RWANDA STANDARD

DRS 608-1

First edition

2025-mm-dd

Fish farming — Code of practice — Part 1: Farming in cage

ICS 65.150.

Reference number

RS 608-1: 2025

In order to match with technological development and to keep continuous progress in industries, standards are subject to periodic review. Users shall ascertain that they are in possession of the latest edition

Rwanda Standards Board

P.O Box 7099 Kigali-Rwanda

KK 15 Rd, 49

Tel. +250 788303492

Toll Free: 3250

E-mail: info@rsb.gov.rw

Website: www.rsb.gov.rw

ePortal: www.portal.rsb.gov.rw

Contents

Page

Foreword ..... **iv**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **1**

4 Site selection and Design **1**
4.1 Location ..... Error! Bookmark not defined.
4.2 Farm design **2**

5 Farm management **3**
5.1 General **3**
5.2 Cleaning the Cage **3**
5.3 Data collection and record keeping **3**
5.4 Diseases and pest control **4**

6 Fish seed and cage stocking **4**
6.1 Seed/Fingerlings **4**
6.2 Stocking **5**
6.2.1 Prior to transport **5**
6.2.2 During transport **5**
6.2.3 Prior to stocking: **5**

7 Feeding **6**
7.1 General **6**
7.2 Feeding rates and frequencies **6**

8 Harvesting **7**

9 Fish grading **7**

Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS 608-1 was prepared by Technical Committee RSB/TC 036, *Fish and fish products.*

DRS 608 consists of the following parts, under the general title Fish farming — *Code of practice*:

— *Part 1: Farming in cage*

— *Part 2: Farming in ponds*

Committee membership

The following organizations were represented on the Technical Committee on *fish and fish products* (RSB/TC 036) in the preparation of this standard.

Rugali meat processing Ltd

Ministry of Agriculture and Animal Resources (MINAGRI)

Res Populi Ltd

Rwanda Inspectorate, Competition and Consumer Protection Authority (RICA)

National Industrial Research and Development Agency (NIRDA)

MINIMEX Ltd

Coopérative pour la Promotion de Pêche et des Activités de Vente d'Isambaza (COOPPAVI)

Rwanda Standards Board (RSB) – Secretariat

Fish farming — Code of practice —Part 1: Farming in cage

1 Scope

This draft Rwanda standard specifies guidelines and recommendations for fish farming in cage.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

RS EAS 973; *compounded fish feeds—Specification*

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply

3.1

cage

bottom and sides enclosed basket, bag or pen of different form/ design and volume, made of net screens, wooden or wired mesh of different mesh size according to the size of fish used in fish farming.

3.2

dissolved oxygen

amount of oxygen that is present in water.

4 Farm site selection and design

4.1 Farm site selection

4.1.1 Cage should be put in waterbodies in an environmentally suitable area where risks to food safety from chemical, biological and physical hazards from sand, wind, soil, and erosion are minimized. A suitable area should be protected from strong winds and waves.

4.1.2 Cage sites should have good water quality and free of industrial pollution, agricultural and domestic pollution. Biological requirements including appropriate temperature, salinity and dissolved oxygen for the farmed species should also be met.

4.1.3 Sites should have sufficient currents which offer good water exchange for water oxygen replenishment and removal of waste metabolites. However, excessive currents may lessen the volume of the cage, add weight to the supporting structures and moorings and may contribute to feed losses.

4.1.5 Farm design and layout should prevent cross-contamination and breakage from the wind forces. Other animals should not be within and around fish cages to prevent cross contamination.

4.1.6 There should be fencing with spotlights to enhance visibility of farm boundaries and fencing using strong nets to prevent the entry of other animals.

4.1.7 Proper facilities for storing feeds and other materials used in the cage must be away from toxic chemicals. Feeds piled in pallets should be provided with appropriate, well-ventilated storage facilities

4.1.8 Water depth is an important criterion for selecting the water body where to establish cage fish farm. Deeper sites are preferred for sufficient water circulation and acceptable water quality. Minimum water body depth should be 10 meters and a clearance of minimum 10 meters is always needed from the cage bottom to the floor of the water body.

4.1.4 An aquaculture license to operate or business permit from competent authority should be optained.

4.2 Farm design

4.2.1 Cage materials should be proven to be durable and corrosion resistant such as polypropylene and non-corrodible materials such as copper alloys, nylon, high-density polyethylene, and rubber.

4.2.2 Chemical (carcinogenic/toxic) containers should not be used as floaters and/or containers of fish; and Sanitary facilities should not be present near the water system and at least 50 meters from farm operation.

4.2.3 Cages and nets, should be designed and constructed to ensure minimal physical damage to fish during growing and harvesting and to allow for adequate cleaning and disinfection.

4.2.4 There should be appropriate feeding areas that would allow large volumes of fish at a time.

4.2.5 Equipment, such as containers and vehicles for feed, seed and harvested fish, should be designed and constructed to allow for adequate cleaning and disinfection.

4.2.6 There should be a space or catwalk along the cage frame required for providing operating and maintenance services, such as feeding, cleaning, monitoring or grading. Its size depends on the cage design, minimum is 0.50m of width

4.2.7 Netting material should be durable with high breaking strength and resistance to abrasion. However, material should not be very heavy to make handling very easy. Cages net of synthetic fibers are convenient as they can be easily folded, installed, removed and are also light to handle,

4.2.8 Additional nets of protection should be installed to prevent the predation from birds and an early detection of fish theft. Predator nets add extra weight and drag on the cage system, thus they should only be installed if predators are problematic.

5 Farm management

5.1 General

The management practices are mainly aimed to maximize the production per unit volume of cage, minimize stock losses, promote good growth while controlling costs and increase the profitability.

5.2 Cleaning the Cage

5.2.1 Cage nets inspection and cleaning care and maintenance of cages should be daily or routine work. Growth of bio-fouling organisms in net bags is primary problem of cage management. In fresh water cages, excessive growth of algae, sponges and debris on nets may impair water circulation in the culture system and can affect the health and growth of the fish due to the competition in oxygen consumption.

5.2.2 Nets should be regularly cleaned by brushing off the algae or changed when needed. Checking the net screen should be done every day for wear and tear as there might be possible damage that may lead to escape of fish stock and diving regularly to inspect the conditions of nets and others materials submerged in the water.

5.3 Data collection and record keeping

5.3.1 Good record keeping habits should be maintained. This will help the producers to be involved and acquainted with not only costs of production and market prices and their patterns, but also with fish behaviour, growth and their interactions with the environment. Fish are sensitive to their environment, so fatal conditions can occur abruptly and spread rapidly. Good record keeping will help the managers to be able to anticipate and quickly detect any problem on a daily basis.

5.3.2 A sheet or book for record keeping should contain the space in which cage operator will record a daily track of both important economic and environment data related to the cage fish culture operation. Each producer should have record keeping sheets appropriate for the cage culture operations. The data required to allow for predictive stock management are:

a) Daily feed records per cage.

b) Monthly average weight sampling.

c) Daily mortality numbers per cage.

d) Movement records of fish between cages

e) Accurate fish numbers at stocking, splitting and grading of cages.

f) Basic water quality data

g) daily dissolved oxygen (sometimes multiple times per day, depending on site).

h) pH (daily in recirculate and ponds, weekly in larger water bodies).

i) Nitrates, phosphates, turbidity, ammonia.

j) Notes on events such as suspected theft, major storms, changing of feed supplier, predation, etc.

k) Grading period and findings

5.4 Diseases and pest control

5.4.1 Fish that are well fed, well handled, not overcrowded, in good environmental conditions are less likely to develop disease. Fish disease could be due to poor nutrition, poor sanitation and environmental conditions, overcrowding in cage, injuries due to rough fish handling, presence of pathogens, vectors and intermediate hosts. Therefore, the following routine general management and measures should be taken to control cage fouling by aquatic weeds, predators, pest and diseases

a) Clean and dry cage after each culture cycle;

b) Regular brushing and removal fouling aquatic weeds attached to the cages;

c) Ensure the water current allow oxygen and water exchange in the cage site;

d) Stock of similar size fish in the same cage in order to feed them properly;

e) Stock good quality healthy and disease-free fingerlings; obtained from known-reputable sources;

f) Avoid overcrowding of fish in ponds;

g) Remove the leftover feeds;

h) Maintain good cage positioning and sanitation; and

i) Remove infected or dead individuals from cage and examine dead fish as soon as possible.

5.4.2 Farmers should immediately notify the competent authority of any unusual symptoms, fish mortality or other negative behaviors to ensure quick response and prevent further spread

5.4.3 In case of any sign of disease is suspected, Regulatory authorities should be involved in all treatments

6 Fish seed and cage stocking

6.1 Fish seed/Fingerlings

6.1.1 Fish seeds should only be obtained from hatcheries approved by competent authority. The following should be considered prior to seed sourcing:

a) The smallest fingerling size recommended to stock is 0.5g; a fish of 0.5g is retained by a 4 mm bar of mesh size; and

b) The readily available post fry are brought from hatcheries or nurseries and grown in nursery cages or hapa from 1 to 2 months until attained desired size for stocking;

6.1.2 The stocking density is rather expressed as number of fish per unit volume or the total expected biomass per unit volume at harvest time. The minimum recommended stocking density for, Tilapia is 80 fish /m3 at stocking or 150 kg/m3 of collective biomass at harvest.

6.2 Stocking

6.2.1 Prior to transport

Fingerlings should be pre-conditioned in hapa or in tank with sufficient aeration and water flow for 1 to 2 days. One day before transport, fish should be deprived of food to empty their digestive tracts. This will minimize fouling of organic matters in transport system and oxygen consumption.

6.2.2 During transport

6.2.2.1 Fingerlings should be packed and transported in the early morning when travel can be more comfortable to the fish.

6.2.2.2 Fish should be transported in water tanks with continuous aeration and plastic bags. One third filled of water and remaining space with oxygen is the recommended transport system of Tilapia.

6.2.2.3 If fish are transported for considerable distance, transportation at night is recommended and water in tank and air in plastic bags or transport containers should be changed every 6 hours.

6.2.2.4 Fish should not be stressed during capturing, handling, counting, transport and stocking to assure that fish are stocked healthy.

6.2.3 Prior to stocking:

6.2.3.1 before stocking the following basic controls should be applied:

a) Inspection of the cage net for any tears to prevent escapees.

b) Cleaning and drying out the nets in the sun to avoid transfer of parasites, bacteria etc.

c) Ensuring that there are no predators in the cage and from the outside environment that can swim through the mesh; and

d) Ensuring that fingerlings are larger enough so they cannot swim through the mesh.

6.2.3.2 There should be an estimation of the number of fish you want to stock as starting number, this may be done through random sampling of a bag, count the fish and work out an average fish count per bag. This is then multiplied by the number of bags received and stocked.

6.2.3.3 Salinity and temperature of fish being transported should approximate that on the new environment. Stocking is done early morning or late evening when temperature is low.

6.2.3.4 Stocking management may be done by either according to a desired density which will allow fish to grow up to harvestable size or stocking at higher density which will be redistributed to other cages as they grow.

7 Feeding

7.1 General

7.1.1 After proper stocking, the most important practice of cage culture is providing good quality feed in the correct amount to the caged fish and age. Fish feed shall comply with RS EAS 973.

7.1.2 Simple self-feeding tools (Automated demand feeder) may be used to make feeding cages easier and to minimize feed waste.

7.1.3 For manual feeding, floating ring should be used to retain feed inside the cage, feeding tray may be built inside the cage or fixed on the cage floor to retain sinking pellets and a demand feeder may be installed on the top of cage with a vertical rod inside the water that will be checked by the fish to open the feeder and allow pellets dropping in the water through the bottom hole.

7.2 Feeding rates and frequencies

7.2.1 Fish should be fed 3 to 4 hours when they have recovered after transfer

7.2.2 Tilapia are fed a ratio varied along the reared period from 1.5 to 11% of the body weight, daily given in 2 to 5 times a day and re-adjustable daily, weekly or every two weeks based on fish growth or according to weather or environmental conditions as given in table 1.

7.2.3 Juvenile fish are fed higher protein diet at greater frequency than adult fish. For juvenile and adult fish, sinking or floating feeds may be used. Floating feed allow observation of the stocks. Sinking feed is preferred for sites with strong winds, waves and current.

7.2.4 The fish should be sampled every 4 to 6 weeks to determine their average weight and the correct feeding rate for calculating adjustments in the daily rations. Adjustment can be made between sampling periods by estimating fish growth based on an assumed feed conversion ratio (FCR); feed weight divided by the weight gained. For example, with a feed conversion ratio of 1.5, a fish should gain 10g for every 15g of feed consumed. The correct feeding rate, expressed as the percentage of body is multiplied by the estimated weight to determine the daily ration.

Table 1— Recommended daily feeding rates, expressed as the percentage of body weight, for Tilapia of different sizes.

S/N	Fish weight (g)	Feeding rate (%)
i. .	1	11
ii.	2	9
iii.	5	6.5
iv.	10	4.2

v.	15	4.6
vi.	20	4.2
vii.	30	3.6
viii.	60	3
ix.	100	2.5
x.	175	2.5
xi.	300	2.1
xii.	400+	1.5

7.2.5 During stock sampling, the cage is partially lifted out of the water, and fish are captured with a dip net or a scoop-net. A sample of fish is taken and then be counted, weighed and returned into the cage for further growth. When the sizes vary significantly during the culture period; all of the fish maybe harvested and be graded.

8 Harvesting

Before harvesting, prepare all materials and equipment required. Two or three persons can harvest one cage. Harvesting of cultured fish in cage is done easily, small cages are brought close to shore and fish are scooped. Harvested fish should be graded, counted and weighed. If fish size uniformity is more important, 4 weeks or more maybe required for complete harvest, because not all fish reach the desired harvest size at the same time.

9 Fish grading

9.1 Grading may be done manually or by the help of grader. The process starts by sorting the fish by its size and physical damages.

9.2 Grading fish during growing stage is aimed to grow similar size in the same cage that will lead to similar size of fish at harvesting.

9.3 Grading fish at harvesting is aimed to sell fish at different size classes or grade; small, medium and larger size or Grade 1-2- 3 respectively.

Bibliography

[1] cage fish farming, Rwanda Agriculture and Animal Resources Development Board (RAB), 2020

Price based on nnn pages