



Project Report: 2013-39

# Institutional, Policy and Regulatory Framework for Sustainable Development of the Egyptian Aquaculture sector



RESEARCH PROGRAM ON Livestock and Fish



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra



Project Report: 2013-39

# Institutional, Policy and Regulatory Framework for Sustainable Development of the Egyptian Aquaculture Sector

## **Authors**

Ian Goulding<sup>a</sup> and Maggie Kamel<sup>b</sup>.

## **Authors Affiliation**

<sup>a</sup>Megapesca Lda, Portugal and <sup>b</sup>Arab African Advisers, Egypt

## **Acknowledgment**

The consultants would like to express heartfelt thanks for the excellent support given by all members of the IEIDEAS Project Team in the organization and implementation of the mission.

## List of Abbreviations

CAA	Competent Administrative Authority
CLAR	Central Laboratory for Aquaculture Research
DANIDA	Danish International Development Agency
DDE	Dichlorodiphenyldichloroethylene
EEAA	Egyptian Environmental Affairs Agency
EEZ	Exclusive Economic Zone
EFPEA	Egyptian Fish Producers and Exporters Association
EIA	Environmental Impact Assessment
EOP	End of Project
EPA	Eicosapentaenoic acid
DHA	Docosahexaenoic acid
EU	European Union
GAFRD	General Authority for Fish Resources Development
GOVS	General Organization for Veterinary Services
Hg	Mercury
IEIDEAS	Improving Employment and Income through the Development of Egypt's Aquaculture Sector
IUU	Illegal Unregulated and Unrecorded
JICA	Japan International Cooperation Agency
LOQ	Limit of Quantitation
M4P	Making Markets Work for the Poor
Mo E	Ministry of Environment
MoWR&I	Ministry of Water Resources and Irrigation
MoALR	Ministry of Agriculture and Land Reclamation
MoU	Memorandum of Understanding
NGO	Non Governmental Organization
Pb	Lead
SDC	Swiss Agency for Development and Cooperation
SOE	State Owned Enterprise
SPS	Sanitary and Phytosanitary
SWOT	Strengths, Weaknesses, Opportunities and Threats
TL	Team Leader
ToR	Terms of Reference
TRIPS	Trade-Related Aspects of Intellectual Property Rights
UAC	Union of Aquatic Cooperatives

## Executive summary

Egyptian aquaculture is a great success story, with production reaching almost 1 million tons in 2011 representing an average consumption of about one fish per person per week. This report presents the findings of a mission undertaken in March 2013 to critically review the institutional, policy and regulatory framework for sustainable development of the Egyptian aquaculture sector on behalf of the "Improving Employment and Income through the Development of Egypt's Aquaculture Sector" (IEIDEAS) project, implemented by WorldFish and CARE and funded by the Swiss Agency for Development and Cooperation (SDC).

The mission found that while there is a clear legal and institutional framework for aquaculture, there is a need to update the legislation to reflect the valid allocation of land and water resources to this activity, and to streamline registration and approval procedures. Available sites are limited by land and water use conflicts (with agriculture, tourism, etc.), overarching and sometimes invalid restrictions on water usage, and environmental concerns while difficult licensing procedures force many operators into the grey economy, where they cannot access credit for investment to upgrade their facilities.

The supply pattern for freshwater fish such as tilapia is extremely seasonal. A lack of processing establishments for packing and freezing means that prices fall significantly towards the end of the season, risking producer viability. Whilst the sector is clearly becoming more competitive, there is a need to improve distribution systems and handling to allow freshwater aquaculture products (in particular tilapia) to reach new markets, including exports. There is also a need for market development measures, but sector organizations currently lack capacity to provide business and marketing support.

The marine aquaculture sector (mainly mullet) supplies 15% of the output, and is almost exclusively dependent on a fishery for wild fry, nearly all supplied by illegal fry fishers and traders. Variable supplies from this activity inhibit the development of marine hatcheries while uncontrolled harvest of marine fry also risks collapse of wild stocks.

Egypt is currently not able to export aquaculture products to the EU, not because of high contaminant levels, but due to non-compliance with residue monitoring requirements set out in EU Directive 96/23/EC. Also in the domain of sanitary and phytosanitary controls, Egypt does not possess a system of coherent animal health control system for aquaculture, exposing the sector to potential disease risks.

Government is advised to **establish an inter-ministerial aquaculture committee** to jointly address license applications and develop a coherent policy towards the management of water and land resources and environmental and other impacts of aquaculture activities.

The General Authority for Fishery Resources Development is recommended to **apply lease conditions and discounts as means of creating incentives for desirable aquaculture practices** (such as use of formulated feeds, inputs of fry from hatcheries, intensification).

Government is recommended to **gain access to the EU market for aquaculture products by developing and implementing a residue monitoring plan in line with EU requirements.**

A more **coherent approach to market policy** is also suggested, with a review of trade and tariff terms, purchase policies in state owned enterprises and a study on fortification of fish feeds for improved food security.

In the longer term a **fish disease control regime should also be developed**, with regulatory powers and surveillance capacity.

Given the need for improved marketing of freshwater species, **the private sector is recommended to strengthen collaboration between the two main sector organizations (the Union of Aquatic Cooperatives and the Egyptian Fish Producers and Exporters Association), strengthen their capacity to deliver business-related and marketing services**, and prepare and implement a series of market development activities.

Ultimately, Egyptian fish producers are recommended to **support a generic promotion campaign (in domestic and export markets) for tilapia**, to be funded by a feed or fry levy, and if possible supported by Government structural funds.



# Table of Contents

<b>Acknowledgements</b>	2
<b>List of abbreviations</b>	3
<b>Executive summary</b>	4
<b>Tables</b>	6
<b>Figures</b>	6
<b>1 Introduction</b>	7
<b>2 Policy framework for aquaculture in Egypt</b>	7
2.1 Strategic Framework for Economic and Social Development Plan until 2022	7
2.2 Fisheries and Aquaculture Policy	7
2.3 Water Policy	8
2.4 Environment Policy	8
<b>3 Institutional arrangements for aquaculture</b>	9
3.1 Government institutions	9
3.1.1 Ministry of Agriculture and Land Reclamation (MoALR)	9
3.1.2 General Authority for Fish Resource Development (GAFRD):	9
3.1.3 General Organization for Veterinary Services (GOVS)	9
3.1.4 Central Laboratory for Aquaculture Research (CLAR)	10
3.1.5 Ministry of State for Environmental Affairs	10
3.1.6 Ministry of Water Resources and Irrigation (MoWRI):	10
3.1.7 Other Ministries	10
3.2 Sector representation	10
3.2.1 Union of Aquatic Cooperatives (UAC)	10
3.2.2 Egyptian Fish Producers and Exporters Association (EFPEA)	10
<b>4 Legislative Framework</b>	11
4.1 Aquaculture regulations	12
4.2 Leasing of aquaculture sites	12
4.3 Water resources	12
4.4 Environment	12
4.5 Licensing requirements	13
4.6 Impacts of current legislation on aquaculture	13
<b>5 Key issues in sector development</b>	14
5.1 Site locations and licensing	14
5.1.1 Access to land and water resources	14
5.1.2 Registration and licensing	14
5.1.3 Pollution controls	14
5.2 Risk of oversupply to the market	14
5.2.1 Investment in distribution infrastructure	16
5.2.2 Market research	16
5.2.3 Generic promotion and market development	16
5.2.4 Development of exports	17
5.2.5 Import substitution	18
5.3 Organisation of aquaculture business operators	18
5.4 Limited fry inputs for marine aquaculture	19
5.5 Weak sanitary and phytosanitary controls	20
5.5.1 Residue monitoring	20
5.5.2 Fish disease monitoring and controls	20
<b>6 Conclusions and recommendations</b>	21
6.1 Conclusion: Strengths weaknesses opportunities and threats in Egyptian aquaculture	21
6.2 Recommendations	22
6.2.1 Government of Egypt	22
6.2.2 Business operators	23
6.3 Donor community	24
<b>Annex 1: Legislation applicable to the aquaculture sector</b>	25
<b>Annex 2: Outline intervention for introduction of aquaculture residue monitoring plan</b>	26

## List of Tables

Table 1: Aquaculture cooperatives in Egypt	11
Table 2: Omega 3 FFA composition of fillets from Tilapia fed diets with various flaxseed oil content	17
Table 3: Exports of fishery products from aquaculture	18
Table 4: Imports of small pelagic fish by Egypt in 2012	18
Table 5: Estimated demand for marine fish fry, 2011	20
Table 6: Sources of marine fry, 2011	20

## List of Figures

Figure 1: Aquaculture Production	15
Figure 2: Wholesale Fish Real Prices (LE / Kg) at El Obur Market (2000 – 2009)	15
Figure 3: Market Development Strategy for EW aquaculture products	23
Figure 4: Processing and distribution investment	24

# 1. Introduction

This report presents the findings of a mission to critically review the institutional, policy and regulatory framework for sustainable development of the Egyptian aquaculture sector. The study was undertaken by an International Expert on Aquaculture Policy, and a National Expert on Institutions, on behalf of the Project "Improving Employment and Income through the Development of Egypt's Aquaculture Sector", implemented by WorldFish and CARE, and funded by the Swiss Agency for Development and Cooperation (SDC). The objective of the mission was to assess the current status of the Egyptian aquaculture sector, in terms of the policy, legal and institutional environment, with a view to suggesting the major issues to be addressed within a future policy dialogue.

The mission commenced on 5th March 2013 and concluded with the submission of the final report on the 9th April. The mission included desk research and meetings in Cairo, Abbassa and Alexandria with relevant Ministries and institutions, sector representative organizations, service providers and fishery business operators. The mission included visits to aquaculture hatchery, production, and grow-out facilities.

## 2. Policy framework for aquaculture in Egypt

### 2.1 Strategic Framework for Economic and Social Development Plan until 2022

In 2012, Egypt developed the Strategic Framework for Economic and Social Development Plan until 2022 to meet the needs of the post-revolution era and the demands of Egyptian citizens for a more inclusive system and social justice. The ultimate goal of the framework is to double the national income and achieve full employment within a framework of social justice<sup>1</sup>. Thus, it has six main objectives:

1. Secure a decent life for all Egyptians through achieving full employment.
2. Establish a state based on responsible democracy along with national participation.
3. Shift to a new economic system that depends on advanced technologies and knowledge.
4. Establish an industrial structure of a high value added and balanced industries.
5. Achieve consistent spatial development through using information technology and communications, developing an integrated transport system and a shift to decentralization.
6. Promote Egypt's regional role in the Arab, African and Mediterranean regions.

The plan emphasizes the importance of the agriculture and fishing sector to the economy which in 2011/2012 contributed 15% to GDP and absorbed 27.8% of total labor. To achieve a more balanced trade structure with high added value, the plan underlines the need to increase the value added of exports through more post-harvest processing activities and integration among agriculture and manufacturing industries and services by promoting innovation in distribution, and marketing. In this respect the strategic framework builds on the objectives of the strategic vision of sustainable agricultural development until 2022, prepared by the Ministry of Agriculture, which are:

1. Improve rural population's standard of living and reduce rural poverty rates;
2. The sustainable usage of natural agricultural resources;
3. Increase the agricultural productivity of land and water;
4. Achieve a higher degree of food security of strategic food commodities;
5. Strengthen the competitiveness of agricultural products in domestic and international markets; and
6. Enhance agricultural investment climate.

Aquaculture can clearly make a contribution to all of the elements within the national economic development and agriculture strategies described. This contribution is recognized in the specific policy related to fisheries and aquaculture described in the next section.

### 2.2 Fisheries and Aquaculture Policy

The General Authority for Fishery Resources Development (GAFRD) laid down, in 2005, a policy for the development of the fisheries and aquaculture sector in Egypt until 2017. The overall aim of the policy is to increase the return on fish resources through environmentally compatible systems; reach annual production of 1.5 million ton (an annual per capita of local fish production which amounts to 16.5kg) by 2017 so as to maintain per capita of fish production given the growing population; improve fish products from various sources to be compatible with international requirements; and support marine aquaculture. The policy has three major objectives<sup>2</sup>:

1. Ensure use of natural fisheries to achieve sustainability, whilst exploring the possibility of using unexploited areas and types.
2. Maximize revenues from aquaculture projects, especially water resources. This could be achieved through incentivizing private and cooperative sectors and implementing research projects that seek to maximize return in this sector.
3. Reform institutional structures for fish resources and build capacity. The structure and mandate of GAFRD needs to be reviewed, particularly those related to control, regulation, enforcement of regulations, implementation of pilot and exploratory projects in the field of development, modernization and guidance.

One of the key issues in the policy is that it proposes that GAFRD ought to desist from activities related to production, use of water surfaces and aquaculture, which should be undertaken by the private and cooperative sectors. The role of GAFRD would be limited to setting environmental, health, economic and social standards. In other words, it should assume the role of regulator rather than producer.

To achieve the above mentioned objectives, the policy proposes undertaking the following measures:

1. Modernize fishing legislation and criminalize violative fishing practices, fishing in shallow waters and in the Northern lakes to preserve the natural nurseries of young fish; creation of no fish zones.
2. Study fish resources in the exclusive economic zones (EEZ), in collaboration with specialized scientific centers, with the help of available expertise to develop short and long term plans.
3. Provide training courses to fishermen to clarify the importance of data and information; and raise their awareness about fishing techniques and new technologies.
4. Identify suitable locations for marine fish cages – whether floating or immersed – seeking international expertise in this area whilst laying down environmental rules and conditions suitable for the capacity of the water bodies.
5. Survey areas and actual locations suitable for marine aquaculture along the Mediterranean Sea and Red Sea coasts and specify the type of activity that can be undertaken in each location.
6. Encourage private sector to plant mollusks enlisting the help of international and local expertise and investigate exporting opportunities.
7. Develop High Dam Lake and study fish resources in it.
8. Encourage establishment of marine hatcheries and identify suitable locations for their establishment.
9. Raise average productivity of existing aquaculture to 5 ton/feddin provided that production remains economic.
10. Give more attention to the main types of fish (Nile tilapia) through genetic enhancement programs to improve productivity.

<sup>1</sup> Arab Republic of Egypt, Strategic Framework for Economic and Social Development Plan until 2022 (proposal for community dialogue), November 2012.

<sup>2</sup> Tamer El-Deeb, "New Strategy to Increase Our Fish Production to 1.5 million tons," Taawon Newspaper, <http://digital.ahram.org/articles.aspx?Serial=516369&eid=5916>

11. Promote investment in the fish feed and supporting industries with the aim of developing national supplies of inputs (whether feed, tools or equipment).
12. Promote aquaculture in fresh water and desert land if water resources are sustainable.
13. Suggest alternative training programs to employ fishermen during fish ban periods.
14. Amend rules of fish farms tenancy between GAFRD and investors to ensure stability and a rewarding economic return; facilitate dealing with banks to obtain credit. The increase in rent should be within the limits of commercial activities.
15. Protect northern and internal lakes through:
  - a. Criminalizing dehydration and pollution of lakes and disrupting the environmental system.
  - b. Studying fishing crafts suitable for every lake.
  - c. Studying reasons and sources of pollution and how to get rid of it.
  - d. Specifying periods of fishing ban in each area in accordance with the nature and type of fish.
  - e. Training lake managers to manage fisheries.
  - f. Identifying priorities for improving water quality, by scientific study of water exchange within lakes by research entities.
  - g. Developing landing sites and equipping them with new equipment such as computers to record and monitor quantities and various types of fish; link them with a data system at GAFRD to analyze and monitor fish reserves.
  - h. Complete infrastructure (road network, extending electricity, and organizing irrigation and discharge canals) for current or proposed areas for aquaculture projects.

Although having in place a policy on aquaculture is a good step, the mixture of measures to both regulate and promote fishery activity, and the mixture of capture fishing measures with aquaculture, undermines the internal consistency of the policy approach.

Furthermore it is not clear to what extent this policy has been implemented. At least, it seems no progress has been made regarding the proposed change in the role of GAFRD, as it is still engaged in production through its hatcheries and ownership of the Egyptian Company for Fishing and Fishing Gears, which operates fishing vessels, and aquaculture sites in Alexandria and North Sinai.

## 2.3 Water Policy

State policy towards agriculture, including aquaculture, is mainly constrained by the availability of arable land and limited water resources in Egypt, since the country suffers from water poverty exacerbated by rapid population growth. Egypt depends mainly on the River Nile for its water. The groundwater in the Western Desert and Sinai constitutes less than 3% of annual water reserves; and rainfall and water desalination plants are located in remote areas and in small quantities. The spread of tourist resorts and villages, which contain golf courts, swimming pools and artificial lakes, etc., uses the limited groundwater reserves and leads to their depletion and to the degradation of the quality of water.

Propelled by concern to meet water needs of various sectors in the country (particularly agriculture), the Ministry of Water Resources and Irrigation (MoWRI) has developed national policies for water resource management since 1975. The latest water policy was developed in 2000 and covered the period 1997-2017<sup>3</sup>. For the first time, an integrated approach to water resource management was adopted, taking into account all levels of water supply and demand vis-à-vis the previous approach, which only took into consideration the MoWRI's perspective. All stakeholders were involved in the planning process.

The main objectives of this policy are to:

- Improve efficiency of use of available resources;
- Develop further resources;
- Protect public health and environment;

The policy objectives stress economic and social aspects of development. Economically, the policy aims for optimal use of available water resources by various economic sectors (industry, agriculture including fish farms, and drinking water) to promote increase in production. It also promotes improvement of the conditions for other sectors that use water (such as navigation and tourism). On the social side, the policy stresses the role that water could play directly and indirectly in job creation; realizing social justice (whether in the distribution of water or in farmers' incomes); and achieving a minimum of food self-sufficiency. Additionally, the policy aims to recover the costs of maintenance and operation to improve the services provided, as well as introduce institutional and legal reform to enhance water management.

Although this policy recognizes the importance of promoting aquaculture, it did not effectively change the position of the MoWRI towards aquaculture in terms of right to first use of water. It remains the position of the Ministry, that aquaculture should not take place in water in supply canals delivering water from the Nile, which is available for agricultural irrigation and for drinking water. Aquaculture is therefore restricted to using water in the drainage canals, which may contain agricultural run-off and other discharges (such as treated sewage). This policy is reflected in the Law on Fisheries No.124/1983 (see section 4). However, on a more positive note, in an attempt to close the gap between legislation and what happens on the ground, the Ministry issued in 2013 a decree (Decree No. 90/2013) that relaxes the limit of effluent from agricultural activities – including aquaculture – discharged in canal waters.

## 2.4 Environment Policy

Over the past few years Egypt has emphasized the need to shift more towards sustainable economic development, as expressed in the national development plan until 2012 and environment policy. Such development is effected through incorporating an environmental dimension in development projects and promoting SME projects in the area of environment. It also entails preservation of natural resources through development and promotion of natural reserves, preservation of marine and wild resources, and addressing the harmful impacts of climate change in coordination with relevant authorities. Egypt's environment policy also provides that the state adopts financial policies that provide incentives to environmentally friendly enterprises and increase penalties against violations and bad environmental practices. The policy emphasizes the need to coordinate among government and non-government authorities in the area of environment at both the national and local levels. This requires supporting decentralization in environmental management and building capacity of environment directorates in governorates.

A key element of environmental management is the requirement for investment projects which involve discharge to air, land or water, to be subject to environmental controls, and this includes aquaculture activities. The Egyptian Environmental Affairs Agency (EEAA) therefore requires certain activities to be subject to full environmental impact assessments (EIA). This can include certain types of aquaculture investment such as sea cages in the Red Sea, where the marine environment is considered to be more sensitive.

<sup>3</sup> A new strategy for water development and management until 2050 was developed in 2011, but it has not been adopted by the new Government.



## 3. Institutional arrangements for aquaculture

### 3.1 Government institutions

#### 3.1.1 Ministry of Agriculture and Land Reclamation (MoALR)

The Ministry is concerned with developing the overall policies for agriculture (including aquaculture) and land reclamation, in accordance with national development plans with the aim of developing agricultural resources, increasing the area of reclaimed land, and developing rural economies. It is also mandated to conduct research and studies to develop agricultural, animal and fish production and use applications of this research to develop the sector. In addition, the Ministry is concerned with coordination among different authorities operating in the field of agriculture and land reclamation.

The main legislation for the Ministry are Law 53/1966, and Resolution 162 of 1996, defines the structure of the Ministry<sup>4</sup>

Under the Ministry the following organizations are relevant to fisheries and aquaculture development:

- GAFRD
- The General Organization for Veterinary Services (GOVS).
- The Agricultural Research Center (including the Central Laboratory for Aquaculture Research (CLAR))

These are described in more detail below.

#### 3.1.2 General Authority for Fish Resource Development (GAFRD):

GAFRD, a subsidiary of the MoALR, is the agency responsible for all planning and control activities related to fish production. It was established by Law No. 190/1983 with the aim of contributing to development of the national economy through fish resources, establishing horizontal and vertical expansion projects within the framework of general state policy and state plan. According to this Law, GAFRD is mandated to carry out the following functions:

1. Work on the development of fisheries and sources and overseeing the implementation of fishing laws and its implementing decisions and for aquatic areas to be determined by the decision of the President.
2. Conduct research studies to increase production and reduce costs and make use of specialized third party, whether national or foreign.
3. Establish pilot projects and models, and develop plans, and training and extension programs to obtain equipment and provide required technical labor in the field of fisheries.
4. Regulate the exploitation of fishing areas and fish farms in surface waters specified by the President and issue licenses for fishing, their maintenance and development and administrative enforcement against infringements and irregularities in these areas.
5. Plan projects, fisheries and fish processing and implement projects in collaboration with Governorates.
6. Work on the development of fishing craft; disseminate mechanization and modern fishing methods; spread awareness and technical training among fishermen; and propose draft decisions necessary to prevent gears and activities harmful to fish resources.
7. Conduct field survey of fishery resources.
8. Cooperate with international and regional bodies in matters related to preservation and development of fisheries in accordance with requirements of technical and economic cooperation agreements in this regard - and follow up the implementation of these agreements.
9. Establish public sector companies specializing in fisheries or participate in their creation and contribute to joint projects in accordance with the Arab and Foreign Capital Investment Scheme Law.
10. Propose marketing and pricing policy of local and imported fish in conjunction with the Ministry of Supply and Internal Trade.

11. Provide technical opinions – within its competence – on public projects undertaken by other entities that involve use of surface water or pollution of water.
12. Provide technical expertise and advice on designs and drawings, and carry out technical studies and economic feasibility studies for fishery projects.

The Chairman of the organization has the authority of a Vice Minister and, accordingly, is authorized to issue relevant fisheries and aquaculture decrees and regulations. The headquarters of the organization is in Cairo and branches are located in the major fisheries regions. These are located in Central Delta, Damietta area, Western region, Suez and Red Sea region, Ismailia region, The Nile Valley region and Aswan region.

GAFRD, besides being responsible for regulating fisheries, is also in charge of extension and support activities.

Under the current institutional setup, GAFRD is therefore the main authority concerned with overseeing aquaculture. It is responsible for monitoring and controlling fish farms through GAFRD branches in each Governorate. It also oversees aquatic cooperatives as it sits on the board of the Union of Aquatic Cooperatives (UAC) which is the umbrella organization for fishermen and aquaculture cooperatives regulated by Law No. 123/193 (see section 3.2). Through this link, between GAFRD and the Union, GAFRD engages with sector representatives<sup>5</sup>.

#### 3.1.3 General Organization for Veterinary Services (GOVS)

The Organization was set up, under the Ministry of Agriculture, by Presidential Decree No. 187/1984 with the aim of protecting livestock (and human health) through preventive care against infectious and epidemic diseases. The ultimate goal is to develop national economy through increase of animal production rate to reduce gradually dependence on imported meat. The Organization supervises quarantine facilities for live animals in accordance with Minister of Agriculture Decree No. 47/1967.

GOVS is the Competent Authority nominated by the Government to be responsible for certification of food safety conditions for export of fishery products to the EU. The Fish Inspection Unit is the body in the Organization responsible for supervising, revising, and enforcing conditions and procedures pertaining to exporting fish and marine products, in coordination with the Central Administration of Veterinary Quarantine and Inspections. In this respect it is responsible for implementing the Joint Ministerial Decree No. (1909/2001) Regarding Regulations and Procedures Related to Fish and Marine Products Exports to European Union Countries.

<sup>4</sup>[http://www.agr-egypt.gov.eg/En\\_MinTargets.aspx](http://www.agr-egypt.gov.eg/En_MinTargets.aspx)

<sup>5</sup>According to the law only cooperatives can be members of the Union.

### 3.1.4 Central Laboratory for Aquaculture Research (CLAR)

The CLAR is located at Abbassa and forms part of the Egyptian Agricultural Research Center.

Its main aim is to “design and carry out the research strategy for sustainable development of aquaculture and fisheries in Egypt, in accordance with the national agricultural strategy of the country and integration with animal and plant production, in order to satisfy the food requirements from fish protein, to reach self-sufficiency from fish protein sources, keeping in mind environmental and socioeconomic aspects.”

In terms of facilities it is provided with 52 hectares of production ponds (162 for production plus small experimental ponds) and a complex with offices, training facilities, laboratories, and accommodation. It has been extensively supported with assistance from JICA. It is staffed by 130 scientists working in 10 research departments as follows:

1. Fish genetics and breeding
2. Fish hatchery and reproductive physiology
3. Fish production and aquaculture systems
4. Limnology
5. Nutrition and feed technology
6. Fish health and zoonosis
7. Fish biology and ecology
8. Economics of aquaculture
9. Extension
10. Fish processing and quality control

The annual research budget from the Government is approximately LE1.5 million, excluding special projects (externally funded). The budget is allocated across all departments (with approximately 75% allocated to research and 25% to training and extension activities). Research covers a wide range of areas such as aquaculture methods, fish processing, breeding and genetics, nutrition and feed technology, health and diseases, and aquaculture economics.

### 3.1.5 Ministry of State for Environmental Affairs

The Ministry is the authority mandated with formulation of environmental policy and necessary plans for the protection of the environment. The Egyptian Environmental Affairs Agency (EEAA) under the Ministry is responsible for implementation of legislation. To get a license, fish farmers have to obtain the approval of the Agency after submitting an EIA study, in accordance with the main environment legislation Law No. 4/1994, amended by Law No. 9/2009, and its executive regulation (Prime Ministerial Decree No. 338/1995) amended by Prime Ministerial Decree No. 1741/2005. Fish farms also have to abide by conditions related to discharge of water as set out in Law No. 4/1994.

### 3.1.6 Ministry of Water Resources and Irrigation (MoWRI):

The Ministry is mandated to develop irrigation system to achieve optimal use of water whilst meeting the needs of all sectors both in terms of quantity and quality. Technical the advice to the Ministry is provided by the National Water Research Centre under the Ministry. To obtain a license, fish farms need to obtain approval of the Ministry, represented by inspection departments affiliated with the Ministry, while marine fish farms need to obtain approval of Authority for Shore Protection.

### 3.1.7 Other Ministries

In addition, other authorities that have oversight over aquaculture sites, and whose approval may be required (depending on circumstances), include: Ministry of Archaeology, Ministry of Tourism, the Authority for Shore Protection, and Border Guard (affiliated with the Ministry of Defense).

## 3.2 Sector representation

### 3.2.1 Union of Aquatic Cooperatives (UAC)

Law No. 123/1983 on Aquatic Wealth Cooperatives describes the role and conditions pertaining to aquatic cooperatives, covering fisheries and aquaculture activities. It defines local cooperatives and the role of the UAC. The law states that judicial persons may not participate in cooperatives (Article 2) thus excluding participation of companies. Cooperatives must also be formed by not less than 20 individuals (Article 7). The law is highly prescriptive with cooperatives only permitted to perform prescribed functions (Article 10); and distribution of surpluses also according to a specified formula (Article 17). Incentives to join cooperatives are provided by their tax exemptions (Article 57), discounts on goods and services purchased from state enterprises, including a 10% discount on energy (Article 58) and preferential consideration in tenders (Article 59).

There are ten aquaculture cooperatives in place (Table 1), out of a total of 99 fisheries and aquaculture cooperatives. The total number of individual members registered was 1,796 in 2011. The largest are in Kafr el Sheikh and Damietta, each with over 400 members, followed by Fayoum with 339 members. Fayoum is reported to be the most active of these organizations, with the remainder only participating in sector issues to a limited extent. The cooperatives are collectively represented by the UAC (whose role is also defined in Law No. 123/1983), which now has three aquaculture members on its Board (of 15 members). The UAC represents the sector to Government, and has a seat on the Board of the GAFRD. It is consulted on policy issues (for example the UAC was asked by GAFRD to comment on the proposals of the MoWRI for a stricter regime regarding licensing of water use for aquaculture).

### 3.2.2 Egyptian Fish Producers and Exporters Association (EFPEA)

Although there were earlier attempts in the past to establish an alternative association of aquaculture producers, to represent wider sectoral interests and without the constraints of Law No. 123/1983, until 2007 these were not successful.

However, in 2007, the Egyptian Fish Producers and Exporters Association (EFPEA) was established as an association under the procedure defined by the Ministry of Social Affairs for NGOs. Membership has fallen from 47 initially to 26 at present. The annual membership fee is LE1,000/year. Its members include aquaculture producers and a number of feed suppliers. Membership is open to individuals and corporate members, and can include wholesale and retail operators, as well as inputs suppliers. Its representation is therefore potentially wider than the Cooperative movement.

The Association has several aims, but mainly to represent the sector to Government and to improve the image and brand identity of Egyptian aquaculture products. However, until now the EFPEA has not developed its institutional structure, only existing as a Board. It has no manager to undertake many of the detailed tasks required.

**Table 1: Aquaculture cooperatives in Egypt**

No.	Name of Cooperative	Address
1	Aquaculture Cooperative in Damietta	Damietta, Shata
2	Aquaculture Cooperative in Suez	Suez, El-Ganayen Section, Shamandoura
3	Aquaculture Cooperative in Sharkia	Sharkia, Markaz El-Hasaneyya, Mansheyat Abu Omar
4	Aquaculture Cooperative in Kafr El-Sheikh	Kafr El-Sheikh, 4 El-Mohandessen St., off El-Nabawy El-Mohandes St.
5	Aquaculture Cooperative in El-Amerya	Alexandria, El-Anfoushy, The Cultural and Social Center for Fishermen
6	Aquaculture Cooperative in Edko	Behaira, Markaz Edko
7	Aquaculture Cooperative in Fayoum	Fayoum, Sheikh Amin St., off El-Nabawy El-Mohandes St.
8	Aquaculture Cooperative in Villages of West Port Said in Manasra Village	Port Said, Zohour Section
9	Aquaculture and Fish Cages Cooperative in Kafr El-Sheikh	Kafr El-Sheikh, Markaz Motobas, Port Said St., near Maher El-Shaarawy grocery
10	Aquaculture in Fish Cages Cooperative in Dakahlia	Manzala, Soda Division, Aly Shaheen St.

## 4. Legislative Framework

The legislation governing the sector could be classified into four broad areas, as follows. More details of each of the measures described are shown in Annex 1.

### 4.1 Aquaculture regulations

The current overall legislation governing agriculture in Egypt is Law No. 53/1966. This law contains provisions for handling animals and poultry. Chapter 1 of Book 2, deals with developing and protecting animal wealth, but does not deal with fish explicitly. It is therefore not clear whether existing agricultural legislation includes fish or not.

The basic fisheries law of Egypt is contained within Act Number 124 of 1983 on Fishing, Aquatic Life and the Regulation for Fish Farms. This Act establishes GAFRD as the organization responsible for administering the Act and establishes an administrative framework for fisheries sector management. Although the basic fisheries legislation is relatively old, it has not yet been reviewed or revised. A new law is reported to have been drafted, but has not been approved.

This Act is composed of 3 Sections divided into 65 articles. Section I deals with General Provisions. Section II provides for water pollution and obstructions to fishing operations. Section III contains aquatic resources and the regulation of fish farms. The Act contains a number of provisions which impact on aquaculture.

- Article 17: No foreign fish spawn or spat thereof shall be used in or introduced into the country for any purpose whatsoever without first obtaining a permit from the General Organization for the Fishery Resources Development Authority.
- Article 19: It is prohibited to gather, transfer or possess fish fry from the sea or lakes or other water bodies, without the written consent of GAFRD.
- Article 40: Fishermen's cooperatives may set up fish-collecting centers (markets) in the extraction areas except at the High Dam Lake.
- Article 47: Concessions relating to the exploitation of aquatic resources and terms shall be issued by a decree of the Minister of Agriculture. The term of the concession shall not exceed 5 years and priority should be given to public authorities, public sector companies and cooperatives.

- Article 48: It is forbidden to construct fish farms except on infertile lands which are not suitable for agriculture, and where the water supply comes from drains and lakes, and not from irrigation (fresh) water. Government hatcheries are exempt from this rule. Farms may only be established after obtaining a license issued by the Minister of Agriculture (GAFRD), which is issued after obtaining permission from the Ministry of Irrigation, which will specify the volume of water available, its source, inlet size and mechanism of drainage.
- Article 49: Fish farming areas will be declared by the decision of the Ministry of Agriculture. The Chairman of GAFRD has issued two such decisions.
- Article 50: Except for irrigation canals, it is prohibited to cut or spray any water weeds specified by decree of GAFRD.

Various Decrees and Resolutions have been issued since 1983 related to aspects of fisheries administration. Presidential Decree No. 90/1983 forms GAFRD under the MoALR. Presidential Decree No. 465/1983 describes powers and duties of GAFRD, including the right to lease all lands within 200m of shorelines for aquaculture and fisheries activity (see below). Decision No. 70/1986 relates to the renting of land allocated by GAFRD for the establishment of fish culture and hatcheries. Enforcement of the legislation is the responsibility of the Military Force for Marine and Related Affairs (on the seas) and the Police Force for Inland Water and Fisheries Affairs ("the water police").

## 4.2 Leasing of aquaculture sites

Utilization of agricultural lands is centrally controlled by the MoALR. Presidential Decree No. 465/1983 describes the powers and duties of GAFRD, including the right to lease all lands within 200 m of shorelines for aquaculture and fisheries activity. Only land which has been allocated to aquaculture may be leased (through GAFRD) for aquaculture. Decision No. 70/1986 decreed that GAFRD will assign locations suitable for aquaculture and hatcheries. In addition, Decision No. 70/1986 deals with the renting of land allocated by the GAFRD for the establishment of fish culture and hatcheries. A Committee of the Authority is responsible for defining areas suitable for fish farming and hatcheries, and for dividing them into economic units for leasing. Land is to be rented by public auction unless:

- Rental is to government bodies, public companies or legal persons.
- Projects are large, and have been proved economically feasible.
- No bids are received, or bids are below the rentable value.
- Existing leases are in operation at the introduction of the decision.

Land is leased to investors for a period of five years through a public tender, where the lease value is determined based on capacity of production, location, availability of services and infrastructure. After the expiry of the lease period, GAFRD could take back the land and offer it for lease again through public tender. This has led to underinvestment in the sector, and is generally regarded as hindering development, as investors may not be able to obtain a suitable return on investment in such a short period of time. However, it also allows for re-allocation of the site if it is not used productively. This has led GAFRD to seek to introduce lease conditions to ensure that the site is effectively developed and managed.

In an attempt to address this limitation, the Minister of Agriculture issued Decree No. 1132/2007 extending the lease-holding period to 25 years subject to an interim periodic review to ensure that investments are being undertaken. This Decree, however, has been ineffective, as according to Law No. 89/1998, which is the main legislation governing government tendering and procurement, if the rental value of land at the time of periodic assessment reaches LE 50,000, it has to be offered for a public tender again. This also inhibits compliance with lease conditions to develop the site, since such developments enhance its value, thus risking its loss at subsequent lease renewal. It should be also noted that public sector organizations and cooperatives are given more favorable terms in public auctions, further reducing the incentive for investment by private operators.

## 4.3 Water resources

The two main laws related to water that impact aquaculture are Law No. 12/1984 and 48/1982. The former is the legislation governing water and irrigation; it regulates the right of access to water by agricultural (including aquaculture) landholders. The Law also sets out the responsibility of the MoWRI in distributing irrigation water and determining the conditions of drilling water wells and use of underground water. Furthermore, the Ministry is responsible for enforcing Law No. 48/1982 concerning protection of the water of River Nile from pollution which determines the conditions of discharge of water in canals. The legislation has traditionally denied aquaculture right to use fresh water and placed strict conditions regarding the discharge of effluent. This is largely due to wide held misperception by the MoWRI that aquaculture is a large consumer a widely.... of water and its discharges are detrimental to water quality of the Nile and its irrigation canals. Law No. 48/1982 also prohibits the discharge into the Nile River, irrigation canals, drains, lakes and groundwater without a license issued by the MoWRI. Law No. 48/1982 is only applicable to inland waters and does not address usage of other water sources.

## 4.4 Environment

Environment related issues are regulated by Environment Law No. 4/1994 which was amended by Law No. 9/2009. The law deals with water pollution from ships and prohibits the discharge of materials that cause pollution into inland waters and seawater from all sources, unless a license has been issued by the EEAA. The Law requires anyone proposing discharge to a controlled water to submit an EIA study, which is then reviewed by the Ministry of Environmental Affairs, in order to receive the license. It also outlines the environmental conditions and requirements (such as setting up an environmental self-monitoring system, maintaining records for environmental contaminants, discharge of waste, and periodic analysis for sampling and test results etc.) that fish farmers have to follow. The Ministry conducts periodic inspection on farms.

The Law states that new establishments or projects as well as expansions or renovations of existing establishments must be subject to an EIA. The EIA should be submitted to the Competent Administrative Authority (CAA), under which jurisdiction the establishment or project falls. The CAA assesses the EIA and sends a copy to the EEAA for review. Subsequently, the CAA issues the license. The Act is implemented by Executive Regulation No. 338/1995, which identifies the establishments and projects that must be subjected to an EIA based upon four basic standards, namely: the type of activity, location of the project, exploitation of natural resources and the type of energy used in the operation. To address the demands of processing EIAs and creating a uniform structure for the submitted EIAs, the EEAA has developed Guidelines for Egyptian Environmental Impact Assessment, which describes in detail the procedures for the preparation of an EIA. The approach adopted in the Guidelines depends on the classification of projects into the following three categories reflecting increasing levels of EIA according to the severity of possible environmental impacts:

- White list projects with minor environmental impacts.
- Grey list projects which may have substantial impacts and may require a scoped EIA.
- Black list projects which require a fully-fledged EIA due to their potentially severe impacts.

The Guidelines include two screening forms, form A for white list projects and form B for grey list projects. For grey list projects the EEAA may require a scoped EIA whose scope is defined by the EEAA on the basis of the information presented in form B. The Guidelines include a general outline of the content of a full EIA report, as well as sectoral guidelines that define the content of EIA reports for establishments that need full EIA.

Reportedly, fisheries projects belong to the grey list, which requires fish farmers to fill in form B. However, fish farms situated in ecologically sensitive areas such as protected areas, or in urban areas, may be considered black list projects and require a fully-fledged EIA study. One such region is the Red Sea.

## 4.5 Licensing requirements

According to Law No. 124/1983, to establish a fish farm, a license must be obtained from the MoALR, which is issued after obtaining authorization of the MoWRI. The license must indicate the quantity of water permitted for water use, its source, inlet size and the method of drainage, including the conditions.

To obtain a license for aquaculture activities, the applicant should fulfill the following requirements:

- Inspection application with the data of the applicant and their partners – in case there are partners i.e. ID, land ownership deed or rent contract with approval of landlord (a copy and the original of landlord approval), as well as the expired license at renewal.
- Approval of MoALR stating that the land in question is fallow and is not suitable for agriculture.
- Cadastral maps for the location of scale 1:2500, with the area, location and source of water (irrigation and discharge).
- Drawings of the various establishments such as pools, gates, levers plants, storehouses, management and workers premises.
- Receipt for paying fees (where fees amount to LE11 for feddan including inspection and licensing fees, service fees and taxes).
- Approval of MoWRI.
- For marine aquaculture which relies on sea water, the approvals of the Authority for Shore Protection and Guard of Borders are required.
- If the location is suitable for establishing a fish farm, the competent authority sends a copy of the application together with 2 copies of cadastral maps and schematic drawings for industrial establishments, statement of irrigation and discharge sources, specifications of feeding and discharge plants – if applicable, to obtain the approval of MoWRI provided that the detailed drawing is presented during inspection procedures.
- If the irrigation inspection authority approves, the fish farm owner should implement the construction works in accordance with the drawings under the supervision of the irrigation engineer for the feeding and discharge openings.

Upon approval of the license, the province affiliated with GAFRD issues a "Fish Farm Card" which entitles the investor to the following:

- Obtain a share of feed, if available;
- Obtain mullet fry;
- Periodic passage of GAFRD specialist to provide the required technical guidelines and solve breeding or disease problems if applicable.

## 4.6 Impacts of current legislation on aquaculture

Whilst officials within the government – in particular represented by the MoALR and GAFRD – seek to support the aquaculture sector through, as far as possible, a flexible interpretation and application of the legislation, in general the legislation and institutional setup is out of date and does not reflect the current priorities and needs of the industry. There is a clear lack of coherence in Egypt's state policy towards the aquaculture sector.

State policy as expressed in the Law No. 124/1983 concerning regulation of aquaculture, appears to favor a policy to support agriculture at the expense of aquaculture in terms of access to land and water resources, as reflected in Article 48:

- 1) Prohibition of use of fresh water in aquaculture, requiring that agricultural drainage water be used instead;
- 2) Prohibition of establishment of fish farms on agricultural land, and allowing their establishment only on desert or fallow land.

The legislation thus disfavors the sector through prohibition of use of fresh water and allowing establishment of fish farms only on land not suitable for agriculture. Furthermore, by prohibiting use of fresh water (except in hatcheries established by the state), it puts private sector hatcheries at a disadvantage. This disadvantage has been further enhanced in reality by allowing capture of fish fry from the wild which competes directly with hatcheries.

Furthermore, the lack of a coherent strategy across different Ministries has resulted in a long list of license and permit requirements (see Annex 1 for licensing requirements) requiring separate approvals of multiple competent authorities. As a result, unlicensed fish farms constitute nearly 60% of the sector.

On the other hand, the government has stopped short of a rigorous enforcement of this legislation, and there are many examples of aquaculture farms in operation in contravention of these measures. Whilst this has allowed the sector to develop to a degree, the operation of farms with doubtful legality, limits their access to credit for investment and expansion. It also means that the Government of Egypt is not able to take full advantage in terms of tax revenues.

There is a clear need to update policy to ensure that support for the sector (or at least equal treatment with other agricultural and livestock activities) is expressed in the legal framework. Aquaculture policy should therefore be to revise the Fisheries Law No. 124/1983, and ensure that the needs of aquaculture are considered in the resource allocation approach of MoWRI. There is also an evident need to strengthen coordination amongst all of the Government authorities involved in issues of permits, as well as other regulatory controls (such as SPS issues).

## 5. Key issues in sector development

### 5.1 Site locations and licensing

#### 5.1.1 Access to land and water resources

As described in Section 4, aquaculture using irrigation and Nile waters may only lawfully take place in locations where a) it does not occupy land designated as agricultural land and b) where it does not use fresh water supplied from the Nile or from irrigation canals (unless the activity is hatchery operation operated by the Government). Additional constraints are placed on selection of sites by permit requirements applied by MoWRI and Ministry of Environment, which will determine on a case by case basis whether the water use and discharge conditions conflict with relevant criteria. Thus cage aquaculture activities upstream of the lowest barrage on the Rosetta branch of the Nile River have been restricted on the basis of its contribution to low oxygen levels. On the other hand, there is no legislation which covers location of marine cages (although their requirements for permits from the Ministries of Environment, Defense and Tourism may restrict locations) and there is no legislation concerning use of groundwater in infertile lands.

The main consequences of these restrictions are that:

- Aquaculture development is spatially limited to those sites which meet the criteria; these may not be optimal in terms of production criteria (for example energy costs in pumping, water quality, soil conditions etc.).
- Aquaculture operators utilizing seawater, or groundwater, or using marine cage production operate without a clear legal basis.
- Farmers are not free to use their land for any agricultural use (crops, livestock or fish production), leading to sub-optimal use of national resources.
- Water quality of "drainage" canals may be a source of contamination of aquaculture products.
- The restrictions do not recognize the potentially advantageous use of aquaculture effluent to fertilize crop agriculture.
- Private sector hatchery businesses operate under greater restrictions compared to competing government operators.

Overall, the legal limitations distort the business environment for aquaculture and influence investment decisions. Of particular damage is the resulting uncertain or poorly defined legal status of many operators, which undermines incentives for investment, and limits availability of formal credit for development (due to lack of collateral).

#### 5.1.2 Registration and licensing

Aquaculture operators, especially smaller individual operators, find the system of permits and licenses required to operate to be a burden. One operator reported a requirement for 16 separate permits. There is clearly scope for a substantive review of this system, with the objective of streamlining the administrative requirements. A number of options are available, to include:

- Removing certain low impact operators (defined by size, species, stocking density) from the requirement for licenses. The system should distinguish between registration and licensing, where all operators are required to register (thus ensuring their location, activity and dimensions are recorded for statistical purposes), whilst those which may have negative impacts are subject to the stricter controls delivered by a licensing system.
- Introducing of aquaculture zones (where substantive permission from different authorities are obtained by GAFRD for the whole region, with subsequent investors needing only to sign the lease with GAFRD).
- Establishing a streamlined licensing system (implementing a "one stop shop" whereby key authorities combine their application forms, and jointly (via an aquaculture committee) consider the application, thus removing the need for serial applications, and ensuring that license and lease conditions are coherent and reflect the requirements of a range of regulatory requirements.

#### 5.1.3 Pollution controls

Under both Law No. 48/1982 concerning protection of the water of River Nile from pollution and Law No. 4/1994 on the Environment, effluent from aquaculture operators is required to comply with discharge requirements, which must meet specific standards. Operating licenses specify the allowed quantity and quality of effluent to be discharged and may, as a condition require license holders to provide suitable waste treatment. Licenses can be revoked under certain conditions. If, for example, the pollution level of a licensed discharge increases and the facility fails to install appropriate treatment within a certain period, the license can be revoked.

In general, these requirements appear not to have impacted unduly on aquaculture operators, although this may be due to the fact that many of those potentially affected do not operate with the required permits. What is clear is that the system does not reflect the limited impact of certain types of aquaculture. For example, low input, extensive production results in very limited environmental impacts (and indeed may produce an effluent with a lower BOD (Biological Oxygen Demand) than the inlet water. There is potential to release certain types of aquaculture from any of these licensing requirements, and this may promote their lawful development in the formal sector.



## 5.2 Risk of oversupply to the market

Production from Egyptian aquaculture has grown rapidly since 1997, to almost 1 million ton in 2011. Tilapia and carp comprise 83% of aquaculture production. Figure 2 shows the trend in the average ex-farm price of tilapia since 1995, indicating that prices of fish have fallen in real terms over the entire period of production growth. This is a typical feature of a successful aquaculture sector, indicating that the market is functioning well (in that prices are responding to increasing supplies) and that aquaculture operators are responding by increasing efficiency of production (especially so considering that costs of feed inputs have increased significantly).

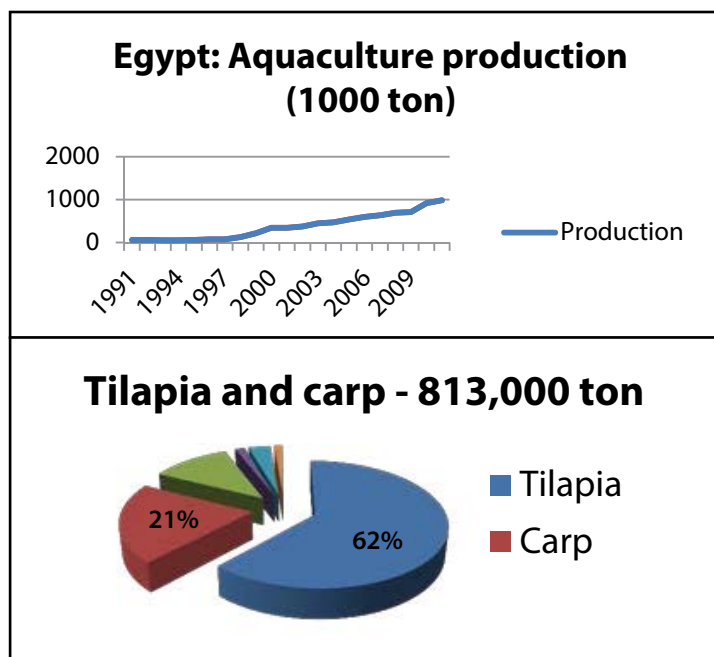


Figure 1: Aquaculture production in Egypt (Source GAFRD 2011).

However, there is now anecdotal evidence that many fish producers are finding significant pressure on margins. The risk of over-supply to the market, especially during peak harvesting season (November onwards) is real. Such events have been experienced in the marketing of aquaculture products elsewhere (Pangasius from Vietnam, salmon from Norway, trout in the UK and shrimp from SE Asia), resulting in withdrawal of many producers from the business. There is a risk that the Egyptian sector could lose some of the significant gains made in terms of rural employment and food security, unless steps are taken to develop the market in line with growth in production capacity. Market development measures are therefore required to expand the market and ensure that demand increases with supply.

Some of the measures proposed are:

- Investment in distribution infrastructure to expand distribution channels (existing and new markets such as tourist catering, supermarkets)
- Generic promotion to the domestic market
- Development of exports
- Import substitution

Each of these is considered in more detail below:

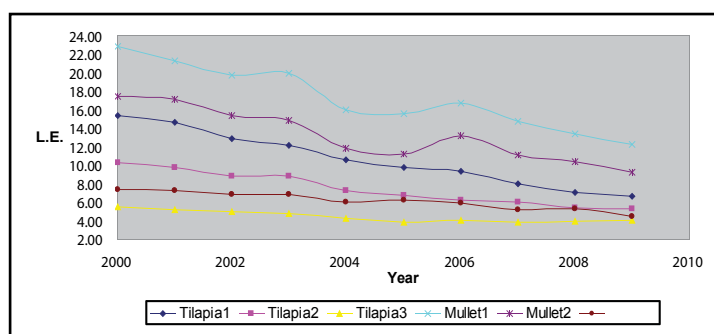


Figure 2: Wholesale price trends for Egyptian aquaculture products, 2000 to 2009 (Source: The Market for Egyptian Farmed Fish, MacFadyen G. et al, IEIDEAS Project, WorldFish June 2012).

### 5.2.1 Investment in distribution infrastructure

It is remarkable that almost all of the production from Egyptian aquaculture is transferred directly from the pond to a vehicle operated by a wholesaler or direct to a wholesale market, with very little intermediate activity. Harvest and distribution conditions are very poor. Typical malpractices include:

- Insufficient use of ice, and poor icing practices
- Poor sanitation and hygiene; lack of cleaning and sanitizing of fish contact surfaces throughout the supply chain
- Transport of fish in inappropriate vehicles
- Lack of refrigerated storage

The consequence of the poor handling conditions is that fish spoils very rapidly (within one or two days after harvest), with a corresponding loss of value at the end of this period. This impacts directly on retailers, who may have to discount prices to sell fish which cannot be stored for another day of trading. Indirectly, it impacts on producers and wholesalers since their markets are limited to those channels which can absorb production volumes within a day or two of distribution time. Fresh whole tilapia can remain fit for human consumption for 2 to 3 weeks, providing it is harvested and stored under good conditions<sup>6</sup>.

The domestic market can be expanded simply by employing shelf life extension through improved handling. This will allow fish to reach locations and market segments not currently served by the existing distribution system. Improved quality and shelf life will also open up the catering market (few restaurants and hotels list tilapia on their menu), as well as allowing fish to be placed in supermarkets.

What is required in the first instance is a much improved distribution of fresh chilled fish on ice, which is the product for which there is greatest demand by the mass market of domestic consumers. Such a business would:

- Work with selected suppliers (under contract, this avoiding unexpected price fluctuations)
- Supply ice to farms
- Collect fish at harvest
- Receive and sort at the factory
- Wash, weigh, and grade
- Chill and store on ice, pending distribution
- Pack chilled fish in fixed weight (in polystyrene boxes, with ice)
- Distribute via a network (including operating chill rooms in major population centers)

Purchasers would be able to keep fish fresh for several days after receiving the fish (in the polystyrene box in which it was supplied). Species, net weight, grade of fish and shelf life limit would be indicated on the label. It should not be necessary to handle the fish at each transaction (only the box). Additional ice could also be supplied if more was required. This system would ensure a high quality product delivered to wholesalers and retailers throughout the country, and it could significantly expand the market, thus helping to keep prices buoyant.

Subsequently such plants could add higher value added lines according to demand (different presentations, Headed & Gutted, fillets etc.). Frozen products would provide immediate benefits to producer by ensuring a market for seasonal surpluses. The producer would also be suitable for export (whole or gilled/gutted, according to requirements). Packaging, ice and labor would all add to the cost. However, this would be balanced by the fact that a) there is a market for premium products (as evidenced by the success of sales of live fish from Fayoum) and b) value lost through spoilage would be regained.

To bring such a development about there is a need to:

1. Prepare outline of business plans
2. Prepare technical specifications
3. Identify interested investors/groups
4. Advise/support on implementation

The Danish Arab Partnership Program has proposed an intervention to support investment in fish processing establishments<sup>7</sup>, to help create value added products based on aquaculture supplies. The approach focuses on value added through product development (frozen fish, fillets etc.). This could be adapted (with support from the IEIDEAS project) to support the development of fresh fish packing facilities.

### 5.2.2 Market research

The current consumption levels correspond to an average of approximately 1 fish/person per week. This has had a major impact on food security (providing not only protein, but also omega 3 and 6 essential fatty acids (with implication for development of the nervous system in the fetus) and Vitamin D (with implications for calcium metabolism.)

However, until now there has been no research undertaken on consumer aspects of aquaculture. There is a need to undertake market research to characterize consumption by socio-economic variables, to determine who eats fish, which types, how much, how it is prepared etc. Furthermore anecdotal evidence suggests that farmed fish has a negative image, and attitudes to fish and farmed fish also need to be characterized as the starting point for design of appropriate marketing strategies.

### 5.2.3 Generic promotion and market development

There has been no generic promotion of farmed fish in Egypt. There is good evidence that generic promotion can help to expand markets, and the longer term aim should be for Egyptian aquaculture producers to fund, design and launch generic promotional campaigns. Possible activities which could be undertaken include leaflets, press radio, and even TV adverts, sponsorship etc. Such campaigns are commonly undertaken in other countries by aquaculture operators acting collectively, to ensure maximum market penetration of their products. Examples are Norwegian salmon, and Vietnamese pangasius campaigns.

The industry also needs to consider means of differentiating its product in the market. One such measure could be to seek to protect the name "Nile tilapia" for use by Egyptian operators who meet specific conditions of production. This would provide a strong promotional tool for use in both domestic and export markets.

<sup>6</sup>Storage Life of Tilapia (*Oreochromis niloticus*) in Ice and Ambient Temperature, Ihuahi Josiah Adoga et al [http://www.sciencepub.net/researcher/research0205/06\\_2727\\_research0205\\_39\\_44.pdf](http://www.sciencepub.net/researcher/research0205/06_2727_research0205_39_44.pdf)

Shelflife of whole fresh Lake Malawi tilapia (*Oreochromis* species – Chambo) stored in ice, F Kapute, J Likongwe, J Kang'ombe, C Kiiyukia, African Journal of Food, Agriculture, Nutrition and Development <http://www.ajol.info/index.php/ajfand/article/view/85311>

<sup>7</sup>The Danish Arab Partnership Program, Egypt: Economic Development and Job Creation in the Aquaculture Sub-sector Concept Paper, 21 February 2013.

It is not known whether this is feasible (given that the reference to the Nile is actually used in the Latin name of the fish – *Oreochromis niloticus*), or whether, if it is feasible, it is too late (since others have used this name). However, within Egypt, and in key export markets, producers could actively seek to register this name as a trade mark. Where target markets operate geographical indication schemes (for example within the EU) producers could seek additional protection by registering this name as protected designation of origin<sup>8</sup>. The Ministry of Industry and Foreign Trade could be requested to support such an approach (for example by including recognition of such schemes in negotiations on trade agreements). The MoALR may have to prepare new legislation to provide such a protection within Egypt.

The use of the name (and an associated logo) could be linked to compliance with a quality scheme (for example covering good aquaculture practices and good hygienic practices). Several aquaculture producers have successfully adopted this quality mark approach.

Although a complex process, the fact of seeking to protect the name “Nile tilapia” would in itself create some considerable publicity. The IEIDEAS Project could support EFPEA to conduct an initial feasibility study to help define a strategic approach to obtaining registration of the name and establishing a quality mark scheme.

Another prospect for market development would be to enhance the nutritional value of farmed fish. Compared to marine fish, tilapia is relatively low in lipids and therefore in the essential fatty acids (unless consumers also eat the head and the eyes, which may be the case – consumer research should determine this). However, there is evidence that by supplementing the diet of tilapia with high omega 3 oils (e.g. flax seed oil), the essential fatty acid content can be increased<sup>9</sup> (see Table 2 below). Feed suppliers could therefore modify their formulas to gain improvements in food security from aquaculture (being one of the national objectives of this activity), without increasing production. Nutritional value of farmed tilapia could be an important pillar of the domestic promotional campaign.

#### 5.2.4 Development of exports

The growth of Egypt’s aquaculture sector has until now been led by demand from the domestic market. Whilst this market must remain the main focus of the future development (through measures described elsewhere in this study) there is also a role for export.

Exports of fishery products from aquaculture are estimated at 15,776 ton in 2011 (Table 3). This represents only about 1.5% of production. Reported destinations are Gaza and Dubai. Egypt is unique amongst major global aquaculture producers in that it has developed its sector based almost exclusively on the domestic market. This means that export potential has hardly been exploited at all, and there is a substantial opportunity to develop export markets.

The obvious target markets are the EU and Middle East countries (particularly Saudi Arabia, UAE, Kuwait, Jordan, all of which are substantial fish importers). However, although Egypt has been able to export marine capture fishery products to the EU since 2002, it has not been able to meet EU sanitary conditions for the export of products from aquaculture. Even if the principal target markets for exports are non-EU countries, it will remain a valid strategy to gain access to the EU market, since:

- some aquaculture producers (particularly of marine fish species) may be able to obtain sales in the EU due to a seasonal competitive advantage compared to EU producers;
- being unable to claim compliance with EU sanitary conditions creates a competitive disadvantage in entering non-EU markets for fishery products.

Therefore developing effective veterinary drug controls and residue monitoring systems in line with EU requirements should be considered as an important short term objective for the MoALR, as a means of improving the marketing of aquaculture products. More details of the approach recommended are shown in Section 5.5.

Furthermore, there is significant export potential in other Middle East markets (particularly GCC countries). Whilst, these countries do not require specific monitoring systems to be in place (at least not yet), it is increasingly common to apply EU access as the benchmark for sanitary controls. Therefore even for exports to non-EU countries it is a great strategic advantage to be able to demonstrate compliance with EU requirements.

**Table 2:** Omega 3 FFA composition of fillets from Tilapia fed diets with various flaxseed oil content

Composition	Flaxseed Oil 0%	Flaxseed Oil 1.25%	Flaxseed Oil 2.5%	Flaxseed Oil 3.75%	Flaxseed Oil 5%
Total Lipids (g/100g)	1.1 ±0.2a	1.1 ±0.2a	1.2 ±0.3a	1.2 ±0.2a	1.1 ±0.2a
Moisture (g/100)	77.4 ±0.0.7a	76.8 ±0.0.4a	77.2 ±0.0.7a	77.3 ±0.1.2a	76.9 ±0.0.4a
LNA (mg/g)	6.5 ±1.8a	18.8 ±3.0b	34.2 ±3.3c	55.3 ±7.3d	59.3 ±7.5e
EPH (mg/g)	0.1 ± 0.0a	0.8 ± 0.1b	1.4 ± 0.1c	2.0 ± 0.2d	2.5 ± 0.4e
DHA (mg/g)	9.9 ± 2.6a	16.8 ± 2.2b	22.7 ± 2.7c	25.9 ± 2.6d	26.1 ± 2.0e

Results are an average of 30 replicates. Different letters in same line signify significant difference (P<0.05)

<sup>8</sup>For example Vietnamese fish processors recently obtained protected designation of origin in the EU for their excellent fish sauce, Phú Quốc

<sup>9</sup>Tilapia Composition, Part I. Proximate Analysis, Factors Affecting Fatty Acid Composition, George Flick, Global Aquaculture Advocate, November/December 2006

### 5.2.5 Import substitution

Imports of fishery products were 160,000 ton in 2010, of which 88% were frozen small pelagic fish (herring, sardine, mackerel, horse mackerel) falling within HS code 0303 (see Table 4). A significant proportion is imported and traded by private sector operators, including some products destined for smoking (herring) and canning (sardine). However, the State Owned Enterprise (SOE), the Egyptian Fish Marketing Company, also imports such products for distribution at modest margins, via their own outlets or via state-owned cooperative stores (gaameya). It is very possible that these products compete for market share with lower priced products of Egyptian aquaculture (such as carp, small sizes of tilapia, and catfish).

**Table 3:** Exports of fishery products from aquaculture

Year	CAMPPS (ton)
2009	1,934
2010	7,100
2011	15,776

In general, ex-farm price of aquaculture products and CIF cost of imported small pelagics are comparable (average value of imports of these species in 2011 was US\$1,561 per ton). There is a lack of coherence in a policy fish of purchasing imports with public funds, which may compete with nationally produced products. Market policy for the aquaculture sector should aim to maximize the purchase of locally produced fish by SOEs.

More work is required to characterize and identify the extent of this competition. The proposed consumer research (see section 6.2) should inter alia identify sources and species of fish purchased, and the extent to which aquaculture species (particularly carp, catfish and tilapia) compete with imported frozen mackerel/horse mackerel sold direct to consumers. Purchase strategies of importing companies should be identified. Sales of aquaculture products could be targeted at importers (both public and private), with a view to them supplying Egyptian aquaculture products via their distribution networks.

**Table 4:** Imports of small pelagic fish by Egypt in 2012

Species/Code	Quantity (kg)	Value US\$	Av.cost (US\$/tonne)
Frozen whole herrings (030351)	14,431,408	25,626,470	1,776
Frozen whole mackerel (030374)	42,503,140	64,627,250	1,521
Frozen whole sardines (030371)	9,047,713	9,015,780	996
Other frozen fish (whole) (030379)	75,898,056	122,219,590	1,610
Totals small pelagics	141,880,317	221,489,090	1,561
Other fishery products, molluscs and crustacean	18,547,791	87,968,169	4,743
Total imports of fishery products (excluding canned fish)	160,428,108	309,457,259	1,929

Source: CAPMAS: NB assumes that imports under 030379 are horse mackerel

### 5.3 Organization of aquaculture business operators

There are two bodies which represent different groups of aquaculture producers. The UAC has a well established organizational infrastructure, with Board of Directors, and an administrative and executive staff, including an experienced technical adviser. However, the Union can only represent cooperative societies, and cannot represent the full extent of business operators in the supply chain (such as input suppliers, distributors, and processors). Companies farming fish are also excluded by law from formally participating in the cooperative organizations.

The EFPEA is able to represent a wider range of stakeholders, and although formed in 2007, has only 26 members. It has a Board, but no executive staff, and therefore depends on the unpaid acts of its Board members for any intervention activities.

Both organizations operate effectively as lobby organizations, representing the views of their members to Government on aspects of policy and legislation. However, until now, neither organization has performed the full range of functions needed at this stage to ensure the sector they represent addresses some of the challenges identified by this mission. In particular, there exist no mechanisms to design, fund and implement the collective marketing actions required for development of the market for freshwater aquaculture products. Neither organization has a business plan for the development of member services.

In other countries, the development of strong, well-financed and managed producer associations has made an important contribution to the development of the aquaculture sector. However, in Egyptian aquaculture, there is a lack of technical, managerial and financial resources to develop a structured approach to the development of future activities by sector organizations. The weakness of these two organizations in the field of marketing planning on behalf of the sector is a major constraint to be addressed, if these challenges are to be overcome. It suggests that there is a need to support these organizations to become established as effective bodies delivering a range of business related services to their members.

Furthermore EFPEA exists alongside the cooperative society structure and UAC. Indeed, there are some members in common. Although there are good relations between several of the individuals concerned, there is no formal agreement between the two organizations. There is a risk that if views were to diverge, then the representation of the sector to the Government would be divided. Given that there are two organizations with essentially the same objectives, and with overlapping memberships, there will also be a need to establish an effective coordination mechanism.

## 5.4 Limited fry inputs for marine aquaculture

Marine aquaculture activities produced an output of about 145,000 ton in 2011. It is estimated that this equates to a total demand for juveniles in the region of 1.5 billion units (Table 5). Note that 78% of the production comprises mullets, mostly *M. cephalus* and *L. ramada* which reproduce in the marine environment but can be grown in the same low salinity systems as 'freshwater' fish such as tilapia.

Law No. 124/1983 prohibits the collection and removal from the sea, lakes or other water bodies of fish fry (i.e. young or newly hatched fishes) and their trading without a permit issued by GARFD. Permits are only issued on the condition that fry are supplied to GARFD. For many years the policy has been to operate a government monopoly in the collection and distribution of fish fry (though a network of licensed collectors and traders, and official fry collection centers). Prices are held artificially low as a production support measure in favor of government farms and private fish farmers. These prices offered are substantially lower than market value, with the result that many fishers catch fry without a license and sell it to traders who also operate illegally.

As well as illegal and legal capture of marine fish fry, there are a number of marine hatcheries in operation (two private and three in the public sector). Based on the known outputs of legal sources determined from GARFD statistics, Table 6 shows the estimated quantities of fry derived from the different sources of juveniles of marine fish species for aquaculture, indicating that 95% of the supplies are derived from illegal fisheries.

The capture and distribution of marine fish fry (from both official and illegal operators) undermines investment in marine hatcheries since hatchery facilities cannot compete on price with official government and illegal operators, who supply cheaper fry from capture fisheries. As well as removing incentives for hatchery production, maintaining supplies of fry from the wild has several consequences:

- High mortality due to poor harvest holding and transport conditions
- Fry with wide variation in growth rates limits improvements in production efficiency
- Commercial strategic benefits of aquaculture not realized (seasonal markets, production planning)
- No potential for genetic improvement with supplies from the wild
- Illegal, unregulated and unrecorded (IUU) marine capture of fry is ultimately unsustainable and carries a risk of recruitment collapse as spawning stock biomass declines (although until now there is no evidence that this is the case)<sup>10</sup>
- Conflicts (fishermen v. aquaculture)
- Commercial development of improved reliable hatchery technology for mullet is undermined

It is clear that the development of the marine aquaculture sector is being held back by the lack of marine fish fry, and the need for hatchery production is now greater than ever. Most of these impacts are due to illegal operators, given that they account for the majority of the supply. The Government will need to act to eliminate the illegal fry trade.

Whilst in theory, the easiest way to do this is through enforcement of the existing legislation, this may be difficult to implement in a single step, since it would have a significant impact on coastal livelihoods (both fry fishers and marine aquaculture producers). It would also create a major technical challenge (since the fry business is essentially a criminal activity and therefore clandestine by nature).

An alternative approach therefore needs to be found, and it is proposed that this should be by creating stronger incentives for marine aquaculture producers to use fry obtained from hatchery operations (at least for species such as bass and bream, where such technology is already established). This means that they should be encouraged to intensify their production by a combination of legal measures (preventing the use of trash fish as feed), and financial incentives for intensification (rental discounts for undertaking to use marine fish feed, equipment required to manage more intensive production such as monitoring, aeration etc.).

Alongside such measures, Government could introduce licensing of the existing fry fishers, and then gradually reduce the number in line with principles of sustainable fisheries. However, it should be considered that 78% of the current production is mullet, for which a robust hatchery technology has not yet been developed (although the proven techniques do exist, they have until now never been successfully extended in Egypt)<sup>11</sup>. Most Mediterranean countries use marine capture fry of these species as inputs for their aquaculture sector, and Egypt will therefore need to maintain this source of supply for mullets until such time as suitable hatcheries are in operation. By operating strict harvest seasons when certain species are available, alongside restricting numbers of licenses (using access fees, allocated by public auction) it should be possible to manage the exploitation rates to ensure sustainable levels of fishing.

<sup>10</sup> An investigation of the stock status of the five species of mullet harvested for fry, along with other marine species (seabass, seabream and meagre) by the National Institute of Oceanography and Fisheries should be considered to be a research priority.

<sup>11</sup> The Italian Debt Swap Project: Marine Aquaculture in Egypt is however addressing the required improvements in marine hatchery technology skills and capacity.

## 5.5 Weak sanitary and phytosanitary (SPS) controls

### 5.5.1 Residue monitoring

Egypt is listed under Decision 766/2006/EC of the European Commission and is thus allowed to export fishery products to the EU. The Competent Authority for the implementation of sanitary controls of fishery products exported to the EU is currently the GOVS under the MoALR<sup>12</sup>. Ten export processing establishments are listed as being approved by GOVS in September 2012.

The EU requirements for food safety controls for animal products of farmed origin are set out in Council Directive 96/23/EC of 29 April 1996 on measures to monitor certain substances and residues thereof in live animals and animal products<sup>13</sup>. This sets out the requirements for the design and implementation of a residue monitoring plan to be implemented by the relevant Competent Authority. However, Egypt has not submitted a residue monitoring plan for aquaculture products, in accordance with Directive 96/23 and is not one of the countries listed under Decision 2004/432/EC of 29 April 2004 on the approval of residue monitoring plans submitted by third countries in accordance with Council Directive 96/23/EC. It cannot therefore export aquaculture products to the EU<sup>14</sup>.

Other work by the IEIDEAS project has described the negative attitude of Egyptian consumers to farmed fish, which is reported to be considered by the public to be contaminated. This is probably not the case for all aquaculture products, although there is no substantive evidence either way<sup>15</sup>. To meet both export market requirements, as well as protecting the health of Egyptian consumers, there is a need for a scientifically designed and published annual monitoring scheme for farmed fishery products, to be executed by an independent body, with follow up and transparent reporting. Egypt does not have comprehensive regulatory control systems which addresses human food safety hazards in animal feeds (including fish feed). Neither is there an effective regime regulating the use of veterinary medicines (approvals, restrictions on use, record keeping, withdrawal periods, and maximum residue limits). Both of these issues will need to be addressed in the development of the SPS regulatory framework for aquaculture.

**Table 5:** Estimated demand for marine fish fry, 2011

Group	Production (ton)	% of Production	No. Of Units	Survival %	Original No. required
Mulletts	114,001	78	409,006,587	30	1,363,355,290
Seabass	17,714	12	63,553,326	75	84,737,768
Seabream	14,155	10	50,784,539	75	67,712,719
Totals	145,870	100	523,344,452		1,515,805,776

Source: GAFRD Statistics, 2011, industry sources

<sup>12</sup>The Ministry of Industry and Foreign Trade is developing a proposal for the establishment of the Egyptian Food Safety Authority, which, if approved, would take responsibilities for food safety regulation.

<sup>13</sup> See <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31996L0023:EN:HTML>

<sup>14</sup> It is commonly believed that this is due to the condition in Egyptian law, noted earlier, that water supplies for aquaculture must come from drainage canals. In fact this is not the case.

<sup>15</sup> A recent ad hoc study by IEIDEAS project found 1 sample from 31 had measurable levels (0.01mg/kg) of Chlorpyrifos an organophosphate insecticide. Five samples had detectable presence of the organochlorine pesticide DDE (but with levels below LOQ). All other samples were "not detected" for organochlorine and organophosphate pesticides and heavy metals (Hg, Cd, Pb and As). However, there was no confirmatory testing by official methods, no follow up of positive results, no testing for illegal substances (for example malachite green), and no testing for residues of veterinary medicines (all being elements required by Directive 96/23). This ad hoc study, as do all others conducted in recent years, does not provide evidence of safety of Egyptian aquaculture products

<sup>16</sup> in 2012 juvenile seabass were imported from Tunisia

**Table 6:** Sources and numbers of marine fry 2011

Source	No. Of Units	%
GAFRD fry centers	62,528,000	4.1
Hatchery	15,800,000	1.0
Illegal catch	1,437,477,776	94.8
Totals	1,515,805,776	100

Source: GAFRD Statistics, 2011, industry sources

### 5.5.2 Fish disease monitoring and controls

Current legislation on animal health controls does not apply to fish produced in aquaculture, and Egypt therefore has no regulations governing fish diseases. There are no checks on third countries supplying live juveniles or gametes for aquaculture<sup>16</sup>.

The intensification of aquaculture increases the risk of occurrence of diseases and their spread. Although freshwater species grown in Egypt (such as tilapia and carp) are considered to be quite robust and not generally threatened by common diseases, there is a definite risk of aquaculture being threatened by disease. In other parts of the world, substantial salmon and shrimp farming businesses have been devastated by the spread of fish diseases. It is therefore in the interests of longer-term sustainability that the MoALR and its competent authority for animal health, the GOVS, take steps to protect Egyptian aquaculture producers from introduction and spread of infectious fish diseases.



## 6 Conclusions and recommendations

### 6.1 Conclusion

#### Strengths weaknesses opportunities and threats in Egyptian aquaculture

The following table provides a summary analysis of the strengths weaknesses opportunities and threats for aquaculture activities, considering separately marine and freshwater production systems (since they have different SWOT characteristics) and those issues which are common to both.

Activity	Strengths	Weaknesses	Opportunities	Threats
General aquaculture	<ul style="list-style-type: none"> <li>Clearly defined legal and institutional responsibility for aquaculture development</li> <li>Native species suitable for culture with strong market image and good culture</li> <li>Characteristics in Egyptian waters (tilapia and mullet)</li> <li>Good domestic market accustomed to fish consumption</li> </ul>	<ul style="list-style-type: none"> <li>GAFRD has limited capacity to effectively protect and promote the sector's interests (expand aquaculture exports to the EU; enforce laws on capture of marine fish fry; establish effective coordination mechanisms with other Ministries).</li> <li>Land and water use conflicts (with agriculture, tourism etc) and environmental concerns limit available sites</li> <li>Difficult licensing procedures force many operators into the grey economy</li> <li>Non-existence of coherent animal health control system for aquaculture</li> </ul>	<ul style="list-style-type: none"> <li>Unexploited export, tourist and domestic (especially in Upper Egypt) markets</li> </ul>	<ul style="list-style-type: none"> <li>Risk of introduction and spread of diseases</li> </ul>
Freshwater aquaculture	<ul style="list-style-type: none"> <li>Good freshwater water resources</li> <li>Robust technologies implemented by farmers with good technical skills</li> </ul>	<ul style="list-style-type: none"> <li>Seasonal temperatures fluctuations create seasonal supply pattern</li> <li>Lack of processing establishments for packing and freezing</li> <li>Sector organizations lack capacity to provide business and marketing support</li> <li>Poor sanitary controls limit marketing options</li> </ul>	<ul style="list-style-type: none"> <li>Market development measures could stimulate demand to expand market</li> <li>Good EU and Middle East export markets for products which meet sanitary requirements</li> </ul>	<ul style="list-style-type: none"> <li>Over-supply of tilapia to market renders aquaculture businesses unprofitable</li> </ul>
Marine aquaculture	<ul style="list-style-type: none"> <li>Good sites available</li> <li>Well developed fish farms already established, based on wild fry inputs</li> </ul>	<ul style="list-style-type: none"> <li>Limited supply of fry from marine hatcheries inhibits development</li> <li>Poor management and high production costs (including feed) cf. Greek aquaculture domestic markets for bass and bream are small and price sensitive</li> <li>Lack of national technical and management expertise</li> </ul>	<ul style="list-style-type: none"> <li>Development and extension of robust hatchery technology boosts production</li> <li>Niche export markets in the Middle East and Europe</li> <li>Improved yields and efficiency through better feeding practices</li> </ul>	<ul style="list-style-type: none"> <li>Uncontrolled harvest of marine fry leads to wild stock collapse</li> <li>Competition from Greek/UAE producers in target markets</li> <li>Even modest increase in production will cause price collapse unless EU market is available</li> </ul>

## 6.2 Recommendations

Recommendations for the development of the policy, institutional and legal framework for aquaculture in Egypt, to address the opportunities and threats described are provided in this section. Recommendations have been classified into three categories addressed to the three main partners in this sector: the government, business operators and the donor community.

### 6.2.1 Government of Egypt

#### 6.2.1.1 Streamline licensing and permits for aquaculture

The Government is recommended to streamline aquaculture licensing system to eliminate unnecessary or the burdensome procedures, requirements and approvals, moving towards a “one stop shop”. For this purpose, an Inter-Ministerial Aquaculture Committee could be established to jointly consider applications (with a consolidated application form). This Committee would comprise senior officials from ministries and authorities that are involved in aquaculture (i.e. MoALR, GAFRD, MoWRI, Ministry of Environment in the first instance). Ministry of Defense, local authorities, Water Surface Police, Authority for Shore Protection and Border Guards may participate where relevant. The Committee could also be responsible for coordinating and discussing cross cutting issues related to the development of the sector (such as land, water and irrigation, environment, etc.). In particular the committee could have the following responsibilities:

- Agree on aquaculture zones and lease conditions as a means of reducing regulatory controls whilst managing impacts.
- Discuss impediments to aquaculture policy developed by GAFRD concerning cross cutting issues.
- Raise awareness among concerned authorities about importance of aquaculture for the economy and food security.
- Discuss applications for aquaculture licensing and problems faced by individual business operators along the supply chain.
- Discuss impact of relevant regulatory changes on the aquaculture sector.
- Consult and coordinate with the sector’s representative organizations on issues that have impact on the sector.
- Revise fees periodically to make sure they are kept up-to-date in line with general economic situation and any changes in the sector.

#### 6.2.1.2 Use GAFRD lease conditions to create incentives for better management

GAFRD is recommended to strengthen content of lease conditions regarding investments in farm improvement and production technologies (e.g. use of compound feed for marine species, constraints on Nile cages, etc.) that will ultimately contribute to the development of the sector. The approach is specifically recommended for the marine aquaculture sector, where, the following conditions are indicated:

- Prohibition on use of trash fish as feed (use of compound feed)
- Monoculture for bass, bream and meagre
- Use of hatchery fry for bass and bream
- Use of aeration

These measures are intended to create incentives for the use of fry from hatcheries. To compensate for the increased cost of these inputs (including formulated feed), GAFRD is recommended to provide a discount on the annual rental, for farmers undertaking to comply with relevant conditions.

This principle could also apply to the freshwater sector with incentives to maximize efficiency in terms of land and water use, and incentives to reduce waste discharges.

Lease conditions may also be used to ensure that conditions specified by other Ministries are applied (as decided by the Inter-Ministerial Committee).

#### 6.2.1.3 Revise aquaculture legislation

In the medium term, there is a need to amend/revise the legislative framework governing aquaculture, through drafting a new Fisheries Law and amendment of the Water Resources Law, to reflect the needs of aquaculture, and specifically to ensure that:

- Access to land and water resources for aquaculture activities is considered equably with other usage demands. (irrigation, industry, drinking water)
- Preferential access of Government and cooperatives to means of production is not expressed in the law.
- Small scale operators are defined and are exempt from licensing requirements except where necessary.

These laws should be developed in consultation with all relevant stakeholders to make sure a consensus is reached about the country’s priorities to avoid conflicts in the future.

#### 6.2.1.4 Strengthen sanitary controls for export and domestic markets

GOVS under the MoALR should be requested to establish an official residue monitoring program for aquaculture products. In the short term this will allow improved access to export markets. This should aim to satisfy, at a minimum, the requirements of EU Directive 96/23. It should establish an effective unit to design and implement the program and to follow up and investigate non-compliances identified by the sampling and testing regime. In the longer term the monitoring should be extended to production for the domestic market, as a tool to provide risk assessment for Egyptian consumers.

The residue monitoring plan, the annual results and the outcome of follow-ups should be published<sup>17</sup>. Regulatory provisions for fish feeds (regarding contaminants) and veterinary medicines in aquaculture are also recommended to be strengthened. Good analytical capacity (accredited to international standards) is already available in the MoALR Central Lab for Residue analysis of pesticides and heavy metals in food in Dokki (although it may require some upgrading of testing methods). However, the technical capacity of GOVS to establish such a plan is presently limited. Donors may therefore wish to support the development and launch of such a program. An outline of such a program is shown in Annex 2.

#### 6.2.1.5 Establish a fish disease control system

The GOVS of the MoALR is also recommended to develop a regulatory system for the control of fish diseases, to manage the risk of fish diseases undermining the aquaculture sector. This should be established in law, and comprise at least the following elements:

- Origin-based controls on import of live fish, juveniles, eggs and gametes (based on disease status of supplying farms)
- Denomination of notifiable fish diseases
- Regulatory powers to limit spread of diseases (e.g. zone and movement controls, slaughter of infected fish etc.)
- Surveillance and monitoring measures

The GOVS is recommended to establish a fish disease unit (with 1 or 2 specialists) to develop and manage this new function.

#### 6.2.1.6 Market policy relating to aquaculture

The MoALR, in collaboration with the Ministry of Industry and Foreign Trade, is recommended to establish a new market policy to protect and improve the benefits of national aquaculture production. The recommended key elements of this policy are to:

- Review trade policy on fishery product imports (to ensure tariff protection is maintained on species which compete with Egyptian aquaculture products).
- Ensure fish purchasing strategies of SOEs (Egyptian Fish Marketing Company) favor nationally produced fishery products, where they are competitive and meet consumer needs.
- Provide a subsidy to feed mill operators for the enrichment of tilapia diets with high omega 3 oils.
- Facilitate the protection of the geographical indications relating to Egyptian aquaculture products. (including, if feasible, the name “Nile tilapia”)

<sup>17</sup> An example is shown at <http://www.vmd.defra.gov.uk/vrc/>.

## 6.2.2 Business operators

### 6.2.2.1 Ensuring coordination between sector representative organisations

As there is a need to develop a collective approach to marketing in the future, to avoid overlapping or competing functions, the two sectoral organizations (UAC and EFPEA) should seek a modus operandi for collaboration and coordination, with a written MoU developed to allow information sharing and coordination of activities. This might include allowing mutual observer status at Board meetings.

### 6.2.2.2 Strengthening capacity of sector organizations in business planning and marketing

Private sector operators through their sectoral organizations (UAC and EFPEA) are recommended to strengthen their industry organizations. The strengthening of these organizations is recommended to include:

- ensuring representation of a wider range of commercial stakeholders in the aquaculture sector;
- strengthening their capacity to provide a range of support services to members with a view to developing capacity to deliver business and marketing services to the sector, including generic marketing activities.

Typically, aquaculture sector organizations will not only provide advocacy on sector interests to Government, but they will also provide a range of services to members. These might include collective purchase of inputs, management of social insurance schemes, and technical advisory and training services. They may also provide market-side services such as cooperative fish selling, market research, price information and reporting and generic promotion in key domestic and export markets.

The IEIDEAS project may wish to consider offering support to these organizations, in the form of technical assistance and training in business planning and service delivery in some of the above functions.

### 6.2.2.3 Implementation of a market development strategy

The sector organizations are recommended to develop a collaborative approach to the implementation of a market development strategy, comprising elements of the activities shown in Figure 3 below.

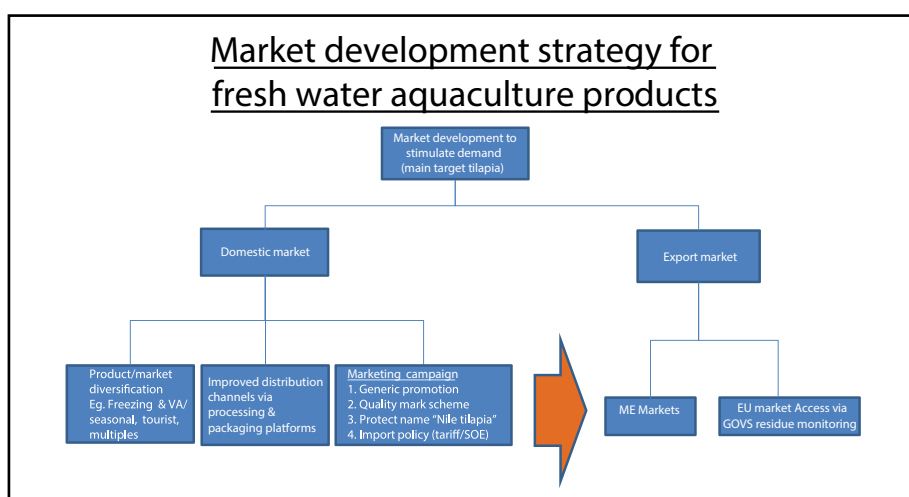
## Implementation of consumer research

Market development for aquaculture products in Egypt should be underpinned by a factual analysis of data derived from a consumer survey. This is already programmed within the IEIDEAS project. It is recommended that this considers both fish consumption and attitudes to fish in a personal interview survey of women aged 18-60, selected by stratified random sampling. The consumption questions should aim to determine socio-economic determinants of consumption of fish (age, class, sex, region, urban/rural, ethnic origin, religion), as well as types of fish, frequency, place and quantity of purchase, alternatives, preparation, and consumption occasions. A sample size of 1500 is required to provide approximately 10 responses per segment. The study should specifically determine the extent to which aquaculture species (particularly carp, catfish and tilapia) compete with imported frozen mackerel/horse mackerel sold direct to consumers. Attitudinal questions should be designed to assess attitudes on scaled constructs derived from regional focus group interviews. In particular the survey should aim to characterize and benchmark any negative images regarding aquaculture products, with a view to monitoring impact of any future generic marketing campaign.

## Establish market support activities

The sector organizations are recommended to collaborate on the development of generic market support activities. Some of the key elements could include:

- Generic promotion of tilapia (in domestic and export markets);
- Quality scheme; to develop a recognizable brand image for Egyptian aquaculture products, based on good aquaculture practices and food safety/quality principles;
- Protection of name; to investigate the potential for protecting the geographical indication of fish produced in Nile waters;
- Lobby for import protection; to ensure trade policy and purchasing policies of SOEs favor Egyptian aquaculture operators where feasible within the limitations of Egypt's international obligations.



**Figure 3:** Market development strategy for fresh water aquaculture products

### Establish fish fund and finance sources (feed levy/grant)

The above activities will require a significant investment, and a high degree of coordination. Government may wish to provide financial support for some of this investment, but sector operators will also need to carry some of the financial costs. It is in the interest of the sector to establish a marketing fund as early as possible, and a fund raising mechanism. In the interests of equity (so that all operators contribute) this could be a levy based system. Levies may be applied on inputs (fry, feed) or outputs (final products consigned to market).

#### 6.2.2.4 Business planning for investment of processing and distribution

Investment in improved processing and distribution is considered to be a sine qua non for market development. However, such a step will increase costs (in packaging and ice, as well as distribution). The assumption is that these cost increases will be more than compensated in value added gained by sector operators and consumers at a later stage of the distribution chain (especially as retailers will be able to avoid financial losses, and more consumers will have access to better quality fish which they may be willing to pay for). This assumption needs to be tested by a comprehensive business planning exercise which will:

- Establish the technical requirements, specifications and costing for investment in fresh chilled fish distribution;
- Undertake an investment appraisal, and cash flow forecast, as well as a marketing plan, drawing on the results of the consumer survey.

It is recommended that this study be undertaken within a donor funded project. The proposed DANIDA intervention, expressed under the Danish Arab Partnership Program described earlier could be adapted (with support from the IEIDEAS project) to support the development and promotion via sector organizations, of a fresh fish packing concept, and support prospective investors in its implementation. A schematic approach is suggested in Figure 4 below.

## 6.3 Donor community

International donors are engaged in the Egyptian aquaculture sector, with current and planned investments by the Swiss Agency for Development and Cooperation (SDC) (IEIDEAS), European Union, Italian-Egyptian Debt for Development Swap Program, and the Dutch Ministry of Economic Affairs. These (or other) donors can make a significant contribution to some of the interventions described previously, especially in those areas where there is only a limited existing capacity within Egyptian organizations. Based on the preceding analysis some of the areas for donor intervention in the forthcoming period could include support for the following:

- Development of simple robust protocols/technologies for marine hatchery operation and intensive marine aquaculture\*
- Strengthening service delivery capacity of sector organizations (UAC and EFPEA)
- Consumer survey (fish consumption and attitudes)\*
- Business planning and technical assistance for private investment in processing platform for freshwater fishery products\*
- Establishment of veterinary drug controls and residue monitoring program in line with EU requirements
- Establishment of fish disease control regime
- Investigation of TRIPS conditions for Geographical Indications related to Egyptian aquaculture products
- Review recommendations for a trade and market policy regime for Egyptian aquaculture products
- Revision of fisheries Law No. 124/1983

Interventions indicated with an\* are already under consideration. More details of the technical approach required to establishment of veterinary drug controls and residue monitoring program is shown in Annex 2.

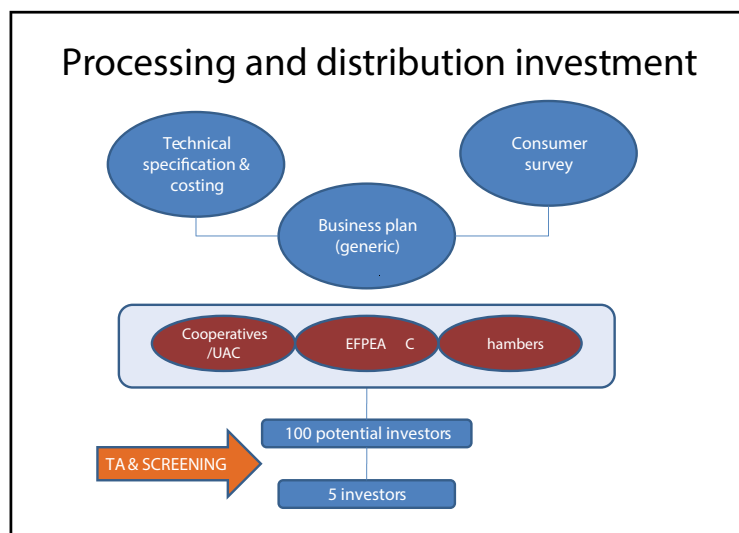


Figure 4: Processing and distribution investment

## Annex 1: Legislation applicable to the aquaculture sector

### Agriculture/Aquaculture

Legislation	Description
Law No. 124/1983 concerning fishing and regulation of aquaculture	<p>This is the main legislation regulating fishing in general and aquaculture in particular. The law sets the conditions and controls in fishing boats. It also stipulated that no foreign fishes, eggs or larva should be introduced for any purpose except with permission of GAFRD and after consulting the Institute for Oceanography and Fisheries for technical opinion.</p> <p>The law also regulates technical research and statistics for aquaculture as it required the cooperatives for aquatic, fishermen, head of fishing boats, and fish traders to collect all statistical data concerning fishing operations and fish production according to the rules specified by the executive regulation. The law specifies fishing licensing requirements and fishing and aquatic fees.</p> <p>The law stipulates aquaculture requirements. It prohibits establishment of fish farms except in fallow land not suitable for agriculture and decrees that it could only use water from lakes or nearby canals. It prohibits use of fresh water except in hatcheries established by the state. The land specified for aquaculture is determined by a decree from the Minister of Agriculture, where violating farms will be demolished at the expense of the violator.</p> <p>The penalties set out by the law range between jail, fine and confiscation of caught material. The law provides that the executive regulation shall be issued by the Minister of Agriculture after agreement with the Minister of Irrigation and other competent authorities to develop conditions and necessary approvals for regulating aquaculture and the provisions for existing farms as well as fees decreed by the Ministry of Agriculture or to obtain approval of the Minister of Irrigation.</p>
Minister of Agriculture Decree No. 303/1987 concerning issue of executive regulation for Law No. 124/1983	<p>This is the executive regulation for the law regulating fishing and aquaculture. The decree regulates fish farms including procedures, fees, competent authorities for issuing license, time for submitting documents and complying with all required conditions. According to this decree, it not allowed to harvest or sell tilapia less than 10 cm length.</p>
Minister of Agriculture Decree No. 447/2012 concerning amendment of the executive regulation of fisheries and aquaculture law, issued by Decree No. 303/1987	<p>The decree included amendments to regulation of fishing and added some conditions and controls for fishing craft in internal lakes.</p>
Presidential Decree No. 190/1983 concerning establishment of GAFRD	<p>The decree lays out the functions of GAFRD, the composition of its board and their responsibilities, and funding resources of the authority.</p>
Presidential Decree No. 456/1983 concerning specification of water surfaces where fishing is developed and overseen by GAFRD	<p>The decree specifies the water surfaces under supervision of GAFRD and it stipulates that aquaculture land specified by the Minister of Agriculture will be under control of GAFRD.</p>
Minister of Agriculture Decree No. 446/1983 concerning oversight of GAFRD on fish resources companies.	<p>The decree gives GAFRD the right to monitor and control on fishing companies (i.e. Egyptian Fishing &amp; Fish Gear Company; Egyptian Company for High Seas Fisheries; and Northern Fisheries Company).</p>
Minister of Agriculture Decree No. 2655/2003 concerning prohibition of use of the hormone of 17 alpha methyl testosterone to produce unisex tilapia	<p>The decree prohibits use of hormone of 17 alpha methyl testosterone to produce unisex tilapia in government owned and private hatcheries to protect consumers from the residues of the hormone in fish.</p>

## Aquaculture Cooperatives

Legislation	Description
Law No. 123/1983 concerning aquatic cooperatives	The law regulates the work of aquatic cooperatives which are overseen by GAFRD. The law includes provisions regarding the functions of cooperatives; their funding; establishment procedures; functions of members, as well as their rights and duties; functions of the board of directors, its composition and sessions; and reasons for meeting of its assembly.
Minister of Agriculture Decree No. 181/1984 concerning issue of executive regulation for Law No. 123/1983	This is the executive regulation for the law concerning aquatic union cooperatives specifying procedures to establish fisheries cooperatives, their sources of funding, and other details that have not been specified by the law.

## Water and Irrigation

Legislation	Description
Law No. 48/1982 concerning protection of the River Nile and water channels from pollution	<p>The law prohibits disposal in the water channels of solid, liquid, or gaseous wastes from: real estates, shops or commercial, industrial, touristic establishments or from the sanitary drainage, without a license from the Ministry of Irrigation which will issue a decree based upon recommendation of the Ministry of Health setting the measures and specifications concerning each case separately after taking samples and testing them. The Ministry of Irrigation is the only authority responsible for providing the license in question.</p> <p>If the analysis result does not meet with specifications and measures set by the law and has a direct dangerous pollution effect on water channels, the Ministry of Irrigation will advise the concerned enterprise to stop causes of pollution otherwise the Ministry will stop the discharge at the expense of the violating enterprise.</p>
Minister of Irrigation Decree No. 92/2013 concerning amendment of executive regulation of the law for protection of water and canals from pollution, issued by Decree No. 402/2009	The decree relaxes restriction for aquaculture discharge in canals.



## Environment

Legislation	Description
Law No.9/2009 concerning amendment of environment Law No. 4/1994	<p>Law No. 4/1994 established the EEAA and sets out its functions. The Authority is concerned, according to the law, with laying out the general policy for environment protection and development and monitoring its implementation with the concerned authorities. The law regulates the ways and measures for protection of air, water and air environment. It emphasizes the link between environment and development.</p> <p>The law specifies the authorities concerned with preservation of water environment which are the Ministry of Environment, Ports and Lighthouse Authority, Suez Canal Authority, ports authorities in Egypt, the Egyptian Authority for Shore Protection, General Egyptian Authority for Petroleum, General Department of Surface Water Police, General Authority for Tourism Development, any other authority identified by a prime ministerial decree. The law stipulates the need to conduct an EIA study before establishing certain projects. It also specifies penalties for offenders.</p>
Prime Minister Decree No. 338/1995 concerning executive regulation of environment Law No. 4/1994	The executive regulation lays out the composition and functions of the board of directors of EEAA. It also provides for establishment of a fund for environment protection. Furthermore, it lays out the environmental requirements and conditions that enterprises have to follow.
Prime Minister Decree No. 1741/2005 concerning amendment of some provisions of Prime Minister Decree No. 338/1995 concerning executive regulation of environment Law	Amendments include modifications to some definitions and licensing procedures for enterprises that have hazardous waste and ways to deal with this waste. The decree also prohibits establishment of any enterprises along Egyptian coastal shores for 200m to the inside except after the approval of the Authority for Shore Protection in coordination with Ministry of Environment.

## Lease of Land

Legislation	Description
Law No. 89/1998 concerning government bids and tenders	The law governs all government transactions and contracts, and sets the rules for financial transactions that are not otherwise regulated by another legislation. The law stipulates that rent or leasehold will be to a legal person through a public auction for transactions of a value more than LE50,000. For lower values it could be by restricted tender.
GAFRD Decision No. 70/1986 concerning rent and allocation of GAFRD land	According to the decision, a committee under GAFRD will determine locations suitable for aquaculture and establishment of hatcheries and dividing them into areas suitable for economic use in these activities. The value of lease or rent is determined according to the characteristics of location, availability of services and infrastructure. Land is then assigned based on a tender between applicants except in the following cases where the decision is not applicable: renting to government bodies or public enterprises; big projects that have a high economic return; if no one applies to bid; if the basic price is not reached; and land had been rented before the issue of this decision.
Minister of Agriculture Decree No. 1132/2007 concerning offering aquaculture and hatcheries overseen by GAFRD for rent or lease-holding	According to the decree, fish farms and hatcheries overseen by GAFRD are offered for rent or lease in public auctions for a period, or periods, that should not exceed a maximum of 25 years subject to the condition that the tenant should expand vertically in fish production using culture or hatchery productivity techniques and establishing the necessary infrastructure to achieve this objective. GAFRD conducts periodic reviews at the end of each lease period to renew the contract. The value of leasehold is reviewed based on prevalent prices. GAFRD has the right to break the contact and reoffer the farm or hatchery in public auction.

### Background and needs to be addressed

Egypt has been permitted to export fishery products to the European Union since 2002, and is listed in Annex II of Commission Decision 766/2006/EC. Ten establishments are approved by the nominated Competent Authority, the GOVS under the MoALR, for the export of fishery products from capture fisheries. However, Egypt is not permitted to export aquaculture products to the EU, since it has not submitted a residue monitoring plan in line with the requirements of Council Directive 96/23/EC of 29 April 1996 on measures to monitor certain substances and residues thereof in live animals and animal products.

This lack of access to the EU market inhibits the marketing options for Egyptian aquaculture business operators, at a time when the domestic market appears to be increasingly saturated, especially in the case of tilapia at the end of the growing season, when harvest quantities are the greatest. Furthermore, compliance with EU sanitary conditions is regarded as an important marketing tool for increased penetration of other markets, including Gulf countries, as well as Egypt's domestic tourist and multiple retail markets.

Directive 96/23/EC requires EU Member States (and third countries) which supply animal products of farmed origin to design and implement a residue monitoring plan, which should include sampling and testing for substances specified in the Annex to the Directive (shown below). Sampling levels and frequencies are also specified.

#### **GROUP A - Substances having anabolic effect and unauthorized substances**

- (1) Stilbenes, stilbene derivatives, and their salts and esters
- (2) Antithyroid agents
- (3) Steroids
- (4) Resorcylic acid lactones including zeranol
- (4) Beta-agonists
- (6) Compounds included in Annex IV to Council Regulation (EEC) No 2377/90 Of 26 June 1990

#### **GROUP B - Veterinary drugs and contaminants**

- (1) Antibacterial substances, including sulphonamides, quinolones
- (2) Other
  - (a) Anthelmintics
  - (b) Anticoccidials, including nitroimidazoles
  - (c) Carbamates and pyrethroids
  - (d) Sedatives
  - (e) Non-steroidal anti-inflammatory drugs (NSAIDs)
  - (f) Other pharmacologically active substances
- (3) Other substances and environmental contaminants
  - (a) Organochlorine compounds including PCBs
  - (b) Organophosphorus compounds
  - (c) Chemical elements
  - (d) Mycotoxins
  - (e) Dyes
  - (f) Others

Egypt should also have in place national regulations which establish a list of unauthorized substances, and permitted levels of authorized substances and environmental contaminants. Egypt's export of fishery products to the EU are governed by the Joint Decree 2001/1909 of the Deputy Prime Minister and Minister of Agriculture and Land Reclamation, and the Minister of Economy and Foreign Trade. This sets out some of the basic requirements for export of aquaculture. However, the regulation is out of date and needs to be updated to take into account current aquaculture practices and existing controls relating to approval and distribution of veterinary medicines.

GOVS has access to laboratory testing facilities within the Central Laboratory for Residue Analysis of Pesticides and Heavy Metals in Foods under the Agricultural Research Centre of the MoALR. These facilities are accredited according to ISO 17025 by an international accreditation body (Finnish Accreditation Service). However, the specific capacities of the laboratory and scope of the accreditation in relation to all of the tests associated with the above parameters does not address all of the parameters required for residue monitoring in aquaculture products<sup>18</sup>. It is therefore necessary to develop and validate some new test methods (the laboratory appears to have all of the equipment necessary, but lacks reference materials), validate methodologies and participation in proficiency testing for these parameters. Screening protocols will also need to be developed to allow the use of rapid tests for initial assessment of compliance in samples taken.

To address these identified needs, the following intervention approach is recommended.

<sup>18</sup> See [http://www.finas.fi/Scopes/T219\\_A10\\_2013.pdf](http://www.finas.fi/Scopes/T219_A10_2013.pdf) for the scope of accreditation

<b>Overall objective</b>
To contribute to sustainable economic development of Egypt
<b>Specific objective</b>
Develop and implement a sustainable residue monitoring plan for export of aquaculture products from Egypt to the EU Result Residue monitoring plan implemented in line with Council Directive 96/23/EC of 29 April 1996 on measures to monitor certain substances and residues thereof in live animals and animal products
<b>Objective indicator of achievement</b>
Egypt added to the list of countries approved by the European Commission for the supply of aquaculture products to the EU, under Commission Decision 2004/432/EC on the approval of residue monitoring plans
<b>Activities</b>
<ul style="list-style-type: none"> <li>• Technical assistance for revision of legislation concerning approval, distribution and use of veterinary medicines in aquaculture</li> <li>• Technical assistance for design and implementation of residue plan, preparation of annual report</li> <li>• In service training for GOVS/laboratory staff in veterinary drug use in aquaculture and monitoring (including EU study tour)</li> <li>• Technical assistance for upgrading/development of appropriate testing methodologies</li> <li>• Supply of reference materials and proficiency testing</li> <li>• Financial support for cost of sampling and testing (two rounds of samples)</li> </ul>
<b>Precondition</b>
Government of Egypt (GOVS, under MoALR) should undertake to finance the implementation of the RMP on an annual basis after the end of the project. It is not financially feasible for the plan to be financed by laboratory test fees charged to operators.
<b>Implementation arrangements</b>
<p>Implementation period should be over two years, in three phases.</p> <p>Phase 1 should support the revision of legislation, develop the plan, upgrade the laboratory capacity and train staff.</p> <p>Phase 2 should include the first round of sampling and testing and support follow ups and the preparation of the residue monitoring report for submission to the EU.</p> <p>In Phase 3 the project should also support a second round of sampling, testing and reporting undertaken by the Competent Authority, with limited technical assistance support as required.</p>
<b>Budget</b>
The dimensions of the aquaculture sector in Egypt (annual turnover c.US\$1 billion at farm gate prices) justify a substantial investment to ensure development of permanent capacity. A project budget up to US\$250,000 is proposed.

This page intentionally left blank.

This page intentionally left blank.



## *Harnessing research that makes a difference*

This publication should be cited as: Goulding, I., Kamel, M. (2013). Institutional, Policy and Regulatory Framework for Sustainable Development of the Egyptian Aquaculture Sector. WorldFish, Penang, Malaysia. Project Report: 2013-39.

The CGIAR Research Program on Livestock and Fish aims to increase the productivity of small-scale livestock and fish systems in sustainable ways, making meat, milk and fish more available and affordable to poor consumers across the developing world. <http://livestockfish.cgiar.org/>.

Design and layout: WorldFish.

Photo credits: Front cover & back cover, Heba El Begawi.

Printed on 100% recycled paper.

© 2013. WorldFish. All rights reserved. This publication may be reproduced without the permission of, but with acknowledgement to, WorldFish.



Contact Details:  
WorldFish, PO Box 500 GPO,  
10670 Penang, MALAYSIA  
Web: [www.worldfishcenter.org](http://www.worldfishcenter.org)