

Tilapia in Aquaculture

Henk Stander, Division of Aquaculture, Faculty of Forestry and Agricultural Sciences, University of Stellenbosch, Office: (021) 8082544, Fax: (021) 808 5833,
E-mail: hbs@sun.ac.za

Introduction

Aquaculture refers to the controlled production of water living organisms such as algae, plants, shellfish, crustaceans, finfish and even reptiles such as crocodiles, tortoises and frogs. Aquaculture is conducted over a wide range of water ecosystems that include fresh-, brackish- and seawater, as well as cold, temperature and warm water systems. The harvesting of natural fisheries resources is declining rapidly on a worldwide basis, due to the overexploitation of resources and the disturbance of natural habitats. The sustainable catch of fisheries on a worldwide basis is estimated on about 110 million metric tons per annum, whilst the annual harvest already exceeds 118 million tons.

This overexploitation and declining harvests of natural fisheries has led to the rapid development of aquaculture technologies through which man can supplement its ever increasing food requirements. The world aquaculture production already contribute about 20% of the total human consumption (2000), an increase from 15% in 1995. Aquaculture is seen as a strategic industry for securing of future food requirements of the world.

Tilapia as production fish

Bream (or Tilapia) is a common name for a group of cichlid fish species, which can be separated in two categories (genus's), namely the mouth breeding or *Oreochromis*-species, and the non-mouth breeders or *Tilapia*-species. The females of the *Oreochromis spp* protect and nurture the eggs and fry in their mouth, until they are large enough to be released in the wild. *O. mossambicus*, *O. niloticus* and *O. aureus* are the three main species of tilapia that are used in aquaculture systems.

O. mossambicus is indigenous to Southern Africa and is the preferred specie for aquaculture production in this region. This specie has its evolutionary origin in the Zambesi River Basin and has since spread southwards through most of the warmer regions Southern African.

O. mossambicus has several positive qualities, which makes it a good candidate specie for aquaculture. These include:

1. High growth rate (up 450g in eight months)
2. High fecundity (females produce about 500 eggs every second week)
3. Adaptable to extreme environment conditions (water quality and temperature)
4. Ability to utilise plant and animal nutrients for growth
5. High meat quality, white with good market acceptance
6. Versatile taste and texture, facilitating development value added products

Tilapia is a warm-water fish with optimal temperatures in the range of 24-32°C. The growth rate are declining rapidly at temperature below 20°C with little or now growth registered at temperature below 15 °C. At these temperatures the fish is also more susceptible to diseases and mortality is often experienced at temperatures of 11°C and below. Females reach sexual maturity at an age earlier than the males, which in general demonstrate a growth rate 40 percent faster than that of the females, making males the preferred sex for production purposes. The ideal market size is 350 – 400g (8 – 10 months old) for whole fish and 650 – 700g (11 – 14 months old) for production of processed fillets.

Site Selection

There are many factors that can influence the success of an aquaculture enterprise. Site selection is one of the most important factors and often does not get adequate attention.

Important factors that have to be considered are:

- Location and climate (water temperature: 24-34°C)
- Slope and topography (avoid flood prone areas)
- Soil type (not more that 10-20 mm seepage per day)

- Quantity and quality of water must be analysed (pH, alkalinity, ammonia, nitrite, etc.)
- The market (market research, demand, price, distance to processing plant, etc.)

A complete feasibility study is required before starting a farming operation, during which all possible technical and economic factors and risks are evaluated, in order to ensure that the prospective producer will succeed.

Water Quality Criteria

The available volumes of water mainly determine production capacity. Water quality is an area of primary concern during the preliminary investigation and plays a major role in the efficiency of production and the quality of the end product. The volume and quality is some of the aspects, which the potential producer has to give attention to. The following parameters can be used as an indication of water quality requirements:

Dissolved oxygen	> 5 mg/L	Ammonia (NH ₃)	< 0.5 mg/L
Temperature	24-36 ° C	Nitrite (NO ₂)	< 5 mg/L
Acid level (pH)	6.8-8.5	Nitrate (NO ₃)	< 100 mg/L

Feed

There is a great variety of commercial Tilapia feed. More plant materials than animal proteins are common in this feed. Mainly, extrusion pills are used. Sinking feed can also be produced at a lower cost. The benefit of extrusion pills is that the water stays stable and because of its floating power, it is more visible.

Market

Before an aquaculture enterprise is established, a thorough market survey has to be conducted. Because of its qualities with regards to taste and texture, Tilapia is often used to substitute other high value fish species and products. The wide-ranging acceptability is one of the main reasons for the fast growth in tilapia culture all over the world. International markets however require a regular supply of large quantities of outstanding quality. High standards of management, product quality and processing is required to address these markets.

Training

Adequate training of staff is also important to ensure successful implementation of an aquaculture enterprise. Aquaculture technologies are often advanced and risks can be minimised through effective training of staff. Training must include a sound knowledge and experience of the organism, its environment and requirements, as well as diseases prevention and treatment. Local training institutes include the University of Stellenbosch, Elsenburg Agriculture College, Rhodes University (Grahamstown) and the University of the North. Distance education programmes are also available through the University of Stellenbosch.

Conclusion

Although knowledge and finance is required, the prospective aquaculturist will also have to develop a keen interest in the science of aquaculture and an understanding of the organism involved, in order to make a success of his business.