Fish for Fertiliser

United Fisheries' Kypros Kotzikas says his biggest fear for commercial fish silage is there won't be enough fish waste in New Zealand to keep up with the demand. Don Carson gets the scoop on this unexpected challenge.

Pioneer work by United Fisheries' Biotechnologist, Smitha James has developed a liquid fish silage for feeding to stock, that doesn't need drying, retains the integrity of the natural ingredients and won't rot.

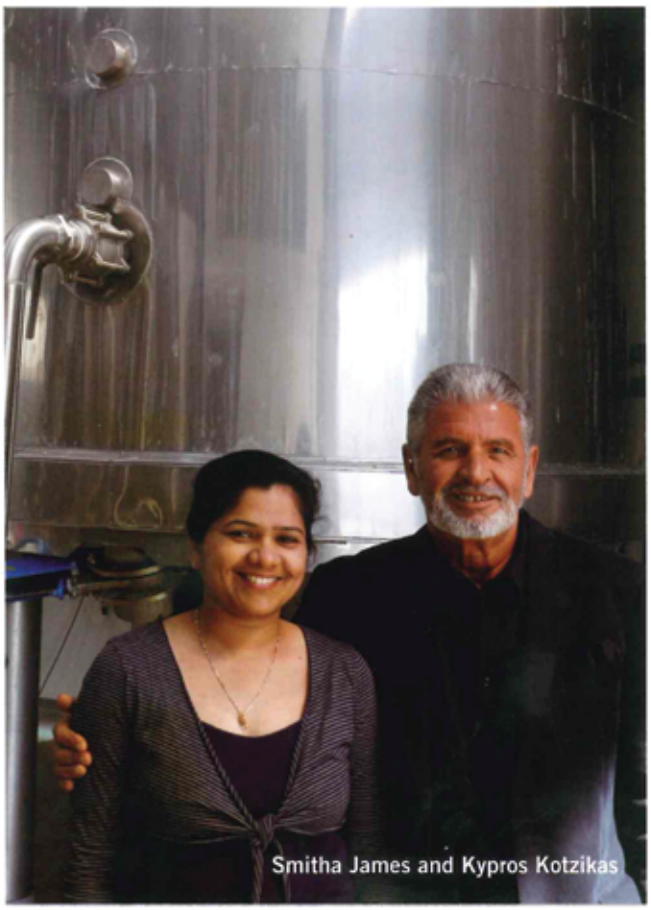
Silage made from fish is not new. It's been used for generations to feed domestic animals in various parts of the world, so obvious are the benefits. But the need to dry the waste ingredients, or to add harsh acids, has been both expensive and the nutrients tend to break down before stock can consume them.

Now, using new ways to refine the heads, frames and guts into a stable solution, which retains all the fish elements, is leading to exciting possibilities for farm animal consumption. Promising field trials, conducted by Dr Jim Gibbs of Lincoln University, have used the silage to reduce methane production and internal parasite burdens, and increase the Omega 3 properties in milk.

The developments come hard on the heels of Kypros Kotzikas's United Fisheries commercialising a fish-based fertiliser.

Kypros came to New Zealand from a mountain village in Cyprus in 1962 and over the years has developed United Fisheries in Christchurch.

With his four sons now running the business, he believes the time has come to consider his legacy. For nearly three years he had watched the suffering of his wife Mary before she succumbed to cancer earlier this year and he has his own heart problems.



Smitha James and Kypros Kotzikas

Kypros has become fixated on soil, and human and animal health and nutrition.

Inspired by the stories of the West Coast vegetable patches fertilised by the spoils of the great whitebait runs of yesteryear, Kypros set about developing a fish fertiliser from fish waste. In 2008, he hired Biotechnologist Smitha James as a food technologist. Smitha admits she only spent one week on food technology for United Fisheries before devoting her efforts ever since then to turn fish waste into a valuable product.

The results of her efforts was United Fisheries' Bio Marinus Liquid Fish Fertiliser manufactured using a unique enzymatic hydrolysis process that takes all of the offal to make a stable product that retains all of the proteins, fish oils, amino acids and vitamins, with no smell and is capable of going through the 200 wide micron spray nozzles which are the horticulture and farm standard.

The name Bio Marinus literally means "life from the sea" and the credit for coming up with this names goes to Mary.

The line-up of ten tonne fermentation processing and storage vats out the back of the Hellenic façade of the United Fisheries' factory in Sockburn shows Kypros was prepared to put his money behind his inspiration and start production of Bio Marinus Liquid Fish Fertiliser. Farmers, horticulturalists and viticulturists' feedback over the past three years has been enthusiastic.

That's where the next step of the story comes in. After all Bio Marinus contains valuable proteins, oils, amino acids, trace and other elements and vitamins, so why not feed it to stock?

A wider team was recruited. Smitha James gave Lincoln University's Dr Gibbs some literature. He was sceptical and took some three weeks to get to it. But he was persuaded by the initial United work on the product that it was a promising new approach that had genuine potential in the livestock industries.

Funding for the trials wasn't easy. Jim Gibbs thought that bringing together the interests of the fishing and pastoral industries was a proposal made in heaven for MAF officials in Wellington.

They didn't see it that way. But that delay improved the eventual shape and scope of the project. The funding for the larger venture came from a joint United and Seafood Innovation Ltd partnership.

Seafood Innovation's General Manager Tony Hadfield says his own pastoral background enabled him to see the potential.

"It's one of those projects where you're really pleased to be able to make the difference. It can give a return for the fishing industry where there's just a cost at the moment, and for farming it could be a real breakthrough."

Kypros is even more enthusiastic. "There is more money to be made out of the by-product for some species of fish than what we are making at the moment selling the fillets."


Jim Gibbs feeding calves the crumble

The benefits from fish silage appear to be many. The process is adaptable enough to not rely on specific fish offal, but take the range of product currently used for fishmeal production or dumped.

There are three potential niche uses. The first is for controlling internal parasites in lambs and calves. Parasites are developing resistance to drench treatments. In the preliminary trials, fish silage has reduced the egg burden by two thirds.

The work here is on-going. Initially Jim Gibbs palletised the silage with barley meal, but the ratio of silage was too low, unless the stock were fed huge volumes and that led to toxic effects from too much barley. Using palm kernel instead to make a crumble has been a significant breakthrough. It's working a treat – the silage rate is up to 40 per cent and there is no toxic effect.

Secondly, the fish silage is liquid enough to pass rapidly through the animal rumen and so not be broken down there. Ingredients, in particular omega oils, are able to pass through and be captured in the milk.

Milk processors are interested in the prospects for infant formula exports, where the ingredients don't have to be added in the factory, but are already naturally there in the milk.

But perhaps the greatest potential use is in the effect fish silage has on an animal's methane production.

The specific oils in fish silage interact with the complex chemistry of the rumen to significantly reduce methane output into the atmosphere, shown both here and internationally. Jim Gibbs is most enthusiastic about this end use for fish silage, citing results showing a greater than 33 per cent fall in methanogenesis in observed animals.

"If farmers are going to have to pay some sort of methane tax in the future, then we require real world mitigation strategies. Consumers widely accept natural seafood oils with positive human health benefits, and this product is a promising contribution to this area. It's a New Zealand first," he says.

Jim Gibbs says he can hardly see a downside in the use of fish silage. The liquid will store indefinitely. The stock enjoy eating the crumble. The manufacture process is low temperature and relatively inexpensive. It is a natural food source. It has a range of applications.

Kypros sees the health benefits; for the soil, for the stock and for the humans that consume the resulting products.

"Fishing catches about a million tonnes a year in this country. About two thirds of that is offal used for fishmeal production or wasted," he says.

"If we used this product to make fertiliser and silage, that's a huge amount of biological product to make the soil healthier; produce healthier grass; healthier animals and finally healthier humans."