



Overarching Comments

The Aquaculture Council of Western Australia has reviewed the background paper and expresses strong support for implementing a circular economy in Australia, particularly in Western Australia. Transitioning to a circular economy, in which waste is actively minimised, and resources are highly valued, is expected to significantly reduce business expenditures, foster the emergence of new industries and job opportunities, and mitigate greenhouse gas emissions. This approach will ultimately yield a substantial economic advantage for Western Australia.

With the rapid growth of the global population and the accompanying demand for seafood, aquaculture plays a pivotal role in enhancing food security. A significant number of aquaculture operators are implementing circular economy principles to minimise waste, enhance efficiency, and foster more sustainable systems. By decreasing waste, the value derived from natural resources is maximised. In essence, this approach allows for greater output while utilising fewer resources.

1. Information request 1: Circular economy success stories and measures of success

Examples of how the aquaculture industry is implementing a circular economy are provided below.

Recirculating Aquaculture Systems (RAS)

Recirculating aquaculture systems (RAS) represent an advanced method of fish farming. They differ from traditional approaches by cultivating fish at high densities in controlled indoor tanks. RAS effectively filters and purifies water for reuse, enhancing operational efficiency while reducing pollution and pathogen risks.

Water recirculation minimises water replacement, maintains specific quality parameters, and addresses limited water availability. Effective designs incorporate aeration, particulate matter removal, biological filtration for ammonia and nitrite elimination, and pH buffering. Biofilters serve as living filters with various media, supporting bacterial films that degrade pollutants.

By integrating technologies to uphold high water quality and hygiene standards, RAS is increasingly becoming the preferred choice in aquaculture.

Seaweed Farming

Seaweed farming represents a sustainable approach to food production, water quality enhancement, and climate change mitigation.

The following points outline its benefits:

- **Food Security:** Seaweed is a nutritious food source for humans and animals. It is rich in essential minerals, amino acids, and iodine and can be incorporated into various culinary applications, including sushi, salads, and sauces.

- **Water Quality Improvement:** Seaweed effectively absorbs nutrients and carbon dioxide from the aquatic environment, enhancing water quality and mitigating the impacts of ocean acidification.
- **Climate Change Mitigation:** Seaweed acts as an underwater forest, capturing carbon, nitrogen, and phosphorus, contributing to global efforts against climate change.
- **Habitat Creation:** Culturing seaweed fosters the development of new habitats for diverse marine life.
- **Minimal Environmental Impact:** Seaweed farming operates with a low environmental footprint, requiring neither fertilisers nor pesticides nor necessitating freshwater resources or land use.
- **Rapid Growth Rate:** Certain species of marine algae can reach maturity for harvest in as little as six weeks, providing a quick turnover for producers.
- **Methane Emission Reduction:** Asparagopsis has demonstrated the capacity to reduce methane emissions in ruminant livestock by up to 80%, thereby decreasing greenhouse gas emissions and presenting an advantageous option for conscientious agricultural practices.
- **The potential of different marine microalgae species to recycle nutrients from recirculating aquaculture systems (RAS) fish farms and produce feed additives**

Alternative Feed ingredients

Aquafeed is essential for the aquaculture industry's production and efficiency. The shift toward alternative feed ingredients supports sustainable practices and reduces reliance on fish meal. Exploring opportunities and challenges associated with plant-based ingredients, insect meals, terrestrial animal by-products, microbial sources, and genetically modified materials.

Using plant-based ingredients in aquaculture is expected to increase, with improved processing enhancing nutrient bioavailability. Genetically modified plants, insect meals, and microbial compounds show promise for future diets. Research into large-scale production of these alternatives and their effects on fish health will be crucial for developing diets that minimise disease and enhance growth. Automated feed systems can also reduce waste.

Recycling by-products in aquaculture can significantly mitigate environmental impacts. Materials like shells and bones, often considered waste, can be transformed into products such as gelatin and chitin. Additionally, fish sludge can be used to cultivate black soldier flies, turning waste into a valuable protein source for aquafeeds while reclaiming residual nutrients and reducing overall waste.

2. Information request 2: Priority opportunities to progress the circular economy

Notwithstanding the examples above, the uptake of circular economy activities within aquaculture is generally low. This can be rectified by segmented communication of the potential environmental and economic outcomes, tailored and targeted at specific industry sectors undertaking aquaculture activities.

These communications needs to be derived from robust analysis and modelling of different supply chain scenarios that allow industry participants to align their operations with real or predicted outcomes. Acknowledging the lag phase associated with the time requirements of this research, it is recommended that more general communication materials be provided in the first instance for awareness raising and engagement outcomes. Actual practice change may require longer periods of time and more detailed and industry-specific information, which is most likely dependent on the research outcomes.

Extensive social research has demonstrated the value of industry-based trials conducted by industry in commercial enterprises for uptake by other industry participants. An appropriately targeted incentive-driven program with embedded engagement activities is most likely to fast-track awareness and adoption of circular economy activities by the broader aquaculture industry.

Industry has demonstrated a strong capacity to develop innovative solutions for a range of economic and environmental challenges. However, increased input costs and decreased market demand (due to cost of living pressures) reduce the flexibility of industry to undertake more speculative solutions. Some primary industry programs delivered using Federal funding have included “safe-fail” components where participants are supported to explore less certain but more innovative solutions. Whilst some elements of this approach may fail to meet all expectations, the inclusion of a robust monitoring and evaluation phase can determine those elements worthy of further development. This approach can significantly fast-track innovative solutions.

Information request 3: Hurdles and barriers to a circular economy

As noted above, more could be done in terms of funding to support innovation in the circular economy. Key constraints are the low margins associated with high input costs and challenging market conditions. Whilst the circular economy activities will address some of these issues, the time period to normalise them will be a constraint to broader uptake by aquaculture enterprises. Incentivised programs (as referred to above) will address some of these constraints.

Coordination and delivery of communication, awareness raising and practice change for circular economy activities can be addressed by peak bodies, including the Aquaculture Council of WA. Industry-based organisations are demonstrably better placed to achieve positive outcomes of this nature than government entities.

3. Information request 4: Governments’ role in the circular economy

The government has a vital role in ensuring a consistent, enabling environment exists for those enterprises seeking to participate in the circular economy. This may involve the following:

- Consistent policy processes between jurisdictions to avoid perverse outcomes.
- Financial support for incentive programs, as noted above.
- Consistent communications and training materials across jurisdictions.
- Promotion of circular economy activities to international markets to assist with access.
- Tailored support for first-nations people to identify appropriate areas of engagement within the circular economy.
- Review opportunities and risks associated with recycling fish-feed wastes as soil remediation materials and identify any municipal laws preventing this.