toward achieving the NFF \$100 billion target and through any long-term improvements in environmental sustainability of Australian agricultural or enhanced regional community wellbeing.

Distribution of Private Impacts

Any future private impacts from the investment in Project 2018-153 will accrue to Australian agricultural producers, including fisheries producers.

Impacts on other Australian industries

The investment covered most, if not all, of Australian agricultural at some level. No direct impacts to other Australian industries were identified. However, as Australia exports on average more than 70% of annual agricultural production (DAFF, 2022), the strategy also may have indirect impacts on related Australian agricultural supply chains including freight and other related products and services.

Impacts Overseas

No direct impacts to overseas parties were identified. Indirect impacts, such as improved consumer satisfaction and health, and increased profitability for import service providers also may occur as a result of a more productive and profitable Australian agricultural sector.

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 2018-153 contributed to National Science and Research Priority 1. Further, the RD&E investment is likely to contribute indirectly to all four Agricultural Innovation Priorities because of the identification, prioritisation, and implementation of policies, practices, and RD&E that contribute to a more profitable and sustainable Australian agricultural sector.

Table 4: Australian R&D Priorities

Australian Government	
National Science and Research Priorities ¹	National Agricultural Innovation Priorities ²
<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.

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

² 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 2018-153 indirectly addressed all three FRDC national RD&E priorities through the project's contribution to development of the strategy that will influence implementation of policies, practices, and RD&E for a more profitable and sustainable Australian agricultural sector, including fisheries and aquaculture.

Valuation of Impacts

The valuation of impacts generally focused on the most important and direct impacts of the investment in project 2018-153. 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 2018-153. The impact valued was:

- 1) Contribution to increased efficiency and/or effectiveness of resource allocation for investments and strategies contributing to the Australian agricultural sector working toward the NFF target of a \$100 billion industry by 2030.

Valuation of Impact 1: Increased efficiency/effectiveness of resource allocation for agricultural RD&E

There are 15 rural RDCs across agriculture, fisheries and forestry industries in Australia. Each one is tasked with delivering tangible and practical improvements for their industries in terms of productivity and profitability, sustainability, and the community. They do this through strategic and targeted investments in and partnerships for research, development and adoption, and in some cases, market access, market development and promotion (CRRDC, 2018b). Over the past three years, on average the 15 rural RDCs collectively have spent approximately \$954 million per annum on agricultural RD&E and marketing to advance the Australian agricultural sector.

It was assumed that the investment in AgriFutures Project PRJ-011482 (including FRDC funds through Project 2018-153) has contributed to increased efficiency and effectiveness of RDC resource allocation. This is achieved through the identification of the four key drivers of and four key risks to Australia net farm performance and by providing information that underpins improved investment and strategies to achieve the NFF's \$100 billion by 2030 target.

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

Attribution

Through Project 2018-153, FRDC contributed approximately 5.7% of the total funding for the Phase II project in real dollar terms, including management and administration costs. Therefore 5.7% of the estimated total benefits were assumed to be attributable to the FRDC investment.

Counterfactual

It was assumed that, without the overall investment in AgriFutures Project PRJ-011482 (including FRDC funds through Project 2018-153), the Phase II of the 'agricultural sector growth project' would not have occurred.

Impacts Not Valued

The impacts not valued included:

- 1) Some contribution to increased productivity and profitability of the Australian agricultural industry in the long-term. This impact was not valued because of a lack of credible data on which to base assumptions and significant uncertainties about the pathways to impacts.

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

Impact 1: Increased efficiency/effectiveness of resource allocation for agricultural RD&E		
Variable	Assumption	Source
Average annual total investment in RD&E and marketing by the Australian rural RDCs	\$954.7 million	Three year average, derived from data on levies received and matching government funds received in the 2019/20 and 2020/21 annual reports for each of the 15 Australian rural RDCs
Efficiency dividend achieved through implementation of the findings of AgriFutures Project PRJ-011482	0.5%	Conservative estimate - analyst assumption
Maximum value of efficiency dividend. The efficiency dividend represents the additional expenditure that would have been required to achieve the same outputs, outcomes and impacts without the investment	\$4.77 million p.a.	\$954.7 million x 0.5%
First year of impact	2020/21	Based on the ACIL Allen project Final Report completed in August 2019
Year of maximum impact	2022/23	Allows for three years for new and improved strategies and investments to flow through RDC strategic planning and funding decisions
Last year of impact	2027/28	Assumes strategies and investments funded after 2027/28 are unlikely to contribute to achieving the NFF \$100 billion by 2030 target
Risk Factors		
Probability of output	100%	Based on successful completion of Project 2018-153
Probability of outcome	50%	The probability of outcome refers to the likelihood that the project outputs are adopted/implemented at the level assumed. Takes into account that many RDCs have existing strategies and investment concepts in place to progress industry priorities regardless of the NFF vision
Probability of impact	90%	Refers to the probability that, given adoption (outcome), the impact as estimated will be realised. This allows for and exogenous factors that may affect the estimated benefits being achieved (e.g. global pandemic)
Attribution of benefits to investment in Project 2018-153	5.7%	Based on FRDC's relative investment. See valuation of impact 1 description reported previously.
Counterfactual	The estimated benefits would not have occurred without the 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 (2018/19) to the final year of benefits assumed.

Investment Criteria

Tables 6 shows the investment criteria estimated for different periods of benefits for the total FRDC investment only as the benefits estimated were those specifically attributable to the investment in Project 2018-053.

Table 6: Investment Criteria for Total Investment in Project 2018-153

Investment criteria	Number of years from year of last investment						
	0	5	10	15	20	25	30
Present value of benefits (\$m)	0	33,287	50,056	50,056	50,056	50,056	50,056
Present value of costs (\$m)	13,077	13,077	13,077	13,077	13,077	13,077	13,077
Net present value (\$m)	-13,077	20,209	36,979	36,979	36,979	36,979	36,979
Benefit-cost ratio	0.00	2.55	3.83	3.83	3.83	3.83	3.83
Internal rate of return (%)	n.s.	33.0	35.8	35.8	35.8	35.8	35.8
MIRR (%)	negative	19.0	15.6	12.7	11.0	10.0	9.4

n.s.: no solution

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

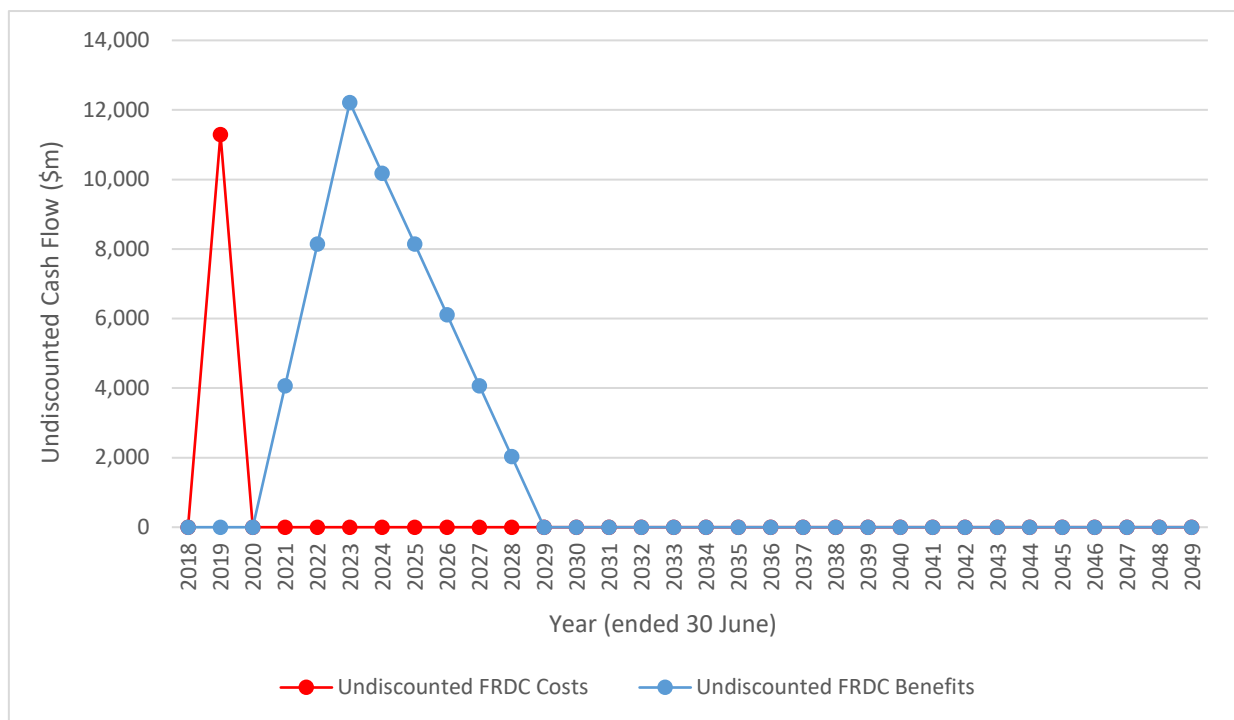


Figure 1: Annual Cash Flow of Undiscounted Total Benefits and Total Costs

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 FRDC 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 7, showed a low sensitivity to the discount rate. This was largely due to the benefit cash flows occurring over the short-term and therefore being subject to relatively less severe discounting.

Table 7: Sensitivity to Discount Rate
(Total FRDC investment, 30 years)

Investment Criteria	Discount rate		
	0%	5% (base)	10%
Present value of benefits (\$m)	54,971	50,056	46,109
Present value of costs (\$m)	11,297	13,077	15,036
Net present value (\$m)	43,674	36,979	31,073
Benefit-cost ratio	4.87	3.83	3.07

A sensitivity analysis then was carried out on the assumed efficiency dividend from the investment. Table 8 shows the results. The investment criteria showed a moderate sensitivity to the efficiency dividend assumed. A break-even analysis indicated that the efficiency dividend created by implementation of the findings of the investment could decline to 0.13% 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 8: Sensitivity to the Assumed Efficiency Dividend
(Total FRDC investment, 5% discount rate, 30 years)

Investment Criteria	Assumed Efficiency Dividend		
	0.5% (base)	1.0%	2.5%
Present value of benefits (\$m)	50,056	100,112	250,281
Present value of costs (\$m)	13,077	13,077	13,077
Net present value (\$m)	36,979	87,035	237,204
Benefit-cost ratio	3.83	7.66	19.14

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 9). 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 9: Confidence in Analysis of Investment

Coverage of Benefits	Confidence in Assumptions
High	Medium-Low

The coverage of benefits was assessed as High as the most direct and important impact from the investment was valued.

Confidence in assumptions was rated as Medium to Low. Improvements to the effectiveness and efficiency of RD&E resource allocation are very difficult to measure. However, sensitivity analyses showed that, even at extremely low values for the key assumptions, the investment criteria were positive.

Conclusions

FRDC contribution to AgriFutures Project PRJ-011482 through Project 2018-053 contributed to the development of an approach for conceptualising the opportunities and risks, against the backdrop of uncertainty facing agriculture, and presented as well as a range of possible offensive and defensive strategies/investments for delivering enduring profitability by the Australian agricultural sector.

The four key drivers of and four key risks to net farm performance identified through the project are likely to have been taken on board by research bodies, government and industry to improve the efficiency and effectiveness of strategies and investments targeted at achieving the NFF's \$100 billion by 2030 target.

Total FRDC funding for the Project was \$13,077 (present value terms). The primary impact was valued which was a contribution to improved effectiveness and/or efficiency of resource allocation on RD&E for the rural RDCs. The impact was estimated to give total expected net benefits attributable to the FRDC investment of \$50,056 (present value terms). This produced an estimated net present value of \$36,979, a benefit-cost ratio of 3.83 to 1, an internal rate of return of 35.8%, and a MIRR of 9.4% (over 30 years, using a 5% discount rate and 5% finance rate).

The estimated average annual investment by the RDCs in agricultural RD&E used in the valuation does not include other investment by other stakeholders that may be influenced by the findings of AgriFutures Project PRJ-011482 and therefore partially attributable to the FRDC investment. Given the conservative assumptions made and the fact that the valuation did not include all relevant investment benefiting from the project, the investment criteria reported are likely to be an underestimate of the true performance of the investment in Project 2018-153. The positive results should be viewed favourable by FRDC, the Australian Government, industry, and other RD&E stakeholders and demonstrates the value of cross-RDC collaboration.

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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