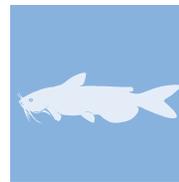
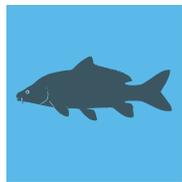
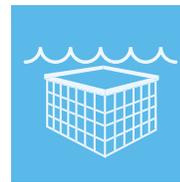
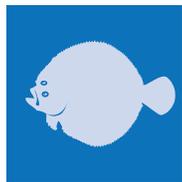




Food and Agriculture
Organization of the
United Nations

COUNTRY REPORTS

Ghana



Country Report Supporting the Preparation of the
First Report on *The State of the World's Aquatic
Genetic Resources for Food and Agriculture*

This Country Report has been submitted by the national authorities as a contribution to the Food and Agriculture Organization of the United Nations (FAO) publication, *The State of the World's Aquatic Genetic Resources for Food and Agriculture*. The information in this Country Report has not been verified by FAO, and its content is entirely the responsibility of the entity preparing the Country Report, and does not necessarily represent the views of FAO, or its Members. The designations employed and the presentation of material do not imply the expression of any opinion whatsoever on the part of FAO concerning legal or development status of any country, territory, city or area or of its authorities or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned.



Food and Agriculture
Organization of the
United Nations

COMMISSION ON
GENETIC RESOURCES
FOR FOOD AND
AGRICULTURE

**Questionnaire for the Preparation of
Country Reports for *the First State of
the World's Aquatic Genetic Resources
for Food and Agriculture***

COMMISSION ON
GENETIC RESOURCES
FOR FOOD AND
AGRICULTURE



INSTRUCTIONS FOR COMPLETING THE DYNAMIC GUIDELINES

How do I complete the dynamic guidelines?

1. You will require Adobe Reader to open the dynamic guidelines. Adobe Reader can be downloaded free of charge from: <http://get.adobe.com/uk/reader/otherversions/>. Use Adobe Reader Version 10 or higher.
2. Open the dynamic guidelines and save it (save as a pdf) on your hard drive.
3. Please rename it <name of your country>.pdf.
4. You may forward the dynamic guidelines to stakeholders you would like to involve or inform by e-mail. You may also print and/or save the dynamic guidelines.
5. It is advisable to prepare textual responses (including any formatting such as bullet points) first in a separate document and then to copy and paste them into the form. Please use font Arial 10. Acronyms and abbreviations should be avoided if possible. If included, they must be introduced (i.e. written out in full) the first time they are used. Note that the text boxes are expandable. Once text has been entered, the box will automatically enlarge to make its content fully visible when you click outside its border. To delete a row you have added, click on the "X" on the far right of the table
6. When you have finished completing the dynamic guidelines, click the "Submit form" button at the end of the form and send the completed dynamic guidelines to Devin.Bartely@fao.org; Matthias.Halwart@fao.org; and ruth.garciagomez@fao.org.
7. This should automatically attach the document to an email that you can then send. Otherwise, please attach the completed dynamic guidelines manually to an e-mail and send it to Devin.Bartely@fao.org; Matthias.Halwart@fao.org; and ruth.garciagomez@fao.org.
8. A letter confirming official endorsement by relevant authorities should also be attached to the email.
9. You will receive a confirmation that the submission was successful.

Where can I get further assistance?

If you have any questions regarding the dynamic guidelines, please contact Devin.Bartely@fao.org; Matthias.Halwart@fao.org; ruth.garciagomez@fao.org

Several websites provide useful information on aquatic species that can be consulted for proper species names and for information on aquatic genetic resources: [AlgaeBase](#), [Aquamaps](#), [Barcode of Life](#), [Census of Marine Life](#), [FishBase](#), [Frozen Ark](#), [GenBank](#), [Global Biodiversity Information Facility](#), [International Union for Conservation of Nature](#), [National Institutes of Health Database on Genomes and Bioinformatics](#), [Ornamental Fish International](#), [SealifeBase](#), [Sea Around Us](#), and [World Register of Marine Species](#).

How, by whom and by when must the completed dynamic guidelines be submitted?

Once officially endorsed by the relevant authorities, the completed dynamic guidelines should be submitted (click the "Submit form" button on the header banner) by the National Focal Point. **Completed dynamic guidelines should be sent by December 31st 2015.**

www.algaebase.org
www.aquamaps.org
www.barcodeoflife.org
www.coml.org
www.fishbase.org
www.frozenark.org
www.genbank.org
www.gbif.org
www.iucn.org
<http://discover.nci.nih.gov/>
www.ornamental-fish-int.org
www.sealifebase.org
www.seaaroundus.org
www.marinespecies.org

I. INTRODUCTION

At its Thirteenth Regular Session, the Commission noted that the preparation of a country-driven *State of the World's Aquatic Genetic Resources for Food and Agriculture* would provide countries with opportunities for assessing the status of their aquatic genetic resources for food and agriculture and enhancing the contributions of aquatic genetic resources to food security and rural development. Additionally the process of producing Country Reports will assist countries in determining their needs and priorities for the conservation and sustainable use of aquatic genetic resources for food and agriculture, and will help raise awareness among policy-makers.

II. COUNTRY REPORTS

As with the other sectors, *The State of the World's Aquatic Genetic Resources for Food and Agriculture (SoWAqGR)* will be compiled from Country Reports. It is recognized that guidance is necessary in order to assist countries in completing those reports under a common framework. The Country Reports will become official government documents submitted to FAO.

The following questionnaire is the suggested format for the preparation and submission of Country Reports. The questionnaire has been prepared by FAO to assist in the preparation of Country Reports contributing to the SoWAqGR Report. It has been designed to assist countries to undertake a strategic assessment of their aquatic genetic resources for food and agriculture.

The scope of the first State of the World's Aquatic Genetic Resources for Food and Agriculture, and therefore the emphasis in the Country Reports, is farmed aquatic species and their wild relatives within national jurisdiction.

Country Reports should:

- become powerful tools for improving the conservation, sustainable use and development of aquatic genetic resources for food and agriculture, at national and regional levels;
- identify threats to aquatic genetic resources, gaps in information about aquatic genetic resources and needs for the strengthening of national capacity to manage aquatic genetic resources effectively;
- inform the development of national policies, legislation, research and development, education, training and extension concerning the conservation, sustainable use and development of aquatic genetic resources for food and agriculture;
- contribute to raising public awareness about the importance of aquatic genetic resources for food and agriculture;
- complement other national reporting activities on the conservation, sustainable use and development of aquatic genetic resources.

Timeline and process

In line with the overall process, as established by the Commission, the Director-General of FAO sent a Circular State Letter on 19 April 2012 to countries requesting them to identify National Focal Points for the preparation of Country Reports by 31 December, 2015.

The following steps are recommended in preparing the Country Report, using a participatory approach:

- Each participating country should appoint a National Focal Point for the coordination of the preparation of the Country Report who will also act as focal point to FAO. National Focal Points should be communicated to the Secretary, Commission on Genetic Resources for Food and Agriculture (cgrfa@fao.org) immediately.
- Countries are encouraged to establish a national committee to oversee the preparation of the Country Report. The national committee should consist of as many representative stakeholders as practical (representing government, industry, research and civil society).
- The national committee should meet frequently to review progress and consult widely with key stakeholders.

- The National Focal Point should coordinate the preparation of the first draft of the Country Report, which should be reviewed by the national committee. The National Focal Point should facilitate a consultative process for broader stakeholder review.
- Following the stakeholder review, the National Focal Point should coordinate the finalization of the Country Report, submit it to the government for official endorsement and transmit it to FAO in one of the Organization's official languages (Arabic, Chinese, English, French, Russian and Spanish) by 31 December 2015.
- The Country Report will be an official government report.
- If countries are unable to submit final Country Reports by the set deadline, preliminary reports of findings should be provided to FAO to contribute to the identification of global priorities for inclusion in the SoWAqGR Report.

**QUESTIONNAIRE FOR PREPARATION OF COUNTRY REPORTS FOR
THE STATE OF THE WORLD'S AQUATIC GENETIC RESOURCES FOR FOOD
AND AGRICULTURE**

Country report supporting the preparation of
The State of the World's Aquatic Genetic Resources for Food and Agriculture

Country	Ghana
Prepared By	DR. FELIX YAO KLENAM ATTIPOE
Date	Sep 1, 2015

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I. EXECUTIVE SUMMARY

The Country Report should contain an executive summary of 2-3 pages highlighting the main findings of the analysis and providing an overview of key issues, constraints and existing capacity to address the issues and challenges. The executive summary should indicate trends and driving forces and present an overview of the proposed strategic directions for future actions aimed at the national, regional and global levels.

Please include the Executive Summary here.

The fisheries resources of Ghana are obtained mainly from the capture and culture environment. Capture fisheries, sourced from the sea, lakes, rivers, dams and reservoirs, constitute about 90% of fish production while culture which is mainly from fresh water aquaculture, forms the remaining 10%. The sector's contribution to Agricultural Gross Domestic Product (GDP) increased consistently from 2.3% in 2010 to 7% in 2014. The fisheries frontier is expanding due to the significant progress made in the aquaculture sub-sector and the introduction of a new high valued shrimp culture niche. Production from farmed aquatic species has been increasing over the last ten years. This trend is expected to continue through the active involvement of public sector institutes, Non Governmental Organizations (NGOs), and private enterprises. The trend in catches of wild relatives of farmed aquatic species has however been fluctuating; overall, production has continued to decline and this is primarily attributed to factors such as overfishing, pollution, climate change, habitat destruction and invasive species (water hyacinth)

In Ghana, most species of farmed fish are sourced as wild seed/wild brood stock. The main biotechnology that has been used in genetic improvement of farmed aquatic organisms is selective breeding and monosex production (of mainly *Oreochromis niloticus*) and for research purposes, hybridization of catfish (*Clarias gariepinus* and *Heterobranchus isopterus*). A national tilapia genetic Breeding and Selection Program was initiated in 1999 with primary objective of improving growth rate and yield at the Aquaculture Research and Development Centre (ARDEC), Akosombo (100km from Accra). The Program has produced a tenth generation of the 'Akosombo strain' of *O. niloticus* which grows at least 30% faster than its wild counterparts. The improved Akosombo strain contributes approximately 85% to national aquaculture production by volume. About 90% of tilapia fingerling operators produce all-male *O. niloticus* using monosex production technology. Live brood stock of the Akosombo strain of Nile tilapia has been transferred to Burkina Faso, La Cote d'Ivoire, Nigeria, Togo and South Africa for aquaculture and research purposes. Aquatic species which have the potential for domestication and future use in aquaculture are: *Oreochromis niloticus*, *Clarias gariepinus*, *Heterobranchus sp.*, *Heterotis niloticus*, *Sarotherodon galilaeus*, *Sarotherodon melanotheron*, *Chrysichthys nigrodigitatus*, *Lates niloticus*, *Macrobrachium vollehoveni* and *Channa striata*, however, research and commercial production have focused mainly on *O. niloticus*, *C. gariepinus* and *H. niloticus*.

The following driving forces have had a positive impact on the aquatic genetic resources of farmed aquatic species in Ghana. These are: human population increase, changes in values and ethics of consumers and increased wealth. These factors have created a very high demand for fish and protein. This increase in demand is met through development and use of improved breeds (e.g. Akosombo strain of Nile tilapia). The government of Ghana has created a new ministry of Fisheries and Aquaculture Development out of the Agriculture ministry. This has resulted in special attention being focused on issues involving aquaculture. Programs have been developed and implemented to encourage private sector participation. Farmer groups and associations (e.g. Ghana Aquaculture association (GAA), Asuogyaman Zone Fish Farmers Association (AZOFFA) and North and South Tongu Fish Farmers association) have been formed to promote aquaculture and help enforce regulations which protect the wild stocks from effects of overfishing. On other hand, other driving forces such as climate change, competition for resources especially fresh water has resulted in negative impacts on aquatic genetic resources of farmed aquatic species which include; loss of breeding grounds for farmed species, drought which impacts availability of water and pollution which could result in outbreak of diseases, increased mortality and loss of aquatic genetic resources.

All the driving factors enumerated above have had a very negative impact on the aquatic genetic resources of wild relatives of farmed aquatic resources in nature. This has resulted in consistent decline in national output as a result of dwindling stocks, overfishing, harvesting of immature and undersized fish, reduced breeding sites due to receding mangrove areas.

The Government of Ghana, through the Fisheries Commission has drawn up a number of programs to address the issues and challenges through the following means. The Environmental Protection Authority (EPA) is empowered to ensure that protected areas are established and human activities that result in habitat loss and degradation are either totally eliminated or reduced to the barest minimum. EPA also monitors chemical levels of water discharge and forces people to abide by safe levels to avoid pollution. A 200m no farming zone has been declared around the Volta Lake which harbors about 144 species of fin fish in order to control flooding and erosion while mechanical removal and biological control measures have been instituted using the weevil blight to control water hyacinth weed invasion on the Volta Lake and other fresh water river bodies. A quarantine and bio-secure facility has been put in place at ARDEC and all fish introduced for breeding purposes (e.g. GIFT tilapia) go through quarantine procedures to ensure that the incidence and menace of introductions of parasites and pathogens are reduced. Health procedures are also adhered to from countries of origin. The Fisheries ministry has since 2014 commissioned a consultant to undertake zoning aquaculture facilities on lake Volta to determine suitable sites for aquaculture and to prevent locating them in sensitive areas that would affect aquatic genetic resources of wild relatives of farmed stocks negatively. There is a program to inspect net cages regularly to prevent the incidence of escapes from aquaculture facilities into main water bodies. Joint task forces from EPA and the Fisheries Commission (FC) have been

trained in enforcement of fisheries Laws and regulations. The Water Resources Commission (WRC) ensures that water extracted for major projects do not exceed permissible levels that would endanger water quality.

Other counter measures that have been taken to reduce adverse impact on aquatic genetic resources of wild relatives of farmed species include; Intensification of genetic improvement programs, development and enforcement of conservation policies which protect the stocks, (ramsar sites and other protected areas), stocking with recruitment stocks, capacity building and provision of government subsidy and incentives to fish farmers.

In situ conservation of Aquatic genetic resources of Farmed Aquatic Species and their wild relatives is of priority in Ghana. The primary objectives being to maintain good strains and preserve genetic diversity for aquaculture production for present and future improvement programs; to develop strains that will meet consumer and market demands and to disseminate improved strains to fish farmers. Great caution is exercised and risk analysis carried out before any introduction is permitted by EPA after Preliminary Environmental Report (PER) has been submitted. Any species of fish which is imported into Ghana without permit or authorization would be confiscated by the EPA and destroyed. Non-native species are quarantined and kept under surveillance in bio-secure facilities and monitored for the minimum allowable period before release to the local water body.

The main National legislative policy governing aquatic genetic resources of farmed aquatic species and their relatives within national jurisdiction is the Fisheries Act 625 of 2002, the Fisheries regulations of 2010 and the Environmental Assessment Regulations 1999 L. I. 1652. Implementation of the Fishery laws and regulations have been weak due largely to absence of adequate human and financial resources to enforce policies and regulations. Enforcement by EPA has been largely effective. The Fisheries commission is in the process of reviewing Fisheries Act 625 of 2002 in line with domestic and emerging international obligations. Collaboration with fishing communities is being strengthened at the district level in order to train local personnel to enforce the Fisheries regulations locally and promote sustainable fisheries resource management.

Importation of the GIFT strain of *O. niloticus* is restricted. Only a government research Institution is permitted to import it into the country for research purposes with permit issued by EPA. Farmers are strictly not permitted to import it for aquaculture purposes.

The Council for Scientific and Industrial Research CSIR- Water Research Institute is the main public institution which focuses on research related aquaculture . It also supports the aquaculture industry in capacity building of farmers, students and Fisheries Officers as well as production and distribution of brood stock and fingerlings of the improved Akosombo strain of Nile tilapia. The CSIR-WRI released the 10th generation of Akosombo strain to fish farmers in 2014.

Training in Aquaculture is also available at Ghana's four public Universities (University of Ghana(UG), University of Science and Technology (KNUST), University of Cape Coast (UCC) and University of Development Studies (UDS) at the undergraduate and post-graduate levels. The diploma awarding Agricultural Colleges provide certificate courses in general agriculture, natural resources development and general agriculture.

There has been close collaboration between Ghana and her neighbors in the sub- region with respect to sharing of aquatic resources within shared water bodies. In order to ensure sustainable and responsible use of the resources, It would be necessary to strengthen and deepen this collaboration in order to enhance genetic well being of the resources for mutual benefit of countries sharing them.

II. INTRODUCTION

The main objective of the Introduction is to present an overview that will allow a person who is unfamiliar with the country to appreciate the context for the Country Report. The Introduction should present a broad overview and present background information from your country on farmed aquatic species, their wild relatives and culture based fisheries. Detailed information should be provided in the main body of the Country Report. Countries may wish to consider developing their Introductions after completing the main body of their Country Reports.

Please write the overview here

In Ghana, fisheries constitute an important sub-sector in national economy. It contributed nearly 7% of agriculture Gross Domestic Product (GDP), representing about 1.7% of the GDP in 2011. It has been estimated that fisheries contributes directly and indirectly to the livelihoods of over 2.2 million people, just under 10 percent of the population. Fish is utilized as the most important source of animal protein, providing more than 60% of protein requirement of the population with an average per-capita consumption of 29.7 kg, one of the highest in sub-Saharan Africa. The overall domestic fish requirement was approximately 992,000 tonnes in 2011 leaving a shortfall of 552,000 tonnes. This shortfall is currently being met by importing fish valued at over US\$200 million annually, highlighting the potentially important role of aquaculture in meeting domestic fish requirements.

The fisheries resources of Ghana are obtained from capture fisheries, culture based fisheries and aquaculture. The capture fisheries are made up of marine fisheries sourced from the sea, and inland fisheries sourced from lakes, rivers, dams and

reservoirs. 90% of total production come from the capture fisheries of which marine fisheries contribute to the highest percentage while aquaculture which is mainly from freshwater aquaculture forms the remaining 10%. Production from capture fisheries has continued to decline since the mid-nineties with decline from the marine capture fisheries experiencing more than 35% dip between 2000 and 2011 according to FAO data. Inland production declined by 8.7% from 2012 to 2013 due to overfishing. Ninety percent of inland fisheries production is from Lake Volta which has about 143 fish species. Production from Lake Bosomtwi, Weija, Barekese, Tano, Veia and Kpong dams, dug outs, rivers and lagoons contribute to the rest of the inland fishery production. The composition of the commercial catch on Lake Volta in the nineties was dominated by *Chrysichthys* spp. (34.4%), *Tilapias* (28.1%), *Synodontis* spp. (11.4%) and many few other species. The remaining other fish species, eg. *Clarias*, *Heterotis*, *Mormyrids*, *Labeo*, *Schilbeids*, *Odaxothrissa*, *Bagrus*, *Citharinus* spp., *Gymnachus*, *Alestes* spp., *Distichodus* spp., *Lates niloticus*, *Hydrocynus* etc. Constitute about 1% each of the total catch. (MOFA, 2003). Non-fin species from inland fisheries include shrimps (*Penaeus* spp.) blue crabs (*Callinectes* spp.) from brackish waters (lagoons), and freshwater prawns (*Macrobrachium vollehoveni*).

The fisheries sub-sector is rapidly expanding due to the significant progress made in aquaculture partly through increased production of tilapia from cage culture and the introduction of high value shrimp culture (*Penaeus monodon*). Production from aquaculture has continued to increase over the last decade. Aquaculture contribution to Ghana's fishery requirement rose from about 10,000 MT in 2010 to about 38,000 MT in 2014. Production varies from small-scale (less than 20 tonnes) to large commercial scale (greater than 50 tonnes) and has the potential to make significant contribution to the total fish production and food security in Ghana.

Pond aquaculture is the dominant production system especially in the southern and central belts, accounting for over 98% of fish farms. In the last 10 years the dominant culture system for tilapia production has changed and the vast majority of cultured tilapia is now being produced in intensive cage farming systems. Cages, introduced in 2001, account for less than 2% of farms by number but contribute about 88% of total production from aquaculture.

Farmers commonly produce various species depending on the culture systems and location. Fish species cultured include: the tilapias such as *Oreochromis niloticus*, *Tilapia zillii*, *Sarotherodon galilaeus*; the catfishes such as *Clarias gariepinus* and *Heterobranchus bidorsalis* and *Heterotis niloticus*. No figures exist on their relative importance, but the tilapias are the most dominant of all the species in aquaculture and *O. niloticus* is the most predominant single species. The percentage contribution of *O. niloticus* to total aquaculture production is estimated to be approximately 80% while the other species contribute about 20%. Aquaculture production has consistently increased as a result of increased production using intensive tilapia cage culture system coupled with good quality extruded feeds and fingerlings. The increased availability of quality inputs contributed to doubling of productivity from 50,5 kg/m³/year in 2009 to 101,7 kg/m³/year in 2013. Commercial cage farming has consistently contributed to more than 88 % of aquaculture production in 2011- 2014 (Rurangwa et.al., 2015). The cages are located mainly on the Volta Lake with over 60 % in Asuogyaman District in Eastern Region near Akosombo and Kpong Dams.

Research into genetically improved species was initiated in 1999 at the CSIR-Water Research Institute's Aquaculture Research and Development Centre (ARDEC) located at Akosombo, 100 Km from Accra. This is a national genetic breeding and selection program which is executed in collaboration with the WorldFish. It is aimed at improving the growth characteristics of the Nile tilapia, *Oreochromis niloticus* for faster growth strains. The program has produced a strain of *O. niloticus* known as "Akosombo strain" which has undergone nine generations of selection and grows at least 30 % faster than the same species in the wild and has been promoted for use in the Ghanaian Aquaculture industry. Wild unimproved strains of tilapia are still being farmed by few farmers. ARDEC serves as the nucleus of the production of the improved broodstocks for dissemination to public and private commercial hatcheries within Ghana and the West African sub-region. Recently, there has been the introduction of the Genetically Improved Farmed Tilapia (GIFT) fish imported from Malaysia to ARDEC for evaluation. In 2015, the West African Regional Fisheries Project (WARP) supported ARDEC with funds to continue the breeding and selection project to improve aquaculture production in the country.

The polyculture of tilapia, prawns, grey mullets (*Mugil* spp.) and the African catfish in ponds have been evaluated by researchers at WRI and this technology is widely being adopted mostly by pond based farmers in the country. There are no marine finfish, molluscs, crustacea or algae, being cultured commercially in Ghana; however, there is a private farm that has started the culture of shrimps on trial basis. The experience elsewhere in West Africa has not yet proven successful in spite of considerable efforts, particularly in the lagoons of Cote d'Ivoire. No fresh-water prawn is being grown commercially in Ghana. Attempts have been made to culture both *M. rosenbergi* and *M. vollehoveni* in experimental trials and in farms, however, these efforts have not been transformed to yield commercial results.

The number of fish species being cultured in aquaculture in Ghana is still limited and research efforts are being made to domesticate more species for culture. Efforts are being made to apply genetic improvement techniques to the mudfish-*Clarias gariepinus* to produce faster growing strains as has been achieved for the Akosombo strain of *O. niloticus*.

III. MAIN BODY OF THE COUNTRY REPORT

Aquaculture, culture-based fisheries and capture fisheries, have differing importance among countries. The structure of chapters in each Country Report will reflect those differences. Countries which do not have a well-developed aquaculture sector but where wild relatives of farmed aquatic species are located, should report on these resources. Countries should decide how to prioritize the coverage of their Country Reports depending on their aquatic genetic resources.

Chapter 1: The Use and Exchange of Aquatic Genetic Resources of Farmed Aquatic Species and their Wild Relatives within National Jurisdiction

The main objective of Chapter 1 is to provide annotated inventories of aquatic genetic resources (AqGR) of farmed aquatic species and their wild relatives.

Farmed aquatic species

1. Over the last 10 years, has production been: *Please mark appropriate box.*

- Increasing
- Stable
- Decreasing
- Stopped
- Still in Research and Development
- Fluctuating
- Not known

2. What is the expected trend over the next 10 years? *Please mark appropriate box.*

- Increasing
- Stable
- Decreasing
- Stopped
- Still in Research and Development
- Fluctuating
- Not known

3. Is the identification and naming of farmed species, subspecies, hybrids, crossbreeds, strains, triploids, other distinct types accurate and up- to-date? *Please mark appropriate box.*

- Yes
- No
- Mostly Yes
- Mostly No

Please include any explanation or additional information here.

4. To what extent are genetic data for farmed aquatic organisms

a) Available? *Please mark appropriate box.*

- Not at all
- To a minor extent
- To some extent
- To a great extent

b) Used in management? *Please mark appropriate box.*

- Not at all
- To a minor extent
- To some extent
- To a great extent

Please add any explanation here.

5. To what extent are the aquatic organisms farmed in your country sourced as wild seed or from wild brood stock?

Please mark appropriate box.

- Not at all
- To a minor extent
- To some extent
- To a great extent

Please add any explanation here.

6. What proportions (%) of breeding programmes and efforts for the genetic improvement of farmed aquatic species in your country are being managed by the public sector (government research, universities etc.), the private sector, and public-private partnerships?

• Percent managed by public sector. **Please Enter Percentage Here**

• Percent managed by private sector. **Please Enter Percentage Here**

• Percent managed by private /public partnership. **Please Enter Percentage Here**

Total

Please add any explanation here.

7. To what extent do genetically improved aquatic organisms, including hybrids, crossbreeds, strains, triploids and other distinct types contribute to national aquaculture production in terms of volume ?

Please mark appropriate box.

- Not at all
- To a minor extent
- To some extent
- To a great extent

8. Please list most significant examples where genetic improvement contributed to increased production and indicate whether they were developed by public, private or public/private partnerships.

Add Row

Species	Type of genetic improvement <i>mark all that apply</i>	Developed By <i>mark all that apply</i>	
Oreochromis niloticus	<input checked="" type="checkbox"/> Traditional selective breeding	<input type="checkbox"/> Private Sector <input checked="" type="checkbox"/> Public Sector <input type="checkbox"/> Private/Public partnership	
	<input type="checkbox"/> Hybrids	<input type="checkbox"/> Private Sector <input type="checkbox"/> Public Sector <input type="checkbox"/> Private/Public partnership	
	<input type="checkbox"/> Triploids and other polyploids	<input type="checkbox"/> Private Sector <input type="checkbox"/> Public Sector <input type="checkbox"/> Private/Public partnership	X
	<input checked="" type="checkbox"/> Mono-sex production	<input checked="" type="checkbox"/> Private Sector <input checked="" type="checkbox"/> Public Sector <input type="checkbox"/> Private/Public partnership	
	<input type="checkbox"/> Other	<input type="checkbox"/> Private Sector <input type="checkbox"/> Public Sector <input type="checkbox"/> Private/Public partnership	
	<input checked="" type="checkbox"/> Traditional selective breeding	<input checked="" type="checkbox"/> Private Sector <input checked="" type="checkbox"/> Public Sector <input type="checkbox"/> Private/Public partnership	
	<input checked="" type="checkbox"/> Hybrids	Specify parental species in the box below C. gariepinus x C. macrocephalus	<input checked="" type="checkbox"/> Private Sector <input checked="" type="checkbox"/> Public Sector <input type="checkbox"/> Private/Public partnership
Clarias gariepinus	<input type="checkbox"/> Triploids and other polyploids	<input type="checkbox"/> Private Sector <input type="checkbox"/> Public Sector <input type="checkbox"/> Private/Public partnership	X
	<input type="checkbox"/> Mono-sex production	<input type="checkbox"/> Private Sector <input type="checkbox"/> Public Sector <input type="checkbox"/> Private/Public partnership	
	<input type="checkbox"/> Other	<input type="checkbox"/> Private Sector <input type="checkbox"/> Public Sector <input type="checkbox"/> Private/Public partnership	

9. Please fill in table 1.1

Table 1.1 Aquatic genetic resources (AqGR) of farmed aquatic species in your country

Add Row							
Farmed species	Genetic type	Availability of genetic data	Trends in production	Future trends in production	Genetic improvement	Future genetic improvement	Comments
List species (scientific names), strains and varieties as scientific names (put in brackets the most widely used national common name or names) and indicate whether native or introduced	<i>Indicate all genetic types that apply to the species</i>	Are genetic data available for farmed populations? If yes, give summary details in comments	Over the last 10 years, production has been (mark one)	Expected trend over the next 10 years is that production will (mark one)	Which genetic technologies are currently being used on the species (mark all that apply)	mark all that apply	For example important traits improved, how data are used in management or name of breed, source of information, etc.
<input checked="" type="radio"/> Native <input type="radio"/> Introduced	<input checked="" type="checkbox"/> Wild Type <input checked="" type="checkbox"/> Selective bred type <input type="checkbox"/> Hybrids <input type="checkbox"/> Cross breeds <input checked="" type="checkbox"/> Strains <input type="checkbox"/> Varieties <input type="checkbox"/> Polyploids	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	<input checked="" type="radio"/> Increasing <input type="radio"/> Stable <input type="radio"/> Fluctuating <input type="radio"/> Decreasing <input type="radio"/> Stopped <input type="radio"/> Not known	<input checked="" type="radio"/> Increasing <input type="radio"/> Stable <input type="radio"/> Fluctuating <input type="radio"/> Decreasing <input type="radio"/> Stopped <input type="radio"/> Not known	<input checked="" type="checkbox"/> Selective breeding <input type="checkbox"/> Hybridization <input type="checkbox"/> Polyploidy (chromosome set manipulation) <input checked="" type="checkbox"/> Monosex <input type="checkbox"/> Marker assisted selection <input type="checkbox"/> Other (specify in comment)	<input checked="" type="checkbox"/> Selective breeding <input type="checkbox"/> Hybridization <input type="checkbox"/> Polyploidy (chromosome set manipulation) <input checked="" type="checkbox"/> Monosex <input type="checkbox"/> Marker assisted selection <input type="checkbox"/> Other (specify in comment)	Name of strain is Akosombo strain of Nile tilapia. Important trait improved is growth rate CSIR-WRI Annual Reports 2008, 2009.
Oreochromis niloticus							X

<input checked="" type="radio"/> Native <input type="radio"/> Introduced	<input type="checkbox"/> Wild Type <input checked="" type="checkbox"/> Selective bred type <input type="checkbox"/> Hybrids <input type="checkbox"/> Cross breeds <input type="checkbox"/> Strains <input type="checkbox"/> Varieties <input type="checkbox"/> Polyploids	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	<input checked="" type="radio"/> Increasing <input type="radio"/> Stable <input type="radio"/> Fluctuating <input type="radio"/> Decreasing <input type="radio"/> Stopped <input type="radio"/> Not known	<input checked="" type="radio"/> Increasing <input type="radio"/> Stable <input type="radio"/> Fluctuating <input type="radio"/> Decreasing <input type="radio"/> Stopped <input type="radio"/> Not known	<input checked="" type="checkbox"/> Selective breeding <input checked="" type="checkbox"/> Hybridization <input type="checkbox"/> Polyploidy (chromosome set manipulation) <input type="checkbox"/> Monosex <input type="checkbox"/> Marker assisted selection <input type="checkbox"/> Other (specify in comment)	<input checked="" type="checkbox"/> Selective breeding <input checked="" type="checkbox"/> Hybridization <input type="checkbox"/> Polyploidy (chromosome set manipulation) <input type="checkbox"/> Monosex <input type="checkbox"/> Marker assisted selection <input type="checkbox"/> Other (specify in comment)		
Clarias gariepinus								X
<input type="radio"/> Native <input type="radio"/> Introduced	<input type="checkbox"/> Wild Type <input checked="" type="checkbox"/> Selective bred type <input type="checkbox"/> Hybrids <input type="checkbox"/> Cross breeds <input type="checkbox"/> Strains <input type="checkbox"/> Varieties <input type="checkbox"/> Polyploids	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	<input checked="" type="radio"/> Increasing <input type="radio"/> Stable <input type="radio"/> Fluctuating <input type="radio"/> Decreasing <input type="radio"/> Stopped <input type="radio"/> Not known	<input checked="" type="radio"/> Increasing <input type="radio"/> Stable <input type="radio"/> Fluctuating <input type="radio"/> Decreasing <input type="radio"/> Stopped <input type="radio"/> Not known	<input checked="" type="checkbox"/> Selective breeding <input type="checkbox"/> Hybridization <input type="checkbox"/> Polyploidy (chromosome set manipulation) <input type="checkbox"/> Monosex <input type="checkbox"/> Marker assisted selection <input type="checkbox"/> Other (specify in comment)	<input checked="" type="checkbox"/> Selective breeding <input type="checkbox"/> Hybridization <input type="checkbox"/> Polyploidy (chromosome set manipulation) <input type="checkbox"/> Monosex <input type="checkbox"/> Marker assisted selection <input type="checkbox"/> Other (specify in comment)		
Clarias batrachus								X

10. Which aquatic species in your country are thought to have potential for domestication and future use in aquaculture?

Add Row

Species <i>Type and select a species</i>	Is the species native to your country?	Comments <i>For example main sources of information</i>	
Oreochromis niloticus	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	Fisheries Commission, Ministry of Food and Agriculture-2011 Annual Report, Monitoring and Evaluation/Fisheries Commission/MOFA. March 2012.	X
Clarias gariepinus	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	Ponzoni, R. W. and N. H. Nguyen (eds.) 2008. Proceedings of a Workshop on the Development of a Genetic Improvement Program for African Catfish Clarias gariepinus. WorldFish Center Conference Proceedings Number 1889. The WorldFish Center, Penang, Malaysia. 130 p.	X
Heterotis niloticus	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known		X

Sarotherodon melanotheron	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known		X
Sarotherodon galilaeus	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known		X
Chrysichthys nigrodigitatus	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known		X

Macrobrachium vollenhovenii	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	<p>It is a freshwater prawn found in the Volta river and other river systems in Ghana</p>	X
Channa striata	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known		X
Lates niloticus	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known		X

11. Please list the aquatic genetic resources of farmed aquatic species your country has transferred or exchanged with other countries over the past 10 years.

Add Row

Species	Genetic alteration of exchanged material Mark all that apply	Details of transfer or exchange	Type of genetic material exchanged Mark all that apply	Country or countries involved with exchange Hold CTRL button to select more than one country	Comments <i>Please add main purpose or objective of the exchange and main sources of information</i>
Oreochromis niloticus	<input type="checkbox"/> No deliberate genetic alteration <input checked="" type="checkbox"/> Traditional selective breeding <input type="checkbox"/> Hybrids <input type="checkbox"/> Triploids and other polyploids <input checked="" type="checkbox"/> Mono-sex production <input type="checkbox"/> Other	<input type="checkbox"/> Import <input checked="" type="checkbox"/> Export	<input type="checkbox"/> DNA <input type="checkbox"/> Genes <input type="checkbox"/> Gametes <input type="checkbox"/> Tissues <input type="checkbox"/> Embryos <input checked="" type="checkbox"/> Living specimens <input type="checkbox"/> Other	Azerbaijan Bahamas Bahrain Bangladesh Barbados Belarus Belgium Belize Benin Bhutan Bolivia (Plurinational State of) Bosnia and Herzegovina Brazil Brunei Darussalam Bulgaria Burkina Faso Burundi	As a source of broodstock for fingerling production for Burkina Fasso, Cote d'ivoire, Nigeria and Togo. In South Africa it was used for comparative experiments CSIR -WRI Annual Reports.

X

Wild relatives of farmed aquatic species

12. Please list any wild relatives of aquatic species present in your country that are farmed in another country (but not in your country) and indicate their uses.

This question refers to aquatic genetic resources that are present in the wild in your country and that are being farmed elsewhere (but not farmed in your country), indicating any uses these resources may have in your country.

Add Row

Species	Use <i>(mark all that apply)</i>	Comments	
	<input type="checkbox"/> Capture fisheries		
	<input type="checkbox"/> Recreational fishery		
	<input type="checkbox"/> Aquaria		
	<input type="checkbox"/> Biological control		
	<input type="checkbox"/> Research and development		X
	<input type="checkbox"/> Other (specify in comments)		

13. Please list the aquatic genetic resources of wild relatives of farmed aquatic species your country has transferred or exchanged with other countries over the past 10 years.

Add Row

This question refers to wild aquatic genetic resources collected from the wild, not from farming facilities as in question 11.

Species	Details of transfer or exchange <i>mark all that apply</i>	Type of genetic material exchanged	Country Hold CTRL button to select more than one country	Comments <i>main sources of information, if the transfer was legal or not</i>	
	<input type="checkbox"/> Import <input type="checkbox"/> Export	<input type="checkbox"/> Tissues <input type="checkbox"/> Gametes <input type="checkbox"/> DNA <input type="checkbox"/> Genes <input type="checkbox"/> Embryos <input type="checkbox"/> Living specimens <input type="checkbox"/> Other	Afghanistan Albania Algeria Andorra Angola Antigua and Barbuda Argentina Armenia Australia Austria Azerbaijan Bahamas Bahrain Bangladesh Barbados Belarus		<div style="text-align: right; border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;">X</div>

14. Please fill in table 1.2

Table 1.2 Aquatic genetic resources of wild relatives of farmed aquatic species in your country.

Add Row										
Target species, stocks or other management units	Characteristics of species	Capture fisheries	Management measures	Availability of genetic data	Use of genetic data in management	Trends in catches	Future trends in catches	Ecosystem(s) where the fishery is located	Changes in ranges and habitats	Reasons for change in abundance of species
For each row, list the species as scientific names (put in brackets the most widely used national common For each species, include the named stocks and name of other management units if known)	Is the species (mark as appropriate) :	Is this species targeted by capture fisheries?	Are there any management measures in place?	Are genetic data available for the fishery?	Are genetic data used in management?	Over the last 10 years, catches have been:	Expected trend over the next 10 years.	Indicate the ecosystem where the fishery is located (mark all that apply)	The habitat or range is	What are likely reasons for changes? (mark all that apply)
	<input type="checkbox"/> Straddling <input type="checkbox"/> Transboundary <input type="checkbox"/> Introduced <input checked="" type="checkbox"/> Native	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	<input type="radio"/> Increasing <input type="radio"/> Stable <input checked="" type="radio"/> Fluctuating <input type="radio"/> Decreasing <input type="radio"/> Depleted <input type="radio"/> Not known	<input type="radio"/> Increasing <input type="radio"/> Stable <input checked="" type="radio"/> Fluctuating <input type="radio"/> Decreasing <input type="radio"/> Depleted <input type="radio"/> Not known	<input type="checkbox"/> Intertidal <input type="checkbox"/> Coastal in EEZ <input type="checkbox"/> High seas <input checked="" type="checkbox"/> Lake <input checked="" type="checkbox"/> Reservoir <input checked="" type="checkbox"/> River <input checked="" type="checkbox"/> Swamp <input type="checkbox"/> Other (specify) <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div>	<input type="radio"/> Increasing <input type="radio"/> Stable <input checked="" type="radio"/> Decreasing <input type="radio"/> Not known	<input type="checkbox"/> Habitat <input checked="" type="checkbox"/> Climate <input checked="" type="checkbox"/> Invasive species <input checked="" type="checkbox"/> Pollution <input type="checkbox"/> Rehabilitation of habitat <input type="checkbox"/> Others <input type="checkbox"/> Not known
Oreochromis niloticus										X

Target species, stocks or other management units	Characteristics of species	Capture fisheries	Management measures	Availability of genetic data	Use of genetic data in management	Trends in catches	Future trends in catches	Ecosystem(s) where the fishery is located	Changes in ranges and habitats	Reasons for change in abundance of species	
Clarias gariepinus	<input type="checkbox"/> Straddling <input type="checkbox"/> Transboundary <input type="checkbox"/> Introduced <input checked="" type="checkbox"/> Native	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not Known	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not Known	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not Known	<input type="radio"/> Increasing <input type="radio"/> Stable <input checked="" type="radio"/> Fluctuating <input type="radio"/> Decreasing <input type="radio"/> Depleted <input type="radio"/> Not known	<input type="radio"/> Increasing <input type="radio"/> Stable <input checked="" type="radio"/> Fluctuating <input type="radio"/> Decreasing <input type="radio"/> Depleted <input type="radio"/> Not known	<input type="checkbox"/> Intertidal <input type="checkbox"/> Coastal in EEZ <input type="checkbox"/> High seas <input checked="" type="checkbox"/> Lake <input checked="" type="checkbox"/> Reservoir <input checked="" type="checkbox"/> River <input checked="" type="checkbox"/> Swamp <input type="checkbox"/> Other (specify) <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div>	<input type="radio"/> Increasing <input type="radio"/> Stable <input type="radio"/> Decreasing <input checked="" type="radio"/> Not known	<input type="checkbox"/> Habitat <input type="checkbox"/> Climate <input type="checkbox"/> Invasive species <input type="checkbox"/> Pollution <input type="checkbox"/> Rehabilitation of habitat <input type="checkbox"/> Others <input type="checkbox"/> Not known	X
Chrysichthys nigrodigitatus	<input type="checkbox"/> Straddling <input type="checkbox"/> Transboundary <input type="checkbox"/> Introduced <input checked="" type="checkbox"/> Native	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Known	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not Known	<input type="radio"/> Increasing <input type="radio"/> Stable <input checked="" type="radio"/> Fluctuating <input type="radio"/> Decreasing <input type="radio"/> Depleted <input type="radio"/> Not known	<input checked="" type="radio"/> Increasing <input type="radio"/> Stable <input type="radio"/> Fluctuating <input type="radio"/> Decreasing <input type="radio"/> Depleted <input type="radio"/> Not known	<input type="checkbox"/> Intertidal <input type="checkbox"/> Coastal in EEZ <input type="checkbox"/> High seas <input checked="" type="checkbox"/> Lake <input checked="" type="checkbox"/> Reservoir <input checked="" type="checkbox"/> River <input type="checkbox"/> Swamp <input type="checkbox"/> Other (specify) <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div>	<input type="radio"/> Increasing <input type="radio"/> Stable <input type="radio"/> Decreasing <input checked="" type="radio"/> Not known	<input type="checkbox"/> Habitat <input type="checkbox"/> Climate <input type="checkbox"/> Invasive species <input type="checkbox"/> Pollution <input type="checkbox"/> Rehabilitation of habitat <input checked="" type="checkbox"/> Others <input type="checkbox"/> Not known	X

Chapter 2: Drivers and Trends in Aquaculture: Consequences for Aquatic Genetic Resources within National Jurisdiction

The main objective of Chapter 2 is to review the main drivers and trends that are shaping aquaculture and their consequences for aquatic genetic resources.

15. Please indicate the ways the aquatic genetic resources (AqGR) of **farmed aquatic species** have been impacted by the following drivers. Please give examples of positive and negative impacts for specific drivers.

This question refers to drivers impacting farmed aquatic genetic resources, not about impacts on the entire aquaculture sector. Drivers should be seen from a national perspective.

Driver impacting aquaculture	Effect on AqGR <i>Mark appropriate box</i>	Comments <i>List examples or other relevant information</i>
Human population increase	<input type="radio"/> Strongly positive <input checked="" type="radio"/> Positive <input type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Millenium Development Goals (MDG) Human protein needs to be met through improved tilapia breeds Increased wealth and demand for fish
Increased wealth and demand for fish	<input checked="" type="radio"/> Strongly positive <input type="radio"/> Positive <input type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Middle income group increasing with increased ability to buy fish. government being pressurized to produce better fish and increased yield. Governance (ability of government, industry and the public to work together in managing resources).
Governance (ability of government, industry and the public to work together in managing resources)	<input type="radio"/> Strongly positive <input checked="" type="radio"/> Positive <input type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Government program to provide jobs Government support for tilapia culture Government created a new ministry for aquaculture development; encourage private sector to participate in aquaculture; incentives given to private sector. Farmer associations have been formed which are helping to enforce regulations.
Climate change	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Studies started on impacts of climate change. In 2015, water level in Volta Lake low and some cages needed to be moved to deeper portions of lake. Increased temperature leads to decreased water levels. Drought impacts availability of water which could lead to overcrowding of fish in cages, disease and increased mortality and loss of AqGR.
Competition for resources, especially freshwater	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Fishers conflict with cages. Wild fish coming near tilapia cages to feed.

Driver impacting aquaculture	Effect on AqGR <i>Mark appropriate box</i>	Comments <i>List examples or other relevant information</i>
Changes in values and ethics of consumers	<input type="radio"/> Strongly positive <input checked="" type="radio"/> Positive <input type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Consumer preference for large fish from farms leads to higher demand for fish - improve genetic resources
Other	<input type="radio"/> Strongly positive <input checked="" type="radio"/> Positive <input type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Force countries to import improved seed to supply external market
Add other drivers as necessary	<input type="radio"/> Strongly positive <input checked="" type="radio"/> Positive <input type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	
Meeting external market demand	<input type="radio"/> Strongly positive <input checked="" type="radio"/> Positive <input type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	
Add Row	Remove Row	

16. Please indicate the ways the aquatic genetic resources of **wild relatives of farmed aquatic species** in nature have been impacted by the following drivers. Please give examples of positive and negative impacts for specific drivers.

This question refers to drivers impacting wild aquatic genetic resources of farmed species, not about impacts on the entire aquaculture sector. Drivers should be seen from a national perspective.

Driver impacting aquaculture	Effect on AqGR <i>Mark appropriate box</i>	Comments <i>List examples or other relevant information</i>
Human population increase	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Overfishing Illegal fishing Loss of habitat
Increased wealth and demand for fish	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	More exploitation of wild stocks Harvesting of immature/ undersized fish
Governance (ability of government, industry and the public to work together in managing resources)	<input type="radio"/> Strongly positive <input checked="" type="radio"/> Positive <input type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Government sponsored research for aquaculture Better management / conservation
Climate change	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Breeding areas being reduced mangrove areas receding
Competition for resources, especially freshwater	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Houses being built near water source

Driver impacting aquaculture	Effect on AqGR <i>Mark appropriate box</i>	Comments <i>List examples or other relevant information</i>
Changes in values and ethics of consumers	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	People wanting more money and development Declining stocks
Other Add other drivers as necessary	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative	Overfishing; IUU
Meeting external demand	<input type="radio"/> Strongly negative <input type="radio"/> No effect	
Add Row	Remove Row	

17. What countermeasures might be taken to reduce adverse impacts on the aquatic genetic resources that sustain current aquaculture and/or provide for its future development?

Describe countermeasures

Risk analysis of introductions of non-native species and strains
Development and enforcement of policies e.g. Ramsar sites and other protected areas
Government subsidies and incentives for fish farmers
Capacity building
Genetic improvement programs

Biotechnologies

18. To what extent have the following biotechnologies been used in your country for the genetic improvement of farmed aquatic organisms.

Biotechnology	Extent of use	Comments <i>main sources of information, important species for which the biotechnology is applied</i>
Selective breeding	<input type="radio"/> Not at all <input type="radio"/> To a minor extent <input type="radio"/> To some extent <input checked="" type="radio"/> To a great extent	Oreochromis niloticus
Hybridization	<input type="radio"/> Not at all <input checked="" type="radio"/> To a minor extent <input type="radio"/> To some extent <input type="radio"/> To a great extent	Clairas gariepinus + Heterohranchus isopterus Universities
Polyploidy (chromosome set manipulation)	<input type="radio"/> Not at all <input checked="" type="radio"/> To a minor extent <input type="radio"/> To some extent <input type="radio"/> To a great extent	Heterobranchus isopterus
Monosex production	<input type="radio"/> Not at all <input type="radio"/> To a minor extent <input type="radio"/> To some extent <input checked="" type="radio"/> To a great extent	Oreochromis niloticus
Marker assisted selection	<input checked="" type="radio"/> Not at all <input type="radio"/> To a minor extent <input type="radio"/> To some extent <input type="radio"/> To a great extent	
Gynogenesis/androgenesis	<input checked="" type="radio"/> Not at all <input type="radio"/> To a minor extent <input type="radio"/> To some extent <input type="radio"/> To a great extent	
Other Continue adding row as necessary	<input type="radio"/> Not at all <input type="radio"/> To a minor extent <input type="radio"/> To some extent <input type="radio"/> To a great extent	
Add Row	Remove Row	

19. Please indicate the ways aquatic genetic resources of the wild relatives of farmed aquatic species have been impacted by drivers that are changing aquatic ecosystems. Please give countermeasures that might be taken to reduce adverse consequences for the aquatic genetic resources that sustain capture fisheries on wild relatives of farmed species.

Drivers that are changing aquatic ecosystems	Effect on AqGR <i>mark appropriate box</i>	Countermeasures and effects
Habitat loss and degradation	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	EIA requires establishment of protected areas which are both effective
Pollution of waters	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input type="radio"/> Negative <input checked="" type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	EPA has powers to monitor chemicals and force people to move away which has been effective
Increased frequency of extreme climatic events and long-term climate change	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	200 m no farming zone around lake Volta for flooding and erosion control
Establishment of invasive species	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Water hyacinth weeds on Volta Lake and other rivers. Mechanical removal and biological control measures using weevil blight
Introductions of parasites and pathogens	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Quarantine and biosecure facilities required and put in place at the Aquaculture Research and Development Center (ARDEC), Akosombo. All fish introduced to Ghana for breeding purposes at ARDEC go through the quarantine procedures. Health procedures required from country of origin

Drivers that are changing aquatic ecosystems	Effect on AqGR <i>mark appropriate box</i>	Countermeasures and effects
Impacts of purposeful stocking and escapes from aquaculture	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	This question addresses question on escapes from aquaculture. Better site selection Program to inspect cages/ use of durable netting materials zoning of aquaculture facilities to prevent locating them in sensitive areas
Capture fisheries	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input checked="" type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	Enforcement of fisheries regulations Establishment of management plans
Other	<input type="radio"/> Strongly positive	Targeting parent stock Duplicate stocking with recruitment Stock in protected areas
<i>Continue listing other driverst</i>	<input checked="" type="radio"/> Positive	
Impacts from purposeful stocking	<input type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect <input type="radio"/> Unknown	
Add Row	Remove Row	

Chapter 3: *In Situ* Conservation of Aquatic Genetic Resources of Farmed Aquatic Species and their wild Relatives within National Jurisdiction

The main objective of Chapter 3 is to review the current status and future prospects for the *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives within national jurisdiction for food and agriculture.

The specific objectives are as follows:

- To review the current and likely future contributions to *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives by those who use them in responsible and well managed capture fisheries, aquaculture, and culture-based fisheries.
- To identify and describe any existing and planned aquatic protected areas that are contributing, or will contribute, to *in situ* conservation of aquatic genetic resources of wild relatives of farmed aquatic species.
- To identify and describe any major existing and planned efforts for the *in situ* conservation of threatened or endangered aquatic genetic resources (farmed and wild).
- To review needs and priorities for the future development of *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives.

Overview of the current status and future prospects for the *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives

20. To what extent are responsible and well managed aquaculture and culture-based fisheries contributing to *in situ* conservation of the aquatic genetic resources of farmed aquatic species and their wild relatives.

Please mark appropriate box.

- To a great extent
 To a limited extent
 Not at all
 Not applicable

Please include any additional information

--

21. To what extent are existing facilities contributing to *in situ* conservation of aquatic genetic resources of wild relatives of farmed aquatic species?

Please mark appropriate box.

- To a great extent
 To a limited extent
 Not at all
 Not applicable

Please include any additional information

22. Please provide *examples* of current or planned activities for the *in situ* conservation of endangered or threatened farmed species and their wild relatives with demonstrated or potential importance for aquaculture, culture-based fisheries, and capture fisheries.

Please describe examples

23. Please rank (from 1 to 10) the importance of the following objectives for *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives in your country.

Objectives of <i>in situ</i> conservation	Rank 1=Very Important 10=No importance
Preservation of aquatic genetic diversity	<input type="text" value="1"/>
Maintain good strains for aquaculture production	<input type="text" value="1"/>
Meet consumer and market demands	<input type="text" value="1"/>
To help adapt to impacts of climate change	<input type="text" value="2"/>
Future breed improvement in aquaculture	<input type="text" value="1"/>
<i>Please continue listing any other objectives as needed</i>	<input type="text"/>
Add Row	

Review of the *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives through their use in responsible and well managed aquaculture and culture-based fisheries

24. Is the *in situ* conservation of aquatic genetic resources included in the policy as an objective in the management of aquaculture and/or culture-based fisheries in your country?

Please mark appropriate box

- Yes
 Not yet, but planned to be included
 No
 Unknown

If yes, please give examples

25. To what extent are collectors of wild seed and brood stock for aquaculture and culture-based fisheries contributing to the conservation of aquatic genetic resources by maintaining habitats and/or limiting the quantities collected?

Please mark appropriate box

- To a great extent
 To a limited extent
 Not at all
 Not applicable

Please include any additional details

Review of the *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives through their use in responsible and well managed capture fisheries

26. Is the conservation of aquatic genetic resources of wild relatives of farmed aquatic species included as an objective in the management of any capture fisheries in your country?

Please mark appropriate box

If yes, please give examples

- Yes
 Not yet, but under development
 No
 Unknown

Review of the *in situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives through the establishment and management of aquatic protected areas

27. Please list any aquatic protected areas in your country that are contributing to the *in situ* conservation of aquatic genetic resources of wild relatives of farmed aquatic species and an assessment of effectiveness

Add Row

Aquatic protected area	Effectiveness of conserving Aquatic Genetic Resources	Comments <i>provide any additional information</i>	
Lake Bosomtwe	<input type="radio"/> Very effective <input type="radio"/> Somewhat effective <input type="radio"/> Not effective <input checked="" type="radio"/> Unknown		X

Chapter 4: *Ex Situ* Conservation of Aquatic Genetic Resources of Farmed Aquatic Species and their Wild Relatives within National Jurisdiction

The main objective of Chapter 4 is to review the current status and future prospects for the *ex situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives.

The specific objectives are:

- To review existing *ex situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives in aquaculture facilities, culture collections and gene banks, research facilities, zoos and aquaria;
- To review the contributions that various stakeholders are making to the *ex situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives;
- To review needs and priorities for the future development of *ex situ* conservation of aquatic genetic resources of farmed aquatic species and their wild relatives, including any that are threatened or endangered.

Review of existing and planned collections of live breeding individuals of aquatic genetic resources of farmed aquatic species and their wild relatives

28. Please list your country's existing collections of live breeding aquatic organisms that can be considered as contributing to the *ex situ* conservation of aquatic genetic resources. This includes not only collections of species farmed directly for human use, but also collections of live feed organisms (e.g., bacterial flocs, yeasts, microalgae, rotifers and brine shrimp (*Artemia*)).

Add Row				
Species (include information on subspecies or strain in comments if available)	Type of use <i>Please mark all that apply</i>	Is the species (or subspecies) threatened or endangered for example in the IUCN Red List, CITES Appendices or national lists? <i>Please mark appropriate box</i>	Comments <i>Please list any additional information</i>	
Oreochromis niloticus	<input checked="" type="checkbox"/> Direct human consumption <input type="checkbox"/> Live feed organism <input type="checkbox"/> Other	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Unknown	Akosombo strain of Nile tilapia, GIFT strain of Nile tilapia Akosombo strain of Nile tilapia kept at ARDEC Government research station (ARDEC, Akosombo) and Universities GIFT strain kept at ARDEC for research purposes	X
Clarias gariepinus	<input checked="" type="checkbox"/> Direct human consumption <input type="checkbox"/> Live feed organism <input type="checkbox"/> Other	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Unknown	Government research station (ARDEC, Akosombo) Universities	X

Species (include information on subspecies or strain in comments if available)	Type of use <i>Please mark all that apply</i>	Is the species (or subspecies) threatened or endangered for example in the IUCN Red List, CITES Appendices or national lists? <i>Please mark appropriate box</i>	Comments <i>Please list any additional information</i>	
Heterotis niloticus	<input checked="" type="checkbox"/> Direct human consumption <input type="checkbox"/> Live feed organism <input type="checkbox"/> Other	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Unknown	Government research station (ARDEC, Akosombo)	X

Review of existing *ex situ* conservation activities of aquatic genetic resources of farmed aquatic species and their wild relatives *in vitro*.

29. Please list your country's *in vitro* collections and gene banks of the gametes, embryos, tissues, spores and other quiescent forms of farmed aquatic species and their wild relatives, using cryopreservation or other methods of long-term storage. Describe the major examples, identifying the facilities in which the collections are held. Include examples of any such genetic material from your country that is being kept in *in vitro* collections outside your country on behalf of beneficiaries in your country.

Add Row					
Species (include information on subspecies or strain if available in comments)	Users and managers <i>List all that apply</i>	Type of <i>ex-situ</i> conservation collection <i>in vitro</i> <i>mark all that apply</i>	Facilities where collection is located <i>mark all that apply</i>	Comments <i>list all breeds, subspecies of the species and any additional information</i>	
		<input type="checkbox"/> In vitro collection of gametes <input type="checkbox"/> In vitro collection of embryos <input type="checkbox"/> In vitro collection of tissues <input type="checkbox"/> Spores <input type="checkbox"/> Other	<input type="checkbox"/> Aquaculture facilities <input type="checkbox"/> Research facilities <input type="checkbox"/> Universities <input type="checkbox"/> Zoos and aquaria <input type="checkbox"/> Other		X

30. Please rank (from 1 – 10) the importance of the following objectives for ex situ conservation of aquatic genetic resources of farmed aquatic species and their wild relatives in your country

Objectives of <i>ex situ</i> conservation	Rank 1=Very Important 10=No importance
Preservation of aquatic genetic diversity	<input type="text" value="1"/>
Maintain good strains for aquaculture production	<input type="text" value="1"/>
Meet consumer and market demands	<input type="text" value="1"/>
To help adapt to impacts of climate change	<input type="text" value="2"/>
Future breed improvement in aquaculture	<input type="text" value="1"/>
Other	
<i>Continue adding row as necessary</i>	
Add Row	Remove Row

Chapter 5: Stakeholders with Interests in Aquatic Genetic Resources of Farmed Aquatic Species and their Wild Relatives within National Jurisdiction

The main objective of Chapter 5 is to provide an overview of the perspectives and needs of the principal stakeholders who have interests in aquatic genetic resources of farmed aquatic species and their wild relatives for food and agriculture. Stakeholder groups can be identified from existing institutional knowledge, from sectoral and sub-sectoral consultations conducted during the country reporting process and where necessary from expert opinions. Gender issues pertaining to the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives should be considered, as well as the perspectives and needs of indigenous peoples and local communities.

The specific objectives are:

- To describe the different principal stakeholder groups with interests in aquatic genetic resources of farmed aquatic species and their wild relatives To identify the type(s) of aquatic genetic resources of farmed aquatic species and their wild relatives in which each stakeholder group has interests and why.
- To describe the roles of stakeholder groups and the actions they are taking for the conservation, sustainable use and development of the aquatic genetic resources in which they have interests.
- To describe the further actions that stakeholder groups would like to see taken for the conservation, sustainable use and development of aquatic genetic resources in which they have interests, and the constraints that are hindering those actions, including lack of capacity and perceived threats.

Overview of the principal stakeholder groups who have interests in aquatic genetic resources of farmed aquatic species and their wild relatives

31. Please indicate the principal stakeholder groups who have interests in aquatic genetic resources of farmed aquatic species and their wild relatives including, *inter alia*: fish farmers; fishers in capture fisheries; persons involved in stocking and harvesting in culture-based fisheries; persons employed in postharvest chains; government officials; staff and members of aquaculture associations; managers of aquatic protected areas and others working for the conservation of aquatic ecosystems; researchers; and civil society.

Stakeholders	Role of stakeholder in regards og AqGR <i>mark all that apply</i>	Genetic resource of main interest <i>mark all that apply</i>	Comments <i>Please provide any information or explanation of stakeholders' role</i>
Fish Farmers	<input checked="" type="checkbox"/> Conservation <input checked="" type="checkbox"/> Production <input checked="" type="checkbox"/> Feed manufacturing <input checked="" type="checkbox"/> Breeding <input type="checkbox"/> Research <input checked="" type="checkbox"/> Marketing <input checked="" type="checkbox"/> Processing <input checked="" type="checkbox"/> Advocacy <input checked="" type="checkbox"/> Outreach/Extension <input type="checkbox"/> Other (specify) <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div>	<input type="checkbox"/> DNA <input checked="" type="checkbox"/> Stock, breed or variety <input checked="" type="checkbox"/> Species <input type="checkbox"/> Other	
Fishers	<input checked="" type="checkbox"/> Conservation <input type="checkbox"/> Production <input type="checkbox"/> Feed manufacturing <input type="checkbox"/> Breeding <input type="checkbox"/> Research <input checked="" type="checkbox"/> Marketing <input checked="" type="checkbox"/> Processing <input checked="" type="checkbox"/> Advocacy <input type="checkbox"/> Outreach/Extension <input type="checkbox"/> Other (specify) <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div>	<input type="checkbox"/> DNA <input type="checkbox"/> Stock, breed or variety <input checked="" type="checkbox"/> Species <input type="checkbox"/> Other	

Stakeholders	Role of stakeholder in regards og AqGR <i>mark all that apply</i>	Genetic resource of main interest <i>mark all that apply</i>	Comments <i>Please provide any information or explanation of stakeholders' role</i>
Fish hatchery people	<input checked="" type="checkbox"/> Conservation <input checked="" type="checkbox"/> Production <input checked="" type="checkbox"/> Feed manufacturing <input checked="" type="checkbox"/> Breeding <input type="checkbox"/> Research <input checked="" type="checkbox"/> Marketing <input type="checkbox"/> Processing <input checked="" type="checkbox"/> Advocacy <input checked="" type="checkbox"/> Outreach/Extension <input type="checkbox"/> Other (specify) <input type="text"/>	<input type="checkbox"/> DNA <input checked="" type="checkbox"/> Stock, breed or variety <input checked="" type="checkbox"/> Species <input type="checkbox"/> Other	
People involved in marketing	<input type="checkbox"/> Conservation <input checked="" type="checkbox"/> Production <input type="checkbox"/> Feed manufacturing <input type="checkbox"/> Breeding <input type="checkbox"/> Research <input checked="" type="checkbox"/> Marketing <input type="checkbox"/> Processing <input checked="" type="checkbox"/> Advocacy <input checked="" type="checkbox"/> Outreach/Extension <input type="checkbox"/> Other (specify) <input type="text"/>	<input type="checkbox"/> DNA <input checked="" type="checkbox"/> Stock, breed or variety <input checked="" type="checkbox"/> Species <input type="checkbox"/> Other	
Government resource managers	<input checked="" type="checkbox"/> Conservation <input checked="" type="checkbox"/> Production <input checked="" type="checkbox"/> Feed manufacturing <input checked="" type="checkbox"/> Breeding <input checked="" type="checkbox"/> Research <input checked="" type="checkbox"/> Marketing <input checked="" type="checkbox"/> Processing <input checked="" type="checkbox"/> Advocacy <input checked="" type="checkbox"/> Outreach/Extension <input type="checkbox"/> Other (specify) <input type="text"/>	<input checked="" type="checkbox"/> DNA <input checked="" type="checkbox"/> Stock, breed or variety <input checked="" type="checkbox"/> Species <input type="checkbox"/> Other	

Stakeholders	Role of stakeholder in regards og AqGR <i>mark all that apply</i>	Genetic resource of main interest <i>mark all that apply</i>	Comments <i>Please provide any information or explanation of stakeholders' role</i>
Fishing or aquaculture associations	<input checked="" type="checkbox"/> Conservation <input checked="" type="checkbox"/> Production <input checked="" type="checkbox"/> Feed manufacturing <input checked="" type="checkbox"/> Breeding <input type="checkbox"/> Research <input checked="" type="checkbox"/> Marketing <input checked="" type="checkbox"/> Processing <input checked="" type="checkbox"/> Advocacy <input checked="" type="checkbox"/> Outreach/Extension <input type="checkbox"/> Other (specify) <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div>	<input type="checkbox"/> DNA <input checked="" type="checkbox"/> Stock, breed or variety <input checked="" type="checkbox"/> Species <input type="checkbox"/> Other	
Aquatic protected area managers	<input checked="" type="checkbox"/> Conservation <input type="checkbox"/> Production <input type="checkbox"/> Feed manufacturing <input type="checkbox"/> Breeding <input checked="" type="checkbox"/> Research <input type="checkbox"/> Marketing <input type="checkbox"/> Processing <input checked="" type="checkbox"/> Advocacy <input checked="" type="checkbox"/> Outreach/Extension <input type="checkbox"/> Other (specify) <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div>	<input type="checkbox"/> DNA <input checked="" type="checkbox"/> Stock, breed or variety <input checked="" type="checkbox"/> Species <input type="checkbox"/> Other	
Policy Makers	<input checked="" type="checkbox"/> Conservation <input checked="" type="checkbox"/> Production <input checked="" type="checkbox"/> Feed manufacturing <input checked="" type="checkbox"/> Breeding <input checked="" type="checkbox"/> Research <input checked="" type="checkbox"/> Marketing <input checked="" type="checkbox"/> Processing <input checked="" type="checkbox"/> Advocacy <input checked="" type="checkbox"/> Outreach/Extension <input type="checkbox"/> Other (specify) <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div>	<input checked="" type="checkbox"/> DNA <input checked="" type="checkbox"/> Stock, breed or variety <input checked="" type="checkbox"/> Species <input type="checkbox"/> Other	

Stakeholders	Role of stakeholder in regards og AqGR <i>mark all that apply</i>	Genetic resource of main interest <i>mark all that apply</i>	Comments <i>Please provide any information or explanation of stakeholders' role</i>
Non-Governmental Organizations	<input checked="" type="checkbox"/> Conservation <input checked="" type="checkbox"/> Production <input type="checkbox"/> Feed manufacturing <input type="checkbox"/> Breeding <input type="checkbox"/> Research <input checked="" type="checkbox"/> Marketing <input checked="" type="checkbox"/> Processing <input checked="" type="checkbox"/> Advocacy <input checked="" type="checkbox"/> Outreach/Extension <input type="checkbox"/> Other (specify) <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div>	<input type="checkbox"/> DNA <input checked="" type="checkbox"/> Stock, breed or variety <input checked="" type="checkbox"/> Species <input type="checkbox"/> Other	
Intergovernmental Organizations	<input checked="" type="checkbox"/> Conservation <input checked="" type="checkbox"/> Production <input checked="" type="checkbox"/> Feed manufacturing <input checked="" type="checkbox"/> Breeding <input checked="" type="checkbox"/> Research <input checked="" type="checkbox"/> Marketing <input checked="" type="checkbox"/> Processing <input checked="" type="checkbox"/> Advocacy <input checked="" type="checkbox"/> Outreach/Extension <input type="checkbox"/> Other (specify) <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div>	<input checked="" type="checkbox"/> DNA <input checked="" type="checkbox"/> Stock, breed or variety <input checked="" type="checkbox"/> Species <input type="checkbox"/> Other	
Donors	<input checked="" type="checkbox"/> Conservation <input checked="" type="checkbox"/> Production <input checked="" type="checkbox"/> Feed manufacturing <input checked="" type="checkbox"/> Breeding <input checked="" type="checkbox"/> Research <input checked="" type="checkbox"/> Marketing <input checked="" type="checkbox"/> Processing <input checked="" type="checkbox"/> Advocacy <input checked="" type="checkbox"/> Outreach/Extension <input type="checkbox"/> Other (specify) <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div>	<input checked="" type="checkbox"/> DNA <input checked="" type="checkbox"/> Stock, breed or variety <input checked="" type="checkbox"/> Species <input type="checkbox"/> Other	

Stakeholders	Role of stakeholder in regards og AqGR <i>mark all that apply</i>	Genetic resource of main interest <i>mark all that apply</i>	Comments <i>Please provide any information or explanation of stakeholders' role</i>										
Consumers	<table><tr><td><input checked="" type="checkbox"/> Conservation</td><td><input checked="" type="checkbox"/> Marketing</td></tr><tr><td><input checked="" type="checkbox"/> Production</td><td><input checked="" type="checkbox"/> Processing</td></tr><tr><td><input type="checkbox"/> Feed manufacturing</td><td><input checked="" type="checkbox"/> Advocacy</td></tr><tr><td><input type="checkbox"/> Breeding</td><td><input type="checkbox"/> Outreach/Extension</td></tr><tr><td><input type="checkbox"/> Research</td><td><input type="checkbox"/> Other (specify)</td></tr></table> <div data-bbox="867 602 1224 703" style="border: 1px solid black; height: 60px; width: 100%;"></div>	<input checked="" type="checkbox"/> Conservation	<input checked="" type="checkbox"/> Marketing	<input checked="" type="checkbox"/> Production	<input checked="" type="checkbox"/> Processing	<input type="checkbox"/> Feed manufacturing	<input checked="" type="checkbox"/> Advocacy	<input type="checkbox"/> Breeding	<input type="checkbox"/> Outreach/Extension	<input type="checkbox"/> Research	<input type="checkbox"/> Other (specify)	<input type="checkbox"/> DNA <input checked="" type="checkbox"/> Stock, breed or variety <input checked="" type="checkbox"/> Species <input type="checkbox"/> Other	
<input checked="" type="checkbox"/> Conservation	<input checked="" type="checkbox"/> Marketing												
<input checked="" type="checkbox"/> Production	<input checked="" type="checkbox"/> Processing												
<input type="checkbox"/> Feed manufacturing	<input checked="" type="checkbox"/> Advocacy												
<input type="checkbox"/> Breeding	<input type="checkbox"/> Outreach/Extension												
<input type="checkbox"/> Research	<input type="checkbox"/> Other (specify)												

a) Please indicate the most important role of women in regards to AqGR

Marketing

b) Please indicate the most important role of indigenous and local communities in regards to AqGR

Conservation

Chapter 6: National Policies and Legislation for Aquatic Genetic Resources of Farmed Aquatic Species and their Wild Relatives within National Jurisdiction

The main objective of Chapter 6 is to review the status and adequacy of national policies and legislation concerning aquatic genetic resources of farmed aquatic species and their wild relatives including access and benefit sharing.

The specific objectives are as follows:

- To describe the existing national policy and legal framework for the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives.
- To review current national policies and instruments for access to aquatic genetic resources of farmed aquatic species and their wild relatives and the fair and equitable sharing of benefits arising from their utilization.
- To identify any significant gaps in policies and legislation concerning aquatic genetic resources of farmed aquatic species and their wild relatives..

Review of national policies and legislation for Aquatic Genetic Resources of farmed aquatic species and their wild relatives within national jurisdiction

32. Please list national legislation, policies and/or mechanisms that address aquatic genetic resources of farmed species and their wild relatives (see question 47 regarding international agreements).

Add Row

National legislation, policy and/or mechanism	Date established	Scope <i>Select all that apply</i>	Comments <i>Please provide any additional information for example whether it has been effective or not; and main sources of information</i>	
The Fisheries Act 625	1/01/2002	<input type="checkbox"/> Genes or molecules only <input checked="" type="checkbox"/> Aquaculture <input checked="" type="checkbox"/> Capture fisheries <input checked="" type="checkbox"/> Conservation <input type="checkbox"/> Intellectual property protection <input checked="" type="checkbox"/> Importation <input checked="" type="checkbox"/> Trade and commerce <input type="checkbox"/> Access and benefit sharing <input type="checkbox"/> Other	weak enforcement due largely to lack of trained manpower and financial constraints Fisheries Commission Annual Report 2013	X
Fisheries Regulations 2010	1/01/2010	<input type="checkbox"/> Genes or molecules only <input checked="" type="checkbox"/> Aquaculture <input type="checkbox"/> Capture fisheries <input checked="" type="checkbox"/> Conservation <input type="checkbox"/> Intellectual property protection <input checked="" type="checkbox"/> Importation <input checked="" type="checkbox"/> Trade and commerce <input type="checkbox"/> Access and benefit sharing <input type="checkbox"/> Other	Environmental Permit required from Environmental Protection Authority (EPA) in compliance with the Environmental Assessment Regulations 1999 L. I. 1652. and EPA Act of 1994. Monitoring activities carried out by EPA on Aquaculture establishments has been largely effective.	X

Review of the current status and gaps in national policies and legislation for the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives

33. Please list any gaps in the coverage or constraints in implementing national legislation, policies and/or mechanisms in regard to aquatic genetic resources.

Limited human and financial resources to enforce policies and legislations

34. Please indicate any national aquatic genetic resources of farmed aquatic species and their wild relatives for which your country restricts access.

Type of genetic resource (can be species name, DNA, gametes or other descriptor)	Comments <i>Please, provide verifiable main sources of information, effectiveness of the restriction, description of type of restriction and for whom does the restriction apply</i>
DNA	
Stock, breed or variety	Importation of the GIFT strain of <i>Oreochromis niloticus</i> is restricted. Only a Government research institution is permitted to import it for research purposes with permit issued by the Environmental Protection Authority (EPA). Farmers are strictly not allowed to import it for aquaculture purposes. A commercial farming enterprise - Tropo Farms which violated the restriction and imported the GIFT strain from Thailand was sanctioned. He was forced to destroy the breed and barred from operating his farm for a period of time.
Species	
Other	
Continue adding row as necessary	
Add Row	Remove Row

35. Over the past 10 years, indicate the actions your country has taken to maintain or enhance access to aquatic genetic resources of farmed aquatic species and their wild relatives located outside your country; for example, by establishing germplasm acquisition agreements or material transfer agreements.

Add Row

Action taken to enhance access to aquatic genetic resources outside your country	Type of genetic resource <i>Mark all that apply</i>	Comment <i>for example other types of genetic resources</i>	
	<input type="checkbox"/> DNA <input type="checkbox"/> Genes <input type="checkbox"/> Gametes <input type="checkbox"/> Tissues <input type="checkbox"/> Embryos <input type="checkbox"/> Living specimens		X

36. Please indicate any obstacles your country has encountered when trying to access aquatic genetic resources of farmed aquatic species and their wild relatives outside of your country (including access for research purposes).

Obstacles to accessing aquatic genetic resources	Please describe type of genetic resource <i>mark all that apply</i>	Comments <i>please include additional information as needed</i>
Intellectual property protection	<input type="checkbox"/> DNA <input type="checkbox"/> Stock, breed or variety <input type="checkbox"/> Species <input type="checkbox"/> Other	
National laws of your country	<input type="checkbox"/> DNA <input type="checkbox"/> Stock, breed or variety <input type="checkbox"/> Species <input type="checkbox"/> Other	
National laws of donor country	<input type="checkbox"/> DNA <input type="checkbox"/> Stock, breed or variety <input type="checkbox"/> Species <input type="checkbox"/> Other	
International laws or protocols	<input type="checkbox"/> DNA <input type="checkbox"/> Stock, breed or variety <input type="checkbox"/> Species <input type="checkbox"/> Other	
Too expensive	<input type="checkbox"/> DNA <input type="checkbox"/> Stock, breed or variety <input type="checkbox"/> Species <input type="checkbox"/> Other	
Material transfer agreements required	<input type="checkbox"/> DNA <input type="checkbox"/> Stock, breed or variety <input type="checkbox"/> Species <input type="checkbox"/> Other	
Knowledge gaps	<input type="checkbox"/> DNA <input type="checkbox"/> Stock, breed or variety <input type="checkbox"/> Species <input type="checkbox"/> Other	
Public perception	<input type="checkbox"/> DNA <input type="checkbox"/> Stock, breed or variety <input type="checkbox"/> Species <input type="checkbox"/> Other	

Obstacles to accessing aquatic genetic resources	Please describe type of genetic resource <i>mark all that apply</i>	Comments <i>please include additional information as needed</i>
Other	<input type="checkbox"/> DNA <input type="checkbox"/> Stock, breed or variety <input type="checkbox"/> Species <input type="checkbox"/> Other	
Continue adding row as necessary		
Add Row		

Chapter 7: Research, Education, Training and Extension on Aquatic Genetic Resources within National Jurisdiction: Coordination, Networking and Information

The main objective of Chapter 7 is to review the status and adequacy of national research, education, training and extension, coordination and networking arrangements and information systems that support the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives for food and agriculture.

The specific objectives are:

- To describe the current status, future plans, gaps, needs and priorities for research, training, extension and education on the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives
- To describe existing or planned national networks for the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives.
- To describe existing or planned information systems for the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives.

Research

37. Does your national research programme support the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives? If yes, give details of current and/or planned research; if no, explain the main reasons why not in box below.

Please mark appropriate box

- Yes
 No
 Unknown

Please provide details

A national selective breeding program on the Nile tilapia (*Oreochromis niloticus*) has been initiated in Ghana since 1999. The breeding is conducted at the Aquaculture Research and Development Center (ARDEC), Akosombo. It has resulted in the production of a tenth generation of Akosombo strain of Nile tilapia which grows 30 % faster than those in the wild.

38. Please list main institutions, organizations, corporations and other entities in your country that are engaged in field and/or laboratory research related to the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives.

Add Row

Main institutions, organizations, corporations and other entities	Area of research <i>Mark all that apply</i>	Comments <i>Please provide any additional information</i>	
Council for Scientific and Industrial Research - Water Research Institute (CSIR-WRI) (Aquaculture Research and Development Center) (ARDEC), Akosombo.	<input type="checkbox"/> Genetic resource management <input checked="" type="checkbox"/> Basic knowledge on aquatic genetic resources Characterization and <input checked="" type="checkbox"/> monitoring of aquatic genetic resources <input checked="" type="checkbox"/> Genetic improvement <input type="checkbox"/> Economic valuation of aquatic genetic resources <input checked="" type="checkbox"/> Conservation of aquatic genetic resources <input checked="" type="checkbox"/> Communication on aquatic genetic resources <input checked="" type="checkbox"/> Access and distribution of aquatic genetic resources <input type="checkbox"/> Other	CSIR-WRI is the only research institution in the country although the universities also carry out some research into aquaculture. WRI has PhD holders with expertise in fields of aquaculture, fish genetics, quantitative genetics, breeding fish biology, fisheries management, biological sciences and agricultural economics (Asmah, 2008).	X
University of Ghana, Legon (UG)	<input type="checkbox"/> Genetic resource management <input checked="" type="checkbox"/> Basic knowledge on aquatic genetic resources Characterization and <input type="checkbox"/> monitoring of aquatic genetic resources <input type="checkbox"/> Genetic improvement <input type="checkbox"/> Economic valuation of aquatic genetic resources <input type="checkbox"/> Conservation of aquatic genetic resources <input checked="" type="checkbox"/> Communication on aquatic genetic resources <input type="checkbox"/> Access and distribution of aquatic genetic resources <input type="checkbox"/> Other		X

Main institutions, organizations, corporations and other entities	Area of research <i>Mark all that apply</i>	Comments <i>Please provide any additional information</i>	
Agricultural Colleges (e.g. Kwadaso Agricultural College, Ohawu Agric. College, Damango Agric. College)	<input type="checkbox"/> Genetic resource management <input checked="" type="checkbox"/> Basic knowledge on aquatic genetic resources Characterization and <input type="checkbox"/> monitoring of aquatic genetic resources <input type="checkbox"/> Genetic improvement <input type="checkbox"/> Economic valuation of aquatic genetic resources <input type="checkbox"/> Conservation of aquatic genetic resources <input type="checkbox"/> Communication on aquatic genetic resources <input type="checkbox"/> Access and distribution of aquatic genetic resources <input type="checkbox"/> Other	Aquaculture, Natural resource management. Certificate is awrdded. Reference Rurangwa et. al. 2015.	X
University of Cape Coast (UCC)	<input type="checkbox"/> Genetic resource management <input checked="" type="checkbox"/> Basic knowledge on aquatic genetic resources Characterization and <input type="checkbox"/> monitoring of aquatic genetic resources <input type="checkbox"/> Genetic improvement <input type="checkbox"/> Economic valuation of aquatic genetic resources <input type="checkbox"/> Conservation of aquatic genetic resources <input checked="" type="checkbox"/> Communication on aquatic genetic resources <input type="checkbox"/> Access and distribution of aquatic genetic resources <input type="checkbox"/> Other	Oreochromis niloticus Clarias gariepinus	X

Main institutions, organizations, corporations and other entities	Area of research <i>Mark all that apply</i>	Comments <i>Please provide any additional information</i>	
Kwame Nkrumah University of Science and Technology, Kumasi (KNUST)	<input type="checkbox"/> Genetic resource management <input checked="" type="checkbox"/> Basic knowledge on aquatic genetic resources Characterization and <input type="checkbox"/> monitoring of aquatic genetic resources <input type="checkbox"/> Genetic improvement <input type="checkbox"/> Economic valuation of aquatic genetic resources <input type="checkbox"/> Conservation of aquatic genetic resources <input checked="" type="checkbox"/> Communication on aquatic genetic resources <input type="checkbox"/> Access and distribution of aquatic genetic resources <input type="checkbox"/> Other	Oreochromis niloticus Clarias gariepinus	X
University of Development Studies, Tamale (UDS)	<input type="checkbox"/> Genetic resource management <input checked="" type="checkbox"/> Basic knowledge on aquatic genetic resources Characterization and <input type="checkbox"/> monitoring of aquatic genetic resources <input type="checkbox"/> Genetic improvement <input type="checkbox"/> Economic valuation of aquatic genetic resources <input type="checkbox"/> Conservation of aquatic genetic resources <input checked="" type="checkbox"/> Communication on aquatic genetic resources <input type="checkbox"/> Access and distribution of aquatic genetic resources <input type="checkbox"/> Other	Oreochromis niloticus Clarias gariepinus	X

39. What capacity strengthening is needed to improve national research in support of the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives?

Please rank the following in regard to capacity strengthening.

Capacities	Rank 1=Very Important 10=No importance
Improve basic knowledge on aquatic genetic resources	1
Improve capacities for characterization and monitoring of aquatic genetic resources	1
Improve capacities for genetic improvement	1
Improve capacities for genetic resource management	1
Improve capacities for economic valuation of aquatic genetic resources	2
Improve capacities for conservation of aquatic genetic resources	2
Improve communication on aquatic genetic resources	2
Improve access to and distribution of aquatic genetic resources	2
Add other rows as appropriate and rank <div style="border: 1px solid black; height: 40px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>
Add Row	Remove Row

Please describe any other capacity building needs in regards to aquatic genetic resources

Improvement in basic infrastructure

Education, training and extension

40. Please indicate the extent that education, training and extension in your country covers the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives? List the main institutions involved and the types of courses offered.

Add Row

Institution	Thematic Area	Type of courses mark all that apply	Comments	
University of Ghana, Legon University of Cape Coast Kwame Nkrumah University of Science and Technology, Kumasi University of Development Studies, Tamale Agricultural Colleges (Diploma awarding institutions [e.g.	Genetic resource management	<input type="checkbox"/> Undergraduate <input type="checkbox"/> Post-graduate <input type="checkbox"/> Training <input type="checkbox"/> Extension		
	Characterization and monitoring of aquatic genetic resources	<input type="checkbox"/> Undergraduate <input checked="" type="checkbox"/> Post-graduate <input type="checkbox"/> Training <input type="checkbox"/> Extension		
	Genetic improvement	<input type="checkbox"/> Undergraduate <input checked="" type="checkbox"/> Post-graduate <input type="checkbox"/> Training <input checked="" type="checkbox"/> Extension		X
	Economic valuation of aquatic genetic resources	<input type="checkbox"/> Undergraduate <input type="checkbox"/> Post-graduate <input type="checkbox"/> Training <input type="checkbox"/> Extension		
	Conservation of aquatic genetic resources	<input type="checkbox"/> Undergraduate <input type="checkbox"/> Post-graduate <input type="checkbox"/> Training <input type="checkbox"/> Extension		

Coordination and networking

41. Please list any mechanisms within your country responsible for coordinating the aquaculture, culture-based fisheries and capture fisheries subsectors with the other sectors that use watersheds and coastal ecosystems and have impacts on aquatic genetic resources of wild relatives of farmed aquatic species (e.g., agriculture, forestry, mining, tourism, waste management and water resources).

If no mechanism exists check here:

Add Row	
Name of mechanism	Description of how mechanism operates
Approval of aquaculture establishments	To be licensed for aquaculture permit, approval is required from the following sectors; the Environmental Protection Authority (EPA) who ensures that the proposed project is environmentally sound by issuing the Environmental Impact Permit (PIM); the Water Resources Commission (WRC) ensures that the quantity of water to be extracted does not adversely affect biodiversity and other users while the Volta River Authority (VRA) who are custodians of the Volta Lake ensure that siting of the project within their jurisdiction does not affect their mandate of hydro electric power generation. Once the above three agencies issue permits approving of the project, the final approval is granted by the Fisheries Commission (FC).
	X

42. Please indicate how capacity strengthening can be improved in intersectoral coordination in support of the conservation, sustainable use and development of aquatic genetic resources.

Please rank the following in regards to capacity strengthening.

Capacities	Rank 1=Very Important 10=No importance
Increase awareness in institutions	1 <input type="text"/>
Increase technical capacities of institutions	1 <input type="text"/>
Increase information sharing between institutions	1 <input type="text"/>
<p>Add other rows as appropriate and rank</p> <div data-bbox="212 779 829 936" style="border: 1px solid black; padding: 5px;"> <p>Increase forums for discussion and exchange of information</p> </div> <div data-bbox="212 936 829 968" style="border: 1px solid black; padding: 2px;"> Add Row Remove Row </div>	1 <input type="text"/>

Please specify in box below

43. Please list any national networks in your country or any international networks your country belongs to that support the conservation, sustainable use and development of aquatic genetic resources.

Add Row

Network	Objectives of the network <i>Please mark all that apply</i> to your country	Comments	
INTERNATIONAL NETWORK OF GENETICS IN AQUACULTURE (INGA)	<input checked="" type="checkbox"/> Improve basic knowledge on aquatic genetic resources <input type="checkbox"/> Improve capacities for characterization and monitoring of aquatic genetic resources <input checked="" type="checkbox"/> Improve capacities for genetic improvement <input checked="" type="checkbox"/> Improve capacities for economic valuation of aquatic genetic resources <input checked="" type="checkbox"/> Improve capacities for conservation of aquatic genetic resources <input checked="" type="checkbox"/> Improve communication on aquatic genetic resources <input checked="" type="checkbox"/> Improve access to and distribution of aquatic genetic resources	Capacity building in general by INGA and support for research work.	X
ANAF	<input type="checkbox"/> Improve basic knowledge on aquatic genetic resources <input type="checkbox"/> Improve capacities for characterization and monitoring of aquatic genetic resources <input type="checkbox"/> Improve capacities for genetic improvement <input type="checkbox"/> Improve capacities for economic valuation of aquatic genetic resources <input type="checkbox"/> Improve capacities for conservation of aquatic genetic resources <input checked="" type="checkbox"/> Improve communication on aquatic genetic resources <input checked="" type="checkbox"/> Improve access to and distribution of aquatic genetic resources	Facilitates access and distribution	X

Network	Objectives of the network <i>Please mark all that apply</i> to your country	Comments	
Aquaculture Associations in Ghana (e.g. Ghana National Aquaculture Association (GNAA), Asuogyaman Zone Fish Farmers Association (AZOFFA))	<input checked="" type="checkbox"/> Improve basic knowledge on aquatic genetic resources <input type="checkbox"/> Improve capacities for characterization and monitoring of aquatic genetic resources <input type="checkbox"/> Improve capacities for genetic improvement <input type="checkbox"/> Improve capacities for economic valuation of aquatic genetic resources <input type="checkbox"/> Improve capacities for conservation of aquatic genetic resources <input type="checkbox"/> Improve communication on aquatic genetic resources <input checked="" type="checkbox"/> Improve access to and distribution of aquatic genetic resources		X
AU-IBAR	<input type="checkbox"/> Improve basic knowledge on aquatic genetic resources <input type="checkbox"/> Improve capacities for characterization and monitoring of aquatic genetic resources <input type="checkbox"/> Improve capacities for genetic improvement <input type="checkbox"/> Improve capacities for economic valuation of aquatic genetic resources <input type="checkbox"/> Improve capacities for conservation of aquatic genetic resources <input type="checkbox"/> Improve communication on aquatic genetic resources <input checked="" type="checkbox"/> Improve access to and distribution of aquatic genetic resources	Fisheries Governance Project	X

Network	Objectives of the network <i>Please mark all that apply</i> to your country	Comments	
WARP (FAO-TCP)	<input type="checkbox"/> Improve basic knowledge on aquatic genetic resources <input type="checkbox"/> Improve capacities for characterization and monitoring of aquatic genetic resources <input type="checkbox"/> Improve capacities for genetic improvement <input type="checkbox"/> Improve capacities for economic valuation of aquatic genetic resources <input type="checkbox"/> Improve capacities for conservation of aquatic genetic resources <input type="checkbox"/> Improve communication on aquatic genetic resources <input type="checkbox"/> Improve access to and distribution of aquatic genetic resources	West African Fisheries Regional Program Action to combat IUU	<input checked="" type="checkbox"/>

Information systems

44. Please list any information systems existing in your country for receiving, managing and communicating information about the conservation, sustainable use and development of aquatic genetic resources of farmed aquatic species and their wild relatives.

Add Row

Name of information system	Type of information stored <i>mark all that apply</i>	Main stakeholders <i>mark all that apply</i>	
SMS marketing systems	<input type="checkbox"/> DNA sequence <input type="checkbox"/> Genes and genotype <input type="checkbox"/> Breeds, strains or stocks <input type="checkbox"/> Species names <input type="checkbox"/> Production figures <input checked="" type="checkbox"/> Distribution <input checked="" type="checkbox"/> Level of endangerment <input type="checkbox"/> Other	<input checked="" type="checkbox"/> Fish farmers <input checked="" type="checkbox"/> Fishers in capture fisheries <input checked="" type="checkbox"/> Fish hatchery people <input checked="" type="checkbox"/> People involved in marketing <input type="checkbox"/> Government resource managers <input checked="" type="checkbox"/> Fishing or aquaculture associations <input type="checkbox"/> Aquatic protected area managers <input checked="" type="checkbox"/> University and academic people <input type="checkbox"/> Non-Governmental Organizations <input type="checkbox"/> Intergovernmental Organizations <input checked="" type="checkbox"/> Policy makers <input checked="" type="checkbox"/> Donors <input checked="" type="checkbox"/> Consumers <input checked="" type="checkbox"/> Politicians <p>Please list other stakeholders as necessary</p> <div style="border: 1px solid black; height: 40px; width: 100%;"></div>	X

45. What capacity strengthening is needed to improve national information systems to support the conservation, sustainable use and development of aquatic genetic resources?

Please describe what capacities need to be strengthened

Data collection mechanisms need to be strengthened

Please describe any other capacity building needs in regards to information systems for aquatic genetic resources

Improve accessibility of information on AqGR

Chapter 8: International Collaboration on Aquatic Genetic Resources of Farmed Aquatic Species and Their Wild Relatives

The main objective of Chapter 8 is to review the mechanisms and instruments through which your country participates in international collaborations on aquatic genetic resources of farmed aquatic species and their wild relatives.

The specific objectives are:

- To identify your country's current participation in bilateral, sub-regional, regional, other international and global forms of collaboration on aquatic genetic resources. List national memberships, status as a Party and other forms of affiliation in agreements, conventions, treaties, international organizations, international networks and international programmes.
- To identify any other forms of international collaboration on aquatic genetic resources.
- To review the benefits from existing forms of international collaboration on aquatic genetic resources.
- To identify needs and priorities for future international collaboration on aquatic genetic resources

International collaboration includes bilateral arrangements and the sharing of particular waters and stocks of wild relatives of farmed aquatic species.

International, regional or sub-regional agreements, conventions and treaties concerning aquatic genetic resources of farmed aquatic species and their wild relatives

46. Please list the international, regional or sub-regional agreements your country subscribes to that cover aquatic genetic resources of farmed species and their wild relatives, such as the Nagoya Protocol² the Convention on Biological Diversity and the Cartagena Protocol and how they have impacted aquatic genetic resources and stakeholders in your country. Examples could include:

² <http://www.cbd.int/abs/nagoya-protocol/signatories/>

- Establishment and management of shared or networked aquatic protected areas as far as wild relatives of farmed aquatic species are concerned
- Aquaculture and culture-based fisheries in transboundary or shared water bodies
- Sharing aquatic genetic material and related information
- Fishing rights, seasons and quotas as far as wild relatives of farmed aquatic species are concerned
- Conservation and sustainable use of shared water bodies and watercourses as far as wild relatives of farmed aquatic species are concerned
- Quarantine procedures for aquatic organisms and for control and notification of aquatic diseases

Add Row

International, Regional, bilateral or Sub-Regional agreement	Year your country ratified or subscribed to the agreement	Impact on aquatic genetic resources	Impact on stakeholders	Comments
Nagoya Protocol	20/05/2011	<input type="radio"/> Strongly positive <input checked="" type="radio"/> Positive <input type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect	<input type="radio"/> Strongly positive <input type="radio"/> Positive <input type="radio"/> Negative <input type="radio"/> Strongly negative <input checked="" type="radio"/> No effect	X

International, Regional, bilateral or Sub-Regional agreement	Year your country ratified or subscribed to the agreement	Impact on aquatic genetic resources	Impact on stakeholders	Comments	
Ramsar Convention	1988	<input type="radio"/> Strongly positive <input checked="" type="radio"/> Positive <input type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect	<input type="radio"/> Strongly positive <input checked="" type="radio"/> Positive <input type="radio"/> Negative <input type="radio"/> Strongly negative <input type="radio"/> No effect		X

47. Please list the priority needs regarding collaboration on conservation and sustainable use of aquatic genetic resources of farmed aquatic species and their wild relatives. Are they being addressed, i.e. are there any critical gaps?

Collaboration is needed in order to ...	Rank 1=Very Important 10=No importance	To what extent are the needs being met	Comments <i>For example any critical gaps</i>
Improve information technology and database management	1	<input type="radio"/> To a great extent <input checked="" type="radio"/> To some extent <input type="radio"/> None <input type="radio"/> Unknown	Capacity building is required in database management of genetic resources
Improve basic knowledge on aquatic genetic resources	1	<input type="radio"/> To a great extent <input checked="" type="radio"/> To some extent <input type="radio"/> None <input type="radio"/> Unknown	Basic knowledge on aquatic genetic resources is available
Improve capacities for characterization and monitoring of aquatic genetic resources	1	<input type="radio"/> To a great extent <input checked="" type="radio"/> To some extent <input type="radio"/> None <input type="radio"/> Unknown	Information on genetic characterization is available for tilapia species; there is a need to do that for Clarias species
Improve capacities for genetic improvement	1	<input checked="" type="radio"/> To a great extent <input type="radio"/> To some extent <input type="radio"/> None <input type="radio"/> Unknown	A national program on breeding and selection of Nile tilapia for faster growth strain has been going on since 1999 and has resulted in production of improved Akosomber strain which is in the tenth generation and grows 30 % faster than those in the wild
Improve capacities for economic valuation of aquatic genetic resources	1	<input type="radio"/> To a great extent <input checked="" type="radio"/> To some extent <input type="radio"/> None <input type="radio"/> Unknown	Capacity is limited and needs to be improved
Improve capacities for conservation of aquatic genetic resources	1	<input type="radio"/> To a great extent <input checked="" type="radio"/> To some extent <input type="radio"/> None <input type="radio"/> Unknown	More capacity required to improve
Improve communication on aquatic genetic resources	1	<input type="radio"/> To a great extent <input checked="" type="radio"/> To some extent <input type="radio"/> None <input type="radio"/> Unknown	More needs to be done

Collaboration is needed in order to ...	Rank 1=Very Important 10=No importance	To what extent are the needs being met	Comments <i>For example any critical gaps</i>
To improve access to and distribution of aquatic genetic resources	1	<input type="radio"/> To a great extent <input checked="" type="radio"/> To some extent <input type="radio"/> None <input type="radio"/> Unknown	There is a gap in seed production and distribution. Capacity building in hatchery management is required
Other		<input type="radio"/> To a great extent	
Continue adding row as necessary		<input type="radio"/> To some extent	
		<input type="radio"/> None	
Add Row	Remove Row	<input type="radio"/> Unknown	

48. Please describe the types of collaboration that have been most beneficial for your country, and why?

Collaboration with 5 other countries in management of aquaculture resources within the Volta basin under a regional project- TILAPIA VOLTA PROJECT (TIVO). The Project involved Benin, Burkina Faso, Cote d'ivoire, Ghana, Mali and Togo with an objective to improve the management of tilapia genetic resources within the Volta Basin sub-region. The improved Akosombo strain of Nile tilapia was assessed by all six countries while information on characterization, conservation, capacity building and early warning signals among relevant ministries was exchanged for mutual benefit of participating countries.

49. Is there a need for your country to expand its collaboration concerning the conservation, sustainable use and development of aquatic genetic resources? If yes, give details, including any requirements for capacity strengthening in box below

Yes

No

If yes, please give details

It is very necessary to expand the collaboration especially between countries sharing the Volta basin as any negative activity of any of the collaborating countries can have adverse effect on the Aquatic genetic resource (AqGR) of other participating countries within the basin

50. Describe important roles that your country performs within its region (and/or sub-region) and globally in terms of being a keeper, user and sharer of aquatic genetic resources.

Keeper, User, Sharer

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