



FRDC

The Pearl Consortium RD&E Plan provides a framework to identify the key strategic research needs of the pearling industry from 2016 – 2021.

Pearl Consortium RD&E Plan

Research, Development and
Extension Plan 2016 – 2021

8 October 2016



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CONTEXT

FRDC RD&E Investment Programs

The FRDC has five RD&E investment programs that directly align with its governing legislation, the PIRD Act. RD&E investments across these program areas will be assessed to ensure the FRDC maintains a balanced portfolio that meets the short and long term needs of its stakeholders, including the Australian Government and the Australian community. The programs include:

Environment

This program relates to RD&E that supports natural resource sustainability in managing fishing and aquaculture activities in Commonwealth, state and territory waters. Many components of FRDC-funded RD&E focus on improving the sustainable use of Australia's aquatic resources.

Industry

This program relates to RD&E that assists the production and value of seafood. It could be in the form of business profitability, international competitiveness, opportunities for productivity increases, resource access, and experience or wellbeing benefits. This program aims to help all sectors improve their overall performance.

Communities

This program relates to RD&E that maintains the long-term sustainability of the commercial sector by understanding the interactions and co-dependence between fishing and aquaculture, and the wider community. It is enhanced by knowledge about the social importance of fisheries.

People

This program relates to RD&E that is needed to attract and advance people who will lead fishing and aquaculture towards a sustainable and profitable future. The FRDC has taken a strong role in this area, from employing and developing young researchers, through to facilitating access to leadership development for all sectors of fishing and aquaculture.

Adoption

This program relates to how project outputs are delivered so they can be easily adopted and support stakeholder decision making and practices. The FRDC continually works with researchers and end users to determine and implement the best way of extending these results. In addition, the FRDC is continuing to develop its systems to ensure its 'knowledge bank' is widely accessible.

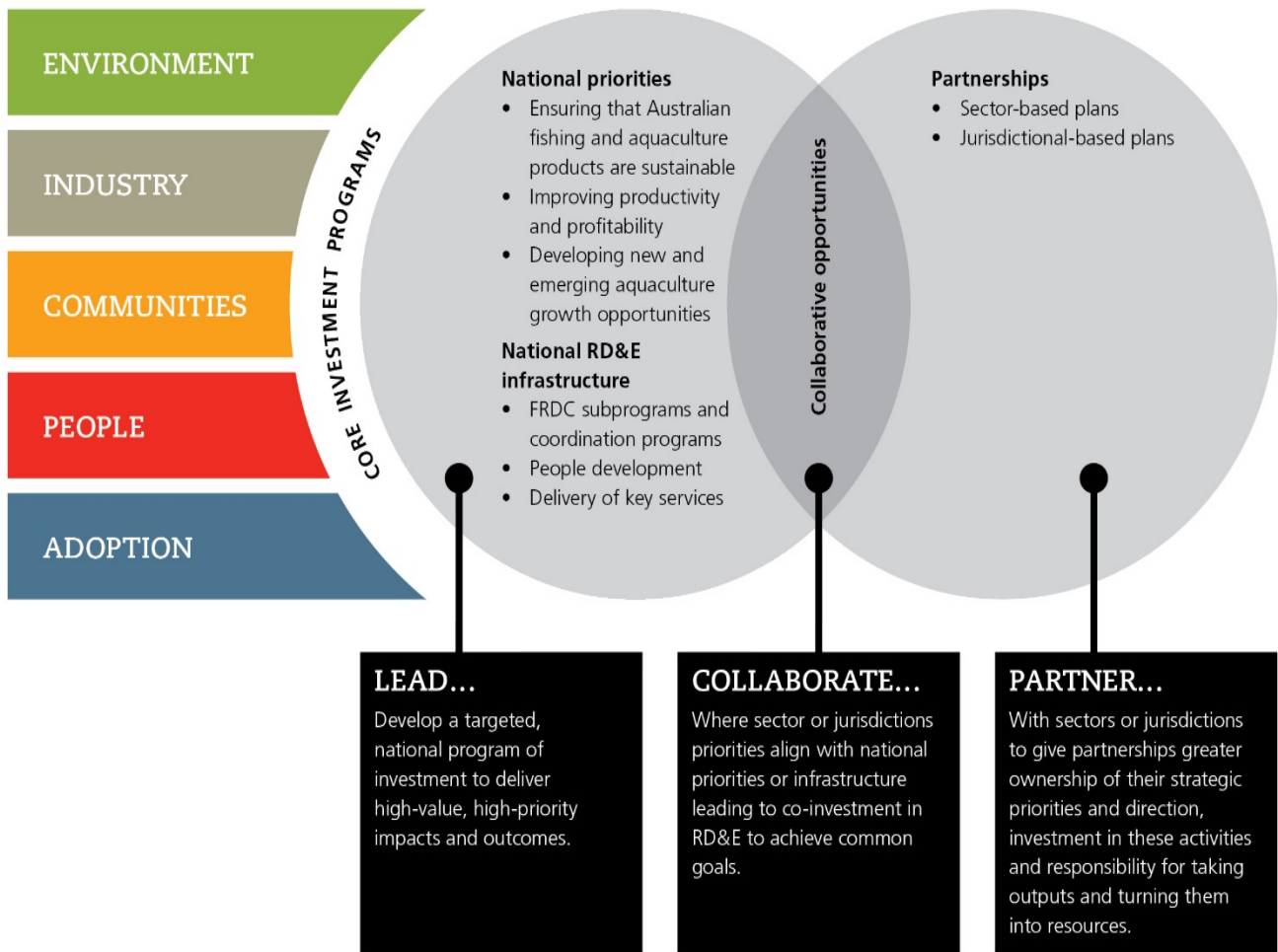
Co-management Investment Model

Under the FRDC's RD&E Plan 2015 - 2020, the FRDC provides greater ownership and authority to industry sectors in developing RD&E priorities, through Industry Partnership Agreements (IPAs) and to jurisdictions through Research Advisory Committees (RACs) - formerly Fisheries Research Advisory Bodies (FRABs).

A key component of this investment model is the development of a multi-year RD&E Plan for each IPA and RAC aligned with the FRDC's 5-year RD&E Plan. This will assist in developing a tailored RD&E program that:

- meets both jurisdictional and national strategic RD&E priorities
- is balanced across FRDC programs (environment, industry, communities, people and extension)
- focusses on short, medium and longer term RD&E outcomes
- is supported by a consistent RD&E planning framework across all RACs.

The framework for RD&E investment by the FRDC for 2015–20.



1. OPERATING ENVIRONMENT

1.1 OVERVIEW

PPCo is the controlling entity for a consortium of pearling companies, subsidiaries and joint venture partnerships in WA and the NT. Through its own licences and joint venture arrangements PPCo delivers services to the pearling industry ranging from hatchery production, through to full control of production from fishing, hatchery, seeding, transport, farming, harvesting and marketing of pearls. Under this structure PPCo controls ca. 85% of Australia's pearl production. As a consequence of this structure technical improvements developed by PPCo R&D are distributed as improved processes and services.

PPCo has been an active co-investor for a number of years with FRDC as part of the broader industry on public research in areas such as OH&S, sustainability and environmental issues. Over the years PPCo has provided significant in-kind contributions and support to these projects. PPCo also undertakes an active and proactive role in industry advocacy through direct liaison with government and NGO's and participation in public forums such as Environmental Risk Assessment workshops.

From 2011 to 2016, PPCo, representing a larger industry consortium, has co-invested directly with FRDC to improve existing production technology and develop new technologies. This partnership has proved to be very beneficial, with significant progress made in a number of areas that have been implemented to improve industry performance.

PPCo have now submitted a new Industry Partnership Agreement to the FRDC Board in order to continue this process through to 2021.

The Term of the IPA will be 5 years.

Under the IPA:

- The Pearl Consortium through PPCo will contribute pearling industry funds from both the Northern Territory and Western Australia.
- FRDC will match PPCo's contribution less an 8% administration fee
- PPCo will provide versions of the program's final reports suitable for general distribution at the time of their completion; and will release further data for general publication after five years.
- PPCo acknowledges that research undertaken by students should, to the maximum extent possible, be in the public arena.

PPCo has already independently established a scientific R&D Review Forum that is comprised of PPCo research staff, external scientists and FRDC. This forum meets twice a year to review existing PPCo R&D projects and to provide advice on future activities. This review structure will be carried forward into the new IPA.

2. THE PEARLING INDUSTRY

2.1 Drivers, Challenges and Opportunities

2.1.1 Strengths

The Australian pearling industry has a long history of innovation and producing the world's finest pearls. This has been underpinned by the reliability of the wildstock fished from the 80 Mile Beach south of Broome. The wildstock fishery is well managed via a recruitment index and TAC. The 80 Mile Beach is the only remaining commercial wildstock fishery in the world.

Historical investment in capital such as specialised ships and longline anchoring systems has resulted in a legacy of high capability.

The Australian pearl farming environment is richer and cleaner than that of competitor nations and supports the production of second and third operation pearls, which are the largest and most valuable in the world.

2.1.2 Weaknesses

The pearling industry is similar to other production industries in Australia in that high labour costs and a strict regulatory regime impose high baseline costs. In contrast competitor countries such as Indonesia, the Philippines and Myanmar have very low labour costs and almost non-existent regulatory structures.

Pearl farming is conducted in the remote northern regions of Western Australia and the Northern Territory. Infrastructure is very poorly developed and many farms can only be accessed by ship or seaplane. This imposes a substantial additional operating cost.

2.1.3 Opportunities

The Australian workforce is highly educated and has been pivotal in Australia remaining competitive in international agricultural markets by increasing mechanisation and efficiency.

Pearl production metrics, particularly for the 2nd and 3rd operations are still poor. Poor quality attributes such as disrupted nacre structure and imperfections are the norm. The underlying environmental, technical and physiological reasons affecting quality are poorly understood but the potential to increase the production of high quality pearls is high.

Recent advances in the production of genetically superior hatchery derived oysters has already delivered substantial improvement in growth, survival and pearl production. This process is still in its early stages but it is anticipated that it will deliver very large benefits in the future as successive generations of selected families are commercialised. The production of these improved oysters needs to be scaled up to reduce spat unit costs and increase the numbers available for seeding. Australian companies require large production volumes to achieve economies of scale, and these volumes are not available from the wildstock fishery.

Increasingly consumers are requiring producers to demonstrate through third party accreditation that they are environmentally sustainable. Australian pearl producers have a long history of demonstrating they are environmentally benign, and are currently engaged in a process to achieve Marine Stewardship Council accreditation. The Australian industry will be the only one in the world that will achieve this accreditation and this will provide a unique point of difference in the world market.

2.1.4 Threats

High production costs and a luxury product mean that Australian producers are vulnerable to downturns in the world's developed economies from global shocks. Pearling is a long term production system, with pearl oysters having a productive lifespan of up to three pearls over 9 years. Hence it is very difficult to adjust production on a short term

basis. The best strategy is to build resilience into the entire business model. Disease, particularly OOD, has had a large negative impact on pearl farming. The first outbreak in seeded oysters was in 2006, and since then large areas of Western Australia have proved to be unsuitable for spat production. As a consequence, a large number of long term companies exited the industry. Improved resilience in genetically selected spat have mitigated the effect of disease, but it is still a threat and exerts a chronic effect on affected oysters, leading to poor pearl production.

2.2 Trends

Sustained competition from countries with cheap labour costs is a permanent structural feature of the world pearl market. Accordingly, Australian producers must continue to strive to efficiently produce high quality pearls in an environmentally sustainable manner. To achieve this, the following areas need to be developed and enhanced:

- Spat production needs to be scaled up and the unit cost reduced
- Programs to produce genetically superior stock need to be maintained and improved
- There needs to be a much greater understanding of the fundamental drivers affecting pearl production and quality
- MSC Environmental accreditation needs to be achieved
- Staff need to be developed and trained to drive the processes and systems required

The Pearl Consortium Members anticipate a number of advantages to their sector from an IPA, including:

1. A clear and direct path from Industry's Strategic Plan (short, medium and longer term priorities), and RD&E investment projects over the next 5 years,
2. Committed funding by industry and FRDC to RD&E investment plans over the next 5 years,
3. Greater industry input to and responsibility for managing its RD&E Investment portfolio and RD&E projects, based on agreed performance indicators,
4. Greater flexibility for industry in the types of investments that can be made, and a quicker path from idea to commercialisation
5. Opportunity for industry to bring proposals to FRDC three times a year, compared to the previous once-a-year annual competitive round.
6. RD&E that can be linked to market outcomes (e.g. market research but not marketing itself)
7. Clear outline between the Pearl Consortium and FRDC regarding the source and use of industry and matched funds.

3. RD&E PLAN 2016 – 2021

3.1 Purpose

This Strategic Plan has been developed to:

- Value-add to the extensive research that has already been undertaken by the Paspaley Pearling Company, both in isolation and more recently in partnership with the Fisheries Research and Development Corporation.
- Promote a disciplined and strategic R,D,E&I structure within the company
- Ensure that the objectives outlined in the Strategic Plan align with those of the PPCo Board
- Encourage PPCo and by inference the wider pearling industry to better promote its social and environmental values and credentials
- Develop IP that can be used to benefit the Australian pearling industry

3.2 Principles

The Research and Development Strategy will be under regular review as new information is generated, and in response to community and market issues.

It will be reviewed every 6 months by an existing panel largely composed of external scientists, and including a representative of the FRDC. This process has been in place since 2004.

3.3 Scope

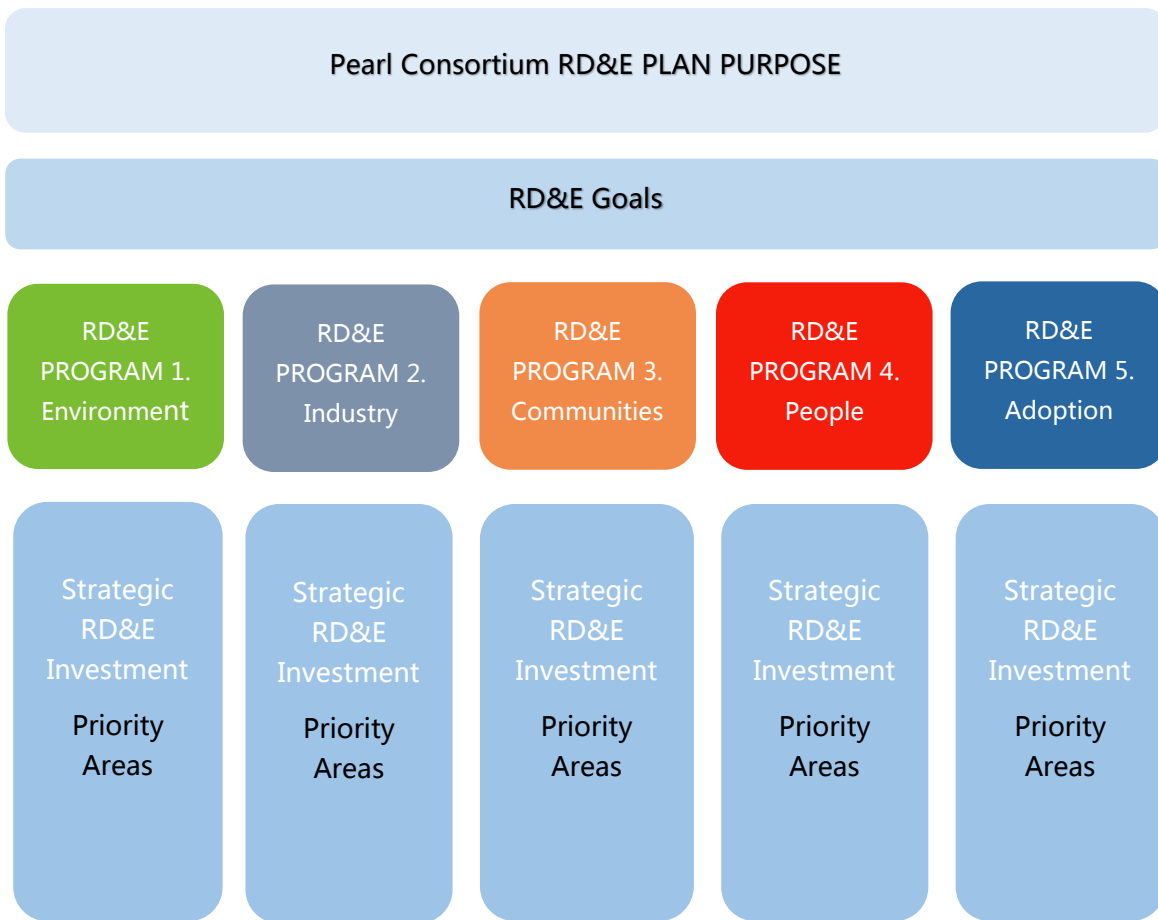
The Strategic Plan has been developed taking into consideration the FRDC objectives as outlined in the Industry Partnership Agreement:

- Sustainable development of the industry
- Maintenance of resource access and property rights
- Increases in profitability
- Improved community relations
- Enhanced market development
- Improved safety and training
- People development across the entire supply chain

3.4 Extension and Implementation

PPCo have a well established mechanism to communicate R&D outcomes from research staff to executive management and hence the Board. This direct line of communication ensures that R&D results are translated rapidly and directly into extension and implemented outcomes.

3.5 Framework Overview



3.6 Goals

Successful outcomes from the R&D priorities will deliver:

- Greater knowledge of pearl oyster health issues and how they interact with production methods
- Improved pearl quality from superior hatchery produced stocks and greater knowledge of the influence of technical, biological, husbandry and environmental factors
- Reliable spat production methods that deliver high quality animals for seeding operations
- Year round hatchery production of improved stock
- Reduction in the production cost per oyster from hatchery to seeding operations
- More efficient farm husbandry methods that minimise WH&S risks
- Enhancement of scientifically based environmental credentials
- Regulatory processes to support changing production, business, sustainability and social needs
- Scientific input into the MSC environmental accreditation process

RD&E Program 1. Environment

Environmental and genetic impacts on pearl production

Outcomes:

- Better understanding of environmental drivers of pearl production
- Monitoring of the pearl farming environment
- Spatial variation due to site variability
- Measuring the G X E effect
- Relationship between genetic origin, environment and husbandry

Third party environmental accreditation

Outcomes:

- Provide scientific information to support the MSC accreditation process
- Undertake research to maintain and strengthen the MSC process

RD&E Program 2. Industry

Improve Pearl Quality

Outcomes:

- Review all information relating to pearl quality
- Improve understanding of the physiological processes affecting pearl quality
- Improving 2nd and 3rd operation results

Increase production efficiency

Outcomes:

- Develop markers to measure environmental and husbandry stress on oysters
- Develop new more efficient farming systems
- Investigate potential antifoulants

Improve hatchery based production

Outcomes:

- Scale up spat production using high volume commercial systems
- Develop measures to mitigate against catastrophic losses from cyclones
- Continue to invest in genetic improvement
- Increased throughput of family lines
- Development of SNP' s for marker assisted selection

RD&E Program 3. Communities

Provide confidence in the community that wildstock fishing of pearl oysters is sustainable

Outcomes:

- Transparent engagement with the community
- Publically available information on the status of the wildstock fishery

Enhance community confidence that pearl farming is not detrimental to the environment

Outcomes:

- Open and transparent engagement with the community
- Publicly available assessment during the Marine Stewardship consultation process
- Improved consumer satisfaction and community support through better understanding of the sector
- Ongoing resource access

RD&E Program 4. People

Support and increase industry capacity

Outcomes:

- Collaborative training programs developed with Charles Darwin University
- PPCo to sponsor staff to undertake the National Seafood Industry Leadership Program
- Staff undertaking skills based management and technical courses
- Internal career paths developed and communicated to staff

Improve personnel welfare and industry productivity

Outcomes:

- Safe work place practices adopted
- increased uptake of co-management
- Improved staff retention

Actively train identified staff in leadership roles

Outcomes:

- Identify and select staff to undertake the National Seafood Industry Leadership Program

RD&E Program 5. Adoption

Communicate the benefits created by the pearling sector

Outcomes:

- Appropriate methods identified and implemented to communicate with the community and consumer
- Periodic review of the information contained on the Pearl Producers Association website

Develop dialogue with the broader seafood industry, other marine resource users, FRDC, agencies, NGOs, and other external stakeholders.

Outcomes:

- Improved engagement with other stakeholders
- Exchange of information and knowledge between fishing sectors increased

Communicate RD&E outputs in the appropriate format to hasten adoption

Outcomes:

- Periodic review of R&D adoption and value
- R&D outputs adopted
-
- 'Fit for purpose' information delivered

3.7 Strategic RD&E Investment Priority Areas

3.7.1 Pearl Oyster Health

Mass mortalities, particularly in small spat, are still prevalent within the industry following the initial outbreak of Oyster Oedema Disease (OOD) in Exmouth Gulf in 2006. No causative agent has yet been identified. Work to identify the causative agent is ongoing, and PPCo will provide support to the work, and any other pearl oyster health research, through the activities supported by this IPA.

3.7.2 Improved Pearl Quality

The Australian pearling industry has always been focused on the production of high quality pearls, rather than on producing large quantities. The pearl production process is very complex and the outcome is an amalgam of two years of biological, technical, husbandry and environmental factors. There has been significant progress made in improving pearl quality; however the success rate, particularly for the re-operated oysters that produce the most valuable pearls, is still relatively low. Improvements in pearl production processes and techniques can deliver very large returns, as there is no change to the underlying cost structure but revenue is expanded.

3.7.3 Genetic Improvement of Pearl Oyster Stocks

Traditionally, the Australian pearling industry has been based on the collection of wildstock from the 80 Mile beach grounds in WA. The introduction of hatchery reared spat has led to this component accounting for 30-50% of current pearl production.

PPCo, in partnership with the FRDC has been developing the technology to create and assess pearl oyster family lines. This program has been successful and there are currently over 220 family lines in various stages of the production system, including 60 F2 families.

PPCo believes that the genetic improvement of pearl oyster stocks will be a transformational technology for the industry. This is already being confirmed by superior results from improved hatchery stocks.

3.7.4 Spat production

The process of hatchery spat production and growout to seeding size are undertaken widely within the industry, albeit inefficiently and at very high cost. Compared to other industries such as the edible oyster industry, hatchery and spat growout for pearl oysters is very poorly developed and extremely expensive.

The northern Australian marine environment is very aggressive. The areas where pearling is carried out are extremely remote. Tidal variations are commonly 8-10m, resulting in massive tidal currents. Fouling and predatory pressures are intense and tropical cyclones are a normal occurrence during summer. These factors combine to make pearling, and in particular spat production, extremely challenging and costly.

Improvements in hatchery production techniques arising from existing PPCo/FRDC partnerships have already been applied and have resulted in a large increase in production and a reduction in unit cost. However, the scale of production needs to be substantially increased and the unit cost further reduced. This will require new processes and technologies as well as the utilization of new sites with appropriate environmental attributes.

A major focus of research will be on the development of reliable and cost effective methods to produce and on-grow spat.

3.7.5 Productivity Improvement

In common with other primary producers, high productivity per unit of labour and capital are critical to maintaining long term competitiveness. PPCo has a number of initiatives in train with the aim of improving productivity, and with other substantial benefits for OH&S and training. Primarily, these initiatives are focused on mechanisation of repetitive manual labour.

Some specific examples are:

- Next generation shell cleaning vessels and husbandry equipment
- New shell cleaning systems
- Automatic shell processing equipment
- Automated pearl grading equipment

3.7.6 Environmental/Social

The pearling industry is reliant on access to public resources to sustain it, specifically to wildstock oysters and to water leases. As for all fishing industries, there is ever increasing public scrutiny on ensuring appropriate private utilisation of public resources.

The pearling industry has been proactive in both securing EPBC Accreditation for the wildstock fishery, and in addressing environmental issues raised by the broader community. The pearling industry is currently progressing through the Marine Stewardship Council accreditation process. PPCo has been heavily involved in all of these processes and has a commitment for this engagement to continue.

Targeted RD&E will provide rigorous, defensible, science based information to support industry environmental claims and ensure that this is communicated to the broader community through publications (such as *Pearling In Perspective*) and public forums.

3.7.7 Education and Training

PPCo has supported 2 successful PhD students and two Honours students, with another PhD student in process. Where appropriate, PPCo will continue to support students to undertake postgraduate research.

PPCo is committed to the development and training of its staff and is proud of its record to provide competency based training initiative right from the commencement of employment through to clear pathways for staff to ensure a successful career in the pearling and marine industry here in Northern Australia:

- PPCo have dedicated training initiatives and recently won “People Development Award” at the Northern Territory Seafood industry awards, recognizing our vessel training / induction program to promote and train our staff. <http://www.abc.net.au/news/2015-10-29/paspaley-training-vessel-a-pearler-for-safety/6860260>
- Recently embarked on a joint venture traineeship with Charles Darwin University, essentially placing a frame work over the first 12 months of pearl farm staff, this traineeship progresses staff through safety qualifications such as Apply first aid, safe food handling to marine qualifications MAR10413 - Certificate I in Maritime Operations (Coxswain Grade 2 Near Coastal) including coxswain engineering to allow 500kw endorsement, completing with SFI30111- Certificate III in Aquaculture Paspaley Training.

We believe these initiatives are a first for our industry and will continue to showcase Paspaley Pearling Company as an employer of choice.

PPCo has sponsored two National Seafood Industry Leadership graduates and intend to support additional staff to undertake the course.

3.7.8 Other areas of Activity

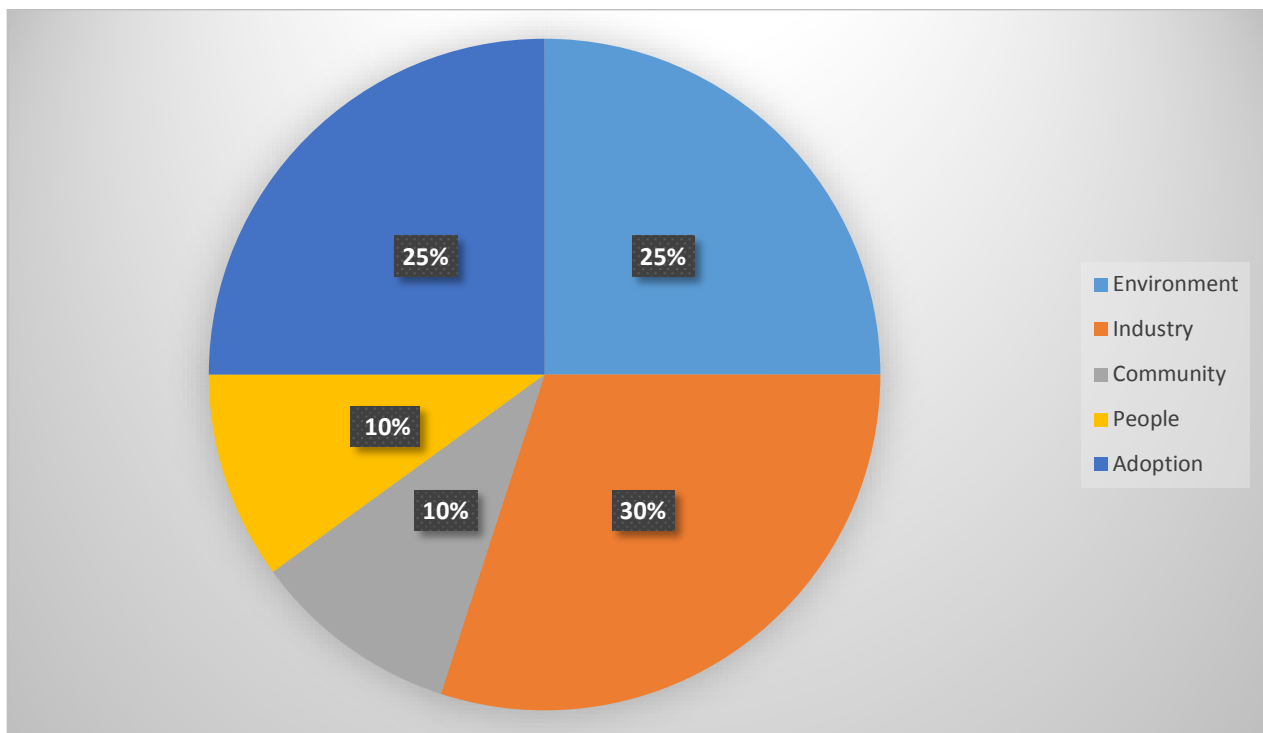
PPCo is actively involved in the governance of the pearling industry, with James Paspaley (Executive Director) being the current Chairman of the PPA.

PPCo is heavily involved in the development of the regulatory environment through input to policy development and new Western Australian Fisheries legislation.

PPCo have been active in industry research and development in numerous areas including dive safety, environmental impacts, wildstock fishery recruitment and stock assessment and pearl oyster health.

3.8 Forecast Pearl Consortium Investment Across Strategic RD&E Priorities

It is intended to achieve a balanced portfolio with national pooled funds between 2016 – 2021 as outlined below. Each investment year may differ from these averages.



4. RD&E PLAN Guidelines

4.1 Investment Collaboration

The RAC's are to be mindful of collaborative opportunities with external funding sources (other than the FRDC) as well as collaboration between the jurisdictional RACs, IPAs and FRDC subprograms. The annual planning workshop provides a forum for the sharing of these priorities to promote collaboration.

Collaboration provides the opportunity to share investment across common areas of interest and promote RD&E execution efficiency.

4.2 Extension

Extension processes are embedded into all FRDC-funded RD&E. How results can be extended begins when a project is approved for funding, are considered in the design and proposal phase where priorities for end users are determined, continue during the project's execution through to the final published report. This is often easier for short-term applied research but needs to be more considered for longer-term, blue-sky research.

On 23 April 2010, the Primary Industries Ministerial Council (PIMC) approved a National Strategy for Fishing and Aquaculture Research, Development and Extension (RD&E) which establishes the future direction to improve the focus, efficiency and effectiveness of RD&E to support Australia's fishing and aquaculture industry.

The FRDC have adopted these as key principles with regards to encouraging and promoting Extension and Adoption. They are:

Principle 1: All stakeholders to value extension and adoption activities in the same way as research activities.

Principle 2: Extension will be a key focus in research project development

Principle 3: Project knowledge and outputs are actively managed

Principle 4: Effectiveness and impact of project extension activities are evaluated

Principle 5: Extension and adoption capacity is maximised and built upon.

It best practice for project managers to have given some thought to how the project outputs will be used and adopted by end users while developing the application. It is a FRDC requirement that an Extension and Adoption Plan is developed and submitted for each project.

4.3 Evaluation of Projects

The FRDC has adopted the Commonwealth input, output, outcome reporting framework policy. The Department of Finance and Deregulation has determined that the FRDC's planned outcome is *Increased knowledge that fosters sustainable economic, environmental and social benefits for the Australian fishing industry; including indigenous, recreational, commercial and aquaculture sectors, and the community; through investing in research, development and adoption.* The FRDC's performance is measured against its ability to deliver this outcome.

The success of the RAC's planning, investment, management and adoption is measured by an evaluation framework that is based on adaptive management. The structure of the evaluation framework is as follows:

- A planning process that ensures investment is made against priorities where research can contribute to a significant improvement.
- An annual report evaluating the performance of individual projects against the targets in the RD&E Plan.

The FRDC has implemented the Rural RD&E Corporation Evaluation Framework methodology to achieve the total portfolio evaluation assessment. This is based on a rolling series of cost benefit analysis of project clusters (based on

previous 5 years investment). The results of the project cluster assessments links to the agreed KPIs that are relevant to that cluster. This process ensures that the investment decisions are continually being adjusted to ensure optimal investment performance. In this ongoing evaluation, the FRDC will measure the performance of RAC investments after the life of its RD&E Plan.

During the life of the RD&E Plan, the RAC should self-evaluate its performance against its identified Priority Areas as well as monitoring investment to ensure balance in investment across the FRDCs 5 programs. This is to be aligned with the prioritisation and RD&E Plan review processes undertaken in the October RAC meeting.

4.4 Review of the RD&E Plan

Annually, the RAC will review their RD&E Plan. This will occur at the October RAC meeting. The Plan will be reviewed to:

- assess performance against the identified Priority Areas of the Plan
- identify gaps against the Priority Areas of the plan
- determine priority areas for investment against these gaps

These annual plans will be circulated to all FRDC subprograms and partnership agreements unless it is deemed that there are areas of sensitivity, IP protection or commercial advantage that require protection.

At the beginning of December each year, the FRDC will hold an annual workshop for all RACs, Industry Partnership Agreements and National Initiatives to provide updates on priority areas for investment and any potential overlap and collaborative opportunities for the coming financial year.

The RAC, at each meeting, should also undertake a situational scan of the jurisdiction to identify any tactical or immediate areas of RD&E need that require short term or immediate remediation.