

Organic waste



Figure 1. Seaweedery prawn oil

Seaweedery

Organic waste is produced at every stage of seafood supply chains. Many businesses now view these organic materials as opportunities to apply circular economy principles to undervalued resources. Collecting, recycling and reprocessing materials like fish frames, shells and offcuts not only diverts organic waste from landfill, it creates new value chains for food products and fertilisers.

At Seaweedery, a chef and a sustainable packaging expert joined forces to reprocess seafood waste into high-value human food products. With the support of business accelerator Seafood for Good, and in collaboration with Austral Fisheries, Seaweedery is transforming prawn shells into high-value prawn oil for human consumption. Their business is based on the concept of a restaurant kitchen where nothing is wasted.



Figure 2. Pet treats made from fish waste

All Fish for Dogs

The founder of All Fish for Dogs (pet food treats made using fish waste) came up with the idea in 2015, after seeing first-hand – as a commercial fisher – the volumes of fishing waste and by-catch. The business was established using the funds from the sale of the founder's fishing licence, and now uses organic fish waste from across Australia.

Based in Mission Beach (Queensland), the company has overcome a range of logistical and packaging challenges linked to the transport of frozen fish from interstate. The fish waste is processed and dried into a range of dog treats (made from 100% fish, with no preservatives, additives or artificial colours).



Figure 3. Venus Shell Systems distillation process

Venus Shell Systems

Unlike many companies that are new to organic waste use, Venus Shell Systems was founded on circular economy principles. The business, based in the Shoalhaven region of NSW, produces unique traceable, premium-quality marine biomass (from seaweed).

New products – including biomaterials, cosmetics, dermatological care, food, nutraceuticals and pharmaceuticals – are created from this waste. Venus Shell Systems collects nutrient waste and carbon dioxide from wheat-processing to enhance seaweed biomass production. The business also processes aquaculture waste (such as mussel and oyster shells), and is expanding its portfolio of ingredients made from sustainable marine sources.



Figure 4. Ocean2Earth fish waste collection

Ocean2Earth

On the far-south coast of NSW, Ocean2Earth provides the local council with an alternative to sending fish waste to landfill. Drawing on previous experience in marine biology and gardening, the business founders began collecting and composting fish waste from boat ramp bins in Bermagui and Eden. This had the added benefit of reducing odours and waterway pollution.

The business has now expanded to collect over 300 tonnes annually of fish waste from the Bega Valley alone. The composting process also uses local timber mill waste. Ocean2Earth believe they have only just begun to scratch the surface of using organic materials that can be diverted from landfill for use as soil fertilisers or conditioners in agriculture, public parks and gardens.

Image sources:

Seaweedery (<https://startsomegood.com/seaweedery/>); All Fish for Dogs (<https://www.cleardog.com.au/category/dog-treats/fish-dog-treats/>)

Venus Shell Systems (<https://www.venusshellsystems.com.au/about-us/>); Ocean2Earth (<https://ocean2earth.com.au/>)

Plastics (produced from fossil fuels) are used extensively in seafood supply chains. Plastic waste enters ocean ecosystems and persists in the environment. Its disposal is increasingly firmly regulated and more expensive for businesses. Plastic waste poses a major challenge to the establishment of circularity in the fishing industry because biosecurity and food safety concerns limit reuse. Many businesses want to eliminate plastic waste and explore the use of alternative materials.



Figure 5. Aquaculture plastics

Tassal

In Tasmania, aquaculture business Tassal makes extensive use of hard and soft plastics in salmon farming. Hard plastics are used in feed pipes, stanchions, and the frames that make up salmon pens. These materials are recycled by Environex locally into second-life products.

Through membership in the Australian Packaging Covenant (APCO), Tassal is exploring similar opportunities for recycling more problematic types of plastic used in packaging (such as film and poly-boxes).



Figure 6. A KoolPak

Tom Kat Line Fish

In Queensland, Tom Kat Line Fish developed a solution to its needs in KoolPak, an innovative seafood packaging product that eliminates single use poly-boxes for transport to market of its tropical, wild-caught fish.

KoolPaks can be reused multiple times, are 100% recyclable, have superior thermal performance to polystyrene, and are strong, airline-approved and leak-proof. Each KoolPak incorporates near-field-communication (for chain of custody tracking), temperature sensing, and has an anti-microbial layer (for compliance with food safety regulations).



Figure 7. Compostable wrap

Great Wrap

A passion for finding alternatives to plastic film packaging led the company Great Wrap to produce the only Australian-made compostable wrap suitable for use in catering and pallet wrapping.

Their product is made from potato waste and a mix of other biopolymers, and is certified compostable (which means it must break down in a compost pile in under 180 days and leave behind zero toxins). The business is currently exploring the potential to replace potato waste with alternatives (like aquaculture-farmed kelp) to make their product even more sustainable.

Image sources:

Tassal (https://tassalgroup.com.au/wp-content/uploads/sites/2/2021/11/Tassal-Sustainability-Report-Final-Interactive_FINAL.pdf)

Tom Kat Line Fish (<https://www.koolpakbox.com/>)

Great Wrap (<https://www.greatwrap.co/products/compostable-pallet-caps-pack-of-100>)

The rising costs of energy and concerns about carbon emissions are driving change in energy use in the fishing industry. Some businesses have found unique renewable energy solutions to suit their individual needs.



Figure 8. Ballina Fisherman's Co-operative

Ballina Fisherman's Co-operative

At Ballina Fisherman's Co-operative the installation of roof top solar photovoltaic cells (PV) generates 97kW of electricity that substantially offsets the Co-op's energy use. The Co-op's electricity bill, mainly to run its ice machines and freezers, has fallen to about \$7,500 per month, less than half the cost of power before the solar PV installation six years ago. While the Co-op cautions that the \$140,000 spent to install the solar system may seem high, the savings mean these costs have been quickly recouped. Businesses seeking to copy Ballina Co-op's success need to be mindful that older buildings may not be suitable for rooftop installations, and there are limits on the amount of electricity that can be generated from grid connected systems before network access fees apply.



Figure 9. Murray Cod Australia aquaculture ponds

Murray Cod Australia

Like Ballina Co-op, aquaculture business, Murray Cod Australia, has also installed solar PV systems at two of its farms with plans to expand solar energy generation to other sites as capital becomes available. Energy is the second biggest cost of production after fish feed for this business. Through its annual carbon footprint audit, the business understands that electricity makes up about 75 per cent of its carbon emissions. However, because in aquaculture much of the power use is at night, solar-PV alone can't offset all of their electricity use. Rather than install expensive battery storage, the business chose to purchase certified green power from commercial electricity suppliers to ensure that they can realise their goal of being carbon-neutral within the next 12 to 18 months.



Figure 10. Tom Kat Line Fish employee

Tom Kat Line Fish

In far-north Queensland, line-fishing business Tom Kat Line Fish turned to solar and wind generation to supply its energy needs. The company requires energy 24 hours a day to run its operations, but in the tropics, high levels of cloud cover and seasonal rainfall can limit electricity generation from solar-PV systems. Tom Kat obtained council approval to install a direct-drive, high-torque wind turbine that harnesses energy from the trade winds. The 6-metre wide, 30-blade turbine is mounted atop a tall tower, and generates 8 or 9 kW of power per hour to supplement the company's energy needs when the solar power generated is insufficient.

Image sources:

Ballina Fisherman's Co-operative (<https://ballinafishermenscoop.com.au>)

Murray Cod Australia (<https://aquna.com/news-room/>)

Tom Kat Line Fish (<https://www.tomkatlinefish.com>)

Applications of CE in the fishing industry encourage efficient use of Australia's limited water resources, and a philosophy of responsible management of waste water from fish farming and processing.



Figure 11. Tom Kat Line Fishing dry-filleted fish

Tom Kat Line Fish

Reducing water use in fish processing while maintaining product quality is central to Tom Kat Line Fishing's operating principles. The company has implemented a dry-filleting process that is unique in Australia.

Fish are dry-filleted using ultraviolet light (to check for bones and scales) before the fillets are vacuum-sealed and blast-chilled to -40°C to lock in freshness. Paper towel rather than fresh water is used to clean work surfaces, which is later combined with fish frames from the filleting line for hydrolysing. The process complies with food safety standards, and the product compares favourably with traditionally produced chilled fillets in professional blind tastings.



Figure 12. Mainstream Aquaculture Group's aquifer

Mainstream Aquaculture Group

Mainstream Aquaculture Group's fish farming operation in Victoria has found a unique solution to supplying fresh barramundi to major urban markets while limiting reliance on municipal water supplies.

Twenty years ago, the business established an urban fish farm at Werribee, to supply the freshest produce to major markets in southern Australia and overseas. The business sustainably extracts water from a deep aquifer that is heated throughout the year by geothermal activity. The water is high in minerals, making it unsuitable as drinking water or for agricultural uses. However, the water's high-mineral content and warm temperature makes it ideal for producing barramundi in a cool climate, and reduces the company's use of urban water supplies and energy for heating.



Figure 13. Tailor Made Fish Farms aquaponics system

Tailor Made Fish Farms

Company concern about the overuse of natural resources (including wild fish stocks and fresh water supplies) led Tailor Made Fish Farms to develop a combined aquaculture and aquaponics production system. The aquaponics side uses waste water from the fish farm to grow vegetables hydroponically.

The waste water from fish production is supplemented with additional nutrients to ensure plant health and high yields. Vegetables (like tomatoes and lettuce) produced this way use only a fraction of the water of field-based crops, making them highly water-resource efficient. The business also runs a restaurant on-site that helps to reduce food miles from paddock (or pond) to fork.

Image sources:

Tom Kat Line Fish (<https://www.tomkatlinefish.com>)

Mainstream Aquaculture (<http://www.mainstreamaquaculture.com/about-us/our-history/>)

Tailor Made Fish Farms (<https://www.tailormadefishfarms.com.au/>)

Collaborative consumption



Applying circular economy principles not only depends on a ready source of materials for recovery and reuse. It also calls for an ethos that integrates circularity into business operations, and a willingness to work with like-minded businesses and consumers.



Figure 14. Farmer Meets Foodie online platform

Farmer Meets Foodie

The establishment of a virtual marketplace has allowed Farmer Meets Foodie to take advantage of a growing trend that links sustainable seafood producers directly to consumers.

The far-north Queensland company was founded due to concern that seafood and farm produce often travels long distances from the place of harvest to centralised urban markets, and then out to consumers (creating significant carbon emissions). They established an online platform and partnered with three seafood businesses to market their produce in 'virtual shopfronts.' This approach suits smaller-scale businesses looking for local distribution, or higher-value products (where transport costs represent a smaller proportion of product value). The seafood products are delivered directly to consumers, ensuring freshness, reducing food miles and providing a fair return to producers.



Figure 15. Fishing boats at harbour

Commercial fishing co-operatives

Commercial fishing co-operatives are common within the NSW fishing industry, and play an important role in the circular economy by sharing services. Co-ops provide local commercial fishers with fuel, ice, gas, cold storage, mooring facilities, transport and marketing. Co-op sustainable procurement policies and circular practices can positively influence the network of members.

Many co-ops organise training delivered through OceanWatch's national SeaNet environmental extension service. This provides advice to members on environmental responsibility and biodiversity conservation, species protection, by-catch reduction, and introduction of sustainable/circular technologies and practices. Some co-ops have implemented new digital data/IT systems to assist members in monitoring progress on key performance indicators of business sustainability and circularity.

Image sources:

Farmer Meets Foodie (<https://www.farmermeetsfoodie.com.au/index.php?>);

Trip Advisor (<https://media-cdn.tripadvisor.com/media/photo-s/10/31/f7/45/the-yamba-boat-harbour.jpg>)