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## FACT SHEET

### Biosecurity practices for tilapia hatcheries: A case of Zambia



#### Introduction

Globally, aquaculture is the fastest growing food sector, and the industry's growth in Zambia is largely anchored on production from tilapia species (*Oreochromis spp.*). This growing industry, currently estimated at 45,670.49 metric tons, needs to be safeguarded through responsible aquaculture practices that ensure sustainability. Challenges like diseases can be detrimental to the continued growth of the industry. Diseases such as tilapia lake virus (TiLV) have the capability of killing an entire industry if preventive and control measures are not put in place in a timely manner. In Zambia, a number of fungal-like and bacterial diseases have been confirmed including epizootic ulcerative syndrome (EUS) and Streptococcosis, among others, that have negatively affected the industry. It is therefore of prime importance that aquaculture farms ensure better management practices and that adequate farm-level biosecurity measures are set up to prevent the entry and spread of pathogens. This fact sheet details key biosecurity measures and principles applicable to tilapia hatcheries and farms within the Zambian context and can be applied to other countries with appropriate adjustments.

#### Biosecurity

According to the Food and Agriculture Organization (FAO) of the United Nations, aquaculture biosecurity is defined as measures put in place by an aquaculture production facility to protect fishstocks from diseases. In the hatchery context, biosecurity measures are therefore meant to minimize the risk of introducing and spreading a disease to the broodstock and fingerlings produced at the hatchery, and the further risk of spreading that disease to other farming sites through dissemination of brood and seed. Biosecurity and better management practices also work as a disease preventive measure by reducing animal stress, consequently making them less susceptible to disease and improving their welfare. Lack of efficient biosecurity measures can result in fish losses, thus impacting the aquaculture industry negatively and reducing the food and nutrition security of the affected groups of people.



#### Project

Zambia Aquaculture Enterprise Development Program (ZAEDP)

#### Donor

African Development Bank (AfDB) through the Government of the Republic of Zambia

#### Partners

WorldFish, Government of the Republic of Zambia, Department of Fisheries and Department of Veterinary Services

#### Duration

2017–2022

#### Location

Zambia

## Biosecurity measures

Key biosecurity measures.

Measure	Procedure
Fish inspection	Inspect fish regularly to detect diseases, if any, at an early stage.
Record of visitors to the farm	It is important to keep a record of all the visitors that come to the farm. This helps with contact tracing in the event that there is a disease outbreak.
Personal protective equipment (PPE)	PPE should be worn to ensure occupational safety, including the prevention of injuries that might occur from accidental exposure to fish, chemicals, machinery and other equipment in the hatchery.
Footbaths	Footbaths should be placed at the entrance of the facility (Plate 4). These need to be cleaned and refilled with disinfectants as required on the basis of the disinfectant type and usage.
Wheel dip	A wheel dip helps to reduce the risk of spreading disease as vehicles move from place to place with the possibility of harboring pathogens on the wheels.
Wildlife control	Birds, fish and other wildlife can be agents of disease, so it is necessary to secure the farm to prevent these from entering the premises.
Staff awareness	Refresher courses are of great help for farm staff to ensure high standards of biosecurity are maintained. The courses should be structured in a way that both the general workers and technical staff will benefit.
Good quality feed	Feed should be properly stored in a clean, dry, pest-free and secure place. This helps reduce contamination, which could compromise feed quality. First-in-first-out use of feed should be adopted, and expired feed should never be fed to the fish.
Water source and routine water management	Good water quality is of prime importance to the health of fish. Ensure that the hatchery has a clean water source. Water quality checks should be conducted and readings recorded on a regular basis to inform better management decisions.
Farm practices and records	Ensure that sections of the hatchery have a unique identity. When you plan to bring in live fish, make sure that you follow biosecurity clearance and other protocols in place prior to bringing the fish into the farm. Have in place a secure quarantine facility that can hold incoming live fish for a period of time.
Emergency response	In the event that you detect pathogens or there is a disease outbreak, it is imperative to have in place a clear procedure on how you will handle the affected batch.
Handling of mortalities	Quickly pick the mortalities and keep them separately from the other fish in the ponds or tanks. It is important to involve a fish health expert or fisheries and aquaculture officers so that they can help in ascertaining the cause of the mortalities. There are a number of factors that can contribute to fish deaths, including disease, predation, cannibalism, old age, pollution, etc.
Disposal of mortalities	Examine the condition of the fish. If you are able to get some samples, collect the liver, spleen, kidney and muscle, as these organs help in detecting the presence of disease. Make sure you wrap the fish in a paper towel and put them in a closed bag. Thereafter, incinerate them or dig a pit of about 1 m deep and bury them. After disposal, make sure that you disinfect the materials and equipment used by spraying ethanol, and sun drying them. This helps to prevent further spread of disease if it is present.

## Procedure for obtaining new broodstock from other farms or from the wild

Whenever you think of bringing new broodstock to the farm, it is important to pay close attention to the health status of the fish from the source to prevent disease from spreading. Engage a fish health specialist and relevant aquaculture and fisheries experts during this process.

All broodstock brought to the hatchery facility should be quarantined (kept separate) and screened for pathogens of concern (e.g. TiLV) before mixing it with existing stocks. During quarantine, the fish should be closely observed for signs of disease. If there is any indication of disease, treatment must be administered depending on the disease type.

In the event of severe diseases, like TiLV, fish should be euthanized (humanely killed). This process helps curb further spread of disease to other units on the farm (Plate 1).



**Plate 1.** *Oreochromis andersonii* broodstock delivered at the National Aquaculture and Development Center, Kitwe Zambia.



## Management of outdoor hatchery facilities on the farm

All facilities, including hapas for broodstock, mating and fry nursing, should be kept clean. Pond inlets should have screens (sieves) to prevent foreign fish, debris and predators present in the water source from entering the farm. Keep the visitors' record book up-to-date by taking details of the people that come in and out of the farm. Please note that it is also important to ensure that visitors observe measures such as washing their hands before and after visiting each section of the farm (Plate 2). In addition to the footbath, a wheel dip should be present at each section of the farm. Ensure that the wheel dip and footbath are always clean and filled with freshly prepared disinfectants (Plate3).



**Plate 2.** Wheel dip at the entrance of the farm.



**Plate 3.** Handwashing facility at the entrance of the farm.

Always ensure that visitors and on-farm employees make use of the footbath at each section of the farm while wearing protective clothing, such as closed shoes (Plate 4). This is important because humans can be agents of disease transmission.



**Plate 4.** Footbath at the entrance of the facility.

## Indoor hatchery management

For all indoor hatcheries, the water source should be free of pathogens. Once this is achieved, ensure that eggs and larvae coming into the hatchery are cleaned.

Before bringing eggs and larvae to the hatchery, clean them by removing any debris (Plate 5). This reduces the number of eggs dying. After removing debris, dip the eggs in a saline solution for about 30–60 seconds prior to putting them in the incubation jars or containers.



**Plate 5.** Cleaning eggs and giving them a saline dip prior to incubating them in the egg incubation containers.

When this is done, you can place the eggs and the larvae in the incubation jars. Make sure that you set a water flow rate that will keep the eggs and larvae moving around in the incubation jar. It also is important to record the weight of the eggs so that the numbers can be easily estimated.



**Plate 6.** Fry feed.

## Disinfection of tools and equipment

Make sure that all tools and equipment are disinfected immediately after use. They should be dried and placed in the right position. To avoid mixing, make sure that you label the equipment and tools by section, for instance “tank area,” “weighing area” etc.

## Feeding

Ensure that you are feeding the fry the right amount of feed. Inadequate feeding will affect the growth of the fish, while too much feeding negatively affects the water quality, which may lead to a disease outbreak.

Occurrence of disease is among the significant challenges that have been experienced as aquaculture expansion occurs. That is why it is necessary to have biosecurity measures in place.

For disease to occur, there are a number of interacting factors that will make the host susceptible: Environmental conditions, health status of the fish and the presence of



**Plate 7.** Fish with fungal growth on the body.

pathogens. If biosecurity measures are not closely followed, there is likely to be a disease outbreak, which can cause mass mortality and impact the industry negatively (Plates 7 and 8).



**Plate 8.** Massive mortalities at a fish farm in Zambia.

## Development of a biosecurity plan

According to Erlacher-Reid (2012), a biosecurity plan is key in ensuring a well-defined and effective biosecurity system at a fish farm. The plan should look to manage interactions among fish, pathogens and people in the facility. Here are some points that can be used to develop an effective biosecurity plan:

- Know the species you are culturing in terms of their susceptibility to disease and their disease history from the source. This is important as it helps produce stocks that are of good health.
- Develop a blueprint of the farm so as to effectively segment the different sections of the facility to reduce the spread of pathogens and diseases from one section to another.
- Should there be a disease outbreak identified through the different clinical signs presented, develop a plan to manage the infected fish. As one of the first steps in the management of infected fish, quarantine is a useful measure as you await the fish health specialist to attend to it.
- It is imperative to educate staff and visitors about the importance of biosecurity and the risks of not adhering to the measures. Staff should be educated about different fish species (biological characteristics and environmental conditions required to grow the fish), fish disease, water quality, etc. A fish health specialist can train staff to help them understand the fundamentals of biosecurity.
- Develop a record keeping file for water quality parameters, disease signs, fish mortalities, growth performance, etc. These will help inform best management practices that would be useful for informed decision-making and prevention of unnecessary depopulation.
- Evaluate the biosecurity plan as often as possible. This is important to help make the necessary improvements to reduce the risks identified, as people, fish and pathogens live in a dynamic environment.



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## Acknowledgments

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This publication was made possible through support provided by the African Development Bank (AfDB), extended to the Government of the Republic of Zambia through the Department of Fisheries. This work is being undertaken as part of the [CGIAR Research Program on Fish Agri-Food Systems \(FISH\)](#) and the CGIAR Initiative on Resilient Aquatic Food Systems led by [WorldFish](#). The program is supported by contributors to the [CGIAR Trust Fund](#). We thank Dr. Mohan Chadag for reviewing the earlier version of the brochure.

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## Citation

This publication should be cited as: Basiita K. R, Malambo T, Hampuwo B, Chungu P and Songe M. 2022. Biosecurity practices for tilapia hatcheries: A case of Zambia. Penang, Malaysia: WorldFish. Fact Sheet: 2022-08.

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