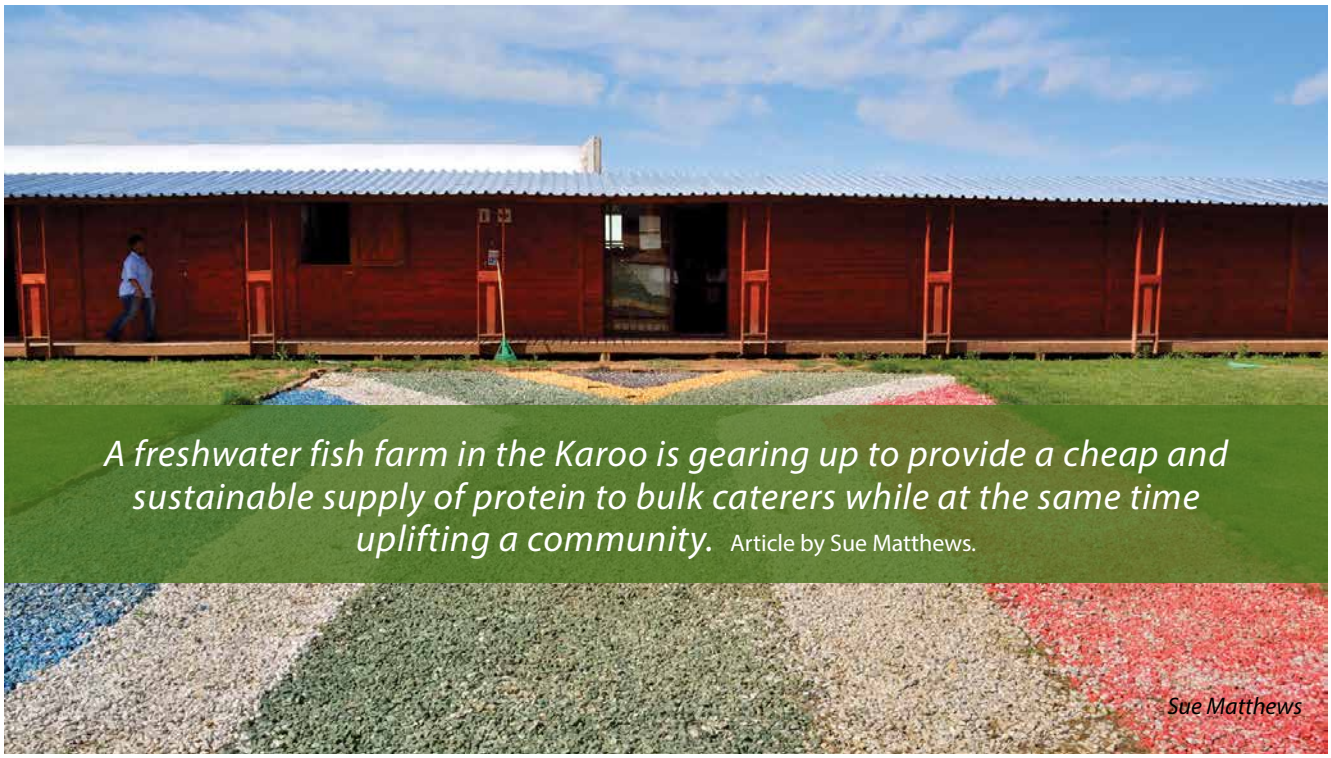
Aquaculture

Farming with fish – Community finds new hope through aquaculture project



A freshwater fish farm in the Karoo is gearing up to provide a cheap and sustainable supply of protein to bulk caterers while at the same time uplifting a community. Article by Sue Matthews.

Sue Matthews

Like many bold enterprises, it started as a hobby, became an ambitious plan, and then evolved into a workable scheme as ideas gelled, lessons were learned and hurdles overcome.

"My husband and a friend started pottering around on our Graaff Reinet smallholding, converting pig sties into fish tanks," explains Blue Karoo Trust project manager, Liesl de la Harpe. "We began raising tilapia with the idea of selling some to local shops, but farmers started approaching us looking for something to occupy the women living on their farms. At that stage we were envisaging fish grown in cages in farm dams and reservoirs, but then we found out that the Total Allowable Catch for pilchard had dropped by 80% since 2004, which meant the gap was wide open for an alternative processed fish. That changed everything, because it would need more people, intensive aquaculture systems and proper processing facilities."

And so the idea was spawned for the Camdeboo Satellite Aquaculture Project, which they presented to the Eastern Cape Development Corporation in 2008. The intention back then was to launch a two-year pilot phase in 2009, followed by a scaling-up period between 2011 and 2015 to establish 50 satellite farms, using recirculating aquaculture systems in greenhouse tunnels. The pitch paid off, in that the ECDC contributed R780 000 towards business plan development, an environmental impact assessment and a market acceptance survey – the results of which prompted a species switch from tilapia to catfish.

"Catfish scored only a few percentage points below pilchards, which were used as a control in the survey," says Liesl. "From a farming point of view, catfish is a no-brainer! It gets to a kilogram in six months, whereas tilapia takes 12 months to reach its marketable size of 450 grams."

This is the African sharptooth catfish *Clarias gariepinus*, which has a native range extending over much of the African continent bar the northern and southern extremes. Also known as barbel, it is considered an alien species in the Western and Eastern Cape provinces, but has already become widely established there as naturalised populations. It has also invaded parts of Asia, South America and Europe after being introduced

for aquaculture. Being a hardy fish that can tolerate high turbidity and low oxygen levels – and eats almost anything – it is easy to raise, even in unsophisticated systems. Global aquaculture production for the species currently exceeds 200 000 t.

In South Africa, a few catfish-farming ventures have tried to make a go of it since the late 1980s, but none became commercially viable. This was attributed largely to a lack of market research and product development – aquaculture production increased rapidly, before a customer base was secured – but the high cost of artificial feed also played a role. A second growth spurt starting in 2000 was nipped in the bud when a strengthening Rand stymied plans to export the fish to Thailand.

At the Camdeboo Satellite Aquaculture Project, they're determined not to make the same mistakes, and have put considerable effort into getting the basics right. *Clarias gariepinus* is an ugly fish with a PR problem, thanks to its eel-like appearance, whiskery barbels and bottom-feeding habits in natural environments. In whole form, it is unlikely to be chosen if displayed on ice next to trout, yellowtail or other more attractive offerings at the supermarket's fish counter – although in most countries where it is cultured it is primarily sold fresh. Even filleted, its 'bloody' flesh makes it somewhat unappealing, so the focus has been to develop a processed product that the market will accept.

"The R&D side of things has been a long journey," says Liesl. "We initially set out to prove we could develop a canned freshwater fish to rival pilchard, so we started out doing it with tomato sauce in small cans, and later moved to large cans. Now we're packaging the fish separately in 2 kg retort pouches, and working with Crown National for a number of different sauce options. Because catfish flesh is quite bland, it takes on the taste of whatever sauce you put it with. So a cook on an oil rig, for example, could buy the fish and ten different sauces, make a variety of meals, and the crew would never guess it's the same fish!"

The product – marketed under the brand name Karoo Catch – is to be targeted specifically at caterers in remote areas, schools, hospitals, prisons, military bases and other operations making use of bulk-feeding schemes.

The farm already has a contract to supply 10 tonnes per month to its first customer, and has letters of intent from others. While feed is indeed expensive – making up 70% of the farm's running costs – it is now being made by Montego, which is based in Graaff Reinet. The cost is partly offset by the farm supplying Montego with heads and tails discarded during processing for use in pet food, but the fish feed contains pricey chicken meal and fish meal. During 2016, researchers from the aquaculture division at Stellenbosch University will be investigating cheaper sources of protein, such as maggot meal or blood meal, with co-funding from THRIP – the Technology and Human Resources for Industry Programme of the Department of Trade and Industry (DTI).

African sharptooth catfish, Clarias gariepinus.

Production manager, Philip Steenkamp, in a grow-out tunnel housing some 25 t of fish.

Aquaculture trainees wait for water to drain during filter cleaning.

The study forms part of a broader THRIP-funded research project headed by Suné Henning from the Department of Food Science and Technology at Cape Peninsula University of Technology (CPUT). Her students will be focusing on product development in the short term, as well as environmental aspects influencing the quality and nutritional value of the fish. They have already gained a valuable understanding of some of the issues to address, because the catfish farm currently has its fish processed in the greater Cape Town area – partly on CPUT's Bellville campus! Blue Karoo Trust used some of its funding to develop a pre-processing line in the Department of Food Science and Technology's pilot plant, where the fish is filleted and minced before being sent to a company in Stellenbosch for packaging and sterilising in retort pouches.

This approach has been useful in ironing out problems and developing the necessary quality control and food safety systems, but transporting the fish to Cape Town in refrigerated trucks is costly. A processing factory will therefore be built on site in Graaff Reinet during 2016, using a R5.4 million grant from DTI's Employment Creation Fund. The processing factory is a key component of Commercial Phase 1, which upon completion would also include 10 aquaculture production tunnels, a hatchery, and training facilities for both farming and processing.

By the end of 2015 the farm had four tunnels in operation – three for production and one for training – as well as the hatchery and a suite of classrooms. Funding contributions to date that have made this possible include a R23.5 million loan made available by the Development Bank of Southern Africa through its Green Fund, a R10 million contribution from the Department of Agriculture, Forestry and Fisheries, R2.7 million from the Industrial Development Corporation, R1.43 million from the Eastern Cape Job Stimulus Fund, and R200 000 from the Cacadu District Municipality, in which the Camdeboo Municipality lies.

The training and job creation aspects of the project are particularly important given that, according to the 2011 census, some 36% of the population aged 20 and older in the Camdeboo Municipality has either no schooling or not gone beyond primary school, and the unemployment rate stands at 30%. Liesl points out that because so many people in the area live on grants, many families lack a role model for being employed, which means there's a limited understanding of what is expected of them in the workplace.

"It's been a massive learning curve on all fronts, but we now have a training programme that works," she says. "We start off with basic adult education, life skills and work skills, during which the trainees receive a stipend, and that's increased for the second year, when they do a learnership. As part of that we run a competition over six months in the training tunnel, allowing them to practise and make their mistakes, and they're mentored as needed. The learnership culminates with an NQF Level 1 qualification, at which stage staff are fully equipped to run the system, and eligible for an employment contract. There are now about 110 people who are either in training or recently qualified, but we'll need 190 people on site for the 10 tunnels planned for Commercial Phase 1."

The farming operation is overseen by technical partner Leslie Ter Morshuizen, who runs an aquaculture training and consulting service in Grahamstown. He spends a week every month at the farm, and has a production manager as well as a hatchery and training manager on site. He explains that the stocking density in the grow-out tanks at harvest time is approximately 400 fish per cubic metre of water, and that optimal growth rates are achieved with a water temperature of 28°C. Since heating is required during the winter months to maintain this temperature, solar panels are being installed to reduce dependency on the Eskom supply, and hence lower production costs.

Back at his home base, he is working on a project with Rhodes University to improve water recycling efficiency and wastewater treatment. The farm relies mainly on borehole water, although it is connected to the municipal water supply too, and water quality in the recirculating aquaculture systems must be kept at acceptable levels for the fish to thrive. Water therefore passes through a mechanical filter to remove faeces, and then through a biological filter where nitrogen-fixing bacteria convert potentially toxic ammonia to nitrates, but some water is discharged when the filters are rinsed.

"We lose between 15 000 and 25 000 ℓ of water per day, which currently flows into a marshy area where it evaporates or seeps into the ground. We're planning to pump that water to what we're calling a wastewater repair system, where we'll remove all the organic material, use it as a fertiliser for crops, and return the cleaned water to the fish."

Based largely on the integrated algal pond system that the Institute of Environmental Biotechnology at Rhodes University developed with Water Research Commission funding, its efficacy for aquaculture wastes needs to be properly assessed.

There is also scope for aquaponics – the combination of aquaculture with hydroponics in a recirculating system. The excretory products of fish provide the nutrients for direct uptake by plants, which cleans the water for the fish. Leslie constructed his own tilapia-based aquaponics tunnel in Grahamstown in 2012 and grew herbs and vegetables such as basil, rocket, lettuce and cucumbers, selling both fish and greens on a small scale. He would now like to install a system at the catfish farm as a demonstration unit, budget-permitting.

And what of the early aspirations for satellite aquaculture farms, dotted around the Karoo? There's still a hope that the dream might become a reality at some stage in the future, but for now that's been put on the backburner as a possible Phase 2.

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The catfish farm makes use of recirculating aquaculture systems in greenhouse tunnels.