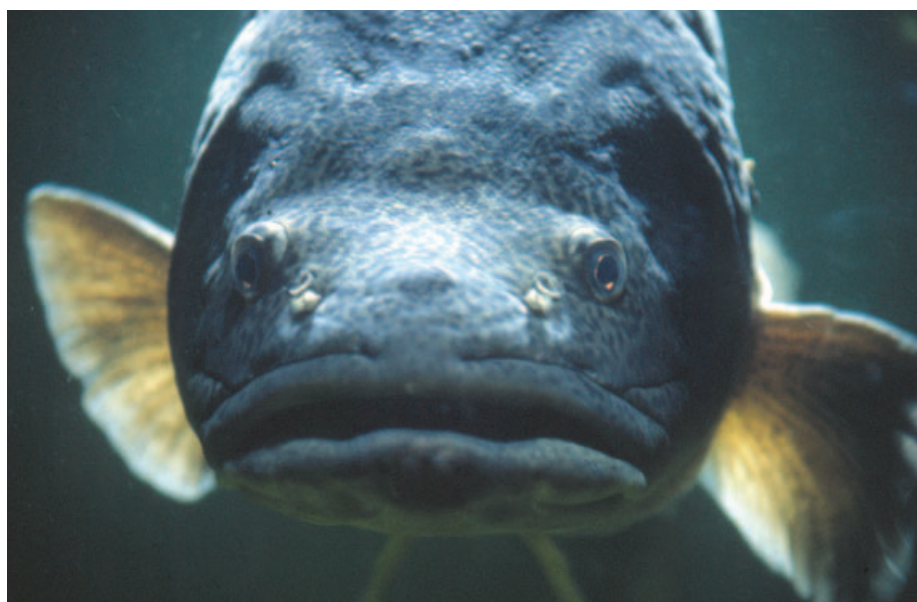


# Plant crops to clean up aquaculture waste



In Australia, Murray cod (pictured) and barramundi have been successfully farmed in commercial aquaponics operations. Sydney Aquarium

**Integrated aquaculture has been used for centuries in China, where farmers have grown rice and fish in the same irrigated plot. Now this small-farm practice is beginning to show promise in the West at a larger scale.**

Fish are efficient converters of low-grade feed into high-value protein. The waste they produce can be used to fertilise plants; plant uptake of these nutrients, in some systems, is used to clean the water for recycling back to the aquaculture module.

Environmentally, this means zero or little wastewater, reduced reliance on artificial fertilisers for plant crops and added value from the water used.

In Australia, a few researchers and entrepreneurs have been investigating different ways of using nutrient-rich water from aquaculture to supplement hydroponic operations – a form of integrated aquaculture known as ‘aquaponics’.

Tailor Made Fish Farms near Port Stephens, NSW, was established by former Sydney builder Nick Arena nine years ago, and is the largest commercial-scale freshwater aquaponics operation in Australia.

The company produces 37 tonnes of barramundi a year, mainly for the lucrative

Sydney restaurant trade. The barramundi are raised in ten 30 000-litre tanks, each housing 3000 fish.

Around 10 per cent of the water that has circulated through the tanks is drawn off to fertilise lettuce, bok choy, silverbeet and herbs grown in hydroponic channels. The company produces the equivalent of 100 000 heads of lettuce a year.

But the barramundi is the real earner. So strong is market demand for the fresh fish, says Operations Manager Peter Francis, that Tailor Made is building a new facility that will produce another 50 tonnes of barramundi a year.

The company has received interest in its technology from the US, Africa, the Middle East, Asia and Europe.

While Tailor Made has approached aquaponics from a large-scale aquaculture perspective, Dr Wilson Lennard of Minnamurra Aquaponics in Melbourne has developed a compact pilot commercial-scale system in which water is completely recycled through both the aquaculture and hydroponics modules.

In this system, solid waste from the fish tanks is diverted to a worm farm, which can also supply fish food, while the liquid

is used to feed hydroponically grown herbs and leafy green vegetables.

The water, depleted of nutrients by the plants, is then oxygenated and recirculated to the fish tanks.

An important component of any aquaponics operation is the bacteria-based biofiltration compartment. Nitrifying bacteria are the ‘work horses’ of the system, says Dr Lennard, converting harmful ammonia-based fish waste to harmless nitrates to feed the plants.

‘This bacterial conversion is especially critical for Australian aquaponic systems, as our native fish are relatively sensitive to these metabolic toxins,’ he adds.

Dr Lennard has managed to successfully trial Murray cod, a high-value culinary species that he now sells to local restaurants. He has also been selling 50–60 kg of basil a week to a pesto manufacturer.

Currently, Dr Lennard is talking to an overseas aid organisation about setting up simple, low-tech aquaponics systems at orphanages in India and Thailand.

Aquaculture researcher Professor Rocky de Nys of James Cook University sees a big future for aquaponics, particularly its integration with the high-volume hydroponics operations that service Australia’s capital cities.

He has been researching other forms of integrated aquaculture, where waste from marine aquaculture operations such as barramundi farms is used to fertilise seaweed ‘crops’.

‘You can take nitrogen – a waste product – out of the aquaculture waste stream by growing seaweeds.

‘In Canada, Europe and Asia, large operators are combining fish farming, such as caged salmon in Canada, with seaweed farming, for example, kelps.

‘In North Queensland we are looking at barramundi or prawn farms and integrating green algae for use as foods and fertilisers.

‘Seaweed products are used in food processing as polysaccharides, agar, carrageenan and food stabilisers,’ adds Professor de Nys. ‘The global market is worth billions.’

● Mary-Lou Considine

#### More information:

Tailor Made Fish Farms:  
[www.tailormadefishfarms.com.au](http://www.tailormadefishfarms.com.au)

Minnamurra Aquaponics:  
[www.aquaponic.com.au](http://www.aquaponic.com.au)

James Cook University School of Marine & Aquaculture:  
[www.jcu.edu.au/school/mbiolaq/](http://www.jcu.edu.au/school/mbiolaq/)