

# Food safety in the aquaculture value chain in Egypt

Mission report: 27 September to 12 October 2012

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## **GIZ Mission report - Safe Food, Fair Food Project (SFFF 2)**

### **Name of partner institution**

WorldFish

### **Reporting period**

October 2012 – February 2013

### **Project coordinator (leading scientist) and project scientists**

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### **Activities completed**

From 27th September to 12th October 2013 WorldFish facilitated a mission trip to Egypt for four scientists in the *Safe Food, Fair Food* (SFFF) project from West Africa who had been trained in participatory risk analysis under the capacity building component of the previous phase (2008-2011) and with expertise on fish. This mission trip was to contribute to the overall project output of SFFF 2 (2012-2015): food safety risks in milk, meat and fish value chains assessed, communicated and better managed as part of an integrated CGIAR Research program for transforming smallholder productivity (Livestock and Fish). For work in the fish value chain, Egypt and Uganda had been previously selected by the CGIAR Research Program on Livestock and Fish.

WorldFish had not yet set up for the work in Uganda (SFFF fish value chain); hence we decided to develop and pilot an assessment tool for evaluating risks associated with fish value chains in Egypt and hence adopt it further afield (e.g. Uganda) at a later point. The tools have been developed during a small mission in Egypt in Cairo and Abbassa (WorldFish field center), where the mission discussed with key staff, stakeholders and partners the design of the tool and the field work required to pilot it.

### **Achievements and constraints**

In addition to SFFF project year one achievements (rapid risk assessment in selected milk, meat and fish value chains), the mission complemented the outputs of a project *"Rapid assessment of potential benefits to human health and nutrition from research on livestock and fish market chains in Asia and Africa"* which is funded by the Australian Centre for

International Agricultural Research (ACIAR). This project was designed to develop a harmonized toolkit for the assessment of food safety risks and nutritional benefits in CGIAR Research Program value chains. This was achieved through collaboration of scientists at the Royal Veterinary College in London and ILRI. This toolkit is now being applied in all SFFF project countries (Ethiopia, Mali, Tanzania and Uganda).

Constraints of the mission were the fact that the SFFF scientists had never been to Egypt before. Since the aquaculture sector in Egypt is far more advanced than in Ghana or Côte d'Ivoire, it was difficult to sufficiently prepare for the mission, i.e. develop an appropriate sampling frame. Moreover, this mission was a first attempt of collaboration between two CGIAR centres, namely WorldFish and ILRI, in the CGIAR Research Program on Livestock and Fish value chains and an attempt to integrate two projects into overall value chain work. This proved to be a challenge to some extent due to misunderstandings in roles and internal administrative procedures.

### **Conclusions for the following reporting period**

Despite all constraints and challenges, the mission contributed to further developing and refining tools that are now being applied in six CRP Livestock and fish value chains (four of them are SFFF project countries):

[http://safefoodfairfood.wordpress.com/2012/11/30/launch\\_ria/](http://safefoodfairfood.wordpress.com/2012/11/30/launch_ria/)

In December 2012, the decision of the WorldFish leadership was not to go ahead with aquaculture value chain research and development activities in Uganda at present, but await developments in the sector and consider opportunities for interventions in future. This recommendation was formally endorsed by the Program and Planning Management Committee of the CGIAR Research Program on Livestock and Fish in December 2012. WorldFish remains committed to continuing on-going activities in Uganda; however, for the time being, WorldFish is scoping for work in fish value chains elsewhere in sub-Saharan Africa or Asia. We hope to contribute to the assessment and management of food safety risks once the country is selected through the application of the toolkit that has been developed.

Possible research questions that evolved from the mission's work in October 2012, preliminary findings and the follow up mission in February 2013 are:

- Different practices of people without freshwater access (unlicensed) and people with freshwater access (licensed)
- risk assessment for tradition of eating *fesikh* (some info is already captured during the participatory risk assessment)
- Consumer perceptions/ knowledge on farmed fish/ wild fish
- Re-do the consumer survey in summer months (higher gastrointestinal occurrence)
- Farm-raised tilapia is said to have low levels of omega-3 fatty acids (the essential nutrient why fish is recommended in a diet) and high levels of omega-6 fatty-acids due to the amount of those acids in the feeds.
- To what extent is the tilapia aquaculture value chain pro-poor? Are more jobs created for the poor if production is intensified? Can processing/ filleting create more jobs for the poor? Can the poor consumers pay for processed fish? Is there a market for processed fish products such as nuggets?
- Possible research/intervention study: develop database
- Feasibility/impact study on BMP training of WorldFish (are farmers using the knowledge and what effect does it have?)
- Effect of slow asphyxiation of live fish at the markets on fish quality

- Effect of cooling method/ fish processing/ feed preparation and impact on microbial elimination and nutritional value of food
- Understanding which product (and by-product) will suit which market; losses due to lack underutilization (discarding) of by-products (edible, not edible)
- Costs of fish-borne disease (loss of work-days; treatment)
- Losses due to condemnation in case of enforcement of food safety standards
- Willingness to pay for quality

**Publications, papers and reports**

None

# Food safety in the aquaculture value chain in Egypt

## Detailed mission report, 27 September to 12 October 2012

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## Introduction

A recent value chain analysis of the industry revealed that the farmed fish value-chain in Egypt is strongly based on the production of tilapia and mullet, with little contributions from carp and catfish. The value chain was found to be short and simple, involving no processing (no value addition). Thus, harvested farmed fish are sold as-is, mostly 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), or alive (as with tilapia). Post-harvest losses are estimated to be less than 1%. The report however indicates some of the reasons for an unexpected poor performance of the sector such as the poor quality of fish fry; poor quality of water; poor practices with regards to feed management, farm design and construction, fish health management, and stocking densities; consumer preference for wild fish and a distrust of processed products; and poor fish hygiene and handling practices throughout the value-chain (WorldFish 2011).

Although all these factors could affect the safety of fish sold to consumers, the analysis did not cover the food safety issues of the value-chain. To provide a needed addendum to the report, a team of five researchers with experience in participatory risk analysis of animal foods in Safe Food Fair Food 1, invited by World Fish Abbassa, came to Egypt from 27 September to 12 October 2012. The team consisted of Professor Kwaku Tano-Debrah, Food Scientist, University of Ghana; Mr Kennedy Bomfeh, Food Scientist, University of Ghana; Dr Yolande Aké Assi-Datté, Veterinary Researcher, Ministry of Agriculture/CSRS, Côte d'Ivoire; Mr Sylvain G. Traoré, Food Scientist, CSRS/University Abobo-Adjamé; and Kimberly Fornace from the Royal Veterinary College, UK.

The main objective of this team before going to Egypt was to conduct a rapid participatory risk assessment on farmed fish in the country. The specific objectives were:

- (i) to determine potential chemical and microbiological hazards associated with farmed fish in Egypt;
- (ii) to determine the exposure of consumers to the identified hazards;
- (iii) to assess the knowledge, attitudes and practices of stakeholders in the value chain which may influence food safety risks associated with the chain.

Discussions held with WorldFish upon arrival in the country brought the following issues into focus:

- i. Farmed fish in Egypt is generally considered unsafe for consumption among consumers;
- ii. Egyptian government legislation forbids the use of fresh water in aquaculture;
- iii. Officially, water supply to aquaculture comes from agronomic drains, suggesting that fish could be contaminated with agrochemicals;

- iv. No official scientific data was available on the safety of farmed fish.

WorldFish subsequently indicated that their key research questions were:

- i. Is farmed fish in Egypt contaminated with food hazards?
- ii. What (safety) quality changes occur in farmed fish post harvest?

WorldFish further indicated that official permits, which could not be procured within the period allotted for the study, were required to do useful field work. Scientists with the Centre also emphasized the difficulties in conducting (especially) consumer surveys within the time available for the study.

Based on the new research questions and limitations on the ground, the team modified its study objectives to focus only on hazard identification. The new specific objectives were

- a. to determine some potential chemical and microbiological hazards associated with farmed fish in Egypt (see Annex 1);
- b. to assess the knowledge and practices of fish farmers that could influence the food safety risks associated farm fish.

With the facilitation of WorldFish, the team collected fish samples from four points along the value chain, conducted a focus group discussion with some farmers, and was assisted to conduct a preliminary trader interview.

## Summary of activities

### Fish sampling

Researchers at WorldFish indicated that Tilapia constitutes the bulk of farmed fish in Egypt, and is the most consume, therefore it was selected for study.

Fish samples were collected from Kafr El Sheikh (KFS), the predominant farming governorate in Egypt, and Cairo, a non-farming governorate. Samples were collected from fish farms in Kafr El Sheikh, and from wholesale points, retail points, and street vendors in both both governorates. The sampling methods and the justification for each are described in Table 1.

**Table 1:** Sampling methods used along farmed fish value chain

| Stakeholders   | Method               | Reasons  |
|----------------|----------------------|--|
| Farmer         | Convenience sampling | Logistic constraints (only a few farmers with whom WorldFish had a relationship could be included) |
| Wholesalers    | Convenience sampling | Logistic constraints   |
| Retailers      | Random sampling      | Estimated population of retailers known; enabled calculation of sample size                        |
| Street vendors |                      | Population unknown and difficult to estimate. Same sample size as retailers considered appropriate |

A total of 52 samples consisting of an average of 3kg of fish were collected. The samples have been coded and frozen, awaiting analysis. Table 2 shows the sampling points and the respective numbers of samples collected at each point.

**Table 2: Sampling points for fish**

| Study area                     | Samplng Point  | District  | Number of Samples                            |    |
|--------------------------------|----------------|---|--|----|
| Cairo                          | Wholesalers    | Obboar  | 3  |    |
|                                | Retailers      | Moneera, Moneeb (both in Giza),<br>Giza Market              | 10   |    |
|                                | Street vendors | KFS Auction, KFS City Market, Balteem Market                | 10   |    |
| Kafr El Sheikh                 | Farms          | Zawya<br>Village 55<br>Pump 7<br>Pump 7<br>Damrou<br>Damrou | 6  |    |
|                                |                | Wholesalers   | KFS Auction                                  | 3  |
|                                |                | Retailers   | KFS Auction, KFS City Market, Balteem market | 10 |
|                                |                | Street vendors  | Giza Market (The Great Sea)                  | 10 |
| <b>Total number of samples</b> |                |   | <b>52</b>                                    |    |

## Capacity assessment of laboratories

Three laboratories were visited to assess their capacities to conduct the required tests: Central Laboratory for Residue Analysis of Pesticides and Heavy Metals in Foods (QCAP), Kafr El Sheikh University Biotechnology Research Laboratory, and WorldFish Laboratory. The observations made are presented in Table 3.

Based on the observations made and the information presented by each laboratory, the team recommended that QCAP be given the contract to conduct the analyses. The final decision, however, will be made by WorldFish.

**Table 3: Evaluation of laboratory capacities to conduct analysis**

| Laboratory                | Facilities to conduct all analysis | Internationally recognized protocols to do all analysis | Experience   | Accreditation | Cost              |
|---------------------------|------------------------------------|---|--|---------------|-------------------|
| QCAP                      | Yes                                | Yes   | Good experience<br>Serves as reference laboratory for fish quality evaluation in Egypt | ISO 17 025    | Expensive         |
| WorldFish                 | No facilities                      | No  | No   | No            | N/A               |
| Kafr El Sheikh University | Some facilities                    | Requires protocols from investigators                   | Experience in required analysis not known  | ISO 17 025    | Discount promised |

## Focus group discussion and retailer interviews

One focus group discussion was held with thirteen farmers (see Annex 2). WorldFish provided personnel to simultaneously moderate the discussions in Arabic and translate into English. The discussion was recorded for transcription.

WorldFish also facilitated the administration of 10 questionnaires to retailers (convenience sampling) (see Annex 3). This was done to get some preliminary information on how retailer knowledge and practices might influence the safety of farmed fish.

## Way forward

WorldFish will decide on the laboratory to conduct the analysis, and communicate the results to the research team upon completion of the tests. Within two weeks of receiving all the results, the team will prepare a draft report of the study.

### Annex 1: List of parameters to be tested for

| Microbiology                   | Heavy metals            | Pesticide residue  |
|--------------------------------|-------------------------|--|
| <i>Salmonella</i> spp.         | Pb                      | Total PCB  |
| <i>Vibrio parahaemolyticus</i> | Arsenic                 | <i>Test 32 samples (all farm and wholesaler samples, some retailer samples)*</i> |
| <i>Listeria monocytogenes</i>  | Cadmium                 |  |
| <i>E. coli</i> (EHEC)          | Hg/methyl mercury       |  |
| <i>Campylobacter jejuni</i>    | <b>Test all samples</b> |  |
| Total Plate Count              |                         |  |

#### **Test all samples**

*\*number of samples reduced due to high cost of PCB analysis*



### Contaminant test results for Egyptian farmed fish (from QCAP reference lab, Cairo)

| Code | Governorate    | Source type | Location                | Mercury | Cadmium | Lead | Arsenic | Pesticides               |
|------|----------------|-------------|-------------------------|---------|---------|------|---------|--------------------------|
| 1001 | Kafr el Sheikh | Fish farm   | Zawya farm              | nd      | <LOQ    | nd   | nd      | nd                       |
| 1003 | Kafr el Sheikh | Fish farm   | Village 55              | nd      | <LOQ    | nd   | <LOQ    | nd                       |
| 1005 | Kafr el Sheikh | Fish farm   | Pump 7                  | nd      | <LOQ    | nd   | <LOQ    | nd                       |
| 1007 | Kafr el Sheikh | Fish farm   | Pump 7                  | nd      | <LOQ    | nd   | <LOQ    | nd                       |
| 1009 | Sharkia        | Fish farm   | Abbassa                 | nd      | <LOQ    | nd   | nd      | p,p-DDE <LOQ             |
| 1011 | Sharkia        | Fish farm   | Abbassa                 | nd      | nd      | nd   | nd      | p,p-DDE <LOQ             |
| 1013 | Kafr el Sheikh | Wholesale   | KeS Auction             | nd      | <LOQ    | nd   | nd      | nd                       |
| 1015 | Kafr el Sheikh | Wholesale   | KeS Auction             | nd      | nd      | nd   | nd      | nd                       |
| 1017 | Kafr el Sheikh | Wholesale   | KeS Auction             | nd      | <LOQ    | nd   | nd      | nd                       |
| 1019 | Cairo          | Wholesale   | Obour market            | <LOQ    | <LOQ    | nd   | nd      | p,p-DDE <LOQ             |
| 1021 | Cairo          | Wholesale   | Obour market            | nd      | <LOQ    | nd   | nd      | nd                       |
| 1023 | Cairo          | Wholesale   | Obour market            | nd      | <LOQ    | nd   | nd      | nd                       |
| 1027 | Kafr el Sheikh | Retail      | KeS Auction             | nd      | <LOQ    | nd   | nd      | nd                       |
| 1029 | Kafr el Sheikh | Retail      | KeS Auction             | nd      | <LOQ    | nd   | nd      | p,p-DDE <LOQ             |
| 1031 | Kafr el Sheikh | Retail      | Balteem                 | nd      | nd      | nd   | nd      | nd                       |
| 1033 | Kafr el Sheikh | Retail      | Balteem                 | nd      | nd      | nd   | nd      | nd                       |
| 1035 | Kafr el Sheikh | Retail      | KeS City market         | nd      | nd      | nd   | nd      | nd                       |
| 1037 | Kafr el Sheikh | Retail      | KeS City market         | nd      | nd      | nd   | nd      | nd                       |
| 1039 | Kafr el Sheikh | Retail      | KeS City market         | nd      | nd      | nd   | nd      | nd                       |
| 1041 | Kafr el Sheikh | Retail      | KeS City market         | nd      | nd      | nd   | <LOQ    | nd                       |
| 1043 | Kafr el Sheikh | Retail      | KeS City market         | nd      | nd      | nd   | <LOQ    | nd                       |
| 1045 | Cairo          | Retail      | Moneeb market           | nd      | nd      | nd   | nd      | nd                       |
| 1047 | Cairo          | Retail      | Moneeb market           | nd      | nd      | nd   | nd      | nd                       |
| 1049 | Cairo          | Retail      | Moneeb market           | nd      | nd      | nd   | nd      | p,p-DDE <LOQ             |
| 1051 | Cairo          | Retail      | Moneera market          | nd      | nd      | nd   | nd      | nd                       |
| 1053 | Cairo          | Retail      | Moneera market          | nd      | nd      | nd   | nd      | nd                       |
| 1055 | Cairo          | Retail      | Moneera market          | nd      | nd      | nd   | nd      | nd                       |
| 1057 | Cairo          | Retail      | Moneera market          | nd      | nd      | nd   | nd      | nd                       |
| 1059 | Cairo          | Retail      | Giza market (Great Sea) | nd      | nd      | nd   | nd      | Chlorpyrifos: 0.01 mg/kg |
| 1061 | Cairo          | Retail      | Giza market (Great Sea) | nd      | nd      | nd   | nd      | nd                       |
| 1063 | Cairo          | Retail      | Giza market (Great Sea) | nd      | nd      | nd   | nd      | nd                       |

nd - not detected

<LOQ - below the limit of quantification