

WATER RESOURCES COMMISSION



Technical Guidelines for Sustainable Cage Aquaculture



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1 Introduction

Aquaculture is growing rapidly in the nation and offering opportunities to contribute to poverty alleviation, employment, community development, reduction of exploitation of natural resources, and food security in tropical and subtropical regions. Many proponents engage in aquaculture without requisite information. This brochure is a summary compilation of the requisite information for cage aquaculture. The objective of the guideline for cage aquaculture is to provide technical and practical steps for both regulators and proponents to facilitate the issuance of permits, whilst protecting the environment and human health, and investment of proponents.

The guidelines provide information on:

- Regulatory and other relevant institutions
- Site selection guide
- Materials for use in cage aquaculture
- Guide to production
- Guide to farm management

Information is based on environmentally friendly methods and best practices for the location, buffers, and carrying capacity of lake/river/stream, framework for monitoring water quality in and around cage aquaculture activities, maximum size of each farm, and checklist for both the proponent and the regulator, water quality monitoring framework and checklist.

Regulatory Institutions

There are a number of Institutions to be consulted before any investment with regards to cage aquaculture. The mandatory regulatory institutions, which issue permits include:

- Water Resources Commission
- Environmental Protection Agency
- Fisheries Commission
- Ghana Maritime Authority

Relevant Institutions

Other institutions which do not give permits, must give no objection if the proponents wish to use their facilities or consult for technical and research activities include:

- Volta River Authority
- Ghana Water Company Limited
- Ghana Irrigation Development Authority
- Water Research Institute and
- Other relevant institutions as in specific cases

NOTE

Please note that even though chiefs and land owners may agree with your project, the required Government administrative processes must be adhered to, to avoid losing your investment.

1.1 Site Selection Guide

Sites for cage aquaculture should have the following characteristics:

- Good water quality (You may consult the Ghana Raw Water Quality Criteria and Guidelines on Aquaculture, WRC).
- Absence of harmful algae
- Absence of pathogens that cause fish diseases
- Good water exchange, average current velocity should be between 10 and 20 cm/s
- Substrate at the site of the proposed operation should be low in organic matter. A maximum concentration of 9 mg/kg may be applied.
- Record of existing benthic communities (the collection of organisms living in lake bottoms) at the selected site will have to be collected before the establishment of the farm.
- A good distance from other cage aquaculture and other water users (a separation distance of 1Km for all farms).
- Not close to commercial crop farming areas (refer to buffer zone policy)
- The depth of the water at the selected site should be such that the distance between the bottom of the cage and the substrate or bottom sediment should be a minimum of 2m. This will help keep cage wastes away from the fish.
- **Prohibited areas for siting**
 - Navigational routes of water bodies.
 - Sensitive installations such as domestic water intake points, hydropower plants, etc.
 - Stagnant water bodies, or water bodies with little outflows eg Lake Bosomtwe
 - Stagnant sections of large lakes with limited water exchange
 - Core Zones of Ramsar sites
 - within Forest Reserves

- **Caution on siting**

- It must be noted that cage aquaculture farms situated just before and or below the spillways of dams are liable to damage during spills, which may be occasional or annual. Farms situated in such places should take precautionary measures in case of such events. The WRC is not liable to pay compensation to any such farm in the likelihood of damage to property due to spillage or improper siting.

1.2 Materials for Cage Construction

Cage structures must, however, be strong enough to withstand the forces of winds and currents while holding stocks securely. For durability and reduced environmental impacts, the following qualities for materials appropriate for construction of cages are recommended:

- Strong
- Light in weight
- Rot and weather resistant
- Rustproof
- Fouling resistant
- Easily worked on and repairable
- Drag free
- Smooth textured and non-abrasive to fish

1.3 Guide to the Production Process

The production process involves the acquisition of fingerlings from hatcheries or own production of fingerlings from brood stock, stocking of cages and application of the right quantities and quality of feed.

It is recommended that:

- Brood stocks and fingerlings should be obtained from suppliers certified by Fisheries Commission.
- Stocking densities of cages aquaculture may range from 50 - 250 fingerlings/m³. This will be site specific. Sites with good water exchange could be allowed higher stocking densities, whilst farms with poor water exchange allowed lower stocking densities
- Feeds play a key role in any aquaculture process. They are the main source of nutrient enrichment or pollution in the water bodies. Feeds used on the farms should:
 - Be properly evaluated by relevant mandated institutions for the absence of bacteria, and other feed contaminants, likely to affect the health of fish and human population.
 - Have a Veterinary Health Certification
 - Be water stable and easily acceptable by the fish
 - Be dry extruded and pelleted.
- Proper feeding technology should be applied with regards to quantity and feeding method. Overfeeding should be avoided.

1.4 Guide to Farm Management

Effective management of fish farming activities and their impacts on the environment forms an integral part of sustainable development of the sector and to avoid loss of investment the following is recommended:

- Registration of aquaculture farms with relevant institutions (see checklist below).
- Monitoring water and sediment quality (parameters to be monitored are listed in Table 1.)
- Minimising Fish Diseases – Diseases can be largely prevented by rearing fish in a good environment, with good nutrition, with a minimum of stress, and isolated from sources of infectious agents. This is best achieved with a pathogen-free water supply, the use of certified pathogen-free stocks, and strict attention to basic rules of bio security
- Reduction of fish escapes

Checklist

Institutions / Activity	YES	NO	Pending
Certificate of incorporation and Certificate to commence business			
Registration with Local Government Authority (MMDAs)			
Water Use Permit (Water Resources Commission)			
Environmental Permit (Environmental Protection Agency)			
Fisheries License (Fisheries Commission)			
Certificate on Feed (Fisheries Commission)			
Certificate on Fingerlings (Fisheries Commission)			
No objection from:			
Volta River Authority (for the use of the Volta Lake)			
Ghana Irrigation Development Authority (for use of their reservoir)			
Ghana Maritime Authority (for rivers with navigational routes)			

Table 1: List of water and sediment quality parameters monitored in relation to aquaculture

Parameter	Monitoring Frequency
Water	
- pH	Quarterly
- Chemical Oxygen Demand	Quarterly
- Nutrients	Quarterly
- Suspended Solids	Quarterly
- Dissolved Oxygen	Quarterly
- Algae (Cyanophyta (blue-green algae), Chlorophyta (Green algae), Euglenophyta, Cryptophyta (Dinoflagellates), and Bacillariophyta (Diatoms))	Half yearly
- Chlorophyll a	Half yearly
- Trace metals (Cu, Zn, Cd, Pb, Al, Fe, Cr)	Half yearly
Sediment	
- Sulphide	Annually
- Redox potential (Eh)	Annually
- Macroinvertebrates	Annually
- pH	Biannually
- Total Nitrogen	Biannually
- Total carbon	Biannually
- Organic matter	Biannually
- Total phosphorus	Biannually
- Trace metals (Cu, Zn)	Annually