



# Tilapia

What should we know?

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**Species tool**

# Tilapia:

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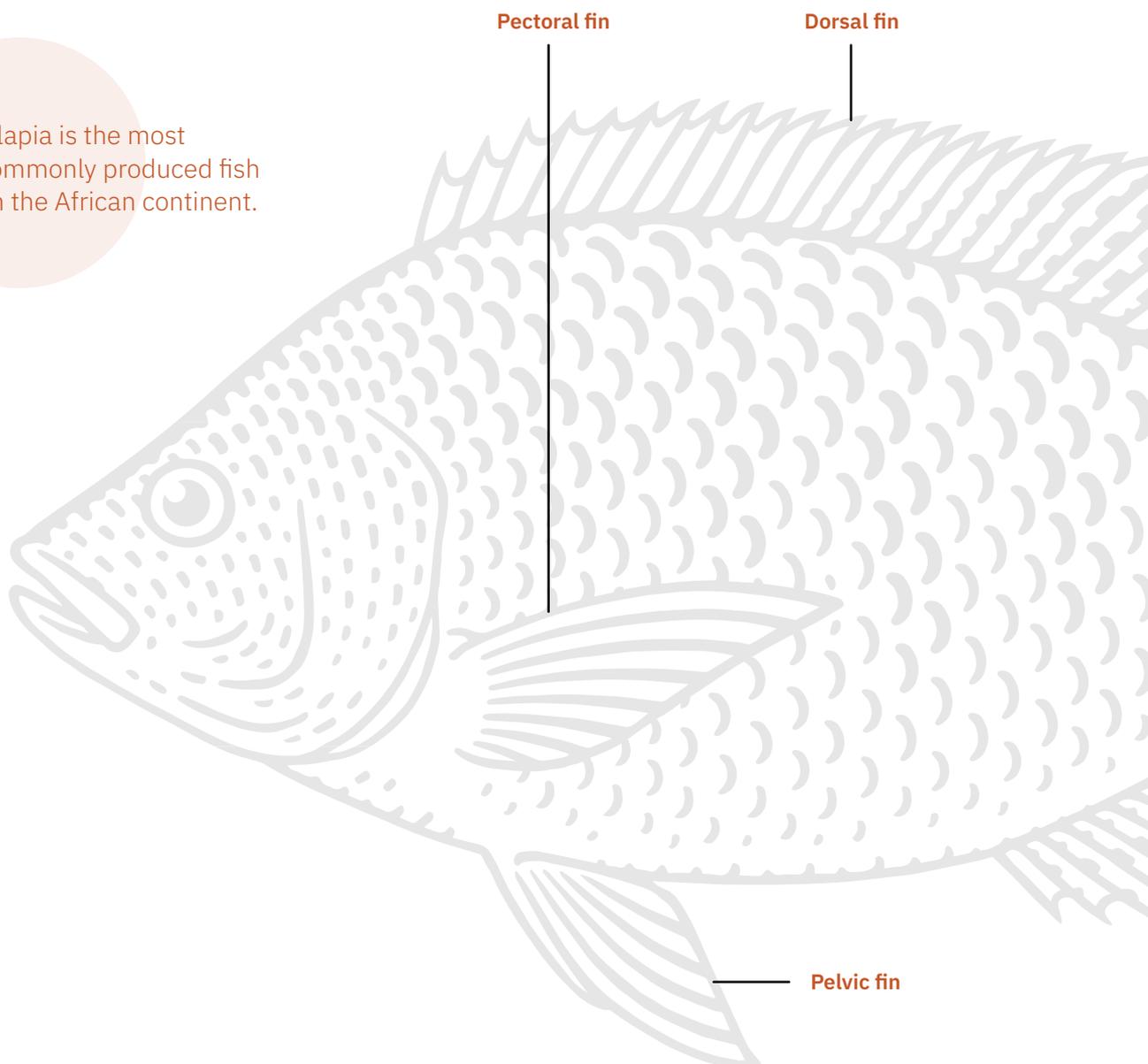
Tilapia farming is one of the oldest forms of fish farming and has developed into a worldwide professional industry. Tilapia are warm water-fish and originate in Sub-Saharan Africa and the Middle East. They are hardy fish that grow well in fresh and brackish water.

Tilapia is the second-most farmed fish in the world, after carp. It has a unique role in subsistence farming in developing countries and is widely produced and exported to high-value markets. Tilapia is a robust tropical fish that can be farmed very sustainably and is often described as an ideal aquaculture species because it is hardy, fast-growing and prolific.

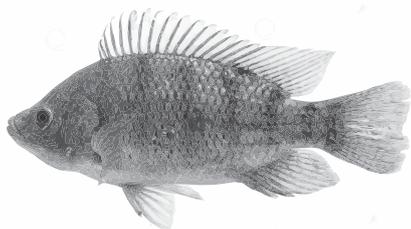
Tilapia can be easily identified by an interrupted lateral line characteristic of the Cichlid family of fishes. They are laterally compressed and deep-bodied, with long dorsal fins. Tilapias are predominantly herbivorous fish that convert lower digestible vegetable products into high-quality fish proteins, making them all the more commercially attractive. Tilapia fillets are internationally recognised as delicious and healthy products.

It is the most commonly produced fish in Africa, and its popularity is partially due to its robustness. The increase in Tilapia production is consistent with both population growth and schemes implemented by governments to boost aquaculture in specific countries.

Tilapia is the most commonly produced fish on the African continent.



# Well-known tilapia species are:



## Mozambique Tilapia

*Oreochromis mossambicus*

The Mozambique or 'Java' tilapia is generally black in colour. The underside of the head is white, and the dorsal and caudal fins have red margins. The *O. mossambicus* can thrive in freshwater, brackish water and/or seawater and is the most common tilapia found in coastal waters upstream of the surf zone. This tilapia breeds in short and successive cycles. It is a commercial food fish, and the small-sized Mozambique tilapias are also used as forage fish for carnivorous marine fishes.

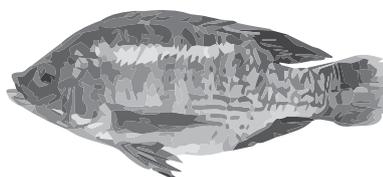


## Red Tilapia

*Oreochromis spp.*

The red tilapias are hybrids produced from crosses between *O. mossambicus* and *O. niloticus* (Taiwanese red tilapia) or *O. mossambicus* and *O. niloticus* (Philippine red tilapia). Red tilapias have no stripes on the caudal fin. Their fingerlings are produced and supplied by several hatcheries.

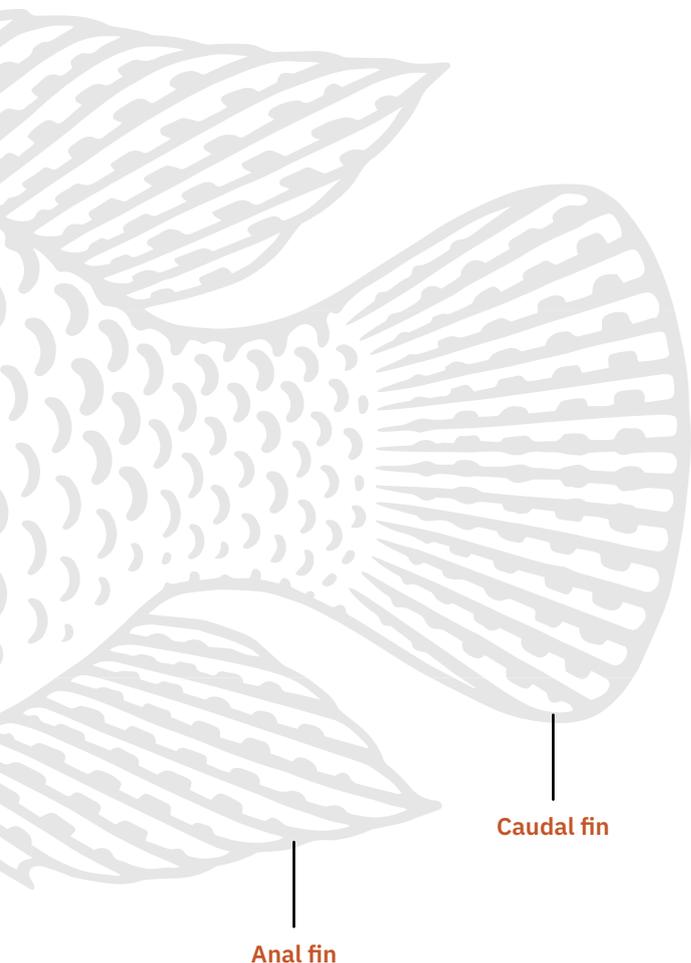
Red tilapias grow as fast as the Nile tilapia and can grow even better in brackish water ponds and sea cages. They have become a popular choice for farming, especially in some Latin American countries. In most parts of Southeast Asia, red tilapia enjoys a good market in fresh, chilled or live form.



## Nile tilapia

*Oreochromis niloticus*

The Nile tilapia is the most popular, globally farmed tilapia species. It has vertical black bands on the body and caudal or tail fin. The dorsal fin (or the fin on the top part of the fish) has a black outline, and the caudal fin has a red margin. Nile tilapia is most preferred because it grows fast, is hardy, and well well-adapted for farming in warm tropical countries.



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# Tilapia farming

The Nile tilapia is generally euryhaline, which means it can thrive in a wide range of salinity, from fresh to seawater. However, it grows best in freshwater under temperatures of 27–31°C. The other species (Mozambique, red hybrid, etc.) are more tolerant to saline waters. Although tilapias are freshwater fish, some species can live in saltwater and withstand high temperatures (between 13–30°C), as well as have low oxygen requirements.

Tilapia demand feed with high nutritional value for easy growth. They are known to be predominantly herbivorous, but can also be trained to eat artificial diets such as the commercially available tilapia feeds that contain plant and animal protein, among other ingredients that are sources of nutrients, such as amino acids, lipids, carbohydrates, vitamins and minerals. Several commercial diets, even phase diets or feeds for different tilapia growth stages (e.g., feeds for tilapia fry, fingerlings and juveniles), are available locally.

## Hatchery

The success of any tilapia farming operation depends mainly on the quality of seedstock used. Farmers can procure seedstock from reliable, reputable hatcheries or their own hatchery to efficiently grow market-size tilapia. Three methods of tilapia fingerlings production are commonly practised. These are:

- **Open ponds (the most commonly used)**
- **Tanks**
- **Hapas (net enclosures) placed in ponds**

For these methods, fry are collected from the spawning units and stocked into fertilised ponds for rearing to the fingerling stage before they are stocked into grow-out ponds.



### Open pond

A properly constructed and well-fertilised pond serves both for breeding and rearing fry. Breeders are stocked into the ponds and allowed to spawn naturally. The brood fish are stocked at a sex ratio of 1:3 or 1:4 (males to females). A female brood fish produces as much as 500 eggs per spawning.



### Tank method

Producing tilapias following the tank method is quite expensive, although it is the common choice of many hatcheries. The hatching tank needs good water quality, and it requires oxygen provisions, unlike in ponds. Hatcheries would need to install blowers and compressors to ensure that the fish do not die. The sex ratio should be 1:3–1:7 (males to females), and the water depth should be maintained at 50–70 cm.



### Hapas

A hapa is a cage-like, rectangular or square net impoundment placed in a pond for holding fish for various purposes. They are made of fine mesh netting material. The mesh size is such that the fry or fish inside cannot escape. Hapa sizes vary, but the ideal size measures 3 m long, 3 m wide and 1.5 m deep. When using hapas to generate fingerlings, stock brooders should be held at a ratio of about 1:5–1:7 males to females.

## Nursery

A nursery tank is a tilapia rearing pool where the young fish develop into fingerlings. The shape and structure of the product types used are different from the hatchery. When the ponds are ready for stocking, the tilapia fingerlings are transported from the hatchery to the farm. Once on the farm, these must be gradually acclimated to the pond water's salinity and temperature levels. The sealed transport bags are allowed to float in the ponds until the water temperature inside the bags is equal to that of the pond water. The bags may also be opened, and pond water gradually added.

## Ongrowing

Because of their feeding behaviour, tilapias grow fast and survive well in different farming systems, given water quality conditions conducive to good growth.

### Farming in cages

Tilapia can be grown in net cages in natural waters like lakes.

### Cage module types

Fixed cage module and floating cage module.

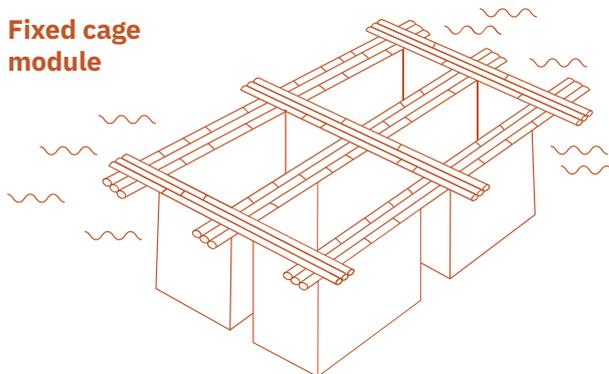
#### Fixed cage module

A fixed module is usually made of bamboo poles on which cages are secured. Fixed modules are chosen when the farm is located at shallow lakes, lagoons or bays of 1–2 m deep.

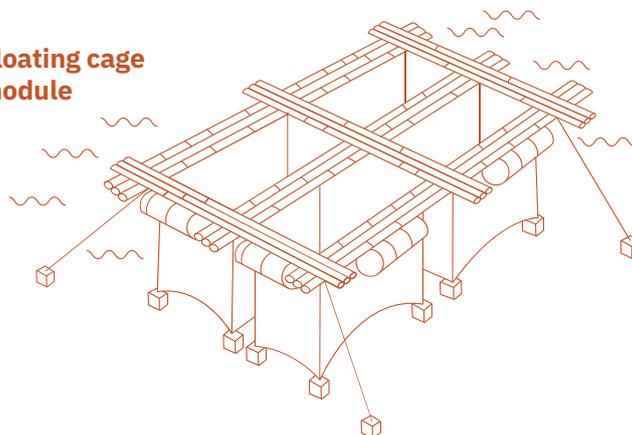
#### Floating cage module

If the selected culture site is in relatively deep lakes, reservoirs, lagoons or bays, a module that stays afloat on the water would be most ideal.

Fixed cage module

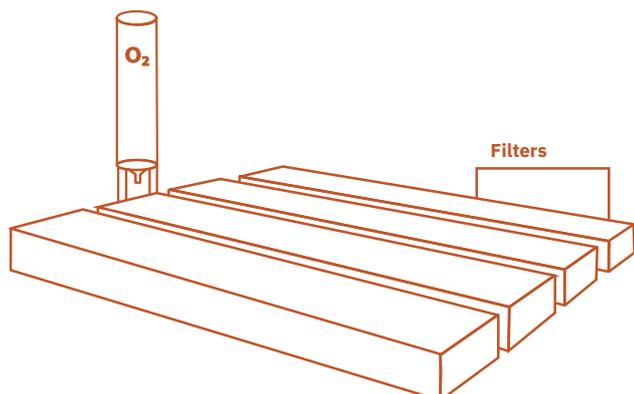
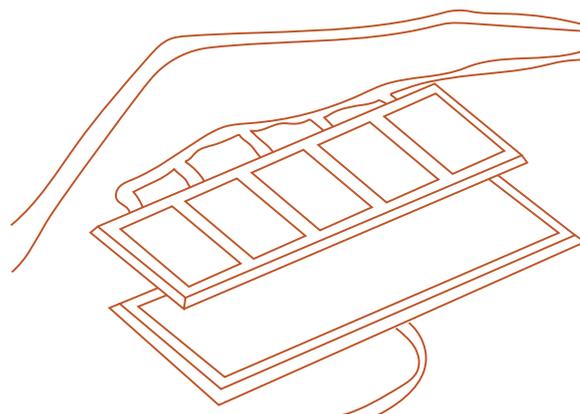


Floating cage module



## Pond farming

Ponds are earthen impoundments, either excavated or diked in, depending on the terrain, such that flooding and draining of water can be done with ease at any given time. Earthen ponds are the most widely used system for growing tilapia to marketable size. Pond compartments may be as small as 100 m<sup>2</sup> or as large as one hectare (10,000 m<sup>2</sup>). Ponds may be from 0.5–3 m deep, depending on the operator's capability, preference and production target.



## RAS farming

In colder climates, tilapia can be farmed in recirculation systems. These systems are more sustainable, providing optimal conditions for high performance while keeping environmental impact to a minimum. Feeds suitable for such systems must meet further criteria other than nutritional value, like high water stability and durability when used with automated chain feeding systems.

## Broodstock

Some of the things that one should know about before starting a tilapia hatchery are how to select and manage broodstock. Broodstock is a group of mature fish that is used for breeding. They can be sourced from other hatcheries, or they can be grown to ensure their quality. Using good broodstock is key to establishing a successful tilapia hatchery, so it is also essential to understand how to manage them. Some of the criteria for selecting tilapia broodstock are:



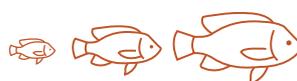
**Good health**



**No deformation on the body, especially the fins**



**A well proportioned body**



**A high growth rate and low FCR**

## Harvest

### Cages

In most countries, the preferred market size for tilapia is 350–500 g. However, this can vary to 150 or 850 g. At least two people are needed to lift a 5 m x 10 m net cage during harvest. For bigger cages, up to four people are needed to lift the cage from a small boat.

### Pond

Tilapia may be harvested from the ponds when the fish reach marketable size (150–300 g; 3–7 fish/kg). Tilapia are best harvested by seining and draining the pond. A complete harvest is not possible by seining alone. Tilapia are adept at escaping a seine by jumping over or burrowing under it. Only 25–40% of a Nile tilapia population can be captured per seine haul in small ponds. Other tilapia species, such as *O. aureus* (Blue Tilapia), are even more difficult to capture. A mesh seine (with a bag) of proper length and width is suitable for harvest.

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# Commercial products

Tilapia can be sold as live, frozen whole and gutted, frozen fillet or dried. Some common serving suggestions include:

- Tilapia tocino
- Tilapia longganisa
- Crusted tilapia nuggets
- Stuffed tilapia rolls
- Brazilian fish stew (Moqueca de Peixe Baiana)
- Grilled tilapia



# Challenges in tilapia production

Under natural conditions, it takes about six months for tilapia to grow from 10 g to 150–200 g, feeding on natural food. With dedicated extruded tilapia feeds, 500 grams or more can be achieved within the same time.



## Feed intake

The key factor considered in the production of farmed fish is growth performance. The more palatable the feed, the more attractive it is to tilapia. Palatability is an important aspect to be considered when formulating feeds. By controlling this characteristic, it is possible to reduce the amount of uneaten feed, thereby minimizing pollution and improving growth and FCR.



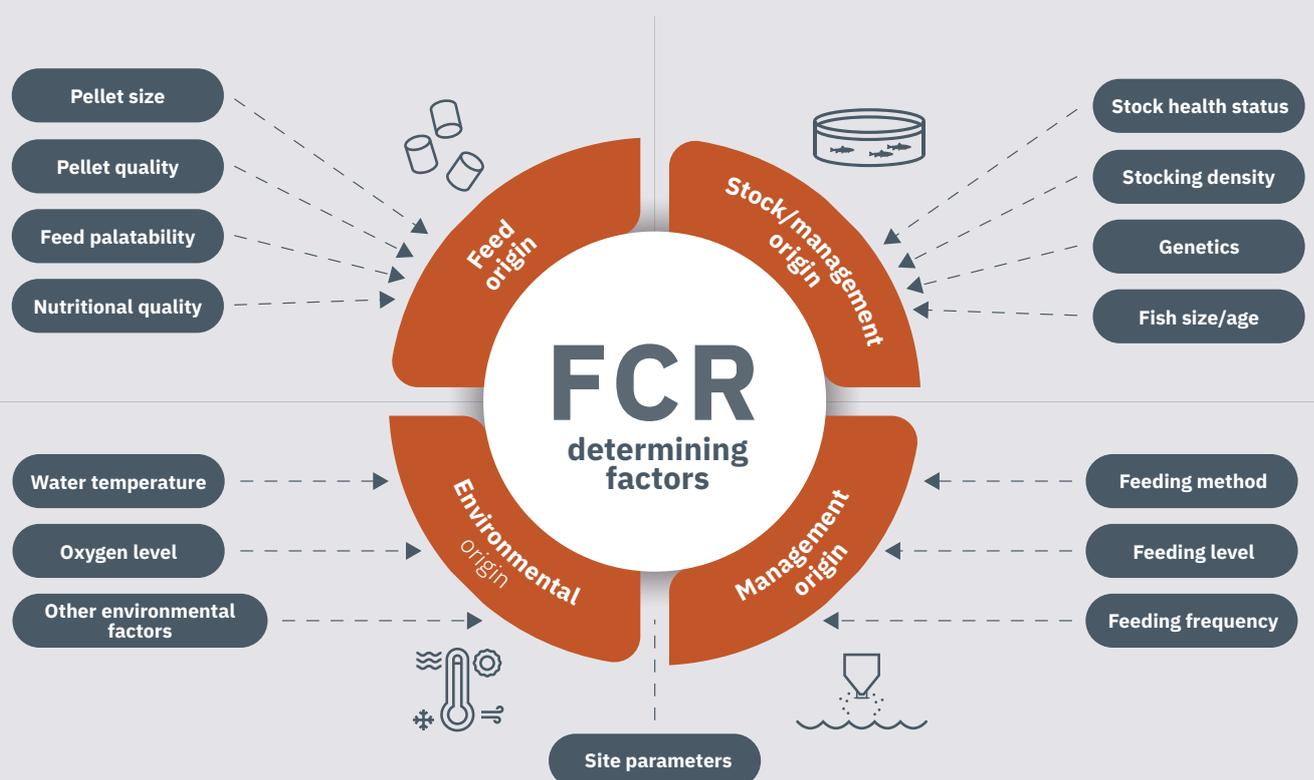
## Return on investment

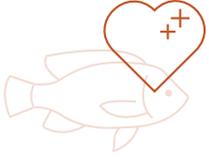
The level of protein, energy and digestibility of a feed plays a vital role in the cost-effectiveness of the diet. This is measured by growth, performance and the feed conversion ratio (FCR).

FCR is a major indicator of feed efficiency in fish farming and, ultimately, farm profitability. FCR is determined by feed, environment, stock and management of the farm.

Tilapia farmed in cages have a higher requirement for feeds with a high protein level than tilapia farmed in ponds. In ponds, tilapia have access to a natural rich form of protein: plankton. A suitable feed with the right nutritional requirement is key.

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### **Biosecurity & fish health**

Producers should only use healthy and good quality fingerlings that come from a reliable source and are free of pathogens. Tilapia lake virus and white spot disease are most common in tilapia farming. Disease monitoring (surveillance and reporting) of the fish stocks should be conducted to enable early detection of any behavioural (e.g., lack of appetite, gasping for air, abnormal swimming, etc.), physical (e.g., fin rot, bulging eyes, haemorrhages, etc.) or any other abnormalities.

A fatal disease is Streptococcosis, which can be triggered by warm water and low oxygen levels. This disease can be recognised by bulging eyes and a thickened tail. Treatment is expensive, higher than the profitability.



### **Pollution**

Pollution can cause serious diseases in farmed tilapia. Inadequate diets and uncontrolled water quality can induce secondary infection. Pollution can be caused by uneaten feeds that sink. Overfeeding fish should be avoided as nutrients in uneaten feeds that leach into the water can be utilised by bacteria during decomposition, resulting in oxygen depletion and pollution of the culture environment. Floating feeds are recommended, as it is difficult to monitor whether sinking feeds have been consumed or not.

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# Solutions:



## Palatable feeds for high feed intake

An effective feed and feeding strategy can improve the production of tilapia. Palatability is a key factor to be considered in the production of farmed fish and successful feeding for tilapia, which can enhance fish production performance in farms sustainably.



## Optical feeding control

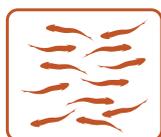
When fish are in ponds, tanks or cages, floating feeds are recommended, as the consumption of sinking feeds is difficult to monitor. Water pollution is also minimised by using high-quality feeds that are very digestible.



## Low FCR – profitability

Guabi and Alltech Coppens collaborate to supply feeds for tilapia to reach a low FCR and better return on investment. Farm profitability is determined by FCR. Along with the temperature, oxygen and pH of the water, feed plays a crucial role in lowering FCR.

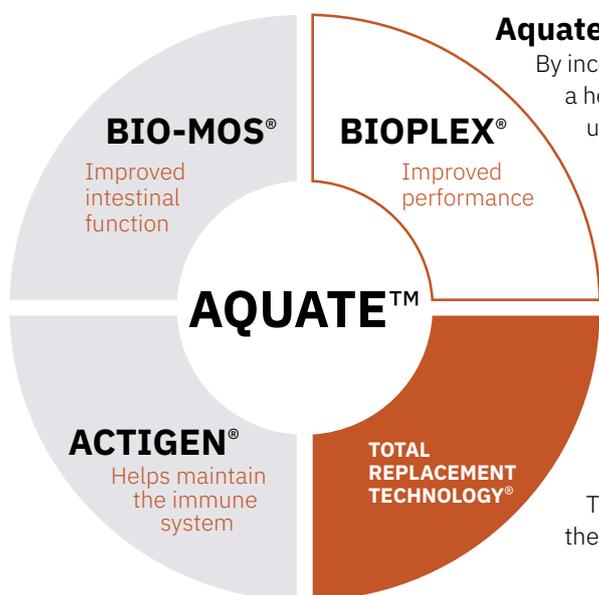
Guabi, a member of the Alltech family and a leading fish feed producer in Brazil, has particular expertise in extruded feeds and unique solutions for a wide variety of aquaculture species, including tilapia. In addition to a range of feeds incorporating Alltech’s sustainable alternatives to fish oil and inorganic trace minerals, Alltech Coppens specialises in nutrition for recirculating aquaculture systems (RAS).



## Stock optimization

When the grow-out enclosures contain only male fish, early breeding and stunting are prevented, and yields are higher. Female tilapia can be easily recognised as they are generally smaller and have a wider beak and thinner back (because of days without eating). In addition, males have a thinner abdomen (no bag for eggs) and a higher back. At 50 g, the females are fertile.

One way of increasing fish yield on the farm is to use single-sex or, specifically, male tilapia fingerlings for grow-out. Male tilapias grow faster and larger than females when grown separately. The natural male tilapia (NMT) technique was developed to produce all-male tilapia offspring through stock manipulation. Next to NMT, another method used is hormonal manipulation.



## Aquate health pack: healthy growth from hatch to harvest

By incorporating Alltech’s Aquate technology in our tilapia formulations, we support a healthy gut microbiome for optimal nutrient digestibility and boost fish health, ultimately contributing to better farm performance. Aquate contains yeast-based products such as Bioplex®, Bio-Mos® and Actigen®.

The inclusion of Aquate safeguards the healthy growth of this fish species, from hatch to harvest. The inclusion of Bio-Mos and Actigen within the feed premix preserves the microbial balance within the gastrointestinal system, ensuring improvement of the digestive system and nutrient absorption and utilisation. The inclusion of Bioplex chelated minerals also guarantees the efficient uptake of dietary micronutrients vital to building and developing a healthy skeletal structure and robust immune system.

An optimal farm performance starts with a good start in the early life stage. The special starter feed Vital is widely used to support the immunity of fish in the first phases.

## Research & development

With 30 years of experience researching, developing and producing high-quality tilapia feeds, Alltech Coppens offers on-farm assistance through our dedicated sales team and technical support team, ensuring optimal farm performance.

Alltech Coppens formulates feed on the 4 Pillars of Fish Nutrition: **Palatability, Performance, Pollution Control** and **Planet**. All four pillars are important and taken into the balance of sourcing new/alternative raw materials:



### Palatability

To ensure the best growth and performance of fish, optimal feed intake is vital. Fish must be attracted to the smell and taste of the feed.

### Performance

Our feeds must perform well. This means that they must generate healthy growth and ensure efficient feed utilisation. This is a decisive factor in the profits of fish farmers.

### Pollution Control

To maintain water quality and secure optimal fish health and performance, it is crucial that all our feeds are highly digestible, thereby decreasing the risk of pollution.

### Planet

The environmental sustainability of the feed.



For more information, please contact us:  
Dwarsdijk 4, 5705 DM Helmond, The Netherlands  
Tel.: +31 (0)88 23 42 200 |    Alltech Coppens  
<https://www.alltechcoppens.com>

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