Food and Agriculture Organization of the United Nations

TECHNICAL ASSISTANCE TO STRENGTHENING FISH DISEASE DIAGNOSIS, SURVEILLANCE AND MONITORING CAPACITY

March 2024

SDGs:	2 ZERO HUNGER, 14 LIFE BELOW WATER
Country:	Ethiopia
Project Code:	TCP/ETH/3805
FAO Contribution:	USD 193 000
Duration:	1 February 2022–31 December 2023
Contact Info:	FAO Representation in Ethiopia FAO-ET@fao.org

Implementing Partners

Disease Prevention and Control Directorate (DPCD) of the Ministry of Agriculture; National Animal Health Diagnostic and Investigation Center (NAHDIC).

Beneficiaries

Fish farmers and aquaculture sector stakeholders.

Country Programming Framework (CPF) Outputs

CPF Priority 1: Crop production, productivity and commercialization improved.

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BACKGROUND

Fish and fishery products play a critical role in meeting global food security and nutritional needs, with approximately 3.1 billion people relying on them for around 20 percent of their average per capita intake of animal protein.

Ethiopia's water bodies encompass 7 334 km² of major lakes and reservoirs, 275 km² of small water bodies, and 7 185 km of rivers. The country hosts a number of indigenous fish species, such as the Nile tilapia and the African catfish, which hold considerable importance for aquaculture. Despite this, Ethiopia's annual per capita fish consumption rate of 0.5 kg in 2022 remains significantly lower than the global average of 20.2 kg.

Fishing in the country relies primarily on artisanal methods, while aquaculture, despite favourable conditions, has not seen significant development. The country contains only a handful of subsistence fish farms, covering small ponds integrated with horticulture and livestock production, while there is a very limited number of commercial fish farming enterprises.

Nevertheless, aquaculture holds promising potential in Ethiopia. As well as a conducive environment, bolstered by the current national strategy for aquaculture development, which offers incentives that attract both local and foreign investors, there are also a number of dams and reservoirs under construction, presenting additional opportunities for fish farming.

Whether conducted semi-intensively or intensively, fish farming often encounters challenges such as stress-induced disease outbreaks, which demand immediate attention. As the number of private investors expressing interest in fish farming grows, with some farms already in operation, the need to implement a surveillance system becomes increasingly vital. It is therefore essential to prioritize the establishment of a fish disease diagnostic and surveillance system in Ethiopia. However, a number of other challenges to the sustainability of the fisheries and aquaculture industry persist. These are outlined below.

- Ethiopia possesses many fish species across its different lakes, yet their diseases remain poorly diagnosed and identified. Moreover, fish diseases often go unreported to the World Organisation for Animal Health (OIE) due to different challenges.
- The absence of effective early warning systems hampers the detection of exotic pathogen introductions.
- Ethiopia lacks a fish health management system to aid farmers in reporting disease outbreaks and managing occurrences, highlighting the necessity to enhance the capacity of veterinary professionals near water bodies in fish disease management.
- Ethiopia lacks a dedicated laboratory capable of conducting fish disease diagnoses. Expanding the capacity of the National Animal Health Diagnostic and Investigation Center (NAHDIC) to include fish disease analysis is essential.
- There is a lack of well-trained professionals in the Ministry of Agriculture and the NAHDIC proficient in fish disease diagnosis, surveillance, and management.

In this context, the current project led by the Food and Agriculture Organization of the United Nations (FAO) offers assistance in laying the foundation to address these issues in a more systematic and strategic approach through the development of an aquatic animal health strategy and surveillance plan, along with capacity development.

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IMPACT

The establishment of a comprehensive aquatic animal health strategy and surveillance plan resulted in improved capacity for managing aquatic resources in aquaculture, leading to enhanced household nutrition and the diversification of livelihoods.

By securing fish productivity and stabilizing food security, this project contributes to Sustainable Development Goal (SDG) 2, aimed at ending hunger. Additionally, by improving management capacities in aquatic resources, the project contributes to SDG 14, which aims to conserve and sustainably use the oceans, seas, and marine resources for sustainable development.

ACHIEVEMENT OF RESULTS

The activities implemented under the project enhanced Ethiopia's capacities in fisheries production, productivity, and commercialization, with a focus on integrating fisheries and aquaculture into policy frameworks to emphasize resource management, consumption, and aquatic organism health and biosecurity.

Thanks to engagement with different stakeholders, a National Strategy on Aquatic Organism Health (NSAOH) was developed within the context of the Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB), which focuses on aquaculture biosecurity and promotes sustainable aquaculture production with good husbandry practices, environmental practices, and prudent treatment or antimicrobial use.

Through the provision of laboratory equipment and specialized training in identifying fish diseases for the Disease Prevention and Control Directorate (DPCD) and the Animal Health Institute (AHI), national capabilities in both active and passive surveillance and disease diagnostics were strengthened. Taking into consideration national and regional disease risk factors, FAO provided technical assistance to support the competent aquatic animal health (AAH) authorities in drafting preliminary national surveillance plans, with particular emphasis placed on developing control plans to address the risk of introducing and transmitting fish diseases, including border controls. Notably, this included the development of a plan for Tilapia lake virus surveillance.

The extensive participation and collaboration among authorities, FAO, associations, academia, and the private sector were key to ensuring the sustainability of the project's outcomes. Once the strategy for surveillance is in place, the aquaculture sector is expected to experience a boost in investment, in particular thanks to the strengthened capacity to diagnose fish diseases, the ability to mitigate disease outbreaks and increased awareness of disease risks.

IMPLEMENTATION OF WORK PLAN AND BUDGET

The project encountered delays caused by internal processes and procurement issues, necessitating an extension of the project deadline to ensure the completion of all activities. Additionally, the project design underwent revisions to better achieve the desired outcome, including adjustments to outputs, activities, and budget to meet the requirements. All of the planned project activities were successfully carried out within the revised completion date and remained within the initially allocated budget.

FOLLOW-UP FOR GOVERNMENT ATTENTION

The sustainability of the project's outcomes depends on the effective implementation of different activities outlined in the NSAOH. It is anticipated that Ethiopia will be able to enhance fish production from current water bodies and planned reservoirs while ensuring effective management of aquatic animal health.

Additional initiatives are required to further advance the sector for food and nutrition security and safety. This includes reinforcing hatcheries and demonstration fish farms to attract private investment into the sector.

For the validation of the developed strategy, it is recommended to involve a wider range of stakeholders, including donors.

SUSTAINABILITY

1. Capacity development

The skills and knowledge transferred during the project will provide long-term benefits to the government, as authorities now possess the ability to develop plans, secure resources, and implement the NSAOH on a broader scale.

A series of training activities were conducted to improve and develop the capacities of staff members from relevant authorities and fish farmers. In addition, a training of trainers (ToT) was conducted to enhance the capacity of DPCD and AHI staff in identifying fish diseases. A total of 23 regional, zonal, and woreda officers took part in the training, and are now equipped to disseminate the knowledge acquired to experts in their respective regions. The objective of the training was to enhance the capacity of different staff and fish farmers to promptly detect the occurrence and distribution of fish diseases and to provide rapid responses.

2. Gender equality

Men and women have benefited equally from the project by participating in the different steps of project implementation. Although the number of women involved was limited, efforts were made to ensure their participation in all technical consultations, meetings, and relevant trainings conducted during the project period.

ACHIEVEMENT OF RESULTS - LOGICAL FRAMEWORK

Expected Impact	**Livestock and fisheries production, productivity and commercialization improved**		
Outcome	Risks of fish production losses minimized		
	Indicator	Significantly reduced fish mortality.	
	Baseline	Scattered information available.	
	End Target	Complete pathogen list.	
	Comments and follow-up action to be taken	All OIE-registered aquatic animal diseases present in the country and those endemic to the country are identified and listed.	
Output 1	National Strategy on Aquatic Organism Health (NSAOH) developed within the context of the Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB)		
	Indicators	Target	Achieved
	AAH Strategy developed.	Draft comprehensive AAH Strategy finalized.	Yes
Baseline	Scattered information available.		
Comments	The initial NSAOH draft underwent preparation, finalization, and review by key stakeholders, with all of their inputs duly incorporated. Subsequently, it underwent an additional review with broader stakeholder participation, including donors, as endorsed by the competent authority. Eventually, the finalized document was published.		
Activity 1.1	Convene the 'official' Ethiopia National Committee on Aquatic Health and Biosecurity with specific ToRs, criteria for membership, responsibilities and reporting mechanisms and work plan		
	Achieved	Yes	
	Comments	- A national technical committee (NTC) consisting of 15 members, including representatives from government authorities, industry/associations, and academia, was established to oversee the preparation of the NSAOH. Committee members were selected based on specific criteria, requiring a minimum degree qualification in agriculture, veterinary medicine, aquaculture, biology, or a related field, as well as academic and professional experience in fish health, aquaculture, information systems, educational tools, policy and governance, and field and laboratory work. Most of the members were selected from the pool of Ethiopian trainees who took part in the virtual training course on the design of an active surveillance for epizootic ulcerative syndrome (EUS) for Malawi using a 12-point checklist for a multidisciplinary team, which was conducted under the FAO-led project TCP/MLW/3804, "Enhancing capacity to respond and manage the risk of epizootic ulcerative syndrome (EUS)", conducted in Malawi in April 2022. - The NTC's terms of reference were prepared and outlined a range of responsibilities, including taking the lead in providing guidance for the development of the NSAOH, conducting a comprehensive review, prioritizing elements for implementation within the project duration, guiding relevant capacity-building activities, holding regular meetings with specific agendas, and reporting to the national project coordinator, who in turn reports to the FAO. - A technical working group was formed under the NTC, and was actively involved in the preparation of the NSAOH and addressing technical issues, including reporting mechanisms and updating work plans.	

Activity 1.2	Develop a draft National Strategy on Aquatic Organism Health (NSAOH) within the context of the Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB)	
	Achieved	Yes
	Comments	- The formed technical working group conducted a self-assessment to identify the national diagnostic capacity gaps, which were subsequently reviewed and approved by the NTC. Based on the results from the self-assessment, the technical working group prepared the initial draft of the NSAOH and conducted a number of surveys that significantly contributed to its preparation. During the drafting process, the technical working group adhered to different FAO guidelines and draft NSAOH, including: i) stepwise guidance for the implementation of PMP/AB pilot testing; ii) guidelines for preparing the NSAOH capacity and performance self-assessment survey questionnaires; iii) guidelines for preparing a NSAOH; iv) guidelines for preparing a national aquatic pathogen list; v) emergency preparedness and response system audit self-assessment survey questionnaires; vi) National Fish Health Strategy Malaysia (2018-2022); vii) draft NSAOH and biosecurity for the Federated States of Micronesia (2021-2024); and viii) development of a Regional Aquatic Biosecurity strategy for the Southern African Development Community (SADC, 2018). - The draft NSAOH was finalized with technical support from a FAO-hired international consultant and subsequently submitted to the FAO Regional Office for Africa and FAO headquarters for further technical review. - In addition to its contribution to the NSAOH, the international consultant developed a concept note titled "Contribution to sustainable food security and livelihood through Strengthened Aquatic Organism Health Management and Aquaculture Biosecurity in Ethiopia" for a future project. The concept note, reviewed by the technical working group, was submitted to the FAO Regional Office for Africa and headquarters for further technical review and possible consideration.
Activity 1.3	Organise a stakeholder consultation to present the draft strategy for feedback and consensus prior to finalization	
	Achieved	Yes
	Comments	- Two consultative workshops were conducted and attended by key stakeholders. The first workshop, with 13 participants, took place in Adama from 26 to 29 April 2023, while the second workshop, with 14 participants, was held in Bishoftu from 9 to 11 November 2023. - Additionally, during the second meeting, a round-table discussion facilitated by an international consultant was held, to obtain technical contributions on a range of aspects, including: i) the outcomes and preliminary analysis of the assessment survey; ii) the NSAOH, drafted by the technical working group under the guidance of the NTC; iii) the preparation of a NSAOH implementation plan for pilot testing and the development of a work plan for 2024; and iv) the training course on passive and active surveillance, diagnostics, mass mortality events in aquatic populations and disease outbreak investigation using the FAO guidance documents. - The workshop fostered a highly interactive environment, enabling participants to share valuable technical experiences and knowledge across different areas of aquaculture and fisheries development. Discussions addressed challenges affecting the sector and issues pertinent to the strategy. Moreover, the sessions provided an excellent opportunity for private investors to collaborate closely with the government, facilitating technical support and attracting more investors to develop the sector.
Activity 1.4	Undertake validation and approval process of the NSAOH	
	Achieved	Partially
	Comments	- The recruitment process for an international consultant was delayed, resulting in the consultant being available at a later stage to contribute to the NSAOH. Consequently, the validation process involved circulating the final NSAOH among key stakeholders to ensure that their feedback was fully addressed. - As a follow-up action, broader stakeholder participation has been suggested, including from donors, to validate the NSAOH, which should subsequently be endorsed by a competent authority and published.
Activity 1.5	Implement the following priority elements of the NSAOH	
	Achieved	Yes
	Comments	The priority actions outlined in the NSAOH were implemented through activities 1.5.1, 1.5.2 and 1.5.3.

Activity 1.5.1	National Aquatic Pathogen List	
	Achieved	Yes
	Comments	- Key priority components, such as the national pathogen list, active and passive surveillance, and diagnostics, were identified for implementation under the guidance of the NSAOH. The technical working group compiled a comprehensive national aquatic pathogen list, including both OIE-listed and endemic diseases. This list underwent review and validation by the NTC and was presented for stakeholder input during the consultation meeting in Adama from 6 to 8 November 2023. - The list of pathogens isolated or detected include: i) nematodes: *Contracaecum spp.* (anisakiasis infection, roundworm), *Amplicaecum spp., Eustrongyloides spp., Porocacum spp.; ii)* digenetic trematodes: *Clinostomum spp., Euclinostomum spp., Tylodelphyes spp., Diplostomum spp.*, *Niascus* (black spot); iii) monogenetic trematodes: *Gyrodactylus spp., Cichlidogyrus spp.; iv)* cestodes*: Bothriocephalus spp., Amithracantha spp., Ligula intestinalis*; v) acanthocephala: *Acanthocephala spp.*; vi) parasitic crustaceans: *Argulus spp., Dolops ranarum, Lernaea* (anchor worm); vii) bloodsucking parasites: leech; viii) protozoan parasites: *Ichthiophthirius multifiliis* (white spot), *Trichodina spp., Myxobolus spp., Coccidian spp.*; ix) bacterial diseases: *Yersiniosis* (enteric red mouth disease), Furunculosis disease, Columnaris disease, Vibriosis disease, fin and tail rot disease, dropsy disease, cotton mouth disease, bacterial gill disease, *Edwardsiella tarda* (emphysematous putrefactive disease of catfish), *Edwardsiella ictaluri* (enteric septicaemia of catfish), *Aeromonasiasis* (haemorrhagic septicaemia), *Pseudomonasis*; and x) fungal diseases: *Saprolegniasis.*
Activity 1.5.2	Active and passive surveillance	
	Achieved	Yes
	Comments	- A refresher course on active and passive surveillance was organized for regional officers from 27 June to 1 July 2023. Facilitated by a FAO-hired international consultant, the course was attended by 15 individuals, including members of the technical working group and participants from Southern Ethiopia, Central Ethiopia, Sidama, and Oromia regions. - The refresher course covered 13 topics, namely: i) introduction to epidemiology and surveillance; ii) checklist one scenario setting; iii) defining surveillance objectives; iv) defining population; v) disease clustering; vi) case definition; vii) study design and sampling; viii) data collection and management; ix) surveillance data analysis; x) validation and quality assurance; xi) human and financial resources and logistics requirements; xii) surveillance in big picture; and xiii) checklist six diagnosis level-III (Kathy Tang Nelson). - Equipped with the knowledge gained from the course, participants collaborated to draft the Ethiopian national action plan for Tilapia lake virus surveillance. The draft was reviewed and finalized by an international consultant and subsequently submitted to FAO technical units for additional technical review and approval. - Additionally, the service provider conducted active and passive surveillance using a tailored 12-point checklist for monitoring diseases in aquatic organisms.
Activity 1.5.3	Diagnostics	
	Achieved	Yes
	Comments	The diagnostic capacities were reinforced through the procurement of essential materials. The AHI and FAO collaborated in acquiring basic laboratory materials, including primers such as GoTaq®Probe and GoTaq® Qpcr Master Mix, for conducting diagnostic activities. Additionally, AHI conducted training sessions for relevant staff to enhance their capacity in diagnosing aquatic animal diseases.

Output 2	Fish disease diagnostic capacity strengthened		
	Indicators	Target	Achieved
	Diagnostic laboratory strengthened.	Expansion of surveillance and laboratory capacity for aquatic animals' disease diagnosis.	Yes
Baseline	Existing laboratory for animal diseases with limited capacity on aquatic animals.		
Comments	The diagnostic capacity gaps were identified, and the necessary expendable materials were procured through an international competitive procurement process.		
Activity 2.1	Assessment of existing laboratories to determine laboratory diagnostic infrastructure and capacity on aquatics		
	Achieved	Yes	
	Comments	A gap analysis was conducted based on assessment results, resulting in the implementation of a specialized training to enhance the capacity of DPCD and AHI in identifying fish diseases. To ensure effective knowledge transfer, a ToT session was conducted with the support of an international consultant. Competent staff members were selected to train additional regional staff and extension workers.	
Activity 2.2	Identify basic materials needed for a functional aquatic disease diagnostic laboratory including materials for field surveillance		
	Achieved	Yes	
	Comments	Critical materials essential for fish disease diagnosis were identified and provided to AHI, resulting in the acquisition of 31 items, comprising five consumables and 26 primers.	
Activity 2.3	Develop and implement training modules on aquatic disease diagnostics: identify various levels (e.g. policy, laboratory, extension, research)		
	Achieved	Yes	
	Comments	- Utilizing a training module developed by the service provider AHI, extension services were delivered to fish farmers, including extension agents as needed. This aimed to raise awareness about water quality requirements and effective pond or cage management to mitigate disease risks. - Data and information on the distribution and status of water bodies, as well as current fisheries and aquaculture activities in different regions, were collected and mapped. A plan was made to expand this initiative to cover all regions. - Regional and zonal fishery and aquaculture staff, along with selected farmers, received training on aquatic animal health management and biosecurity. They will subsequently disseminate the knowledge gained to farmers and AHI's staff in Wereda and Kebele districts.	
Activity 2.4	Organize study tour		
	Achieved	Yes	
	Comments	- Three national fish disease experts, representing the Ministry of Agriculture and the AHI, engaged in exchange visits to Bangkok, Thailand from 31 August to 12 September 2023. Facilitated by FAO, the experts gained valuable practical knowledge and experience in fish disease management, aiming to apply these insights in Ethiopia. - A field visit was arranged to a fish disease diagnostic laboratory in Bangkok, as well as to tilapia and shrimp farms. - The training and field visits were crucial in enhancing the capacity of the participants in designing risk analysis, conducting fish health management, including laboratory diagnosis of diseases, and providing technical oversight to the aquaculture and fishery industry in Ethiopia.	

Partnerships and Outreach
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