WorldFish activities on AMR, AMU and residues in aquaculture

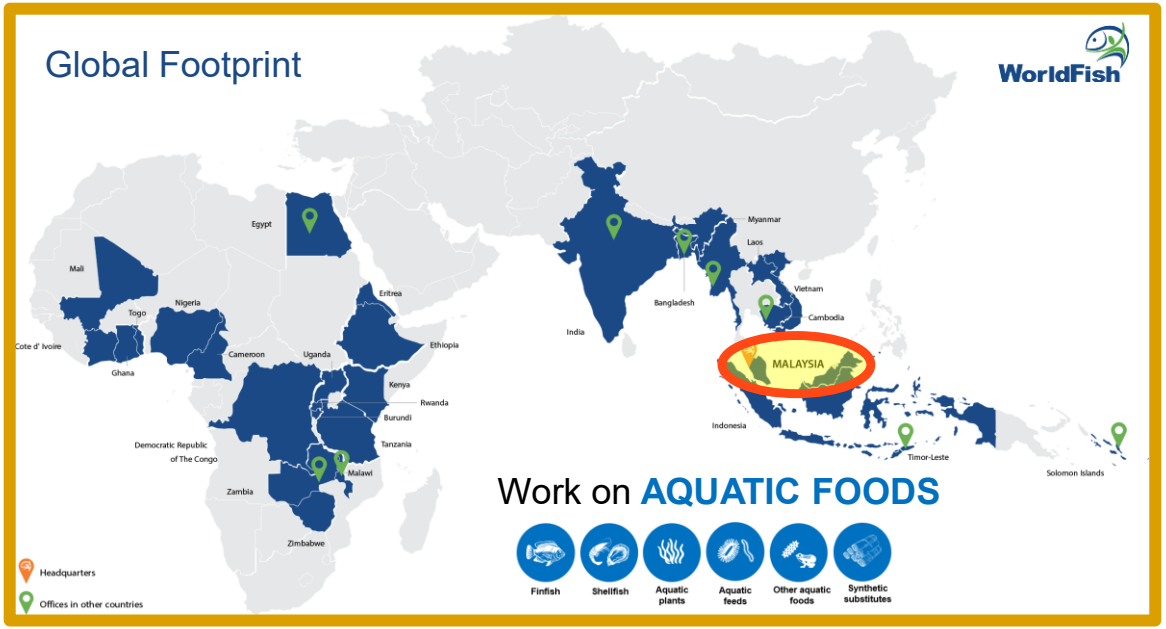
David Verner-Jeffreys

2nd Regional Consultation on the Draft “Regional Guideline for Monitoring and Surveillance of Antimicrobial Residues in Foods of Animal Origin” 27-29 January 2025 Bangkok, Thailand

WorldFish

About WorldFish

WorldFish is a non-profit organization under CGIAR, a global research partnership for a food secure future dedicated to reducing poverty, enhancing food and nutrition security, and improving natural resources.



Who benefits FROM OUR WORK

- Small-scale fishers, farmers, producers, processors, traders and consumers
- Local community & development actors
- Scientific community in low- & middle-income countries
- Public sector
- Private sector
- One CGIAR
- Media and the general public
- Young scientists, innovators & entrepreneurs
- Investors, philanthropic actors & development agencies

WorldFish is implementing projects in **27 countries** across Asia, Africa, and the Pacific region.

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Multi-sectorial collaboration on AMR under the One Health Initiative

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
IFPRI

WorldFish

Meet the CGIAR AMR team

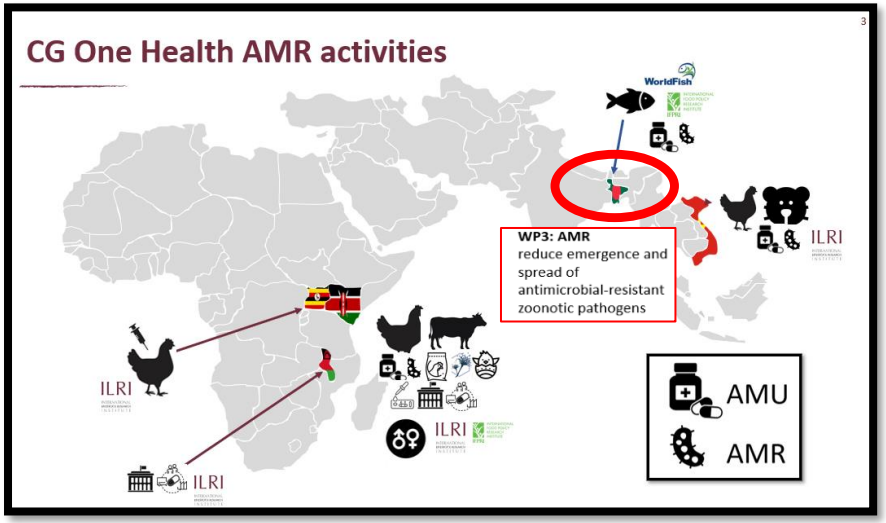
CGIAR

Focal country for AMU/AMR work by WorldFish

Why is Bangladesh vulnerable to AMR?

CGIAR Initiative

"Protecting Human Health through a One Health approach"

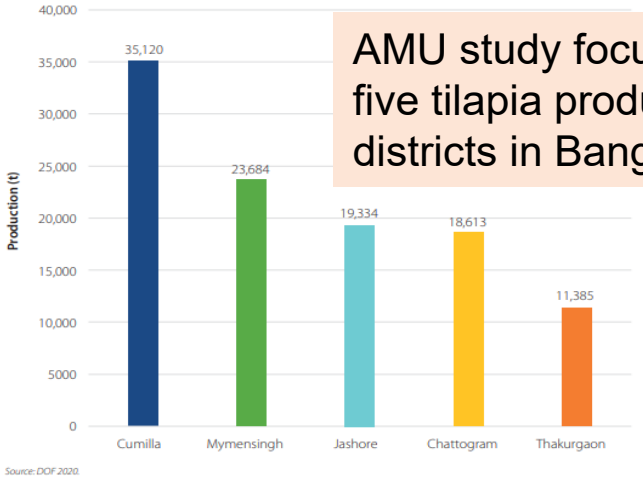


Food Safety Authority, Ministry of Livestock and Fisheries, Bangladesh Livestock Research Institute

In Bangladesh Aquaculture: 46 chemicals including seven antibiotics are commonly used in aquaculture farms

3rd on the Asian list of number of antibiotics (21 compounds) used in aquaculture

Over 100,000 licensed and 100,000 unlicensed retail drug shops selling drugs including antibiotics



AMU study focused on top-five tilapia producing districts in Bangladesh

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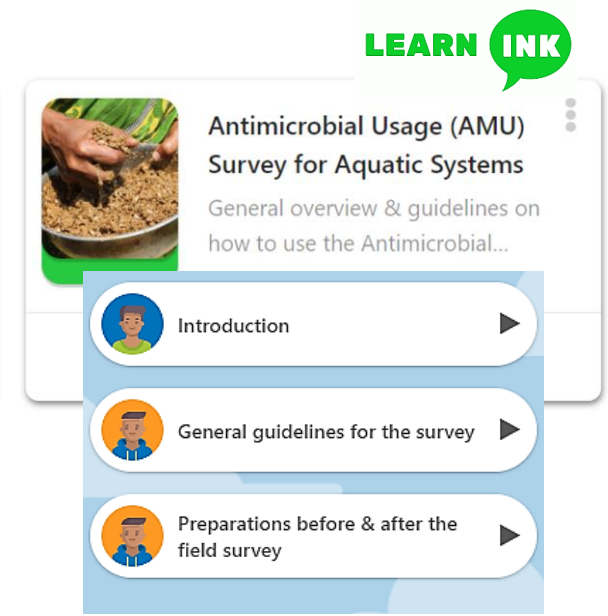
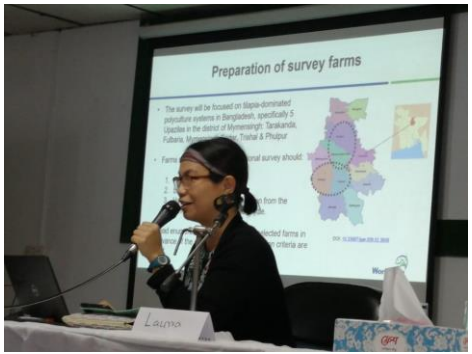
Trainings of enumerators on AMU/AMR data collection

Pretraining using Learn.ink courses, in-person trainings & demonstrations



Quick overview of survey tools, selecting the survey pond for capturing inputs & outputs.



Hands-on training on the survey & biological sampling

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Assessment of AMR at wet markets

https://doi.org/10.3389/fmicb.2024.13296

frontiers | Frontiers in Microbiology

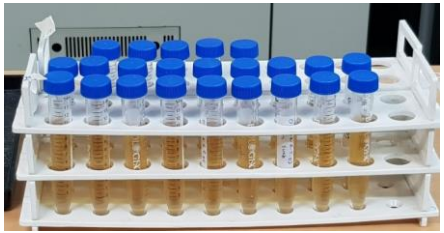
Nanopore sequencing for identification and characterization of antimicrobial-resistant *Escherichia coli* and *Salmonella* spp. from tilapia and shrimp sold at wet markets in Dhaka, Bangladesh

Shafiq Rheman[1*†], Sabrina Hossain[1†], Md Samun Sarker[2], Farhana Akter[1], Laura Khor[3], Han Ming Gan[4], Andy Powell[5,6], Roderick M. Card[7], Yaovi Mahuton Gildas Hounmanou[8], Anders Dalsgaard[8], Chadag Vishnumurthy Mohan[3], Zamila Bueaza Bupasha[2], Mohammed A. Samad[2], David W. Verner-Jeffreys[5,6] and Jérôme Delamare-Debouttеville[3*]

Collection of wet market samples

Processing of fish & shrimp samples

	Tilapia	Shrimp
Skin	✓	X
Gills	✓	X
Muscle	✓	✓
Intestine	✓	✓



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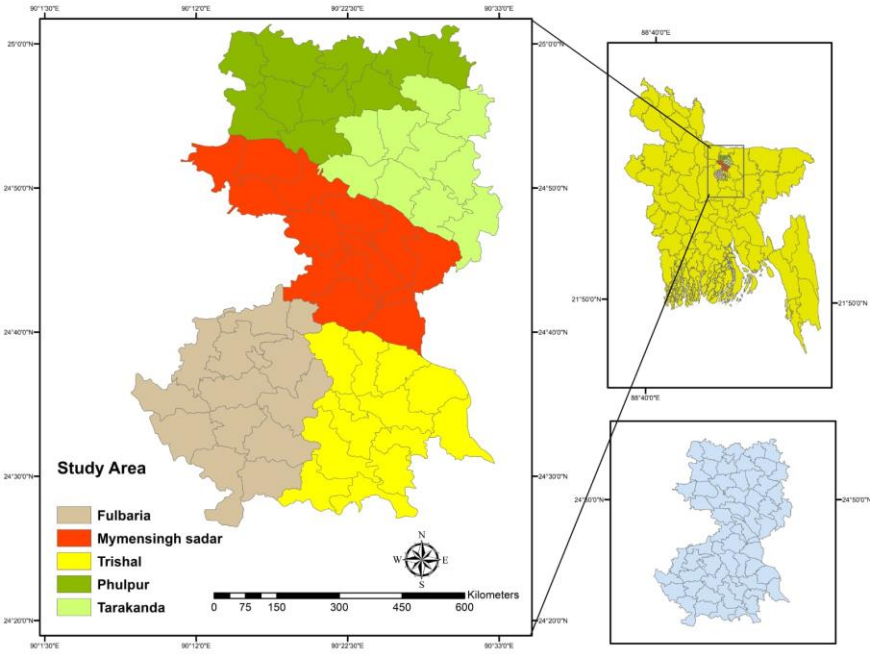
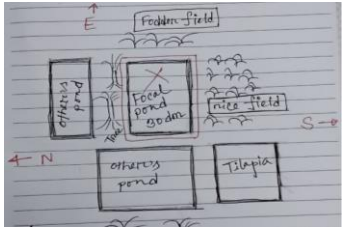
AMU/AMR Cross-sectional & Longitudinal Survey on Tilapia-dominant systems



Five upazilas within Mymensingh districts in Bangladesh where the study was conducted

- Questionnaire developed in collaboration with ILRI, IFPRI for harmonization with poultry production dataset
- Observation of 1 pond through 1 cycle (6 months) on farm biosecurity practices, inputs (including antimicrobials) & outputs



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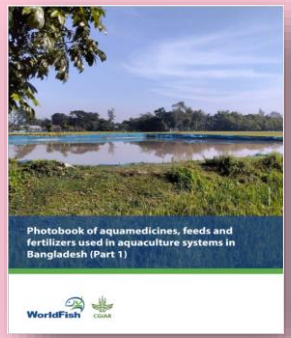
Development of aquamedicines photobook for AMU referencing

- Photobook of aquamedicines developed from farm product photos and input shop data.
  - Jute bags provided to observe packages of aquamedicines which includes antimicrobials (antiparasitics, antibiotics, antivirals, antifungals)
  - Survey of 52 input shops under 7 Upazilas in Mymensingh District for listing agro-chemicals and antimicrobials commonly provided to aquaculture farmers.
- Aquamedicines categorized into antimicrobials, insecticides, oxygen suppliers, harmful gas removers, probiotics, feed supplements and growth promoters.
- List of product photos, brand name, manufacturer and active ingredients.



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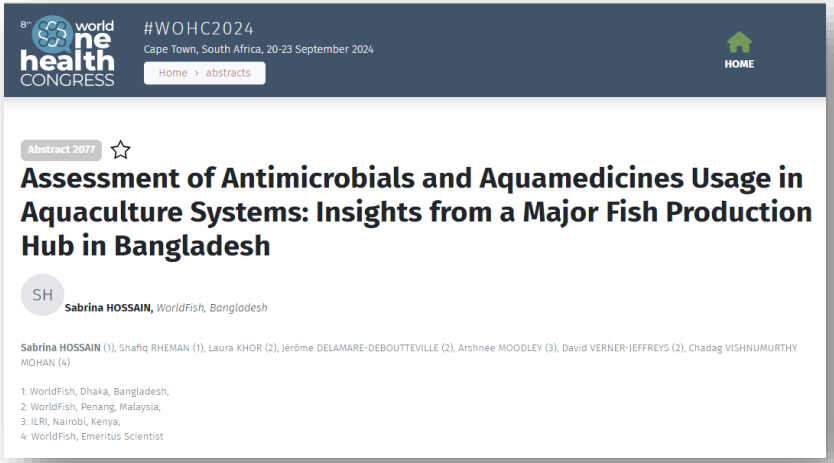
Agrovet shop survey

- Sales and use of antibiotics in aquaculture
- Practitioner's knowledge, attitude and practices.
- More than 300 aquamedicine brands were documented.
- Sixty-seven antibiotic brands belonging to 9 CIAs and 8 HIAs were reported.


8th world one health CONGRESS

#WOHC2024

Cape Town, South Africa, 20-23 September 2024

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Abstract 2077

Assessment of Antimicrobials and Aquamedicines Usage in Aquaculture Systems: Insights from a Major Fish Production Hub in Bangladesh

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2: WorldFish, Penang, Malaysia;
3: ILRI, Nairobi, Kenya;
4: WorldFish, Emeritus Scientist

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Antimicrobial residue study in Bangladesh

Overview of study

- A total of 90 muscle samples were collected from 30 commercial tilapia farms located in Tarakanda, Mymensingh Sadar, Fulbaria, Phulpur, and Trishal of Mymensingh, Bangladesh between October 2022 and April 2023.
- Samples were tested for antimicrobial residues using Ultra-High Performance Liquid Chromatography (U-HPLC) at the Bangladesh Livestock Research Institute (BLRI).
- Residues of amoxicillin, oxytetracycline, ciprofloxacin, tetracycline, and sulfamethoxazole were tested.

Sample tested:
AMOX, OT, CIP (n=90)
TET (n=72)
SUL (n=15)

Key findings

- Preliminary results indicate some samples above the maximum residue limits (MRLs) for sulfamethoxazole and amoxicillin residues. Results being verified/ followed up.
- No oxytetracycline, teracycline and ciprofloxacin residues were obtained in the samples

Results were interpreted following CODEX ALIMENTARIUS (FAO)

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Antimicrobial residue study in Bangladesh

On-going activities

- Thirty pond water and 30 sediment samples from the same tilapia farms were extracted for determining antibiotic residues by Liquid Chromatography-Mass Spectrometry (LC-MS).
- The testing will be done soon.

Future directions

- Conducting antimicrobial residue surveillance in major aquaculture hubs and other fish species in Bangladesh.
- Performing residue testing on environmental samples/inputs to evaluate potential contamination sources/pathways.
- Developing and implementing effective rapid testing methods for detecting antimicrobial residues.

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Partnerships and collaborations (WorldFish work with partners)

- Application of a ***systems-thinking approach*** to aquaculture systems for ***identifying hotspots*** for antibiotic resistance emergence, elucidating pathways to human exposure and to identify and assess feasibility of ***potential interventions*** (RVCL)
- Assessment of Aquatic food systems from a ***One Health lens*** – Bangladesh work (C*efas UK)*
- ***Microbiomes*** and AMR in aquatic food systems in Malawi and Bangladesh *(UoE UK)*
- AMR ***Learning platforms*** and ***participatory modelling approaches*** *(SRC, University of Waterloo Canada)*
- **Behavior and practice change** (SBCC) of aquatic food value chain actors including producers in Bangladesh (UoE UK)
- Fleming Fund country grants (Nigeria and Bangladesh) and FF Fellowship programs- ***embedding aquatic food systems*** in their AMR surveillance and One health work.
- ***CGIAR AMR and CGIAR Covid hub*** *(ILRI, IFPRI, IWMI and WorldFish)* and ***One CGIAR new initiative on One Health*** *(9 year program)*
- ***Rapid genomic detection*** *of aquaculture pathogens (UQ, WilderLab, Centex Mahidol, GeneSEQ, Cefas, UoE)*

Future work with:

- ***Fleming Fund Regional grant on AMROH activities*** *in South Asia (from 2024)*

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Thank you

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The WorldFish Aquatic Animal Health & One Health