Food and Agriculture Organization of the United Nations

# DEFINING AND IMPLEMENTING A TILAPIA WELFARE ASSESSMENT PROTOCOL IN BRAZIL



*The researchers behind a practical welfare assessment protocol for tilapia production in Brazil hope it can act as a framework for the implementation of a welfare management system that can be applied by tilapia farmers around the world.*

The aquaculture industry, especially in the Global South, is at a similar stage of development as the pig and poultry sectors were 30 to 40 years ago. The sector's drive is to develop production systems that remove the animal from its environment and possible disease challenges, rather than meeting the animal's health and welfare needs.

In the last 20 years many studies regarding anatomical, physiological, behavioural and pharmacological aspects have produced evidence that fish experience feelings such as pain and fear, in similar ways to other vertebrates (Broom, 1996, 2007). As evidence of fish sentience gains prominence, concern about animal welfare by society is showing parallel increases, affecting the consumer market and aquaculture regulations (Branson, 2008). If aquatic animals like fish and shrimp are capable of suffering, then their welfare must be protected, within the same rationale employed for other vertebrate animals.

Because of the number and diversity of critical welfare points, assessing the degree of farmed animal welfare requires the development of diagnostic techniques that can consider an array of indicators (Pedrazzani *et al.*, 2020). This has been applied to an on-farm tilapia welfare assessment protocol, initially directed at semi-intensive Brazilian production systems. The initiative aims to bring fish welfare assessment efforts closer to the welfare assessments used for many terrestrial farmed animals (FAWC, 1996).

# TECHNIQUE AND APPROACH USED

Although welfare protocols for fish such as salmon and trout have been developed in the past, indicators are species-specific and peer-reviewed journals do not contain any tilapia welfare protocol assessments.

Overall, the effectiveness of a welfare protocol depends on its validity, reliability and feasibility. In other words, the protocol needs to be validated by expert judgement, repeatedly, to achieve the same results by the same or different observers after adequate training and be consistent across different farm conditions.

The new tilapia welfare assessment protocol was disaggregated into four categories: (a) health, (b) environment, (c) behaviour and (d) nutrition, and considers the severity and duration of potential welfare risks.

Health and environmental indicators were established based on salmon protocols and adapted for tilapia. Tilapia environmental and nutritional needs, congruent with the scientific literature, were used to adjust the criteria of the scores. Finally, behavioural indicators were incorporated into the protocol. Scores were set for all categories.

Ten health indicators were established, based on clinical examination of the eyes, jaws, operculum, skin, fins, gills and spine; the presence of ectoparasites; blood glucose; and mortality. Environmental indicators included water physicochemical factors such as stocking density, the presence of interspecific cohabitants, shading and terrestrial predators. For nutritional assessment the indicators were body condition, the dietary crude protein level, the feed conversion ratio and feeding behaviour. The condition factor (K) was defined to estimate tilapia 'body score'.

Stocking density was also assessed as part of the nutritional evaluation and was classified as adequate or inadequate, according to life stage recommendations. For all nutritional indicators, a score of 1 was the ideal scenario, while scores of 2, 3 and 4 were off by 10 percent, 20 percent and over 20 percent of the optimal values, respectively.

Feeding behaviour was classified as appropriate if fish consumed the supplied feed within three minutes to five minutes. The swimming behaviour and the level of exposure to air after harvest, and the time it took for the fish to lose consciousness after harvest were also included in the protocol. The indicators for the evaluation of tilapia consciousness included the following clinical reflexes: opercular rate, vestibulo-ocular reflex, equilibrium and the tail-grab reflex.

The welfare indicator trials took place in both ponds and cage farms in southern and southeastern Brazil. Indicators were always measured by the same researcher during routine farming practices and with minimum interference to daily management and procedures. The sample sizes were determined by assessing the maximum number of individual tilapia, without disturbing the farm routine.

All the environmental indicators were assessed minutes before removing the fish from water. The physicochemical indicators were measured directly in the water. Feeding behaviour was measured during the time taken for the feed to be fully consumed by the animals. Production indices were collected via interviews with farm staff, mostly regarding mortality rate, stocking density and the daily amount of feed provided, to calculate feed conversion ratios.

The welfare score at harvest was assessed according to the capture method adopted in each site, which directly influenced the length of the light and air exposure periods, as well as the level of crowding.

After harvest, the slaughter score was assessed. Health examinations and blood glucose analyses were made before slaughter.


Delivering feed to a tilapia farm in Brazil

# SCOPE AND SCALE OF APPLICATION

Commercial farms in Brazil supported the research. The methodology can be applied at farm and slaughter levels by tilapia farmers in any part of the world after training – which can either be done on site or via a free e-learning platform.

The same framework is currently being applied in China and Thailand, while protocols and standards for shrimp and carp are also being developed.


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Feeding time is a good opportunity to assess tilapia welfare.

# ACCESSIBILITY

The assessment tool developed by the researchers can be used by farmers or processors. Those wishing to use the tool are guided through a series of simple questions that will help them to monitor and drive progress regarding welfare and best practices.

Answering the relevant questions generates immediate feedback (either direct or through e-learning activities), allowing tilapia producers to continuously improve their production practices.

In addition to tracking their own progress, users can see how they compare to others using similar production systems. For other stakeholders – such as goods and equipment suppliers – information on health and welfare in production and slaughter can be shared. Users will also be able to generate targeted reports about the impact of the tool on the tilapia sector.

The service is offered to farmers free of charge, with the highest general data protection regulation standards and information disclosure and security levels being in place.

# OUTCOME AND BENEFITS

The use of an animal-centred approach argues that assessing the welfare of individuals or groups of aquatic animals, naturally leads to fulfilment of their nutritional, health, environmental and behavioural needs. As a positive spiral, if any problem regarding any of these aspects is found, actions need to be taken to improve it, resulting in better welfare.

As the most critical stage of the supply chain, the farm is where most actions of welfare improvement can be performed. With that in mind, several institutions and organizations are working to provide support for the different stakeholders, with the common goal to drive real improvements in the aquaculture sector, generating an environment where:

Farmers can apply better fish husbandry at the farm level. They can constantly benchmark their own production both internally and with others and seek knowledge (online and in person), to secure optimal productivity.

Industry and processors can report on their developments in terms of positive welfare processes and actions and secure better yields and quality.

Food brands and retailers can provide more transparency to their clients on how and under what conditions their food has been produced.

The practical application of animal welfare science is an important tool to reduce the environmental impact of farms, increase their economic resilience and support social development. It can improve the quality of life for both people and fish.

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