



# Aquaponics Proves Profitable in Australia

## Barramundi and lettuce combination increases revenues

By Geoff Wilson

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A successful Australian aquaponic enterprise is about to double its output. Its three-year track record has well-proved that fish wastes can be completely absorbed by salad vegetables . . . for a double-barreled aquaponic revenue stream.

The company involved is Tailor Made Fish Farms Pty Ltd which has an aquaponic facility located on a sandy 17-hectare (42-acre) rural block at Port Stephens close to the Australian city of Newcastle some 150 kilometers north of Sydney.

The company began its aquaponics using the famed Australian Barramundi fin fish for its aquaculture component in recirculating water tanks. The Barramundi wastes are then fully utilized for the growing of hydroponic lettuce.

In 1996, Barramundi and lettuce aquaponics was merely a raw idea in the minds of two men who met by chance in Sydney in the Australian state of New South Wales. Their well-matured idea is now a thriving “world-first” that is currently selling:



*Top left: lettuce is grown outdoors with minimal protection. Bottom right: An almost fully-grown barramundi being shown by Peter Nicholson, the manager of the hydroponic project.*

\* Around 600 kilograms of Barramundi fish a week for an almost insatiable local market for plate-sized live fish . . . and

\* Up to 20,000 heads of lettuce every month-to-six-weeks, depending on the season.

This commercial success has made the Tailor Made project Australia’s most

advanced aquaponics facility and the first aquaponics in the world using Barramundi, a fin fish of tropical waters which, when grown in colder climates like those in New South Wales, must be enclosed in greenhouses or polyhouses that entrap heat.

The next step in this operation is to expand fish production, not only of the 700-gram Barramundi but

also of two other Australian fish: the fresh-water Murray Cod and the seawater Mulloway. Such a move into two kinds of waters means that Tailor Made Fish Farms will probably be the first commercial aquaponic producers in the world to take full advantage of the range of aquaponic combinations.

While lettuce, herbs and other vegetables will come from fresh-water waste streams, the salt-water waste streams will harvest halophytic (salt tolerant) plants, such as edible seaweeds or algae that can be grazed by estuarine fish such as mullet or rabbit fish.

I forecast that the expansion in these directions will lead to other investments in aquaponics across the face of Australia – particularly as the Tailor Made Fish Farms commercial pioneering start is likely to be supported for others by Australian-government research and development funding.

A number of Australian research organizations are closely studying aquaponic investment options, especially those which can take full advantage of the horrendous stream salinity problems of inland Australia. Some are saltier than the Dead Sea thanks to massive over-clearing of farm trees and poor irrigation drainage practices.

The two men leading the Tailor Made Fish Farms project are Dr. Rocky de Nys, a marine biologist with the University of Sydney, and Nick Arena, who operated a kitchen and bathroom renovation business before he became a world leader in aquaponic management.

The two met in Sydney in 1997, when Dr. de Nys commissioned home renovations. A friendship clicked into place and their chatting somehow turned to discussions of the great potential of farming fish in recirculating systems to satisfy the demand created by over-fishing of wild stocks. Aquaponics technology, the combination of aquaculture and hydroponics, fascinated both men so they decided to do something about it.

Mr. Arena became full-time Managing Director of Tailor Made Fish Farms Pty Ltd and Dr. de Nys became Technical Director on a part-time basis



*The 10 x 30,000-liter barramundi tanks in the twin-span polyhouse at Tailor Made Fish Farms Pty Ltd., Port Stephens, near Newcastle, New South Wales. The 10 tanks have the capacity to produce at least one ton/week. Current harvest is 600 kg/week.*

(because he still works in marine biology at the University of New South Wales). This is advantageous because this university is, like many others in Australia today, “an ideas-rich environment” that can be extremely useful to private enterprise -- and vice versa. Plus, any academic who can relate so well to knock-about business is welcome indeed!

According to Dr. de Nys, a group of private investors was recruited to join them and the planning began. It took about 18 months from the birth of the idea to the purchase of a suit-



*Lettuce is delivered to a nearby supermarket on a regular basis and urgent orders are quickly filled if a supermarket runs short.*

able property that provided good water and was close to markets.

Properties up and down the coast from Sydney were inspected. The first to best meet all needs was located near Newcastle about 150 kilometers north of Sydney at the little hamlet of Bob's Farm.

Once the property was chosen, Mr. Arena made things happen . . . including work-parties by all shareholders to get the facility (comprised of 10 aquaculture tanks and a series of hydroponic tables) installed and operational. Such dedication by shareholders to their own company is perhaps one of the secrets of subsequent success of Tailor Made Fish Farms Pty Ltd.

Dr. de Nys comments, "The shareholders have now retired to being just holders of equity and not a source of labor. Nick Arena has now been running the place for three years and it has progressed well through many teething problems and many mistakes we made by being first in a new field."

"The least of our problems at start-up was passing the requirement of NSW Fisheries and the Environmental Protection Authority." Dr. de Nys adds, "They were magnificent in their understanding and helpfulness and we quickly had approvals."

Local council was also required as was an environmental impact statement (EIS) by Dr. de Nys. However, council approval was slow and arduous, mostly because untrained council staff had no idea of what an aquaponics operation was and seemed almost suspicious of it.

This problem no longer exists in NSW because of a new, one-stop-shop approach that has been initiated by State and municipal governments keen to encourage sound investment in innovative new technologies such as aquaponics.



*Managing Director, Nick Arena, next to the unique cleaning filter built by Tailor Made Fish Farms which is claimed to be superior to any other on the market. The company is making and selling units to other fish farms.*

Another problem overcome because of the expertise of Dr. de Nys was the large number of people in aquaculture and hydroponics with confused and confusing plans, models and schemes. Most were based on inadequate technology and a poor understanding of biology.

"I sympathize with other investors in the field," he said.

"They have a real job in trying to sort out what is sensible and what is plain silliness."

Water management for the project has been made unique by a waste filter innovation that Nick Arena and Dr. de Nys developed after being disappointed with either the operations or the prices of most aquaculture equipment they were offered.

Indeed, the unique, gravity-fed, Tailor Made Waste Filter is now being sold to others and is operating well at the Port Stephens Research Centre of Fisheries NSW and fish farms in NSW and other Australian States.

The units are made by a local engineer and cost from A\$2,500 to A\$3,000 (around



*Peter Nicholson lifting the inspection porthole on the fish waste settling tank adjacent to the barramundi polyhouses.*

\$1,500<sup>USD</sup>) depending on size. They are expected to find a world market in aquaculture's rapidly expanding recirculating aquaculture industry and in the expanding group of commercial aquaponic growers.

Dr. de Nys said, "Nick Arena generally researched and developed the filter. Our 10 filter units serve 10 - 30,000 liter fish tanks and have a water flow rate of 30,000 liters an hour so that the barramundi water has 24 filter cycles every day,"

"But we can scale the filters down or up to suit smaller or larger fish tanks. I believe they could be made to handle up to 60,000 liters of filtering an hour," he said.

An enormous management advantage of the custom-built filters is their ability to greatly reduce the biological load on biofilters and subsequent clogging, thus reducing cleaning labor.

"The recirculating water system we have designed around these unique stainless steel filters means reduced ammonia in the fish tanks and reduced fish stress," Dr. de Nys said.

Tailor Made is now designing improved tanks and ozone equipment specifically for aquaculture. The company has also commissioned purpose-built tank moulds as part of ongoing innovation and expansion of facilities.

The filtered fish solids are pumped to three concrete tanks (totaling about 90,000 liters) that were already on the property. These store the organic waste until it is needed in the hydroponic lettuce



*Above: Hydroponics Manager, Peter Nicholson, inspecting part of the hydroponic lettuce growing on the barramundi wastes. The barramundi polyhouses are seen in the background. Right: A close-up of a colored variety of lettuce being grown at Tailor Made Fish Farms Pty Ltd.*



unit.

The plant grow beds are managed by Peter Nicholson, a shareholder who has taken on the job of hydroponics manager. He has the honor of being one of the world's most successful organic hydroponic operators.

Storage of organic hydroponic nutrient from the fish enterprise is aerobic because the tanks are aerated. This mini-

mizes production of methane or hydrogen sulfide gases that are a product of anaerobic bacterial action in fish waste tanks that are not aerated.

As the organic fish-waste liquid is needed it is gravity-fed to an 8,000 liter hydroponic nutrient tank where a dosimeter injects any necessary micro-nutrients and tops up macro-nutrients.

According to Dr. de Nys, the Barramundi-waste-water is capable of supporting good lettuce production by itself. But additional nutrients can be required for maximized output from the 22,000 lettuce holes in the four kilometers of rectangular-section channels.

In winter, a lettuce crop has a growth cycle of six weeks and, in summer, every four weeks providing around 11 lettuce crops a year or a maximum annual output potential of around 240,000 lettuces. Lettuce is harvested three or four times a week to supply local supermarkets.

Fish output potential using the current equipment is estimated to be around one ton a week, which compares with current output of about 600 kg a week of fish grown from fingerlings from Queensland or South Aus-

tralia, to around 700 grams weight. The company expects that its system might even be able to produce up to two tons a week once fine-tuning is complete.

According to company directors, the installation of a fingerling nursery to boost initial growth will be one of the secrets behind this expansion. The 700-grams-plus Barramundi are sold live as “banquet fish” for two people.

Despite being so far south of the Barramundi’s warm, northern Australian habitat, Tailor Made Fish Farms only provides supplemental heating of water for the fingerlings “to make sure they are kept happy.”

The fish grow out in the 10 tanks in water warmed by the “greenhouse effect” of the twin-roof polyhouse erected by the shareholders. No extra heating is required for maturing fish which generally require water temperatures of more than 27° C (80° F) to feed.

Another surprise for visitors is the fact that little or no waste water comes from the aquaponics

process.

Lettuce crops completely use the waste from aquaculture, thus making money from what might have been a costly problem in waste disposal. Any excess that may occur can be sprayed on adjacent pastures for cattle or on vegetable crops as an excellent nutrient-rich fertilizer.

The well on the property provides around 30,000 liters of “drinking quality” water to the fish tanks and hydroponics. The hydroponics enterprise needs water in addition to that going through the fish tanks.

When the salt-water aquaponics is under way, seawater will come from the bay less than half a kilometer (500 yards) away.

Therefore, the Tailor Made operation is well proving some very good points about aquaponics in an almost fully organic mode.

The directors and shareholders now clearly see opportunities for expansion on the existing site and in joint ventures that include consultancy to help other investors avoid first-timer mistakes and to produce maximum revenues.

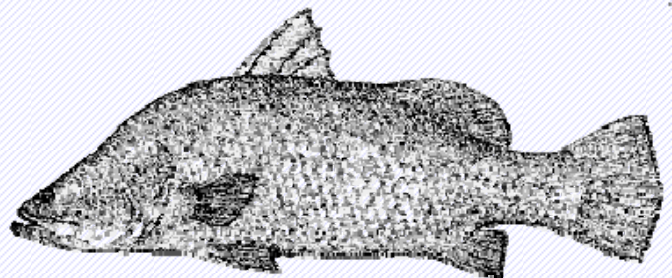
## Barramundi Facts

*from the Fisheries of Western Australia*

Barramundi, *Lates calcarifer*, occurs throughout the South-East Asian region, including northern Australia. In South-East Asia barramundi is known as Asian sea bass and a successful farming industry, particularly in Thailand, has been established for many years. In the wild, they can grow to 180 cm total length (up to 60 kg) but farmed fish are usually sold at plate size (500 g) or around 3 kg (for filleting). Research into the culture of barramundi began in Australia in 1984 with studies carried out by the Queensland Government. The work was initially aimed at adapting culture techniques developed in Thailand to Australian conditions. Following the evident success of preliminary research, the first commercial barramundi hatchery and farm was started in Mourilyan Harbour, North Queensland (Schipp, 1996).

Barramundi move between fresh and salt water during various stages of their life cycle. Mature barramundi live in estuaries and associated coastal areas or in the lower reaches of rivers. Larvae and young juveniles inhabit seasonal brackish-water swamps associated with estuaries and older juveniles are found in the upper reaches of rivers (Schipp, 1996).

Production of barramundi from aquaculture in Australia in 1995/96 was approximately 529t, valued at AU\$5.83 million. Most product (about 90 per cent) was sold as 400 to 500g whole fish, with the remainder being larger fish for the premium fillet market (Barlow et al., 1996). An increasing proportion is being sold at around 3kg.



For more information on farming Barramundi, visit:  
<http://www.wa.gov.au/westfish/aqua/broc/aqwa/barra/index.html>

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Dr. de Nys says, "We believe there's great opportunity for the export of Australia's farmed Barramundi and other Australian native fin fish. But, for that to be successful, we need considerably more investment by others so that volumes of quality fish are sufficient to attract overseas buyers seeking consistent supply."

As the company gains more and more knowledge about aquaponics, it aims to design and produce components and systems for sale which, they believe, will answer the technological and environmental challenges facing this integrated industry.

Mr. Arena comments, "The words we hate to hear are 'You can't do that.'"

A fortunate meeting by Dr de Nys and Mr. Arena over house renovations could thus be the start of a very important development of both Australian Barramundi production and to the budding

"organic" aquaponics industry. For further information including financial analysis, visit:  
[www.urbanagricultureonline.com](http://www.urbanagricultureonline.com)

#### **About the Author:**

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