



---

# “NATIONAL STRATEGY ON AQUATIC ANIMAL HEALTH” (2022-27)

Government of Pakistan

**By Fisheries Development Board**

NARC, PARK ROAD  
ISLAMABAD

Phone: +92-51-9255945

# “National Strategy on Aquatic Animal Health” (2022-27)

By

Fisheries Development Board

Government of Pakistan

2022

Main Author: Muhammad Junaid Wattoo, CEO, FDB  
Contract No. 0092-336-4444938  
E-mail address: [junaid.fdb@gmail.com](mailto:junaid.fdb@gmail.com)  
Address: FDB, Gate no. 2, NARC, Park Road, Islamabad-Pakistan

## Foreword

---

Recent global trend in aquaculture is that transboundary diseases affecting farmed and wild aquatic species emerge, spread rapidly and cause major production losses approximately every three to five years. Most often, there is a long-time lapse (usually years) from the time that a serious mortality event caused by an unknown and emerging pathogen is observed in the field, to its subsequent identification and confirmation, to global awareness, the establishment and implementation of surveillance and reporting/notification systems and cost-effective risk management measures.

To manage and maintain good biosecurity, the issues and challenges are wide-ranging and multifactorial with many compounding factors. These challenges can be grouped in four general categories, which are challenging the design and implementation of efficient and effective biosecurity strategies against existing and emerging pathogens, namely: 1) Trade and movement of live animals and products, 2) Knowledge of pathogens and their hosts, 3) Aquatic Animal Health (AAH) management and 4) Ecosystem changes. Therefore, to keep the aquaculture sustainable there is an urgent need to develop a permanent system to prevent and manage diseases of aquatic organisms.

A very important aspect of managing aquatic disease challenges is economics. Disease impacts have been estimated in socio-economic terms e.g., losses in production, income, employment, market access or market share, investment, and consumer confidence; food shortages; industry failure or closure of business or industry. Disease remains an economic and societal challenge. One of the greatest signs of a maturing industry is when the focus is on disease prevention supported by effective governance and innovation.

Biosecurity measures are less expensive when put in place proactively and preventatively, and are more expensive as solution-based, reactionary responses to outbreaks. It is time to consider designing and applying a holistic national aquaculture biosecurity program, taking into account the years of global experience by both public and private actors, livestock sector achievements, and various bottlenecks observed and experienced, especially in developing countries. It is emphasized that biosecurity should be in place and parallel to aquaculture development efforts in Pakistan. Reducing the response time following an outbreak is an essential basic step for efficient biosecurity.

National Strategy on Aquatic Animal Health (NSAAH) has been designed to set goals and take actions to create a comprehensive biosecurity framework. The NSAAH defines collectively the purpose and priorities of federal and provincial governments aimed to minimize the risk of aquatic animal diseases impacting on the sustainable development of aquaculture, with focus on aquatic biodiversity, food security, food safety and the national economy.

# Contents

Foreword .....	3
List of Abbreviations and Acronyms .....	7
1. INTRODUCTION .....	9
1.1. Background .....	9
1.2. Scope .....	9
1.3. Country General Information .....	10
1.4. Aquatic Resources and Biodiversity .....	11
1.5. Aquaculture in Pakistan .....	12
1.6. International Trade .....	13
1.7. Status of Fish Health in Pakistan .....	14
1.7.1. Parasitic diseases .....	14
1.7.2. Fungal diseases .....	14
1.7.3. Bacterial diseases .....	15
1.7.4. Viral diseases .....	15
1.8. Aquaculture and Aquatic Animal Health Policy .....	15
2. Process of Developing a National Strategy on Aquatic Animal Health for Pakistan .....	16
3. Statement of Purpose .....	16
4. Vision .....	16
5. Guiding Principles .....	16
6. The Program Overview .....	18
6.1. Program 1: Policy, Legislation and enforcement .....	18
6.1.1. Objectives .....	18
6.1.2. Current status .....	19
6.1.3. Projects .....	<b>Error! Bookmark not defined.</b>
6.2. Program 2: Risk Analysis .....	20
6.2.1. Objectives .....	20
6.2.2. Current status .....	20
6.2.3. Projects .....	<b>Error! Bookmark not defined.</b>
6.3. Program 3: Pathogen List .....	22
6.3.1. Objectives .....	22
6.3.2. Current status .....	22
6.3.3. Projects .....	<b>Error! Bookmark not defined.</b>
6.4. Program 4: Border Inspection and Quarantine .....	23
6.4.1. Objectives .....	23
6.4.2. Current status .....	23
6.4.3. Projects .....	<b>Error! Bookmark not defined.</b>

6.5. Program 5: Diagnostics.....	25
6.5.1. Objectives.....	25
6.5.2. Current status.....	25
6.5.3. Projects .....	<b>Error! Bookmark not defined.</b>
6.6. Program 6: Farm-level Biosecurity and Health management.....	26
6.6.1. Objectives.....	26
6.6.2. Current status.....	27
6.6.3. Projects .....	<b>Error! Bookmark not defined.</b>
6.7. Program 7: Chemicals, Veterinary Drugs, Effective Microbes and Antimicrobial Resistance (AMR) in Aquaculture .....	28
6.7.1. Objectives.....	28
6.7.2. Current status.....	29
6.7.3. Projects .....	<b>Error! Bookmark not defined.</b>
6.8. Program 8: Surveillance, Monitoring and Reporting.....	30
6.8.1. Objectives.....	30
6.8.2. Current status.....	31
6.8.3. Projects .....	<b>Error! Bookmark not defined.</b>
6.9. Program 9: Communication and Information System.....	32
6.9.1. Objectives.....	32
6.9.2. Current status.....	33
6.9.3. Projects .....	<b>Error! Bookmark not defined.</b>
6.10. Program 10: Zoning and Compartmentalization.....	34
6.10.1. Objectives.....	34
6.10.2. Current status.....	34
6.10.3. Projects.....	<b>Error! Bookmark not defined.</b>
6.11. Program 11: Emergency Preparedness and Contingency Planning .....	35
6.11.1. Objectives.....	35
6.11.2. Current status.....	35
6.11.3. Projects.....	<b>Error! Bookmark not defined.</b>
6.12. Program 12: Research and Development .....	36
6.12.1. Objectives.....	37
6.12.2. Current status.....	37
6.12.3. Projects.....	<b>Error! Bookmark not defined.</b>
6.13. Program 13: Institutional Structure (including Infrastructure).....	38
6.13.1. Objectives.....	38
6.13.2. Current status.....	38
6.13.3. Projects.....	<b>Error! Bookmark not defined.</b>

6.14.	Program 14: Human Resources and Institutional Capacity Development .....	39
6.14.1.	Objectives.....	39
6.14.2.	Current status .....	39
6.14.3.	Projects.....	<b>Error! Bookmark not defined.</b>
6.15.	Program 15: Regional and International Cooperation .....	41
6.15.1.	Objectives.....	41
6.15.2.	Current status .....	41
6.15.3.	Projects.....	<b>Error! Bookmark not defined.</b>
7.	IMPLEMENTATION.....	42
	Annex I .....	43
	<b>Summary of the National Fish Health Strategy’s Programs and Projects .....</b>	<b>43</b>
	Annex II .....	46
	<b>Terms of Reference for the Main Committee on NSAAH .....</b>	<b>46</b>
	Annex III .....	50
	<b>National Pathogen List .....</b>	<b>50</b>

## List of Abbreviations and Acronyms

---

AHPND:	Acute hepatopancreatic necrosis disease
ALOP:	Appropriate level of protection
ALOR:	Acceptable level of risk
AMR:	Antimicrobial resistance
AQD:	Animal Quarantine Department
NRCP:	National Residue Control Program
ASEAN:	Association of Southeast Asian Nations
BIMP-EAGA:	Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area
BMPs:	Best management practices
CA:	Competent Authority
CITES:	Convention on Trade in Endangered Species
CIASA:	Committee for Incoming Alien Species Application
DAN:	Dasar Agro-Makanan [National Agro-Food Policy]
PFD:	Provincial Fisheries Department
EHP:	<i>Enterocytozoon hepatopenaei</i>
EUS:	Epizootic ulcerative syndrome
EU:	European Union
FAO:	Food and Agriculture Organization of the United Nations
FDB:	Fisheries Development Board
FRI:	Fisheries Research Institute
GAPs:	Good agriculture practices
GDP:	Gross domestic production
GMPs:	Good manufacturing practices
GOP:	Government of Pakistan
HACCP:	Hazard analysis and critical control points
HPV:	Hepatopancreatic parvovirus
IRA:	Import risk analysis
MFD:	Marine Fisheries Department
MoU:	Memorandum of understanding
MNFSR:	Ministry of National Food Security and Research

Pk-GAP:	Pakistan Good Agriculture Practices
NACA:	Network of Aquaculture Centres in Asia-Pacific
NPL:	National Pathogen List
OIE:	World Organisation for Animal Health
PT:	Proficiency Testing
R&D:	Research and development
SEAFDEC:	Southeast Asian Fisheries Development Centre
SOPs:	Standard operating procedures
SPF:	Specific pathogen free
SPR:	Specific pathogen resistant
TAADs:	Transboundary aquatic animal diseases
UN:	United Nations

## 1. INTRODUCTION

---

### 1.1. Background

Since November 2021, FAO and NACA are working on the development of a regional and national aquaculture strategy for Asia and the Pacific region. A Concept Note was presented during NACA's Governing Council Meeting in 2021. This partnership presents a great opportunity to initiate the development of such strategies at regional and national levels. This progression is envisaged in the longer term, as presentation of key concepts, principles and application of the NSAAH as a basic tool and first step in the process; conduct of assessment and gap analysis; finalize regional strategy. Later the national strategies will be presented for adoption by NACA members to develop regional strategies.

Aquaculture is receiving increasing recognition worldwide as government authorities and private sector recognizing that there is a need to enhance productivity in an accelerated way to ensure food security and improved nutrition for a growing population. At the global level, it is believed that aquaculture will need to produce more fish to meet the growing demand of the population plus declining catches of wild fisheries resource.

Fisheries Development Board (FDB) at Federal and Fisheries Departments at Provincial and Area level are responsible and striving for development and promotion of aquaculture sector in Pakistan. Their mission is to manage and develop the fisheries and aquaculture sector in a sustainable, dynamic, and competitive economy based on scientific information and quality services. In carrying out this mission, the departments are focusing their efforts to improve the quality, efficiency and effectiveness of service delivery and partnerships between the public and private sector stakeholders.

Office of the Animal Husbandry Commissioner under Ministry of National Food Security and Research is responsible to collect, compile and share with OIE, the information related to animal health, disease surveillance. Fisheries Departments at Provincial and area level are responsible to provision of extension services to aquaculture farmers. The registration of farms, aquaculture residue monitoring and farm certification has not yet initiated in Pakistan, however, FDB is working to develop a framework which will help farm registration, residue monitoring and farm certification. There is a need to review, update the legislation to include in its scope the aquaculture and aquatic animal health.

### 1.2. Scope

This document serves as the main development plan for the fish health aspects of the three components of Pakistan's Aquaculture Biosecurity: Official Control, Official Analysis and Official Guarantee. Pakistan's NAASH consists of X Programs and Y Projects that are to be completed within the indicated timeframe and provides detailed guidance. The FDB Pakistan is the main custodian of this document and is responsible for the implementation

of the activities outlined herein in coordination with provincial and area fisheries departments.

## Aquaculture Biosecurity

### Official Control

- Official policies and standard
- Import and export control
- Premise registration
- Fish Disease Surveillance
- Sampling and monitoring
- Inspection

### official Analysis

- Fish Health Analysis
- Service laboratories
- Laboratory maintenance and accreditation
- Proficiency Testing (PT)
- Diagnostic Protocols

### official Guarantee

- Aquaculture Premise/Farm Certification\*
- Sanitation and health and residue Certification\*
- Certificate of Origin\*
- DS 2031 (for US)\*
- CITES Permits \*\*

\* MFD, MOMA

\*\*Authority Inspector General Forests, Ministry of Climate Change,

### 1.3. Country General Information

Pakistan is spread over an area of 882,000 km<sup>2</sup>, lying between 24° and 37° north, 61° and 75° east. It extends some 1,700 km north from the Arabian Sea coast and the mouth of the Indus River to its headwaters in the Hindu Kush and Karakorum ranges of the Himalayan mountains. Pakistan is endowed with considerable quantity of resources i.e. 0.29 million sq km of marine with 1120 km long coastline and approximately 8.6 million ha of inland waters. Pakistan possesses seafood industry of worth about \$1.2 billion of which exports alone are worth nearly \$450 million per annum. About one million people are associated with the industry for their livelihood directly or indirectly. The seafood industry is under threat from two sides, one is over-fishing, which may reduce the resource base and hence the yields. The other is from poor quality control, which means that the value of the catch is not being maximized and much is going to waste. It is evident through export conditions that poor quality is a main issue of Pakistan's competitiveness in the world markets, since the standards demanded by the importing countries (notably EU and US) at large are not being maintained on vessels, at landing sites and auction centers and in the processing units. Pakistan is one of the beneficiary coastal states of the most important international initiative contributing to the transition of the fisheries sector worldwide by adoption in 1982 of the United Nations Convention on the Law of the Sea (UNCLOS) granting the legal rights to

regulate and manage fish resources up to 200 nautical miles from the coast and during 2015 another 50000 sq. km is added into the Exclusive Economic Zone (EEZ) of Pakistan. This extension of jurisdiction has redistributed fisheries resources away from distant industrialized fishing states to the coastal states, enabling them to extract benefits from developed nations through license fees and joint ventures and it also encouraged the development of the coastal states' own industrial fishing fleets, thereby increasing the contribution to the country's economic, social, and nutritional objectives. Second, it allowed coastal states to exercise greater management control over their fishery resources. Ironically Pakistan is one of those few countries which have yet to develop the capacity and knowledge to manage the fishery resources sustainability. If we would have realized this potential, a clear outcome would have been those structural changes in the fishing particularly in the processing industry would have taken place which potentially could have changed the complexion of the fisheries in Pakistan altogether not only by transfer of boat titles; investments in new boats; but above all it would have tremendously increased the supply chain. Carp farming is the major aquaculture activity in Punjab, Sindh, Khyber Pakhtunkhwa and part of Balochistan. The northern mountains of Pakistan have good potential for trout culture, but production is still small.

#### 1.4. Aquatic Resources and Biodiversity

The Marine fisheries resources of Pakistan is divided into parts, the fisheries resources of coast along Balochistan and Sindh. With the declaration of an exclusive economic zone (EEZ) in 1976, Pakistan's fishing limits were extended to 200 nautical miles from the shore, providing the country with a fishing area of approximately 196,600 square kilometers, with shoreline areas of less than 200 metres in depth estimated at around 50,000 square kilometers. The entire coastline bordering the Arabian Sea, lies within the subtropical zone and is divided into the coasts of Sindh, and Makran in Balochistan. The continental shelf off the Makran coast is steep, rough and very narrow, i.e., between 12-32 km wide. The Sindh coast, on the other hand, has an extended 40-120 km shelf area. Mostly flat, it forms good trawlable ground. The coast protrudes into the sea in the form of capes and peninsulas and is, at a few sites, cut off into several small and large bays. There are only a few islands along the coast. The large estuarine delta of the river Indus provides good nurseries for finfish, shrimp and other marine life.

The freshwater resources are immense, as Pakistan possesses an extensive lake, river and canal system. Natural lakes cover an area of 109,780 hectares. Some are high- altitude lakes suitable for cold water fish e.g., Saif-ul-Mulook in the Khyber Pakhtunkhwa (KPK), Satpara in the Gilgit Baltistan Areas and Hanna in Balochistan. Warm water lakes are mostly located in Sindh, and two such lakes are Manchar and Keenjhar. There are several small lakes also, mostly in the Thatta and Sanghar districts of Sindh. The Indus and its tributaries are the major freshwater fisheries of the country. The Indus flows from the GB Areas through the KPK and the Punjab, where it is joined by five large rivers: Kabul, Jhelum, Chenab, Ravi, and Satluj before passing through Sindh and finally draining into the Arabian Sea. Along the

course of the Indus are a number of dams and reservoirs which provide water to an extensive irrigation network in the Punjab and upper Sindh regions, representing one of the world's largest canal systems. These running and still waters cover about 4.57 million hectares, while waterlogging covers about 2.225 million hectares. Of the reservoirs, six; Mangla, Tarbela, Chashma, Hab, Khanpur and Warsak cover an area of 80, 613 hectares and play an important role in freshwater fisheries. Besides these, more than a hundred small and mini dams (in the barani (rain-fed) tract of the country, particularly in the Potwar Plateau) built for the storage of water, hold an immense potential for aquaculture. At present only a few of these water resources are being used to raise fish. Although aquaculture is a fairly new activity in the country, dug-out ponds for fish farming have been constructed in the private sector.

Although more than 1,500 types of finfish and shellfish are found along the Pakistan coast, about 200 species are commercially harvested. Shrimp is the most important commodity which is mainly exported. Among other shellfish, crab, lobster, squid, cuttlefish and mollusk are important. Among finfish, a large number of species are caught which includes sardines, croakers, snappers, pomfrets, sharks, catfish, barracudas, river shad and eels. Palla fish (*Tenalosa ilisha*) which is considered a delicacy, is an anadromous fish that swims up the Indus River to breed

The freshwater fish fauna of Pakistan is represented by a minimum of 193 fish species. These species belong to class Actinopterygii, sub-class Teleostei, 3 cohorts, 6 super orders, 13 orders, 30 families and 86 genera. This diversity also includes the exotic species introduced in wild or fish farming system of Pakistan during the recent past years. Among the total fish fauna of Pakistan, 86 species (8 exotic and 78 indigenous) have been identified as "species of special importance" on the basis of endemism, IUCN status, economic importance and rarity.

## 1.5. Aquaculture in Pakistan

As per estimate, the total area covered by fishponds across all provinces is about 80,000 ha, mainly in Sindh and Punjab and few in other provinces (Balochistan, Khyber Pakhtunkhwa, Azad Kashmir, and Northern Area). The size of these farms varies considerably, however, the average farm size ranges from 5-10 ha. No direct data on the number of fish farmers employed in this sector is available as fish farming in most parts of the country is carried out as an integral part of crop farming. According to a best estimate, nearly 50 000 persons are either directly or indirectly employed in the sector.

Pakistan's aquaculture production increased more than tenfold, from 12,485 tonnes in 2000 to 157,469 tonnes in 2017; the 16 percent annual growth during the period is double the Southern Asian average (8 percent). In Pakistan, aquaculture's share in total fishery production increased from 2.0 percent in 2000 to 22.8 percent in 2007 and stabilized at around 23 percent afterwards. Pakistan's aquaculture production in 2017 came almost entirely from freshwater finfish aquaculture in inland waters, whereas aquaculture in marine

(including coastal) areas only produced a minimal amount of crustaceans. In contrast, aquaculture in marine areas accounted for 11 percent of Southern Asia's aquaculture and 56 percent of global aquaculture. Pakistan's aquaculture production in 2017 was composed almost entirely of freshwater fishes, except for a minimal amount of river prawn and marine shrimp production, which accounted for 0.2 percent of the total production. The species composition of Pakistan's aquaculture is much less diverse than that of Southern Asia and the world. Pakistan's aquaculture is dominated by carp farming; the production of multiple carp species accounted for 97.76 percent of its 157 469 tonnes of aquaculture production in 2017, including Rohu labeo 29 percent, mrigal carp 18 percent, grass carp 17 percent, silver carp 16 percent, and catla 16 percent. Tilapia culture is a recent entry in aquaculture system and has an estimated production of 10,000 tons mainly in Punjab.

## 1.6. International Trade

Pakistan's fish export increased from USD 150 million in 2000 to USD 451 million in 2018, yet the 5.49 percent annual growth was lower than the 7.83 percent annual growth of Southern Asia's fish export during the period. Pakistan's USD 451 million fish export in 2018 was composed of 70.8 percent of finfish and 29.2 percent of shellfish; the species composition is similar to the world average but quite different from Southern Asia's. Flatfishes, Salmoniformes and marine shrimps and prawns were the three largest species groups in Pakistan's fish export in 2018 in terms of both quantity and value. These products were primarily supplied by the country's capture fisheries production. The top 10 commodities in Pakistan's fish export in 2016-18 are presented below:

<b>EXPORT OF TOP 10 COUNTRIES</b>						
<b>Quantity in Metric Tons</b>						
<b>Value I US\$</b>						
<b>Country/Year</b>	<b>2016-17</b>		<b>2017-18</b>		<b>2018-19</b>	
	<b>Q</b>	<b>V</b>	<b>Q</b>	<b>V</b>	<b>Q</b>	<b>V</b>
China	35,123	64.32	37,235	65.34	36,123	64.42
Taiwan	28,936	30.12	32,261	32.12	31,758	31.89
UAE	14,632	42.23	15,223	43.23	14,653	42.63
Korea	10,324	24.36	11,632	25.42	10,423	24.85
Malaysia	9,321	13.25	9,631	14.63	8,765	13.87
Saudi Arabia	7,652	26.96	8,123	27.65	7,652	26.54
Sri Lanka	5,763	24.32	6,321	24.99	5,638	23.76
Vietnam	5,412	23.15	5,965	24.11	5,321	23.89
Kuwait	4,521	12.34	4,832	13.23	4,326	12.87
EU Countries	1,355	4.96	1,856	6.53	1,765	6.01

## 1.7. Status of Fish Health in Pakistan

In the wild, the pathogens normally do not harm their host or causes fish mortality. Under the intensive aquaculture conditions fish often get stressed and some pathogens do affect the fish severely and cause serious effects which results in the death of the host. Infections can have a variety of detrimental effects ranging from poor or slow growth, low reproductive potential, low flesh quality, and even high level of mortality. The transmission of pathogens with imported consignments of ornamental fish into Pakistan has been observed since long. Status of disease occurrence has been reported by various researchers. An updated summary is given below:

### 1.7.1. Parasitic diseases

In the major cyprinids culture in Pakistan, the *Dactylogyrus* Spp. infections on the gills was very common, causing serious or complete damage to the secondary lamellae. The infection of various *Lernaea* spp. on the skin, fins and gills of carps were pathologically very serious and even resulted in fish mortality and economic losses to fish farmers. Argulosis or skin infection by the crustacean *Argulus foliaceus* was commonly encountered. *Posthodiplostomum cuticula*, the causative agent of black spot disease also found in fry of *L. rohita* in Pakistan. *Tchthyophthirius multifilliis* is another serious protozoan disease of freshwater fish in Pakistan. List of main fish diseases is given below.

- Gill infection
- Lernaeasis
- Argulosis or skin infection
- Black Spot disease
- Gyrodactylosis
- Ichthyophthiriosis or White spot disease

### 1.7.2. Fungal diseases

The common water mold/fungal infection found in cultured carps was *Saprolegnia* Spp. was also found infecting various freshwater fish causing fungal infection, which include eroded fins, skin lesions and infections of the eyes and the head. Infection of *Lernaea* and *Saprolegnia* were also common in these fish species. *Aspergillus* spp. was also isolated in some species. *Blastomyces* spp. and *Fusarium* spp. were found in goldfish in Punjab.

### 1.7.3. Bacterial diseases

Four bacterial genera, i.e., *Pseudomonas* spp. *Aeromonas* spp., *Bacillus* spp. and *Streptococcus* spp. were found in carps' species in Pakistan. The list of diseases is given below:

- Dropsy
- Fin Rot
- Furunculosis

### 1.7.4. Viral diseases

The following viral diseases have been found in Pakistan.

- Epizootic haematopoietic necrosis\* (EHN)
- Infectious haematopoietic necrosis\* (IHN)
- Oncorhynchus masou virus disease\* (OMVD)
- Infectious pancreatic necrosis (IPN)
- Viral encephalopathy and retinopathy (VER)

## 1.8. Aquaculture and Aquatic Animal Health Policy

Pakistan has no approved policy for aquatic animal health.

## 2. Process of Developing a National Strategy on Aquatic Animal Health for Pakistan.....

Fisheries Development Board through inhouse consultation has prepared the zero-draft document for “National Strategy on Aquatic Animal Health for Pakistan”. The consultative process for review and consensus building on the draft document has been initiated. First consultative meeting is scheduled to be held on 14<sup>th</sup> June 2022. The aim of the first meeting is to share the document with stakeholder and brief them on the various components and implementation mechanism proposed under this document.

After receipt of comments from stakeholders, the draft document will be revised, and a second consultative workshop will be organized in September-October 2022 for final comments. After revision, the strategy document will be finalized and submitted to Ministry of National Food Security and Research for approval through cabinet.

## 3. Statement of Purpose.....

The NSAAH Pakistan is aimed to minimize the risk of aquatic animal diseases impacting on the sustainable development of aquaculture, with focus on aquatic biodiversity, food security, food safety and the national economy.

## 4. Vision.....

To establish a national fish health strategy that will support sustainable aquaculture development, protect aquatic biodiversity, and provide high-quality products for local supply and export purposes.

## 5. Guiding Principles.....

The NSAAH will be developed in conformity with the following guiding principles:

- a) Aquatic health management will enable aquaculture to make a positive contribution to the national economy through being internationally competitive in the marketplace and economically viable at the national level.
- b) Fish health management measures should facilitate aquaculture to develop in harmony with nature, managing and minimizing transient environmental impacts and avoiding significant, cumulative, long-term, or irreversible changes to ecological systems, to cultural remains or to valued landscape and scenery.

- c) Fish health measures should foster strong aqua-culturists' links, recognizing and supporting the needs of private sector aqua-culturists and collaborating with community initiatives to manage local environments for mutual benefit.
- d) National fish health programs should contribute to social, economic, and environmental sustainability and embrace the precepts of transparency, integration, coordinated government and fit-for-purpose regulation, partnership and stakeholder participation, accountability, ethics and regard for animal welfare, and a culture of best practice and continuous improvement.
- e) Fish health is important for economic, social, development and public resource purposes. Collaboration among all stakeholders including governments, public institutions, the private sector and existing aquaculture and fishing industries is important to achieve effective health management.
- f) The role of fish health management is to reduce the risks arising from the culture, reproduction and movement of fish and the potential entry, establishment or spread of associated pathogens and the diseases they cause. This is necessary to protect living aquatic resources, the natural aquatic environment and the aquatic biodiversity in Pakistan and neighbouring countries, territories or regions.
- g) Pakistan may introduce or maintain sanitary measures resulting in a higher level of protection than would be achieved by measures based on the relevant international standards, guidelines or recommendations (e.g., the Aquatic Animal Health Code (2016)); however, such measures must be justifiable based on science (i.e. risk analysis) and be consistent with the country's appropriate level of protection (ALOP). Control measures applied to movements of fish within the country must also be consistent with this ALOP.
- h) The NSAAH of Pakistan and related procedures will adhere to international and regional standards and be harmonised on as wide a basis as possible.
- i) Pakistan's aquaculture sector is encouraged to implement preventative measures such as the use of good aquaculture practices (GAPs), health certification, specific pathogen free (SPF) and high health (HH) stocks, biosecurity and vaccination protocols.
- j) Health management measures will be effective, practical, cost-effective and utilize readily available resources. These resources will allow the development of appropriate national and regional policies and regulatory frameworks as required to reduce the fish health risks incorporated in the culture, reproduction and movement of fish.
- k) Access to relevant national fish health capacity (infrastructure and specialised expertise) is crucial for health management of fish. Collaboration with international organisations and with other countries will be sought wherever possible to further increase Pakistan capacity in fish health issues.

## 6. The Program Overview

### 6.1. Program 1: Policy, Legislation and enforcement

Policy refers to a national long-term (typically >20 years) government program outlining what is to be achieved in broad terms. It includes the government's major goals and objectives for the sector and recommendations for its sustainable development. In contrast, a strategy is typically a mid-term (5-15 year) plan and outlines how the national policy is to be achieved. It contains specific objectives and outputs, a timeframe, indicators of performance, and provision for monitoring and review. Legislation is, of course, the sum of laws, regulations and other legally binding documents issued by the government to enforce its policies. The inclusion of a NSAAH may be new to some authorities, and policymakers may not realize the urgency of formulating effective regional and national aquatic biosecurity strategies and acting on the respective program activities needed to implement them. To have an effective national policy for fish health and biosecurity, identification of the Competent Authority (CA) on aquaculture and fish health is essential. The advantages of harmonizing fish health policy among countries belonging to the same region or subregion are many and include facilitated trade in live fish and their products and increased aquatic biosecurity for all countries. To address aquatic biosecurity adequately and to support improved national fish health policy, the national legislation should be reviewed and where necessary, updated and/or revised. In some cases, new legislation may be drafted to support fish health and aquatic biosecurity.

#### 6.1.1. Objectives

In accordance with international criteria (e.g., requirements of trading partners), the objectives of Program are:

- a) to ensure that Pakistan's aquatic animal health legislation is up-to-date and fully harmonized with relevant international standards.
- b) to ensure the registration and licensing of all aquaculture facilities.
- c) to better define the measures to be taken upon detection and confirmation of a disease outbreak.
- d) to develop plans for aquaculture zoning and compartmentalization.
- e) to improve control of domestic and international (import and export) movements of live fish, including the control of introductions of exotic species.
- f) to establish fish welfare regulations.
- g) to improve the responsible use and regulation of veterinary medicines, and
- h) to establish laws and regulations regarding the use of feeds for aquaculture animals.

### 6.1.2. Current status

Pakistan do not have specific policy and legislation to address issues related to aquatic animal health in aquaculture and import/export of fish. Some reference of diseases exists in recently proposed changes in Animal Quarantine Department Rules, which is still under review. THEREFORE, there is lack of adequate and harmonized legislation on aquatic animal health for entire of Pakistan.

In Pakistan, the jurisdiction of law for the control of fish culture system is under the provincial authorities. Meanwhile, the federal authority is responsible for the control of marine aquaculture for entire of Pakistan.

In Pakistan, regulations to control fish health are limited only to the export/import of live fish and their products and that too without any fish quarantine station support. There is a need draft regulation on aquatic animal health management to cover inland (including natural or manmade waterbodies) and marine aquaculture.

### 6.1.3. Projects (Plan Objectives)

#### **Project 1: Review and Harmonization of Legal Framework for Aquatic Animal Health.**

This activity will ensure fully harmonized and updated legislation for the sustainable development of Pakistan's aquaculture sector and fish health including registration, licensing, measures taken upon detection and confirmation of disease, zoning and compartmentalization, domestic movements, import, export, fish welfare, veterinary medicines and inspections.

#### **Project 2: Formalization of a Group of Legal and Technical Experts to Advise on Implementation of Legislation.**

This activity will establish a group of legal and technical experts of relevant institutions and authorities to advise on implementation of legal and policy activities relevant to fish health.

#### **Project 3: Drafting of Legislation (Acts) Governing Fish Feeds and Development of Associated Regulations.**

This activity will draft the legal framework for the regulation of fish feeds to ensure that it is in line with international standards for food safety, fish health and public health and, if necessary, make recommendations for revision of current related legislation or the formulation of new regulations.

#### **Project 4: Drafting of Legislation for Use of Chemicals in Aquaculture and Veterinary Drugs for Fish.**

This activity will review and draft the legal framework for the regulation of drugs used in aquaculture to ensure that existing legislation is in line with international standards for food safety, fish health and public health. If necessary, changes to existing legislation will be recommended and/or new legislation formulated.

#### **Project 5: Strengthening of Inspection and Enforcement Capacities.**

This activity will strengthen the inspection and enforcement capacities of the CA through the targeted training of inspectors (e.g., fish health officers) to improve their ability to implement the relevant laws and regulations on import/export of fish and their products, the operation of aquaculture establishments and fish health management.

## **6.2. Program 2: Risk Analysis**

Risk analysis is a structured process that provides a flexible framework within which the risks of adverse consequences resulting from a course of action can be evaluated in a systematic, science-based manner. Import risk analysis (IRA) is an internationally accepted method for deciding whether trade in a particular commodity (a live fish or its product) poses a significant risk to human, animal or plant health and, if so, what measures, if any, can be applied to reduce that risk to an acceptable level. All countries having international trade in live fish should have a minimum level of capacity to assess possible risks due to pests (invasive aquatic alien species) and pathogens.

### **6.2.1. Objectives**

- a) to strengthen the capability of the Sub-Committee for Incoming Alien Species Application (CIASA).
- b) to develop a national appropriate level of protection (ALOP).
- c) to minimize the risk of incoming fish which may pose a disease, biodiversity or genetic threat to national aquatic resources.
- d) to identify and priorities commodities of concern.
- e) to conduct risk analyses for proposed new species introductions to Pakistan; and
- f) to implement risk analysis and risk management for live fish importation.

### **6.2.2. Current status**

There is no competent authority in Pakistan to conduct risk analysis for introductions of alien aquatic species and live fish. A Sub-Committee shall be established by the Main Committee proposed for implement the NSAAH Pakistan and the Sub-Committee with the assistance

of FDB will be mandated to conduct Import Risk Analysis. This Sub-Committee shall consist of staff from the FDB, Provincial Fisheries Departments and other stakeholders. Capacity of Human Resources for implementation of NSAAH will be developed.

### 6.2.3. Projects (Plan Objectives)

#### **Project 6: Formation of the Committee for Incoming Alien Species Application (CIASA)**

A Committee for Incoming Alien Species Application (CIASA) shall be established through notification to provide efficient mechanisms to process, evaluate and recommend actions on proposals to introduce new aquatic alien species in Pakistan. The capability and procedures needed to conduct expert risk analyses for pathogen, ecological and genetic risks for fish introductions will be considered such that the methodologies used will comply with best international standards and practices (e.g., the OIE import risk analysis (IRA) process, in the case of pathogen risks and the International Council for the Exploration of the Sea Code of Practice for the Introductions and Transfers of Marine Organisms 2005.

#### **Project 7: Determining the Appropriate Level of Protection (ALOP) for Pakistan**

As Pakistan does not have a clearly stated ALOP, it is currently difficult to establish a clear ALOR (acceptable level of risk) for use in conducting risk analyses. This activity will bring together key government experts and managers from the plant, terrestrial animal and fish sectors to agree upon a single standard for ALOP/ALOR across all three sectors. The recommended ALOP will then be put forward in a policy statement for endorsement at the highest political level.

#### **Project 8: Review and Analysis of Trade in Fish Commodities**

Knowledge of historical and existing trading patterns in fish commodities is essential to conducting risk analyses. Therefore, through this project, available data on aquatic species movements both internationally (imports and exports) and domestically will be consolidated in the form of a computerized database (see Program 9). Data on species, volume, origin, destination and use/ purpose are examples of information that this database will contain. The database will contribute directly to the process of hazard identification for the purpose of IRA. This activity will form the basis for an on-line database for use by risk analysts, government veterinary officers and border inspection personnel and could be linked to similar activities for terrestrial animals and plants.

## Project 9: Conducting Risk Analyses for Key Commodities

This activity will be contingent upon successful completion of Projects 6 and 7, as these will improve the functional administrative and working structure for risk analysis and will identify and prioritize commodities of concern. Under this activity, risk analyses will be conducted for several key commodities identified by the main Committee for NSAAH.

### 6.3. Program 3: Pathogen List

National Pathogen Lists (NPLs) are essential for health certification, disease surveillance and monitoring, emergency response planning, prevention and control of diseases in aquaculture facilities, etc. Clearly established criteria for listing/delisting of diseases (based on internationally accepted methods) should be established. OIE-listed diseases that are relevant to national conditions form a good starting point; however, the OIE-listed diseases are those of internationally traded commodities, while NPLs must also consider other serious diseases of national concern. NPLs need to be founded on a thorough knowledge of a country's disease status, which can only be obtained through passive and active disease surveillance programs, generalized disease/pathogen surveys, adequate disease record keeping and reporting, and a national disease database.

#### 6.3.1. Objectives

- a) to identify and build consensus on a list of priority fish diseases for Pakistan.
- b) to harmonize approaches for fish health management within Pakistan.

#### 6.3.2. Current status

The development of a NPL is an essential element in Pakistan's NSAAH. Pakistan has been listing fish diseases based on the presence of susceptible host species in national territory and the potential disease impacts. However, in general, such a list should consist of diseases exotic to Pakistan and, in particular, the diseases listed by the World Organization for Animal Health (OIE) and the Network of Aquaculture Centers in Asia-Pacific/Food and Agriculture Organization of the United Nations (NACA/FAO) Quarterly Aquatic Animal Disease Reports. The concerns of importing countries should be considered.

At the moment, there is no list available of fish diseases in Pakistan. A draft list has been prepared as given in this document, but it is not exhaustive and further input is required from all stakeholders to finalize this list. Such disease list once finalized shall be shared with OIE/NACA and with national stakeholders.

### 6.3.3. Projects (Plan Objectives)

#### **Project 10: Survey and finalization of the National Fish Pathogen List**

This activity will be guided by the OIE’s “Criteria for Listing Fish Diseases” and “Diseases Listed by the OIE”. However, the National Fish Pathogen List should be specifically tailored to address Pakistan’s national situation, with strong consideration of the biological particularities (susceptible species inhabiting national waters and used for aquaculture production) and a clear export orientation for Pakistan’s aquaculture sector. The draft National Fish Pathogen List should be subjected to stakeholder review and implemented by legislation or other legal mechanisms.

### 6.4. Program 4: Border Inspection and Quarantine

Border inspection includes all those activities regulating the importation and exportation of live fish and their products that are conducted by the national Competent Authorities (CAs) and national customs officers at international airports, land border posts and seaports of international entry. Quarantine (which is missing in Pakistan) is the holding of fish under conditions that prevent their escape, and the escape of any pathogens or “fellow travelers” they may be carrying, into the surrounding environment. Quarantine may be conducted pre-border (in the exporting country), border (at the border post of the importing country) or post-border (at a quarantine facility operated directly by the CA or by the private sector, under the standards and supervision of the CA). Quarantine is one of several risk mitigation measures that may be applied to shipments of live fish to reduce the risk of introducing serious pathogens and pests.

#### 6.4.1. Objectives

- a) to establish and ensure that pre-border, border and post-border controls are adequate to minimize the risk of pathogens of incoming or outgoing fish.
- b) to ensure that inspection and quarantine protocols and procedures comply with national and international standards; and
- c) to prepare and update the List of Aquatic Species Prohibited in Pakistan.

#### 6.4.2. Current status

As the CA for export, the MFD issues health certificates for every live fish consignment to be exported from Pakistan. The format for health certificates is given in the Pakistan Fish Inspection and Quality Control Rule 1998. The declarations given in the health certificates made and signed on behalf of the Director-General of Marine Fisheries Department based

on the importing countries' requirements for importation of live fish. Inspection prior to export shall be done before issuance of a health certificate.

For import of live aquatic animals, AQD is the CA for Pakistan. The AQD has not yet issued a formal notification of health certificate for the import requirements of live aquatic animals, particularly for live fish and ornamental fish. However, AQD is responsible for the control of border and post-border inspections. AQD conducts inspection of documentation and for clinical signs of disease for consignments of live fish. The post-import inspections at the importing premises to ensure the validity of the importing documents and for consignments of live fish to be quarantined for between 7 to 21 days according to national requirements is still missing in Pakistan. However, a Quarantine premises has been established by the Fisheries Department Government of Pakistan at Rawal Town Hatchery in Islamabad but yet it is not functional.

### 6.4.3. Projects (Plan Objectives)

#### **Project 11: Review and Assessment of Border Procedures for Import and Export of Live Fish and their Products**

The current border procedures for the import and export of live fish and their products will be reviewed and, if needed, recommendations made for their improvement (e.g., via standard operating procedures, SOPs). Available SOPs under existing frameworks developed by other intergovernmental organizations (e.g., ASEAN, Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area (BIMP-EAGA) and EU/USA) should be considered and included in the review.

#### **Project 12: Develop Protocols for Quarantine of Fish**

The quarantine facilities and practices to put in use will be established. The use of quarantine will be incorporated into risk management measures that may be recommended based on risk analysis, and protocols (SOPs) will be developed for approved quarantine facilities, so that quarantine will be applied only in those cases where it is likely to be effective in reducing risks. This will also place the policies and procedures of Pakistan in agreement with current international standards and agreements.

#### **Project 13: Prepare a List of Aquatic Species Prohibited in Pakistan**

National experts, in consultation with national CAs, will review regional and international experiences with exotic aquatic species to identify those species that, due to their invasiveness or other negative characteristics, have caused serious harmful economic, environmental and/ or human health impacts to importing countries, both within the South Asian Region and elsewhere in the world. Based on this review, FDB will draw up a revised

list of fish species that, if absent, should not be imported into the country or, if already introduced, should be prevented from further spread and, if possible, eradicated. FDB will also establish the criteria for listing of an aquatic species as “prohibited” and a mechanism for regular review and updating of the species listing.

## 6.5. Program 5: Diagnostics

Adequate disease diagnostic capability is an essential component of any national or regional aquatic biosecurity program. Disease diagnostics plays two significant roles in health management and disease control. The first role of diagnostics is to ensure that stocks of fish that are intended to be moved from one area or country to another are not carrying infection by specific pathogens at subclinical levels and is accomplished through screening of apparently healthy animals. The second equally important role of diagnostics is to determine the cause of unfavorable health or other abnormalities in order to recommend measures appropriate to a particular situation. The accurate and rapid diagnosis of an outbreak of disease in a cultured or wild population is essential to preventing further losses through correct treatment, and to disease containment and, where possible, eradication. Diagnostics is also a key supporting element of quarantine and health certification, surveillance and monitoring, zoning (including demonstration of national freedom from a disease), etc. Diagnostics includes both simple pond-side methods and more advanced laboratory-based techniques requiring a high level of expertise and infrastructure.

### 6.5.1. Objectives

- a) to ensure that laboratory tests for fish diseases are accredited with MS ISO/IEC 17025:2005.
- b) to harmonize the diagnostic methods used by all fish disease laboratories in accordance with OIE standards.
- c) to develop personnel with expertise on fish disease diagnostics.
- d) to strengthen networking with regional OIE reference and other laboratories; and
- e) to strengthen the national reference laboratory for fish diseases.

### 6.5.2. Current status

Laboratory system in Pakistan is fragmented, various departments have their own laboratories. Accreditation system is weak and need regular support due to low traffic of testing requirement. Laboratory with Punjab Fisheries Department, Lahore is well equipped and can be strengthened to cater the need of fisheries sector in Punjab and KP. For Sindh, and Balochistan, the laboratory of MFD can be strengthened to support the testing service. However, many laboratories like labs of PCSIR, UVAS, animal department in four provinces

and labs of PARC are available which can be considered in include in the implementation of NSAAH program.

### 6.5.3. Projects (Plan Objectives)

#### **Project 14: Strengthen the Capacity of the National Diagnostic Laboratories**

Based on an assessment of national diagnostic needs and the current capacity of the national disease diagnostic laboratories, Pakistan will develop any essential specialist expertise or infrastructure that is lacking.

#### **Project 15: harmonize the Methods for Disease Diagnostics**

Under this activity, an expert team will develop harmonized methods for diagnosing diseases of national importance. This effort will primarily target diagnostic methods for those diseases listed in the National Pathogen List to be developed under Program 3: Pathogen List and will draw upon the OIE Aquatic Animal Health Code and the Manual for the Diagnosis of Aquatic Diseases, as well as other regional and national diagnostic manuals (e.g., Asia Diagnostic Guide to Aquatic Animal Diseases). Based on these regional standards, the minimum national capacity required by Pakistan for diagnosis of fish diseases can be established.

## 6.6. Program 6: Farm-level Biosecurity and Health management

Farm-level biosecurity and health management includes such aspects as farm, hatchery, feed mill registration program, development of standard operating procedures (SOPs) and better management practices (BMPs), certification programs that include brood stock and post larvae, in-situ diagnostic techniques, disease reporting, farm-level contingency planning for disease outbreaks, staff training, awareness and promotion of biosecurity to farmers and farmer associations, etc.

### 6.6.1. Objectives

- a) to develop requirements of farm-level biosecurity and health management based on risks to the cultured species.
- b) to develop the knowledge and skills of the CAs, relevant agencies and farm personnel regarding GAPs and good biosecurity management; and
- c) to increase and sustain the number of certified aquaculture farms

## 6.6.2. Current status

At the moment, there is no system exists for fish health management at farm level. No system of farm registration, surveillance, monitoring or sampling for aquatic diseases. A plan is underway to develop National Residue Monitoring and Control Plan, which will pave a way for farm registration and sampling for fish health and residue but for the purpose of export development. There is a need to develop a system to register farms, hatcheries, and feed mills along with registration of exporters/importers who shall be involved in the export of farm raised products, namely through:

- certification to comply with biosecurity requirements.
- control measures of fish disease notification or for mass mortality.
- inspection prior to export for live fish at registered exporter premises or exit points before issuance of health certificate; and
- post-import inspection of live fish at importer premises.

The purpose of registration is to establish farm profiles and to monitor their activities. The requirements for registration are minimal, e.g., the name of the company and owner, the address, contact details, culture system, species cultured, existing biosecurity facilities and relevant documentation. However, certification requirements shall be more stringent than those for registration. Application for certification could be made after the farm is registered.

## 6.6.3. Projects (Plan Objectives)

### **Project 16: Organize and strengthen small-scale farmers into producer organizations**

Under this project, Provincial Fisheries Department will identify the small scale-farmers and organize and strengthen them into producer organizations. FDB will coordinate with provinces and producers' organization to assemble them into a national farmer body and get them register with Director General Trade Organization (DGTO) under Ministry of Commerce as a trade body. As a trade body, the farmers will have a voice to provide budget proposals and other important decision-making process. This project will enhance the capacities and skills of small-scale aquaculturists to make them competitive with other producer categories.

### **Project 17: Assistance to small-scale producers to comply with market requirements such as aquaculture certification standards**

Under this project, FDB will establish and coordinate an awareness program targeting small-scale producers, so that they will be better able to comply with market requirements such as aquaculture certification standards. This project will also establish a minimum standard for small-scale farmers to comply with domestic and regional standards.

### **Project 18: Evaluate the possibility of an aquaculture insurance scheme**

Under this project, FDB will collect and identify the information and requirements needed to evaluate the possibility of establishing an aquaculture insurance scheme. Initially this project will be directed towards medium and large-scale aquaculture enterprises.

### **Project 19: Capability and Capacity Building on Farm Biosecurity and Disease Surveillance**

Under this project, the FDB will strengthen farmers' knowledge and skills on farm biosecurity and disease surveillance. The number of farms that comply with biosecurity requirements and that are involved in disease surveillance is currently very minimal.

## **6.7. Program 7: Chemicals, Veterinary Drugs, Effective Microbes and Antimicrobial Resistance (AMR) in Aquaculture**

Access to safe and effective veterinary drugs is essential to the success of semi-intensive and intensive aquaculture, as in some instances entire stocks may be lost if such drugs are not available. However, veterinary drugs, if inappropriately used, may be ineffective or may lead to unacceptable residue levels in aquaculture products. The presence of residues in exported aquaculture products that are above the importing country's acceptable levels may lead to bans on importation, with severe impacts on a country's aquaculture industry. It is thus essential that countries establish mechanisms (e.g., laws, regulations, guidelines, SOPs) to ensure the safe use of veterinary drugs, along with testing and monitoring programs to assure trading partners that national aquaculture products are safe and meet importing country standards. Antimicrobial resistance (AMR) is the development of bacterial strains that are resistant to antibiotics that have been inappropriately used in aquaculture and other farming systems. AMR is a growing problem, as the use (and misuse) of some antibiotics critical to human medicine by aquaculture and terrestrial farming systems has led to the development of "superbugs", reducing the effectiveness of some essential antibiotics in treating infections in humans.

### **6.7.1. Objectives**

- a) to develop a system for approval of chemicals, veterinary drugs, effective microbes and antimicrobials for use in aquaculture; and
- b) to develop and enforce the regulations on feed quality regarding the use of chemicals, veterinary drugs, effective microbes and antimicrobials in aquaculture.

## 6.7.2. Current status

In Pakistan research on the use of veterinary drugs and AMR is mostly in the livestock and poultry industries, under the provincial Department of livestock and the private sector. At federal level recently a project has been initiated to test AMR in fisheries sector. The FDB is developing an Aquaculture Residue Monitoring Program at the farm level to monitor the usage of prohibited veterinary drugs such as chloramphenicol and nitrofurans among others. To control the use of chemicals, veterinary drugs, effective microbes and other antimicrobials in aquaculture, Pakistan needs to develop a Feed Act, review and revise Pure Food Ordinance 1960, and the Poisons Act, 1919. There is a need to regulate feed quality by controlling the importation, manufacture, sale and use of feed and feed additives; to ensure that feed satisfies the nutritional requirements of animals, is not harmful to animals and is not contaminated, so that animals and animal products are safe for human consumption and other usage; and for other matters incidental thereto. This Food Act should enforce the regulations regarding prohibited usage of antibiotics. The Poison Act should regulate the importation, possession, manufacture, compounding, storage, transport, sale and use of poisons.

### 6.7.3. Projects (Plan Objectives)

#### **Project 20: Review of Current use of Chemicals, Veterinary Drugs, Effective Microbes and Antimicrobial Residues in Aquaculture**

Under this activity, the FDB or PFDs will conduct a survey of the use of chemicals, veterinary drugs, effective microbes and AMR in Pakistani aquaculture. The results will help determine the extent of use and misuse of aquaculture drugs and will assist in determining if tighter regulation is needed.

## 6.8. Program 8: Surveillance, Monitoring and Reporting

Disease surveillance is a fundamental component of any official fish health protection program. Surveillance and monitoring programs are essential for the detection and rapid emergency response to significant disease outbreaks and form the basis for early warning of exotic incursions or newly emerging diseases. They are also increasingly demanded by trading partners to support statements of national disease status and are the basis for disease zonation. Surveillance also provides the building blocks of information necessary to have an accurate picture of the distribution and occurrence of diseases relevant to disease control and international movement of fish and their products. Surveillance can be passive (reactive and general in nature) or active (proactive and targeted). In both cases, there must be adequate reporting mechanisms so that suspected cases of serious disease are quickly brought to the attention of the Competent Authority (CA). Surveillance and monitoring efforts must be supported by adequate diagnostic capability (including appropriately trained expertise, suitably equipped laboratory and rapid-response field diagnostics, and standardized field and laboratory methods), information system management (i.e. a system to record, collate and analyses data and to report findings), legal support structures, transport and communication networks and linked to national and international (OIE) disease reporting systems (e.g. pathogen list or list of diseases of concern, disease notification and reporting procedures). Surveillance to demonstrate freedom from a specific disease requires a well-designed active surveillance program that meets the standards outlined in the OIE Aquatic Animal Health Code, 2016.

### 6.8.1. Objectives

- a) to enhance and strengthen fish disease management with regard to disease surveillance and movement control within Pakistan.
- b) to strengthen reporting mechanisms on disease status and outbreak.
- c) to develop baseline data on diseases in wild and cultured fish; and to strengthen and harmonize the outbreak and Fishkill investigation procedures.

## 6.8.2. Current status

The PFDs will develop Disease Surveillance Programs that would covers both ornamental and food fish. There is a need to start a proper disease surveillance program. The surveillance program will follow OIE requirements, and surveillance will be conducted two times a year (every six months). Many species will be included in this surveillance program: food fish, and shrimp (e.g., carps, pangasius, seabass, tilapia, and white-leg shrimp).

All registered farms/premises will be obliged to notify the PFDs in the case of the occurrence or suspicion of a listed fish disease or the occurrence of mass mortality. The PFDs will have a Fish Disease Notification Form that will be distributed to registered farms/premises. The PFDs will report it to FDB and the FDB will report it to NACA on a quarterly basis and to OIE through AHC office every six months.

## 6.8.3. Projects (Plan Objectives)

### **Project 21: Program on Fish Disease Surveillance**

Based on the National Pathogen List (NPL), the FDB in partnership with PFDs will establish an active disease surveillance program for the nationally listed diseases. The project's long-term goals will include demonstrating the absence of infection for international trade in live animals and their products and providing an early warning system for detection and identification of disease outbreaks. Data storage and analysis will need to be incorporated into a national fish disease data management system, including monitoring, recording and analyzing morbidity and mortality data.

### **Project 22: Study on Diseases of Fish Species Newly Introduced for Aquaculture**

Information on the health status of wild aquatic and newly introduced species is essential to support claims of freedom from specific disease agents, in conducting risk analyses and in controlling disease spread. While Project 21 conducts active surveillance of fish populations for OIE-listed diseases, this activity will initiate baseline studies on the parasites and non-OIE listed diseases of cultured fish of Pakistan. This study will focus on species recently introduced or developed for aquaculture or of potential future aquaculture significance.

### **Project 23: Establishment of a Fish Internal Movement Control Scheme**

This activity will review and strengthen mechanisms for controlling the intra-regional domestic movements of live fish (i.e., movements within the territories of Pakistan). Such data are essential to effective disease control program and emergency response, and this activity will examine possible options for tracking movements and data storage and retrieval. FDB in partnership with provincial fisheries department will maintain this data for record purposes.

### **Project 24: Establishment of a Categorization Scheme for Aquaculture Establishments**

A categorization scheme will be initiated for aquaculture establishments based on their current health status, exposure to health risks and health status history aimed at improving the overall quality of the fish health surveillance system in Pakistan. In addition to passive and active surveillance, targeted surveillance will be applied for high-risk diseases, high-risk practices and high-risk regions. Historical records will be used to reinforce the hypothesis of freedom from disease based on targeted surveillance for possible environmental and/or pathogen changes. This system may form the basis for future disease-zoning activities.

### **Project 25: Training in Outbreak and Fishkill Investigation**

The capability of the CA to investigate efficiently any unusual health event is of essential importance for any health surveillance system. An outbreak and Fishkill investigation should be carried out by performing systematic and logical steps toward identification of the cause(s) and source(s) of the mortalities in question, to put the spread of any existing epizootic under appropriate control, and to prevent exposure to new infections in the future. Under this project, appropriate short- term training in Fishkill investigation, fish disease epidemiology and emergency response will be arranged for government officials, veterinary inspectors, staff of national research laboratories and other relevant parties.

## **6.9. Program 9: Communication and Information System**

Communication includes activities that increase the flow of information between and among national policymakers, researchers, CAs, regional bodies and international agencies and experts. Communication activities assist with problem solving and keep national experts, who may be working in relative isolation, up to date about the regional and global fish health situation. It is important to have an effective national fish biosecurity program to establish and promote good communication and linkages among national stakeholders. Communication may include development of national and regional fish health information systems and networks.

### **6.9.1. Objectives**

- a) to enhance a reliable database system on fish health in Pakistan; and
- b) to ensure that the system is accessible and user friendly to all relevant stakeholders.

## 6.9.2. Current status

FDB has established a website which can be assessed at [www.fdb.org.pk](http://www.fdb.org.pk). The website will be linked with other websites of PFDs, MFD and AQD and it will share information regarding fish health and biosecurity status in Pakistan.

The above organizations will develop a specific system regarding fish health information, which may be called as “E-biosecurity”. This system will be used by fisheries staff and relevant stakeholders, as well as other government agencies and the private sector. The main information to be presented relates to Official Control, Official Analysis and Official Guarantee. For Official Control, the main information given will be detailed profiles and activities of stakeholders, fish disease notifications, reporting and mapping. Official Analysis will consist of information on the disease surveillance program and laboratory analyses. Official Guarantee will be the information regarding certification and export/import for live fish. This system will be ready for use at FDB, PFDs, MFD and AQD headquarters during the coming years.

## 6.9.3. Projects (Plan Objectives)

### **Project 26: Establishment, Upgrading and Maintenance of a National Database on Fish Health**

A national database will be established to contain the results of surveillance activities, laboratory testing, health management measures and other relevant information. The database will assure consistently collected and reliable data on fish health in Pakistan. Worldwide it has been established that a centralized electronic database is the best way to manage information on national fish health status appropriately. Information for entry into the database will be obtained from the activities outlined under Program 8: Surveillance, Monitoring and Reporting and other data sources. Transparency and accessibility of the data will be provided through supervised and multileveled Internet access. The main responsibility for establishment, upgrading and maintenance of the database will rest with the FDB; however, active and constant participation of other stakeholders (e.g., the academic community and private sector aquaculturists) will be encouraged.

The stakeholders in consultative meeting proposed to adopt recent methods of GIS system for mapping and reporting of fish diseases in the database.

A function of disease alert system shall be included in the database to timely communicate the occurrence and reporting of any new disease in the database to the relevant authorities in public sector to initiate response action for the same disease to contain and control it.

## 6.10. Program 10: Zoning and Compartmentalization

Zoning and compartmentalization are mechanisms that allow a particular geographical unit (e.g., subregion, drainage basin, coastal area, cluster of aquaculture establishments or even a single establishment) to establish and maintain officially recognized freedom from a specified disease or diseases, even though surrounding units may be infected. A zone is a portion of one or more countries comprising an entire water catchment from the source of a waterway to the estuary or lake, or more than one water catchment, or part of a water catchment from the source of a waterway to a barrier that prevents the introduction of a specific disease or diseases, or part of a coastal area with a precise geographical delimitation, or an estuary with a precise geographical delimitation, that consists of a contiguous hydrological system with a distinct health status with respect to a specific disease or diseases. A compartment is one or more aquaculture establishments under a common biosecurity management system containing a fish population with a distinct health status with respect to a specific disease or diseases for which required surveillance and control measures are applied and basic biosecurity conditions are met for the purpose of international trade (see the OIE Aquatic Animal Health Code, 2016). In addition to contributing to the safety of international trade, zoning and compartmentalization may assist disease control or eradication.

### 6.10.1. Objectives

- a) to develop zoning and compartmentalization of disease-free or diseased areas.

### 6.10.2. Current status

Currently no surveillance program exists in Pakistan for fish and shrimp diseases. The PFDs will initiate a program to be conducted at the farm level for earthen ponds, tanks and cages. So far, no official zones or compartments have been established, due to a lack of disease information and related legislation and due to insufficient knowledge for their establishment.

### 6.10.3. Projects (Plan Objectives)

#### **Project 27: Assessment of the Feasibility of Disease Zoning and Compartmentalization**

Based on information gathered through the disease surveillance and monitoring program the feasibility of zoning and compartmentalization will be assessed and the requirements developed.

## 6.11. Program 11: Emergency Preparedness and Contingency Planning

Emergency preparedness is the ability to respond effectively and in a timely fashion to disease emergencies (e.g., disease outbreaks, mass mortalities). The capability to deal with emergency disease situations requires a great deal of planning and coordination (including establishing operational, financial and legislative mechanisms) and making available required resources (i.e., skilled personnel and essential equipment). If there is importation of live fish, the possibility of serious disease outbreaks due to exotic pathogens will exist. Even under the best of circumstances, pathogens will occasionally escape detection, breach national barriers, become established, spread, and cause major losses. The extent to which losses occur often depends on the quickness of detection (which depends on the effectiveness of disease surveillance, diagnostics, and reporting program) and the rapidity and effectiveness with which governments recognize and react to the first reports of serious disease. As quick and effective reaction (containment and/or eradication) is largely dependent upon contingency planning, all countries need to develop such plans for key cultured species and diseases.

### 6.11.1. Objectives

- a) to enhance the procedures for emergency preparedness and contingency planning to control outbreaks of relevant fish diseases in Pakistan; and
- b) to implement simulation exercises at aquaculture farms.

### 6.11.2. Current status

The FDB in partnership with PFDs will develop a procedure for contingency planning. Their SOP will be a guideline on how to manage the emergency situation to contain and eradicate any disease outbreak in an aquaculture farm or premise. Trainings will be conducted on table-top exercise for contingency plan to obtain the information needed to document and implement methods for a contingency plan simulation exercise. On the findings from the Table-Top Exercise Training Course, FDB will implement a Training Courses on Field Simulation on Fish Diseases Contingency Plan with the objective to assess the response capability at every level viz division and district level to a mass Fishkill due to disease. The main activity of this training course will be the formation of a Staff Group, briefing on the contingency plan SOPs and an exercise on the occurrence of fish disease cases. Further, FDB will plan to conduct training courses at the farm level which will involve other agencies and private sector.

### 6.11.3. Projects (Plan Objectives)

#### **Project 28: Establishment of Emergency Preparedness Procedures for Fish Disease Outbreaks**

Under this activity, the FDB and PFDs will review existing national legislation and operational documents and procedures related to emergency response to outbreaks of serious transboundary diseases in terrestrial animals and plants and formulate similar approaches and plans for emergency response to nationally listed fish diseases.

#### **Project 29: Simulation Exercises**

Under this project, PFDs will test the rapidity and effectiveness of contingency plans for fish disease outbreaks. Results will be used to improve the operational framework, refine the responsibilities of the various agencies and individuals and revise protocols to achieve better response.

#### **Project 30: Establishment of Case Definitions for Diseases included in the National Pathogen List**

Case definitions are an integral part of contingency plans, representing sets of standardized criteria that are used to decide whether an individual unit of interest (an individual animal or a group of animals such as a fish cage, an aquaculture establishment or an aquaculture zone) has a particular disease. Unambiguous case definitions provide essential consistency in the detection and diagnosis of diseases caused by nationally listed pathogens. Indicators of the defined case may be relevant to the clinical field diagnostics and/or laboratory diagnostics of the disease. This project will develop case definitions for diseases for which contingency plans have been developed under Project 28. Meeting the criteria listed in a specific disease case definition will trigger further diagnostic and epidemiological investigations and the initiation of an appropriate contingency plan.

## 6.12. Program 12: Research and Development

Research capacity in fish health is necessary to the successful expansion of aquaculture development. Targeted and basic research can lead to better disease management, better understanding of national fish health status, support to risk analysis, improved diagnostic methods, etc. Where specific research capacity is lacking, countries must rely, to a large extent, on research conducted by scientists in other nations. Often, such “borrowed” research may not be directly applicable to local situations and experimental testing must be undertaken to adapt these findings. In other cases, little or no relevant information on the

specific problem may be available. There are many mechanisms to improve access to research capacity. These include development of national fish health research laboratories, supporting linkages and research program within universities and the private sector, contracting of targeted research with foreign institutions, and development of a regional fish health center. Targeted national research needs to be supported to allow a better understanding of those aquatic diseases that have recently been introduced into national territory. The impact and spread of such diseases among indigenous species and the spread of such diseases among widely divergent catchments is often poorly studied. A better knowledge of such transboundary aquatic animal diseases (TAADs) under local conditions is vital for the sustainable development of national aquaculture production and the maintenance of aquatic biodiversity.

### 6.12.1. Objectives

- a) to identify the national health status with regard to economically important aquaculture diseases through epizootiological studies to obtain a scientific database and use it as a reference at the national or international level.
- b) to develop vaccines/diagnostic kits for the control of diseases such as streptococcosis in tilapia and vibriosis in marine fish, especially at the hatchery level.
- c) to develop prevention or treatment methods based on natural resources and an environmentally friendly approach; and
- d) to enhance skills, capabilities and expertise in research and development (R&D) on fish health through continuous training, workshops and seminars at the local and international levels.

### 6.12.2. Current status

Currently there are limited number of fisheries officers in any of the provincial fisheries department with background in Epidemiology & Diagnosis, and Microbiology & Pathology, which could function as the hub to enhance research capability in fish health. Universities have disciplines in microbiology, epidemiology and pathology but their work is limited to basic research. Research in fish diseases is a neglected area which needs to be strengthened to promote commercial aquaculture. .

### 6.12.3. Projects (Plan Objectives)

**Project 31: Identify and Prioritize National Fish Health Research and Development Program (including Research on Emerging Pathogens).**

Under this activity, Fisheries Program NARC and Department of Fisheries Punjab will identify and prioritize current and potential fish health research and development Programs

that can contribute to the advancement of fish health management and biosecurity in Pakistan. This research will specifically include:

- Research on fish virology/virus base disease
- Research on fish feed related disease
- Research on Zoonotic diseases.

**Project 32: Research and Study on Methods to Assess Systematically the Socio-economic Impacts of Fish Diseases and the Benefits of Good Biosecurity Governance.**

This pioneering research will provide support to the generation of evidence that can be used for raising the profile of fish health issues, including a basis for resource mobilization.

### 6.13. Program 13: Institutional Structure (including Infrastructure)

Infrastructure for fish health encompasses the essential facilities and systems serving a country and thus includes dedicated physical structures such as buildings for office space, diagnostic and other laboratories, quarantine facilities, tank rooms, experimental ponds, etc. Adequate and appropriate infrastructure is essential to the success of any national aquatic biosecurity program. Institutional Structure includes the organizational hierarchy and inter- and intra-organizational relationships between the Competent Authority (CA) and other relevant governmental agencies. In some instances, national organizational structures, hierarchies and lines of reporting and communication may need to be restructured in order to achieve efficient and effective national biosecurity.

#### 6.13.1. Objectives

- a) to establish new facilities or upgrade existing facilities and the institutional structure of fish health laboratories; and
- b) to develop a mechanism for sharing of facilities, information, and cross-referencing among the laboratories.

#### 6.13.2. Current status

Pakistan has fisheries department in each province and area, but they lack fish health infrastructure for fish health management, except Punjab Fisheries Department which has

a well-equipped lab for such function. The Universities have basic research facilities, the full detail of facilities and infrastructure still needs to be worked out.

### 6.13.3. Projects (Plan Objectives)

#### **Project 33: Assess and identify gaps in infrastructure requirements to support the NSAAH**

The FDB will undertake a national review and analysis of infrastructure needed and currently dedicated or available to support the NSAAH. The review will identify gaps in essential infrastructure needed to implement the strategy.

## 6.14. Program 14: Human Resources and Institutional Capacity Development

Human resources and institutional capacity development refers to having the correct number of staff with the appropriate expertise to accomplish the essential tasks that have been identified as part of a NSAAH. This requires the hiring and/or training of scientists, fisheries officers, veterinarians and other staff possessing critical expertise and training in the key areas of fish health (often at the PhD, MSc and DVM level (with specialized training in aquatic pathology), including, for example, disease diagnostics, aquatic biosecurity, aquatic veterinary medicine, risk analysis, aquatic epidemiology, emergency preparedness, extension services, enforcement, border control, and information services. In addition, a program to maintain and upgrade expertise through short-term and other training, attendance at international conferences and meetings, international collaboration, etc. must be established.

### 6.14.1. Objectives

- a) to produce sufficient number of competent fish health professionals; and
- b) to enhance and strengthen the knowledge, skills and application of relevant biosecurity and food safety principles (e.g., GAPS, hazard analysis and critical control points (HACCP), BMPs, good manufacturing practices (GMPs), aquaculture risks) to aquaculture production in Pakistan.

### 6.14.2. Current status

Fish health and biosecurity management is a new subject in Pakistan. The AQD is responsible for the implementation of official analysis and guarantee for fish and fishery products on import stage and Fisheries Departments in provinces are responsible for provision of extension and health related services at farm level. There is a need to establish a designated Fish biosecurity unit in each fisheries department to implement the relevant

legislation, policies, strategies, and action plans. The unit will carry out registration, inspection, certification, surveillance and monitoring programs at the province and area level. Each unit will have Fisheries Biosecurity Laboratories and these laboratories will provide services on fish health and disease analysis and diagnosis.

### 6.14.3. Projects (Plan Objectives)

#### **Project 34: Assessment and gap analysis of current human capacity**

A comprehensive assessment and gap analysis of current human capacity will be conducted to guide the formation of the human resources development program.

#### **Project 35: Development of capacity-building program to support the aquaculture industry, including succession planning programs**

Educational programs (formal/informal, degree/non-degree, short/long-term, local/overseas, training of trainers/ToT) to improve the knowledge and skills of relevant service providers from the government, academe and private sectors will be developed. Succession planning should be an integral part of any capacity-building program to ensure continuity of provision of fish health services to the sector. Retired experts should be tapped for technical advice.

#### **Project 36: Build and expand on existing training programs on fish health from producer to service-provider levels**

The FDB will conduct a review of short-term (non-degree) training opportunities related to fish health including fish pathology and aquatic epidemiology that are currently available in Pakistan. It will then conduct a survey of relevant agencies, organizations, and private sector aquaculturists to identify and prioritize short-term training needs. Based on the results of these surveys, FDB will seek mechanisms and funding to meet the training needs identified.

#### **Project 37: Short Courses on HACCP, BMPs and GMPs**

Under this activity, a series of short courses will be developed for aquaculturists and post-harvest processors on maintaining quality control in aquaculture. The course series will use both international and national expertise and will focus on the application of HACCP, BMPs, GMPs, etc. to aquaculture production in Pakistan.

Stakeholders in consultative meeting suggested local and foreign degree programs for fish diseases.

## 6.15. Program 15: Regional and International Cooperation

Cooperation refers to the sharing of effort and resources (e.g. staff, infrastructure, funding) between and/or among countries, government agencies, universities, the private sector and other stakeholders to achieve common objectives or goals. Cooperation in research and training is possible via international agencies such as the FAO and OIE and with foreign universities and experts. There is a great potential for regional cooperation and networking in almost all areas of fish health. Examples include the development of standardized procedures for import and export of live fish, harmonization of legislation, shared communication structures (websites, newsletters), development of a regional fish health information system (pathogen database, regional disease diagnostic and extension manuals), cooperative research programs, development of regional strategy and policy, regional disease reporting, a regional emergency response system, regional reference laboratory, regional risk analysis case studies, coordinated training efforts, etc. At the national level, cooperation between agencies, particularly those agencies responsible for fisheries and aquaculture, veterinary services, biosecurity, and environmental/conservation issues, should be promoted.

### 6.15.1. Objectives

- a) to fulfil the implementation of obligatory and voluntary regional and international commitments; and
- b) to benefit from bilateral and multilateral partnerships and trade agreements

### 6.15.2. Current status

Pakistan currently has cooperation with the Food and Agriculture Organization of the United Nations (FAO), the Network of Aquaculture Centers in Asia-Pacific (NACA), the Southeast Asia Fisheries Development Centre (SEAFDEC), the World Organization for Animal Health (OIE); and bilateral cooperation with many countries. This can be tapped to develop linkages for fish health management.

### 6.15.3. Projects (Plan Objectives)

**Project 38: Development of joint biosecurity governance, research and educational programs between Pakistan and partner countries and organizations in the control of serious diseases of fish.**

The FDB and Provincial Fisheries Departments will identify and facilitate mechanisms to increase cooperation among its neighbours and regional countries and international

bodies/organizations that will assist in controlling serious fish diseases that are present in the region.

## 7. IMPLEMENTATION

Implementation of the NSAAH for Pakistan will be led by a Committee on National Strategy on Aquatic Animal Health for Pakistan that shall be formed after approval of the strategy in 2022 and will consist of members representing different departments of the federal and provincial and area fisheries departments, line department and other stakeholders. The Terms of Reference of the Committee are attached as Annex 2. The implementation of the NSAAH will commence after approval of the document by the Federal Government or Secretary, Ministry of National Food Security and Research and allocation of resources for the strategy. The mechanisms that will be used to implement the identified program activities will be through local working-group discussions, expert meetings, workshops and targeted training, enforcement of regulations, research and education, collection and analysis of information and other appropriate means, either done singly or in combination among departments.

## Summary of the National Fish Health Strategy's Programs and Projects

(S = short term, M = medium term, L = long term)

Programs/Projects		Timeframe	Priority	Responsibility	
<b>Program 1. Policy, legislation, and enforcement</b>					
Project 1:	Review and harmonization of legal framework for fish health	S	High	FDB	In partnership with provincial departments
Project 2:	Formalization of a Group of Legal and Technical Experts to Advise on Implementation of Legislation.	S	High	FDB	-do-
Project 3:	Drafting of Legislation (Acts) Governing Fish Feeds and Development of Associated Regulations.	L	High	FDB	-do-
Project 4:	Drafting of Legislation for Use of Chemicals in Aquaculture and Veterinary Drugs for Fish.	L	High	FDB	-do-
Project 5:	Strengthening of Inspection and Enforcement Capacities	M	High	CAs	-do-
<b>Program 2: Risk Analysis</b>					
Project 6:	Formation of the Committee for Incoming Alien Species Application (CIASA)	S	High	FDB	-do-
Project 7:	Determining the Appropriate Level of Protection (ALOP) for Pakistan	S	High	FDB	-do-
Project 8:	Review and Analysis of Trade in Fish Commodities	S	High	FDB	-do-
Project 9:	Conducting Risk Analyses for Key Commodities	S	High	FDB	-do-
<b>Program 3: Pathogen List</b>					
Project 10:	Survey and finalization of the National Fish Pathogen List	S	High	FDB	-do-
<b>Program 4: Border Inspection and Quarantine</b>					
Project 11:	Review and Assessment of Border Procedures for Import and Export of Live Fish and their Products	S	High	CAs	-do-
Project 12:	Develop Protocols for Quarantine of Fish	S	High	AQD	-do-
Project 13:	Prepare a List of Aquatic Species Prohibited in Pakistan	S	High	FDB-AQD	-do-
<b>Program 5: Diagnostics</b>					
Project 14:	Strengthen the Capacity of the National Diagnostic Laboratories	S	High	PFDs-FDB	-do-
Project 15:	harmonize the Methods for Disease Diagnostics	S	High	Labs	-do-
<b>Program 6: Farm-level Biosecurity and Health management</b>					

Project 16:	Organize and strengthen small-scale farmers into producer organizations	S	High	FDB	-do-
Project 17:	Assistance to small-scale producers to comply with market requirements such as aquaculture certification standards	S	High	FDB	-do-
Project 18:	Evaluate the possibility of an aquaculture insurance scheme	M	Medium	FDB	-do-
Project 19:	Capability and Capacity Building on Farm Biosecurity and Disease Surveillance	L	High	PFDs	-do-
<b>Program 7: Chemicals, Veterinary Drugs, Effective Microbes and Antimicrobial Resistance (AMR) in Aquaculture</b>					
Project 20:	Review of Current use of Chemicals, Veterinary Drugs, Effective Microbes and Antimicrobial Residues in Aquaculture	L	High	FDB	-do-
<b>Program 8: Surveillance, Monitoring and Reporting</b>					
Project 21:	Program on Fish Disease Surveillance	L	High	PFDs	-do-
Project 22:	Study on Diseases of Fish Species Newly Introduced for Aquaculture	L	High	PFDs	-do-
Project 23:	Establishment of a Fish Internal Movement Control Scheme	L	High	FDB-PFDs	-do-
Project 24:	Establishment of a Categorization Scheme for Aquaculture Establishments	L	High	FDB-AQD-PFDs	-do-
Project 25:	Training in Outbreak and Fishkill Investigation	L	High	FDB	-do-
<b>Program 9: Communication and Information System</b>					
Project 26:	Establishment, Upgrading and Maintenance of a National Database on Fish Health	L	High	FDB-PFDs	-do-
<b>Program 10: Zoning and Compartmentalization</b>					
Project 27:	Assessment of the Feasibility of Disease Zoning and Compartmentalization	L	High	FDB	-do-
<b>Program 11: Emergency Preparedness and Contingency Planning</b>					
Project 28:	Establishment of Emergency Preparedness Procedures for Fish Disease Outbreaks	M	High	PFDs	-do-
Project 29:	Simulation Exercises	L	High	PFDs	-do-
Project 30:	Establishment of Case Definitions for Diseases included in the National Pathogen List	M, L	High	PFDs	-do-
<b>Program 12: Research and Development</b>					
Project 31:	Identify and Prioritize National Fish Health Research and Development Program (including Research on Emerging Pathogens).	M, L	High	FDB-NARC-PFDs	-do-
Project 32:	Research and Study on Methods to Assess Systematically the Socio-economic Impacts of Fish Diseases and the Benefits of Good Biosecurity Governance.	L	High	FDB-NARC-PFDs	-do-
<b>Program 13: Institutional Structure (including Infrastructure)</b>					

Project 33:	Assess and identify gaps in infrastructure requirements to support the NSAAH	L	High	FDB-PFDs	-do-
<b>Program 14: Human Resources and Institutional Capacity Development</b>					
Project 34:	Assessment and gap analysis of current human capacity	L	High	FDB-PFDs	-do-
Project 35:	Development of capacity-building program to support the aquaculture industry, including succession planning programs	S	High	FDB-PFDs	-do-
Project 36:	Build and expand on existing training programs on fish health from producer to service-provider levels	S	High	FDB-PFDs	-do-
Project 37:	Short Courses on HACCP, BMPs and GMPs	S	High	FDB-PFDs	-do-
<b>Program 15: Regional and International Cooperation</b>					
Project 38:	Development of joint biosecurity governance, research and educational programs between Pakistan and partner countries and organizations in the control of serious diseases of fish.	L	Medium	FDB-PFDs	-do-

## Terms of Reference for the Main Committee on NSAAH

## TERMS OF REFERENCE FOR THE MAIN COMMITTEE FOR THE NATIONAL STRATEGY ON AQUATIC ANIMAL HEALTH (NSAAH)

### PURPOSE

The Committee will provide strategic direction and leadership in the process of implementation and completion of the National Strategy on Aquatic Animal Health for Pakistan (NSAAH-PAK) to ensure Pakistan has a well-defined and guided approach in fish health management. The Committee will also be the main entity responsible for the overview, monitoring and key-decision makings for fish health management in Pakistan.

### TERM

The Committee will come into effect/be operative from the official date of launching of the NSAAH and the membership and terms NSAAH will be subject to a review at any appropriate time as determined by the consensus of the Committee.

### MEMBERS

Sr. No.	Member	Position	Responsibility
<b>Permanent Members</b>			
	CEO, FDB	Chairperson	Take a lead role in implementing the tasks/ mandates of NSAAH; direct reporting of the outcomes of NSAAH/Working Committee meetings to the Secretary, MNFSR
	CTO, FDB	Committee Secretary	To organize meetings, record minutes and contribute in agenda setting and discussions
	DAHC/AAHC, MNFSR	Member	Contribute to agenda settings, discussions, and decisions, representing the interests of fisheries program's planning and development.
	FDC/AFDC	Member	Contribute to agenda settings, discussions, and decisions, representing the interests of fisheries program's planning and development.
	DG, MFD	Member	Contribute to agenda settings, discussions, and decisions, representing the interests of fisheries program's planning and development.
	Director, AQD	Member	Contribute to agenda settings, discussions, and decisions, representing the interests of fisheries program's planning and development.

	DG, Fisheries Punjab	Member	Contribute to agenda settings, discussions, and decisions, representing the interests of fisheries program's planning and development.
	DG, Fisheries Sindh	Member	-do-
	DG, Fisheries Balochistan	Member	-do-
	DG, Fisheries KPK	Member	-do-
	Director, Fisheries GB	Member	-do-
	Director, Fisheries AJK	Member	-do-
Need based members			
	DG, NVL	Member	Contribute to agenda settings, discussions, and decisions, representing the interests of the veterinary services.
	In-charge Fisheries Program, NARC	Member	Contribute to agenda settings, discussions, and decisions, representing the interests of the Research bodies
	Representative of EPA	Member	Contribute to agenda settings, discussions, and decisions, representing the interests of the environment management authorities
	Representative of Inspector General Forests, Ministry of Climate Change	Member	Contribute to agenda settings, discussions, and decisions, representing the interests of the aquatic endangered animals.
	Representative of PSQCA	Member	Contribute to agenda settings, discussions, and decisions, representing the interests of the standard bodies
	Representative of Provincial Food Authorities	Member	Contribute to agenda settings, discussions, and decisions, representing the interests of the general consumers

## ROLES AND RESPONSIBILITIES

The Main Committee will be entrusted to:

- Develop the agenda, responsibility and estimated timeframe for the preparation, revision, approval and endorsement of the NSAAH.
- Conduct scheduled meetings and/or other means of communication as deemed appropriate. Ensure the progress and completion of activities/programs that are decided by the committee as integral parts of the NSAAH.
- Appoint new or exclude any appointed members based on logical and necessary reasons through a consensus.
- Appoint Sub-Committee for "Incoming Alien Species Application" (CIASA).
- Appoint any subgroups/ working groups/ advisory groups /technical groups regarding NSAAH as supporting entities to the committee.

- Record and retain information regarding meetings, discussions, progress reports, drafts and any other items that are vital to the NSAAH.
- Report and submit documents regarding the details of planning, implementation, and completion of the NSAAH to the Secretary, MNFSR.

## MEETINGS

All meetings regarding NSAAH will be chaired by the CEO, FDB.

The CEO, FDB shall work as chairperson of the Committee. A permanent and an alternate representative (name-appointed) for each membership to this committee will be as appointed by the representative's organization. A meeting quorum will be constituted when 50% of all permanent members are present. Only the named permanent representatives may attend the meetings.

All decisions must be made by consensus (i.e., members accept the decision, even though it may not be their first choice). If not possible, the majority vote may make the final decision. Minutes and agenda will be recorded and distributed by the FDB, appointed as secretariat to the committee.

Meetings will be held at least two (2) times a year, as scheduled by the committee through consensus.

If required, subgroup meetings may be arranged outside the scheduled times, as convenient to the subgroup members.

## AMMENDMENTS / MODIFICATIONS / VARIATIONS

These Terms of Reference may be amended, varied or modified in writing after consultation and agreement through consensus of the committee members.

## National Pathogen List

### Fish Diseases

#### 1. Parasitic Diseases

- a. Gill infection
- b. Lernaeasis
- c. Argulosis or skin infection
- d. Black Spot disease
- e. Gyrodactylosis
- f. Ichthyophthirius or White spot disease

#### 2. Fungal Diseases of Fish

- a. Saprolegniasis
- b. EUS

#### 3. Bacterial Diseases of Fishes

- a. Dropsy
- b. Fin Rot
- c. Furunculosis

#### 4. Viral Diseases

- a. Epizootic haematopoietic necrosis\* (EHN)
- b. Infectious haematopoietic necrosis\* (IHN)
- c. Oncorhynchus masou virus disease\* (OMVD)
- d. Infectious pancreatic necrosis (IPN)
- e. Viral encephalopathy and retinopathy (VER)