

A Living Gift

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A grown-up might say "yummy", looking at the fat fish. A child, observing the yellow flow coming from its mouth, would probably claim that it is truly disgusting to look at. But, we are on a fish farm and, as you will find out later, this is simply a part of modern fish production, yummy or yucky!

Modern fish production systems will not seem too strange to you if you compare them with a more familiar process—though it is still a bit of an eye-opener to watch fish being brought up by humans. Still, let us start with the comparison: if you go to a modern chicken farm you will definitely not find hens sitting on nests in shady shacks, resting patiently on their eggs till they are ready to hatch. In fact, the eggs are collected from the hens on a daily basis. Those that are not packed and sold in six-packs are put into a hatching machine until their shells break and the chickens are ready to live their lives, before they go to the deep-freeze department of a supermarket.

You might think that things would be quite different when it comes to farming fish. But this is not necessarily true for all fish everywhere. If you drive around 40 km east of Thailand's capital, Bangkok, you might notice a nice white wall with some giant fish painted on it and a big poster telling you that this is 'P. Chareon Farm'. 'Fish farm' would be

more precise. Of course, none of the eggs produced here are taken directly to your table, but otherwise the comparison with the chicken farm stands.

The brood area consists of around 200 small ponds, at some distance from the highway, covered by a light roof. Each pond has a cement walkway around it with blue netting around the inside. This is the equivalent of the hen house, and the egg producers are swimming in selected ponds. Here the eggs are collected each week, and are then taken care of by the expert staff. The care they give is probably even better than the fishes' mothers would have given them. And, like hens, the mother fish will straight away note that their eggs have disappeared and will immediately begin producing new ones. At least, they will during those months of the year when the temperature is not too high for comfort.

The particular fish farmed here is called the Nile Tilapia and, like all tilapia, it tends to be a very good mother, and takes good care of its offspring. The father plays a caring role too. So, he will build a nest in the soft bottom of the basin in which the female fish will spawn. Her eggs are then fertilised by the male. Right after that in the wild, the mother fish sucks all the eggs into her mouth, and keeps them there for ten days, just letting water circulate around them and not taking any food for the whole period. This was nature's idea, but on P. Chareon Farm they do it differently.

Looking back in time

Now there were not always experts on this farm. Twenty-five years ago Preecha Nawatrilap, the founder of this large family business, owned a 4 acre plot some distance away from here, but still in the same region



Eggs, stored in the mouth of a healthy fish, are harvested by a fish-farm worker. They will be very well taken care of in this hatchery.

of Chachoengsao province. He used these 4 acres entirely for the production of young fish. Now he owns 300 acres, spread over three locations, and uses them for exactly the same purpose.

When Preecha began his business, pond fish were not held in high esteem in this area. The preference was definitely for wild fish from rivers and lakes. As Preecha's 24 year old son, Prachaya, will tell you, there was a good reason for this. The quality of the cultured fish was generally low and tended to vary between producers and from one season to the next. So, it was a tough market. Not that the Nawatrilap family faced the consumers directly. From the beginning they specialised in producing small fish for other pond owners to grow to market size, and this is still their main concern.

But gradually Nawatrilap senior got a better grip of his trade, and expanded his landholdings. He learned from a friend in the Fisheries Department how to improve his management of the farm. This increased the quality of the fish he produced and, by 1986, he was able to expand to the P. Chareon Farm. Over the years he changed the site, which sat on 100 acres, into a modern hatchery.

If we ask Preecha's son to show us around, he will proudly point out the details of the equipment as the busy workers bustle past: "This is my father's invention" he says, telling us that Preecha has expanded a great deal on ideas picked up elsewhere over the years. We can try to see the fish at their various stages of growth, from eggs to tiny fish, which any expert will tell you are known as 'swim-up sizes'. And, if we do, Prachaya will gladly point out that the containers, the tubes and the water-flow mechanism are a copy of those they have developed down at NAGRI. What is NAGRI? Well, it is the National Aquaculture Genetics Research Institute, and it is there we must visit next.

A multi-purpose institution

In a set of cool laboratory buildings near to Bangkok you can meet the director of NAGRI, who will smilingly admit that her institution is a much smaller operation than the Chareon farm. However, NAGRI uses more labour: the institution employs 60 people at its headquarters and 40 more on 4 substations spread over the country, while Preecha employs 50 people on his private fish farm. But the budgets of the two can definitely not be compared, as the farm produces 100 million fingerlings annually for sale to other farmers. Such a high production number ensures that the farm's work has a very great impact on the quality of pond fish produced in this part of Thailand.

When you consider the National Aquaculture Genetics Research Institute's name, you might think that it has a pretty narrow task. Do the researchers live a quiet life in the nice buildings set in a green landscape outside the bustling city? Far from it. The work done by the institute is much broader than its name signals. The laboratories are important, of course, containing advanced equipment and running experiments which are registered on dozens of computers. But, outside there are also fish ponds and a hatchery where, as Prachaya told you back on the farm, the researchers have worked as engineers and inventors. They have come up with machinery and equipment which is easier for smaller hatcheries to handle than that which they could buy ready-made from factories.

Plus, this installation is a school as well, offering advanced training to students from the university and to colleagues from Thailand as well as to those from other countries. The technical staff of the fisheries' authorities come here for training which will teach them how to improve fish production. Also, and not least for the Nawatrilap family as well as



Tanks containing harvested fish eggs. When the eggs hatch, the tiny fish fry will swim to the surface and spill over into trays—an example of efficient, simple technology based on sound scientific know-how.



A worker on a Vietnamese fish farm carefully inserts a microchip beneath the skin of this fish. This ensures that the lineage of each of the thousands of fish bred here can be easily traced.

for many other fish farmers around here, this is a 'fish university', which teaches the farmers a lot of what they need to know to run their businesses. The four other stations in the country do the same in their own regions, giving courses when farmers present their problems.

But, the institute is also a high quality fish producer, which sells fingerlings to farmers and which delivers to other government institutions. This allows NAGRI to make an income—its budget certainly needs a booster. But this is also, and just as importantly, a way to make sure that when pond owners renew their stock, they use healthy and productive fish.

Last, but not least, NAGRI is taking care of spreading the news and information concerning this trade. Some of the news is very hot, as Preecha Nawatrilap will tell you. Let's go back to his farm.

Selling like hotcakes

It is noon, and very hot. There is not a lot of traffic, and no lorries wait in the covered parking space outside the office building. But, customers are expected late in the afternoon, when the air cools down a bit. So, transparent plastic bags have been filled with water and left on the cement floor near the small concrete basins. The buyers will want young fish of fingerling size—and two out of three will ask for tilapia. There are several strains of this fish in Thailand, but there is no need to ask the buyers for details, for most probably they will just request GIFT.

Not that they expect it to be free, the name is simply a short way of describing this type of tilapia. In fact, this is the type of fish we saw delivering its eggs when we first came here (remember the yellow flow from the fish's mouth?). The name stands for 'Genetic Improvement of



Young fish being transported to their new home. They can survive for up to eight hours in bags like these, which contain a good supply of extra oxygen.

Farmed Tilapia'. Preecha will tell you that it certainly is an improvement over the Nile Tilapia he used to produce. He might not know the details of its long history, but he knows that this fish has been good news for him for the last five years.

The way he treats these new fish is no different from the routines he used to produce fish previously. But he will stress that he is careful to make sure that he continues to farm pure GIFT fish; he ensures that his stock does not get mixed up with wild tilapia from the rivers and canals around about. Some hatcheries might not be so careful, a point he stresses, and in the long run those hatcheries may have poorer results because of this. Because they are not as careful as him, other farms may not have a quality control laboratory with microscopes, which you will find here, to make sure that they sell only first-rate fingerlings.

Preecha's statistics are impressive. They correspond well with NAGRI's figures and, for that matter, with the figures quoted by Bangladesh, China, Vietnam, Indonesia and the Philippines (where it all started, back in 1987).

A demanding idea

Tilapia is originally an African fish which was introduced to, and is doing well in, Asia. It is popular in fish ponds, because it can grow on little feed from outside the pond and breeds easily. But, it is not exactly a fast grower. So, in consultation with its partners in aquaculture, the WorldFish Center, whose headquarters were in the Philippines back then, came up with the idea of trying to breed a better strain of the fish.

Of course, they knew this would not be easy. In far away Norway, scientists had been able to develop improved salmon strains which

outperformed the wild strains in temperate waters. But, in Israel, scientists had had no success trying to improve a tropical fish. And tilapia is, of course, tropical. Tough luck.

But, combining the forces of the WorldFish Center, the Norwegians and several research institutions in the Philippines, the work began by selecting Nile Tilapia from many locations in Africa and Asia. Mixing them with each other did not produce any useful results, only more of the same low growth. So, a round of hard thinking came up with a more refined technique. This required not only skilful planning and expertise but was also a major task in terms of calculation and registration. It also required a lot of labour to run the laboratories and the ponds. Last, but not least, the research required plenty of water space and netting.

The thousands of fish needed were divided into groups of males and females, and each of them was given a registration number by means of a tiny electronic chip inserted under their skin ('tagged', as the scientists call it). The males and the females were then paired.

The eggs of one female would be fertilised by two or three males—the eggs from each mating going into a separate small net-cage. Once the fish grew to the required size, they were compared. From the families in which the most fish survived, the biggest males and females were selected. They, in turn, were tagged and combined in pairs, and from their offspring, the best performers in terms of growth and survival were again selected.

As the people involved will tell you, the whole programme was very time consuming. Why? Well, for a start, it takes wild tilapia almost half a year to grow to maturity. To this must be added the fact that the scientists involved needed time to calculate their results after each new



It is not only research stations that use cutting-edge science. Private hatcheries like this one use advanced technology for quality control inspections.



This tilapia is just about the right size to be harvested. It will be sold, either for use locally or for export, for a very good price.

generation had grown. Also, at this stage, the institutions involved had to spend days trouble-shooting, keeping in close contact and comparing results from the locations where the research was performed. So, step by step, the methods were refined and simplified. Still, all this hard work was worthwhile because the results were inspiring.

The researchers arrived at a promising successive generations of GIFT fish. These were spread—with all the quarantine requirements and safety measures needed—to a few countries in the region, to see if they would work as well on the research stations and in farmers' fish ponds there. The results were convincing everywhere.

A combination of improvements

NAGRI has kept track of production figures in Thailand, both at the Chareon Farm, of course, and at tens of thousands of other small hatcheries and small fish farms. The figures have been clear and constant. The GIFT strain grows 40 per cent better than the local strain. This means that a local fish will end up with a weight of around 700 g after eight months, good enough for the local market. But a GIFT fish receiving the same feed will have passed the 1 kg mark, qualifying it for a better export price as a frozen fillet. Plus, smaller GIFT fish will still fetch a better price than a local fish, because their quality is higher.

And that is not all. The new fish is hardier so, again in comparison with the local fish, 35 per cent more of its fingerlings will survive to reach maturity. So, if you combine the better growth rate and the higher survival rate, the gains made in Thailand are more than 60 per cent.

Preecha Nawatrilap believes that the results achieved on his farm are a little bit lower than this. But, on the other hand, his son notes that tilapia used to account for 35 per cent of the farm's income, with two other fish accounting for about the same share. But now tilapia accounts for close to 60 per cent of the farm's income, so you can be sure that it brings in good money.

But this is far from the end of the story. All countries involved in the project have continued the selection work. The sixth GIFT generation of 1997 is now regarded as the new 'base-line' tilapia, and each country undertakes experiments, both with regard to growth and with regard to making the tilapia perform better under specific conditions. At NAGRI, the second generation of 'their own' tilapia is already 10 per cent better in terms of growth than the basic GIFT fish, and the other countries report similar gains.

But there's a lot more

The project delivered the hoped-for improved breed of tilapia, and everyone involved could simply have taken pride in that result alone. But, in the process, the project's partners developed, jointly, a simple and environmentally friendly method of breeding for improvement that will work for tropical finfish in general. This technique is now being used for other species of fish, among them some popular carp species.

The many institutions taking part in the original project and in the follow-up and testing of the GIFT have learned a lot of new things. This was through special courses on the methods and through the academic work of a number of students who worked on the project. All the countries which worked on the project now have national breeding programmes. All this adds up very nicely, giving a strong impact in terms of what is called 'capacity building'.



The hatchery at P. Chareon fish farm produces hundreds of thousands of juvenile tilapia each day, providing food, income and employment for people in the region.

During the early years of the project, consultations were found to be so useful that a special network (the INGA or the International Network on Genetics in Aquaculture) was established. This now involves 13 countries in Asia, the Pacific and Africa, 10 scientific institutions in industrialised countries and 2 international organisations. What is more, to secure the continuation of the research partnership, and to ensure a wide distribution of the GIFT fish—and of later, improved generations—an international foundation has been set up in the Philippines. This uses income from the sales of the fingerlings to finance the work. Monthly production there now stands at around 25 million fingerlings a month.

The Nawatrilap family's results are not recorded in the official documents of the project. But such self-made producers are just as much a part of this very positive story. So, it is for good reasons that the name of the farm, Chareon, can be translated as 'Progress'—or simply 'Success'.