

The FRDC would like to acknowledge Australia's Indigenous People who are the Traditional Owners of country throughout Australia and recognises their continuing connection to land, waters and culture.

We pay our respect to their Elders both past and present and extend that respect to all Indigenous People.



Indigenous Australians are advised that this document may contain an image of a person who has died.

Imagining the future of fishing and aquaculture



FRDC

Fish forever 2030:
Collaborative, vibrant
fishing and aquaculture,
creating diverse benefits
from aquatic resources,
and celebrated by
the community.

Fishing and aquaculture include commercial wild catch, aquaculture, recreational, Indigenous and post-harvest sectors, along with fisheries management, research, development and extension professionals and the Australian community.

R&D Plan at a glance

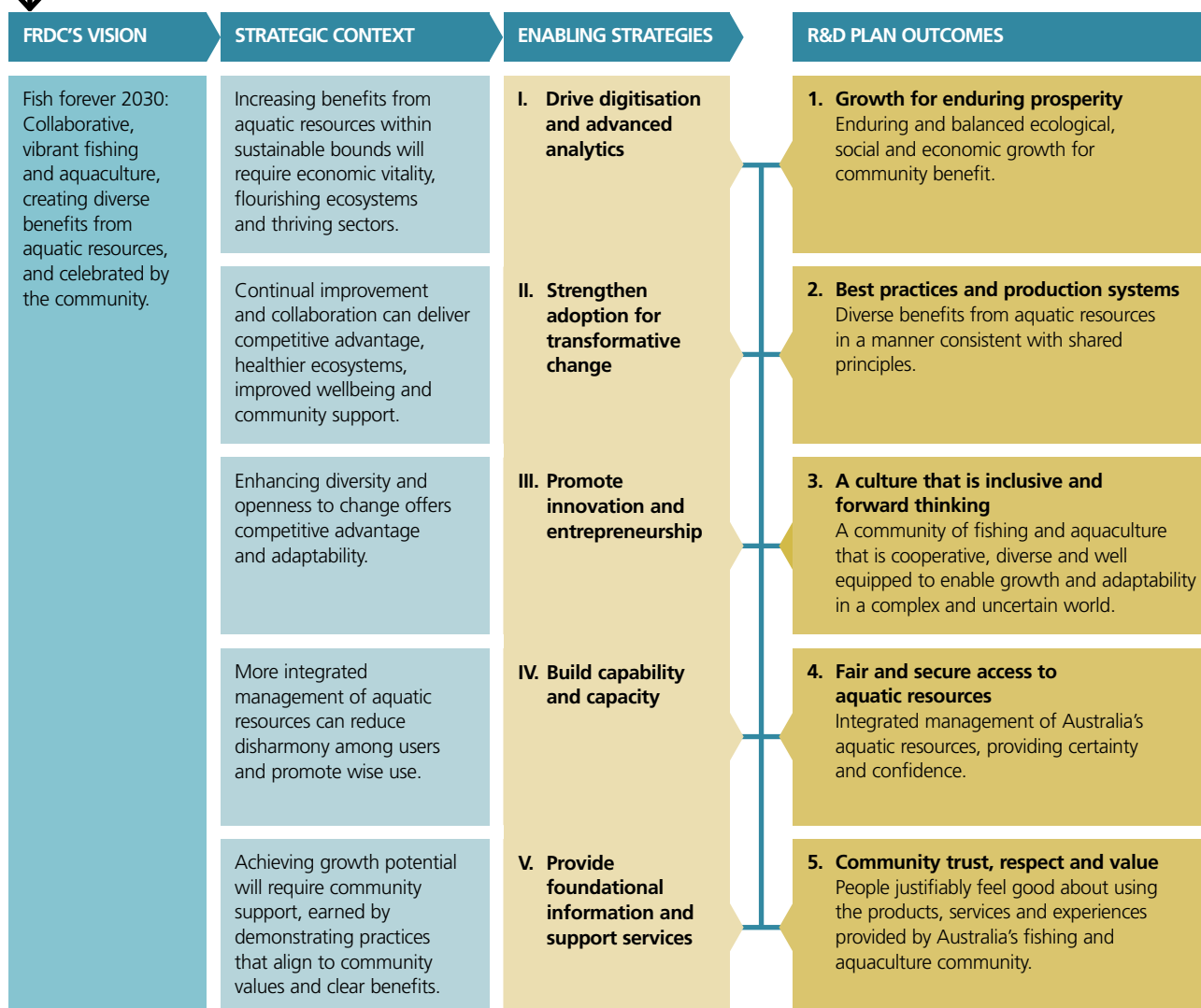
FRDC'S ENABLING LEGISLATION

Objects of section 3 of the *Primary Industries Research and Development Act 1989*:

- (a) make provision for the funding and administration of research and development relating to primary industries with a view to:
 - (i) increasing the economic, environmental and social benefits to members of primary industries and to the community in general by improving the production, processing, storage, transport or marketing of the products of primary industries, and
 - (ii) achieving the sustainable use and sustainable management of natural resources, and
 - (iii) making more effective use of the resources and skills of the community in general and the scientific community in particular, and
 - (iv) supporting the development of scientific and technical capacity, and
 - (v) developing the adoptive capacity of primary producers, and
 - (vi) improving accountability for expenditure on research and development activities in relation to primary industries.

FRDC'S MISSION: To act as a national thought leader, facilitating knowledge creation, collaboration and innovation to shape the future of fishing and aquaculture in Australia for the benefit of the Australian people.

FRDC'S ROLE: To plan, invest in and manage research and development for fishing and aquaculture, and the wider community, and ensure that the resulting knowledge and innovation is adopted for impact.





About this R&D Plan

2030 vision	The FRDC will invest to achieve the shared vision of Australia’s fishing and aquaculture sectors of building collaborative, vibrant fishing and aquaculture, creating diverse benefits from aquatic resources, and celebrated by the community.
FRDC’s outcome	Increased economic, social and environmental benefits for Australian fishing and aquaculture, and the wider community, by investing in knowledge, innovation and marketing.
FRDC’s mission	To act as a national thought leader, facilitating knowledge creation, collaboration and innovation to shape the future of fishing and aquaculture in Australia for the benefit of the Australian people.
FRDC’s role	To plan, invest in and manage research and development for fishing and aquaculture, and the wider community, and ensure that the resulting knowledge and innovation is adopted for impact.
Governance	<p>FRDC is committed to best practice and recognises the value of corporate governance principles.</p> <p>The governing body of the FRDC, the Board, provides oversight within the following legislation:</p> <ul style="list-style-type: none"> • <i>Primary Industries Research and Development Act 1989</i> (PIRD Act), • <i>Public Governance, Performance and Accountability Act 2013</i> (PGPA Act). <p>The Board’s objectives are to add value by ensuring that appropriate governance is in place by:</p> <ol style="list-style-type: none"> a. setting the strategic direction of the FRDC, b. developing policy to help implement this direction, c. monitoring and supervising systems that deliver the results of the FRDC, d. ensuring accountability (including engaging with, and reporting to, stakeholders), e. ensuring legal compliance.
Stakeholders	The FRDC works with a diverse and geographically dispersed collective of stakeholders that share a connection and interest in fishing and aquaculture. Among these are four ministerially declared representative organisations (see www.frdc.com.au). More broadly, FRDC works with members of commercial wild catch, aquaculture, recreational, Indigenous and post-harvest sectors, fisheries managers, researchers, non-government organisations and the Australian community.
Revenue	<p>Revenue for research and development (R&D) investment is collected through:</p> <ol style="list-style-type: none"> a. Australian Government unmatched funds equivalent to 0.50 per cent of the average gross value of commercial Australian fisheries production (AGVP) for the current year plus the two preceding years, b. commercial fishers and aquaculturists contribute at least 0.25 per cent of AGVP, c. Australian Government matches these contributions up to a maximum of 0.25 per cent of AGVP.
Planning	<p>The purpose of this R&D Plan is to set a five-year strategic direction for the FRDC. Supporting the R&D Plan itself are annual operational plans and targeted measures for each outcome and enabling strategy to identify FRDC’s investment priorities over the next five years.</p> <p>The FRDC will ensure this R&D Plan has meaningful impact by contributing to national and international targets and commitments, such as the National Marine Science Plan and the United Nations Sustainable Development Goals.</p>
Reporting	Reporting of progress against this R&D Plan will be consistent with a performance management framework in alignment with the FRDC’s statutory obligations. This framework sets out how achievement along the way will be evaluated using metrics that are appropriate, timely and provide an accurate picture of FRDC’s investment.



Finding prosperity in
deep uncertainty.

Developing a plan for the future

Fishing and aquaculture play unique roles in Australia. As well as offering physical and cultural nourishment, fishing and seafood provide connection to the natural environment, promote wellbeing, and bring communities together. Fishing and aquaculture have significant potential for growth. As the most highly traded animal protein, seafood plays a vital role in meeting the challenge of producing enough protein to feed a growing global population.

In 2020, complexity and uncertainty are influencing our lives and businesses more than ever before. There are many unknowns that make planning and future decisions difficult, such as how a changing climate will shape water security and food production; the likely impact and duration of COVID-19 on global trade and economics; in what ways will extreme events (bushfires, cyclones and drought) influence interactions with the natural environment; geopolitical instability; and the take up of alternate proteins.

In developing this five-year R&D Plan, the FRDC has:

- consulted broadly and conducted research to gain a picture of each fishing and aquaculture sector,
- reviewed FRDC's business, management and practices to see how these can be improved,
- used computer modelling to help understand how future dynamics may affect fishing and aquaculture.

In addition, the FRDC has expanded its approach and has worked with stakeholders to explore alternative futures through scenario planning.

The purpose of exploring alternative scenarios has been to encourage consideration of the changes that are already shaping today's world, how they might impact on fishing and aquaculture, and identify what might be required today to deal with dynamics that may emerge in the future.

This R&D Plan provides an opportunity for both the FRDC and the fishing and aquaculture community to pause and take stock. Its main purpose is to convey a shared vision for the future, the outcomes required to pursue that vision, and the enabling strategies to achieve them.

It is accompanied by a companion document, *Shaping FRDC's R&D Plan 2020–25*, which provides a comprehensive situational analysis and summarises the fishing and aquaculture community's recent past, current status and imminent challenges. This is written for readers seeking contextual and methodological background. Additional detail on areas of investment to deliver the R&D Plan outcomes will be in the FRDC's annual operational plans.

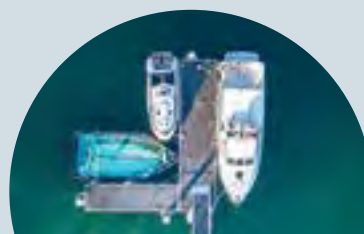
We would like to thank all sectors, researchers, managers, non-government organisation representatives and staff who have already given significant time, energy, wisdom and enthusiasm to developing this shared plan for change and resilience.



John Williams
Chair, FRDC

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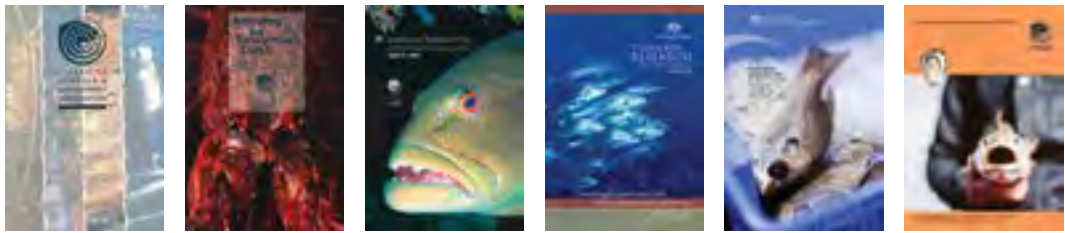


This R&D Plan aligns with 14 of the 17 United Nations Sustainable Development Goals:

- Zero hunger (Goal 2),
- Quality education (Goal 4),
- Gender equality (Goal 5),
- Affordable and clean energy (Goal 7),
- Decent work and economic growth (Goal 8),
- Industry, innovation and infrastructure (Goal 9),
- Reduced inequalities (Goal 10),
- Sustainable cities and communities (Goal 11),
- Responsible consumption and production (Goal 12),
- Climate action (Goal 13),
- Life below water (Goal 14),
- Life on land (Goal 15),
- Peace, justice and strong institutions (Goal 16),
- Partnership for the goals (Goal 17).



Looking back and looking ahead: Fishing and aquaculture in Australia



1993–94 to
1997–98

1996–2001

2000–05

2005–10

2010–15

2015–20

The past 27 years of FRDC's strategic planning and investment in fishing and aquaculture show an emphasis on improving practices and product quality to help both sectors prosper. In more recent years this has continued, and has been joined by an increasing focus on ecological and social sustainability and the social licence to operate.

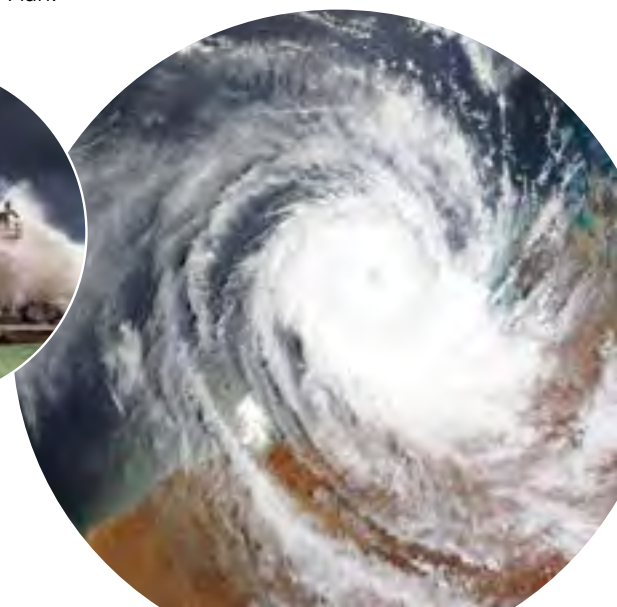
Fundamentally, the capacity of fishing sectors to deliver quality products in a sustainable manner is brought about through knowledge. In fisheries, knowledge—when wisely applied—creates economic, social and environmental benefits by adding value, accessing new markets, creating new products, reducing waste and improving efficiency.

The evolution of FRDC's strategic plans shows a wider awareness of the many and varied stakeholders with interests in fishing and aquaculture. More recent plans increasingly acknowledge the needs of recreational and Indigenous fishers and the Australian community.

The coming years pose challenges that will test the resilience of all fishing sectors. Climate variability and longer-term change is occurring across the world and will bring a myriad of ecological and biological variation that need altered policies specific to fishing and aquaculture. International uncertainty, with implications for trade—including seafood—present additional difficulties that will also need to be considered.

Yet few challenges are without opportunity. Successfully meeting these challenges, and capitalising on opportunities, will mean rethinking how institutions conducting research and their collaborations can generate the knowledge that needs to be used in fishing and aquaculture and then applied to the broader community.

Detailed summaries of the five sectors—commercial wild catch, aquaculture, Indigenous, recreational and post-harvest—that make up fishing and aquaculture are in the companion document *Shaping FRDC's R&D Plan 2020–25*. This information on historical performance has been developed to provide background for this R&D Plan.





Imagining the future of fishing and aquaculture

The consultative process to shape this R&D Plan was extensive, with leaders and innovators from all sectors, fisheries managers, researchers and environmental non-government organisations working together on various elements. Using different socio-political scenarios, they explored possible implications for fishing and aquaculture over the next 10 years.

These deliberations were distilled into 14 major themes that are considered likely to shape the future for fishing and aquaculture. These themes were then used to define the five outcomes of this R&D Plan which were shared by all sectors, and five enabling strategies for achieving those outcomes.

Additional detail relating to the R&D Plan's implementation will be contained in the FRDC's annual operational plans and reported to correspond with FRDC's performance management framework (Figure 1).

A review of national-level planning documents relating to the emerging 'blue economy' shows that their strategic directions and the outcomes of this R&D Plan are similar.

All R&D Plan outcomes contribute towards meeting Australia's commitments to the United Nations Sustainable Development Goals (SDGs), which provide a blueprint for sustainable, harmonious and prosperous human communities and natural ecosystems, agreed to by all United Nations member states. This five-year plan has also considered national and international issues that are part of a broader movement in public policy more generally, and management of aquatic resources in particular.

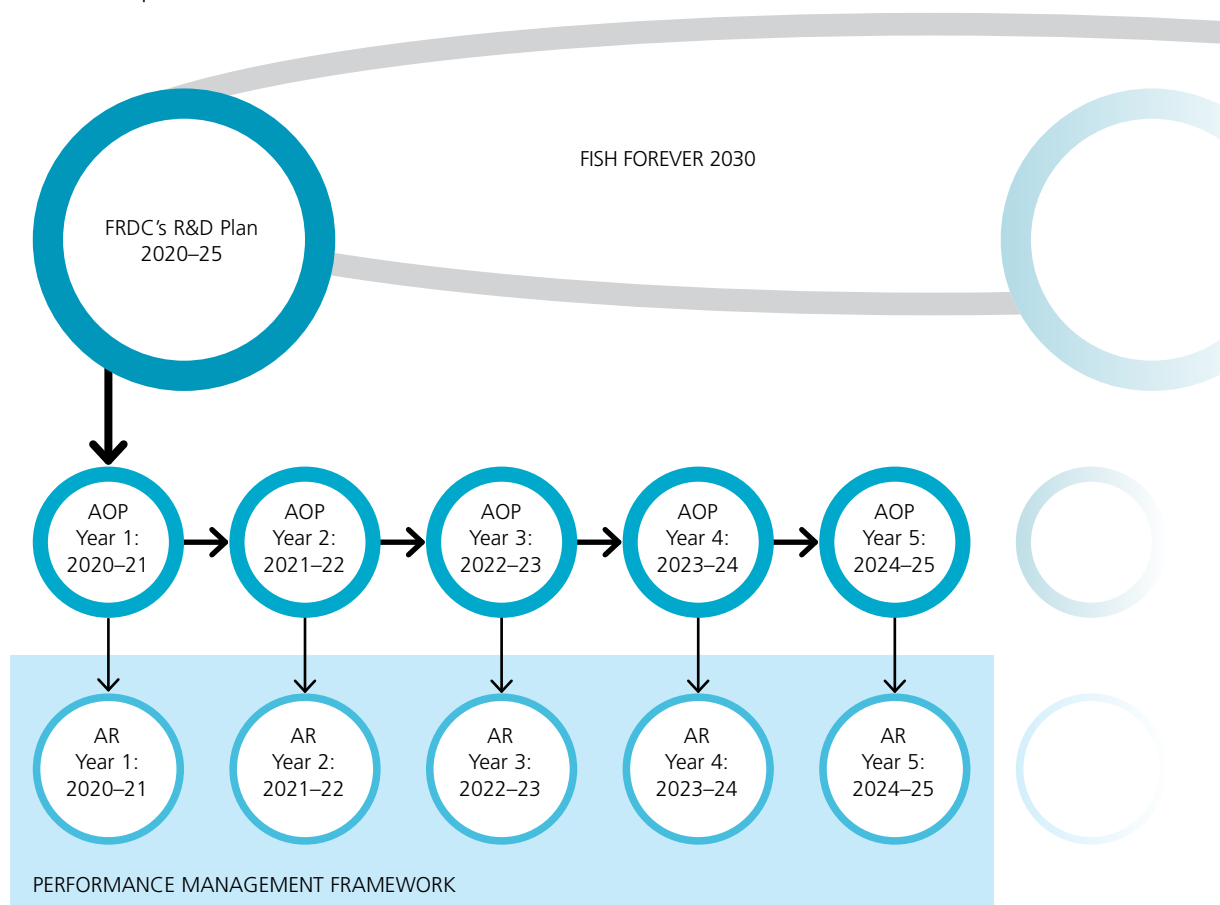


Figure 1 explains how FRDC's R&D Plan, annual operational plans (AOP), performance management framework and annual reporting (AR) processes interact.



R&D Plan outcomes

Over the next five years, FRDC investment will be targeted to achieve the five outcomes of this R&D Plan, shown in Figure 2. To help make progress towards these outcomes easier, the FRDC will use five enabling strategies to realise the highest potential from investments made for fishing and aquaculture. These are:

- expanding capacity to make future decisions based on data,
- increasing adoption of results from R&D to bring about beneficial change,
- encouraging new solutions, products and processes as well as new ways of thinking and doing,
- helping people gain the knowledge and skills to be safe, happy and productive, and to adapt and flourish in the face of change,
- delivering information to guide the evolution of fishing and aquaculture in Australia.

This is one of the FRDC's most 'people-centric' plans to date, with a focus on capacity building, shaping culture, building relationships and establishing shared principles and values.

The five outcomes in FRDC's R&D Plan align with 13 of the 17 United Nations SDGs, although the extent to which each outcome contributes to a particular SDG will depend on how the FRDC allocates its R&D investments.

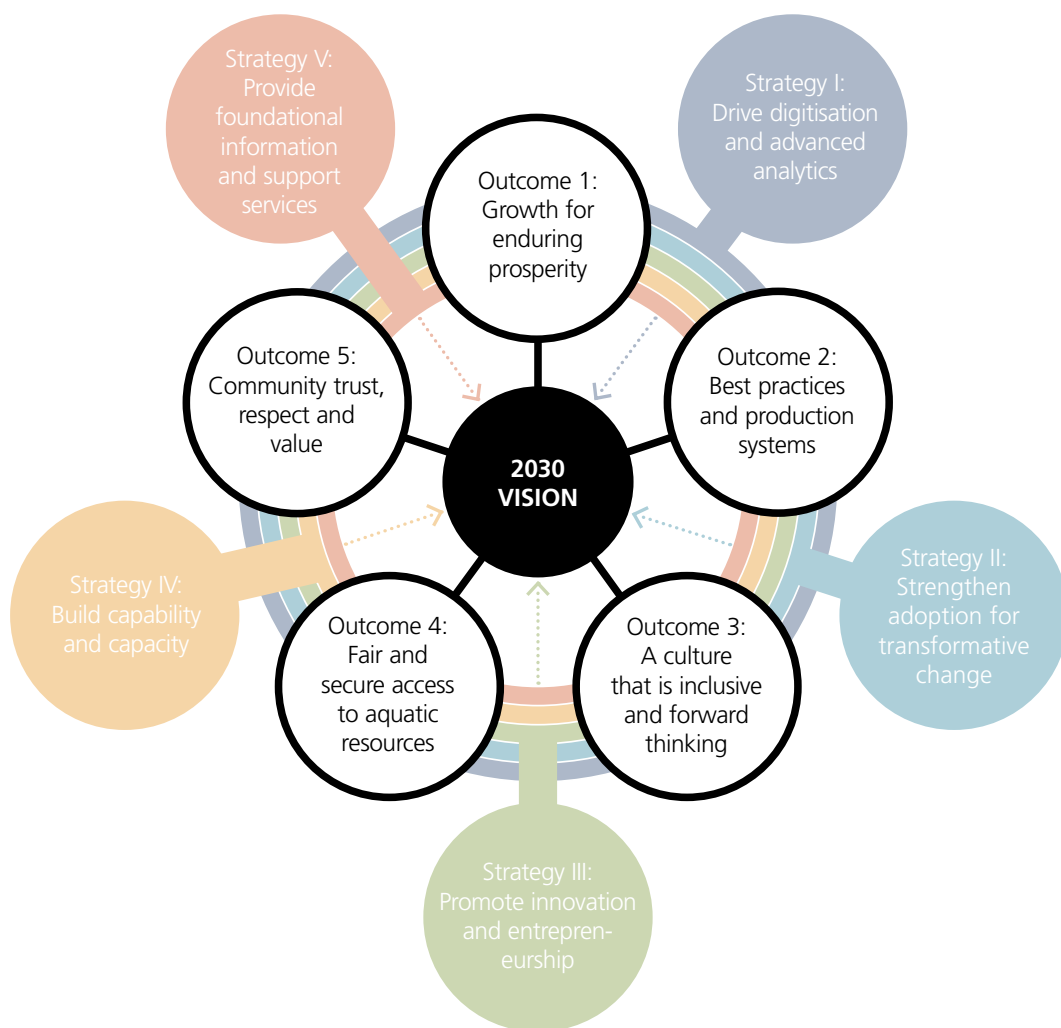


Figure 2. The heart of FRDC's R&D Plan 2020–25: Five outcomes supported by five enabling strategies (paler shading).



R&D Plan Outcome 1: Growth for enduring prosperity

Enduring and balanced ecological, social and economic growth for the community benefit

As the world's population grows, so must the range of benefits that come from Australia's aquatic resources. If managed sustainably, fishing and aquaculture can contribute to growth and diversification, helping Australia achieve its target of growing agriculture to \$100 billion by 2030.

Confidence from economic security promotes innovation and new perspectives that will deliver benefits for the wider community. An awareness that prosperity and sustainability are mutually supporting concepts is central to this R&D Plan. Unfortunately, Australia's aquatic ecosystems are under pressure from a variety of activities and influences. Fishing and aquaculture can affect natural systems, yet improved and better-informed management has seen fewer unwanted incidents.

Meanwhile, other threats to ecosystems are now better understood. Examples are increased water use, exploration and extraction of minerals and petroleum, climate change, runoff, habitat removal and degradation from urban and agricultural areas, larger amounts of plastics and their impact as well as greater levels of vessel traffic and associated port infrastructure. These pressures can compromise the productivity of Australia's aquatic systems and fisheries.

The FRDC will explore opportunities to invest in, manage and promote adoption of R&D to:

- support a sustainable, efficient and effective increase in production, value and price,
- guide a coordinated and evidence-based strategy for growth,
- develop more effective and cost-efficient solutions for understanding and responding to biosecurity risks from a changing climate and increased global movement of goods,
- promote a circular economy to remove waste from the processing system, keep products and materials in use and promote the repair of natural systems,
- improve understanding of, and increase community benefits from, fishing and aquaculture,
- better connect Indigenous communities with fishing and aquaculture initiatives to build opportunities for economic security in regional and remote areas where desired,
- improve understanding of the cause and extent of impacts to aquatic systems and what is needed to improve them,
- build skills and networks, including the traditional knowledge, innovation and practices of Indigenous Australians to understand, restore and create healthy aquatic ecosystems,
- build partnerships to develop system-wide understanding, and identify ways to maintain and get the most benefits from aquatic systems.

This outcome aligns with the following SDGs:



THE FUTURE: Expanding aquaculture

Aquaculture is Australia's fastest growing form of primary production and will be critical in meeting food security needs, economic targets and nutritional requirements. Yet, expansion of aquaculture is currently limited by various constraints. Increased production further offshore and within closed land-based systems presents challenges, but also opportunities for improving prospects for controlling disease and pathogens.



R&D Plan Outcome 2: Best practices and production systems

Diverse benefits from aquatic resources to be consistent with shared principles

Ethical performance is now big business worldwide, with benefits including improved reputation, reduced risk, competitive advantage, access to new markets and value creation. Industries and sectors are responding by adopting practices that have less impact on the environment or are even regenerative. They also consider the wellbeing of workers, communities and consumers, conserve non-renewable energy, sustainably manage natural resources, minimise stress in animals, and do not compromise the needs of future generations.

The FRDC will explore opportunities to invest in, manage and promote adoption of R&D to:

- minimise impacts on non-target species and ecosystems,
- better understand and increase wellbeing, equity and safety of workers within each sector,
- develop innovative ways to conduct and communicate independent validation of sustainable practices and outcomes to markets and consumers,
- improve animal welfare outcomes,
- promote learning and sharing among sectors and industries, including identifying, documenting and promoting Indigenous traditional fisheries management systems and practices,
- inform effective management of climate change impacts through adaptation and mitigation,
- explore ways to capitalise on new opportunities presented by climate change,
- develop improved decision-making tools better able to respond to biological variability and increased revenue volatility and risks.

This outcome aligns with the following SDGs:



THE FUTURE: Reducing the environmental footprint of commercial wild-catch fisheries

Fishing has evolved through the ages, yet is still based on the same basic elements: hooks, nets, traps and hand collection, each with their own advantages and disadvantages. Developments in robotics, sensors, artificial intelligence and automation present opportunities to explore new ways to harvest seafood while reducing impacts on the environment and improving economic returns.



R&D Plan Outcome 3: A culture that is inclusive and forward thinking

A fishing and aquaculture community that is cooperative, diverse and well equipped to enable growth and adaptability in a complex and uncertain world

'Culture' describes an emergent pattern of behaviours and responses adopted by a group over time, which they consider to be the 'correct' way to perceive, feel, think and act. Culture reflects what a group stands for, what they consider to be right and wrong, and is shaped by the rules, systems and protocols of their surroundings.

Working to address the dynamics that affect fishing and aquaculture today—such as market volatility, evolving societal beliefs, climate-driven ecological changes and technological disruption—will require a culture that is focused on solutions, resourceful and willing to be collaborative.

To change culture, you must modify what shaped it in the first place. This means identifying the underlying beliefs, relationships and norms that are influencing decision making and challenging assumptions and expectations. This requires developing new ways of working together.

To assist, the FRDC will explore opportunities to invest in and manage adoption of R&D research to:

- understand and address factors that hold back positive cultural and behavioural change,
- promote greater inclusiveness, creative thought and solution seeking,
- support sharing among stakeholders so that others can learn from those who are already producing promising results,
- encourage openness to new ideas, approaches and ways of thinking and behaving, recognising that needs may differ among sectors,
- strengthen collaboration across sectors to enable the full benefit of collaborative partnerships.

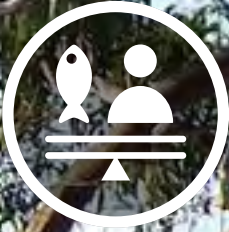
The FRDC will also aim to modify how it identifies and solves problems by engaging a range of collaborators to tackle ambitious challenges together. This may mean accepting new tolerances for risk and realising that experimentation can fail or come up with unexpected results, but will always provide opportunities for learning.

This outcome aligns with the following SDGs:



THE FUTURE: Playing it safe

Fatalities in fishing and aquaculture make it one of the most dangerous occupations and recreational pursuits in Australia. Changing the 'culture' so that safety is viewed as an investment rather than a cost will require reshaping current values, attitudes and behaviours. It will involve establishing an environment where some behaviours are 'easy' and others are 'hard'. Rewarding 'desired' behaviours, discouraging those that are 'negative' will bring about incremental new ways of behaving and aim to ensure positive actions and practices are socially reinforced.



R&D Plan Outcome 4: Fair and secure access to aquatic resources

Integrated management of Australia's aquatic resources, providing certainty and confidence

Access to aquatic resources, guided by good management, is fundamental for the continued delivery of economic and social benefits such as food, income, employment, recreation and cultural identity for all Australians. However, resource sharing among users can be contentious. As the 'blue economy' takes shape and seafood species move in response to a changing climate, Australia's seascapes are likely to become busier and more contested.

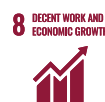
Optimising benefits for the Australian community means sharing resources fairly using open and evidence-based processes within the limits of sustainability.

Decision making on the management of aquatic resources sometimes occurs without a multi-sector view and the associated context necessary to ensure that the Australian community receives the best value from any decisions made. This has led—at times—to trade-offs, environmental impacts, unnecessary complexity, ineffectiveness, inefficiency and increased costs.

To assist, the FRDC will explore opportunities to invest in R&D to:

- support increasingly integrated and effective management of Australia's aquatic resources,
- promote development and adoption of management measures that are well suited for resilience to change, including:
 - harvest strategies that are flexible to take account for the dynamic nature of resource use,
 - flexible spatial arrangements, decision-making tools better able to transparently deal with biological variability, climate change, harvest uncertainty, management of revenue volatility and risks,
 - management approaches that aim for fairness,
 - participative management across Australia's fisheries to improve efficiency and reduce costs.

This outcome aligns with the following SDGs:



THE FUTURE: A busy aquatic landscape

Australia's aquatic environment is governed by a complex series of rules, zones and reserves that apply to its many diverse users. Research and development that moves efforts towards an integrated, system-wide approach for managing these vast water resources would help ensure that the objectives, programs and measures are consistent across different users.



R&D Plan Outcome 5: Community trust, respect and value

People feel good about using the products, services and experiences provided by fishing and aquaculture

Community support is essential if Australia's fisheries are to grow and prosper. Aquaculture activities also need the approval and trust of local residents, given the sector's aspirations for growth into new coastal waters. Achieving and retaining this support means that fishing and aquaculture need to show that using publicly owned resources can co-exist with community values and also deliver benefits to them.

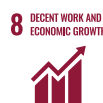
FRDC research (Alexander et al., 2020) determined the main reasons for society's support of fishing and aquaculture. They included that:

- government is seen to have a strong oversight of the sector and there are fair decision-making processes in place,
- operations are acting in alignment with social norms, have a level of visibility and there is evidence of sustainable and responsible practices,
- sectors are building relationships, connecting with the community and communicating effectively,
- fishing and aquaculture work together, using alliances and partnerships to resolve issues,
- there is a shared vision, with benefits being generated and distributed to the Australian community.

The FRDC will explore opportunities to invest in, manage and promote adoption of R&D to:

- motivate action across sectors to achieve a shared vision,
- nurture relationships and communications between stakeholders and with the community,
- encourage the use of transparent decision-making tools and best practice in the management of fisheries and aquaculture to ensure a fair distribution of economic and societal benefits,
- improve seafood traceability and integrity from capture through to end user.

This outcome aligns with the following SDGs:



THE FUTURE: Restorative aquatic farming

FRDC research has identified that communities look for sustainable practices and operations which are in alignment with social norms. Ocean-based mixed farming systems that grow multiple 'crops' in the same area are a win/win, allowing nutrients from growing fish to be used by seaweeds and shellfish that improve water quality and provide additional products for a growing market. They also have an added benefit of providing habitat for the wild fish that share these aquatic spaces.



Enabling strategies to help achieve R&D Plan outcomes

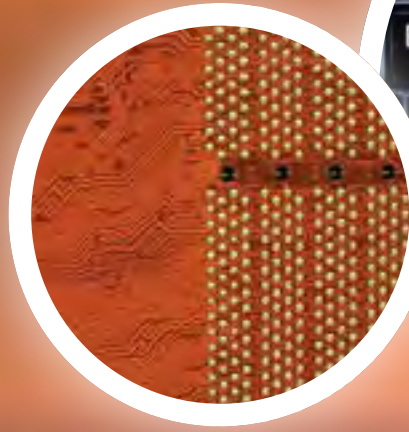
To help make progress towards the five R&D Plan outcomes easier, the FRDC will also invest in five enabling strategies:

- I. 'Drive digitisation and advanced analytics' (this means expanding capacity to make decisions based on data).
- II. 'Strengthen adoption for transformative change' (this means increasing adoption of results from R&D to bring about beneficial change).
- III. 'Promote innovation and entrepreneurship' (this means encouraging new solutions, products and processes as well as new ways of thinking and doing).
- IV. 'Build capability and capacity' (this means helping people from across fishing and aquaculture to have the knowledge and skills needed to be safe, happy and productive, and to adapt and flourish in the face of change).
- V. 'Provide foundational information and support services' (this means delivering information to guide the evolution of fishing and aquaculture in Australia).

These enabling strategies aim to equip fishing and aquaculture sectors with tools and ways to tackle shared challenges in the future. Each strategy can support one or multiple outcomes.



Figure 3. Five enabling strategies (highlighted) that drive progress towards the R&D Plan outcomes.



Advanced analytics is now more viable because of ...

- increased data through sensors, satellite imagery, cameras, drones and other technologies,
- better tools for deploying information and communication, such as smartphones and the 'internet of things',
- improved data-ingestion capabilities resulting from machine learning, artificial intelligence, better data storage, increased computational power and other technological advances.

... driving improvements for fisheries with ...

- better decision-making tools to achieve complex and sometimes conflicting goals such as profitability and sustainability,
- new tools that address biological variability, capture uncertainty and manage revenue volatility and risks,
- better methods for reporting to public authorities.

...and creating benefits for seafood consumers with ...

- increased sustainability of the world's fish stocks which will improve food security and maintain the economic and social benefits of fisheries,
- more efficient monitoring, control and surveillance instruments that will reduce illegal fishing (as well as poor labour conditions and human rights abuses often found at companies that engage in such practices).

Figure 4. How advanced analytics is being applied in fisheries. (Source McKinsey & Company 2019.)

Enabling strategy I: Drive digitisation and advanced analytics

Technology is changing the way people live, work and relate to one another. Some of these 'new technologies' present opportunities for fishing and aquaculture to easily combine and analyse data to make decisions that reduce costs and increase benefits. Commercial wild-catch fishers will have access to data previously unavailable, including near real-time information on:

- gear performance and efficiency,
- costs and usage of energy and other inputs,
- behaviour and distribution of target species,
- markets and prices.

In aquaculture, new technologies already mean that operators can remotely monitor:

- stock health and welfare,
- feed efficiency,
- disease incidence,
- responses of fish to medicine and treatment.

These new technologies are called 'advanced analytics' (Figure 4). They allow for automated collection and analysis of large datasets that translate into tools for decision making. Implementing advanced analytics in Australian fishing and aquaculture means that all sectors could conduct their activities 'smarter' and add value to their products. In addition to the economic and social benefits, these technologies can be used to improve ecosystem health. All fishing and aquaculture sectors, including managers, must be open to change to make the most of these decision-support tools.

Falling technology costs are making broadscale adoption of advanced analytics in Australian fishing and aquaculture more affordable. Increased collaboration across sectors and industries should also motivate the uptake of advanced analytics across fishing and aquaculture.

The FRDC will explore how to invest in, manage and promote adoption of R&D to:

- encourage collection and sharing of data to support advanced analytics that will benefit fishing and aquaculture and the community,
- work towards building trust and confidence in digital technologies and data,
- support the development of systems and tools,
- contribute to a series of cross-disciplinary 'lighthouse projects' showing how advanced analytics can help transform Australian fishing and aquaculture.

Increased capacity for data-driven decision making will provide opportunities for all stakeholders.

- Fishers and aquaculturists will be able to fine-tune their operations to reduce costs and maximise benefits, including profit (R&D Plan Outcome 1).
- Fisheries managers will be able to address environmental and social impacts, and fishers and aquaculturists will be able to show best practice (R&D Plan Outcome 2).
- Post-harvest operators will be able to benefit from increasingly transparent and controllable supply chains (R&D Plan Outcome 5).
- Researchers will be able to access large volumes of data on markets, consumer choices, fish stocks and ecosystems (all R&D Plan outcomes).
- Managers will have capacity to flexibly and responsively integrate biological and commercial imperatives into decision making (R&D Plan Outcomes 1 and 4).



Enabling strategy II: Strengthen adoption for transformative change

Research and development only deliver benefits for industry when results are shared and used. Adoption of research results by end users is determined by factors including:

- degree of end-user participation in delivery,
- complexity of research outputs,
- financial cost of adoption,
- time period to recover expenditure following adoption,
- end-user beliefs and opinions,
- level of end-user motivation,
- perceptions of relevance of research outputs,
- end-user attitudes towards risk and change,
- the ease or difficulty with which outcomes of adoption may be observed.

A review in 2019 reported variable results from FRDC's past extension (or adoption) efforts. It found that these could be more structured, but that a 'one size fits all' approach would be difficult to apply across all fisheries. Feedback from stakeholders noted that:

- the FRDC may be well-placed to coordinate extension activities, even if they are delivered by someone else,
- the most efficient extension methods are not always the most effective because end users are more likely to take up the results of research when they are explained or shown by a trusted colleague,
- successful extension of research requires awareness of local context, effective networks and understanding who the 'adopter' is, what they need, what will encourage them and any constraints they are facing along the way.

Over the life of this R&D Plan the FRDC will:

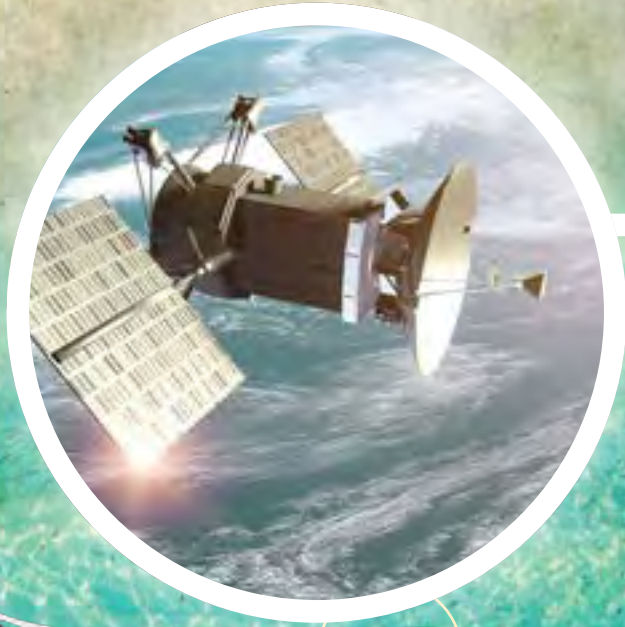
- take a new approach to adoption by moving beyond transferring knowledge to helping end users make changes in their businesses,
- support end users in forming 'communities of practice' —informal groups that work together to use their local knowledge and experience to refine and improve adoption.

This enabling strategy will help to make progress against all R&D Plan outcomes.



THE FUTURE: Bringing together performance measurement

Adoption of research happens when people understand how to use the results and the benefits of doing so, believe they are capable of doing what is needed, and feel everyone else is doing it too. Adoption of R&D can be increased by understanding human behaviour and how to influence it, communicating effectively, and supporting people and communities to undertake necessary changes. Adoption and change can also be supported in informal ways, such as creating spaces for people to chat about new information and responses and encouraging them to ask questions.



Enabling strategy III: Promote innovation and entrepreneurship

Fishing and aquaculture need inventive people with the ability to solve problems more than ever before. In the face of many changes, societies need to think differently, work together and explore solutions to varied problems. Making a difference usually demands that a new product or process is not just developed but is used to deliver increased benefits. This is the process of innovation.

There are many ways innovation occurs, but all require different ways of thinking about the future and how we interact with it.

Doing things better

This involves ongoing small improvements to how business is conducted, usually by introducing new but well-understood advances. Adoption and benefits are usually over shorter timescales.

Doing things differently

This involves a business's capability to change the way it normally does things. It often means applying ideas or technology in new ways but takes longer to implement or see the benefits from.

Doing different things

This involves creating new things—or ways of doing them—in response to changes in the world and requires innovation and invention. Without knowing what is needed in the future, breaking new ground usually involves envisioning an outcome (be it a product or process) and being committed to achieving it. There may not be a preconceived plan and results may take years to emerge, but could change how businesses or communities operate.

Balancing FRDC's investment

Much of the FRDC's past investment has focused on 'doing things better'. This is understandable because innovations in small steps usually solve problems for present-day problems. In contrast, investments seeking to change or disrupt how things are done (or do entirely new things) need different ways of thinking and problem solving. Although these are less likely to provide immediate pay-offs, they may come up with unexpected results.

Innovations that disrupt will continue to emerge, and their effects will be felt in fishing and aquaculture even if they are not actively sought. An example is the emergence of laboratory-cultured protein alternatives. Consequently, fishing and aquaculture sectors need to imagine and shape the future they would like to see by solving problems over variable timescales and using different approaches.

Over the life of this R&D Plan the FRDC will trial more effective ways to invest in:

- sharing ways of solving problems,
- exploring alternative solutions,
- using the results of R&D to foster longer-term, high-impact innovations that aim to generate new capabilities.

Investment in this enabling strategy aims to improve FRDC's impact across all R&D Plan outcomes.

THE FUTURE: Spotting opportunities on the horizon

Using new technologies can improve or upgrade the efficiency of contemporary fishing. Drones instead of spotter aircraft can make aerial surveillance cheaper, easier and more accessible. The same technology can be applied to aquaculture to identify issues with ponds or disease outbreaks.



Enabling strategy IV: Build capability and capacity

The FRDC has an ongoing commitment to supporting the development of people across fishing and aquaculture. As the needs and demands of fishers and aquaculturists evolve, so will the need to invest in building capability and capacity to ensure their resilience and preparedness. The FRDC recognises that capacity will not always be equal among sectors, and will make sure it has an up-to-date understanding of each sector's needs so it can target investment in the future.

Building capacity will be an area of increased focus over the life this R&D Plan. The FRDC will explore ways to invest in and manage adoption of R&D for stakeholders across fishing and aquaculture to:

- promote a globally oriented outlook,
- encourage a culture of transparency,
- support collaboration across sectors,
- provide skills and mindsets necessary to respond to this uncertain world.

Informed by stakeholder input, FRDC investments will focus on the skills required for success in a changing world. These are likely to include:

- digital and technological proficiency (e.g. the ability to use decision-support tools to increase profits, reduce costs and enhance environmental outcomes; R&D Plan Outcome 1),
- leadership and managing change (e.g. the willingness to implement best practice in workplace safety and culture, technology adoption, environmental stewardship and animal welfare; R&D Plan Outcomes 1, 2, 3),
- conflict resolution (e.g. the expertise to engage with opposing sides on resource access and allocation issues; R&D Plan Outcome 4),
- effective communication (e.g. the ability to convey clearly the integrity and transparency of supply chains, refine sector research and management needs, and tell the stories of seafood; R&D Plan Outcome 5).
- biosecurity (e.g. the capacity to take a proactive role in detecting, and managing biosecurity risks as part of day-to-day activities; R&D Plan Outcome 1, 2, 5),
- environmental stewardship (e.g. the ability to identify, develop and adopt practices and technologies that sustain and enhance stocks and ecosystems; R&D Plan Outcome 1, 2, 5).

Another priority of this R&D Plan is to increase the capacity of Australia's fisheries research to benefit from collaboration.



THE FUTURE: Digital solutions to build capability

The world is ever-changing and those who will thrive are constantly upgrading their skills, knowledge and networks. Events including COVID-19 have changed the way people connect and organise themselves when they want to learn how to operate at greater scales, engage larger audiences and increase their impact. Online tools have the potential to expand existing approaches to build capability and capacity throughout fishing and aquaculture across Australia's vast expanse.



Enabling strategy V: Provide foundational information and support services

Organised information provides the ability to make and justify good decisions. The FRDC delivers a range of services on its websites to support fishing and aquaculture. These track and report on:

- sustainability status of fish stocks and performance of fisheries,
- environmental impacts and risk,
- international trade and market access,
- consistency of best practice,
- consumer/community perceptions and behaviour, which inform sectors about emerging trends.

FRDC's stakeholders have emphasised the value of these services. However, there is a need to assess how well they continue to meet the needs of end users. Under this R&D Plan, the FRDC will review and improve the services it delivers, including national reporting that:

- extends beyond standard measures of economic performance (e.g. GVP) to include more informative, near-real-time economic indicators,
- integrates broader metrics that better describe and track environmental and human wellbeing across fishing and aquaculture,
- expands performance reporting of species and sectors so that consumers and the community have access to accurate information.

All FRDC-funded services are reviewed regularly and receive feedback from end users on their awareness, use and impact of these resources. This ensures FRDC's investments are deployed in areas that deliver value to stakeholders.

Providing foundational information and support services will benefit FRDC's stakeholders in the R&D Plan outcome areas, including:

- expanded environmental management to cover areas other than stock status of target species (R&D Plan Outcome 1),
- improved decision making by fishers and aquaculturists so they can get the most from their business and the products delivered (R&D Plan Outcomes 1, 2, 5),
- increased capacity for managers to consistently and adaptively inform their decision making (R&D Plan Outcomes 1, 2, 4, 5),
- greater transparency and product traceability so the community and consumers will be able to confidently make more informed choices (R&D Plan Outcome 5),
- more up-to-date information so researchers will be able to target their work to areas of need (all R&D Plan outcomes).



THE FUTURE: More holistic reporting of performance

Looking forward, performance will be measured by more than target stock sustainability and GVP. More producers will need to tell a story—supported by evidence—about their bycatch levels, carbon footprint, wellbeing of fishers and farmers, quality along the value chain, and how benefits will be distributed. Transforming performance reporting for fisheries and aquaculture will involve being able to collect new information both cheaply and effectively, although this may take years to be fully implemented.



Measuring performance

As a statutory authority, the FRDC has a legislative obligation to ensure its investments in R&D projects deliver benefits for its stakeholders. However, measuring these can be difficult for a range of reasons including the duration and complexity of the project, what to measure from it and what the impacts may be.

First, how quickly project results are adopted can vary because of the nature of knowledge generated and how motivated end users are towards risk and their capacity to implement changes in their businesses. This can result in a delay between adopting new knowledge and when increased economic, environmental or social benefits are realised.

Second, it can be difficult to decide what to measure and how. Some funded projects aim for profit, some seek to develop new processes or products, while others want greater cultural connections, outcomes for recreation, and environmental and/or community wellbeing.

Third, when measuring impact, it can be complicated to show what change or improvement is attributable to FRDC's investment and what has been influenced by external factors such as exchange rates, environmental change, or unrelated marketing campaigns.

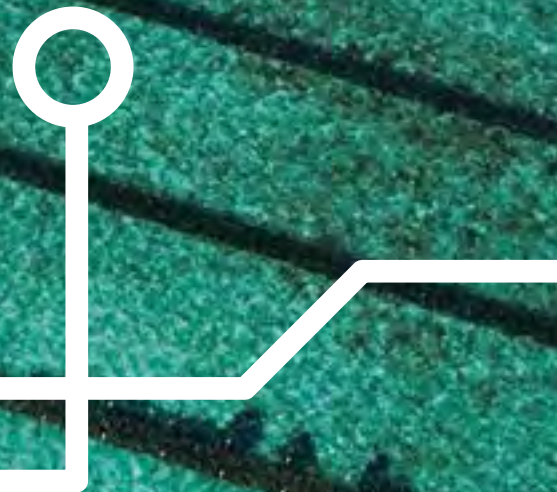
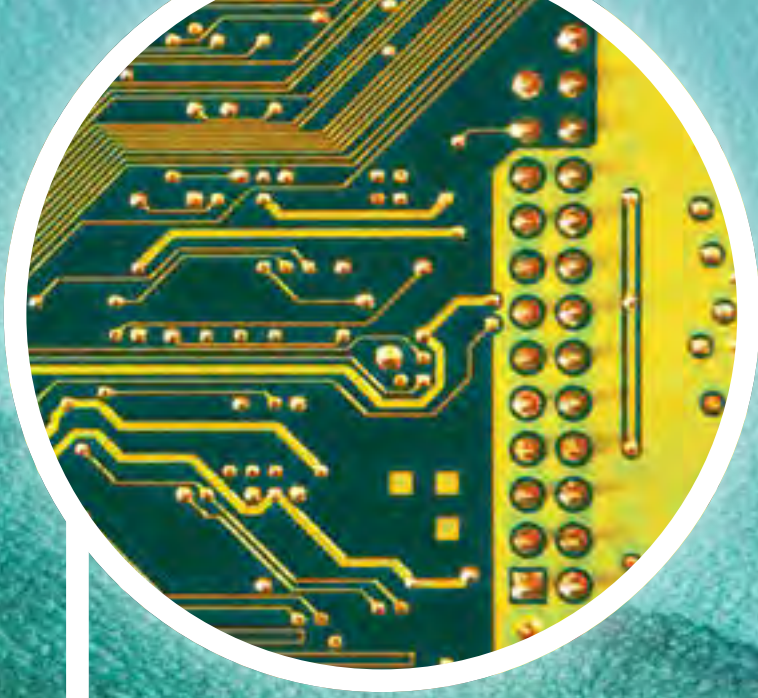
Inputs are easier to measure than outcomes. Inputs are either the quantity of funds invested or the number of projects funded. Submissions for funding are evaluated by FRDC's advisory groups and approved or not.

The FRDC conducts regular evaluation of the benefits and costs associated with its investments as part of guidelines to measure the results of R&D activities by the Council of Rural Research and Development Corporations (CRRDC). Methods used to measure benefits and costs are based on work by the Department of Finance for undertaking cost-benefit analysis and alternative evaluation methodologies.

In the most recent analysis (2019), in which 20 projects that concluded between 2016 and 2018 were examined, it was found that an investment of \$16.15 million delivered \$92.21 million in benefits. Notably, not all value derived from projects is monetary, and the analysis did not estimate non-monetary value.

During the life of this R&D Plan, the FRDC will develop a new performance measurement framework to assess progress against the five outcomes, as well as its corporate performance. Proposed expansion of national fishing and aquaculture accounting metrics under Enabling strategy V (Provide foundational information and support services) will help tracking of environmental, social and economic metrics beyond GVP, employment and target stock sustainability. The framework will be adaptive and updated as new information becomes available and what is considered the 'benchmark for best practice' changes.





Strategic alignment with priorities

The FRDC is part of a larger national agrisystem and global community working together to tackle shared challenges. The size and extent of these challenges means that collaboration will be critical.

The objects of the PIRD Act provide the foundation for everything that the FRDC does and ensures there is alignment between FRDC's strategic plan and the CRRDC's vision for 2050. As the FRDC aims to achieve the outcomes of this R&D Plan it will continue to work closely with the CRRDC and other rural research and development corporations on areas of common interest.

The focus of this R&D Plan is consistent with the Australian Government's rural research, development and extension priorities:

- **advanced technology**—to enhance innovation of products, processes and practices across the food and fibre supply chains through technologies such as robotics, digitisation, big data, genetics and precision agriculture,
- **biosecurity**—to improve understanding and evidence of pest and disease pathways to help direct biosecurity resources to their best uses, minimising biosecurity threats and improving market access for primary producers,
- **soil, water and managing natural resources**—to manage soil health, improve water use efficiency and certainty of supply, sustainably develop new production areas and improve resilience to climate events and impacts,
- **adoption of R&D**—focusing on flexible delivery of extension services that meet primary producers' needs and recognising the growing role of private service delivery.

The FRDC's investment in R&D over the life this R&D Plan, also aligns in focus or intent with global and national strategies, which include the:

- United Nations Sustainable Development Goals,
- Australian Government's nine science and research priorities and associated practical research challenges relating to food, soil and water, transport, advanced manufacturing, environmental change and health,
- National Marine Science Plan, National Fishing Advisory Council, Australian Fisheries Management Forum and relevant industry and sector plans.

Considering both national and international strategies has been important because the FRDC and the planned outcomes of this five-year R&D Plan are part of a movement for change in public policy generally and the use of aquatic resources in particular.



“

When planning for a year,
stock fish.



When planning for a decade,
improve ecosystem health.



When planning for life,
train and educate people.



”



Australian Government

Fisheries Research and Development Corporation

Imagining the future of fishing and aquaculture, FRDC's R&D Plan 2020–25.

June 2020.

Published by: Fisheries Research and Development Corporation

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ISBN 978-1-925983-42-5

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Back cover quote: Mahatma Gandhi

Front cover illustration: Alex Thornton

Design: Angel Ink

The future depends on
what you do today.



The FRDC's R&D Plan 2020–25 outlines
the investment areas for today that will create
a better future for fishing and aquaculture in Australia.

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