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Characterisation of production, marketing and consumption patterns of farmed tilapia in the Nile Delta of Egypt

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ABSTRACT

Egypt has one of the world's largest aquaculture sectors which makes a significant contribution to income, employment creation and food security. However, there are very limited data available on the farmed tilapia value chain. The aim of this study therefore was to characterise production, marketing and consumption patterns of farmed tilapia in the Nile Delta of Egypt. A cross sectional study was conducted to collect data from tilapia producers (100), transporters (32), retailers (100), fish fry shops (20) and households (300) in three case study communities (fish producing, peri-urban and rural community). We conducted structured questionnaire interviews and participatory assessments for producers and consumers. Focus group discussions with mothers were also held to collect data for the availability, sources and consumption patterns of tilapia.

Results showed that, more than half of producers were small scale, having a farm size of 10 feddan or less (1 feddan = 4200 m^2). The main water supply for almost all farms was agricultural drain water, a potential source of contamination with chemical and biological hazards. The main production constraints were reported to be feed prices, water quality and availability, land rent, fuel and energy sources and environmental conditions. The farmed tilapia value chain was short with some value added in the form of marketing fresh and live fish as well as selling tilapia in fried or grilled form. The majority of produced tilapia was transported to retail sale and sold to consumers as fresh, while only a small proportion was processed by cleaning, grilling or frying. A lack of hygiene during transportation and marketing of farmed tilapia was found that could be potential sources for post-harvesting contamination. The availability and frequency of tilapia consumption were higher in the community in the production areas than in other communities. In non-producing areas, tilapia may be available in the market once a week during the village market day. Potential areas for further research in order to improve safety, quality and production of farmed tilapia were identified.

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Introduction

Animal source foods (ASF) provide important sources of energy, micro and macro nutrients but are commonly associated with foodborne diseases. Livestock and fish value chains support the livelihoods of millions of rural and urban poor, for whom they can act as pathways out of poverty (ILRI, 2011). For more than 30% of the world population particularly in developing countries, fish and other aquatic products provide at least 20% of protein intake (Béné et al., 2007). In the poorest countries of Africa and South Asia, small-scale fisheries are considered critical for food security, as they supply more than 50% of the protein and minerals for over 400 million people (Richardson et al., 2011). Fisheries and aquaculture also provide direct jobs for more than 36 million people worldwide (98% of them in developing countries), and indirect jobs for about half a billion people (Richardson et al., 2011).

Egypt is the largest aquaculture producer in Africa and the 8th largest globally; in 2011 the aquaculture production was about 986,820 tonnes (FAO, 2013). According to the General Authority for Fisheries Resource Development (GAFRD) the aquaculture sector makes a significant contribution to income, employment

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creation and food security (Macfadyen et al., 2012). It is also a rapidly growing sector: fish consumption in Egypt rose from 8.5 kg to 15.4 kg/person/year between 1996 and 2008 (Macfadyen et al., 2012). A recent value chain analysis of the industry revealed that the farmed fish value chain in Egypt is mainly based on the production of tilapia with mullet the second most important species on private fish farms. Other species of fish such as carp and catfish are farmed in small quantities (Macfadyen et al., 2012).

To the authors' knowledge there are no data available that characterise the farmed tilapia value chain in Egypt. While available studies focus mainly on the financial performance of the farmed fish marketing and a few on the farmed fish sector in general, none of these studies evaluated the practices and perceptions of all value chain actors, including consumers (Norman-López and Bjørndal, 2009; Macfadyen et al., 2012, 2011; Kleih et al., 2013; El-Naggar et al., 2006). There is a need for research to understand the state of current tilapia production, marketing and consumption patterns as a basis to inform measures that ensure the availability and safety of tilapia. The aim of this study therefore was to characterise production, marketing and consumption patterns of farmed tilapia in the Nile Delta of Egypt. The objectives were to (1) characterise the production system of farmed tilapia and to identify production constraints, (2) describe harvesting, transportation and marketing of farmed tilapia in order to identify factors influencing its availability and safety, (3) determine the frequency of consumption of tilapia in different case study communities, and (4) to identify data gaps and areas for further research. The information obtained is useful to monitor the farmed tilapia production chain from production to consumption, identify critical control points and finally to suggest avenues to overcome production, quality and safety constraints along the chain.

Materials and methods

Overview

For the purpose of this study, questionnaire surveys were conducted among producers, transporters, retailers and households in the Nile Delta in Egypt. For producers, transporters and retailers a direct observation checklist was used. In addition, participatory rural assessments (PRA) for producers were conducted mainly to identify perceived tilapia production constraints in the study area. Moreover, PRAs or Participatory Urban Appraisals (PUAs) were held with consumers and focus group discussions (FGD) with mothers with children under five years of age to collect data for the availability, sources and consumption patterns of tilapia. The PRAs/PUAs and FGDs were held at health care centres during child vaccination days. For all surveys, questionnaires and checklists were developed in English and later translated to Arabic by two independent Egyptian native Arabic speakers for accuracy. The research objectives were fully explained to them before translation to make sure that they were familiar with these objectives. The interview protocols and questionnaires were discussed and explained to the enumerators. The interview team comprised six men (four veterinarians and two local people) and two women health visitors. The fieldwork was supervised by the first author. Questionnaires were pilot tested and changes were made where things were unclear and could be misunderstood by survey participants. In addition to questionnaires, enumerators were asked to register their observations of the environment in observation checklists and take photos when possible. All instruments are available upon request from the corresponding author. This study was conducted from October 2012 to May 2013 in order to cover both the production and marketing seasons.

Study sites

The target area for producers was Kafrelsheikh governorate, as this is the main fish producing area in Egypt with about 324,479 tonnes (55% of the national farmed fish production) and a total tilapia production of 259,583 tonnes (44% of the national farmed tilapia production) (Macfadyen et al., 2011). For consumption surveys, three case study sites were identified based on demographic characteristics and proximity to fish-farming areas. Purposive sampling was used to be able to compare non-tilapia producing and tilapia producing areas as well as urban and rural areas. The following communities were included: Community A, village in Kafrelsheikh governorate (close proximity to fish-farming areas), Community B, urban/peri-urban area in Gharbia governorate and Community C, village in Monofya governorate (geographically removed from fish-farming area), Fig. 1. Fish retailers and street vendors were interviewed also in these communities. Fish transporters and wholesalers were interviewed at the main wholesale fish market in Kafrelsheikh, *Alborsah*.

Surveys and questionnaires

Producers

In the absence of a database for all fish farms in Egypt, a list of fish farms in Kafrelsheikh governorate was compiled through government records of licensed farms and records of fines administered to farms without licenses. These lists were compiled and stratified into farms of different sizes, namely <5 feddan[1] (278), 5–10 feddan (194) and >10 feddan (287). The sample size was calculated to estimate the frequency of certain binary fish farm characteristics; 50% was chosen as an estimate of prevalence which was likely to apply to characteristics of interest (e.g. use of poultry manure in fish farms, use of commercial feed and other characteristics) with a 95% confidence interval and 10% precision, which resulted in a sample size of 97 farms. Farms were selected randomly from each group in numbers proportional to the percentage of farms in each group. Contact details for each farm were obtained from the government records, fish associations and/or fish feed factories. Visits were scheduled with the owner, manager, or a worker who was authorised to talk to the enumerators. Upon visiting fish farms, structured interviews were conducted to collect data about different production parameters, production inputs and outputs, farm management, water management and producers perception towards the quality and safety of farmed tilapia. Producers were also asked about the inspection or supervision of their production process by the government or any other organisation. In addition to questionnaires, four PRAs were conducted. For each PRA, enumerators with support from local key persons such as large scale farmers and feed producers invited a group of 10–15 producers to participate in the study. Participants were randomly selected from the list of the fish farms visited and key informants, including hatchery owners and feed factory owners. During the meeting, the aims and objectives of the PRA were described by the facilitators and informed oral consent was obtained from each participant. Different tools were used for collecting data, namely data show projector, seasonal calendar, chapatti diagrams, flow charts and problem opportunity matrix. Notes were taken by one of the facilitators in addition to audio-recording and photos. After the meeting, one person synthesised the notes, audio-records and the photos into a summary document. The PRA discussions mainly focussed on production constraints and producers' suggestions to overcome these constraints.

[1] Feddan is a unit of area used in Egypt and some other Arab countries, 1 feddan = 0.42 ha = 1.038 acres = 4200 m^2.

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