

Full Length Research Paper

Determinants of fish consumption in the state of Qatar: Post blockade

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This study used a count data model to analyse the factors that affect fish consumption in Qatar after the blockade; aiming for effective evaluation, formulation and implementation, of policies for the fishery sector. To achieve this, the community of Qatar is divided into three groups based on their fish consumption rate: high, moderate, and low consumer. The determinants of fish consumption were confirmed using the Poisson model, namely demographic and attitude variables. The findings showed that consumption rates were high (90%); both Qataris and White-collars belonged to the moderate consumers group (52 and 41%, respectively), while Blue-collars occupied the larger portion of the highest consumer category (36%). Fish consumption determinants in Qatar with positive effect included employment, health awareness, and number of children; in contrast, negative determinants included higher level of education, high price, and accessibility to purchase fish. The study is the first to focus on socio-economics and attitudinal variables to understand the factors that determine fish consumption that in turn, encourages policy formulation. The study supports the government policy to open foreign investment opportunities to meet consumption demands and preserve marine resources. Furthermore, managers may use information on fish species to manage fish stock, especially identifying fish species that are highly consumed. They will therefore formulate the necessary policies for sustainable marine fishery.

Key words: Marine, consumption, Qatar, blockade, tilapia, sustainability.

INTRODUCTION

Fish is a protein-rich food for both humans and animals and a source of fish oil and omega 3, which help treat some diseases such as high blood pressure, asthma, arthritis, psoriasis, and some cancers (Larsson and Orsini, 2011; Van Gelder et al., 2007; Maciel et al., 2019). Globally, the demand for fish consumption continues to increase due to an increased population, thus putting

pressure on the carrying capacity of the seas to sustain provision of fish. According to the Food and Agriculture Organization (2018), third of the world's fish face extinction and fish consumption from marine and aquaculture sources increased exponentially to 20.3 kg/year between 2011 and 2016.

The Persian Gulf region is not different from the rest of

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the world: according to Second National Development Strategy 2018-2022, Qatar marine resources are facing demand pressures, owing to overharvesting. As a result, some agricultural systems such as aquaculture have been developed to meet the high demand (Planning and Statistics Authority (2019b). Aquaculture is a food production method invented to support the marine resources that are under high-pressure of human consumption. Aquaculture witnessed a rapidly growing and significant source of sustainable food (Little, 2016). Many countries depend on aquaculture to meet the high demand of fish; however, aquaculture is also facing some challenges, including the risk of disruption of the natural habitat of the fish caused by the technology, since most aquaculture enterprises are established at the coast. However, when aquaculture cages established offshore in the sea it can be more beneficial (Klinger and Naylor, 2012).

The main drivers of the decision to consume fish are studied empirically worldwide that include some demographic and attitude factors. Some of demographic factors are gender, age, number of children, income level, educational level, employment status, regions and national policies (Verbeke and Vackier, 2005; Can et al., 2015; Pieniak et al., 2008; Zhou, 2015). Attitude factors include health awareness, fish taste, preference for specific fish species, fresh versus frozen, fish price and some certain national policies that related to training, advertising and different marketing strategies are all found to be important in studying fish consumption (Brunso et al., 2009; Zhou et al., 2015; Brunso et al., 2009; Thong and Olsen, 2012; Leek et al., 2000).

Studies on fish consumption are essential in the context of Qatar owing to the impact that fish has on human wellbeing from social, economic and environmental perspective. The country endeavours to achieve food security and self-sufficiency, especially after the blockade by launching food security strategies aimed at 90% self-sufficiency in fish production. From economical perspective, studies on fish consumption will help in the estimation of the local demand, thereby identifying the gap between production and import. In addition, it will help managers to gain insight into some socio-economic characteristics and attitudes of the sector, which will ultimately assist in improving both consumers' satisfaction and markets. From environmental point of view, managers will be able to manage fish stock by using the insights acquired from these studies on fish consumption. In particular, they will be able to identify fish species that are under pressure of high demand. As a result, they could formulate the necessary policies pertaining to sustainability of fish.

In Qatar, however, there are few and outdated publications in fish consumptions attitudes. Therefore, this study may serve as an updated publication to help the government formulate policies pertaining to the

production, consumption, import, and export of fish. Moreover, better understanding of consumers' preference and attitude towards consuming fish is very important for formulation, implementation, and evaluation of policies related to fishery sectors. In this study, we therefore aim to highlight some socio-economic characteristics of fish consumption in the state of Qatar and to measure the fish consumption rate.

Background of Qatar marine and aquatic resources

Qatar is characterized by the highest economic growth in the world. The fishery sector in Qatar is generally artisanal in nature, but grown remarkably in the last decade. According to food security strategy 2018-2023, in 2020, self-sufficiency in fish products in Qatar is estimated at 74% and the average annual consumption is about 22.3 kg per capita, roughly the same as the world average. The sector employs a significant number of employees from Asian countries (Fishery Annual Statistics State of Qatar Book, 2017).

Fishing equipment is of two types: outboard-powered fiberglass vessels and traditional 'dhows'. The most frequently used equipment include traps (*Gargoor*), followed by gillnets, hand and troll lines, in addition to seasonal trolling and hand lining. Qatar owns ships on which the labour force comprises expatriates from different Asian countries, such as India, Bangladesh, and Iran (Fishery Annual Statistics State of Qatar Book, 2017).

Economic fish species by local names include *Ghirsh*, *Shaari*, *Kanaad*, *Hamour*, *Safi Arabi*, and *Kofer*. Local and scientific names are listed in Table 1 in the Appendice.

Qatar communities buy fish from both supermarkets and traditional fish markets. The main fish market, 'Um Salal' has been recently opened as a main fish market for better services.

Fish management in Qatar is based on, vessel and gear fishing licenses, but there is no limit on the quantity of catches per day.

High consumption of fish puts some species under pressure of over-fishing; the government has put a limit on wild fish production at 14 000 tons per year to alleviate the pressure. In contrast, the national annual demand sits at approximately 21 000 tons; therefore, the government plans to increase aquaculture production from the current 1 000 tons seen in summer 2019 to 6 000 tons (Lund, 2019).

Marine aquaculture has just been implemented recently in Qatar. The country endeavours to achieve self-sufficiency through fish supply within five years (2018-2023); hence, a number of floating cage fish farming and Shrimp farming projects have been established. The production will include various fish species such as *shrimp*, *tilapia*, and *hamour*. As highlighted in its national

development strategy, Qatari government aims to increase the self-sufficiency ratio of fish stocks to 65% through advanced fish farms by 2023. According to the Ministry of Municipality and Environment's food security strategy 2018-2023, the government is planning to license six offshore cage aquaculture projects covering 270 ha of marine water area. *Tilapia* is the main fish species produced from these farms because of its high adaptability to harsh environments. In addition, it is a new freshwater species to the community; hence, studies on *tilapia* demands are essential to provide a suitable supply (Ministry of Environment and Municipality, 2020).

Over the last two years, the government has embarked on a mission to diversify its economy, increase self-sufficiency in the food sector, and establish free zones and other regulatory schemes to attract foreign investment. These endeavours create a new marketing strategy to attract investors and commercialize the sector to yield better rewards for the economy (Ministry of Municipality and Environment, 2020; Planning and Statistics Authority, 2019a).

MATERIALS AND METHODS

Fieldwork and data description

Many empirical studies collected data by using different methods, such as face-to-face surveys in the case of Vietnam and six qualitative focus group discussions in Spain and Belgium. Data were also collected through a quantitative cross-sectional consumer survey carried out in five European countries: Belgium, Denmark, the Netherlands, Poland, and Spain (Thong and Olsen, 2012; Brunsø, 2009; Pieniak et al., 2008). Moreover, different econometric models have been used to suit the different ways in which fish consumption rate is measured.

In this study, we used the data that the Social and Economic Survey Research Institute (SESRI) at Qatar University conducted in its fourteenth Qatar Semi-Annual Survey (QSAS) in May 2019. SESRI collected data for the QSAS via computer assisted telephone interviewing (CATI) method and uses scientifically grounded sampling and interviewing methodology to provide valuable information to decision-makers, politicians, scholars, and students about the general opinion of the three main groups of residents in Qatar (Qataris, white-collar and blue-collar workers). Qatar has a very diverse population that is classified into three population sub-groups, Qataris, white-collar expats and blue-collar workers. The first sub-group of the population are Qataris, who are the citizens of the state of Qatar. The other two sub-groups of the population, white-collar expats and blue-collar workers, are those who are working temporarily in Qatar and they are grouped according to their skill and income levels. The former are skilled professionals, while the latter are characterized by being male low-skilled workers. During the survey administration, the sub-groups of the population are determined by a series of income and nationality questions that sets the specific sub-group. The survey consisted of 2 335 completed telephone interviews conducted across the three segments of the Qatari population (Qataris (677), white-collar (821) and blue-collar workers (837)). Interviews were conducted by trained and experienced interviewers from both the SESRI call centre and a research facility located at Qatar University.

Some demographic variables included resident type, income,

gender, marital status, employment, number of children and education. These demographic variables are of importance to our study as they describe the respondent type and they affect their attitudes towards specific issues. Other attitude variables include consumption frequency, preferred fish (local versus import), price of fish, health awareness, and cooking time to prepare fish. Attitude variables also include the factors affecting the purchase of fish and the reason for buying from a specific market. An assessment of willingness to consume the fish species *tilapia* if it were to be produced locally is also included in the survey.

Specification of empirical model

The dependent variable in this study is a positive discrete number ranging from 1 to 40, measuring the number of times people consume fish during a month. The study intends to achieve three objectives. The first is to study the fish consumption rate in general and divide consumers according to their consumption rate. The second is to identify the determinants of fish consumption in Qatar. Finally, to measure the extent to which Qataris accept and consume the emerging fish species *tilapia* which was introduced recently to Qatar.

To achieve our objectives mentioned earlier, we had to define an arbitrary cut-off point to separate the consumption rate into low consumption (LC: 1 to 3 times a month), medium consumption (MC: 4 to 8 times a month), and high consumption (HC: more than 9 times a month). Consumers were asked about the number of times they consumed fish during a month. They were classified accordingly into LC, MC, and HC.

International institutions, such as Institute of Medicine (IOM), Food and Agriculture Organization of the United Nations (FAO) and World Health Organization (WHO), recommended that fish should be consumed regularly at least twice a week in order to reach benefits and can be a protective factor against heart diseases (Hellberg et al., 2012).

RESULTS AND DISCUSSION

Descriptive analysis

Table 1 shows that fish consumption in Qatar is highly secured and the fish products are affordable, fresh, healthy, and tasty, meeting all indicators of food security. Out of the ten commercial fish species available, Qataris prefer to consume only four of them: *hamour*, *Safi Arabi*, *kanaad*, and *shaari*. Interestingly, these are the same fish species that are preferred by other resident types but at different rate as presented in Table 2 in the Appendice.

All community categories in Qatar show a very high level of health awareness about the health benefits of consuming fish, especially in development of children's brains. They are also fully aware of fish being an important source of omega 3, but when asked about what omega 3 is, only 62% Qataris, 52% expatriates and 27% of labourers knew that omega 3 is essential healthy fats. The study also measures the willingness of the Qatari community to consume *Tilapia* as emerging species by asking them a hypothetical question about the willingness to consume *tilapia* if produced locally. This question

Table 1. Factors affected the purchase of fish in the state of Qatar.

Variable	Percentage
It is healthy	27
Easy to prepare	5
Like the taste	18
Affordable and fits budget	18
Always fresh and good quality	32

Table 2. Willingness to consume *tilapia* by resident type.

Variable	Yes (%)	No (%)
Qataris	50	50
White-collar workers	64	36
Blue-collar workers	69	31

comes in line with the Qatar strategy to produce *tilapia* for the first time as aquaculture products. We found that a significant number of community members (65%) are willing to consume it, while 35% are not.

Cross tabulation by respondent type in Qatar

The rate of fish consumption in Qatar is very high (90%); with Qatari (52%) and white-collars (41%) as MC and 36% of blue-collars are found to be HC.

The cross tabulation showed the difference among fish consumption typology concerning education, employment, and the willingness to consume fresh local fish as presented in Table 3 in the Appendice. Among all respondents, blue-collar workers reported the highest fish consumption compared to Qataris and white-collar workers. Moreover, the frequency of consuming fish increased with education and preference to consume local species for moderate consumers. White-collar workers and Qataris prefer local fish, while blue-collar workers prefer imported fish. This may be because of lower prices and willingness to consume species found in their home countries, such as freshwater fish.

Tilapia demand was further analysed by resident type; Table 2 explains the willingness to consume *tilapia* by different types of residents. We found that Qataris were divided into two equal categories in terms of willingness to consume *tilapia*. Both white-collar and blue-collar workers show willingness to consume *tilapia*.

Empirical results

Empirical studies on fish consumption generally concentrate on demographic and attitude variables of fish

consumption determinants. The demographics factors play a vital role in influencing fish consumption, such as gender, age, number of children, income, educational level, and region (Verbeke and Vackier, 2005; Pieniak et al., 2008; Can et al., 2015; Brunsø et al., 2009; Zhou et al., 2015).

On the other hand, attitude factors include health awareness, knowledge about the health benefits of eating fish and the importance of fish for children's brain development. Moreover, if consumers preferred fresh fish to frozen fish or preserved imported fish. Perceived price of fish, fish preparation and cooking time are also some other attitudinal factors affecting fish consumption (Leek et al., 2000; Can et al., 2015; Thong and Olson, 2012; Brunsø et al., 2009; Zhou et al., 2015).

To investigate the determinants of fish consumption in Qatar, the study applied the Poisson estimation technique. The most common feature of the count data model is that the variables are discrete or non-negative and no monotonic transformation in the data. However, the study used the Poisson model because of the characteristic of the data that support the Poisson distribution through the maximum likelihood (Payne et al., 2015). Moreover, the dispersion between the mean and the variance is small as shown in Table 3.

Notable variation in observation numbers existed, particularly in the demographic variables such as age. The descriptive statistics indicated that Poisson estimation method is ideal for exploring the determinants of fish consumption. The dispersion in the data seems quite plausible, particularly, the unconditional mean and the variation measured by the standard deviation.

The following equation explains the possible determinants of fish consumption:

attributed to the fact that fish consumption is very important for the development of the children brain. That is, it may be explained by, the level of health awareness that has a significant and positive effect on fish consumption.

The strong and negative relationship of the price of fish in Qatar and the amount of fish monthly consumed by the individuals aligned with the economic theory and consumer's rationality. This negative relationship could be attributed to the substitution effect caused by the low price of the other type of meat, for example, chicken. The fish consumption rate though increases with the number of children, shows low insignificant level which, may be influenced by the effect of price on the consumption rate.

The findings of this study agreed with those from other researcher for instance, the awareness of health benefits of fish are also found to be positive and significant (Verbeke and Vackier, 2005; Pieniak et al., 2008; Brunso et al., 2009; Zhou et al., 2015; Can et al., 2015). However, while Can et al. (2015) study showed similar results in age groups, Verbeke and Vackier (2005) in their study showed that increasing age would influence fish consumption positively.

Both Brunso et al. (2009) and Sayin et al. (2010) showed that price decreases the amount of fish consumed. However, a study conducted in Vietnam showed that fish prices are not expensive and there is high availability of fresh fish in Vietnam (Thong and Olson, 2012).

The significant and positive relation of occupation and the amount of fish consumed per month is further analysed by gender in other study. For instance, Zhou et al. (2015) showed that fish consumption for women in work would be less than non-working women because working-women will have less time for cooking, thus their consumption would decrease (Zhou et al., 2015).

Conclusion

Qatar fishery resources, including those in aquaculture systems, are an important sector for development. There is significant pressure of HC on some commercial species, such as *hamour*, *kanaad*, *shaari*, and *Safi Arabi*, by the entire Qatar community; this could affect diversity of fish and lead to their extinction. Fish is a very important renewable resource; it can be used for economic diversification, as opposed to oil, which is non-renewable. Qatar has particularly been paying attention to marine resources after the blockade.

This study applied different econometric techniques to analyse the determinants of fish consumption in Qatar: demographic (education, employment, and number of children in household) and attitude variables such as preference of fresh fish, price of fish, and accessibility to buy fish. High fish consumption rates were observed

(90%) and the consumption rate was divided into three categories: HC, MU, and LC. The frequency of fish consumption is further analysed according to the resident type (Qatari, white-collar, and blue-collar workers). Among all respondents, blue-collar workers had the highest fish consumption (36%) within HC, compared to Qataris and white-collars (52 and 41%, respectively) ranked as MC. Clear differences between categories are found with regard to demographics variables of consuming fish such as occupation, education level, and the preference to consume local as opposed to imported fish species. White-collars and Qataris prefer local fish while blue-collars prefer imported fish. The willingness to consume the aquaculture product *tilapia* is also analysed. Both white and blue-collar workers have enough knowledge about *tilapia* and are willing to consume it. In contrast, 50% of Qataris are not willing to consume *tilapia*.

Among fish consumption demographic determinants, employment, education, age, and number of children are found to be the most important determinants compared to marital status and gender. These results are consistent with widely observed findings in the literature. The findings further indicate the reduction in food consumption in the elders' group.

The study also confirms the importance of attitude determinants such as health awareness, accessibility to buy fish, and price being highly statistically significant. The community of Qatar is aware of the fact that fish consumption is good for health. However, their consumption decreases with the increase in price, which makes them shift to alternative protein.

Rational and scientific exploitation of the fisheries in Qatar by adapting a management regime that can assure both increase in production and management of stock in a sustainable way is very important; this will also ease the change from the artisanal nature of fishing to a more commercialized sector, which will help diversify the economy. Finally, a health awareness campaign is necessary to increase the fish consumption rate of other species generally facing low demand. This is especially important to safeguard fish biodiversity. A strategy that concentrates on increasing the consumption of low demanded species, such as creating more marketing channels or process them into other fish products, is vital.

Future research may focus on fish supply chain evaluation and possible development. Moreover, research on fish waste treatment and sustainable food production systems are highly required in the state of Qatar. This can explain the possibility of using fish compost to fish/chicken feeds and invest on sustainable food production systems.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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