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VALUE-CHAIN ANALYSIS OF EGYPTIAN AQUACULTURE

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ACRONYMS

BMP	Best Management Practice
CLAR	Central Laboratory for Aquaculture Research
EU	European Union
FAO	Food and Agriculture Organisation (of the United Nations)
Fed	Feddan
FFFA	Fayoum Fish Farmers Association
FTE	Full-Time Equivalent (jobs)
GAFRD	General Authority for Fisheries Resource Development
GDP	Gross Domestic Product
Ha	Hectare
KFFCS	Kafr El-Shaikh Fish Farming Cooperative Society
MOALR	Ministry of Agriculture and Land Reclamation
MWRI	Ministry of Water Resources and Irrigation
NIOF	National Institute of Oceanography and Fisheries
SDC	Swiss Agency for Development and Cooperation

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EXECUTIVE SUMMARY

Egypt's aquaculture production (705,490 tonnes in 2009) is by far the largest of any African country and places it 11th in terms of global production. The aquaculture sector makes a significant contribution to income, employment creation and food security in the country, all of which are national priority areas given low per capita income levels, rising population, worsening food security indicators, and official unemployment levels which have remained at around 10% for the last ten years.

Despite the fact that the aquaculture sector in Egypt is now a mature one, having developed over a period of more than 30 years, the economic performance of the sector is not well understood or documented. To help improve this understanding, this report presents the outputs of a value-chain study for the sector. The study focused on four of the most important governorates in terms of aquaculture production: Kafr el Sheikh, Behera, Sharkia, and Fayoum. Individual interviews and focus group discussions with fish farmers, traders/wholesalers, and retailers, were used to collect quantitative and qualitative information about financial performance, employment creation, and the critical factors impacting on the performance of each sub-sector of the value-chain.

The farmed fish value-chain in Egypt is strongly based on the production of tilapia, with mullet a key second species, and with small quantities of carp and catfish also contributing to farm production. Some key features of the value-chain are that:

- There are virtually no exports of farmed fish, and so the value-chain is a short and simple one compared to aquaculture value-chains in some other countries;
- There is no processing at all of farmed fish i.e. all fish is sold in whole form, with no value-addition either through primary processing into fillets or into other secondary processed products (e.g. ready meals, etc);
- Most fish are sold either fresh on ice (in summer months or if sales are made far from farms) or fresh with no ice (in winter months and/or if sales are made close to farms). There is a growing trend however for the sale of live tilapia, motivated by the fact that fish prices have fallen in real terms over the last ten years and higher prices can be achieved for live product;
- There is a very short time-period from harvest to final consumption by the consumer (due to the live/fresh nature of all sales), and very low rates (<1%) of post-harvest losses (which is in contrast to many wild fisheries value-chains in developing countries); and
- Direct employment creation throughout the value-chain is significant, at around 14 full-time equivalents for every 100 tonnes of fish produced and sold. This employment is fairly evenly divided between those over and under 30 years of age, and is mostly accounted for by men, although some female employment is created in the retail sub-sector. Considerable additional indirect employment creation results from sector activity through jobs created through the production of inputs used by the value-chain i.e. jobs in feed mills, hatcheries, ice plants, suppliers of vehicles, water pumps and generators, building contractors, and manufacturers of boxes used during transport.

Constructing costs and earnings models for each link in the value chain, allows for a comparison across the various sub-sectors, and for performance to be assessed both individually in each governorate and across all governorates. Some key findings from the data analysis made possible by the fieldwork completed during the study are:

- Fish farmers obtain a high percentage (72%) of the final consumer price, due to the lack of any exports, the short-supply chain, and the lack of value-addition in the value-chain;

- The average total production cost across all fish-farms is LE 7,769/tonne. This represents the break-even weighted sales price i.e. the average price of all fish sold by a farm must be more than LE 7,769/tonne if the farm is to make a profit;
- Feed costs represent a very high percentage in all governorates of operational costs for the farming sub-sector (67% of operational costs);
- Operational costs represent a very high percentage of total costs for all sub-sectors in the value-chain i.e. fixed are relatively small;
- In the farming sub-sector operational profits are 29% of sales and net profits 22% of sales. Corresponding figures for the trader/wholesaler sub-sector are 4.1% and 3.9%, and for the retail sub-sector are 7.1% and 6.8%; and
- Operational profits generated throughout the value-chain are LE 4,460/tonne of fish produced/sold, net profits are LE 3,736/tonne, and value-added (net profits plus wage earnings) is LE 4,619/tonne, with the farming sub-sector contributing more than 60% of total profits/value-added for all of these indicators.

While the above figures confirm that the industry is sustainable and generates considerable profits and employment, this study suggests that the sector as a whole is under increasing financial pressure. Critical factors facing the sector and impacting on profitability, can be grouped into those related to inputs, those related to production, and those related to the marketing, transportation and sale of product.

With regards to inputs the price and quality of fish feed have had a critical impact on costs and profits. Prices have risen by 200-250% over the last 7 years. The poor quality of fish fry, lack of available land for expansion in many governorates and short lease periods, poor quality of water, lack of access to capital, and the lack of electricity and high fuel costs for generators and vehicles, are all additional problems of considerable importance.

At the production level, critical factors affecting value-chain performance are: poor practices with regards to feed management, farm design and construction, fish health management, and stocking densities; a growing season which is restricted to about 8 months due to the colder weather in the winter months; absence of improved strains of fish that been shown to have major impacts on production in other countries; and a widespread lack of effective representative organisations for any of the sub-sectors.

With regards to the marketing and distribution of fish, the study showed that critical factors are: declining fish prices in real terms; consumer preference for wild fish and a distrust of filleted/processed products; strongly fluctuating seasonal prices (with declines in prices towards the end of the year coinciding with the major harvesting period); poor fish hygiene and handling practices throughout the value-chain; the lack of any value-addition through processing; the lack of any exports; and in some cases poor road networks impacting on the ability to get fish to markets.

This report provides a large number of recommendations for support to the aquaculture sector in Egypt, which flow directly from these challenges and critical factors. Some of the necessary actions should be the responsibility of the sector itself, some the responsibility of government, and some the responsibility of donors and NGOs. What is clear is that for meaningful improvements in value-chain performance, substantial action and investments will be needed by many stakeholders.

1.0 INTRODUCTION AND BACKGROUND

1.1 BACKGROUND TO THE STUDY

This report presents the outputs of a value-chain study, completed during September 2011, and prepared as part of the "Employment Creation in Egypt - Set-Up Phase" project funded by the Swiss Agency for Development and Cooperation (SDC). The study was completed by a team of local aquaculture experts from the WorldFish Center and CARE Egypt, supported by an international expert in value-chain analysis. The study focused on four key governorates in terms of aquaculture production in Egypt, namely Kafr el Sheikh, Behera, Sharkia, and Fayoum.

The **objectives of the study** were to better understand, and report on, the farmed fish sector in Egypt. In particular the study aimed to:

- Map the value-chain for farmed fish in Egypt i.e. to describe the main stakeholders and the flow of product through the value-chain;
- Consider the employment generated by the sector;
- Understand the costs and earnings profiles of the different sub-sectors of the value-chain;
- Identify the key constraints and problems impacting on different actors in the value-chain; and
- Identify potential solutions to the problems identified.

This report is complemented by two separate reports, which may be of interest to the reader. The first is a report produced by CARE Egypt on the potential for fish farming in Mineya governorate. The second is a report produced by a consultant to WorldFish, Dr. Hebicha, on the national level context in which the fish farming sector operates. This latter report provides a background description of the political and economic context in the country, the food security situation, population changes, institutions of relevance to the farmed fish sector, aquaculture policy and legislation, and some background information on fish farming and fish marketing in Egypt. Chapter 3 of this document draws heavily on Dr. Hebicha's report.

1.2 INTRODUCTION TO VALUE-CHAIN ANALYSIS

Value-chain analysis is not a new concept. It was first described and popularized by Michael Porter in the mid-1980's (Porter, 1985), and forms of analysis with many similarities have been undertaken since then by others[1]. However, value-chain analysis is now becoming increasingly mainstream in development circles. Its increasing prominence as a form of analysis is largely due to the fact that it provides an excellent 'lens' through which we can:

- Focus on distributional issues and pro-poor growth, and on global linkages (in the context of globalization); Benchmark changes over time; Assess the relative importance of factors affecting competitiveness, and the costs and earnings of those involved in the value chain;
- Identify gaps/weaknesses in value chain performance; and perhaps most importantly
- Identify 'levers' and targeted action programmes to 'upgrade' and improve value-chain performance.

[1] e.g. on value streams (e.g. by Womack and Jones), by French researchers and termed '*Filiere*' (thread) examining the flow of physical inputs and services in the production of a final product, and on global commodity chains (e.g. by Gereffi) focusing primarily on the power relations in value-chains.

A value chain is a sequence of related enterprises (operators) conducting activities (functions) so as to add value to a product from its primary production, through its processing and marketing to the final sale of the product to consumers. The functions of each link in the chain involve sourcing inputs, making/producing, and then delivering/selling product to the next link in the chain.

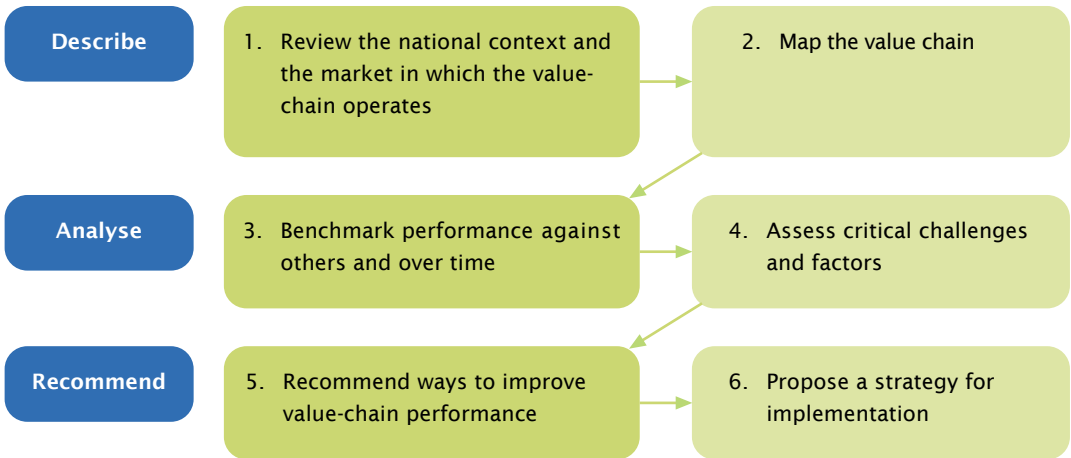
Best practice **value chain analysis** is composed of a number of steps, which are both descriptive and analytical in nature. Value chain analysis normally first describes the overall market within which the specific value chain operates. The second descriptive task should be to describe the value chain itself. This involves considering who is involved, and describes the employment, revenues, profits, and unit product values for those involved in the value chain. Analytical steps then involve benchmarking the performance of the value chain, both so as to consider changes over time, and potentially also to compare with international competitors. Analysis should also be conducted to assess the critical challenges and factors impacting on value-addition through the chain. Finally, these descriptive and analytical steps can be used to recommend solutions to the critical challenges, and to specify an implementation plan to bring about an 'upgrading' or improvement of the value chain. These steps are presented schematically in Figure 1 below.

An important component of value-chain analysis is recognition that support and action for improving performance throughout the value chain can be achieved both by those within the value chain itself i.e. private sector operators, and by those outside of it i.e. typically government or donors.

For businesses in the chain, they can improve performance by reducing costs, increasing outputs, and/or increasing the prices of their products. Typically mechanisms to do so involve being more efficient at what they do, and improving the quality or form of product being sold to the next link in the value chain.

Improvements in value chain performance can also be supported by governments and other parties external to the value chain. For example, policy, institutions and infrastructure all impact on the ability of businesses in the value chain to source the inputs that they need, to make or engage in their primary activity, and then to sell and deliver their product to their customers. These impacts may take the form of policy, subsidies, licensing, standards, transport infrastructure and costs, property rights, enforcement of regulations, government charges/rent collection, and other impacts on factor costs (e.g. labour, capital, land, utilities).

Figure 1: Steps involved in value chain analysis



Source: This report

1.3 STRUCTURE OF THIS REPORT

Following this short introduction, Chapter 2 of this report provides some information on the methodology used to complete the study. Subsequent Chapters of the report largely follow the value-chain analysis steps outlined in Figure 1. However, while this report identifies a number of potential ways to improve the performance of the farmed fish value-chain in Egypt (e.g. Step 5 in Figure 1), it does not present a detailed strategy for the implementation of the solutions identified (Step 6 in Figure 1). It is anticipated that the forthcoming project proposal to be prepared by the WorldFish Center will further elaborate some of the solutions presented in the outline in this report, and propose a more detailed strategy for their implementation.

2.0 STUDY METHODOLOGY AND APPROACH

This report is the result of three main stages of work completed by the study team.

Stage 1 involved a number of specific ***planning*** tasks which were completed, as follows:

- Introductory presentations on value-chain analysis were made by the international expert to WorldFish Center and CARE staff who comprised the study team;
- A detailed schedule of activities and travel was discussed and agreed by the study team, and appropriate travel arrangements and contacts in the governorates were made ahead of the field visits completed during Stage 2;
- A draft report structure for this report was discussed and agreed by the team;
- Two study questionnaires were drafted in English and then translated into Arabic, one for fish farmers, and one to cover the post harvest sub-sector i.e. traders/wholesalers and retailers. The study team then discussed the questionnaires and proposed various changes which resulted in the addition/deletion of some questions, and changes to other questions in terms of the phrasing and wording used in Arabic. The two questionnaires were then piloted at the WorldFish Center office in Abbassa with one fish farmer and one fish trader/wholesaler. This piloting resulted in some small additional amendments based on the lessons learned, and the questionnaires were then finalised and printed in multiple copies in readiness for the field work. The finalised questionnaires are presented (in English) in Appendix 2, along with some general suggestions for the approaches to be taken during the interviews and group discussions. The WorldFish Center retains copies of the questionnaire templates in Arabic.

Stage 2 of this study involved the completion of the ***field work***.

In order to maximise the number of interviews possible during the time available for the field work, and so as to reduce travel time, the general approach taken was to use local WorldFish Center contacts in each of the governorates to arrange for small groups of stakeholders to meet the study team at a central location. This provided the study team with the opportunity to introduce the study and to hold a focus group discussion in plenary, before individual interviews were then conducted with the participants i.e. each member of the seven-strong study team sat with a different participant and went through the questionnaire. The introductory comments and focus group discussions, which concentrated mainly on key stakeholder problems and potential solutions, generally lasted around sixty to ninety minutes, as did the individual interviews. Each meeting was thus scheduled to last around half a day, with different sub-sectors invited to different meetings i.e. a morning meeting might be held with fish farmers, before the study team met with fish wholesalers in the afternoon. All participants at meetings were provided with lunch, and this allowed for further discussion time with those attending the meetings.The field work focused most strongly on fish farmers, but interviews were also completed with fish traders/wholesalers, and some fish retailers. The field work also enabled discussion with a number of fish farmers who run hatcheries, and who make their own fish feed, although specific questionnaires were not completed to assess the costs and earnings specifically of these activities. The study period was unfortunately not sufficient to allow for interviews with stakeholders in the food service sub-sector e.g. restaurants.

The following table provides information on the number of individual questionnaires completed with stakeholders in each of the four governorates, along with the number of participants in the focus group discussions.

Table 1: Sample frame used during the study

Governorate	Fish Farmers	Fish Traders and/or Wholesalers	Fish Retailers	Total
Kafr el Sheikh	22 questionnaires 1 focus group with 9 1 focus group with 7 1 focus group with 8	6 questionnaires 1 focus group with 8	5 questionnaires	33 Questionnaires Focus group discussions with 32
Behera	14 questionnaires 1 focus group with 15	5 questionnaires 1 focus group with 9	-	19 Questionnaires Focus group discussions with 24
Fayoum	16 questionnaires 1 focus group with 29	4 questionnaires	7 questionnaires	27 Questionnaires Focus group discussions with 29
Sharkia	9 questionnaires 1 focus group with 12	6 questionnaires	1 questionnaire	16 Questionnaires Focus group discussions with 12
Total	61 questionnaires 6 focus groups with a total of 80	21 questionnaires 2 focus groups with a total of 17	13 questionnaires	**95 Questionnaires 8 Focus group discussions with a total of 97**

Map of Egypt Governates

Source: Lanternix at the wikipedia project

Stage 3 of this study involved ***data entry and analysis***, and ***report writing***.

During this stage, all data from the questionnaires were entered into a spreadsheet, and checked for their validity with the different interviewers responsible for completing the individual interviews. The data were then analyzed to generate the data outputs presented in later Chapters of this report.

A general comment is worth making on the validity of the data obtained. While the collection of good costs and earnings data is notoriously difficult, the data entry and analysis completed as part of this study suggest the data collected and presented in this report are remarkably robust given the short timeframe provided for the study and the relatively small sample sizes within each sub-sector. While there was of course variability in the results collected for the different variables between different stakeholders, the differences are generally thought to reflect actual differences in individual financial performance rather than misreporting. This hypothesis is supported by the fact that very little data cleaning was necessary, and that the differences observed between individual responses, and indeed between overall financial performance within each link in the value-chain, appear to 'make sense' in terms of the study team's existing knowledge of the aquaculture sector in Egypt. The reason for the high quality of data collected may be explained by:

- The approach taken to the meetings i.e. focus group discussions being held first to put participants at ease followed by the individual interviews;
- The extensive work that went into the questionnaire design, and the use of piloting to make certain modifications prior to the fieldwork;
- The fact that WorldFish and CARE Egypt staff were already known to many of the participants which meant that existing levels of trust had already been established;
- The specialist aquaculture sector knowledge and previous experience of all members of the field team in completing such surveys, which allowed sufficient probing and re-questioning of some questions during the interviews, where/if the interviewer felt that the respondent's answer might not reflect reality.

With respect to the preparation of this report, a draft was first prepared by the international consultant. The draft was then circulated to all team members for their comments and based on various suggestions, a number of changes were then made before finalisation of this output.

Figure 2: Focus group discussions and individual questionnaire completion in Fayoum

3.0 OVERVIEW OF GLOBAL AQUACULTURE TRENDS, THE NATIONAL CONTEXT, AND THE MARKET FOR FARMED FISH IN EGYPT

3.1 GLOBAL TRENDS IN AQUACULTURE AND FISH TRADE

Aquaculture is the fastest-growing animal-food-producing sector in the world, and continues to outpace population growth, with per capita supply from aquaculture increasing from 0.7 kg in 1970 to 7.8 kg in 2008, an average annual growth rate of 6.6 percent. It has already overtaken capture fisheries as the main source of food fish. While aquaculture production (excluding aquatic plants) was less than 1 million tonnes per year in the early 1950s, production in 2008 was 52.5 million tonnes, with a value of US$98.4 billion (FAO, 2010)[2].

Egypt is Africa's largest aquaculture producing country with a production of around 700,000 tonnes in 2009[3]. Other important countries in Africa are Nigeria (153,000 tonnes of farmed fish in 2009), Zambia (8,505 tonnes in 2009), Ghana (7,154 tonnes in 2009), and Zimbabwe (2,652 tonnes in 2009).

Global production of tilapia (*Oreochromis niloticus*), the most common species farmed in both Africa in general and in Egypt (as discussed in more detail below), has been estimated by FAO at 3.7 million tonnes with at least 2.8 million tonnes of this from aquaculture.

Global markets for fish and fishery products are expanding, representing a growing source of foreign currency earnings for many developing countries. In 2008, world exports of fish and fishery products reached a record US$102 billion, up 9 percent on 2007. Despite a dip in 2009 (when food prices soared), data for 2010 indicate that fish trade recovered - and the long-term forecast remains positive, with a growing share of fish production entering international markets[4]. A noticeable trend in these overall figures is the rise in the share of total trade from developing country exporters. In global terms, the principal markets for aquaculture (and fisheries) products are the EU, the USA and Japan.

A second noticeable trend within the overall figures on fish trade is the significant increase in regional trade between developing countries. This trend has been driven in part by the increasing costs of exporting to the EU and the USA, both in terms of transport costs (given fuel price rises), and the costs of trade associated with compliance with import standards and legislation in these markets. The increase in regional trade has also been caused by increasing population and purchasing power in many regional markets, making regional prices for fish in developing countries increasingly competitive with EU, USA and Japanese markets. Given stable or declining wild fish catches in African countries, only very limited aquaculture production in Africa (save primarily for Nigeria and Egypt, with production principally serving their domestic markets), and some of the highest population growth rates in the world, there is a growing gap between the supply and demand for fish in Africa, which aquaculture production is well placed to fill given likely impacts on prices. In addition, Egypt is strategically well-placed geographically to consider exports to both the EU and Middle-East markets. Indeed, some farmed fish from Egypt has already been sold into regional markets in Gulf countries.

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2 The State of World Fisheries and Aquaculture (2010). FAO Fisheries and Aquaculture Department. Food and Agriculture Organisation, Rome.

3 Egypt is the 11th largest producer of aquaculture products in volume terms, the leading producer for mullet, and the second largest producer of tilapia.

4 FAO (2010) op. cit.

All aquaculture producers also sell product into their local markets. The comments made above in relation to regional markets about increasing population, purchasing power, and the demand/supply gap, also apply to the domestic market in Egypt, suggesting that in the medium- to long-term, the domestic market offers significant potential for Egyptian fish farmers.

3.2 NATIONAL MACRO-ECONOMIC AND FOOD SECURITY CONTEXT AFFECTING THE SECTOR

With a population of 84.6 million in 2010, Egypt has the 15th largest population in the world, the largest population in the Arab region, and the third largest population in Africa. Population has been growing in recent years at a constant rate of about 1.48 million per year.

National figures for Gross Domestic Product (GDP), and for GDP per capita show constant rises over the last ten years. However with annual per capita incomes of LE 12,556 ($2,107), Egypt remains a developing country. Official unemployment has been hovering around 10% for the last ten years, with unemployment numbers particularly high for the 20-30 year-old age group. Around 75% of the labour force are men.

Significant challenges exist for Egypt in terms of food security, as evidenced by worsening performance over the last decade in performance indicators for[5]: food imports; the ratio of food imports to total export values; per capita food production; per capita daily availability of energy (Kcal/day), protein, and fat (g/day); and household average food spending (having adjusted for inflation). However, interestingly for this study real food prices (i.e. adjusted for inflation) show declines in recent years, with fish species showing the highest declines in real terms - prices declined in real terms over the period 2000-2010 by 45.9% for catfish, 37.7% for tilapia, and 31% for mullet. While these declines may be good for the consumer in Egypt, they present a serious challenge for the financial performance of the sector.

5 See background paper by Dr. Hebicha for additional quantitative information on these indicators.

3.3 INSTITUTIONAL, POLICY AND LEGAL CONTEXT GOVERNING THE AQUACULTURE SECTOR IN EGYPT

President Mubarak relinquished power on February 11, 2011 after 18 days of popular protests. The Armed Forces Supreme Council assumed the president's responsibilities and is committed to a peaceful transition process towards free and fair parliamentary and presidential elections and a new constitution with diminished presidential powers. These elections are expected to be held late in 2011. Clarity over existing and future government policy with regards to the fisheries and aquaculture sector is thus difficult to determine at present. However, for the time being it appears that previous policy is being followed without any significant changes.

The Ministry of Agriculture and Land Reclamation (MOALR) has overall responsibility for managing the fisheries and aquaculture sector. Implementation of sector policy and management has been delegated to the General Authority for Fisheries Resource Development (GAFRD) since 1983, when the Presidential Decree 90/183 articulated the powers and duties of GAFRD.

Act No. 124 (1983) on fishing, aquatic life and aquaculture is the main body of fisheries legislation regarding the sector. There are a number of important Articles that relate to aquaculture, including conditions in the Act which specify that:

- It is prohibited to establish fish farms except in areas unsuitable for agriculture and water sources should be from lakes or drainage canals. Only governmental fish hatcheries can use freshwater. A fish farm has to have a permit from GAFRD and approval from Ministry of Water Resources and Irrigation (MWRI), indicating the water inlet, outlet, and the amount of water to be used; and
- GAFRD leases the land it controls within 200 metres of all shorelines.

The key institutions which have a bearing on the aquaculture sector in Egypt are presented in Table 2, along with their main function and area of responsibility/control over the sector.

Table 2: Key institutions of relevance to the aquaculture sector, and their role/influence

Institution	Key function and responsibility related to aquaculture
Ministry of Agriculture and Land Reclamation (MOALR)	Overall management of the sector, setting policy, legislation (decrees, laws, regulations)
General Authority for Fisheries Resource Development (GAFRD)	Licensing of all fish farms and hatcheries, leasing of land within 200m of lakes, data collection, extension/training, capture of wild fry, designation of suitable aquaculture areas, running of government hatcheries and feed mills
Ministry of Water Resources and Irrigation (MWRI)	Approval for inlet, outlet and quantities of water used by farms, approval of farm establishment
Ministry of Defence	Approval of cage farming at sea
Central Laboratory for Aquaculture Research (CLAR) National Institute of Oceanography and Fisheries (NIOF) and various universities under the Ministry of Higher Education WorldFish Center	Fisheries research and extension

Source: This study

In addition to these key institutions it should be noted that Egypt is divided into 26 governorates, with each governorate headed by a Governor appointed by the President. Local government establishes and runs all public utilities, provides services, and designates industrial areas. Local Councils work closely with local government. Thus governorate and local council offices also have a bearing on the aquaculture sector.

3.4 WILD AND FARMED FISH PRODUCTION IN EGYPT

The main sources of fish production in Egypt include a) marine fisheries, b) inland fisheries in lakes, lagoons, the Nile River, irrigation and drainage canals, and c) aquaculture. Total production levels increased by more than 50% over the period 2000 to 2009 from 724,300 tonnes in 2000 to 1.1 million tonnes in 2009. These increases were primarily obtained from significant increases in aquaculture production, while wild capture fisheries production remained almost constant (389,398 tonnes in 2009), and by 2009 the share of total production provided by aquaculture had risen to 65% (up from 47% in 2000). From the total aquaculture production in 2009, 84.75% was from farm pond culture (from an area of 361,326 feddans / 151,757 ha), 9.64% from cage culture, 5.34% from rice field culture, and 0.26% from intensive culture (10-12 kg/m^3).

3.5 THE MARKET FOR FISH IN EGYPT

In addition to domestic fish production highlighted above, the market in Egypt was provided with an additional 135,523 tonnes of imported fish in 2009. Fish exports were very small at only 7,594 tonnes in 2009. Of particular importance for the market for farmed fish in Egypt are the imports of low value fish species such as tilapia and pangasius from China, Vietnam and Thailand, which compete directly with local farmed fish production.

Data on fish prices show how fish prices have only risen slightly over the past 10 years, but when considered in real terms, have fallen[6]. Mullet command the highest price, followed by tilapia first and second grades, and catfish. These declines in price may in part be due to the increases in local production of fish, and the increases in per capita availability of fish which have resulted despite declines in imports of fish in recent years. Almost all fish in Egypt, and all fish from the farmed sector, is sold live or in fresh form (either with or without ice). An increasing share of aquaculture production is reported to be sold in live form. With regards to the aquaculture sector in Egypt there is no value-addition at all in terms of processing e.g. into fillets. There appears to be a strong distrust of frozen fish, and also to some extent of processed fish, as consumers are less able to determine both the source of the product (e.g. imported or local), and its quality. These factors are of significant importance for farmed fish value-chain improvements, and will be considered later in this report.

Additional information on the marketing of farmed fish is provided in the following Chapters.

6 Again see the background report presented by Dr. Hebicha for additional information and specific data.

4.0 MAPPING THE VALUE-CHAIN FOR FARMED FISH IN EGYPT

4.1 INTRODUCTION

As highlighted in the previous chapter, pond farm production accounts for around 85% of the volume of total aquaculture production in Egypt. This study has thus focused almost entirely on the value-chain arising from this type of production, and in this Chapter we describe and map the pond fish farming value-chain. One interview was however completed with a tilapia cage farmer in Behera Governorate, and a costs and earnings model for this type of fish farming is provided in Appendix 3, based on the interview completed. Data from the cage farming interview are not included in the data presented below for the fish farming sub-sector.

In order to help contextualise the field work completed during this study, Table 3 below provides some background information on each of the four governorates in terms of population and unemployment, and aquaculture production.

Table 3: Background data on governorates selected for study

	Kafr el Sheikh	Behera	Fayoum	Sharkia
Population ('000s)	2,875 (4%)	5,206 (7%)	2,803 (4%)	5,876 (7%)
Unemployment ('000s)	72 (3%)	122 (5%)	61 (3%)	168 (7%)
Area of pond production (fed)	143,727 (40%)	14,229 (4%)	2,668 (1%)	35,011 (10%)
Total production from ponds (tonnes)	324,479 (55%)	31,292 (5%)	6,271 (1%)	76,845 (13%)
Tilapia production from ponds (tonnes)	259,583	23,568	8,349	62,176
Mullet production from ponds (tonnes)	14,966	1,553	2,783	3,831
Carp production from ponds (tonnes)	42,383	4,610	n/a	10,838
Catfish production from ponds (tonnes)	7,547	n/a	n/a	n/a
Total number of fish cages	12,614	12,000	120 licensed 44 in operation	0
Total cage production (tonnes)	37,842 (55.5%)	30,000 (44%)	373 (0.5%)	0
Tilapia cage production (tonnes)	5,800	3,167	200	0
Mullet cage production (tonnes)	34,675	24,200	0	0

Notes: Figures in parentheses are the % of Egypt's total. Carp species include common, silver, and bighead. Additional aquaculture production in Egypt is also obtained from rice/fish farming

Source: GAFRD (2010), CAPMAS (2011), and authors' calculations

Our mapping of the value-chain starts at the fish farm. In some aquaculture value-chain analysis, such mapping may begin at the hatchery stage. However, we have taken the view that fish fry/fingerlings represent an input to the farming operations along with other key inputs such as fish feed, labour, capital etc. Hatchery operations and the quality and quantity of fry being produced are therefore considered in detail in Chapter 5 of this report when we discuss the critical challenges and problems facing the sector, but costs and earnings data for hatcheries are not provided in this Chapter.

The data and discussion provided in this Chapter of the report, and indeed in subsequent chapters, are based on the primary data collection completed during the study, and pertain to the year 2010.

4.2 OVERVIEW

The value-chain for farmed fish in Egypt is comprised of three main stakeholder groups before fish reaches the consumer, as presented in the Figure below. There are virtually no exports of farmed fish, and so the value-chain is short and simple compared to aquaculture value-chains in some other countries. This is especially true given that there is no processing at all of farmed fish i.e. all fish is sold in whole form (either live, fresh on ice, or fresh without ice)[7], and there is no value-addition either through primary processing into fillets or into other secondary processed products (e.g. ready meals, etc).

All catfish[8] is sold live, while other species (tilapia, mullet[9], carp[10]) are generally sold either fresh on ice (in summer months or if sales are made far from farms) or fresh with no ice (in winter months and/or if sales are made close to farms). There appears to be a growing trend however for the sale of live tilapia. This is particularly the case for tilapia being produced in Fayoum governorate, which is almost all sold live, and transported in drums/tanks with oxygen by traders to wholesaler and retailers (see Figure 5). This live fish is typically held in pens/cages in the Nile in Giza and Beni Suef and sold as 'wild' fish from the Nile. In other Governorates in the delta, live fish may also be held in irrigation channels, and sold as wild fish. This in itself indicates that consumers have a preference for wild fish over farmed fish.

Figure 3 (Pg 23) provides data on the average annual sales volumes and values of individual operators involved in the value chain. It also highlights the time that it takes fish to flow through the value-chain, and the post harvest losses experienced. What is noticeable from the Figure is the very short time-period from harvest[11] to final consumption by the consumer (due to the live/fresh nature of all sales), and also the very low rates of post-harvest losses (which is in contrast to many wild fisheries value-chains, where significant post harvest losses often occur in developing countries). Differences between production and sales in the farming sub-sector are exclusively the result of some fish being consumed by labour on the fish farms or their families rather than any spoilage/wastage, and harvests are often coordinated with fish traders/wholesalers (who may be present at the harvest) so that there is no wastage of product. In both the trading/wholesale and retail sub-sectors, the general lack of chill/frozen storage equipment/facilities means that all fish need to be sold quickly, and prices are reduced by sellers to ensure that product is sold, even at a low price, rather than not being sold at all.

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7 Some tiny quantities of farmed fish may be sold frozen by retailers if they are unable to sell product on a particular day, and deteriorating quality requires them to place fish in home/shop freezers and then to sell it frozen. There is however no mass freezing of product at the wholesale/trading stage of the value-chain.

8 African catfish (*Clarias gariepinus*).

9 The main species are flathead grey mullet (*Mugil cephalus*), thinlip mullet (*Liza ramada* previously known as *Mugil capito*).

10 The main species farmed are common carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idella*), silver carp (*Hypophthalmichthys molitrix*).

11 Harvesting most commonly occurs between September and December. However our interviews highlight the fact that fish farmers may deploy a range of harvesting strategies e.g. partial harvesting, over-wintering and harvesting early in the year, and attempts to harvest over the summer months when harvest volumes from other farms may be small and prices therefore higher.

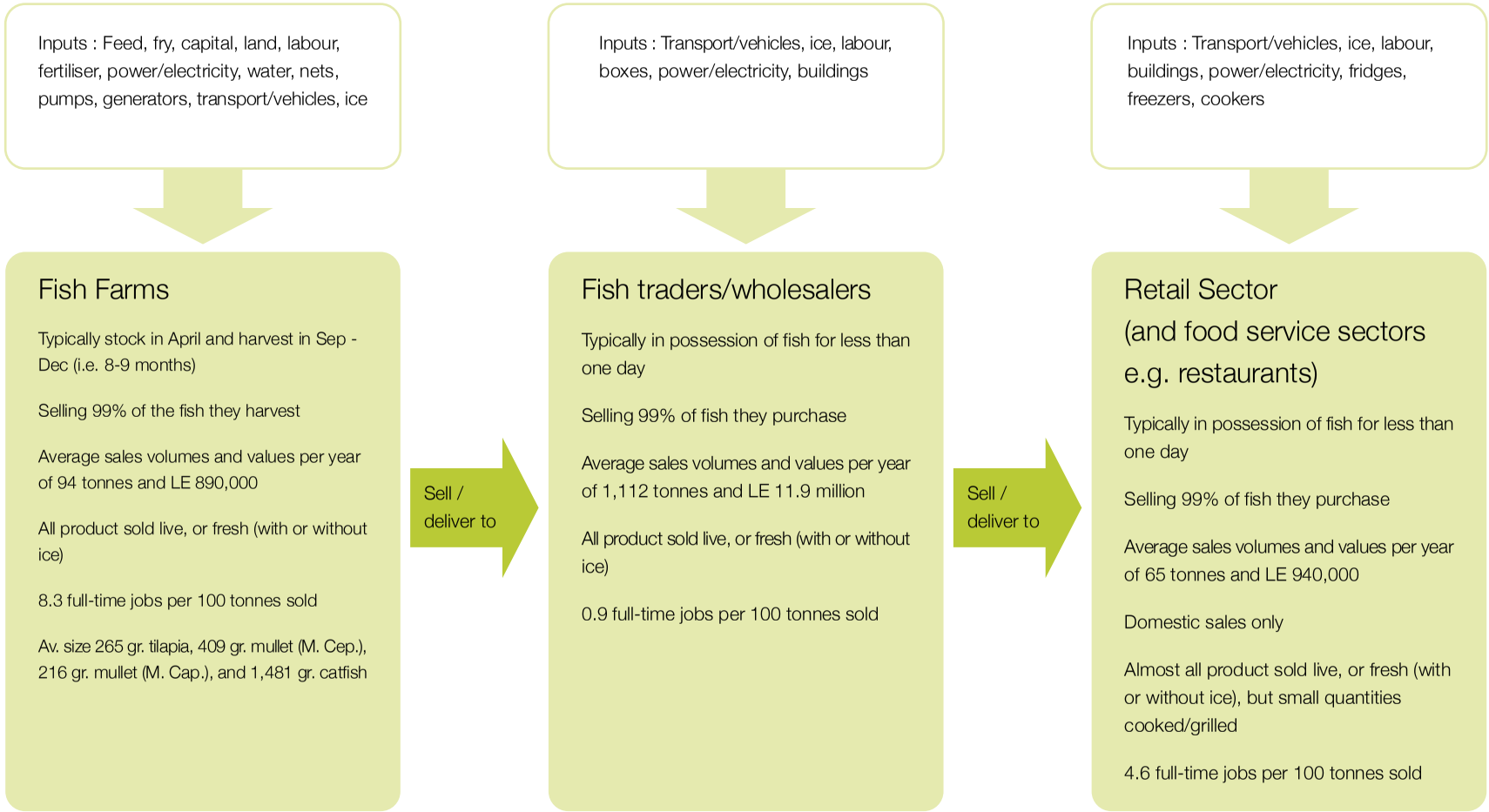
Almost all fish farms produce and sell a mix of fish species, dominated by sales of tilapia, but also including sales of mullet, catfish, and carp. The data from our fieldwork show that 89% of the volume and 81% of the value of farm production in 2010 covered by our survey was accounted for by tilapia. These figures are considerably higher than official figures for 2009 which show around 55% of farmed fish production being tilapia. The reason for this difference may be a combination of a change that took place in species mix in 2010, the relatively small sample size used in our work, errors in the official data, and/or the focus of our work on pond fish farming (rather than fish produced in rice fields). Our data also showed that mullet represented 9% of farm volumes and 18% of farm values, carp 0.2% of volumes and 0.1% of values, and catfish 1.7% of volumes and 1.3% of values. Catfish and carp volumes are very low as a percentage of total farm production. Catfish either enter ponds on their own or are stocked as a strategy to consume tilapia fry if adult fish spawn while in the ponds (see later discussion on the quality of fry being produced by hatcheries for more on this subject). Grass carp are often stocked as a way to manage the growth of grass/weed in the ponds. Once fish has been harvested, there appear to be no distinct value-chains for different species i.e. individual traders/wholesalers deal in all fish species, rather than in particular ones.

Data obtained during our fieldwork, indicate that the average size of fish being harvested is 265 grams for tilapia, 409 grams for mullet (M. Cep.), 216 grams for mullet (M. Cap.), and 1,481 grams for catfish.

It should also be noted that Figure 3 (Pg 23) provides a simplified presentation of the actual flow of product. In particular:

- The data presented in sub-sections of this Chapter are combined for traders and wholesalers, as it is not easy, or indeed very meaningful to try to define traders and wholesalers separately and to present different costs/earnings models for traders and wholesalers;
- In reality farms may sell to traders who in turn may sell to wholesalers, or farms may sell straight to wholesalers. There are also very small quantities of product sold direct from farms to retailers;
- The presentation does not include the very small reported quantities of farmed fish exports to markets in Gulf countries; and
- Some product, especially Kafr el Sheikh, Behera and Sharkia Governorates may pass through wholesale markets, while other product is transported directly by traders/wholesalers to retailers. It appears that much of the largest size-grade of tilapia (known as ‘super’) is sold through the wholesale markets in Kafr el Sheikh, Behera and at Al-Obour close to Cairo, while smaller fish may by-pass these market establishments and be sold closer to the farms, where purchasing power of the local population is weaker, and where there is thus a greater demand for smaller and cheaper fish.

Figure 3: Schematic presentation of the farmed fish value-chain in Egypt



4.3 SUMMARY OF EMPLOYMENT CREATION IN THE FARMED FISH VALUE-CHAIN

Before presenting information on each sub-sector in the value chain, this sub-section of the report presents some information on employment generated through the value-chain. Given the focus of the SDC's priorities on employment creation, a special effort was made during the fieldwork to collect information on employment. As can be seen from the questionnaires presented in Appendix 2, each sub-sector of the value-chain was asked to provide information not just on the number of people employed, but also on:

- Whether employment is full-time, part-time or seasonal;
- The number or working days per year for part-time and seasonal workers;
- Whether employees are men or women;
- Whether employees are over or under the age of 30; and
- Where labour comes from.

The data collected were analysed and converted into Full-Time Equivalent (FTE) jobs[12]. This has allowed us to generate some quantitative information on employment creation in the value chain, as shown in Table 4 (Pg 26).

The table demonstrates that in the fish farming sub-sector, employment is entirely male, is fairly evenly divided between those over and under 30 years of age, is more strongly made up of full-time work, and generates 8.3 jobs for each 100 tonnes of fish produced. Non-full time employment is associated with the seasonal nature of some fish farming activities e.g. stocking and harvesting, weed clearance, etc. Seasonal activities on farms e.g. harvesting, are an unskilled activity which can be completed by younger people with fewer skills (at a low cost to the farmers), hence the relatively high rate of employment for the under 30's.

For the trader/wholesaler sub-sector, employment is also almost exclusively male, even more full-time in nature than in the farming sub-sector, and generates a lower percentage of jobs for the under 30's. Employment is generally associated with loading and unloading of fish. The lower percentage of employment for those under 30's compared to the farm sub-sector is probably explained by the fact that traders/wholesalers represent key players in the value-chain, requiring considerable amounts of capital (generally from their own sources) which the young are likely to find less able to provide. The trading/wholesaling sub-sector generates just under 1 FTE job for each 100 tonnes of fish being sold - much lower than for the farming sub-sector due to the short-time traders have product in their possession and the fact that they are in the business of distribution, rather than processing.

It is only at the retail sub-sector that we see any meaningful quantities of female employment being created. This employment tends to be full-time in nature, and with a low proportion of total employment being for the under 30's, again probably because of the need to have capital and/or facilities to commence such an activity. The retail sector creates 4.6 jobs per 100 tonnes of fish sold.

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[12] Based on the number of days usually worked in the different sub-sectors as reported in our interviews, we have estimated FTEs based on 300 days per year equalling 1 FTE in the farming sub-sector, 340 days equalling 1 FTE in the trader/wholesaler sub-sector, and 360 days equalling 1 FTE in the retail sub-sector.

These data on FTE creation per tonne of fish, allow us to estimate that for every 100 tonnes of fish produced by fish farms, once the product has travelled through the value-chain it has resulted in almost 14 FTE jobs being created. For the total production from ponds in Egypt (591,296 tonnes in 2009), a total of around 82,000 FTE jobs can thus be estimated in the sector as a whole at the national level[13].

Three very important points must be made about these estimations. Firstly, these figures are for FTEs, and the number of people (and therefore households) that depend on the sector for some form of employment and income is considerably greater given the many people employed on a part-time or seasonal basis, especially in the fish farming sub-sector. Secondly, the figures are for direct employment only, and do not consider the multiplier effects of the sector. Considerable additional employment creation results from the sector through jobs created through the production of inputs to the sector e.g. jobs in feed mills, hatcheries, ice plants, suppliers of vehicles, water pumps and generators, building contractors, manufacturers of boxes used during transport, and so on. And thirdly, because our fieldwork only covered the retail sector, the estimations may be an under-estimation given that not all fish passes through the retail sub-sector to consumers - job creation for every 100 tonnes of fish sold in the food service sub-sector e.g. restaurants, may be higher than in the retail sector.

For the sector as a whole, and for all sub-sectors within it, almost all labour is sourced from within the Governorate in which the business is based. However our interviews did identify some limited numbers of people, especially from Kafr el Sheikh, who work in other Governorates.

Wages paid to those working in the sector are typically around LE 800-900/month for full-time labour, and LE 30-50/day for part-time and seasonal labour.

[13] Our use of the number of days in each sub-sector equalling one FTE may be higher than previous studies, and may help to explain slightly lower estimations of total employment (other studies have suggested around 120,000 people are employed in the fish farming sub-sector).

Table 4: Employment creation in the farmed fish value chain

Employment	Full time equivalent jobs per 100 tonnes sold				
	Kafr el Sheikh	Behera	Fayoum	Sharkia	Overall
Farmers	6.99	5.31	12.59	7.98	8.31
Traders/Wholesalers	0.40	0.62	0.92	1.56	0.87
Retailers	1.34	n/a	7.79	2.02	4.62
Total	8.73	5.93	21.29	11.57	13.80
% of FTE days contributed by men					
	Kafr el Sheikh	Behera	Fayoum	Sharkia	Overall
Farmers	100%	100%	100%	100%	100%
Traders/Wholesalers	100%	100%	100%	94%	98%
Retailers	60%	n/a	80%	50%	69%
% of FTE days for full-time employment as opposed to part-time or seasonal work					
	Kafr el Sheikh	Behera	Fayoum	Sharkia	Overall
Farmers	70%	86%	63%	73%	72%
Traders/Wholesalers	83%	91%	97%	92%	91%
Retailers	100%	n/a	100%	100%	100%
% of FTE days contributed by those under 30 years of age					
	Kafr el Sheikh	Behera	Fayoum	Sharkia	Overall
Farmers	71%	41%	52%	56%	57%
Traders/Wholesalers	35%	52%	36%	28%	37%
Retailers	50%	n/a	16%	100%	37%

Source: This study

4.4 FISH FARMERS

Table 5 (Pg 28) provides the average operational data for fish farms in each of the four governorates, and average operational data for our sample frame as a whole.

Some interesting points to highlight from the summary data, and from the individual questionnaire data used to generate them, are:

- The relatively low average farm size in Fayoum;
- The fact that most interviewees have been involved in the fish farming business for many years;
- The relatively uniform stocking size for tilapia (around 10 grammes), except for in Behera where stocking size appears to be lower;

- Feed Conversion Ratios (FCRs) that are similar in Kafr el Sheikh and Fayoum, but not as good as in Behera and Sharkia (which also have similar FCRs to each other). Differences in the FCR rates are likely to be the result of a number of different factors such as:
  - The size of fish at stocking;
  - The extent to which fertiliser is also used;
  - Feed management techniques and relative efficiencies;
  - The quality of the feed being used, which varies considerably between farms and governorates; and
  - The extent of water exchange.
- Production per feddan that is comparable in Kafr el Sheikh, Fayoum and Sharkia, but highest in Behera. This is perhaps due to the fact that many of the fish farms included in the sample frame in Behera are located close to the lake, and so water availability and exchange is particularly good in this area;
- Higher levels of employment per tonne in Fayoum, probably due to the smaller average farm size in that Governorate, meaning that fewer economies of scale can be generated compared to other Governorates;
- Relatively low fish prices in Behera due mainly to a smaller percentage of total production being comprised of 'super' grade tilapia in that governorate, and the relatively high prices in Fayoum due to the dominance of the live fish trade in that governorate;
- Tilapia 'super' prices in Fayoum which are higher than the average price for total production in Fayoum, due to the low percentage of total production comprised of mullet compared to other Governorates - because mullet prices are higher than prices for tilapia, in other governorates mullet production means that the average price for all production is higher than the price for 'super' tilapia. (The issue of availability of mullet fry is considered in Chapter 6);
- The very strong reliance on tilapia production as a percentage of total production in all governorates, but especially in Fayoum and Sharkia;
- Stocking densities that are quite uniform across governorates, but which can vary hugely between farms, depending on farming strategies. For example, stocking rates reported during our interviews range between 6,000 and 30,000 per feddan for tilapia. However most farms stock between 10,000 and 15,000 tilapia per feddan; and
- Fairly consistent average size of fish at harvest in the four governorates.

Table 5: Operational data for the fish farming sub-sector

Operational data	Kafr el Sheikh	Behera	Fayoum	Sharkia	Overall
Number of farms interviewed	21	13	16	9	59
Total feddan of interviewed farms under production	531	448	198	341	1,517
Average years involved in the sector	20	18	16	18	18
Average area under production (fed)	25	34	12	38	26
Average size of tilapia when stocking (g)	10	4	11	10	9.05
Average FTE per feddan	0.21	0.23	0.38	0.23	0.26
Average FTE per 100 tonne	6.99	5.31	12.59	7.98	8.31
Average production (tonnes / fed)	3.26	4.81	3.16	3.12	3.55
Average FCR	1.89	1.44	1.71	1.38	1.66
Average sales price (LE/kg (all species))	9.70	8.26	11.79	9.87	9.98
Average sales price tilapia 'super' (LE/kg)	9.59	8.75	11.88	9.34	10.14
Average % of total production from tilapia	86%	94%	93%	79%	89%
Average stocking density tilapia / fed	12,786	17,500	13,656	11,012	13,790
Average stocking density mullet M. Cep / fed	700	784	858	788	776
Average stocking density mullet M. Cap / fed	1,600	1,354	1,466	2,167	1,676
Average stocking density catfish / fed	200	317	n/a	844	332
Average growth period (months)	9.6	8.7	8.3	7.7	8.7
Average size tilapia at harvest (g)	276	235	283	252	265
Average size mullet M. Cep at harvest (g)	421	342	453	402	409
Average size mullet M. Cap at harvest (g)	223	206	500	177	216
Average size catfish at harvest (g)	1,321	1,333	n/a	1,340	1,481

Source: This study

Having presented some operational data for fish farms, Table 6 below provides information on the financial performance, and the costs and earnings, of the farms owned or managed by those we interviewed.

Table 6: Financial performance of fish farms

Financial performance data	Kafr el Sheikh	Behera	Fayoum	Sharkia	Overall Average
Average sales revenue (LE)	804,447	1,385,487	427,841	1,267,517	885,964
Average operational costs (LE)	563,226	1,008,630	286,703	720,814	600,242
Average feed costs as % of operational costs	72%	66%	68%	57%	67%
Average labour costs per tonne produced (LE)	516	486	948	768	660
Average op. costs per tonne produced (LE)	7,020	6,405	8,011	6,692	7,115
Average operational profit (LE)	253,551	410,652	141,138	546,703	301,357
Average operational profit per tonne (LE)	2,724	2,243	3,402	3,179	2,997
Average operational profit as % of sales revenue	27%	24%	32%	31%	29%
Average fixed costs (LE)	68,612	52,593	13,498	87,933	51,343
Average total production cost (LE/tonne)	8,051	6,688	8,392	7,442	7,769
Average net profit (LE)	182,036	356,410	127,639	458,770	247,172
Average net profit per tonne (LE)	1,640	1,914	3,402	2,429	2,329
Average net profit as % of sales	16%	20%	29%	24%	22%
Average total value-added per tonne (LE)	2,155	2,400	4,350	3,198	2,989

Source: This study.

Note: Value added per tonne before fixed costs can also be calculated from the data collected (operational profit per tonne plus labour costs per tonne) as LE 3,240, LE 2,729, LE 4,350, and LE 3,947 for Kafr el Sheikh, Behera, Fayoum, and Sharkia respectively, with an overall average of LE 3,518

Methodological comments of importance include the fact that:

- All data per feddan relate to the actual area being used for production. Thus a farm may be 20 feddan in total, but with only 18 feddan of ponds, given that some land may be used for buildings, roads, etc. However virtually none of the interviews reported any pond area itself lying idle or un-utilised;
- Operational costs are those costs which vary depending on the amount of fish being produced, and typically include costs for feed, fertiliser, fry, power, transport, ice, sales commission paid to traders/wholesalers, and labour; and
- Fixed costs are those costs which do not vary depending on production volumes i.e. they need to be paid each year irrespective of production. Typically they include government licences, repair and maintenance costs, rents paid for land, and depreciation costs. Depreciation costs have been estimated by obtaining information on the replacement costs of fixed assets, and depreciating these costs over standardised lifespans for different items e.g. buildings over 25 years, nets over 3 years, water pumps over 5 years, generators over 10 years, vehicles over 10 years.

Key findings from the analysis, as shown by the data in the table above, and from the individual questionnaires, are:

- The positive financial performance in all governorates in terms of average net profits (LE 247,172), net profits per tonne of fish (LE 2,329), and net profits as a percentage of sales (22%). Fayoum is the best performing Governorate even though it has the highest production cost per tonne, due largely to the high prices of fish paid for their live product. Other reasons may be the level of skills and good management practices in the Governorate due to the fact that farmers in Fayoum in particular have been the beneficiaries of considerable amounts of training in the past, and more so perhaps than farmers in other Governorates. In general farms in Kafr el Sheikh have the worst performance of the four governorates;
- An average total production cost across all farms of LE 7,769/tonne, which represents the break-even weighted sale price i.e. the average price of all fish sold by a farm must be more than LE 7,769/tonne if the farm is to make a profit;
- The consistently high percentage in all governorates of operational costs which are comprised of feed costs (67% across all farms). Fish fry constitute the next most important input (13% of operational costs), followed by labour (8%), sales commission (5%), and fuel/electricity/power (3%);
- The high percentage (91.5%) of total costs which are comprised of operational costs, as opposed to fixed costs. Fixed costs are low due to the nature of the fish farming business, and also because many farms are on rented land with short lease periods, which decreases the incentive for farmers to invest in fixed assets;
- Land rents are the highest single fixed cost, representing 62% of fixed costs for our sample as a whole, with depreciation, and repair/maintenance costs both contributing 17% of total fixed costs. Very few farms have any formal fixed finance costs in the form of interest payments on loans, as there is virtually no formal bank lending to the sector;
- Total value-added by the sub-sector i.e. net profits plus wages paid to labour, is LE 2,989 per tonne of fish produced. Again, this figure is the highest for fish farms in Fayoum.

Figure 4: Fish ponds in Kafr el Sheikh

4.5 TRADERS/WHOLESALERS

Fish traders/wholesalers are typically individuals working alone but employing small amounts of labour to load and unload fish. Fish is transported in pickup trucks in plastic boxes (with or without ice) and covered with plastic sheets or tarpaulins. No chilled or freezer trucks are used for transportation. Some individuals maintain wholesale fish shops and operate out of wholesale markets, while others just trade fish.

Table 7 below provides the outputs of the data collected and analysed for this sub-sector of the value-chain. Traders/wholesalers are key players in the value-chain, especially in terms of determining prices. The one exception to this is in Fayoum, where fish farmers are reported to have a much stronger influence on farm gate prices than in other Governorates (although the influence of traders/wholesalers is still significant in Fayoum also). The traders/wholesalers play a key role in providing finance to many of the fish farms (along with feed mills/traders in many cases), and most of them finance their operations out of their own finance (often earned from other economic activities). This provides an indication of the overall financial position/wealth of such individuals, and their influence in the value-chain. Even though final profit margins (3.9% on average) and profits per tonne of fish sold (LE 422) are both low compared to the farming sub-sector, given the large average value of sales made by individuals each year (LE 11.9 million on average), profits in absolute terms are significant, with individuals typically earning around LE 400,000 per year.

The earnings made by traders/wholesalers are generated from a sales commission, usually of between 3-6% on the sales of fish, which is paid to them by the fish farmers. This margin is typically lower (e.g. 3%) when farmers deliver product to them, and higher (5-6%) if a) they collect fish from the farms and therefore have to pay for transportation and ice, and/or b) they have provided finance to fish farmers. Individual questionnaire responses reveal that net profits and net profit margins are generally higher when traders/wholesalers collect fish from the farms, because the costs they incur on ice and transport are less than the difference between the commission they take for collecting fish at the farms, and the commission they get if fish is delivered to them.

Other interesting observations which can be drawn from the data in Table 7 (Pg 32) are:

- The higher farm gate price for fish in Fayoum continues to be passed through the value-chain, with higher average prices of fish sold by traders/wholesalers in Fayoum compared to other governorates;
- Average annual sales values for individual traders/wholesalers sold within Fayoum are lower than in other Governorates, due to the lower level of total farm production in this Governorate;
- Operational ‘costs’ are comprised almost entirely of the fish traders/wholesalers buying from farms or selling for them. Other operational cost items include labour, truck rental/transport, ice, and fuel/power, but none of these items alone comprise more than one percent of the value of sales;
- Fixed costs are generally very low, and more evenly distributed across a range of items such as rents/leases (32% of total fixed costs), depreciation of buildings, fish boxes and vehicles (30% of fixed costs), and repairs and maintenance of buildings and vehicles (15% of fixed costs);
- The individual average earnings for traders/wholesalers across the four governorates appear very consistent, with those in Fayoum similar to those in other governorates even though average total sales values are lower, due to the higher margins being achieved; and
- The average value-added (net profit plus wages) per tonne of fish sold is LE 503, with almost double that being generated in Fayoum.

Table 7: Operational and financial performance data for fish traders/wholesalers

Summary/Average trader model 2010					
Operational data	Kafr el Sheikh	Behera	Fayoum	Sharkia	Overall
No. of traders/wholesalers interviewed	6	5	5	6	22
Total annual sales value of interviewees (LE)	105,948,000	75,463,200	36,026,210	51,739,588	269,176,998
Average FTE per '00 tonnes of sales	0.40	0.62	0.92	1.56	0.87
Average sales price (LE/kg (all species))	10.83	9.86	12.95	10.23	10.66
Average sales price tilapia 'super' (LE/kg)	10.17	9.67	12.80	10.17	10.5
Financial performance	Kafr el Sheikh	Behera	Fayoum	Sharkia	Overall Average
Average annual sales value (LE)	17,658,000	12,577,200	7,205,242	8,623,265	11,930,954
Average operational costs (LE)	17,158,250	12,172,752	6,800,911	8,226,058	11,510,701
Average operational profit (LE)	499,750	404,448	404,331	397,206	420,254
Average labour costs per tonne sold (LE)	42	96	98	91	80
Average operational profit per tonne (LE)	293	265	822	413	440
Average operational profit as % of sales	2.6%	3.9%	6.5%	4.5%	4.1%
Average fixed costs (LE)	34,454	13,517	9,532	7,918	17,377
Average net profit (LE)	465,296	390,931	394,799	389,288	402,877
Average net profit per tonne (LE)	268	252	804	400	422
Average net profit as % of sales	2.3%	3.7%	6.4%	4.4%	3.9%
Average total value-added per tonne (LE)	310	347	903	491	503

Figure 5: Live tilapia transportation from Fayoum

4.6 RETAILERS

There are two main types of farmed fish retailers in Egypt. The first group engage in 'informal' street sales, which take place usually by individual operators who purchase fish from wholesale markets or traders, and then set up shop by the roadside to sell their product. Sales facilities/equipment is minimal - often comprising just a shelter from the sun. Labour is generally not employed, and these types of retailers aim to make LE 0.5-1.0 profit on each kg of fish they buy/sell.

The second group is more formalised, with sales taking place from retail shop facilities, and retailers may also have fridges and or freezers for storing fish if it cannot be sold the same day it is purchased. These businesses often employ labour to clean/prepare fish. As a result their operational and fixed costs tend to be higher than the informal street traders.

However, this simplistic description and division is not always entirely accurate or obvious in reality. For example some formal retail businesses may employ people to sell fish (generally of lower quality of or particular species) informally on the street outside or nearby their shop. Equally, many formal retailers also engage in some elements of the food service/restaurant business, and use grills to cook fish for consumers.

The data provided in Table 8 does not distinguish between the two types of operation, due to the small sample size achieved during the study. The sample size may also have resulted in data being the weakest of the outputs for the three sub-sectors presented in this Chapter. Nevertheless, some confidence can be gained from the consistency shown in the data between Governorates, and the data are interesting in that they show:

- Businesses typically have low fixed costs, and a high percentage of operational costs comprising fish purchases (with other operational costs being primarily for transport of fish from markets, and ice). This suggests that as long as retailers can sell their product for a small standard margin over and above the purchase price, there is little 'risk' inherent in the business;
- Higher prices for fish in Fayoum exhibited in earlier links in the value-chain are maintained in the retail sub-sector;
- Average net profits per individual business owners are LE 58,778, still considerably above national average earnings; and
- The retail sector creates an average of LE 1,131 for every one tonne of fish sold.

Table 8: Operational and financial performance data for fish retailers

Summary/Average trader model 2010					
Operational data	Kafr el Sheikh	Behera	Fayoum	Sharkia	Overall
No. of retailers interviewed	5	0	6	1	12
Total annual sales value of interviewees (LE)	5,244,300	n/a	4,998,210	1,056,600	11,299,110
Average FTE per 100 tonnes of sales	1.34	n/a	7.79	2.02	4.62
Average sales price (LE/kg (all species))	12.51	n/a	15.75	10.67	13.98
Average sales price tilapia 'super' (LE/kg)	10.83	n/a	13.38	11.50	12.19
Financial performance	Kafr el Sheikh	Behera	Fayoum	Sharkia	Overall Average
Average annual sales value (LE)	1,048,860	n/a	833,035	1,056,600	941,593
Average operational costs (LE)	972,648	n/a	786,268	974,880	879,644
Average labour costs per tonne sold (LE)	0	n/a	333	170	181
Average operational profit (LE)	76,212	n/a	46,767	81,720	61,948
Average operational profit per tonne (LE)	916	n/a	1,091	825	996
Average operational profit as % of sales	7%	n/a	7%	8%	7.1%
Average fixed costs (LE)	-	n/a	5,557	4,700	3,170
Average net profit (LE)	76,212	n/a	41,210	77,020	58,778
Average net profit per tonne (LE)	916	n/a	1,008	778	951
Average net profit as % of sales	7%	n/a	6%	7%	6.8%
Average total value-added per tonne (LE)	916	n/a	1,341	948	1,131

Source: This study

Figure 6: Street-side retailer Kafr el Sheikh

4.7 SUMMARY DATA

Mapping the value chain and constructing costs and earnings models for each link in the value chain as presented above, allows for a comparison across the various sub-sectors in the value chain, as presented in Table 9, Table 10, Table 11 and Table 12.

Table 9 shows how the average price of product both for all sales sold by each link the value-chain (i.e. the basket price), and separately for tilapia 'super' grade, increases as farmed fish moves through the supply chain in each governorate. It also shows for the basket price of fish the percentage of the final consumer price achieved by each link in the value-chain. The data in the right-hand columns of this table show that the farmers are obtaining a relatively high percentage of the final price. This is due to the lack of any exports, the short-supply chain, and the lack of value-addition through the chain.

Table 10 and Table 11 show the operational and net profit per tonne respectively for each link in the value chain. These two tables also show the operational and net rates of return on sales values for each link in the value chain, and the percentage contribution of each link in the value-chain to total profits created. The tables show that operational and net profits as a percentage of own sales, and in absolute terms per tonne of fish sold, are highest in the farm sub-sector.

Finally, Table 12 provides information on the total value-added created through the value-chain i.e. the net profit, plus the wages earned by those working in the sector. The data show that on average across all governorates, a total of LE 4,619 value-added is generated for each tonne of fish produced by the farming sub-sector. Again, the levels of value-added created are highest in the fish farming sub-sector (LE 2,985/tonne), and in Fayoum (LE 6,594/tonne).

Table 9: Gross output values i.e. fish prices for the farmed fish value-chain

Gross output values	LE/kg (all species basket price)					LE/kg (tilapia 'super' price)					All species basket price as % of final consumer price				
	K el Sh	Beh	Fay	Sha	All	K el Sh	Beh	Fay	Sha	All	K el Sh	Beh	Fay	Sha	All
Farmers	9.70	8.26	11.79	10.04	10.01	9.59	8.75	11.88	9.18	10.13	78%	n/a	75%	94%	72%
Traders/Wholesalers	10.83	9.86	12.95	10.23	10.66	10.17	9.67	12.80	10.17	10.50	87%	n/a	82%	96%	76%
Retailers	12.51	n/a	15.75	10.67	13.98	10.83	n/a	13.38	11.50	12.19	100%	n/a	100%	100%	100%

Source: This study

Table 10: Operational profits created in the farmed fish value-chain

Operational profit	LE/tonne					% of own sales					% of value-chain operational profit creation				
	K el Sh	Beh	Fay	Sha	All	K el Sh	Beh	Fay	Sha	All	K el Sh	Beh	Fay	Sha	All
Farmers	2,724	2,243	3,402	3,394	3,025	27.2%	24.5%	32.0%	33.2%	29.0%	69.3%	89.4%	64.0%	73.3%	67.8%
Traders/Wholesalers	293	265	822	413	440	2.6%	3.9%	6.5%	4.5%	4.1%	7.4%	10.6%	15.5%	8.9%	9.9%
Retailers	916	n/a	1,091	825	996	7.3%	n/a	6.8%	7.7%	7.1%	23.3%	n/a	20.5%	17.8%	22.3%
Total	3,933	2,508	5,315	4,632	4,460										

Source: This study

Table 11: Net profits created in the farmed fish value-chain

Net profit	LE/tonne					% of own sales					% of value-chain net profit creation				
	K el Sh	Beh	Fay	Sha	All	K el Sh	Beh	Fay	Sha	All	K el Sh	Beh	Fay	Sha	All
Farmers	1,640	1,895	3,402	2,703	2,363	15.8%	20.1%	28.8%	26.4%	22.1%	58.1%	88.3%	65.2%	69.6%	63.2%
Traders/Wholesalers	268	252	804	400	422	2.3%	3.7%	6.4%	4.4%	3.9%	9.5%	11.7%	15.4%	10.3%	11.3%
Retailers	916	n/a	1,008	778	951	7.3%	n/a	6.3%	7.3%	6.8%	32.4%	n/a	19.3%	20.0%	25.4%
Total	2,824	2,147	5,215	3,881	3,736										

Source: This study

Table 12: Total value-added created in the farmed fish value-chain

Total Value-Added	LE/tonne					% of value-chain value-added creation				
	K el Sh	Beh	Fay	Sha	All	K el Sh	Beh	Fay	Sha	All
Farmers	2,155	2,382	4,350	3,198	2,985	63.7%	87.3%	66.0%	69.0%	64.6%
Traders/Wholesalers	310	347	903	491	503	9.2%	12.7%	13.7%	10.6%	10.9%
Retailers	916	n/a	1,341	948	1,131	27.1%	n/a	20.3%	20.4%	24.5%
Total	3,381	2,729	6,594	4,637	4,619					

Source: This study

5.0 BENCHMARKING

5.1 GLOBAL PRICES

Detailed costs and earnings data on fish farm production of tilapia and mullet in other countries against which Egyptian performance could be benchmarked, are not widely available. However, recent global and regional prices for tilapia from a number of sources are provided in Table 13. These prices demonstrate the variability in prices not just between countries, but between markets within those countries. They also show that prices in Egypt as presented earlier in this report are generally low compared to other countries.

Table 13: Global and regional tilapia prices, 2010-2011

Country	Prices	Comments
Malaysia	$4.00/kg	Live fish in traditional markets
Malaysia	$6.00/kg	Whole fish supermarket
Bangladesh	$1.20-2.00/kg	Retail
Middle East	$2.10/kg cfr	Whole dressed fish retail
USA	$3.53/kg	Frozen fillet wholesale
USA	$7.00/kg	Fresh fillet wholesale
USA	$5.00/kg	Live whole fish wholesale
USA	$1.50/kg	Frozen whole fish wholesale
South Sudan	$2.70/kg	Retail whole
Kenya (Nairobi)	$3.00-5.00/kg	Retail whole
Kenya (Nairobi)	$8.30/kg	Fresh fillet, supermarket
Kenya (Nairobi)	$1.85-2.00/kg	Whole wholesale
Uganda	$1.96/kg	Wild tilapia retail
Egypt	$1.70	Tilapia farm gate price
	$1.76	Tilapia wholesale price
	$2.04	Tilapia whole retail price
	$1.50-2.00/kg	Wild Nile tilapia retail (Mineya governorate)
Nigeria	$3.00/kg	African Catfish - Ex-farm price
Egypt	$1.31/kg	Catfish - Ex-farm price

Sources: Globefish, Kevin Fitzsimmons, Kochi Conference presentation 2011, Miller et al, 2010, Jim Miller, pers. comm. 2011, Patrick Blow, pers. comm. 2011, Egyptian prices based on averages across all four governorates sampled by this study, and CARE Egypt report for the Mineya price.

5.2 CHANGES IN PROFITABILITY OVER TIME IN EGYPT

The data present in Chapter 4 of this report, have already benchmarked performance by the sub-sectors of the value-chain in different governorates, and have demonstrated the superior performance in Fayoum governorate. The emphasis on live fish trade, on which Fayoum's superior performance appears to be largely based, also seems to be a strategy that is increasingly being pursued in other Governorates.

Our fieldwork did not collect information to allow for a quantitative comparison of the changes in performance within the sub-sectors of the value-chain over time in any one governorate (i.e. benchmarking sub-sector performance against itself over time). However we did attempt to generate some findings of a more qualitative nature by asking interviewees to comment on their perceptions about changes in key variables over the last three years. The responses do not provide a very clear picture with regards to the changes in volumes of production/sales, or of the prices of fish being sold. For example in the fish farming sector almost the same number of people reported an increase in the price for tilapia as reported a decrease, with only slightly fewer reporting static prices.

However, a much more uniform picture was provided in terms of the perceived changes in the operational and fixed costs incurred in the fish farming sub-sector, with a dominant view being that most individual cost items e.g. feed, labour, rents, power, etc., have increased over recent years. Given what we know about fish prices in recent years (declining in real terms and only small increases in nominal terms), this would certainly seem to indicate that profitability has been declining in recent years. Sector performance may now be under threat, especially due to increases in the costs of feed, which as already noted represent such a significant proportion of operational costs. While the cost of feed varies significantly between producers depending on the quality of the feed, it does appear that over the last 6-7 years, feed prices have increased by 200-250%.

Finally with respect to benchmarking, it is worth noting that to the best of our knowledge, a detailed costs and earnings survey of the sub-sectors of the farmed fish value-chain similar to the one presented in this report has not previously been completed in Egypt. While our data cannot therefore be used to quantitatively assess changes in value-chain performance in recent years, the data obtained during this study may be useful as baseline data to be used for future benchmarking of changes over time. In particular, the data may be helpful in the monitoring and evaluation of any subsequent interventions supported by the SDC.

6.0 ANALYSIS OF CRITICAL FACTORS AND CHALLENGES

6.1 INTRODUCTION

This Chapter focuses on the critical factors facing the aquaculture sector in Egypt, and the challenges now being faced. However before examining key weaknesses, it is also worth noting the key achievements and strengths of the sector, on which future interventions and development can be based.

The dramatic rise in aquaculture production in Egypt has been fuelled by certain natural environmental factors such as the availability of suitable land and an abundance of water, by the entrepreneurial nature of the private sector in the country, by Government support to the sector (e.g. government hatcheries and feed mills, demonstration farms, research, and extension), and by market demand in the country due to the large, and ever growing, population.

As noted earlier, Egypt is by far the largest aquaculture producer in Africa, and the sector is a pioneering and vibrant one. When one considers the attempts by other African and Middle-Eastern countries to develop aquaculture and the small production volumes that have resulted, the success achieved in Egypt is all the more impressive. The sector generates very considerable levels of value-added, results in profitable businesses at each stage of the value-chain, and provides direct and indirect employment for many thousands of people (who in turn have many others in their households dependent on their earnings). Most people who work in the sector have been doing so for many years, indicating the sustainable nature of the value-chain.

However, the sector now faces a number of very significant challenges (discussed in the text below), and it is noteworthy that the yearly percentage increase in aquaculture production in 2009 (1.7% above 2008) was the lowest yearly percentage increase for the last 10 years.

The historical strength of the sector, coupled with recent challenges, and indeed opportunities for further improvements in value-chain performance, provide a strong argument for support to be provided to the sector, both to safeguard the current financial and employment benefits being generated in the sector, and to increase such benefits in the future. The rest of this Chapter therefore outlines the main challenges facing the sector, before Chapter 7 provides some ideas about how to address these challenges.

6.2 SUMMARY OF KEY CRITICAL FACTORS

The table below provides a summary of the critical issues identified during the study. Subsequent sub-sections of this Chapter explore these issues in more detail. As is evident from the text provided, some of the critical challenges are posed by factors outside of the value-chain itself e.g. government policy, environment, while others are problems stemming from poor performance by those within the value-chain, or by those supplying it with inputs.

Table 14: Summary of critical issues and factors constraining the sector

	Critical issue or factor	Severity of the problem
Input factors	• Access to capital and finance	• Medium
	• Cost and quality of feed	• High
	• Fry quality (tilapia) and availability (mullet)	• High
	• Water quality and availability	• Medium / High
	• Labour availability and cost	• Low
	• Labour skills	• Medium
	• Land availability, opportunities to own, security of tenure	• High
	• Power/fuel costs and availability of electricity	• Medium
Production factors	• Length of growing season	• Medium
	• Farm design and construction	• Low
	• Feed management	• High
	• Stocking densities	• Medium
	• Fish health management	• Medium
	• Level of sector, and sub-sector, organisation	• Medium / High
	• Diversity of fish species used	• Medium
Post-harvest distribution and marketing factors	• Weak prices and consumer perceptions about farmed fish	• High
	• Fluctuations in prices (daily, seasonal)	• High
	• Health and hygiene conditions in wholesale and retail markets, and in transportation network	• Medium
	• Lack of exports	• Medium
	• Lack of any processing for value-addition	• Medium
	• Road networks	• Low

Source: This study

6.3 INPUT FACTORS

CAPITAL

Formal banking sector lending to the aquaculture sector is virtually non-existent, and banks are generally not supportive of loans to the sector as they consider it to be high risk. In addition the requirements for collateral are often viewed by those in the sector as being too stringent, and fish farmers may find it especially difficult to provide any collateral if they rent, rather than own, the land on which they are farming.

As a result, many fish farmers obtain credit either from feed mills/traders, and/or from fish traders/wholesalers in order to cover the cash-flow requirements of the business. With the significant increases in feed costs since the mid-1990s, the reliance on such forms of finance by fish farmers, as opposed to their own finance, has become increasingly marked. As already noted, fish traders tend to make a higher sales commission and more profit when lending to farms and collecting fish from the farm (rather than having fish delivered to them by the farm). The same may well be true also for feed suppliers, with higher profits being made when such traders provide feed on credit. So the increasing reliance by fish farmers on capital provided by feed mills/traders, and fish traders/wholesalers, may have shifted the distribution of profits in recent years from the farming sub-sector to both upstream (feed) and downstream (trading/wholesaling) sub-sectors. In some cases it may also result in sub-optimal harvesting times, if fish farmers are pressurised to re-pay finance at particular times by their creditors.

However, it should be noted that our interviews did not identify access to capital itself as a key constraint - fish traders and retailers generally appear to be able to finance their businesses out of their own capital, as can many fish farmers. Where fish farmers do have a requirement for capital, they can generally obtain it either from traders/wholesalers or in the form of credit for feed from feed mills/traders. The value-chain itself therefore seems to have solved the problem of access to capital through credit, lending and commissions-based mechanisms.

FISH FEED

There are reported to be 25 fish feed mills in Egypt, producing more than 300,000 tonnes of fish feed each year. Five mills produce extruded fish feed and their production represents around 20-25% of total fish feed production. Feed mills also provide a wide range of different feed formulations to match the requirements of different stages of the growth cycle (e.g. different protein content). In addition to the registered mills, there are around 50 small-scale pelletizing units, the annual production of each is 3,000 - 4000 tonnes of fish feed with total annual production of 120,000 to 240,000 tonnes (El-Naggar et. al, 2011). These pelletizing units use simple technologies and are not equipped with air driers, and simply offer the service of pelletizing farmers' feed ingredients at a cost of about LE 100-150 per metric tonne (El-Naggar et. al., 2011).

Good quality feed now costs as much as LE 3,600 per tonne, up from around LE 1,250 in 2001. The average price reported across our sample frame was LE 2,971/tonne. Given the high proportion of total operational costs comprising of fish feed, the increase in feed price is a very serious problem for fish farmers, impacting directly on profitability. Most farmers acknowledge however that fish feed is a commodity product, and that prices are determined by global commodity prices for the inputs to feed, and so there is little that can be done to reduce the costs incurred by feed mills in making good quality product.

The increase in feed prices has meant that many farms buy lower quality feed because it is cheaper, increasingly rely on traders (who may pass-off poorer quality feed on fish farmers) or purchase feed ingredients (when they are available on the market, which is not always the case) so as to make their own feed (this appears to be especially the case in Behera and Sharkia). The lower quality feed that may result in all these cases worsens FCRs and ultimately increases production costs per tonne of fish produced, even if farmers may have the impression that they are reducing costs.

The MOALR is supposed to monitor both the ingredients being imported to manufacture feed, as well as the final product. However, this monitoring is reported to be insufficient and not systematic.

With the exception of Fayoum, there is no effective group action by farmers to buy feed in bulk (with potential price savings on bulk orders) or to ensure they receive good quality product. Some lessons can be learnt from the Fayoum Fish Farmers Association (FFFA), which buys fish feed in bulk for its members, and as a result is able to get a guaranteed top quality product. The FFFA members pay for part of feed costs up-front, and then make a monthly payment. This reduces the need for farmers to obtain credit from feed traders, reducing the risk to farmers of being provided with poor quality feed.

FRY

There are 12 governmental fish hatcheries (two of them for research activities), and 98 licensed private hatcheries (of which three are for marine species). In addition there are an estimated 500 operational but unlicensed private hatcheries, many of which have been established in recent years. The increase in the number of hatcheries has helped to keep the price of fry down (tilapia fry typically cost between LE 50 and LE 200 per 1,000 fry, depending on quality and exact size), even though official data show numbers of tilapia fry having decreased in 2009. However, while no farmers we interviewed reported shortages of tilapia fry, almost all of the fish farmers we interviewed reported some form of problem with hatchery production and the quality of fry. The most common complaint was that while hatcheries are selling mono-sex tilapia, fish are reproducing, indicating that the quality and/or use of hormones by hatcheries is not good. This in turn increases/worsens the FCR because the fry that are born consume feed[14]. It appears therefore that the quality of fry may be being compromised either by hatcheries deliberately 'cutting corners', or because of insufficient technical knowledge of best management practices in hatcheries[15].

[14] It is not clear the extent to which the presence of unwanted fry in ponds is due to the poor quality of fry provided by hatcheries, or due to unplanned entry of wild fry/eggs into ponds through poor screens.

[15] There is no indication that these weaknesses in hatchery performance are necessarily more common in unlicensed hatcheries than in licensed ones.

Other problems in relation to hatchery operations and the quality and/or availability of fry raised by fish farmers are that:

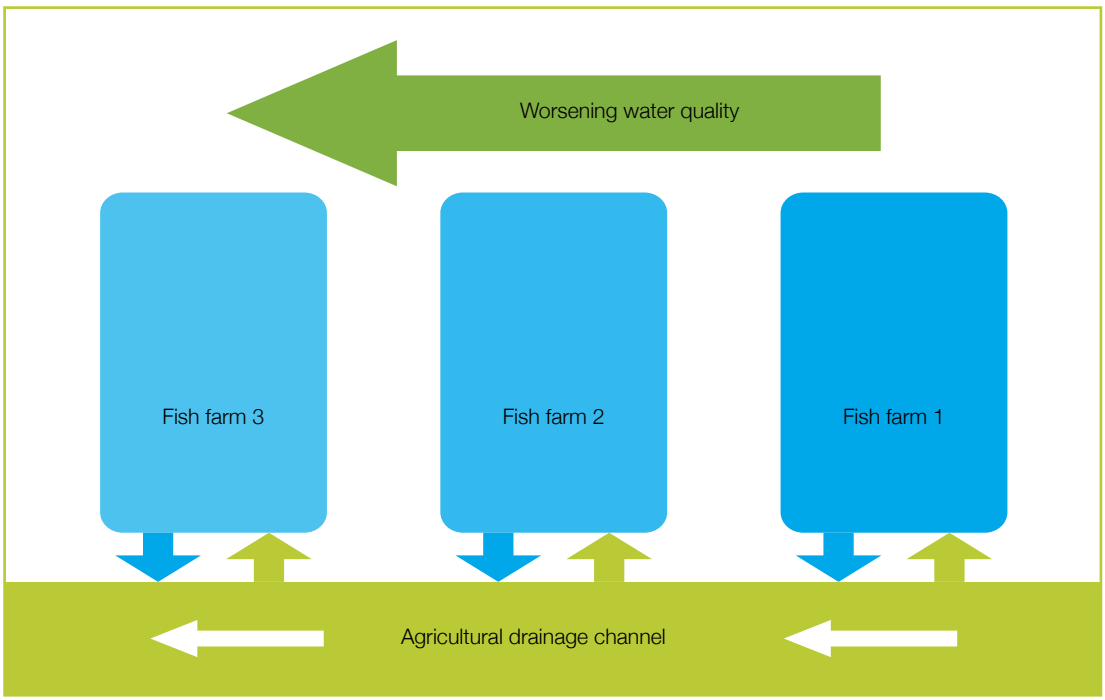
- There is sometimes a shortage of fry for early stocking (in April);
- Farmers often purchase poor quality fry simply because they are cheaper. This is because they do not understand the benefit that quality fry has on production and profits and/or because of recent financial pressures on fish farmers that are forcing them to reduce costs;
- Hatcheries may not always use good broodstock, and there is very little/no selective breeding taking place[15];
- The lack of concern and knowledge about correct use of hormones on farm-based hatcheries;
- There is currently no genetically improved fish being used in Egypt at the present time; and
- There is a shortage of mullet fry, particularly in some locations e.g. Fayoum. The supply of mullet (spp.) fry and to some extent sea bream and sea bass, are dependent on wild resources. GAFRD is supposed to control all mullet fry collection through fry collection centers on the coast, but the number of fry collected from the wild declined from 93.98 million to 57.4 million fry between 2000 and 2009, and due to shortages a black market for mullet fry has developed. This is of concern for the profitability of fish farms, because black market fry prices may be elevated, and because the inclusion of mullet in fish ponds can play a critical role in profitability due to their high market prices (LE 19.6/kg) and because there is probably unsustainable collection of wild fry.

[16] A selective breeding programme currently being conducted by the WorldFish Center, and following eight generations of selection, will shortly begin to distribute improved broodstock.

WATER

The Ministry of Water Resources and Irrigation allocate irrigation quotas for water use for agricultural crops, but not for fish farming. The aquaculture sector in Egypt is not allowed to use irrigation/Nile water, and is generally dependent instead on water in agricultural drainage channels, although some farms may access lake water. As a result, while not universally the case it is certainly true that many farms face problems with water quality, especially when they are located at the downstream end of agricultural drainage channels - in such instances water may be used in turn by fish farms, with increasingly poor water quality (see Figure 7). This point is supported by the fact that land rents for fish farms are reported to reflect water quality i.e. rents are higher for fish farms with better water, and decrease downstream along the drainage channels. This practice of re-use of water also means that if there is a disease outbreak, disease can quickly spread through the farms.

Figure 7: Simplified presentation of water re-use by fish farms along agricultural drainage channels



Key: Shaded arrows represent water inflow and outflow to farms

Notes: Not all fish farms are dependent on this type of configuration and the re-use of water in this way.

Problems relating to water are not just related to *quality* however, but in some cases to *quantity*. While in general Egypt is fortunate in terms of the good availability of water supplied by the Nile, fish farms may face water shortages during some periods of the year due to intensive use of water by the agriculture sector (e.g. during the rice growing season in Sharkia from 1st June), which means that there is less water for circulation through farms. This in turn increases the risk of disease outbreaks, and may mean that farms have to reduce their use of feed thereby reducing productivity.

LABOUR

Our fieldwork did not identify any significant issues with regards to the availability of labour given the wages that are paid. In almost all cases labour is available in the governorate in which a farm or trader/wholesaler is located, although our interviews did identify some use of labour from Kafr el Sheikh in other governorates. In general it is also the case that there are no significant problems in terms of the availability of some of the skills needed, at least for those activities which do not require a complicated skill set e.g. harvesting, loading/unloading, weeding, etc. However, other activities, especially for managers/owners at the farm level, do require specialist expertise e.g. feed management. Extension and training is supposed to be carried out by GAFRD, but extension services are not thought to function well, and many farmers are in need of up-skilling.

LAND

A number of critical challenges face the sector in terms of land needed for fish farms. In all of the four governorates covered by our fieldwork, it is increasingly difficult to access land for aquaculture expansion (at least this is the case for 'old' land, although there may be 'desert' land available if sufficient water can be made available). There may however be land available for expansion of fish farming in other governorates, especially in Upper Egypt.

However, of more concern to the farmers we interviewed were a number of issues including:

- Increasing rents being demanded by both government[17] and the private sector;
- The inability under the current law for fish farmers to own land within 200 m of lake shorelines. This provides a disincentive for them to make improvements through investment in fixed assets;
- Rents payable to government in a particular location that do not reflect the extent to which fish farmers may have invested in the fish farm over the years i.e. new entrants taking over an existing farm can be expected to pay the same rent per feddan as a fish farmer who has invested in the construction of the farm;
- Relatively short lease/rental periods for land (from both government and from private land owners) which reduces security and interest in developing new land; and
- The use in some cases of land designated for agriculture not for fish farming.

POWER

Many farms are not on the electricity grid, and are prevented from installing electricity on rented land. This means that their power costs are increased through the need to use generators for the considerable amounts of power needed to pump water. Furthermore, fuel used to power water pumps is considered expensive by farmers, and is periodically unavailable in some locations. However, this problem is rated as 'Low' in our summary Table 14 (Pg 41) given that power costs typically represent only around 3% of operational costs for fish farms.

[17] Rents may be paid to the MOALR, the Ministry of Endowment, GAFRD, and/or to governorates.

6.4 PRODUCTION FACTORS

LENGTH OF GROWING SEASON

While the environmental conditions in Egypt are generally favourable for fish production, the colder winter months from January through April place constraints on the fish farming sub-sector, due to the lack of cold tolerance of fish and a growth period that is limited to around 8 months. Stocking typically (though not always) takes place in April, and harvesting in November and December. Some farmers reported to us that they try to avoid overwintering of fish due to the associated risks of both mortalities and also losses from theft. This 8 month growing period has obvious implications for the size of fish at harvest, and therefore the market prices achieved.

FARM DESIGN AND CONSTRUCTION

The level of skills and human capacity for appropriate pond construction and farm design are generally good in Egypt, due to the fact that the industry is a mature one having started so many years ago. However for some farms, pond size, layout and design is not optimal, with resulting negative impacts on production.

Figure 8: Fish harvesting in Kafr el Sheikh

FEED MANAGEMENT

This report has already stressed a number of times how important feed is as a contributor to production costs. In addition to the comments made earlier about the quality and price of feed, at the production stage of the value-chain, it is critical that fish farmers use feed correctly through good management of feed use. Our fieldwork suggests that there is very variable knowledge about Best Management Practices (BMPs) for feed use. For example, while over-use of feed is not a significant problem for some farmers, not all farmers have good knowledge of how to minimise feed costs, how to sample fish biomass correctly so as to determine the feed required, and how to feed regularly.

STOCKING DENSITIES

As noted earlier, stocking densities and the size of fish at stocking vary very significantly between different farms. This may in part be appropriate due to the different characteristics of different farms (e.g. soil types, water quality), or due to deliberately different strategies (e.g. for feeding, growth periods) being deployed. However the wide ranges identified by our fieldwork also indicate that it is highly likely that many farms are using sub-optimal stocking strategies, with resulting impacts on overall productivity and financial performance.

FISH HEALTH MANAGEMENT

Fish health management is a critical aspect of fish farming. Water quality (either due to the position of farms along drainage channels, or potentially also due to the use of pesticides in water canals to control weed), water quantity, extreme or changeable temperatures, and the quality and quantity of feed used, can all increase the risks of disease. Knowing how to minimise the risks of disease outbreaks, how to monitor for them, and what to do when they occur, can make the difference between a farm being profitable or not. Our interviews did not explore the strategies for fish health management used by fish farmers in any detail, but given that disease outbreaks were reported to the field team as a problem in all four governorates, it is likely that BMPs for fish health management are not always followed.

LEVEL OF SECTOR, AND SUB-SECTOR, ORGANISATION

Sector and sub-sector organisation is very weak. Only in Fayoum, where the FFFA represents fish farmers, is there any form of representative organisation that is functioning in a meaningful way (see Box 1 below). It is likely to remain a significant challenge to organise existing fish farmers into effective organisations when they have become accustomed to working alone for so many years. But if aquaculture is to be supported in new areas/governorates, it may be possible, and indeed desirable, to encourage group organisation at sub-sector level e.g. farmer organisations, trader/wholesaler organisations, retail organisations. The benefits of such organisations could include: reductions on the purchase price of inputs made on bulk orders; a coordinated voice to represent the views of members in policy forums; organisation of harvesting so as to even out the fluctuations in supply that result from many farmers harvesting at the same time; conflict resolution mechanisms; savings schemes; and a conduit through which training and other support could be provided.

Box 1: The Fayoum Fish Farmers Association

The Fayoum Fish Farmers Association has around 350 members. Its main function is to purchase high quality fish feed on behalf of its members, and to verify the quality of the feed supplied. The buying price by the FFFA per tonne of feed is the same as paid by individual farmers purchasing from the same feed mills, but the FFFA does not pay for the transportation of the feed. The FFFA does not make any mark-up on the feed price when selling to its members and the service it provides eliminates the need for fish farmers in Fayoum to rely on feed traders. The FFFA has also helped to establish some new ponds, and other functions include some basic advice to its members on farming practices. Previous attempts have been made to organise/stagger harvesting times between members, but were not successful.

DIVERSITY OF FISH SPECIES USED

The most important species grown in Egypt are currently tilapia, mullet and carp. The dominance of tilapia and mullet reflects the fact that these are indigenous species and are widely consumed in the country, tilapia especially so by poor consumers. While the Egyptian Aquaculture Strategy projects that tilapia will continue to dominate the industry for the foreseeable future, it will be useful to explore opportunities for diversification where this is possible. Some farmers believe that there is great potential for sea bass and sea bream but this has yet to be demonstrated.

6.5 TRANSPORT, DELIVERY AND DISTRIBUTION FACTORS

WEAK PRICES AND CONSUMER PERCEPTIONS ABOUT FARMED FISH

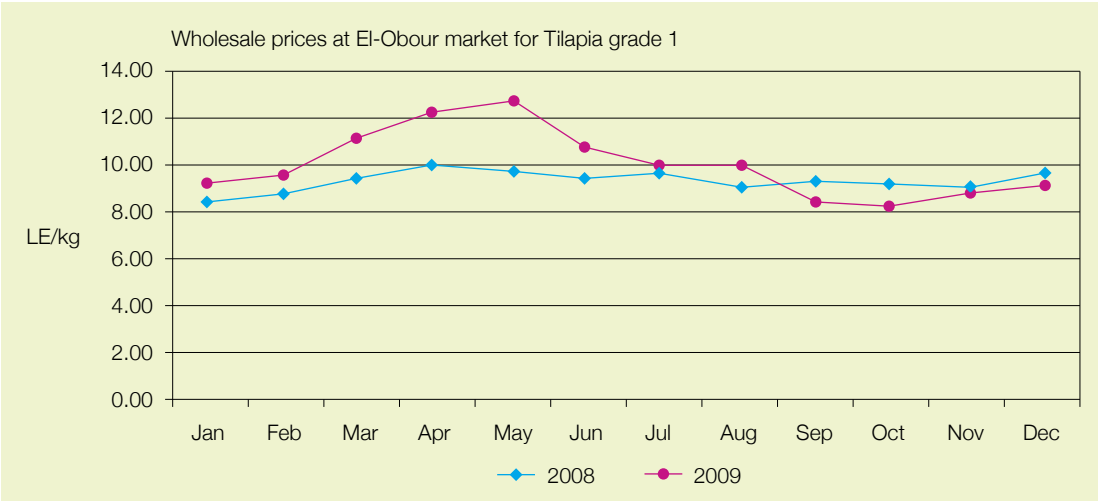
Earlier text has raised concerns over the decline (in real terms) of fish prices in recent years. Pressure on fish prices is likely to be the result of a number of factors including, increasing aquaculture production over the last decade, consumer preference for meat as a source of protein, the presence of significant quantities (although declining) of imports of competitor products (often of poor quality), and a consumer preference for wild fish due to health concerns about fish produced by farms because of water quality issues. Given that all fish is generally sold within a day of being harvested, either live or on ice, it may be that low fish prices are more a result of these aforementioned factors, rather than due to the poor quality of fish (although additional comment is made on this point below).

The sector as a whole therefore faces very considerable challenges in changing perceptions about farmed fish. However if such perceptions could be altered and prices increased as a result, then increases in value-added made throughout the value-chain could be expected.

FLUCTUATIONS IN PRICES

Fish prices can exhibit considerable daily and seasonal fluctuations, primarily due to changes in the volume of supply on particular days, or between different months. Because of the 8 month growing season, as noted above many farms harvest their product over the same months (September through December). This increase in supply depresses prices. The data presented earlier in this report (see Table 5 and Table 6) indicate that the average yearly sales price achieved by fish farmers is around LE 2.2/kg above the total production cost per kg of fish. This means that prices only have to decrease by LE 2.2/kg for production costs to equal sales prices, meaning that farms would then make no profits. While we were not able to collect detailed information on price fluctuations, anecdotal evidence from our interviews suggests that prices can be at least LE 1-3/kg lower in periods of peak supply, and the data available for prices at El-Obour market confirm this (see Figure 9). These fluctuations in price represent particular risks and challenges to fish farmers who have already incurred costs for considerable periods before fish is sold. For traders/wholesalers and retailers, the use of set margins (e.g. a selling price in the retail sub-sector typically of LE 0.5-1.5/kg above the price they pay for fish, and a 3-6% commission in the trader/wholesaler sub-sector) means that price fluctuations pose less of a risk as reductions in price can be passed back down the value-chain to the fish farm sub-sector.

Figure 9: Tilapia grade 1 prices at El-Obour market 2008 and 2009 (LE/kg)



Notes: Prices for other tilapia grades show similar yearly fluctuations, but mullet prices appear less variable during the course of the year

HEALTH AND HYGIENE CONDITIONS IN WHOLESALE AND RETAIL MARKETS, AND IN THE TRANSPORTATION NETWORK

Quality and hygiene conditions in wholesale and retail markets are generally very poor, with a lack of temperature controlled environments, poor specification of surfaces used for handling/presenting fish, inadequate water provision and drainage for cleaning, etc. In addition, it is notable that fish is generally transported on ice under sheets/tarpaulins, and that there is virtually no use of any chilled/insulated trucks for the transportation of fish.

The need for improvements in health and hygiene conditions is only partly mitigated by the rapid speed with which fish moves from the farm to the consumer. However, for the sector as a whole long-term improvements will need to be made both for the sake of public health, and so as to increase the quality and value of fish being sold. Making such improvements poses a considerable challenge given the high investment costs that could be necessary to improve facilities.

LACK OF EXPORTS

At the present time, total exports from Egypt are very small at around 7-8000 tonnes per year, with only very small quantities of exports from the aquaculture sector reportedly being made to some Gulf countries. Exports are constrained by the use of agricultural drainage water and by the traceability and health and hygiene requirements in export markets such as the EU. Given high purchasing power in exports markets such as the EU, and Egypt's geographical location, Egypt may have some competitive advantages over other exporters to the EU and the Gulf. However increasing exports to the EU and other markets poses significant challenges in terms of:

- Compliance with the legislative requirements for imports in such markets;
- Understanding buyer requirements in export markets (e.g. quality, delivery frequency, price, batch sizes, regularity of supply, etc);
- Competition in export markets from other suppliers given their competitive position; and
- The market promotion and identification of market contacts that would be necessary.

At the present time there is not enough knowledge about Egypt's competitive position *vis a vis* other suppliers, about comparative prices in Egypt and in overseas markets, and about the steps that would have to be taken to expand exports, in order to make an informed opinion about the merits of a push to try to access export markets.

LACK OF ANY PROCESSING FOR VALUE-ADDITION

It is a rather peculiar feature of the farmed fish value-chain in Egypt that there is absolutely no value-addition through processing. This may in part be because consumers are generally wary both of fresh fillets and also of frozen fish because of the difficulties in determining both the quality and the source of fish when presented in this form. Or it may be due to a lack of access to capital for investors, or simply that it has not been done before. Our fieldwork identified one potential initiative in Kafr El Sheikh to establish a filleting plant, but the exact status of this initiative and when/if it will commence operations is not known. The trend towards increasing sales of live fish as opposed to sales fresh fish on ice or without ice is perhaps also an indication of consumer preference for the very freshest of product.

Current knowledge about the financial viability of any new processing initiatives, and how to incentivize/support them, is not well understood. But processing might be expected to generate additional levels of value-added in the farmed fish value-chain, as well to create considerable levels of employment (especially for women who might be expected to staff processing facilities). A challenge for potential processing businesses is therefore to first better understand the potential viability of any such developments.

Figure 10: Retail fish sales - note whole fish only

ROAD NETWORKS

Finally with regards to the delivery and distribution of fish, a comment needs to be made about the road network in some farming areas. Poor road infrastructure was raised as a particular problem in Behera, but may well be an issue in other governorates as well. While no specific problems were reported during our interviews about the main road network between villages/towns/cities, the network of connecting roads to and around farms is often poor, with sandy/dusty tracks being the norm. In dry weather such conditions cannot help with maintenance of the quality of product as it is being transported, but it is in wet weather that the main problems arise - some farmers report that in heavy rains it can be impossible, or at least very difficult, to move harvested fish from the farms because the roads/tracks can become unusable.

7.0 RECOMMENDATIONS FOR ACTION

7.1 SUMMARY OF RECOMMENDATIONS

This Chapter provides a number of recommendations for support to the sector in Egypt. The recommendations flow directly from the challenges and critical factors presented in Chapter 6. While these recommendations are presented in outline form only it is recognized that they constitute a long list that will require substantial action and investment by many stakeholders. Each stakeholder will need to consider where their contribution can be most effective.

The table below provides a summary list of our recommendations, and is followed by more detailed explanatory text on each recommendation.

Table 15: Summary table of recommended actions

Action	Priority
ACTIONS IN SUPPORT OF AQUACULTURE INPUT CONSTRAINTS	
• Study into the costs/benefits of farm-based feed production, training in best management practice for feed production on farms and use of feed, and support for government monitoring of inputs and products produced by feed mills	• High
• Training for hatchery managers, control of imported hormone, use of improved broodstock, creation of an information source on hatchery performance/quality, study into ways to increase availability of wild mullet fry	• High
• Improvements in water quality through the introduction of appropriate technology for water filtering, provision of water testing equipment and training, lobbying for aquaculture sector to have a water quota like other agricultural crops	• Medium
• Facilitated workshop of all appropriate institutions with a potential training and capacity development role, to agree on a division of responsibilities for the numerous training and capacity development recommendations made in this report	• High
• Ministries to increase lease periods for rented land	• Medium
• GAFRD to address lack of electricity on some land, and study completed into the feasibility of alternative power sources on fish farms	• Medium
ACTIONS IN SUPPORT OF PRODUCTION CONSTRAINTS	
• Approaches to accommodating the short growing season	• Low
• Training in farm design and construction	• Medium
• Training to improve feed and fertiliser use	• High
• Training to optimise stocking densities	• Medium
• Training to improve fish health management	• Medium
• Support for organisational strengthening and cross-site visits	• Medium
• Study into optimal species mix in production ponds	• Medium
ACTIONS IN SUPPORT OF POST-HARVEST AND MARKETING CONSTRAINTS	
• Research and then roll-out of consumer campaign on the benefits of farmed fish, water testing and transparency of results, improved labelling/branding of farmed fish	• High
• Establishment of database on harvesting volumes and times, so as to better plan harvests to reduce fluctuations in price	• Low
• Small loans scheme for health and hygiene and improvements in the post-harvest value chain	• High
• Study into the feasibility of an export strategy for farmed fish	• High
• Feasibility study into farmed fish processing and value-addition	• High
• Upgrading of road network	• Low

7.2 RECOMMENDATIONS TO ADDRESS INPUT FACTORS

REDUCING FEED COSTS AND IMPROVING FEED QUALITY

Along with efforts focusing on post-harvest issues (see Section 7.4 on Pg 57), efforts to reduce unit feed costs, increase feed quality, and improve feed management, are perhaps the most important areas requiring attention in any future support to the sector, given the critical role that feed cost and quality plays in determining overall financial viability. Investment to address this is needed.

This study did not investigate the margins being made by feed producers and the relative unit costs of feed production by mills, as opposed to by farmers themselves. It is already the case that many farmers are making their own feed rather than purchasing it from feed mills[18]. It *may* therefore be that small-scale feed manufacture on farms could result in lower unit costs of feed for any given feed quality. However more researches need to be undertaken into the relative costs of production by commercial feed mills and by farmers, and the potential benefits of farmers producing feed, either individually or as groups. An in-depth study into this issue is recommended.

In the meantime, training and capacity development could be provided through a programme to:

- Ensure that the quality of feed being produced by farmers is up to standard, and that the production of feed by farmers is not compromising quality for the sake of price;
- Encourage best management practice for the use of feed. As already highlighted there is considerable variation in the skills available at the farm level for good use and management of feed. A training programme could be expected to make very real differences to the financial performance of fish farms.

Another mechanism to reduce feed costs paid by farmers and therefore their financial performance, and which could also potentially better guarantee the quality of feed, would be the bulk purchase of feed by farmers, if they can group together to successfully negotiate favourable purchasing conditions, and to test feed quality.

IMPROVING THE QUALITY AND AVAILABILITY OF FRY

Key areas of support to improve hatchery operations and the quality of tilapia fry could include support for:

- Training of hatchery managers in best management practices, particularly on the storage and use of hormones;
- More active involvement of GAFRD in the control of the quality of imported hormone;
- Generation and dissemination of improved broodstock and seed[19];
- Establishment of a central information source on the quality of different hatcheries, the hormones they use, the fry they produce, etc. Such an information source could be used by farmers to obtain and share information about hatchery performance, and therefore incentivize improved practices by hatcheries.

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18 Our interviews suggest that some farms may be able to produce feed at a lower cost than mills while maintaining quality, but this assertion was not verified during the study.

19 By WorldFish Center and other appropriate institutions.

With respect to the shortage of wild mullet fry, capture fisheries management measures appear to be failing to protect resources given recent declines in fry availability. A special study into this issue is therefore recommended to determine the best ways to safeguard wild fry production, given the critical role that mullet production can play in overall farm profitability. This study should consider for example the length and area of closed seasons for commercial mullet fisheries, and whether it is appropriate for GAFRD to have total responsibility for wild fry collection, or whether there might be benefits from leaving farmers and fry collectors to decide prices thereby avoiding the need for the black market which has developed.

IMPROVING THE QUALITY OF WATER USED BY FARMS

The sector should work with the Ministry of Water Resources and Irrigation, and the Cabinet, for aquaculture to be considered as an agricultural crop with its own water quota. This has been attempted previously without success, but it remains a critically important issue that needs to be addressed. Appropriate presentations to key individuals in the Ministry and the Cabinet should be made, highlighting the significant benefits generated by the aquaculture sector in Egypt in terms of income and employment, and emphasizing the fact that fish farming 'takes place' in water, rather than 'uses up' water.

Other actions which could be taken by the fish farming sub-sector itself, perhaps with some support in terms of technical assistance and finance, include the use of simple technology for cleaning suspended solids from water coming in and being discharged back into drainage canals, as well as the potential use of bio-filters for non-suspended matter.

Consideration should also be given to the provision of water quality testing equipment, to be accompanied by appropriate training of people to do the testing.

To reduce the use of harmful substances in the water as a way of controlling weed, relevant Ministries should be urged to use alternative methods of weed control e.g. manual, use of grass carp.

Ground water availability and use in fish farming was not investigated in this study, but could potentially help in alleviating the problem of surface water shortages.

ENSURING SUFFICIENT LABOUR SKILLS

Training for labour working in the sector may be especially needed for those governorates in which it may be possible to expand aquaculture i.e. for new entrants to the sector. However, as highlighted throughout this Chapter, many of the areas requiring action relate to training and capacity development for those already working in the sector. It is therefore recommended that relevant stakeholders such as the Fisheries and Oceans Institute, GAFRD, CLAR, the private sector and the WorldFish Center should work jointly to address the various capacity development needs.

INCREASING SECURITY OF TENURE OVER LAND

It is not realistic to expect any future intervention to interfere in the market for privately rented land. However, the concerns raised by many farmers about poor security of tenure could be addressed for land rented by the Government. It is recommended that relevant Ministries that own land which they rent to fish farms, consider increasing the duration of their lease periods so as to provide greater security to fish farmers.

GENERATING FUEL USE EFFICIENCIES AND POWER SAVINGS

The lack of electricity on many farms is a deficiency which should be addressed by GAFRD. However, consideration could also be given to the introduction of alternative power sources such as wind and solar power, as such sources could generate efficiencies over both power from the electricity grid and from generators. A short study is recommended into developments taking place in other countries so as to learn lessons from the experiences of others, and into the feasibility (practically/technologically, and financially) of the use of such alternative power sources in Egypt.

7.3 RECOMMENDATIONS TO ADDRESS PRODUCTION FACTORS

ADDRESSING THE LENGTH OF GROWING SEASON

While it has been suggested that cold-tolerant tilapia might be bred for use in Egypt, research undertaken to date suggests that this is unlikely to be successful. Alternative approaches include the development of faster growing fish to make better use of the short growing season, and more widespread use of effective overwintering techniques. A programme of training and on-farm trials should be provided to farmers in methods which could support over-wintering (e.g. deeper pond construction, early stocking).

ENSURING GOOD FARM DESIGN AND CONSTRUCTION

It is not likely to be cost effective to alter the design of existing farms which have already been built. However, for any new expansion of fish farms either in the governorates covered by our study, or in other governorates (e.g. in Upper Egypt), the risks of poor farm design must be mitigated. Training and extension should thus be provided for any new expansion of aquaculture into new areas, so as to ensure optimal farm design.

IMPROVING FEED AND FERTILISER USE

Training in best management practice for the use of feed and fertiliser on fish farms must be a key component of any future training programme provided in support of the sector. Training should focus on best practice with regards to the sampling of biomass, feed quantities to be used and the timing of feeding.

OPTIMISING STOCKING DENSITIES

Training in BMPs for optimal stocking densities should be provided. This training should draw on existing knowledge of best practice, and demonstrate how stocking rates and size at stocking should be adapted to reflect local conditions and production strategies.

IMPROVING FISH HEALTH MANAGEMENT

A programme of training should be specified for fish farmers on best management practices with regards to fish health management and disease prevention.

SUPPORT FOR ORGANISATIONAL STRENGTHENING

Organisational strengthening and the building of representative institutions at farm or trader/wholesaler level, is a long-term process. Any support for such developments must therefore be accompanied by long-term commitments from those providing such support. It should also be acknowledged that building organisations for people who have already been involved with the sector for many years, or who have been involved in failed or ineffective organisations, may be difficult. However, the FFFA (see Box 1) has shown that there can be clear benefits of such organisations. It is therefore recommended that any support for the expansion of aquaculture into new areas should be accompanied by training and support for the establishment of representative organisations. Motivation for the establishment of such organisations could be encouraged through the use of 'cross site visits' with those potentially interested in forming new organisations being exposed to the experiences of other organisations, such as the FFFA.

OPTIMISING THE SPECIES MIX/COMPOSITION BEING PRODUCED

It is recommended that consideration be given to preparing a detailed financial and production study of the various possible strategies with regards to optimal species composition in production ponds, so as to maximise production, minimise costs, and maximise profits.

7.4 RECOMMENDATIONS TO ADDRESS FACTORS AFFECTING TRANSPORT, DELIVERY AND DISTRIBUTION

ADDRESSING CONSUMER PERCEPTIONS ABOUT FARMED FISH

Changing consumer preferences for fish can be difficult, and any promotional/marketing campaigns would need to carefully assess the most appropriate strategies for increasing demand for farmed fish i.e. what should be the main messages (e.g. health benefits especially to children, sustainability of aquaculture vs capture fisheries), and who should be the main target group of any such promotional efforts (e.g. women if they are the main group making purchases of fish). Appropriate consumer research is therefore recommended as a first step to design an effective marketing/promotion campaign, before such a campaign is implemented.

Other initiatives to change perceptions about farmed fish, could include:

- Better control over the quality of farmed fish imports (reported to be poor), so that consumer perception about farmed fish in general is improved. Any such initiatives would need to be carefully designed so as not to fall foul of the World Trade Organisation agreements on Technical Barriers to Trade and Sanitary and Phytosanitary measures, or to escalate bilateral tariffs between Egypt and other countries if tariff rates in imported fish were to be raised;
- Publicised water quality testing and transparency in the results; and
- Better marking/labelling, and potentially even branding, of locally produced farmed fish in local markets so that consumers know what is farmed in Egypt and what is imported. Such an initiative could be first trialled on a pilot basis to assess its efficacy.

REDUCING FLUCTUATIONS IN PRICES (DAILY, SEASONAL)

There is no easy or obvious solution to the problem of fluctuating prices. Price information is already available from GAFRD on prices at Al-Obour wholesale market. However, the earlier recommendations in this report on ways to support over-wintering should help to even-out harvesting volumes through the year, and farms can also be encouraged to engage in partial harvesting strategies. Establishment of a database on the timing and volume of harvests from fish farms could be considered as a way to better understand and manage supplies, so as to reduce fluctuations in supply. But agreement would need to be reached by stakeholders about who should host and update such a database, and about issues of confidentiality of commercially sensitive data being provided.

IMPROVING HEALTH AND HYGIENE CONDITIONS IN WHOLESALE AND RETAIL MARKETS, AND IN THE TRANSPORTATION NETWORK

There is considerable potential to improve the health and hygiene conditions in the post-harvest marketing of farmed fish in Egypt. It is recommended that the Social Fund for Development (a Governmental Agency), donors, or appropriate charities provide small loans focusing on such improvements. Funds could be provided for chill trucks (for transportation, and/or to be used as mobile retail fish outlets), fridges/chill stores, retail store improvements, etc. Care would need to be taken over the methods for applying for such funds, the eligibility requirements, and the approval processes used. Such a scheme could benefit both those already operating in the value-chain, but could also favour applications made by new young entrants, which would provide particular employment benefits.

IMPROVE KNOWLEDGE OF EXPORT VIABILITY AND POTENTIAL

Earlier text suggested that current knowledge about the costs and benefits of exporting farmed fish, as opposed to selling it domestically, is insufficient to determine whether an export strategy should be pursued or not. While there have been several previous studies of this issue it will be important to review the current status of this work. It is therefore recommended that a short study be completed to do so. The study should consider the buyer and legal requirements in potential export markets, the feasibility of complying with such requirements and any steps that would need to be taken, and the competitive position (in terms of production costs, transportation costs, etc) of Egyptian producers compared to other exporters.

INVESTIGATION INTO APPROPRIATE METHODS OF PROCESSING FOR VALUE-ADDITION

Value-addition through the processing of farmed fish (with potential for associated benefits in terms of both profits and employment) is an exciting, but as yet unproven, way to improve value-chain performance. As already noted, concerns rest largely on consumer reticence over processed products. Further assessment and analysis is therefore necessary into the feasibility of different forms of processing (e.g. into fillets, cans, etc) and the accompanying market promotion and financing (amounts and methods) that might be necessary.

IMPROVEMENTS TO ROAD NETWORKS

The problem of poor road networks on and to some farms, should be addressed through appropriate investments to be made by GAFRD and other relevant Ministries.

7.5 RECOMMENDATIONS TO SUPPORT EMPLOYMENT CREATION

Before discussing ways to *increase* employment, it must be stressed that support for the sector is justified as a way of *protecting existing* employment. The quantitative data presented earlier in this report show that the sector is currently financially viable and generates considerable amounts of direct and indirect employment. However, the qualitative benchmarking of performance over time suggests that recent increases in input costs, associated with stagnating or declining fish prices, are placing considerable financial pressures on the value chain, and especially on the fish farming sub-sector. Support for the sector can thus be viewed as important in maintaining existing levels of employment, which might otherwise be jeopardised.

However support for the sector could also be expected to increase employment. There are three main avenues through which this could occur.

Firstly, support leading to the expansion of aquaculture into new areas, and the increasing production that would result, would generate employment in all sub-sectors of the value chain. The potential numbers of jobs that could be created could be estimated based on the figures provided earlier on employment per tonne of fish produced/sold by each link the value-chain.

The second avenue for increased employment is to increase the intensity of production for existing businesses. Because Egyptian aquaculture is still semi-intensive and extensive in places, there is considerable potential to increase production from existing farms in ways that will increase employment. This will require the profitability of farms to increase.

Finally, even if existing farm production was to remain unchanged, employment levels in the value-chain could be increased with some post-harvest processing. Such employment could be expected to have particular benefits in terms of potential employment for women and the young. Again, the first step in such a development is to better understand the feasibility of such processing and the steps that would need to be taken to incentivize it (in terms of financing, and market demand). But even without processing, improvements in the health and hygiene conditions when selling and transporting fish could achieve significant employment gains.

APPENDIX 1: REFERENCES

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APPENDIX 2: STUDY QUESTIONNAIRES

FISH FARMER QUESTIONNAIRE

Questionnaire number
(to be entered when entering data into spreadsheet so as to provide a cross reference)

SECTION 1:
BACKGROUND INFORMATION

1. Location

   .....

   Notes: this should be the location of the FARM, not necessarily where the interview was completed. State Governorate and specific location within it.

2. Date of interview

   .....

3. When did you start fish farming?

   .....

4. What was the size of the fish farm you started with?

   .....

5. Are you the owner of the farm, the manager of the farm, or both?

   .....

6. Other sources of income in addition to fish farming

   .....

7. Interviewer name(s)

   .....

SECTION 2:
MAPPING / DESCRIBING THE VALUE-CHAIN

8. What is the total farm size? Specify unit i.e. ha or Fed

   Total area ..... Used area 2010 .....

9. Do you own or rent your farm land?

   .....

10. What were your stocking densities and sizes for different species last year?

Species	# per unit of area (fed or cages)	Size of fry/fingerlings when stocked
Tilapia		
Mullet (M.Cep)		
Mullet (M.Cap)		
Common carp		
Silver Carp		
Catfish		
Others		
Total		

11. How long typically is the period between stocking and harvest (in months)

    .....

    Notes: differentiate if different for different species

12. What is the typical size of the fish when you sell them? (kg)

    Tilapia .....

    Mullet M. Cep .....

    Mullet M. Cap .....

    Common carp .....

    Silver carp .....

    Catfish .....

13. When are the main harvest/sales periods? (tick boxes)

Month	Tick
January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	

14. How many people do you employ of different ages? Note: i.e. family members and employees

Type of people employed	Number of employees over 30	Number of employees under 30	Estimated total days of employment per year i.e. number x working days per year
Men full time			
Men part-time all year			
Men seasonal			
Women full time			
Women part-time all year			
Women seasonal			

15. Where do the people you employ come from? Note: i.e. family members and employees

Type of people employed	No. from this governorate	No. from another governorate (say where from)
Men full time		
Men part-time		
Men seasonal		
Women full time		
Women part-time		
Women seasonal		

16. What proportion of your total yearly earnings/sales revenue come from fish farming different aquaculture species, and what proportion from other business activities you may have?

    .....% from fish farming

    .....% from other business activities

17. Which link in the value chain is most important in setting prices for fish?

    .....

18. How much fish did you sell last year/season in terms of volume and value, and for what average price?

    Notes
    - *This is a critical question and table must be completed in full.*
    - *Let interviewee provide answer to total value, and the average price for 2010 (not the current price). Check that the average price = the volume divided by price, and if not explore why not and correct figures if necessary*

Species	Annual production volume (tonnes) last year/season	Annual sales value (LE) last year/season	Average annual price last year/season
Tilapia grade super			
Tilapia grade 1			
Tilapia grade 2			
Mullet (M.Cep)			
Mullet (M.Cap)			
Common carp			
Silver Carp			
Catfish			
Others			
Total			

19. How have those volumes, sales revenue and prices changed compared to previous years?

Species	Annual production volume (up, down, static)	Annual sales value (up, down, static)	Average annual price (up, down, static)
Tilapia grade super			
Tilapia grade 1			
Tilapia grade 2			
Mullet (M.Cep)			
Mullet (M.Cap)			
Common carp			
Silver Carp			
Catfish			
Others			
Total			
General comments on reasons for change			

20. What proportion (%) of the total amount of fish that you harvest are you typically unable to sell because of

    a) wastage, spoiling

    .....

    b) other reasons (specify what e.g. family consumption)

    .....

    .....

21. What proportion of the total value of sales for different species do you sell in different product forms

Species	Live	Fresh not on ice	Fresh on ice
Tilapia			
Mullet (M.Cep)			
Mullet (M.Cap)			
Common carp			
Silver Carp			
Catfish			
Others			

22. What type of feed and how much feed did you use last year (either total per year or per feddan per year). Could be feed purchased or feed made themselves

.....

.....

.....

23. What were the prices for different types of feed you bought last year?

.....

24. Please could you tell us about your main operating costs last year? It would also be helpful to know for each item how costs this year compare to those over the last three years. If costs not provided per year but by unit, make sure to enter the unit e.g. per fed per year

Cost item	Total cost per year (in LE) for last year/season	How is cost changing over the years (up, down, static)
Fry/fingerlings tilapia		
Fry/fingerlings mullet Cep		
Fry/fingerlings mullet Cap		
Fry/fingerlings common carp		
Fry/fingerlings silver carp		
Fry/fingerlings catfish		
Fish feed (bought and made)		
Fertilisers		
Power/electricity/fuel		
Labour and management (regular and harvesting)		
Water		
Sales commission to agents		
Transport costs to market		
Ice		
Other (specify)		
Total		

25. After you have paid for your operating expenses, how much profit do you make on average from selling farmed fish (specify if profit is total, LE per kg or tonne, or per area).

.....

This question may not be necessary if we have collected good sales and costs data. If answers to the previous questions are not thought to be reliable, the question is very important.

26. What were your investment/fixed costs last year/season? If costs not provided per year but by unit, make sure to enter the unit e.g. per fed per year

Item needing to be bought	Total cost last year/season in LE	How are costs changing over the years (up, down, static) (for unit costs, not totals which may depend on whether farm size growing or not)
Financial/interest charges (bank loans only not if financed by traders)		
Licensing and other government charges		
Repair and maintenance costs		
Land rent (if applicable)		
Cost and number assets (i.e. new replacement cost) (lifespan in brackets) of - Aerators (10) - Buildings (25) - Nets (3) - Pumps (5) - Generators (10) - Machinery (10) - Other (specify)	 - - - - - - -	
Other (pls specify)		
Total		

27. What % of the total value of your sales do you sell to:

- Fish traders .....
- Fish wholesalers .....
- Retailers .....

28. What are the main sources of finance used in your fish farming business (tick and obtain % if possible)

( ) Own finance .....

( ) Traders or other links in the value chain .....

( ) Formal bank sources .....

( ) Other .....

SECTION 3:
CRITICAL FACTORS IMPACTING ON THE INPUTS NEEDED BY THE INTERVIEWEE

Notes:

- *Explain that this means things that they use or need to buy*
- *Interviewer should prompt using the costs listed in question 21*
- *Reasons may relate to government policy, activities of other businesses supplying them, competition, or anything else*
- *Try to get interviewee to think about who could solve the problem as well as what the solution might be*

29. Are there any particular problems at the moment or risks for the future in terms of a) costs, b) availability, c) reliability, d) government policy, etc affecting any of the inputs to your activities that you mentioned just now (ie. daily/operational and investment/fixed costs)? If you could please explain for each problem why you think these problems occur?

Input being used	Problem experienced or expected	Why does this problem occur?	What do you think could be done to solve the problem and/or what are you doing to try to solve the problem?
Fry/fingerlings			
Feed			
Fertiliser			
Electricity, power, fuel			
Labour			
Water			
Transport			
Ice			
Other			
Land availability			

SECTION 4:

CRITICAL FACTORS IMPACTING ON FARM PRODUCTION ITSELF

Notes: some examples may include:

- *Issues related to government licensing, related costs, regulation, government policy, corruption, etc i.e. things outside of the influence of the interviewee*
- *Skills or efficiency of labour employed*
- *Management practices and how good they are e.g. feed management, disease prevention, water quality, etc*
- *Try to get interviewee to think about who could solve the problem as well as what the solution might be*

30. Are there any particular problems at the moment or risks for the future in terms of a) skills, b) techniques and methods, c) information, d) government policy, etc, of any of the activities that you carry out? If you could please explain for each problem why you think these problems occur?

Problem experienced or expected	Why does this problem occur?	What do you think could be done to solve the problem and/or what are you doing to try to solve the problem?

SECTION 5:

CRITICAL FACTORS IMPACTING ON THE DELIVERY OR SALES OF FISH TO TRADERS OR MARKETS

Notes: some examples may include:

- *Reliability or costs of transport*
- *Location impacting on time to transport*
- *Lack of information on sales prices in markets*

31. Are there any particular problems at the moment or risks for the future in terms of a) methods, b) information, c) logistics/transport, d) negotiating of delivering or selling your fish to those you sell it to? If you could please explain for each problem why you think these problems occur?

Problem experienced or expected	Why does this problem occur?	What do you think could be done to solve the problem and/or what are you doing to try to solve the problem?

SECTION 6:
OTHER QUESTIONS

32. Has any sort of training or capacity development provided to fish farms such as yours? If yes provide details (when, what and from who).

.....

.....

.....

33. If not, what sort of training do you think would be most useful, if any. Please provide details.

.....

.....

34. Is any sort of other support provided to fish farms such as yours? If yes provide details.

.....

.....

.....

Examples may include subsidies to cost items

35. Do you have any other comments you would like to make about your activities, or how you think your livelihood and profits could be improved?

.....

.....

.....

36. Interviewee name

.....

37. Interviewee contact phone number and/or email

.....

.....

FISH TRADER, WHOLESALER OR RETAILER QUESTIONNAIRE

Questionnaire number
(to be entered when entering data into spreadsheet so as to provide a cross reference)

SECTION 1:
BACKGROUND INFORMATION

38. Location

    .....
    Notes: this should be the location of the business, not necessarily where the interview was completed. State Governorate and specific location within it.

39. Date of interview

    .....

40. Are you (tick all relevant options), and since when?

    a. A trader buying or collecting from farms and selling/delivering to wholesalers
    b. A wholesaler
    c. A retailer
    d. Other (specify)

41. If you ticked more than one in the question above, what is your main activity (tick one option)

    a. A trader buying from farms and selling to wholesalers
    b. A wholesaler
    c. A retailer
    d. Other (specify)

PLEASE ANSWER ALL THE FOLLOWING QUESTIONS FOR YOUR MAIN ACTIVITY

42. Other sources of income in addition to fish sales

    .....

    .....

43. Interviewer name(s)

    .....

SECTION 2:
GENERAL QUESTIONS

44. How important do you think the following issues are to your customers on a scale of 1- 5, with 5 being not important and 1 being the most important at all

*Notes: **Each** item should be ranked 1-5 deleted column*

Issue	Interviewee perception of importance of issue to their buyers/markets (1-5)
Prices	
Quantity of supply	
Size per piece	
Reliability of supply i.e. seasonality	
Quality of product	
Type of species being sold	
Types of product i.e. levels of processing	
Type of packaging materials used	
Other (pls specify)	
Other (pls specify)	

45. Has any sort of training or capacity development provided to businesses such as yours? If yes provide details (when, what and from who).

.....

.....

.....

.....

46. If not, what sort of training do you think would be most useful, if any? Please provide details.

.....

.....

.....

.....

47. Is any sort of other support provided to businesses such as yours? If yes provide details. *Examples may include subsidies to cost items*. If not, is there a need for any specific type of support?

.....

.....

.....

.....

48. Is any sort of organisation representing businesses like yours? If yes provide details.

Name or organisation if there is one

.....

Are you a member?

.....

What services does it provide?

.....

If there is no organisation, is there a need for one?

.....

.....

49. What is the most demanded grade and size of fish in the market?

.....

50. Does the market require or provide incentives in terms of price differences for the sorting and re-grading of fish coming from farmers?

.....

SECTION 3:
MAPPING / DESCRIBING THE VALUE CHAIN

51. Could you tell us a little bit about your facilities and operations in terms of assets, places of business, etc.

.....

.....

.....

52. How long do you usually have/store fish after you have bought it until you sell it (in days)?

.....

Notes: differentiate if different for different species

53. What is the typical size of the fish when you sell them? (kg)

Tilapia .....

Mullet M. Cep .....

Mullet M. Cap .....

Common carp .....

Silver carp .....

Catfish .....

54. When are the peak periods in terms of a) supply of products to you, and b) demand for your sales? (tick boxes) i.e. is supply meeting demand

Month	Peak supply	Peak demand	Average total farmed fish sales/day (tonnes)	Comments on any species-specific issues
January				
February				
March				
April				
May				
June				
July				
August				
September				
October				
November				
December				

55. How many people do you employ of different ages? Note: i.e. family members and employees

Type of people employed	Number of employees over 30	Number of employees under 30	Estimated total days of employment per year per person
Men full time			
Men part-time all year			
Men seasonal			
Women full time			
Women part-time all year			
Women seasonal			

56. Where do the people you employ come from? Note: i.e. family members and employees

Type of people employed	No. from this governorate	No. from another governorate (say where from)
Men full time		
Men part-time		
Men seasonal		
Women full time		
Women part-time		

57. What proportion of your total yearly sales revenue come from farmed fish, wild fish, and from other business activities you may have?

.....% from sales from farmed fish

.....% of sales from wild-caught fish

.....% from other business activities (may include importing fish)

58. How much farmed fish did you sell last year/season in terms of volume and value, and for what average price?

Notes

- *This is a critical question and table must be completed in full.*
- *Let interviewee provide answer to total value, and the average price for 2010 (not the current price). Check that the average price = the volume divided by price, and if not explore why not and correct figures if necessary*

Species	Annual sales volume (tonnes) last year	Annual sales value (LE) last year	Average annual price last year
Tilapia grade super			
Tilapia grade 1			
Tilapia grade 2			
Mullet (M.Cep)			
Mullet (M.Cap)			
Common carp			
Silver Carp			
Catfish			
Others			
Total			

59. How have your sales volumes, sales revenues and prices changed over recent years?

Species	Annual sales volume (up, down, static)	Annual sales value (up, down, static)	Average annual price (up, down, static)
Tilapia grade super			
Tilapia grade 1			
Tilapia grade 2			
Mullet (M.Cep)			
Mullet (M.Cap)			
Common carp			
Silver Carp			
Catfish			
Others			
Total			
General comments on reasons for change			

60. Could you please explain how farmed fish prices change over the course of the year, and what are the main reasons for any fluctuations?

.....

.....

.....

61. Which link in the value chain is most important in setting prices for fish?

.....

.....

62. What proportion (%) of the total amount of fish that you buy are you typically unable to sell because of

a) wastage, spoiling

.....

b) other reasons (specify what e.g. family consumption)

.....

63. What % of the total value of sales for different locally farmed species do you sell.

Note each row should add up to 100%

Species	Live	Fresh not on ice	Fresh on ice	Frozen (or which has been frozen)	Processed/ Filleted fresh	Processed/ filleted frozen
Tilapia						
Mullet (M.Cep)						
Mullet (M.Cap)						
Common carp						
Silver Carp						
Catfish						
Others						

64. Please could you tell us about your main operating costs last year? It would also be helpful to know for each item how costs this year compare to those over the last three years. Be careful to provide the unit if figures provided per kg or per month or per year

Cost item	Total cost per year (in LE) for last year/season month/yr issue	How is cost changing over the years (up, down, static)
Farmed tilapia purchases grade super		
Farmed tilapia purchases grade 1		
Farmed tilapia purchases grade 2		
Farmed mullet Cep purchases		
Farmed mullet Cap purchases		
Farmed common carp purchases		
Farmed silver carp purchases		
Farmed catfish purchases		
Wild caught fish purchases		
Imported fish purchases		
Power/electricity/fuel		
Labour and management		
Water		
Sales commissions		
Transport costs to market		
Ice		
Other (specify)		
Total		

65. After you have paid for your operating expenses, how much profit do you make on average from selling farmed fish (specify if profit is LE per kg, or per year). Note this may be total profit per year, or a margin/profit per kg or tonne.

.....

This question may not be necessary if we have collected good sales and costs data. If answers to the previous questions are not thought to be reliable, the question is very important.

66. What were your investment/fixed costs last year/season? Be careful to provide the unit if figures provided per month

Item needing to be paid for	Total cost last year/ season in LE	How are costs changing over the years (up, down, static) (for unit costs, not totals which may depend on whether the business is growing or not)
Financial/interest charges (e.g. on bank loans)		
Licensing and other government charges		
Repair and maintenance costs to buildings, vehicles, etc		
Land or building rents/leasing costs (if applicable)		
Depreciation on assets (i.e. purchase price divided by lifespan) of - buildings - ice and chill machines and storage - generators - machinery - other (specify)	 - - - - -	
Other (pls specify)		
Total		

67. What % of the total value of your sales do you sell to:

- Fish traders .....
- Fish wholesalers .....
- Retailers .....
- Consumers .....

68. What are the main sources of finance used in your fish farming business (tick and obtain % if possible)

( ) Own finance .....
( ) Traders or other links in the value chain .....
( ) Formal bank sources .....
( ) Other .....

SECTION 4:
CRITICAL FACTORS IMPACTING ON THE INTERVIEWEE

Notes: Make sure to cover the following issues in discussion to see if important in terms of availability and price

1. *government policy or regulations*
2. *infrastructure e.g. roads*
3. *availability of fish supply*
4. *quality of fish (e.g. ice, handling, storage)*
5. *transport*
6. *issues related to fish prices and demand*
7. *issues related to labour (availability and skills)*
8. *issues relating to organisation*
9. *issues related to access to finance/capital*

69. Are there any particular problems at the moment or risks for the future in terms of the list of issues (or other) above? If you could please explain for each problem why you think these problems occur?

Issues	Problem experienced or expected	Why does this problem occur?	What do you think could be done to solve the problem and/or what are you doing to try to solve the problem?

Issues	Problem experienced or expected	Why does this problem occur?	What do you think could be done to solve the problem and/or what are you doing to try to solve the problem?

70. Do you have any other comments you would like to make about your activities, or how you think your livelihood and profits could be improved?

.....

.....

.....

71. Interviewee name

.....

72. Interviewee contact phone number and/or email

.....

.....

APPENDIX 3: TILAPIA CAGE FARMING MODEL

This Appendix provides the costs and earnings model generated from an interview conducted with a cage farmer operating in Rashid, to the east of Alexandria in Behera Governorate. The data are not included in the fish farming sub-sector data on Behera presented earlier in this report.

Table 16: Costs and earnings of tilapia cage farm, 2010

Key performance data for tilapia cage farm with 4 cages each of 10x12x6m	
FTE	2.36
% of FTE men	100%
% of FTE full time	85%
% of FTE under 30	7%
Employment per 100 tonne	20.52
Employment cost per tonne	1,043
FCR	1.39
Av price received per kg produced (LE)	12.81
Av op production cost per tonne (LE)	5,722
Feed cost as % of total op costs	36%
Operational profit (LE)	81,500
Operational profit per tonne (LE)	7,087
Operational profit as % of sales	55%
Total production cost per tonne (LE)	5,901
Net profit (LE)	79,440
Net profit per tonne (LE)	6,908
Net profit as % of sales	54%
Total value-added per tonne (LE)	7,951

Figure 11: Tilapia cage farming in Behera

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