Feeds and feeding in the cage culture system

Fish must be fed enough food to ensure optimal growth within the shortest possible time and to result in maximum returns at a minimum cost. This is because feed costs contribute to about 60 percent of a farm's total operating cost.

In tilapia cage aquaculture, commercially prepared floating tilapia feed works best. These feeds have been prepared with formulations that are palatable and easily digestible for fish and result in optimal growth at each stage. Tilapia are fed daily rations as a function of their weight. Because they grow very fast, fingerlings and juveniles are fed at a higher percentage of weight and crude protein than adults. Their feeds are known as starter feeds, which come in crumbled or powdered form that makes them easy to eat. Grower and finisher feeds are pelletized. Feed for adult tilapia has a lower crude protein content and is given at a lower weight, as the fish will have already attained adult size and do not need to build new muscle.

A nutritionally balanced diet helps increase resistance to diseases for fish and results in faster growth and a proper body shape, which help fetch a good price. If farmers use relatively higher stocking densities, the natural productivity of the water might not be adequate for the fish and so supplemental feed must be added in proper rations. In the cage culture system, tilapia are confined to cages, so they have limited access to natural food and therefore need supplemental feed for a nutritionally complete diet.

Plate 1. Sample of tilapia feed.

To feed tilapia in a cage, follow these guidelines:

- Do not feed fish their entire daily ration at once. Adjust it to suit their feeding habits by feeding them more or less, as required. This is called feeding up to satiation.
- Feed the fish at specific times each day.
- Do not feed the fish if their appetite has decreased. Investigate to know what the cause might be.
- Feed the fish in small amounts and spread the feed throughout the cage. Do not stand at one spot to feed.
- Record how much feed was given to each cage every day and upload it into your digital records.
- Feed with your back to the wind so that the feed goes into the cage and not out into open water.
- Do not give the fish feed that is wet, moldy or has a strange smell (rancid feeds).
- Feed the fish with feed that has been certified for use by fish farmers.
- To avoid your feed from going bad or rancid, store enough feed for only up to 3 months in your shed/warehouse.
- Keep feed on raised pallets and arrange them in such a way that air circulation is still possible.
- Do not apply pesticides near your feed.
- Ensure feed distribution is carried out on a first-in-first out basis, where the oldest feed in the warehouse is sent to the cages first.
- The fish should eat the feed within the first 15 minutes of feeding. Adjust how much to give at each feeding session based on the feeding response of the fish.
- If the fish do not eat the feed in 15 minutes, or stop feeding entirely, reduce or stop feeding them until they respond eagerly to the feed, and adjust the daily ratio depending on consumption.
- Fish usually eat less on cloudy, overcast days, so do not overfeed your fish when this type of weather occurs.
- When the water quality is poor, it might be necessary to restrict feeding until the situation clears up or to address the cause of the decline in the water quality.
- Feed the fish three times a day: at sunrise, midday and early evening.

Plate 2. Daniel Chukwuma, Head farmer Orisha farm feeding in cages.

When not to feed

Do not feed the fish if any of the following occur:

- when feeding response is poor, as wasted, uneaten feed accumulates at the base of the cage and fouls the water, leading to poor water quality and low oxygen directly at the base of the cages if flushing is inadequateduring disease outbreaks
- a day before sampling, transportation or harvest to reduce stress and also empty their stomachs to maintain freshness and reduce stressa day after sampling and/or transportation to help mitigate shocks and mortalities
- after rains
- when temperatures are highest and oxygen levels are lowest (early morning).

Stage	Feed size (mm)	Protein requirement
Fingerlings	0.5–1	35%
Juveniles	1.5–2	32%
Adults	3–6	30%

Table 1. Appropriate feed size for stages of tilapia growth.

Photo credit: Olaniyi Ajibola/WorldFish

Plate 3. Piles of 2 mm, 3 mm and 4 mm feed (left to right).

Feed conversion ratio (FCR)

The feed conversion ratio (FCR) is how much feed is required to produce a unit of fish. The lower the FCR, the better the feed conversion. FCR values tell us how well feed is being converted into mass, and if there is wastage. Farmers can compare the FCRs of different feeders to determine which is effective. This also tells farmers how well a particular brand of feed is performing.

FCRs need to be checked to enable management to carry out timely decisions to sustain the aquaculture venture. FCRs can be calculated during routine sampling or harvest.

FCR is calculated as follows:

- $\text{FCR} = \dfrac{\text{weight of feed intake}}{\text{average weight gain}}$
- Biomass of fish = Final biomass – Initial biomass (at stocking or prior reference point)
- An FCR between 1.5–2 is a good indicator of effective use of feed. A good grow-out operation should aim for FCRs between 1.5–2 or even less. FCRs above 2 indicate poor feed use, wastage or poor quality feed. They could also indicate high mortalities and poor water quality parameters.

Feed handling

The following are tips for buying and using feed:

- Always buy the freshest feed from your suppliers.
- Check for rancidity, moldiness, wetness, etc.
- Only buy what will the fish will consume within 4–6 weeks. Older feed tends to go rancid and gets depleted in some nutrients, such as vitamin C.
- Protect feed from moisture, heat and rainfall during transportation and while in storage.
- Store feed in a well-ventilated, dry, cool room.
- Do not stack feed on bare floors. Stack it on pallets to keep it dry.
- Ensure rodents and other pests do not get into the feed shed/warehouse.
- Do not use pesticides or insecticides near feed bags.
- Discard feed immediately if it is going bad, such as feed that is moldy, has an unpleasant smell, is wet or has changed color.

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