



Food and Agriculture  
Organization of the  
United Nations



# AQUATIC GENETIC RESOURCES AND AQUAGRIS

## FAO resources in support of effective management of aquatic biodiversity in African aquaculture

*Graham Mair and Daniela Lucente*

*Unlocking the Potential of  
Sustainable Aquaculture in Africa*

**FAO-WBG SPECIAL DAY**

*15 November 2023 – Lusaka, ZAMBIA*





# Outline

- Background – FAO’s Cycle of work
- Summary of FAO developed resources
  - Global Assessment
  - Global Plan of Action
  - Response to challenges and needs – Information is key
- The context of African aquaculture
- What next?

# The scope of FAO's work on Aquatic Genetic Resources (AqGR)

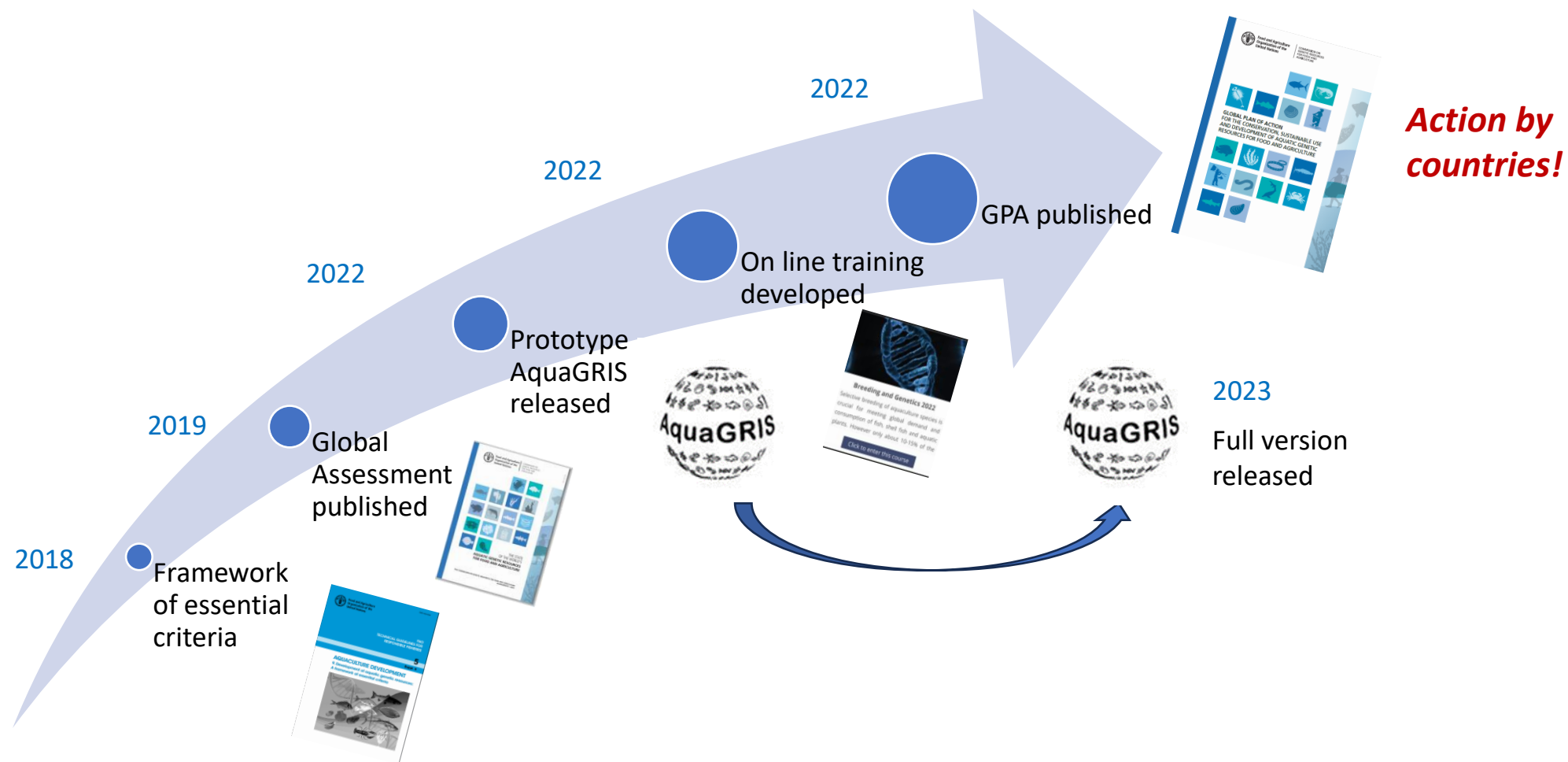
- A strategic approach guided by our members:
  - Commission on Genetic Resources for Food and Agriculture (CGRFA)
    - Intergovernmental Technical Working Group on AqGR (ITWG)
  - Committee on Fisheries (COFI)
    - COFI – Sub-committee on Aquaculture (COFI:AQ)
    - COFI – Advisory Working Group on AqGR and technologies
- **AqGR = Farmed species and their wild relatives within national jurisdiction**



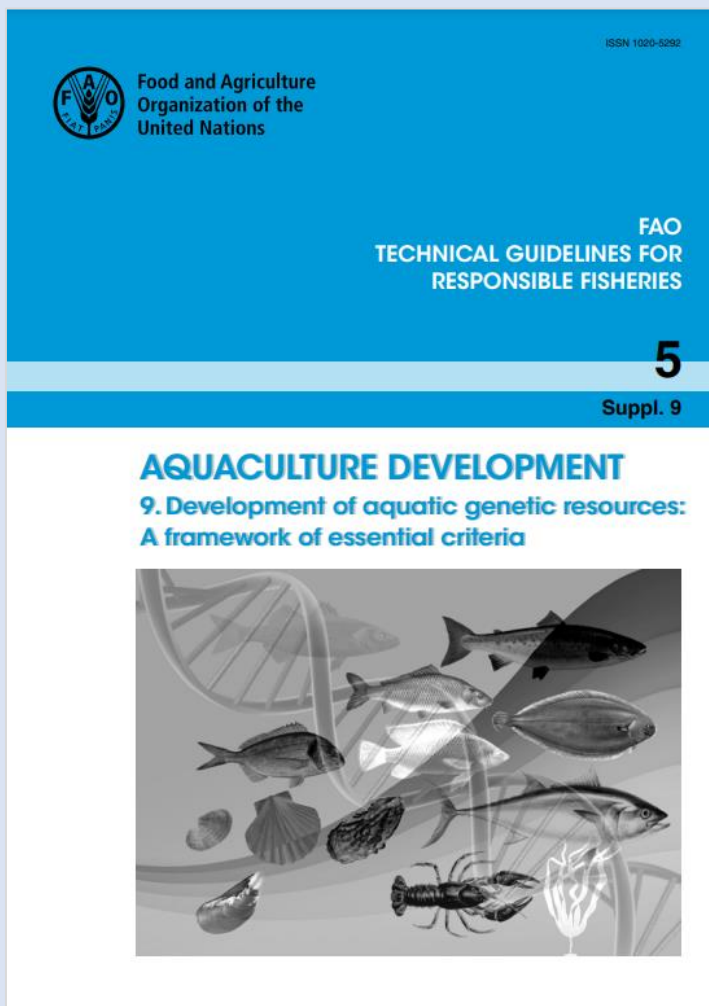
# Commission on Genetic Resources for Food and Agriculture - Cycle of Work



# FAO resource development for AqGR management



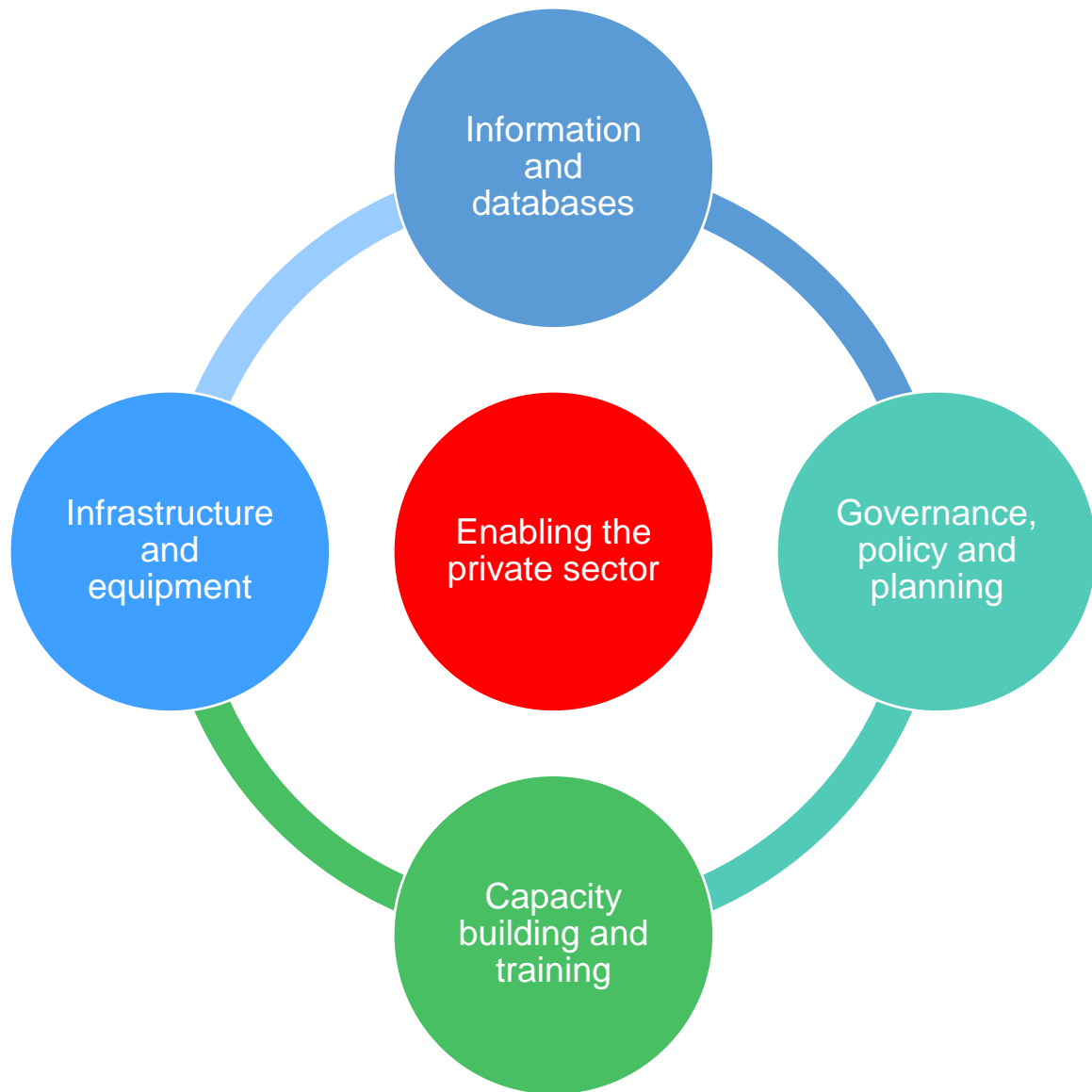
# The Framework of Essential Criteria



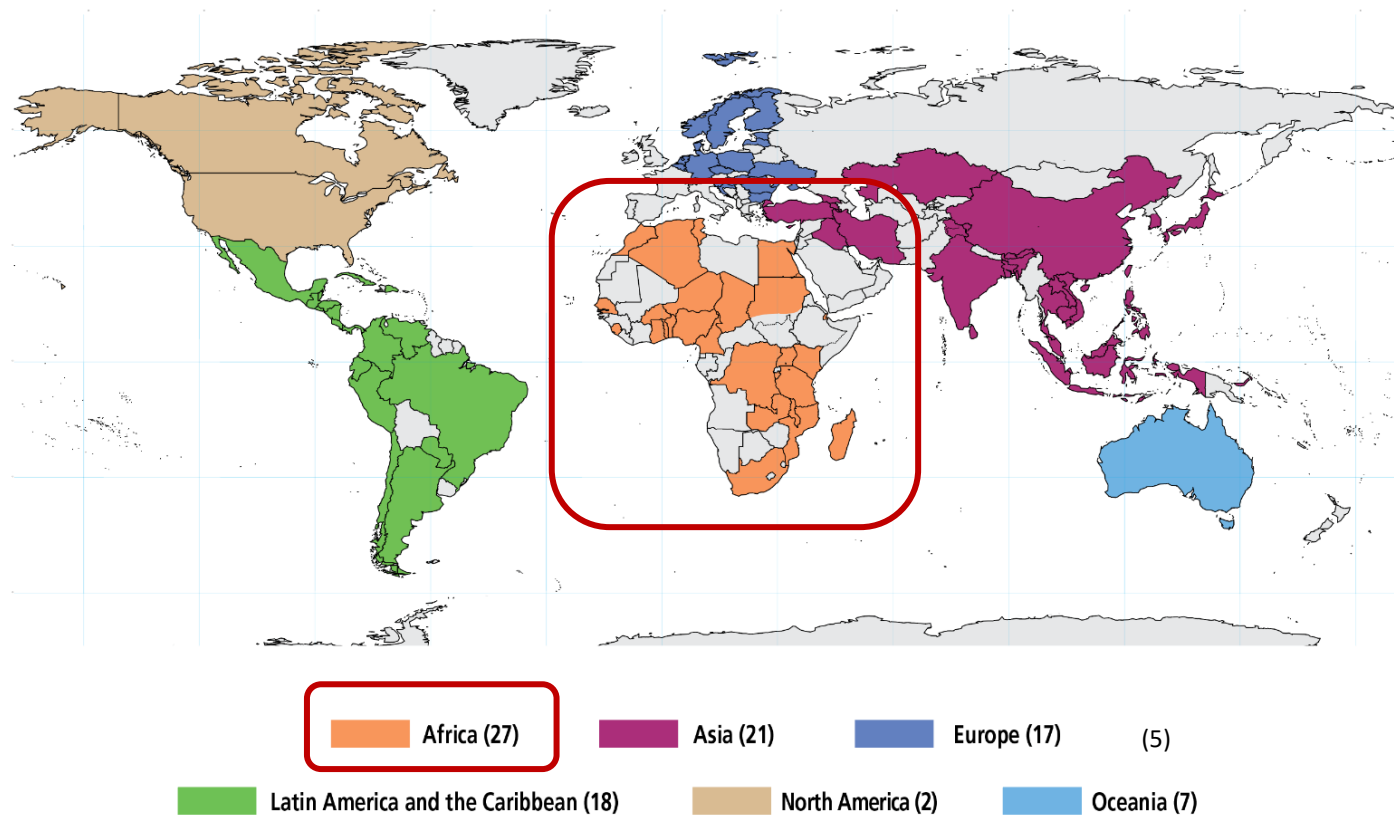
The Framework helps countries to establish conditions necessary to sustainably manage their AqGR

A **needs assessment document** that calls for national dialogue to develop an implementation strategy, and a review or revision of national policy and practice

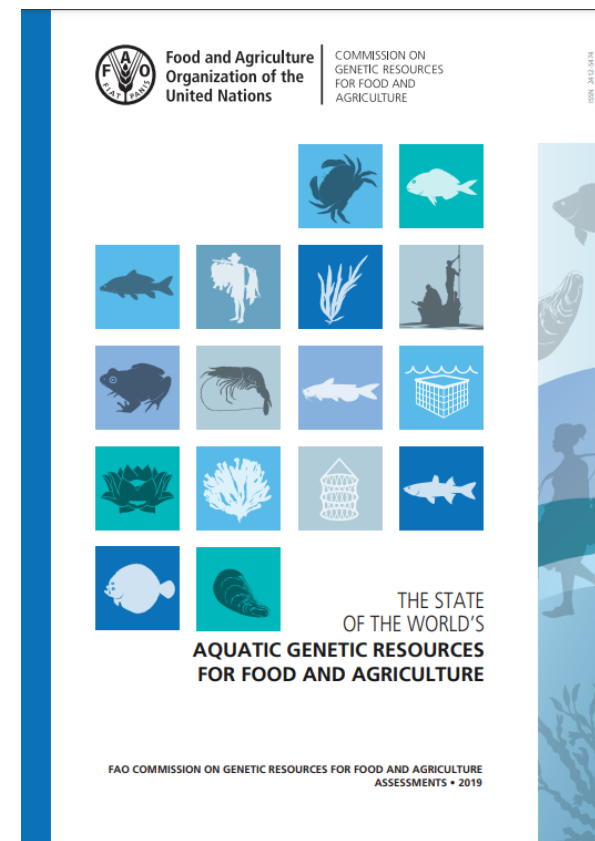
# How to use the Framework



- Consists of 5 main components that should be considered and developed as a package
- Stakeholders should map current policies, practices, infrastructure and resources onto the elements of the Framework
- Can assess which requirements would need to be created or better developed in a particular area



- Representing **96%** of aquaculture production
- Representing **80%** of capture fisheries production
- Includes the **11** major aquaculture producers
- **27** countries from Africa!



Based on **92 country reports**  
+  
thematic studies

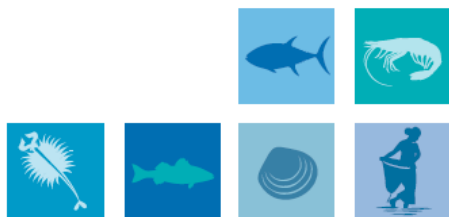


# Policy Response – Global Plan of Action: 4 Priority Areas



Food and Agriculture  
Organization of the  
United Nations

COMMISSION ON  
GENETIC RESOURCES  
FOR FOOD AND  
AGRICULTURE



**GLOBAL PLAN OF ACTION  
FOR THE CONSERVATION, SUSTAINABLE USE  
AND DEVELOPMENT OF AQUATIC GENETIC  
RESOURCES FOR FOOD AND AGRICULTURE**



## **INVENTORY, CHARACTERIZATION AND MONITORING**

Establish and strengthen national and global characterization, monitoring and information systems for AqGR



## **CONSERVATION AND SUSTAINABLE USE OF AQGR**

Promote the conservation and sustainable use of cultured and wild relative AqGR



## **DEVELOPMENT OF AqGR FOR AQUACULTURE**

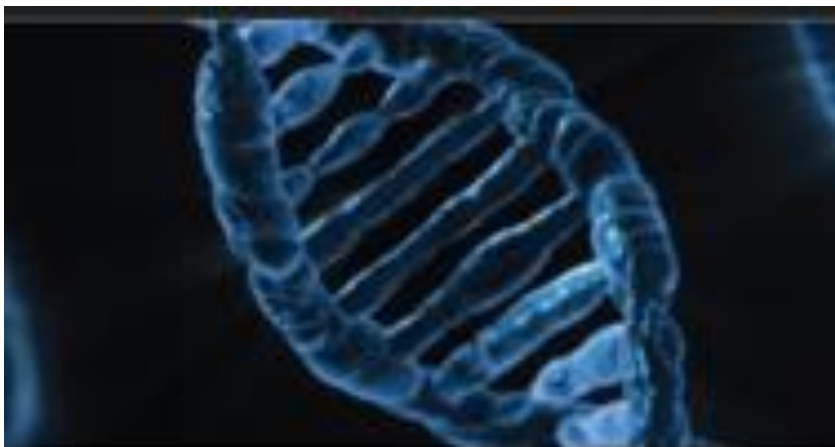
Accelerate the development and uptake of genetic improvement of aquaculture farmed types, with a focus on the expansion of selective breeding programmes



## **POLICIES, INSTITUTIONS AND CAPACITY BUILDING**

Promote the development of AqGR-related policies, support the development of stakeholder institutions and build capacity to support the management of AqGR

# On-line course on Aquaculture Breeding and Genetics



## Breeding and Genetics 2022

Selective breeding of aquaculture species is crucial for meeting global demand and consumption of fish, shell fish and aquatic plants. However only about 10-15% of the

[Click to enter this course](#)

- Developed in partnership with Nofima (Norway)
- 17 modules covering introduction to AqGR management and selective breeding
- 6½ hours of video lectures, interviews and demonstrations
- Will be made available free through FAO's e-learning platform
- Includes assessments and FAO certification
- Targeted at industry players (e.g. hatchery managers), resource managers and certificate or undergraduate level students
- Content is complete and reviewed, delivery platform pending.

## Capacity Building - Publications on Management of AqGR

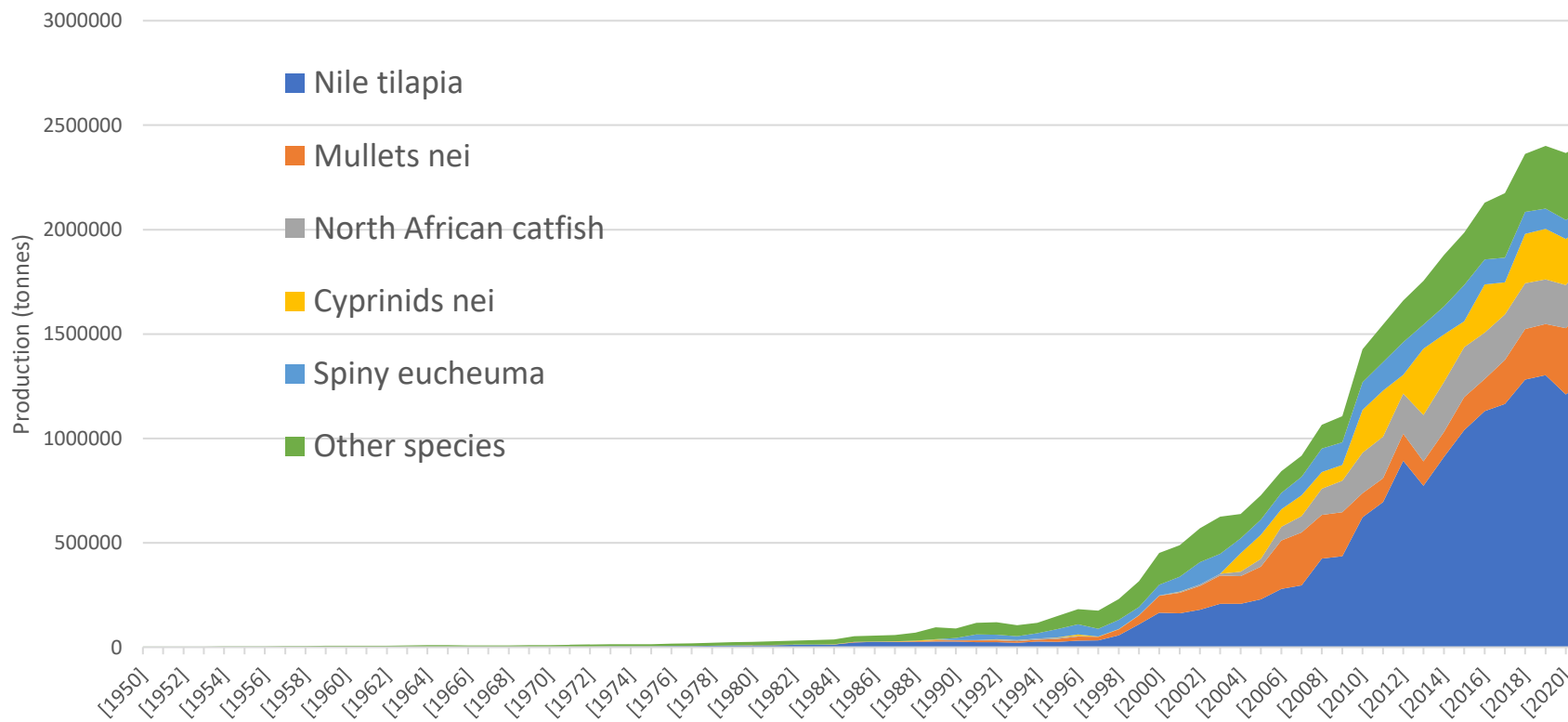
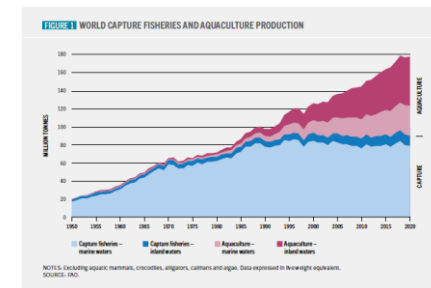
- Three case studies on critical issues on AqGR management
  - ➔ • **Lessons from two decades of tilapia genetic improvement in Africa**
  - **Genetic management of Indian major carps**
  - **Proactive approach proved key to survival for the Australasian Pacific oyster industry**
- Guidelines under preparation
  - **Genetic management in stocking programmes**
  - **Guidelines for *ex situ in vitro* gene banking**



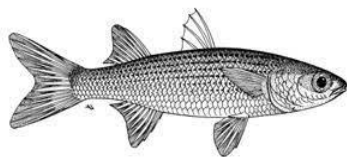
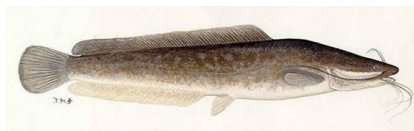
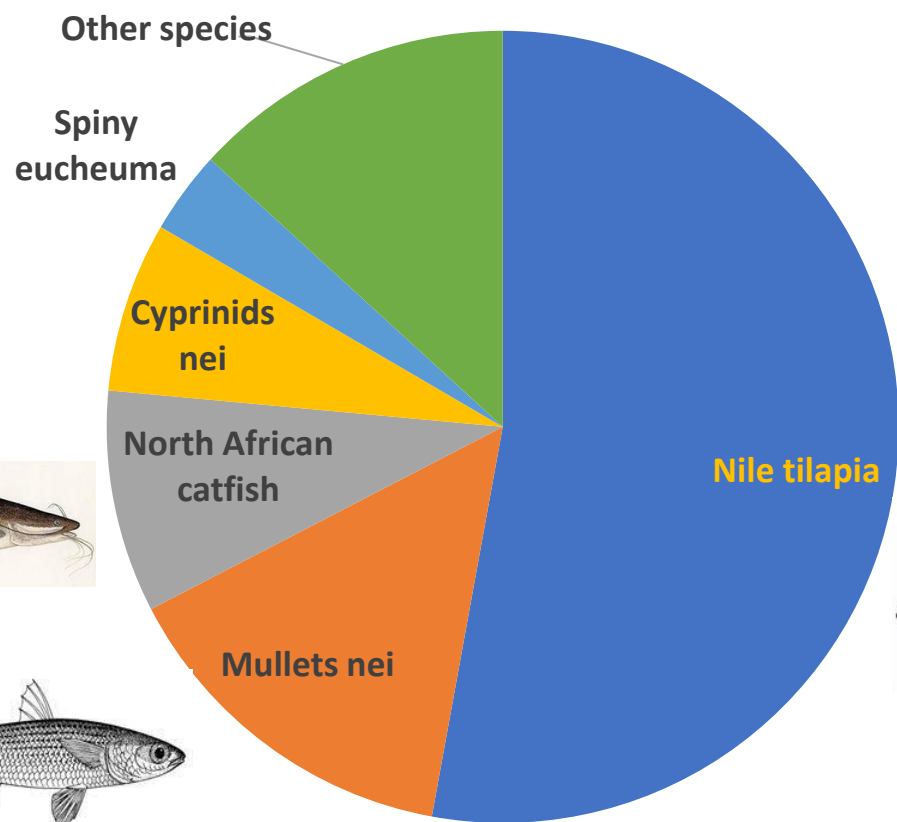
# African Region – Aquaculture Production

**Aquaculture ~ 2.4 million tonnes; USD 5.6 billion**  
**Capture fisheries ~ 10.3 million tonnes**

<2% of global aquaculture



# African Aquaculture – Species diversity



- ~38 species (>1,000 tonnes)
- ~85 species total
- *Effective genetic management lacking*
- *A few breeding programs*



# AqGR management in African aquaculture

- Native vs non-native species and farmed types
- Conservation of key wild genetic resources
- Effective genetic management of domesticated farmed types
- Implementation of genetic improvement (incl. regional programs)
- Governance mechanisms and capacity building
- Effective access and benefit sharing mechanisms

# Inventory, characterisation and monitoring *information → understanding → appropriate action*

- FAO statistics provide information on production of species but incomplete
- Insufficient monitoring and reporting on AqGR, especially below the level of species
- Lack of standardization of nomenclature and terminology – needs harmonization

*“Variety”*      *“Strain”*      *“Wild relative”*      *“Hybrid”*      *“Breed”*

**Farmed type: A descriptor applied to farmed aquatic organisms at a level below species, including strain, variety, hybrid, triploid, monosex group, other genetically altered forms or wild-sourced.**

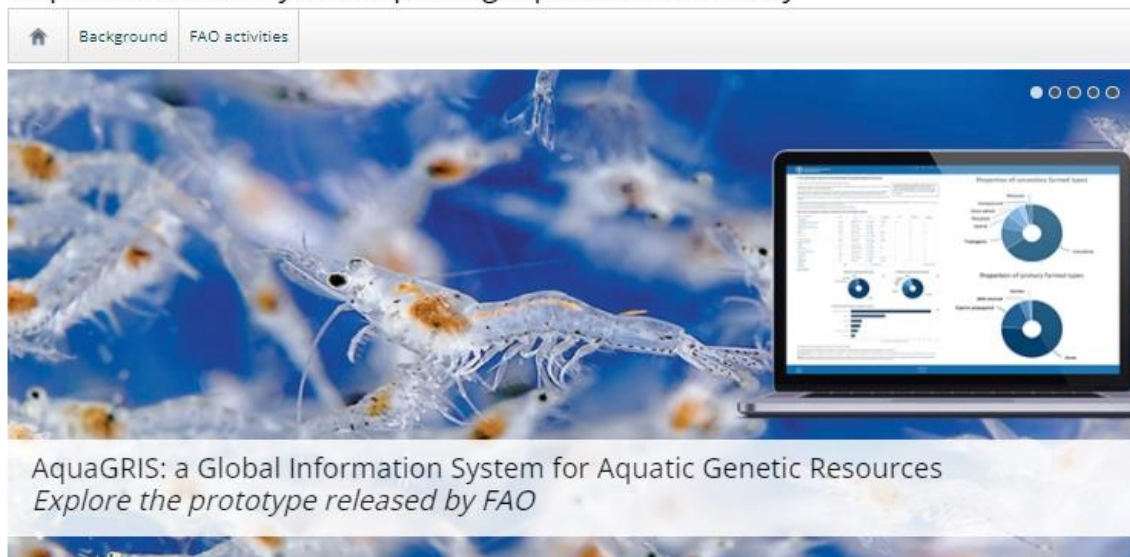


# What is AquaGRIS

## (Aquatic Genetic Resources Information System)

AquaGRIS is an FAO-based information system to collect, organize and make freely available global genetic data on farmed types and wild stocks of aquaculture species

Aquatic biodiversity: underpinning aquatic food security

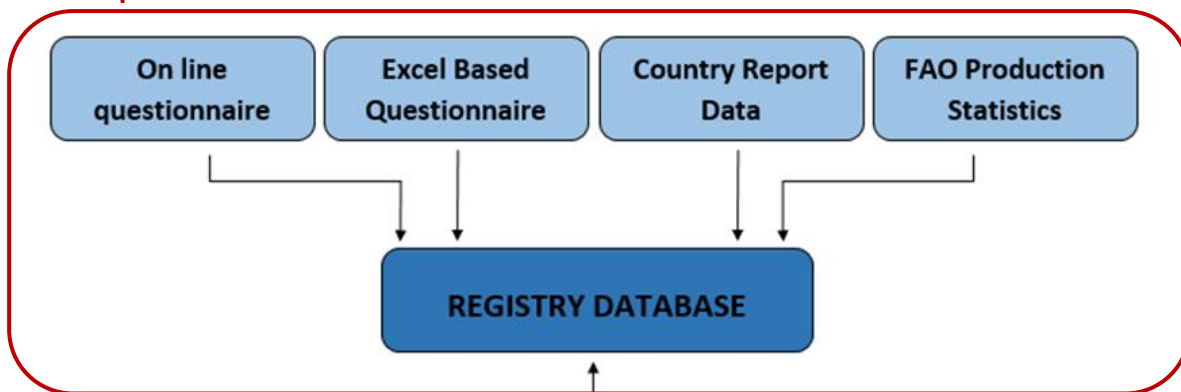


<https://www.fao.org/aquatic-genetic-resources/home/en/>



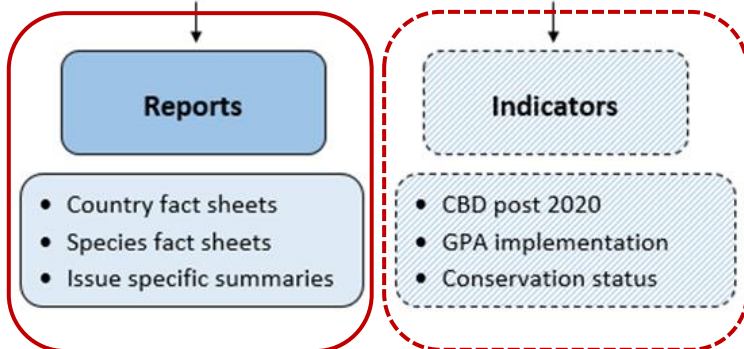
# AquaGRIS prototype: structure and functions

Complete



DATA QUERY USER INTERFACE

Update pending

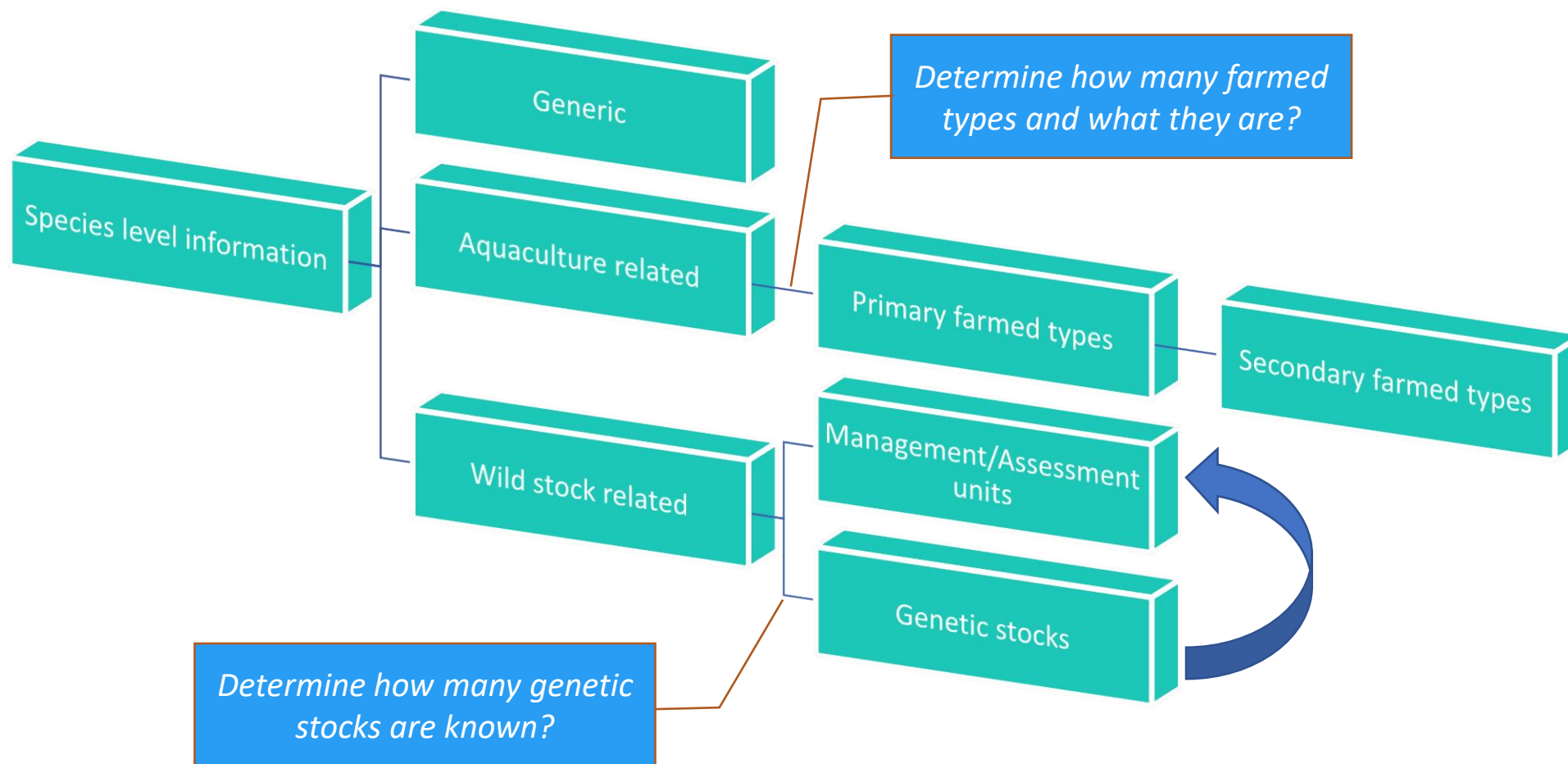


Users can query a variety of data and filter them by:

- **Geographic level**  
International, regional and national level
- **Taxonomic groups**  
Aquatic plants (freshwater aquatic macrophytes, seaweeds and microalgae), crustaceans, finfish, and molluscs
- **Species**  
Over 600 species which represent all species for which farming has been reported to FAO
- **Farmed types**  
Strain (animals/micro-organisms), variety (plants/seaweed), captive propagated, wild sourced, hybrid, crossbred, introgressed, monosex, polyploidy, gene edited, transgenic.

<https://www.fao.org/fishery/aquagris/home>

# The new data entry interface



# Commission on Genetic Resources for Food and Agriculture - Cycle of Work



**10 Year  
Cycle**

Resource indicator reports  
Process indicator reports

92 countries



National Registry Creation  
Strategies for implementation

# The opportunity in Africa?

## Status

- Limited understanding of status of AqGR
- Threats to indigenous genetic diversity
- Small number of species and few farmed types

## Opportunity

- To enhance management before AqGR are compromised
- To inventory AqGR nationally and regionally
- Apply Framework to understand national and regional capacity
- Move towards development of AqGR management plans

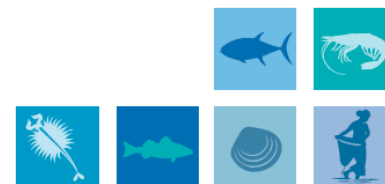
## First Actions

- Nominate National Focal Points and engage with FAO
- Adopt AquaGRIS and create national registries of AqGR – a great starting point

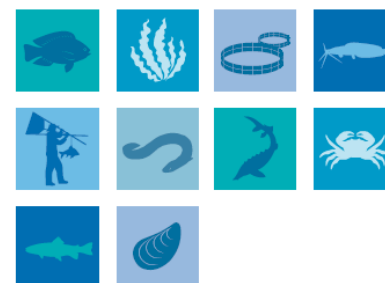


Food and Agriculture  
Organization of the  
United Nations

COMMISSION ON  
GENETIC RESOURCES  
FOR FOOD AND  
AGRICULTURE



GLOBAL PLAN OF ACTION  
FOR THE CONSERVATION, SUSTAINABLE USE  
AND DEVELOPMENT OF AQUATIC GENETIC  
RESOURCES FOR FOOD AND AGRICULTURE



# Thank You

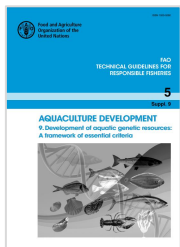


**Food and Agriculture Organization  
of the United Nations**

<https://www.fao.org/aquatic-genetic-resources/home/en/>

Spare slides

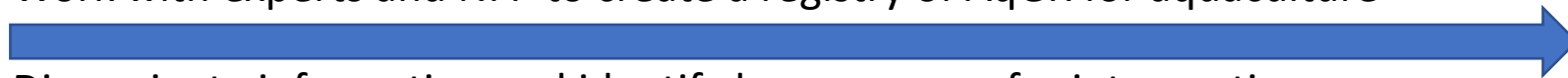
## Framework



Map current policies, practices, infrastructure and resources onto the elements of the Framework and identify gaps and needs



Work with experts and NFP to create a registry of AqGR for aquaculture



Disseminate information and identify key resources for intervention i.e. conservation, sustainable use or development

## GPA



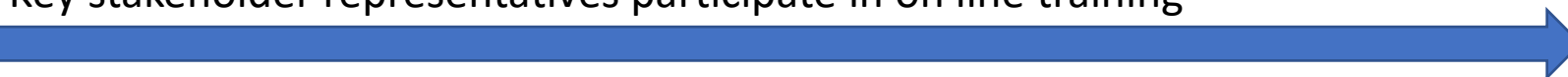
Review national priorities within the four priority areas in the context of above and identify key actions to prioritise within a national strategy



## Training



Key stakeholder representatives participate in on line training



Tailored trainings/awareness raising as required

**A national register of  
AqGR**

--

**Key conservation  
needs (incl. gene  
banking)**

--

**Priority farmed types  
for better genetic  
management**

--

**Genetic  
improvement needs  
and approaches**

--

**Capacity building  
and policy  
development needs**

**National strategy for AqGR management**