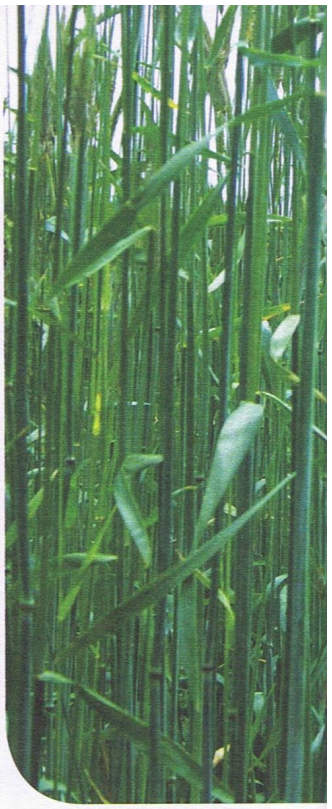

Terraquaculture in Taranaki

Kama Burwell describes her experiments in implementing terraquaculture, including growing rice, inspired by a visit to China

I grew up on a dairy farm in Taranaki, and I live on a corner of the same family farm now, with my husband Peter and our two children. For the last 10 years or so, we have been exploring what sustainable farming in Taranaki might be. That exploration led us to training in terraquaculture with Professor Haikai Tane, and in late 2009, I had the great fortune to travel to China with Haikai for a month, studying the traditional farming systems of that vast and diverse country.

We travelled widely in our short time there, covering massive distances overnight by train, which allowed me to see traditional terraquaculture in very different landscapes and climates – from low rainfall temperate mountain farming systems in the northwest, to high rainfall subtropical floodplain farming systems in the southeast. Despite the great differences in climate and landform, the same basic principles of terraquaculture were practised.

What is terraquaculture?

In a nutshell, terraquaculture is farming the water that flows through the landscape. This water is typically below the ground in drier habitats used for market gardening and tree crops, whereas in wetland habitats the ground is saturated and often has water ponding and flowing above as well. The emphasis is on stalling, slowing, and storing water in the landscape.

Great value is placed on wetland and aquatic habitats, where a skilled farmer can grow 40–50 tonnes of food per hectare per year. This is in stark contrast to the farming paradigm of Aotearoa, where we usually aim to drain away water as quickly as possible, and wetlands are either considered unproductive areas that need to be drained, or fragile areas that should be fenced off and planted in natives.

I was blown away by the beauty and productivity of the traditional terraquaculture farming systems in China. For me they epitomise sustainable farming. So we are putting terraquaculture principles in place on our corner of the family farm.

Photos Kama Burwell/Peter Heard:

Clockwise from left: Freshly planted rice paddies at the end of November

The rice in mid January. The plants are sending up multiple stalk

The rye patch

The rye patch is ripe and ready for harvest

Getting the water into the ground

We haven't had any hard-hoofed animals on our farmlet for two and a half years. Previously, a large part of it was grazed by bulls and the ground was severely compacted. Since then, the ground has fluffed up nicely through no particular effort on our behalf (the action of worms, micro-organisms, and plant roots, plus the absence of hooves, superphosphate, and urea). We hadn't really noticed the difference until the neighbours' pet cow bungled through the fence and left deep puncture holes everywhere she walked. Much more rainfall must be sinking into the soft ground now, compared to when the bulls were stomping around.

A pattern that I observed almost everywhere in traditional farming systems in China was the planting of forests on every hilltop and ridgeline. This has many functions, including keeping the ground cool so water can sink in, harvesting atmospheric moisture which drips off the trees' leaves, and providing a source of fertility that seeps downhill slowly with the groundwater.

It is a pattern that makes a lot of sense, so we have planted our hilltop with a range of pioneering shelter and firewood trees, and intend to succeed those with high value forestry and tree crops in time. Smart pastoral farmers are starting to use this landscape pattern as well.

Slowing, stalling, storing the water (un-draining our farm)

Our farm had been drained by my great grandfather, grandfather, and father. Most pressing for us was a drain that my father had dug through the wetland at the bottom

of our farmlet. It made me quite anxious to watch the water of our farm bleeding away.

In the long term, we plan to build large seepage weirs across the wetland and its downstream waterway, which will also double as vehicle crossings. They will be large structures, so we decided to build a small experimental seepage weir across the wetland first.

A seepage weir is a purposefully leaky dam, like a beaver dam. It doesn't stop the water, but the water seeps slowly through it. A seepage weir also acts to spread water flows and increase groundwater levels (and therefore storage) upstream and uphill.

We invited lots of friends around for a 'mucky bee' and happily mucked around building a seepage weir across the drained wetland from gravel, mud, and live willow branches. The willow branches are sprouting up and growing nicely. The willow leaf litter will provide lots of food for a thriving aquatic ecosystem and the roots of the willows will reinforce and protect the seepage weir from erosion.

Trialling different crops in different habitats

One of the features of terraquaculture is that crops aren't irrigated – they simply plant each crop in the right place – so that it has sufficient water and nutrients to sustain it.

We have been planting trees and gardening here for eight years, so we've started to build up a picture about matching crops to habitats. I already knew our blueberries were in the wrong place (way too dry!), the plums would be happier in a wetter habitat (they get bad pear slug each year), the chestnuts seem to be in the perfect spot, and that beetroot doesn't grow at the top of the hill even with irrigation.

This year, we consciously trialled vegetable and grain crops in different habitats, using no irrigation except when sowing or transplanting. The spring drought (no significant rain for more than two months) provided us with a good test of our crop-to-habitat matching. It is a little early to tell for some crops, but most have done well. The amaranth and sorghum are doing very nicely in their drier habitat. The beetroot, cabbages, and broccoli have done brilliantly in their low-lying spot above the wetland. The peas, pak choy, tatsoi, and lettuce would have done better if I had planted them down there too. The early onion crop was a write-off and the dryland rice trial isn't looking too good (no surprises there – rice is a wetland plant).

Growing rice

Having undrained the wetland, we were keen to trial crops that love a wetland habitat. Topping the list was rice. This amazing grass is one of the most productive crops in the world – especially when grown with its traditional companions of ducks or fish, shellfish, frogs, and snakes (!).

We built three rice paddies uphill of the seepage weir, by forming the ground into terraces. Then we transplanted rice seedlings. I've had enormous fun playing in the mud to manage the water levels in the paddies. The rice is looking really good (to my novice eyes) and I'm finding it's my favourite crop to grow. Just imagine how much more fun it will be once we've sourced the right fish species, introduced freshwater mussels, and the local frogs have moved in. Follow our progress on our blog at www.greencloak.net.

For more information about terraquaculture see www.terraquaculture.net

Learning from the masters

Peter and I think we have a good grasp of the theory of terraquaculture, but to make a good living off one hectare, we need to develop our practical skills. So in October we are packing ourselves and the kids off to a remote rural part of China for four seasons, to learn from the masters – elderly Chinese farmers who are among the most productive and sustainable farmers in the world.

We will rent a house in a village called Dragon's Nest in the mountains of Fujian province, where we will work alongside the village farmers and let the kids run wild.

They are multi-talented folks over there, able to skilfully farm a multitude of grain and vegetable crops, tree crops, medicinal herbs, mushrooms, pigs, chooks, guinea pigs, and add value by distilling tinctures, brewing beverages, and so on. We plan to focus on learning to farm rice, fish, shellfish, and frogs in the rice paddies, while absorbing the ecological, socio-cultural and economic structures that support village terraquaculture.

Kama Burwell is a former chair of the Soil & Health Association and an environmental engineer. With her husband, she has a business called Green Cloak in which she teaches permaculture and terraquaculture, provides consultancy services, and farms part time too. www.greencloak.net