The role of farmed fish in the diets of the resource-poor in Egypt

THE ROLE OF FARMED FISH IN THE DIETS OF THE RESOURCE-POOR IN EGYPT

Authors

Dr. Alia El Mahdi,[1] Jelena Krstic,[1] Ali Abdallah,[1] Hesham Abdullah,[1] Paula Kantor[2] and Natalie Valpiani[3]

Author Affiliation

[1] Environment and Development Group
[2] CIMMYT
[3] Food and nutrition policy researcher

Citation

This publication should be cited as: El Mahdi A, Krstic J, Abdallah A, Abdullah H, Kantor P and Valpiani N. 2015. The role of farmed fish in the diets of the resource-poor in Egypt. Penang, Malaysia: WorldFish. Program Report: 2015-05.

Acknowledgments

CONTENTS

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES

EXECUTIVE SUMMARY

What motivated this study?

The Egyptian aquaculture industry provides more than 100,000 full-time or part-time jobs and produces the country's least-expensive farmed animal protein (Kantor and Kruijssen 2014). Thus, aquaculture plays an important role in both sustaining livelihoods and improving the diet quality and nutritional health of Egyptians, including a significant proportion of the 25.5% who are resource-poor (WFP 2013). Recognizing this dual role, WorldFish has promoted sustainable growth in Egyptian aquaculture for more than 20 years.

Through its work, WorldFish has identified a lack of quality data about fish consumption preferences and practices. Eager to fill this knowledge gap, WorldFish partnered with the Environment and Development Group (EDG) to study consumption of fish, red meat and poultry among the resource-poor in Egypt. The study aimed to answer three questions:

- What are the relative preferences for and consumption patterns of fish, red meat and poultry among resource-poor Egyptians?
- What factors affect consumer demand for different types and qualities of these foods?
- How are decisions about fish purchases made, and fish consumption distributed, in households?

How was the study conducted?

In May 2014, EDG conducted 1400 household surveys and 32 in-depth interviews in five governorates: Beheira, Sharkia, Fayoum, El Mineya and Cairo. The sample included villages close to fish farms, villages far from fish farms, and urban districts. One goal of this design was to enable analyses that explored whether proximity to fish farms affects the availability of fish, its price relative to red meat or poultry, and preferences for fish consumption. This design also enabled comparisons between rural and urban households in order to ascertain whether the urban communities face different barriers to fish consumption than do rural villages.

The survey included questions on household demographic characteristics, expenditures, animal-source food preferences, factors that influence fish purchases, and intra-household decision-making. The interviews aimed for a more nuanced understanding of the factors that motivate food preferences and consumption, with a special interest in intra-household dynamics.

What did the study find?

Levels of consumption for red meat, poultry and fish were assessed via questions about spending and intake:
- Household spending on fish ranged from 5.4% to 6.7% of total food expenditures.
- Households purchased twice as much fish and three times as much poultry as red meat. The relative quantities proved consistent across location and expenditure quintile.
- The proportion of households consuming poultry regularly (71.2%) was significantly greater than the proportion consuming fish (58.2%) or red meat regularly (43.0%).
- The frequency of fish consumption increased with level of resources, but even in households in the highest expenditure quintile, fish was eaten as a main dish just 2.9 times per month.
- An increase in the level of education completed by the household head predicted a significant increase in the frequency of fish consumption by the household head.

The survey identified several factors that shape preferences for fish, red meat and poultry:
- A majority (57.9%) of respondents would like to, but do not, increase their fish consumption. When asked why they do not do so, more than 90% cited price or limited budget.

- More than 85% of respondents perceived fish to be less expensive than red meat or poultry, a perception confirmed by actual purchase data. Though fish was least expensive, just 16.5% of households preferred it over red meat or poultry.
- Half of households preferred red meat to fish because they believed it to be a "more important source of protein."
- Though nearly all respondents believed fish to be highly nutritious, a third of respondents were concerned that fish may be contaminated with chemicals, while 30.0% reported believing that one can get sick from eating fish raised by aquaculture.
- Availability was mentioned infrequently as a factor that limits increased fish consumption.

Survey results do not indicate intra-household discrimination regarding fish consumption:
- In 50% of households, women decided both when to purchase fish and which type to purchase.
- More than 95% of households reported distributing fish equitably among members, either by giving equal portions or by allowing each person to have the amount he or she would like.
- When available fish was not sufficient for all, most households reduced the portions served to all members. However, in 11.5% of homes, female members received less than others.

Moving forward

Pursue opportunities for future research. First, future research should confirm the extent to which respondents' knowledge about the healthfulness of fish affects their actual consumption behaviors. Second, future research should identify the characteristics consumers use to judge fish safety and quality by sight. Third, future research should confirm the association, suggested by this study, between proximity of the household to an aquaculture operation and consumption of farmed fish. Finally, research should ascertain whether this association is due to greater awareness of the origin of the fish, availability of farmed fish, or a more widespread belief in its quality in villages near farms.

Reduce the price of fish. A full 87% of survey respondents said that they would buy more fish if it were less expensive. Reducing prices by improving the efficiency of production or marketing could benefit consumers without hurting producer livelihoods or aquaculture sustainability.

Improve the quality and freshness of marketed fish. Nearly all survey respondents believed that fish safety, an aspect of quality, can be judged by sight and taste. Improving provision of transport and cold storage services to small-scale fish retailers could serve to improve its quality and freshness as it reaches the marketplace.

Educate consumers about aquaculture and nutrients in fish. Consumer education campaigns backed by evidence could help to allay concerns about the safety of farmed fish and convince consumers that the health benefits of fish are comparable to red meat and poultry, and that health benefits are higher for fish in terms of essential micronutrients.

The present results and those of future research efforts will empower value chain actors to more successfully market their products and enable organizations like WorldFish to improve the design and targeting of programmatic efforts to boost sustainable fish production and consumption among the resource-poor.

INTRODUCTION

The aquaculture sector in Egypt has grown steadily for two decades. The industry is worth USD 1.5 billion, provides more than 100,000 full-time or part-time jobs to Egyptians, and produces approximately 65% of the fish eaten by Egyptians (Kantor and Kruijssen 2014). Aquaculture also provides the least-expensive farmed animal protein in Egypt. Thus, it has an important role to play in improving the diet quality and nutritional health of Egyptians, and in particular the 25.5% nationwide who are resource-poor (WFP 2013).

Recognizing the ability of the aquaculture value chain to secure livelihoods via job creation and to improve diets via increased access to protein and essential micronutrients, WorldFish has worked to promote sustainable growth in Egypt's aquaculture sector for more than 20 years. Most recently, efforts have focused on implementing the Improving Employment and Income through Development of Egypt's Aquaculture Sector (IEIDEAS) project. This three-year collaboration between CARE Egypt and the Egyptian Ministry of Agriculture and Land Reclamation, supported by the Swiss Government, aims to create an additional 10,000 aquaculture jobs and improve nutritional health of low-income consumers (Macfadyen et al. 2012).

Efforts to boost fish marketing and consumption in Egypt, such as the IEIDEAS project, can be increasingly well designed and targeted when based on quality data about fish consumption preferences and practices. Yet, few studies have examined these preferences and behaviors. In an effort to better understand the use of animal-source foods in the diets of the resource-poor, the factors that drive preferences for them, and intra-household decision-making about fish consumption, WorldFish partnered with the Environment and Development Group (EDG) to conduct the present study.

In May 2014, EDG conducted 1400 household surveys and 32 in-depth interviews in five governorates: Beheira, Sharkia, Fayoum, El Mineya and Cairo. The surveys collected data on household demographic characteristics, expenditures, animal-source food preferences, factors that influence fish purchases, and intra-household decision-making. Key informant interviews probed for additional detail on the factors that drive fish preferences and consumption.

This report communicates the methods employed by researchers, results on the main questions of interest, and implications of those results for future expansion of the sector. The remainder of the introduction provides a brief background on what is known about the place of animal-source foods in the diets of Egyptians and sets out the three main research questions of the study.

Background

Since 2005, Egypt has experienced a series of internal and external crises that have slowed economic growth to a near standstill. The mass culling of poultry in the 2006 bout of avian influenza, spikes in global food prices between 2007 and 2009, and the political revolution of 2011 jeopardized livelihoods, purchasing power and foreign investment. Economic growth fell from a mean of 6.2% between 2005 and 2010 to 2.2% in the 2011–2012 fiscal year (WFP 2013).

These macroeconomic forces have had detrimental effects at the household level. Unemployment rose from 8.8% in 2010 to 13.4% at the end of 2013. Poverty rates rose concurrently. In 2011, 25.2% of Egyptians had incomes below the poverty line, and an additional 23.7% were found to be "near poor," subsisting just above the poverty line (WFP 2013). Poverty affects residents of both rural and urban Egypt. Rural areas have higher poverty rates; in 2001, 62.2% of the chronic resource-poor in the country lived in rural Upper Egypt. Yet urban poverty is on the rise, increasing 40% between 2009 and 2011 (WFP 2013). Due to the size of the population, the absolute number of resource-poor individuals in Greater Cairo exceeds that of the most resource-poor governorates of Upper Egypt.

Rising unemployment and poverty rates have been paralleled by an increase in food insecurity across the country. On average, Egyptian households spend 40.6% of their household budget on food. That percent is even higher (51%) among the most resource-poor decile of households (WFP 2013). This high percentage makes household food consumption vulnerable to changes in food availability or price as well as to crises like those mentioned above that affect household incomes. The prevalence of food insecurity rose to 17.2% in 2011 (WFP 2013). In the third quarter of 2013, 80.2% of vulnerable households responding to a quarterly World Food Programme survey reported having insufficient income to meet their monthly household needs; 63.4% had insufficient income to meet their food needs (Egyptian Food Observatory 2013). Like poverty, food insecurity affects both rural and urban households.

Households faced with insufficient income and food insecurity, whether due to chronic poverty or periodic external shocks, adopt a variety of coping strategies. Given the large share that food holds in the household budget, common coping strategies include relying on less expensive foods or reducing meal portions. For example, the 2011 Household Income and Expenditure Survey found that 88% of resource-poor households rely on less expensive foods in times of need, and 72.4% reduce their intake of meat, poultry and fish (WFP 2013).

A result of these food-based coping strategies is reduced dietary diversity among household members. In 2011, 58.3% of resource-poor Egyptians had poor dietary diversity, as did 36% of the near poor and 22.9% of the nonpoor (WFP 2013). Resource-poor households consume less energy from more expensive but micronutrient-rich meat, poultry, vegetables, fruit and dairy products and more energy from cereals and tubers than nonpoor households.

Reductions in the diversity, quality and quantity of foods consumed in response to rising rates of poverty and food insecurity have detrimental implications for Egyptians' nutritional health. Poverty, food insecurity and poor dietary diversity have all been associated with faltering growth in young children and micronutrient deficiencies in children and adults (Black et al. 2013; WFP 2013). In Egypt, recent data indicates that nearly one-third of children aged 6–59 months are stunted (31% in 2011; WFP 2013). Anemia prevalence is also high, and not only among children aged 6–59 months (50.2%). The prevalence estimates of anemia among both youth aged 15–19 (48.2%) and women of childbearing age (20–49 years, 44.1%) were positively correlated with poverty. Childhood stunting and micronutrient deficiencies can have lasting consequences for physical health, cognitive development and earning potential (Victora et al. 2008).

Increased intake of fish, which is a good source of protein and essential micronutrients, could help Egyptians boost their dietary diversity and prevent nutritional deficiencies. Increases in intake will depend on sufficient availability of fish products and improved access for resource-poor families. Annual aquaculture production has grown from 57,000 tons in 1994 to 705,000 tons in 2009. Recent data indicates that consumption of fish is also on the rise; per capita consumption rose from 8.5 kilograms (kg)/person/year in 1996 to 15.4 kg/person/year in 2008 (WorldFish 2014). Yet, intake of animal proteins, including fish, among the resource-poor is still quite low. Meat (beef or lamb) and fish (tilapia or catfish) are consumed by resource-poor households less than once per week. Poultry is consumed more often, but still just once per week by 81.6% of resource-poor households (Egyptian Food Observatory 2013).

While it is clear from data on the diet composition and coping strategies of resource-poor households that price affects demand for fish products, it is also evident that price cannot be the only factor that drives consumption decisions. For example, December 2013 price data shows poultry to be more expensive than tilapia nationwide, yet households reported consuming more poultry than fish (Egyptian Food Observatory 2013). Little is known about factors other than price that may explain such behavior and shape fish demand. What drives households to purchase chicken or beef, rather than fish, especially when fish is the least expensive of the three? Are there barriers, other than price, that prevent households from increasing their fish intake? How does knowledge about the healthfulness of fish affect demand for it? The present study sought to answer these and similar questions.

Main research questions

This study aimed to characterize current consumer preferences for and consumption patterns of animal-source foods, comparing red meat, poultry and fish. The resulting data is meant to contribute to a better understanding of what drives demand for fish among the resource-poor in Egypt, allowing value chain actors to more successfully market their products to this segment of the population.

The study explored the following three research questions:
- What are the relative preferences for and consumption patterns of three animal-source foods—fish, red meat and poultry—in the diets of resource-poor Egyptians?
- What factors affect consumer demand for different types and qualities of animal-source foods among the resource-poor?
- How are decision-making about fish purchases and actual consumption of fish distributed within resource-poor households?

Small fish retailers from low-income districts in Cairo.

This study aimed to characterize preferences for and consumption of animal-source foods, particularly fish, in the diets of the resource-poor in Egypt. To achieve this aim, the study employed a mixed-methods research strategy, combining quantitative data from a household survey with qualitative data from in-depth interviews conducted in a small subsample of households. Survey questions were designed to enable exploration of how animal-source food preferences, expenditures and consumption vary by household characteristics. The interviews aimed for a more nuanced understanding of the factors that motivate animal-source food preferences and consumption, with a special interest in intra-household dynamics.

The study was conducted in four of the five governorates in which the IEIDEAS project has been working to develop the Egyptian aquaculture value chain. Two of these governorates, Sharkia and Beheira, are located in Lower Egypt, while the other two, Fayoum and El Mineya, are located in Upper Egypt. Additionally, the study was conducted in the urban governorate of Cairo. From each of the four rural governorates, the study included villages close to fish farms, villages far from fish farms, and urban districts. One aim of representing each of these geographic areas was to enable analyses that explore whether proximity to fish farms affects the availability of fish, the relative price of animal-source foods, and preferences for fish consumption. This design also enabled comparisons of fish availability, price and consumption between rural and urban households in order to ascertain whether urban communities face different barriers to fish consumption than do rural villages.

The remainder of this section describes in further detail the development of the survey and interview samples and instruments, staff training and data collection activities, and data management procedures.

Household survey

Using a household survey, the research team collected quantitative data from a total of 1400 households on the demographic characteristics of household members, household food spending and consumption behaviors, knowledge and attitudes regarding fish consumption, and the intra-household distribution of both fish intake and general decision-making responsibilities. Questions on household food consumption and the factors that influence it focused on animal-source foods, and in particular on fish. The following subsections describe the development of the survey sample and instrument.

Survey sample design

The survey sample was selected using a two-stage sample design. The first stage consisted of the selection of 14 primary sampling units. Three primary sampling units were selected from each of the four non-urban IEIDEAS project governorates included in the study (Sharkia, Beheira, Fayoum and El Mineya), while the remaining two were selected from the Cairo urban area.

For each governorate, maps were examined to identify the location of fish farms. Next, three lists were created: a list of rural villages close to fish farms, defined as those that surrounded or had direct access to a farm; a list of rural villages considered far from a fish farm, defined as villages that had at least two other villages between them and a fish farm; and a list of districts from urban areas in the governorate. One village or district was selected randomly from each list using the Statistical Package for the Social Sciences (SPSS). Thus, the 14 sampled primary sampling units consisted of four rural villages located close to fish farms, four rural villages located far from fish farms and six urban districts (one from each governorate and two from Cairo).

Following the sampling of primary sampling units, survey staff proceeded to household selection. In each primary sampling unit, a sampling frame of resource-poor households was created. The survey staff identified resource-poor households via nine screening questions. A household was considered resource-poor based on having five of the following nine characteristics:

- head of household does not have social security
- ratio of workers within the household is less than 0.25
- family lives in one room only, or household member share of the rooms is less than 0.5 rooms
- absence of private bathrooms (urban areas)
- none of the household members study in private schools
- electricity consumption is less than EGP 20
- family does not have a landline
- type of floors
- main material used for the house roof

From the sampling frame of resource-poor households in each primary sampling unit, a random sample of 100 households was selected for data collection. Thus, the total sample consisted of 1400 households (Table 2.1).

Survey instrument development
The initial survey questionnaire was designed following the completion of a literature review by the implementing research team. In order to both pretest the survey questions and train the data collection team, a pilot study was conducted in the Fayoum governorate. Within the Fayoum governorate, the research team selected three locations that had not already been selected into the survey sample: Tameya, selected to represent urban areas; Tameya-Kasr Rashwan, selected to represent rural villages far from fish farms; and Yusef El-sedeek – Batn Ehret, selected to represent rural villages close to fish farms. The draft questionnaire was then revised and finalized based on a review of the pilot questionnaires.

Governorate	Village	Geographic location			Total
		Urban	Rural close to fish farms	Rural far from fish farms	
Beheira	El Naser	0	0	100	100
	Hosh Issa	100	0	0	100
	Kom Belal	0	100	0	100
Cairo	Ain Elsiera	100	0	0	100
	Kafr Elbasha	100	0	0	100
El Mineya	Banimazar	100	0	0	100
	Eladwa	0	0	100	100
	Younis	0	100	0	100
Fayoum	Awel Elfayoum	100	0	0	100
	El Khaledia	0	100	0	100
	Sarsna	0	0	100	100
Sharkia	Awlad Mehana	0	0	100	100
	Baher Elbaqer	0	100	0	100
	Fakwos	100	0	0	100
Full sample		**600**	**400**	**400**	**1,400**

Table 2.1. Number of sampled households by governorate and geographic location of household.

In-depth interviews

In-depth interviews were conducted in 32 selected households in order to complement the quantitative survey results with detailed qualitative data. The interviews focused on developing a more comprehensive understanding of resource-poor women's and men's preferences and attitudes towards fish consumption. In addition, the in-depth interviews asked about factors influencing these preferences, including fish price, fish availability, fish perishability and taboos related to fish consumption. The qualitative research component also looked at the share of the household budget spent on animal-source foods in general and fish in particular, as well as how and why this spending changes seasonally. Finally, interviews included questions about the quantity of foods consumed, the intra-household decision-making related to food expenditures and allocation, and the reasons behind any intra-household inequality in fish intake.

In-depth interviews were conducted over a two-week period, after enough data had been generated from the survey to indicate which households would be good candidates for further evaluation. The following section describes the selection of households for in-depth interviews.

Interview sample design

For the qualitative data collection, 32 in-depth interviews were carried out. First, one Lower Egypt governorate (Sharkia) and one Upper Egypt governorate (El Mineya) were selected. Next, two households were selected from each of the governorates' three primary sampling units (six households per governorate). To these 12 households were added 2 households from each of the sampled Cairo primary sampling units, for a total of 16 households (Table 2.2).

From each selected household, an adult man and an adult woman were interviewed separately. Thus, the final interview sample consisted of 16 adult women and 16 adult men. Half of the men and women lived in rural villages, while the other half lived in urban districts (Table 2.3).

Household survey in Abo Elsoud District, Old Cairo, Egypt.

Governorate	Urban	Rural close to fish farms	Rural far from fish farms
Cairo	Kafr Elbasha Ein Elsera		
El Mineya (Upper Egypt)	Beni Maza	Younis Semeda	Elakela
Sharkia (Lower Egypt)	Om Yousef	Bahr Elabakar	Awlad Mehana

Table 2.2.   Rural villages and urban districts selected for in-depth interviews.

Governorate	Urban	Rural close to fish farms	Rural far from fish farms
Cairo	4 men 4 women		
El Mineya (Upper Egypt)	2 men 2 women	2 men 2 women	2 men 2 women
Sharkia (Lower Egypt)	2 men 2 women	2 men 2 women	2 men 2 women
Total	**8 men 8 women**	**4 men 4 women**	**4 men 4 women**

Table 2.3.   Number of individuals sampled for in-depth interviews, by geographic location of household.

Households identified as eligible for the in-depth interview sample met one of the following three criteria:
- The household did not buy fish in general (or very rarely).
- Within the household, fish was distributed unequally.
- The household consumed a lot of fish compared to others in the same primary sampling unit.

In addition to these screening criteria, the survey staff looked for households with unique fish consumption patterns that could offer insight into the various factors that influence those patterns. The final sample of 16 households included the following:
- Two households were selected based on exhibited inequality in animal-source food distribution.
- One household was selected based on the fact that the husband never eats fish.
- Four households were selected based on their low consumption of fish. (They hadn't consumed fish in between 18 months and 3 years.)
- Seven households were selected because of their frequent consumption of fish. One household among them exhibited inequality in animal-source food distribution, and another housed children that did not consume any fish.

- Two households were selected because of their occasional consumption of fish (every two or three months) and their location far from fish farms.

Individuals within these households were identified as eligible for the interview based on having sufficient information about the types and quantities of commodities consumed in the household. The selection of individuals from the sampled households also gave special attention to the representation of both young and elderly family members.

Data collection activities

Following the design of the household survey questionnaire, data collection activities began with the recruitment and training of the data collection staff. Staff recruitment and training were succeeded by the pilot study and finalization of the questionnaire. Data was collected over three weeks in May 2014.

Staff recruitment and training
The survey developers recruited 35 university graduates with previous experience in data collection to carry out the household interviews and assume supervisory responsibilities in the field. The selected field workers had been staff members at and were nominated by the

Demographic and Health Survey in Egypt and the National Center for Social and Criminal Studies. An additional four researchers with past experience in qualitative research methods were recruited to implement and analyze the in-depth interviews. The field staff included 27 interviewers, 8 field reviewers and 4 field supervisors. In addition, two general supervisors and two quality control personnel were recruited.

Training began with general office-based information sessions. Subsequent training sessions were organized in the form of workshops where participants prepared for data collection through role-play activities and field work simulation techniques. Field staff then practiced their skills through the previously mentioned survey pilot test.

Data management and quality control
An office editor reviewed questionnaires for internal consistency and completeness upon receipt. One senior staff member and three office editors also coded survey responses at the office prior to the data entry. A Microsoft Access database program was developed by a software developer and used for data entry. The data was entered by six data entry personnel recruited and trained for this purpose, and 20% of the questionnaires were re-entered for verification. The in-depth interview responses were transcribed in Arabic.

Data quality was assured through the following steps:
- selecting qualified field staff and providing them interactive, field-based training
- field editing of questionnaires by field editors and supervisors
- field checking and re-interviewing by quality control personnel and general supervisors
- office editing of questionnaires
- re-entry of 20% of questionnaires

Data analysis

Descriptive statistics about surveyed households were conducted using IBM's SPSS Statistics (20). They describe household size, the gender and age distribution of household members, and their educational attainment and employment status. Analyses pertaining to household expenditures and animal-source food preferences and consumption were completed in Stata/IC 10.0. (StataCorp 2007) using the survey commands to account for the multistage

sampling plan and generate appropriate standard errors for significance testing.

Many of the analyses were repeated by geographic location of the household. The sample was also divided into quintiles based on total household expenditures per capita, and results were compared across these expenditure quintiles. Accounting for the complex survey design, tests of independence between categorical variables were based on a corrected Pearson chi-square test, while the significance of differences in means was determined using an adjusted Wald test.[1]

Household expenditure quintiles were created by first calculating the sum of monthly household expenditures estimated by respondents in each of eight expenditure categories. This estimated total monthly household expenditure was divided by the number of permanent members living in the household to arrive at estimated per capita monthly expenditures. Households were categorized into quintiles based on this variable.

For two of the variables, a handful of outliers were removed from the sample. All but 27 of the 1176 households with full expenditure data had total monthly household expenditures of less than EGP 2000. Of those 27 households for which expenditures exceeded EGP 2000, four had values that ranged from EGP 6100 to EGP 10,759. Closer examination of the data for these households revealed what appeared to be coding errors in an expenditure category. These four outliers, which inflated mean total household expenditure by EGP 26, were excluded.

Similarly, eight observations were excluded from the analysis of mean monthly per capita quantity of red meat purchased. All had values of more than 20 kg/capita/month, and there was evidence that either the respondent or the data entry personnel had confused grams and kilograms when reporting the quantity purchased.

Household characteristics

This subsection provides an overview of sample characteristics. It describes the sampled households in terms of the demographic make-up of their members, the employment activities of their members, and household income and expenditures.

Demographic characteristics
Household size and marital status of household head
The 1400 households in the survey sample had, on average, 5.2 permanent members. Nearly 87% of the heads of household were married and 10.2% were widowed. Of widowed heads of household, 89% were women.

Gender
Nearly equal proportions of household members were male (50.9%) and female (49.1%; Table 3.1). Across the full sample, men headed 88.4% of households. While a slightly greater percentage of households were headed by women in urban areas (13.3%) than in rural villages close to fish farms (9.8%) or rural villages far from fish farms (11.0%), there was no significant association between location and gender of household head.

Age
The age distribution of household members in the sample reveals its youthfulness. Children aged 15 years or younger represented 40% of all household members (Table 3.2). Elderly persons over the age of 60 years made up just 4.5% of household members. The remaining 55% of household members were working age (between 15 and 60 years old), and 62% of household heads were between the ages of 36 and 60 years.

Gender	% of household members			Total
	Urban	Rural close to fish farms	Rural far from fish farms	
Male	86.7	90.2	89.0	88.4
Female	13.3	9.8	11.0	11.6
Total	**100.0**	**100.0**	**100.0**	**100.0**

Table 3.1. Gender distribution of household head, by geographical location of household.

Age	% of members		Total
	Male	Female	
6 years or fewer	17.2	18.6	17.9
7–15 years	23.5	22.2	22.8
16–25 years	20.4	17.9	19.2
26–35 years	12.3	15.9	14.1
36–45 years	11.4	11.7	11.5
46–60 years	10.2	9.6	9.9
more than 60 years	4.9	4.1	4.5
Total	**100.0**	**100.0**	**100.0**

Table 3.2. Age distribution of the household members, by gender.

Education

Members of study households exhibited low educational attainment levels (Table 3.3). The illiteracy rate among members of study households (36.8%) was higher than the national illiteracy rate (27%). A larger proportion of women (40.9%) than men (33.0%) in the sampled households were illiterate. Only a quarter of the household members completed education beyond the primary school level.

Employment characteristics

Work status

Work status showed distinct variation by gender. More than 60% of men were employed, compared to just 11.8% of women (Table 3.4). The majority of working men were wage workers, while 86% of women were unemployed but not looking for work. A possible explanation of this high percentage is that women, who are responsible for running the household, do not seek to work outside the home as well. Finally, the unemployment rate in the sample was remarkably low, at just 1.9% for women and 2.8% for men. This could be explained by the extreme poverty of the sampled households, whose members must work even at extremely low wage rates.

Sector of employment

The survey data indicates that 87.7% of working household members worked in the private sector, while the remainder worked for the government or public sector companies. More than half of the total sample worked in the service sector (60.9%; Table 3.5). The service sector includes jobs in education, healthcare, construction, food service, financial services and real estate, government services, and household services. Agriculture was the next most important sector, employing 16.4% of working men and 7.4% of working women. Only a very small percentage of men in the surveyed households worked in aquaculture (0.8%).

Education	% of members		Total
	Male	Female	
Illiterate	33.0	40.9	36.8
Literate, no formal schooling	24.7	22.3	23.6
Primary	14.5	13.5	14.0
Preparatory	10.0	9.1	9.6
Secondary, vocational or technical school	15.4	12.9	14.2
Intermediate or higher institutes	0.5	0.3	0.4
University	1.7	0.8	1.3
Postgraduate studies	0.2	0.1	0.1
Total	**100.0**	**100.0**	**100.0**

Table 3.3.   Educational attainment of household members, by gender.

Work status	% of members		Total
	Male	Female	
Wage worker	52.2	8.1	30.7
Unpaid family worker	1.5	1.5	1.5
Self-employed	7.5	2.2	4.9
Business owner	0.2	0.0	0.1
Unemployed, looking for work	2.8	1.9	2.3
Unemployed, not looking for work	35.8	86.3	60.5
Total	**100.0**	**100.0**	**100.0**

Table 3.4.   Work status of the household members aged 15 years and older, by gender.

Economic activity	% of working members		Total
	Male	Female	
N	1,308	148	1,456
Service sector	62.5	45.9	60.9
Agriculture	16.4	7.4	15.5
Trade (other than fish)	12.5	41.2	15.5
Manufacturing (other than fish)	6.7	3.4	6.4
Aquaculture	0.8	0.0	0.7
Fish trading	0.6	1.4	0.7
Fish manufacturing	0.4	0.7	0.4
All	100.0	100.0	100.0

Table 3.5. Percent of working men and women employed in various sectors of the economy.

Household income and expenditures
Survey respondents estimated both their total household income per month and their average monthly expenditures in eight expenditure categories. An additional set of questions asked respondents for further detail on their household food expenditures. This subsection summarizes the results of the income and expenditure analyses.

Estimated income
Estimated total monthly household income ranged from EGP 50 per month to EGP 10,000 per month.[2] Nearly all households (99.3%) had an estimated monthly income of less than EGP 2000 per month. The mean estimated

income was EGP 793.70 per month across the sample. Figure 1 shows the distribution of monthly household income for the 99.3% of households with reported income less than EGP 2000 per month.

Estimated household expenditures
Each respondent also estimated, based on the previous three months, the household's average monthly expenditures in eight expenditure categories: accommodation, utilities, education, transportation, total food expenditures, healthcare, entertainment and other. These estimates were summed to arrive at a calculated monthly total household expenditure for each household.
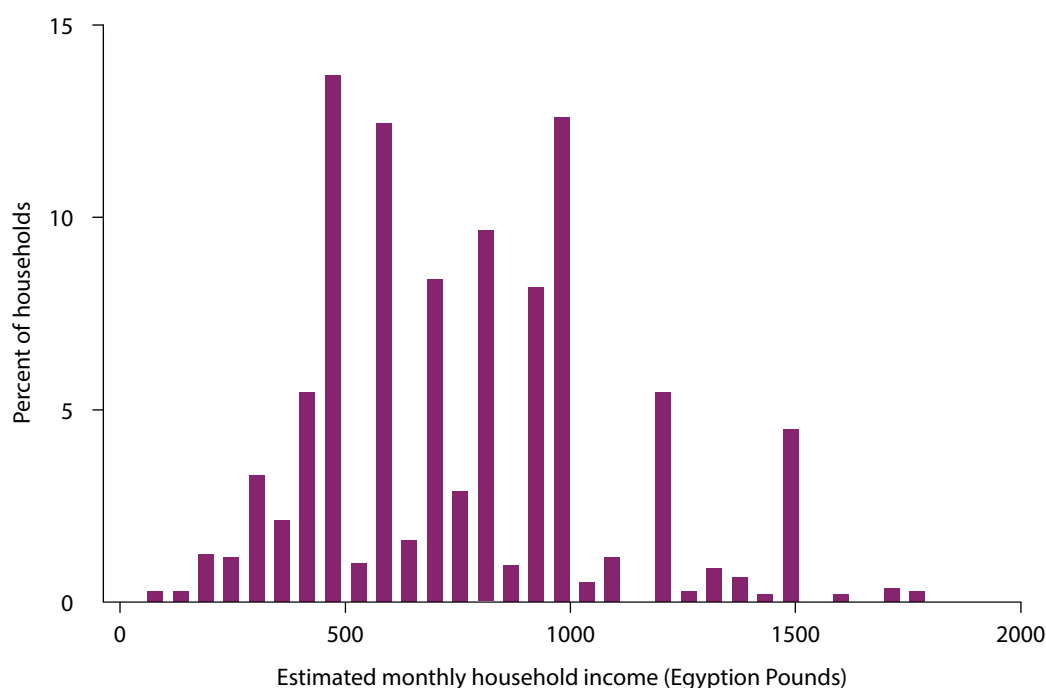
Figure 1. Distribution of surveyed households by estimated monthly household income.

As can be seen in Table 3.6, the mean monthly total household expenditure across the full sample (EGP 886.78) was higher than the mean income estimated by respondents (EGP 793.70). On average, households in urban areas and rural villages located far from fish farms spent about EGP 150 more per month than rural households close to fish farms (significant at p<0.05). The total expenditures of urban households and rural households far from fish farms did not differ significantly from one another.

The average monthly per capita expenditures of the sampled households equaled EGP 182.99 (about USD 25.62/month). On average, daily per capita expenditures were less than USD 1, below the international poverty line. Monetary poverty in Egypt is measured using consumption expenditure data. In 2012–2013, the lower poverty line was set at EGP 3920 per person per year (EGP 326.67/person/month; UNICEF 2014). Of the sampled households with complete expenditure data, 94.5% fell below this lower poverty line. The data demonstrates that the majority of households in the sample are extremely resource-poor.

Though all households met criteria designating them as resource-poor (see Section 2: Methods), variation existed in the sample for both estimated income and calculated expenditures. The analyses took advantage of this variation to explore whether animal-source food preferences and consumption behaviors differed by level of household resources. For many of the analyses that follow, the sample was divided into quintiles based on total monthly household spending per capita. Standardizing total household expenditures by the size of the household provided a more accurate picture of the well-being of members than total household spending.

Table 3.7 displays estimates of calculated monthly food and total expenditures for households in the sample broken out by these per capita expenditure quintiles. Monthly household food expenditure increased consistently across total expenditure quintiles, from an average of EGP 317.06 per household per month for households in the lowest expenditure quintile to EGP 547.21 per household per month in the highest expenditure quintile.

Geographic location	Mean	N
Urban	933.27 [a]	488
Rural close to fish farms	780.97 [b]	349
Rural far from fish farms	928.79 [a]	339
Full sample	886.78	1176
[a, b] Means with different superscripts are significantly different based on adjusted Wald tests, p<0.05.		

Table 3.6. Mean calculated monthly total household expenditure (EGP), by location of household.

Expenditure quintile	Mean (EGP)			N
	Monthly food expenditure	Monthly total expenditure	Monthly total expenditure per capita	
1st	317.06 [a]	549.79 [a]	88.07 [a]	236
2nd	404.11 [b]	723.44 [b]	133.97 [b]	233
3rd	469.98 [c]	891.06 [c]	170.92 [c]	237
4th	542.54 [d]	1033.90 [d]	213.30 [d]	233
5th	574.21 [d]	1239.21 [e]	310.12 [e]	233
Full sample	461.35	886.78	182.99	1,172
[a, b, c, d, e] Comparing across expenditure quintiles down each column, means with different superscripts are significantly different based on F-statistics from adjusted Wald tests, p<0.05.				

Table 3.7. Mean estimated monthly food expenditure and calculated total household expenditure (EGP), by household expenditure quintile.

Figure 2 shows the percent of total monthly household expenditures devoted to each of the eight surveyed categories. Food expenditures made up the largest percentage of household budgets in all expenditure quintiles, ranging from 57.7% of total monthly expenditures for the lowest quintile to 46.3% of expenditures for the highest quintile.

Estimated household food expenditures
In addition to estimating their monthly food expenditures as one category of total household expenditures, respondents provided detailed information about purchasing habits for nine food categories. Respondents shared how frequently they purchased each food category, the quantity they purchase at each buying occasion and the cost of that quantity at the time of their last purchase. Responses to these questions were used to calculate a sum of total monthly food expenditures (distinct from the single estimate of food spending displayed in Figure 2).

Figure 3 displays a breakdown of reported food expenditures per capita by quintiles of total monthly household expenditure per capita. Across expenditure quintiles, vegetables account for the largest percentage of total food expenditures. The animal-source foods of interest to this study—red meat, poultry and fish—together make up about one-third of the calculated household food expenditures across all five expenditure quintiles. Household spending on fish ranged from 5.4% to 6.7% of total food expenditures. Table 3.8 reports the detailed monthly per capita expenditures on these animal-source foods by total household expenditure quintile. Worth noting is the fact that the average of the total household food expenditures calculated from the more detailed purchase responses far exceeds the single estimate of total household food expenditure reported in the previous section.
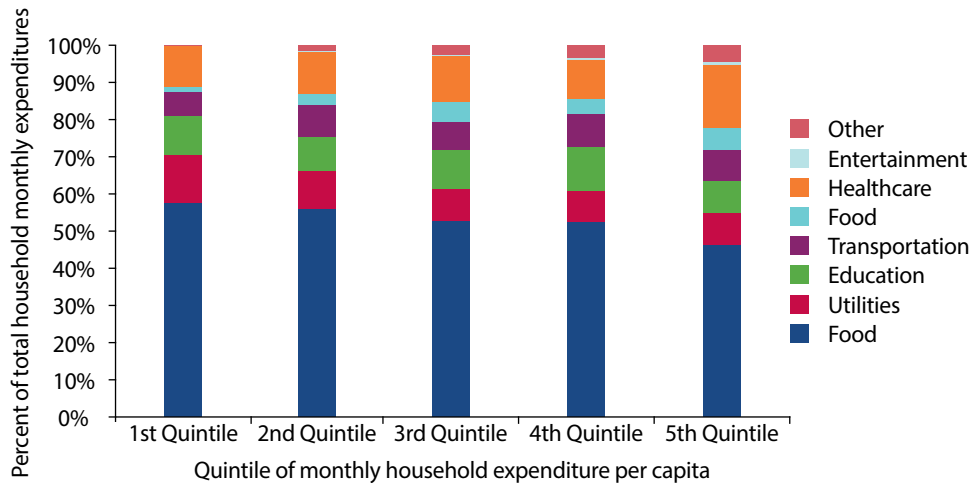
Figure 2. Average monthly household expenditures, by quintile of household expenditures per capita.
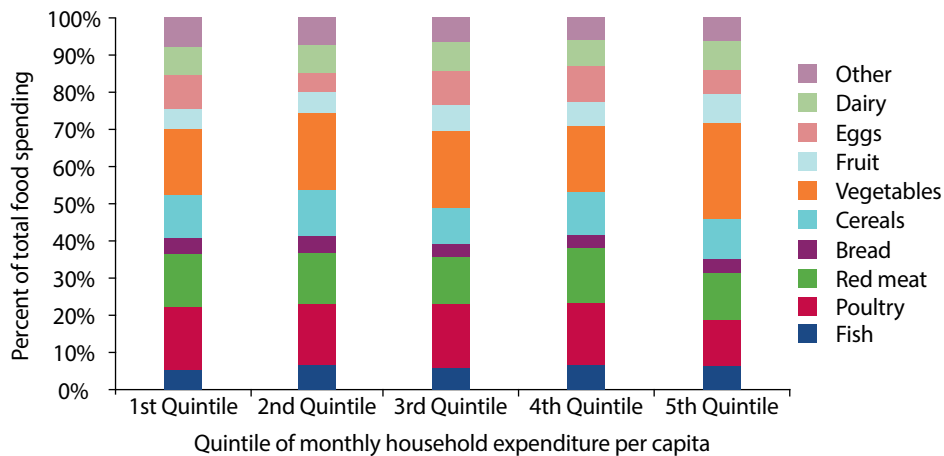
Figure 3. Average monthly household expenditures by quintile of total monthly household expenditures.

Food item	Mean expenditure (EGP)				
	1st quintile	2nd quintile	3rd quintile	4th quintile	5th quintile
Bread	6.39	8.12	7.38	8.42	9.97
Cereals	17.72	23.15	20.91	27.61	31.39
Vegetables	26.59	37.82	44.01	42.63	73.50
Fruit	8.19	10.41	14.76	15.77	23.15
Poultry	25.43	29.93	36.56	39.93	35.35
Red meat	21.40	25.70	26.97	35.53	37.07
Fish	8.23	12.31	12.71	16.00	18.44
Eggs	13.89	9.58	20.00	22.74	18.13
Dairy	11.40	13.87	16.53	17.00	22.66
Other	11.88	13.45	14.16	14.32	17.96
Total	**151.12**	**184.34**	**213.99**	**239.95**	**287.62**

Table 3.8. Mean monthly per capita food expenditures (EGP), by food category and quintile of monthly total expenditures per capita.

Household purchase and consumption of animal-source foods

The first objective of this study was to characterize the relative preferences for and consumption of three animal-source foods—red meat, poultry and fish—in the diets of resource-poor Egyptians. Respondents answered questions about their purchasing behaviors regarding these three animal-source foods as well as usual consumption of them within the household. The results from these questions are presented in the following sections.

Household animal-source food purchase behaviors

The study inquired about animal-source food purchasing behavior in several different ways. First, respondents reported the frequency of purchase of animal-source foods (Table 3.9). The results are reported by geographic location of the household as well as by quintiles of total household expenditure.

Sabri family eating fish for lunch in Abbassa, Sharkia, Egypt.

Photo Credit: Mona El Azazy/WorldFish

Poultry was purchased most frequently, with 73.7% of the total sample reporting weekly purchase of it. By comparison, just more than one-third of households (39.6%) purchased red meat on a weekly basis. A similar proportion of households (31.5%) purchased red meat monthly, and more than 10% of households purchased it even less frequently. The frequency of fish purchasing fell between red meat and poultry. More than half of households (53.1%) purchased fish weekly, while nearly one-third (29.2%) purchased it monthly.

Though the results suggest that rural households purchase fish more frequently than urban households (57% purchased weekly in rural areas vs. 48% in urban areas), the relationship between location of the household and frequency of purchase was not statistically significant.

The frequency-of-purchase data were standardized to enable an estimate of the mean number of times per week that the household purchased animal-source foods (Table 3.10). On average, households purchased poultry nearly once per week. Fish was purchased just 0.67 times per week, and red meat least frequently at 0.57 times per week. The frequency of purchase did not vary significantly by geographic location of the household.

Geographic location of village		% of respondents					
		Daily	Weekly	Monthly	Quarterly	Semi-annually	Annually
Red meat	Urban	1.0	39.0	34.6	11.6	4.4	6.4
	Rural close to fish farms	0.5	33.6	32.3	10.5	3.0	15.0
	Rural far from fish farms	1.3	46.9	25.3	7.2	3.9	10.3
Poultry	Urban	2.4	71.6	22.9	1.5	.03	.03
	Rural close to fish farms	1.5	74.6	16.3	1.5	0.3	0.3
	Rural far from fish farms	1.8	76.1	12.8	1.8	1.3	1.0
Fish	Urban	1.0	47.6	38.5	9.4	1.3	1.8
	Rural close to fish farms	1.0	57.5	17.3	11.0	7.0	5.75
	Rural far from fish farms	0.5	57.0	27.3	11.3	2.0	2.0
Quintile of household expenditure							
Red meat	1st	0.4	40.9	31.1	10.2	4.7	10.2
	2nd	0.4	39.2	28.6	10.1	4.4	10.1
	3rd	0.9	37.9	35.8	8.6	4.3	7.8
	4th	0.9	36.8	33.3	8.3	4.0	12.3
	5th	1.7	41.0	33.2	8.6	2.2	8.2
Poultry	1st	2.2	77.0	17.4	0.9	0.4	0.4
	2nd	2.2	75.4	15.5	1.7	0.9	0.9
	3rd	3.4	69.8	20.0	2.6	0.4	0.0
	4th	1.3	69.9	18.8	1.3	0.9	1.3
	5th	0.4	73.4	20.2	1.7	0.0	0.0
Fish	1st	0.4	50.4	28.8	12.3	5.5	2.5
	2nd	0.4	57.1	24.7	10.0	3.0	4.8
	3rd	0.8	55.3	29.5	9.3	3.0	2.1
	4th	0.4	58.4	28.8	6.0	2.2	3.4
	5th	1.7	54.5	27.5	10.3	3.4	1.7

Table 3.9. Frequency of purchase of animal-source foods, by geographic location and quintile of household expenditure.

	Urban	Rural close to fish farms	Rural far from fish farms	Total	N
Red meat	0.57	0.48	0.66	0.57	1,322
Poultry	0.94	0.94	0.97	0.95	1,337
Fish	0.64	0.70	0.68	0.67	1,393

Table 3.10. Mean times per week household purchases animal-source foods.

Households also described their purchasing behavior in terms of the quantity of meat or fish they purchase each time they purchase the item (Table 3.11). Interestingly, on average, households purchased approximately the same quantity of red meat, poultry and fish on a purchase occasion: about 2 kg. Urban households purchased red meat in slightly larger quantities per occasion than households in rural villages close to fish farms or rural villages far from fish farms, but this difference was not statistically significant.

Finally, using responses to the above questions about frequency of purchase and quantity purchased on each occasion, the mean monthly quantity of animal-source foods per capita was calculated for each household (Table 3.12). The kilograms of red meat purchased as compared to poultry or fish, per person per month, was remarkably consistent across both geographic location of the households and across quintiles of expenditure. Households purchased twice as much fish as red meat per person and more than three times as much poultry as red meat.

The quantity of fish purchased increased across expenditure quintile, with the highest quintile purchasing twice as much per capita per month as the lowest quintile. To test the significance of this positive trend, the per capita quantity of fish purchased was regressed on expenditure quintile. An increase in household expenditure from one quintile to the next predicted an additional 0.16 kg of fish purchased per person per month. This trend was significant ($p=0.01$).

Household animal-source food consumption behaviors
In addition to questions about the purchase of animal-source foods, survey respondents answered questions about consumption of red meat, poultry and fish in their households. Respondents were asked about each of the three foods, "Is this item part of your family's regular diet? Do you eat it weekly or monthly, for instance?"

	Geographic location				
	Urban	**Rural close to fish farms**	**Rural far from fish farms**	**Total**	**N**
Red meat	2.5	1.3	1.6	1.9	1,389
Poultry	1.9	1.9	2.2	2.0	542[*]
Fish	1.9	1.9	2.0	1.9	1,380

[*] The sample size for poultry is small because more than half of respondents reported purchasing poultry by whole bird, rather than by weight.

Table 3.11.　Mean quantity of animal-source foods (kg) purchased on each purchase occasion.

	Kg/month/capita		
	Red meat	**Poultry**	**Fish**
Location of household			
N	1,308	529	1,372
Urban	0.5	1.6	1.0
Rural close to fish farms	0.4	1.8	1.1
Rural far from fish farms	0.6	1.8	1.0
Household expenditure quintile			
N	1,089	450	1,151
1st	0.4	1.3	0.7
2nd	0.5	1.8	0.9
3rd	0.6	1.8	1.0
4th	0.5	1.8	1.2
5th	0.7	1.5	1.4
Full sample	**0.5**	**1.7**	**1.1**

Table 3.12.　Mean monthly purchased quantity of animal-source food (kg) per capita by geographic location and household expenditure quintile.

The results, shown in Table 3.13, are consistent with those discussed above about frequency and monthly quantity of purchase of each of the foods. Poultry was the animal-source food consumed regularly in the largest percentage of households (71.2%). The proportion of households consuming poultry regularly was significantly greater than the proportion consuming fish (58.2%) and red meat regularly (43.0%).

The proportion of households that regularly consumed each type of animal-source food was independent of the geographic location of the household. Interestingly, a greater percentage of households in the lower quintiles of total household expenditure reported consuming red meat, poultry and fish regularly than those in the upper expenditure quintiles. However, this observation did not prove statistically significant.

Respondents were also asked to report the number of times in the past month that the household head consumed fish as a main dish (Table 3.14). The question also specified "with the rest of the family." Thus, it may be that fish was served as a main dish more often than reported in Table 3.14, but that the head of household did not join the meal each time. Nonetheless, the responses give a sense of a minimum frequency of consumption of each animal-source food.

On average, heads of household consumed fish as a main dish (with the rest of the family) 2.5 times per month. The results suggest that proximity to fish farms may boost frequency of fish consumption: household heads in rural villages close to fish farms consumed fish an average of 3.7 times/month, compared to 2.2 times/month in rural villages far from fish farms and 1.9 times/month in urban areas. Yet, these differences were not found to be statistically significant (adjusted Wald tests, $p < 0.05$).

The number of times the household head consumed fish as a main meal was also examined by household expenditure quintile. The frequency of fish consumption increased with the total expenditures of the household, climbing from 1.9 times per month among heads of households in the first (lowest) expenditure quintile to 2.9 times per month among heads of households in the fifth expenditure quintile. However, pairwise comparisons between each expenditure quintile did not find any significant differences between them in the frequency of consumption. Frequency of fish consumption was also regressed on expenditure quintile to assess the potential for a positive trend in fish intake with total per capita expenditure; the coefficient was not significant, indicating a lack of linear trend.

	% of households		
	Red meat	Poultry	Fish
Geographic location			
Urban	38.8	70.7	56.2
Rural close to fish farms	40.5	69.8	57.5
Rural far from fish farms	51.8	73.5	62.0
Full sample	**43.0** [a]	**71.2** [b]	**58.2** [c]
Household expenditure quintile			
1st	57.2	30.9	45.8
2nd	57.1	26.6	42.5
3rd	55.3	31.2	42.2
4th	59.2	28.8	36.9
5th	54.5	29.3	39.5
Full sample	**56.7**	**29.2**	**41.4**

[a, b, c] Values with different superscripts are statistically different from one another based on adjusted Wald tests, $p < 0.05$.

Table 3.13. Percent of households that consume animal-source food as part of family's regular diet. (Respondents were told that "regular" meant weekly or monthly.)

		Mean	N
Geographic location			
Urban		1.9	578
Rural close to fish farms		3.7	384
Rural far from fish farms		2.2	388
Household expenditure quintile			
1st		1.9	227
2nd		2.3	226
3rd		2.7	233
4th		2.8	217
5th		2.9	224
Education of household head			
Illiterate		2.3 [a]	747
Literate, no formal schooling		2.5 [a]	180
Primary or preparatory		2.8	162
Secondary, vocational or technical school		3.0 [b]	214
Postsecondary*		3.4	44
Full sample		**2.5**	**1,347**

[a, b] Means with different subscripts differ significantly from other means within the same subset of observations, based on F-statistics from adjusted Wald tests, p<0.05.

* Includes those who have completed higher institute studies, university and postgraduate education.

Table 3.14.   Mean number of times in last month the head of household consumed fish as main dish.

Finally, this analysis was also disaggregated by educational attainment of the household head to explore whether or not education affects reported fish consumption. Pairwise comparisons showed only two significant differences in frequency by education level: those who completed secondary or vocational school consumed fish more frequently (3.0 times per month) than household heads who were literate without formal schooling (2.5 times per month) or illiterate (2.3 times per month). Frequency of fish consumption was then regressed on education of household to evaluate the significance of the observed upward trend in consumption by the household head as his or her level of education increased. Each additional level of schooling completed corresponded to an additional 0.26 times per month that fish was consumed by the household head. This positive trend was significant (p=0.02).

Factors affecting fish consumption differences

The second objective of this study was to identify factors that affect demand for different types of animal-source foods, and particularly for fish, among resource-poor Egyptians. The following subsections present both quantitative and qualitative results that provide insight into the role of price, seasonality, and knowledge and attitudes about the healthfulness of fish, as well as fish species and size, on animal-source food consumption behaviors.

Overview of preferences

Responses to several household survey questions provide a quantitative snapshot of household animal-source food preferences. Respondents were asked to rank red meat, poultry and fish according to their family's preferences. Table 3.15 reports the percentage of respondents who selected each as his or her family's first priority. Across the full sample, nearly two-thirds (63.3%) of households ranked red meat as their preferred animal-source food. Poultry was the first priority for 20.3% of households and fish for 16.5% of households.

The data suggests some difference in preferences by geographic location. For example, urban households reported red meat as their first priority less often, but poultry more often, than rural households. Fish was

preferred least often in rural villages located far from fish farms. However, these differences were not statistically significant. Disaggregating the sample by expenditure quintile was more interesting. Households in the fourth and fifth (higher) expenditure quintiles preferred red meat less often and poultry and fish more often than households in the lowest two quintiles (Table 3.16). However, red meat remained the most preferred choice overall, regardless of the quintile into which the household fell, and none of the differences by expenditure quintile were significant.

Though fish was the preferred choice less often than red meat and poultry, 57.9% of survey respondents said they would like to increase the amount of fish consumed in their household, compared to 39% who would keep the current amount and just 3.1% who would reduce the fish consumed. When asked about the factors that prevent them from increasing fish consumption, more than 90% of respondents in all three geographic locations selected financial barriers, rather than limited availability (Table 3.17). The percent of respondents selecting a particular reason did not vary significantly by geographic location. Households in the lowest three expenditure quintiles gave price or high cost as the factor preventing increased consumption more often than those in the upper two quintiles, while the inverse was true for the factor of limited budget. However, as for geographic

location, the association between reason and expenditure quintile was not significant.

Price
Survey respondents were asked about both their perception of the relative prices of red meat, poultry and fish and the actual prices they pay for each type of food. As shown in Table 3.18, nearly all respondents perceived fish to be cheaper than red meat. While there was a little more geographic variation in the percent of respondents who perceived fish to be cheaper than poultry, the vast majority perceived this to be the case. These perceptions were consistent across geographic location of the household.

In addition to their perceptions about relative prices, respondents reported for each animal-source food the total cost of the quantity they regularly buy, judging from the last purchase of that food. For each household, this response was divided by the reported quantity in kilograms that the household buys each time they purchase the food item. This enabled estimates of the actual mean price (EGP/kg) that sampled households paid for red meat, poultry and fish at the time of their last purchase.

In the full sample, and in both urban and rural locations when examined individually, the price per kilogram paid by respondents for red meat (EGP 57.8/kg in full sample) was more than twice that paid for poultry (EGP 21.0/kg), and

Type of meat	% of households			
	Urban	Rural close to fish farms	Rural far from fish farms	Total
N	574	381	382	1,337
Red meat	55.3	68.5	70.4	63.3
Poultry	26.1	13.9	17.8	20.3
Fish	18.8	17.6	11.8	16.5

Table 3.15.   Households' preferred animal-source food, by geographic location of household.

Type of meat	% of households					
	1st quintile	2nd quintile	3rd quintile	4th quintile	5th quintile	Total
N	221	219	229	224	225	1,118
Red meat	67.9	67.1	64.6	60.3	58.7	63.7
Poultry	16.7	16.4	21.0	21.4	20.4	19.2
Fish	15.4	16.4	14.4	18.3	20.9	17.1

Table 3.16.   Households' preferred animal-source food, by expenditure quintile.

more than three times the price paid for fish (EGP 14.2/kg; Table 3.19). The price per kilogram actually paid by respondents was examined across household expenditure quintile as well (results not shown). While it might be expected that households in lower quintiles paid less per kilogram for lower-quality products, the data indicates that prices paid for all three animal-source foods were very similar across quintiles, varying by just a few EGP/kilogram. The estimated actual prices paid confirmed the respondent perceptions reported in Table 3.18.

When considered together, Tables 3.18 and 3.19 indicate that respondents' perceptions about the relative prices of animal-source foods are consistent with the reality that they face when purchasing these items. The fact that fish is the least expensive of the three animal-source foods suggests that the predominant preference for red meat over poultry and fish is not driven by price. Respondents who indicated that the high price of fish prevented them from consuming more of it were likely referring to its high price relative to their limited food budget. This data suggests that fish prices may shape the quantity a household can afford to purchase, but not its preference for red meat or poultry.

This interpretation is supported by results from several other survey questions. When asked whether their families would rather consume red meat or fish if the two items were the same price, 82.1% of respondents selected red meat. Given equivalent prices, 72.8% of families would rather consume poultry than fish. A followup to these questions probed respondents for reasons for their stated preference (Table 3.20). More than 75% of respondents selected one of two reasons: either that red meat or poultry is a more important source of protein than fish, or that red meat or poultry tastes better than fish. The former was the most-selected response for red meat (50.0%), while the latter was the primary reason given for selecting poultry over fish (53.0%).

Among the smaller percentage of sampled families that preferred fish to red meat or poultry, preferred taste and the belief that fish was a more important source of protein were again the most-cited reasons for the preference (Table 3.21). Availability was rarely cited as a reason for preferring one form of animal food to another (Tables 3.20 and 3.21).

	% of households				
	Price or high cost	Limited budget	Limited availability	Other	N
Geographic location					
Urban	56.6	40.2	2.6	0.6	348
Rural close to fish farms	47.4	42.8	8.8	1.0	194
Rural far from fish farms	50.5	41.5	7.6	0.5	224
Full sample	**52.5**	**41.3**	**5.6**	**6.5**	**766**
Household expenditure quintile					
1st	63.2	29.7	5.8	1.3	155
2nd	53.7	43.3	3.0	0.0	134
3rd	46.4	45.6	7.2	0.8	125
4th	47.5	49.2	3.3	0.0	122
5th	48.5	46.9	3.9	0.8	130
Full sample*	**52.4**	**42.3**	**4.7**	**0.6**	**666**

*This is across the full sample of participants with both a response to this question and total household expenditure data.

Table 3.17. Factors that prevent the household from increasing fish consumption.

	% of respondents			
	Fish is cheaper	Same price	Fish is more expensive	N
Poultry				
Urban	83.6	13.2	3.2	598
Rural close to fish farms	85.3	11.3	3.5	400
Rural far from fish farms	87.2	10.1	2.8	397
Red meat				
Urban	96.6	2.9	0.5	556
Rural close to fish farms	97.6	2.4	0.0	374
Rural far from fish farms	99.5	2.7	0.03	374

Table 3.18. Perception of respondents regarding affordability of fish compared to poultry and red meat.

Type of meat	EGP/kg			Full sample
	Urban (N)	Rural close to fish farms (N)	Rural far from fish farms (N)	
Red meat	60.8 (586)	56.9 (395)	54.2 (393)	57.8
Poultry	20.6 (264)	20.3 (134)	22.4 (143)	21.0
Fish	14.2 (591)	13.0 (392)	15.2 (396)	14.2

Table 3.19. Mean price per kilogram paid for animal-source food at time of last purchase.

	% of respondents	
Reason given by respondent	Red meat preferred to fish	Poultry preferred to fish
N	1,131	1,002
More important source of protein	50.0	28.6
Tastes better	25.6	53.0
More available	0.4	1.3
Better for the household diet	21.0	13.6
Other	0.4	0.8

Table 3.20. Reasons why households would rather consume red meat or poultry than fish, given equal prices.

	% of respondents selecting given reason	
Reason given by respondent	Fish preferred to red meat	Fish preferred to poultry
N	244	367
More important source of protein	49.6	40.6
Tastes better	45.5	41.7
More available	0.0	0.8
Better for the household diet	2.5	14.4
Other	2.4	2.3

Table 3.21. Reasons why households would rather consume fish than red meat or poultry, given equal prices.

Seasonality

The previous section argued that price does not seem to be the primary factor driving households' relative preferences for animal-source foods, yet the absolute price of fish very likely affects the quantity that households purchase and consume. Thus, factors that affect prices, such as seasonality, would also influence fish demand.

Though this survey was conducted only in the month of May, fish consumption across the year was assessed through respondent recall. Respondents were asked to estimate, for each month of the year preceding the survey, the number of days per month that the family ate at least one meal of fish. Figures 4 and 5 suggest only a slight decrease in consumption of fish across regions and expenditure quintiles in the spring season.

When data collectors noticed variation in fish consumption over the year, they asked respondents to give the main reasons why fish consumption increased in some months and decreased in others. Their responses (Tables 3.22 and 3.23) indicate that fish prices may fluctuate across the year, thus affecting the quantity of fish households can afford. More than one-third of households in each type of geographic location selected "fish is cheaper" or "fish is more expensive" to explain the respective increase and decrease in consumption. The next-most-selected responses indicate that fish availability may vary over the course of the year. Though there seem to be some differences in the reason given for seasonal variation in consumption by geographic location (for example, urban respondents selected the price of fish more often than rural respondents), chi-square tests indicated that the differences were not statistically significant.
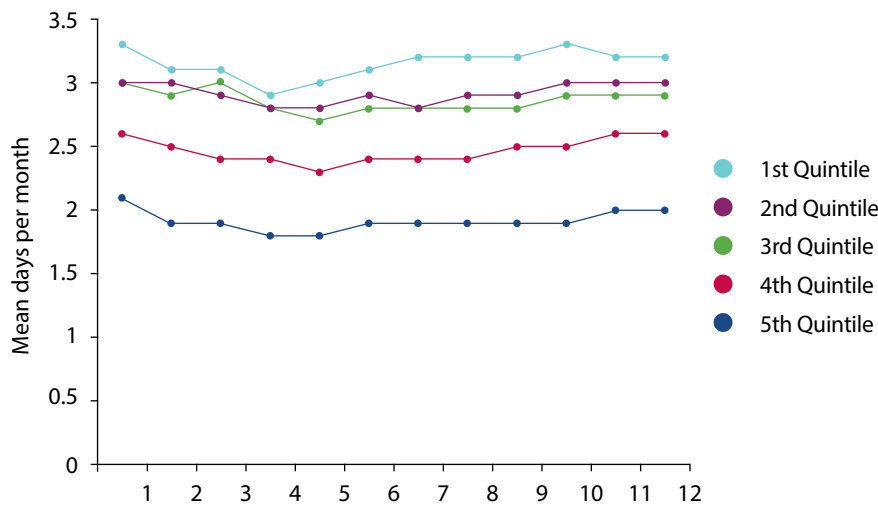

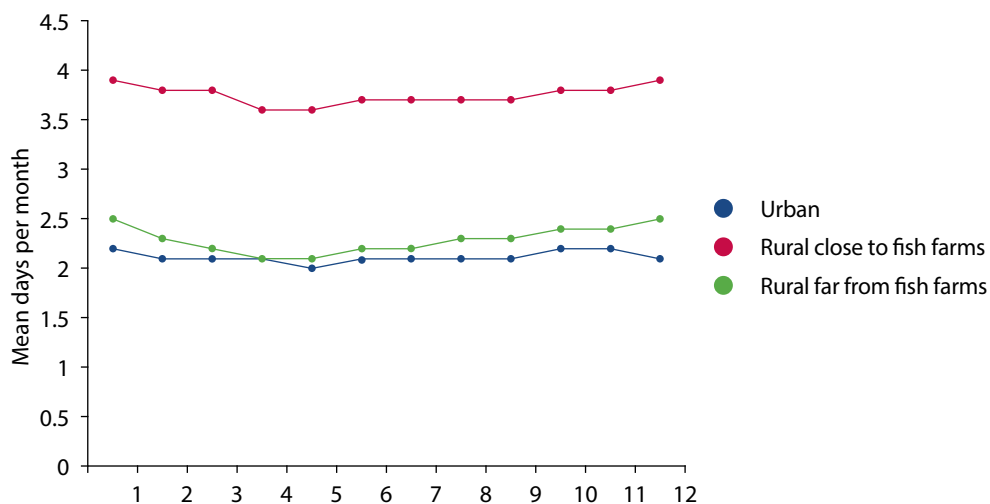**Figure 4.** Mean days per month household ate at least one fish meal, by expenditure quintile.

Figure 5. Mean days per month household ate at least one fish meal, by location of household.

	% of respondents selecting given reason							
	Fish is cheaper	Fish is more available	Alternate animal-source food more expensive	Weather too hot	Able to buy it	Weather too cold	Other	N
Urban	45.1	8.2	5.9	4.3	24.3	2.8	9.4	255
Rural close to fish farms	41.9	25.7	5.4	4.1	10.8	4.7	7.4	148
Rural far from fish farms	37.7	14.4	2.4	3.0	18.6	10.8	13.2	167

Table 3.22. In households where fish consumption varied by month, reason for increase in some months.

	% of respondents selecting given reason							
	Fish is more expensive	Fish is less available	Alternate animal-source food cheaper	Weather too cold	Not able to buy it	Weather too hot	Other	N
Urban	45.7	5.9	2.4	6.3	23.6	3.5	12.6	254
Rural close to fish farms	33.8	26.4	4.1	6.8	10.8	7.4	10.8	148
Rural far from fish farms	35.3	11.4	1.2	3.6	20.4	12.6	15.6	167

Table 3.23. In households where fish consumption varied by month, reason for decrease in some months.

Qualitative responses suggest additional seasonal factors that may shape fish demand. Interview respondents indicated that most households tend to consume more animal-source foods, including fish, during the winter, since they can keep the meat for longer periods of time in the cooler weather. In addition, during holidays like Eid Adha, households tend to consume more animal-source foods. Yet, when discussing this holiday and its impact on consumption, only one interview respondent said, "We only eat meat the first day, and during other days we have fish."

Knowledge and attitudes about the healthfulness of fish

In addition to seasonal factors, both the survey and interview responses indicate that current knowledge and attitudes about the freshness and healthfulness of fish may shape household fish demand. Survey respondents were asked a series of questions related to these considerations. Table 3.24 reports the percentage of respondents who replied "Yes" to the question, as opposed to "No" or "I don't know."

Considering the full sample, nearly all respondents (96.9%) believed that eating fish is good for one's health and that it is a highly nutritious food (93.2%). However, a substantial percentage also had concerns about the healthfulness of fish. More than one-third of respondents (34.3%) believed that fish may be contaminated with chemicals, and 30.0% believed that one can get sick from eating fish. The same percentage believed that one can get sick from eating fish raised by aquaculture (30.1%). Nearly all respondents (94.9%) believed that the safety of fish can be judged by sight and taste. The survey data does not indicate the extent to which these perceptions influence actual purchasing and consumption of fish.

Qualitative responses also indicate concerns with aquaculture. One female respondent from a rural village close to fish farms stated: "We haven't eaten fish for two years because we heard farmed fish are being fed dead animals, and we don't have access to sea fish. This is why we eat red meat each Thursday and poultry each Sunday."

Also of note, and consistent with results reported in the section on price, 87.5% of respondents indicated that they would buy more fish if it were cheaper. Yet, only 18.7% of respondents believed that fish price is more important than fish quality, demonstrating once again that factors other than price also shape fish demand. As indicated by the p-values of individual t-tests conducted for each question, knowledge and attitudes did not vary by geographic location of the household.

To see whether education shaped knowledge and attitudes about fish intake, responses to these questions were analyzed by the highest level of education completed by the household head (Table 3.25). Few substantial differences in knowledge and attitudes were noted by education level; none were statistically significant.

Question	% who said "Yes"				P-value
	Urban (N)	Rural close to fish farms (N)	Rural far from fish farms (N)	Full sample	
Do you think eating fish is good for your health?	97.3% (584)	97.0% (388)	96.3% (385)	96.9% (1,400)	0.60
Do you think you can get sick from eating fish?	29.3% (175)	29.0% (115)	32.2% (128)	30.0% (1,392)	0.84
Do you think fish is a highly nutritious food?	94.1% (561)	92.7% (369)	92.5% (368)	93.2% (1,392)	0.66
Do you think the fish you eat may be contaminated with chemicals?	33.7% (202)	32.3% (129)	37.1% (148)	34.3% (1,397)	0.94
Do you think children under 1 year should eat fish?	65.2% (390)	59.7% (238)	67.2% (268)	64.2% (1,396)	0.49
Do you think fish safety can be judged by sight and taste?	94.3% (566)	94.8% (379)	95.7% (382)	94.9% (1,399)	0.69
Do you think you would buy more fish if it were cheaper?	87.0% (522)	89.0% (355)	86.9% (346)	87.5% (1,397)	0.85
Do you think price of fish is more important than quality?	20.7% (124)	18.0% (72)	16.6% (66)	18.7% (1,398)	0.94
Do you think in the future your household will eat more fish?	59.9% (356)	61.8% (247)	59.7% (237)	60.4% (1,391)	0.98
Did you or any of your family become sick from eating fish?	23.2% (139)	18.8% (75)	17.8% (71)	20.4% (1,399)	0.36
Is it possible that a person could become sick from eating fish from aquaculture?	34.1% (204)	24.3% (97)	30.0% (120)	30.1% (1,399)	0.21
Have you ever had any sickness you can confidently trace to eating fish from aquaculture?	37.4% (223)	32.8% (131)	42.8% (171)	37.6% (1,396)	0.41

Table 3.24. Percent of respondents who answered "Yes" to selected questions about fish healthfulness and quality.

Question	% who responded "Yes"					
	Illiterate	Literate, no schooling	Primary	Secondary, vocational	Post-secondary*	P-value
Do you think eating fish is good for your health?	96.0% (745)	97.3% (180)	97.6% (162)	98.7% (220)	100% (47)	0.49
Do you think you can get sick from eating fish?	29.6% (771)	33.0% (185)	28.7% (164)	30.2% (222)	31.9% (47)	0.63
Do you think fish is a highly nutritious food?	90.9% (770)	94.6% (185)	95.2% (165)	97.3% (222)	100% (47)	0.19
Do you think the fish you eat may be contaminated with chemicals?	30.3% (775)	37.0% (184)	41.6% (166)	38.7% (222)	44.7% (47)	0.09
Do you think children under 1 year should eat fish?	63.7% (773)	61.4% (184)	71.1% (166)	62.8% (223)	63.8% (47)	0.21
Do you think fish safety can be judged by sight and taste?	92.9% (775)	94.1% (185)	98.2% (166)	99.1% (223)	97.9% (47)	0.14
Is it possible that a person could become sick by eating fish from aquaculture?	27.5% (775)	31.9% (185)	35.5% (166)	34.1% (223)	29.8% (47)	0.32

* Includes those who have completed higher institute studies, university and postgraduate education.

Table 3.25. Percent of respondents who answered "Yes" to selected questions about fish healthfulness and quality, by level of education of household head.

Given stated concerns about aquaculture, analyses looked at the percent of households who reported eating farmed fish. More than one-third of urban households reported eating farmed fish (38.6%), compared to 42.3% of households in rural villages far from fish farms and 70.0% of households in rural villages close to fish farms. Though the differences by location were not found to be statistically significant in this analysis, proximity to fish farms seems to correspond to farmed fish consumption. The data gives no indication as to whether this is due to increased availability of farmed fish or increased acceptance of aquaculture in rural villages close

to fish farms. It may also be that farmed and wild-caught fish are easier to identify in rural villages close to fish farms. Fewer respondents in rural villages close to fish farms answered "Do not know" to the question about farmed fish consumption, and 69.5% of them believed that they could differentiate between farm and Nile fish, compared to 60.1% of urban respondents and 57.8% of respondents in rural villages far from fish farms (not significant). An analysis of the percentage of households who eat farmed fish by education level of the household head showed no pattern or significant effect of education (results not shown).

Species and size

To further understand fish preferences and inform future development of Egypt's aquaculture industry, respondents were asked about their purchase of specific types of fish. As can be seen in Table 3.26, some species were favored while others were rarely or never purchased. Tilapia was the most purchased fish species: 36.2% of the sample purchased grade 2 tilapia weekly or monthly, and 45.6% purchased the smaller, grade 3 tilapia weekly or monthly. After tilapia, frozen mackerel, sardines and African catfish were the next most frequently purchased, though these three types of fish were never purchased by two-thirds of the sample. Mullet, carp and catfish sold dead were almost never purchased by households.

When asked what affects their decision to buy a particular type of fish, more than half of respondents (55.8%) reported price as the most important factor. Price was followed by the quality or freshness of the fish (32.3% of respondents) and taste (9.6%). Other factors such as size, availability and retailer factors appear from the quantitative analysis to play a minor role in decisions between fish types (Table 3.27).

Fish type		% of respondents						
		Daily	Weekly	Monthly	Quarterly	Semi-annually	Annually	Never
Tilapia	Grade 1 (fewer than 3 fish/kg)	0.2	1.9	3.4	2.1	1.4	1.1	89.9
	Grade 2 (3–5 fish/kg)	1.3	20.5	15.7	5.4	1.9	1.9	53.4
	Grade 3 (more than 5 fish/kg)	0.8	26.9	18.7	4.6	1.9	2.0	45.2
African catfish	Dead	0.1	0.1	0.6	0.9	0.1	0.3	97.8
	Alive	0.4	6.4	11.4	7.9	3.4	4.3	66.2
Mullet	Grade 1 (fewer than 3 fish/kg)	0.3	0.7	0	0.6	0	0.1	98.4
	Grade 2 (3–5 fish/kg)	0.2	2.0	2.8	1.8	0.4	0.4	92.5
	Grade 3 (more than 5 fish/kg)	0.1	2.6	5.5	2.9	0.5	1.0	87.4
Carp		0.1	0.9	2.0	0.8	0.1	0.9	95.2
Frozen mackerel		0.2	14.2	12.6	3.7	1.2	0.8	67.3
Sardine		0.5	12.3	13.7	6.1	2.6	1.5	63.4

Table 3.26. Frequency of purchase of different types of fish.

	% of respondents			Total
	Urban	Rural close to fish farms	Rural far from fish farms	
N	599	396	396	1,391
Price	58.3	56.8	51.0	55.8
Quality or freshness	30.7	31.8	34.8	32.3
Taste	9.4	7.6	11.9	9.6
Size	0.3	1.3	0.8	0.7
Trusted retailer	0.7	0.0	0.5	0.4
Availability	0.7	1.3	1.0	0.9
Other	0.0	1.0	0.0	0.3

Table 3.27. Factors determining the decision to buy a particular type of fish. (Respondents were able to select more than one factor; thus, the table reports the percent of sample in each geographic location that named the factor as the first factor affecting the decision.)

Qualitative results, however, did mention fish size as a consideration that works through price and taste to affect purchasing behavior. For example, one female respondent stated, "We are poor people, and cannot afford bigger-sized fish, so we buy medium size." Another one said, "I think everyone who has children should buy medium-size fish." Moreover, one-quarter of households interviewed preferred bigger fish because they think that larger fish taste better. Less than one-quarter of the households interviewed preferred smaller fish because each member can receive more than one piece. One family stated that they prefer to combine small and big pieces: "We purchase bigger fish because it contains more meat, while the small size can be used for children." Bigger pieces were also bought in some cases because the husband prefers them. In one household, the female respondent stated that the bigger fish was purchased for the husband, while smaller fish were purchased for children.

Respondents who reported that their household never purchased a type of fish were asked to give a reason why that was the case. Table 3.28 reports the results for all fish species discussed. The reason given most frequently varied quite a bit by type of fish. For mullet, never purchased by almost all households, expense was the biggest reason. This was also the case for the higher grades of tilapia. Poor taste or dislike of African catfish was the primary reason respondents never purchased it, though 17% cited poor

quality as the primary barrier to purchase. Poor taste was also the most frequently cited reason that households never purchased sardines and frozen mackerel. Poor availability was rarely given as a reason; it was most commonly cited as the reason for never purchasing carp, and even then only by 20% of respondents.

Sources of purchased fish

When households purchased fish, they did so from a variety of sources (Table 3.29), though more than 90% of respondents always purchased fish from one of three sources. Nearly 40% of respondents always purchased fish at street vendor stands, while 30.9% always purchased it at a retail market and 21.9% purchased fish from a mobile street vendor. Other sources played a minor role in supplying households with fish on a regular basis. Only 16.2% of households stored fish after purchase before cooking it.

The importance to consumers of access to a trusted retailer and the quality of animal-source foods, and of fish in particular, were mentioned in the qualitative findings. Three-quarters of the interview sample stated that they only buy red meat or poultry if it is of high quality. Some of them added that they "always buy it from a trusted butcher." Respondents stated that they prefer to buy live fish and live poultry. In the words of one respondent, "We make sure the fish is fresh and still alive."

Fish type		% of respondents					
		Not available	Too expensive	Poor quality	Do not like it or poor taste	Hard to cook	Other
Tilapia	Grade 1 (fewer than 3 fish/kg)	9.0	77.1	1.5	11.6	0.4	0.4
	Grade 2 (3–5 fish/kg)	5.5	73.5	2.8	17.2	0.9	0
	Grade 3 (more than 5 fish/kg)	5.3	31.3	17.1	41.6	4.3	0.5
African catfish	Dead	2.7	9.0	17.0	70.2	0.5	0.5
	Alive	2.8	12.2	9.0	74.6	0.8	0.7
Mullet	Grade 1 (fewer than 3 fish/kg)	10.9	67.3	0.7	8.5	0.1	12.4
	Grade 2 (3–5 fish/kg)	10.5	66.4	0.9	8.9	0.2	13.2
	Grade 3 (more than 5 fish/kg)	11.5	61.6	1.7	10.4	0.7	14.1
Carp		20.0	26.2	1.2	17.7	0.6	34.3
Frozen mackerel		15.2	13.5	6.4	34.2	0.2	30.5
Sardine		7.7	13.0	6.9	53.3	1.7	17.3

Table 3.28. Reasons why household never consumes a particular type of fish.

Source	% of respondents		
	Always	**Sometimes**	**Never**
Mobile street vendor	21.9	8.0	70.1
Street vendor stand	38.9	6.0	55.1
Fish shop	5.1	4.0	90.9
Consumer association	0.3	1.4	98.3
On agreement	1.2	1.8	97.0
Supermarket	0.5	1.6	97.9
Wholesale market	5.0	2.1	92.8
Retail market (fresh fish)	30.9	4.2	64.9
Fish fry shop (cooked fish)	2.9	5.5	91.5
From work place (fish farm)	0.9	1.7	97.4

Table 3.29. Frequency with which households purchase fish from various sources.

This attention to quality seemed to be driven by concerns with both value and health. Some interview respondents believed that cooking would take care of any potential health risks found in poultry. One female respondent stated, "When poultry is cooked in a fire, everything will be killed, unlike the expensive red meat and fish, which may still be contaminated and lead to diseases. This is why we have to make sure the quality of meat is good." The same group of households stated that they care more about the quality of red meat because it is expensive, while fish quality is very important in order to avoid health risks.

Intra-household decision-making about and distribution of fish

The third objective of this study was to examine how equitably decision-making about and consumption of fish are distributed within households. The following subsections present both quantitative and qualitative results that provide insight into intra-household dynamics as they relate to fish consumption.

Decision-making about fish consumption
Table 3.30 and Table 3.31 indicate that decisions about when fish is consumed and which type is purchased were most often made by the wife, acting independently. In nearly 50% of households, the wife decided when fish was consumed. She decided with her husband and/or children in 26.1% of households. In a small percentage of households (15.3%), the husband decided when to purchase fish.

These patterns were similar across geographic location of the household.

The results about what type of fish to purchase were very similar to those about when fish was purchased. In more than half (52.7%) of households, the wife decided which type was consumed. She decided with her husband and/or children in 23.9% of households. In a small percentage of households (15.9%), the husband decided what type of fish to purchase. Again, there was not a significant association between location of the household and the decision maker (results not shown).

Intra-household distribution of fish
Respondents were asked to indicate how meals of fish are shared within the household. Their response choices were as follows: "Equally"; "Each one gets what he or she wishes"; "Men get priority"; "Children get priority"; and "Other." Because servings were not observed, the term "equally" was defined by each respondent for him- or herself. Some may have interpreted it in absolute amounts, while others may have considered amounts proportionate to need as equal.

In nearly all households, fish was distributed for consumption quite equitably. More than two-thirds of households surveyed (68.6%) reported that they distribute fish equally among household members (Table 3.32). Most of the remaining households distributed fish to each individual according to what he or she wants. In a small percentage of households

Household member	% of households
Wife	49.9
Husband	15.3
Joint decision[*]	26.1
Children	5.8
Other male	0.4
Other female	2.4
Other	0.2
[*] The joint decision category reflects combinations of wife, husband and children (e.g. husband and wife, wife and children).	

Table 3.30. Household member who decides when fish is consumed.

Household member	% of households
Wife	52.7
Husband	15.9
Joint decision	23.9
Children	4.6
Other male	0.3
Other female	2.3
Other	0.3

Table 3.31. Household member who decides which type of fish is consumed.

	% of households			Total
	Urban	Rural close to fish farms	Rural far from fish farms	
Equally	63.1	69.3	76.3	68.6
Everyone gets what he or she wants	33.7	25.5	21.5	27.9
Children get priority	2.0	4.3	1.3	2.4
Men get priority	0.8	0.8	1.0	0.9
Other	0.3	0.3	0.0	0.2
Total	**100.0**	**100.0**	**100.0**	**100.0**

Table 3.32. Distribution of meals of fish within the household.

(2.4%), children received priority. Men were given priority in less than 1% of households. There was no statistically significant difference in distribution by geographic location of the households (chi-square test of independence).

Similarly, respondents were asked to report who in the household receives less fish when the amount available is not sufficient to be shared equitably between members. In more than two-thirds of households surveyed (70.3%), all members received less fish when the available quantities were insufficient (Table 3.33). Where the reduction in quantity given was not equal across household members, elderly members (in 12.4% of households) or female members (in 11.5% of households) received less fish. There was no statistically significant difference in distribution by geographic location of the households (chi-square test of independence).

	% of households			Total
	Urban	**Rural close to fish farms**	**Rural far from fish farms**	
Children	3.4	3.5	2.5	3.2
Female members	10.1	15.8	9.3	11.5
Elderly members	13.8	8.5	14.0	12.4
Equally	69.6	68.3	73.4	70.3
Other	3.2	3.8	0.8	2.7
Total	**100.0**	**100.0**	**100.0**	**100.0**

Table 3.33. Household member who receives less when the available fish is not sufficient to be shared among members.

The in-depth interviews also probed respondents about distribution of fish among household members. The responses suggest more inequality in distribution and preference for the husband than do the survey results. Half of the interview respondents reported that animal-source foods are equally distributed among family members, as compared to 68.6% of households in the survey. One-quarter of the households stated that distribution is unequal. When probed for reasons, respondents indicated that the husband "gets more because he works," or "because he doesn't like red meat and poultry, so he consumes more fish as a compensation." Some of these households also stated that "children get smaller amounts because it is sufficient for them." Finally, one-quarter of the households did not distribute animal-source foods, but rather let family members take what they prefer.

When asked about the ideal animal-source food intra-household distribution, half of survey participants responded that the food should be distributed equally and that both female and male children should get equal portions to support their growth. One-quarter of the households stated that it would be best not to distribute animal-source foods in a formal manner, but rather "let each household member choose what he or she likes." However, qualitative data suggests a greater acceptance of unequal distribution among some men. One husband stated that "the head of the household should get more animal-source foods because of the hard work he does." Another husband mentioned in the same interview that "the children should get more" and "animal-source foods should be distributed equally." In two other households, the wife stated that animal-source foods should be distributed equally, while the husband argued that the children should receive smaller amounts and the men larger. In sum, there seems to be inconsistency between the quantitative and qualitative results regarding intra-household distribution of animal-source food consumption.

CONCLUSIONS AND RECOMMENDATIONS

This study had three main objectives: first, to describe preferences for and consumption of animal-source foods in the diets of resource-poor Egyptians; second, to understand the factors that drive these preferences and consumption patterns; and third, to explore intra-household dynamics related to fish purchases and consumption. The survey sample included 1400 households in five governorates, enabling comparison of the results between urban households, rural households located near fish farms, and rural households located far from fish farms. Though all households included in the sample were considered poor, there was sufficient variation in resources to also stratify results by total monthly per capita expenditures.

Animal-source foods in the diets of the resource-poor

Preferences for and consumption of red meat, poultry and fish in the diets of the resource-poor were assessed via questions about spending and consumption. Monthly household food expenditures varied across total expenditure quintiles, from an average of EGP 317.06 (57.7% of total expenditures) in the lowest to EGP 547.21 (46.3% of total expenditures) in the highest. However, the per capita relative quantities of red meat, poultry and fish purchased monthly proved consistent across location and expenditure quintiles. Households purchased twice as much fish and three times as much poultry per capita as red meat. These purchases required substantial resources from the household food budget. Household spending on fish alone ranged from 5.4% to 6.7% of total food expenditures.

In terms of consumption, the proportion of households consuming poultry regularly (71.2%) was significantly greater than the proportion consuming fish (58.2%) or red meat regularly (43.0%). Both the per capita quantity of fish purchased each month and the frequency of fish consumption increased as household resources increased. Each increase in household expenditure quintile predicted an additional 0.16 kg of fish purchased per person per month. Yet, even in households in

the highest monthly expenditure quintile, the household head consumed fish as a main dish just 2.9 times per month.

Factors that drive animal-source food preferences and consumption

Both the increase in the frequency of fish consumption across household expenditure quintiles and the results indicating that households that would like to, but do not, increase fish consumption most often because of price or limited budget suggest that price is an important factor shaping fish consumption. However, it is not clear from this study that reduced fish prices would translate directly into increased consumption. Only 16.5% of households reported a preference for fish over red meat or poultry, despite the perception among nearly all respondents that it is least expensive of the three proteins, a perception confirmed by their actual purchase data.

Preference for the more expensive poultry and red meat may be driven more by taste, the primary reason households gave for preferring poultry, or by beliefs about healthfulness. Half of households reported preferring red meat to fish because it was a better source of protein. Furthermore, surveyed households reported concerns with the quality of fish. Though nearly all respondents believed fish to be highly nutritious, a third of respondents were concerned that fish may be contaminated with chemicals, while 30.0% reported believing that one can get sick from eating fish raised by aquaculture. The potential importance of knowledge about the healthfulness of fish was also suggested by the significant increase in the frequency of fish consumption by the household head as his or her level of education completed increased.

Price may play a larger role in decisions between fish types. When households select one type of fish over another, half of the sample named price as the first factor affecting their decision, followed by quality and freshness (32.3%) and taste (9.6%).

The results suggest that retailer availability is not a primary constraint affecting fish purchasing and consumption. Availability was mentioned infrequently as a factor that limits increased fish consumption or influences the decision to purchase red meat or poultry rather than fish or a particular type of fish over another.

Intra-household decision-making and distribution of fish

Survey results do not indicate discrimination against women with regard to decision-making over the role of fish in the household diet or actual fish consumption. In half of households, women decided both when to purchase fish and which type of fish to purchase. In a quarter of households, the decision was shared between husband and wife, sometimes with input from children. In terms of actual distribution, more than 95% of households reported distributing fish equitably among members, either by giving equal portions or by allowing each person to have the amount he or she would like. When the available fish was not sufficient for all, most households reduced the portions served to all members. However, in 11.5% of households, female members received less than others if the amount was not sufficient for all.

Recommendations

Based on these results, several strategies seem promising for boosting demand for and consumption of fish among the resource-poor in both urban and rural Egypt.

Support policies that raise household incomes

Support policies that raise household incomes. Consistent with national survey data indicating that nonpoor households consume more calories from animal proteins than resource-poor households, this study found that even within a group of resource-poor households, those with more resources consumed fish more frequently (WFP 2013). A majority of households indicated that they would like to increase their fish consumption. While additional resources may translate into increased purchases of red meat and poultry as well as fish, increased incomes should positively affect the demand for fish. Thus, programs and policies that support sustainable job creation and increased household income should indirectly boost fish demand.

Reduce the price of fish. Similar to the effect of increased incomes, a drop in the price of fish might serve to boost intake of fish or of all three animal proteins studied if households use the income freed by cheaper fish to purchase additional red meat or poultry, according to their preference. The fact that 87% of survey respondents said that they would buy more fish if it were cheaper suggests that price reductions would raise demand. Reducing prices by improving the efficiency of production or marketing could benefit consumers without negatively impacting producer livelihoods or the sustainability of aquaculture overall. This strategy may be particularly relevant for producers of mullet and grade 1 tilapia, as a high percentage of households listed price as a reason for never consuming those types of fish.

Improve the quality and freshness of marketed fish. Nearly all survey respondents believed that fish safety, an aspect of quality, can be judged by sight and taste. Additional research to determine what characteristics consumers use to judge fish safety and quality by sight would help fish producers and retailers improve the desirability of their products and allay concerns about fish safety. Improving provision of transport and cold storage services to fish retailers, identified in previous WorldFish research as an important strategy for improving the livelihoods of small-scale fish retailers, could also serve to improve the quality and freshness of fish as it reaches consumers in the marketplace (Kantor and Kruijssen 2014). Finally, this study suggests that producers seeking to reach resource-poor consumers should not standardize the size of fish in an effort to improve quality. Consumers reported satisfaction with the ability to serve fish of different sizes based on taste preferences and the household budget.

Educate consumers about aquaculture and nutrients in fish. Despite a widespread belief in the nutritional benefits of consuming fish, survey and in-depth interview respondents communicated concern about the safety of consuming fish. Some believed that fish contained chemicals, others that consumers could fall ill from eating fish raised by aquaculture. If the belief of one interview respondent that farmed fish are fed dead animals is representative, there may be

widespread misconceptions about aquaculture that reduce demand for farmed fish. Consumer education campaigns could help to allay these concerns and convince consumers that the health benefits of fish consumption are comparable to other animal foods. Women should be a primary target of these messages given their important role in shaping fish consumption decisions in the household.

Pursue opportunities for further research. The results of the present study raised several questions for future research. First, future research should examine the relationship between a respondent's knowledge and attitudes about the healthfulness of fish and the actual purchase and consumption behaviors of the respondent. Nearly one-third of respondents believed that individuals can get sick from eating fish, and in particular, fish raised by aquaculture. Yet, these same respondents may be purchasing and consuming fish regularly, while taking precautions to reduce their risk of illness. The extent to which safety concerns influence consumption decisions warrants further inquiry.

Second, the link between proximity of the household to an aquaculture operation and consumption by household members of farmed fish, specifically, should be further explored. The results of this study suggest that proximity to fish farms may be associated with increased farmed fish consumption. Future work should not only seek to confirm this association, but to probe possible reasons for it, such as increased availability of farmed fish, awareness of the origin of the fish, or a more widespread belief in the quality of farmed fish in villages close to the farms.

Finally, the quantitative and qualitative results regarding intra-household distribution of fish consumption were not highly consistent. Future surveys should seek to more clearly explore and distinguish between household members' opinions about food distribution and actual distribution practices within the household. These questions should be asked of both male and female household members where possible.

Women sell fish from a newly constructed marketplace in Fayoum, Egypt.

Photo Credit: Heba el Begawi/WorldFish

NOTES

1   The Wald test is a parametric statistical test used by Stata/IC 10.0 to perform hypothesis tests on parameters estimated from clustered samples. In samples with fewer than approximately 100 clusters, the Wald test more accurately estimates statistical significance if its chi-square statistic is converted to an F-statistic and adjusted for the small number of clusters. Results were considered significant if $p < 0.05$.

2   EGP 1 was worth USD 0.14 on November 8, 2014.

REFERENCES

Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, Ezzati M, Grantham-McGregor S, Katz J, Martorell R and Uauy R. 2013. Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet* 382(9890):427–51.

Egyptian Food Observatory. 2013. Food monitoring and evaluation system report. *Quarterly Bulletin* 146 (October–December 2013):1–16. Information and Decision Support Center and World Food Programme.

Kantor P and Kruijssen F. 2014. Informal fish retailing in rural Egypt: Opportunities to enhance income and work conditions for women and men. Penang, Malaysia: WorldFish. Project Report: 2014-51.

Macfadyen G, Nasr-Allah A and Dickson M. 2012. The market for Egyptian farmed fish. Improving Employment and Income through Development of Egypt's Aquaculture Sector (IEIDEAS) Project. Egypt: WorldFish Center.

StataCorp. 2007. *Stata Statistical Software: Release 10*. College Station, TX: StataCorp LP.

UNICEF [United Nations Children's Fund]. 2014. *Children in Egypt: A Statistical Digest*. Cairo: UNICEF Egypt.

Victora CG, Adair L, Fall C, Hallal PC, Martorell R, Richter L and Sachdev HS. 2008. Maternal and child undernutrition: Consequences for adult health and human capital. *The Lancet* 371(9609):340–57.

WFP [World Food Programme]. 2013. *The Status of Poverty and Food Security in Egypt: Analysis and Policy Recommendations*. Preliminary Summary Report. World Food Programme. Retrieved from http://documents.wfp.org/stellent/groups/public/documents/ena/wfp257467.pdf

WorldFish. 2014. Investment in Egypt's aquaculture sector to increase food security and provide employment. Retrieved from http://www.worldfishcenter.org/our-research/ongoing-projects/investment-in-egypts-aquaculture#.VF5LoGB0zIU

This publication should be cited as:
El Mahdi A, Krstic J, Abdallah A and Abdullah H. 2015. The role of farmed fish in the diets of the resource-poor in Egypt. Penang, Malaysia: WorldFish. Program Report: 2015-05.

About the CGIAR Research Program on Livestock and Fish
In developing countries, resource-poor people, especially women and children, consume very little meat, milk and fish. This contributes to nutrient deficiencies and poor physical and cognitive development for children, and poor health and livelihood outcomes for adults. Additionally, the productivity of small- and medium-scale livestock and fish producers and marketing systems in developing countries lags far behind those in other parts of the world.

The CGIAR Research Program on Livestock and Fish seeks to increase the productivity of small-scale livestock and fish systems in sustainable ways, making meat, milk and fish more available and affordable to resource-poor consumers across the developing world.

**100%
RECYCLED**
Paper made from
recycled material

Photo credit: Front cover, Mona El Azzazy/WorldFish
Photo credit: Back cover, Jens Peter Tang Dalsgaard/WorldFish

Harnessing research that makes a difference

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

**Swiss Agency for Development
and Cooperation SDC**

care

CGIAR

**RESEARCH
PROGRAM ON**
Livestock and Fish

WorldFish