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Value-chain analysis — An assessment methodology to estimate Egyptian aquaculture sector performance ☆

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ABSTRACT

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 aquaculture production. The aquaculture sector in Egypt is now a mature one having developed over a period of more than 30 years, but the financial performance of the sector is not well understood or documented, even though value-chain analysis provides a methodological tool to do so. To provide a better understanding of the sector, a WorldFish Center study completed in September 2011 and funded by the Swiss Agency for Development and Cooperation, conducted a value-chain analysis of the pond fish farming sector. The sector concentrates on the production of tilapia with additional production of mullet, catfish and carp from earthen ponds. The study mapped the value-chain and showed that there is no processing and virtually no export of farmed fish, a short time-period from harvest to final consumption by the consumer (typically around one day) due to the live/fresh nature of all sales, and very low rates (<1%) of post-harvest losses. Quantitative data were collected for each link in the value-chain on operational and financial performance (e.g. gross output values, variable and fixed costs, operational and net profit margins, value-added generation), and on employment creation (by gender, age and full-time/part-time). The results showed that the industry generates a combined LE 4619 ($775) of value-added (i.e. profits plus wages/earnings) for farmers, traders and retailers for each tonne of fish produced. Employment generation is also significant with around 14 full-time equivalent jobs generated for every 100 tonnes of fish produced. However, the sector as a whole is under increasing financial pressure. Critical factors impacting on the performance of the value-chain relate to inputs (most importantly to rising feed costs and the poor quality of fry), to production (most importantly to poor practices with regard to feed management, farm design and construction, fish health management, and stocking densities), and to the marketing, transportation and sale of product (most importantly to declining fish prices in real terms, consumer preference for wild fish and a distrust of filleted/processed products, fluctuating seasonal prices, poor hygiene and handling practices, the lack of value-addition through processing, and the lack of exports). This paper highlights the benefits of value-chain analysis as a useful tool to understand sector performance and argues for its wider use in identifying critical factors and actions to support aquaculture sector improvements.

1. Introduction

The main sources of fish production in Egypt include marine fisheries, inland capture fisheries and aquaculture. Total production increased from 724,300 tonnes in 2000 to 1.1 million tonnes in 2009. These increases were primarily obtained from significant increases in aquaculture production, and the share of total production provided by aquaculture had risen to 65%, up from 47% in 2000 (GAFRD, 2011).

Egypt's aquaculture production was 705,490 tonnes in 2009 (GAFRD, 2011), which is the largest of any African country. According to FAO statistics (FAO FISHSTAT) Egypt ranks 11th in terms of global aquaculture production. Eighty-four percent of aquaculture production comes from earthen ponds, with the rest produced in fish/rice fields,

Abbreviations: LE, Egyptian pounds (LE1 = $5.96); FTE, full time equivalents; Av., average; g, grammes; FCR, Feed Conversion Ratio; BMPs, Best Management Practices; Fed, Feddan (1 ha = 2.381 feddan).

☆ All authors listed above were part of the study team which planned and executed the fieldwork which generated the data and information used and presented in this paper.

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and intensive cage farms (GAFRD 2011). Aquaculture production is strongly concentrated in the delta region to the north of Cairo. Tilapia (*Oreochromis niloticus*) accounts for 55.5% of national aquaculture production by volume, grey mullet (*Mugil cephalus*) and thinlip mullet (*Liza ramada*) for 29.9%, common carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idella*), and silver carp (*Hypophthalmichthys molitrix*) for 10.5%, North African catfish (*Clarias gariepinus*) for 2.5%, and European seabass (*Dicentrarchus labrax*) and gilthead seabream (*Sparus aurata*) for 1.5% (GAFRD 2011).

With a production of over 700,000 tonnes in 2011 and more than 120,000 people estimated to be employed in the sector[2] Egyptian aquaculture makes an important contribution to income, employment creation and food security, all of which are national policy priority areas given low per capita income levels (LE1 2556 or $2107 in 2010),[3] a population that has been growing in recent years at a constant rate of about 1.48 million per year, worsening food security indicators, and official unemployment levels which have remained at around 10% for the last ten years (CAPMAS, 2011).

However, despite the fact that the aquaculture sector in Egypt is now mature, having developed over a period of more than 30 years, the financial and social performance of the sector are not well understood or documented. This is a little surprising given the existence of value-chain analysis as a useful tool to assess performance, and its increasing prominence as a form of analysis in the fisheries and aquaculture sectors (Veliu et al., 2009; Christensen et al., 2011). The increasing interest in value-chain analysis is due to the fact that it provides an excellent means of assessment to:

- Focus on distributional issues and pro-poor and gender equitable growth (Mayoux and Mackie 2008; Rubin et al., 2009; USAID 2011), and on global linkages in the context of globalisation;
- 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 to
- Identify 'levers' and targeted action programmes to 'upgrade' and improve value chain performance.

This paper presents the outputs of a value-chain study completed during September 2011. The study was funded by the Swiss Agency for Development and Cooperation and completed by a team from the WorldFish Center and CARE Egypt, supported by an international expert in value-chain analysis.

The objectives of the study were to better understand, and report on, the pond fish farming value-chain in Egypt. In particular the study aimed to:

- Map the value-chain for pond farmed fish 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 and financial performance of the different sub-sectors/links of the value-chain; and
- Identify the key constrains and problems impacting on different actors in the value-chain.

This paper focusses on presenting the results of the first three of these bullets, and only presents in summary form some of the key constraints and problems identified during the study as impacting on the value-chain.

[2] Figures estimated by the General Authority for Fisheries Resource Development.

[3] Most financial/economic figures in this paper are provided in Egyptian pounds (LE). LE 1 = US$ 5.96.

2. Material and methods

2.1. Study scope

The scope of the study presented in this paper was limited to earthen pond farming (which accounts for 85% of the total Egyptian aquaculture production) in four governorates, which together account for almost 74% of the total national production from ponds, namely: Kafr el Sheikh, Behera, Fayoum and Sharkia (see Fig. 1). Pond farms in Egypt are generally considered as 'semi-intensive', although there are a range of different strategies used by fish farmers in terms of stocking densities and the use of feed.

The mapping and financial analyses of the pond farming value-chain start at the fish farm and finish with retail sales to the consumer, with fish fry/fingerlings viewed as a farm input along with other key inputs such as fish feed, labour, capital etc. Hatchery operations and the quality and quantity of fry being produced were considered by the study in terms of the critical challenges and problems facing the sector, but costs and earnings data for hatcheries were not collected as part of the study. The study was also limited to the retail sector, and did not cover the food service sector (e.g. restaurants).

All data on the financial performance of the value chain collected and presented in this paper pertain to the full calendar year 2010, and are yearly averages. The data for each link in the value-chain presented for the four governorates covered by the study are averages, and hide nuances in performance between individual operators.

2.2. Study phases

The study was completed in three main phases.

During the first phase, two study questionnaires covering both qualitative and quantitative issues were drafted, one for fish farmers, and one to cover the post-harvest sub-sector i.e. traders/wholesalers and retailers. 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 changes to the questionnaires, which were then finalised and printed for the field work.

In Phase 2, individual interviews and focus group discussions were held with fish farmers, traders/wholesalers, and retailers. In order to maximise the number of interviews possible during the time available for the field work, the study team (the authors of this paper) arranged to meet small groups of stakeholders at a central location in each governorate. This provided an opportunity to introduce the study and to hold a focus group discussion in plenary before individual interviews with those participating in the focus groups were then conducted with the participants (each member of the 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 60 to 90 min, as did the individual interviews.

Table 1 provides information on the number of individual questionnaires completed in each of the four governorates and the number of participants that were involved in the focus group discussions.

During Phase 3, data from the questionnaires were entered into a Microsoft Excel spreadsheet and then analysed to generate the results. The quantitative results were considered in light of, and informed by, the qualitative focus group discussions which had also taken place during Phase 2.

3. Theory/calculation

3.1. Value-chain analysis

A value chain is a sequence of related enterprises conducting activities so as to add value to a product from its primary production,