

## **Consumer Preference of Consuming Farm Raised Fish in Rajshahi City Corporation**

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### **Abstract**

*Fish is an important source of animal protein which is consumed by people almost all over the world. Dietary fish consumption patterns are influenced by complex interactions of several factors such as geographic and demographic profile, availability, income, tradition and customs, etc. In this study, a total of 100 survey responses (100 in-person) residing in the district of Rajshahi city were randomly selected. This study utilized a logistic regression model or logit model to measure consumers' preference for farm-raised fish. The study found that 42 percent families consume 1 to 5 kg wild fish in a month, while 45 percent families consume 1 to 5 kg farm fish in a month. It is also found that 72 percent of the total respondents have interest for farm raised fish because of the low price, where 28 percent choose wild fish. The estimation of the results of logistic regression model found that out of eleven independent variables four variables are statistically significant at different levels, which are education of household head, market price of fish, quality of fish and no alternative of farm fish to fulfil the demand of protein. Age and gender of the household head, household income, household size, nutrition of fish, taste of fish, food security are not statistically significant.*

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*Among these variables only age and gender of the households have positive impact on consumer preference and the other variables have negative impact. On the other hand, education, market price of fish, quality of fish and no alternative of farm raised fish have a significant but negative impact on consumer preference. The result shows that the value of Pseudo R<sup>2</sup> is 0.415, which means that 41.5% variation of farm fish preference is explained by the considered explanatory variables. Finally, this study suggests that, fisheries department and fish farmers should be more careful and follow the rules of applying fish feed to produce healthy and nutritious fish at farm level.*

*JEL Classification* Q22 · C2 · D12

*Keywords* Farm Fish Vs Wild Fish · Consumer Preferences · Logistic Regression Model · Rajshahi City

## 1. Introduction

Fish is an important source of animal protein which is consumed by people almost all over the world. Dietary fish consumption patterns are influenced by complex interactions of several factors such as geographic and demographic profile, availability, income, tradition and customs, etc. Fish and fish products play a highly important role in the food and nutritional security of rural, urban and coastal populations throughout the world. In recent years, consumers have started to understand that food choice may have consequences for their health (Franz and Nowak, 2010). There are countries where catching or farming fish is a vital part of rural people's livelihoods and contributes a major source of protein, especially for the low-income and deprived populations. A healthy diet is now a trend which is getting good attention in the world (Kaimakoudi et al., 2013). The importance of fish in both cultural and nutritional terms is clear, yet harder to pin down what are the actual amounts of fish that people throughout the world/region/country are consuming.

Increase in aquaculture production is being attempted though both the expansion of area under culture and the intensification of existing practices. Extensive areas of wastelands appear to be available for aquaculture in most countries of the region, except in Singapore and Hong Kong. According to rough estimates the area under culture has increased about 25 percent in the last three years. The available area for future expansion is estimated to be around 20 million hectares. Detailed site surveys, including studies of alternate uses of such area, are required to determine whether all these can be used and are available for aquaculture purposes.

The study of York and Gossard (1993) reveals that fish consumption is influenced by cultural/geographical features, and economic development which

stimulates Asians to eat considerably more fish. But in non-Asian regions, economic development stimulates consumption of meat. The pattern of consumption of fish is different in terms of quantity, quality, and the different levels of natural availability of aquatic resources in adjacent waters as well as diverse food traditions, tastes, income levels, prices and seasons (FAO 2012).

According to the report of FAO 2012, annual per capita fish consumption varies from country to country which ranges from 10.0 kg to 100 kg. The annual per capita consumption of fish was highest in Oceania (24.6 kg), followed by North America (24.1 kg), Europe (22.0 kg), Asia (20.7 kg), Latin America and Caribbean (9.9 kg), and Africa (9.1 kg) in the year 2009. The report reveals that global per capita fish consumption increased from 9.9 kg in the 1960s to 18.4 kg in 2009. The most substantial increases in annual per capita fish consumption have occurred in East Asia (from 10.6 kg in 1961 to 34.5 kg in 2009), Southeast Asia (from 12.8 kg in 1961 to 32.0 kg in 2009), and North Africa (from 2.8 kg in 1961 to 10.6 kg in 2009). China has been responsible for the increase in world per capita fish consumption due to the substantial increase in its fish production from aquaculture. China's share in world fish production grew from 7.0% in 1961 to 34% in 2009. Per capita fish consumption in China has also increased dramatically, reached about 31.9 kg in 2009, with an average annual growth rate of 4.3% in the period 1961-2009 and of 6.0 % in the period 1990-2009.

Mirza and Ismot (2017) conducted a study to obtain a clarified concept about financial, educational and physiological circumstances in relation to fish consumption status as a diet of rural people of Islamnagar village next to Jahangirnagar University campus at Saver Upazila under the Dhaka district in Bangladesh from August, 2016 to February, 2017. The results of this study enlighten that the people were engaged in various professions as local businessman (72%), government employee (8%), farmer (4%) and others (16%). Their monthly income varied from BDT 5,000 to BDT 55,000. In spite of their engagement in varied professions, they had awareness about fish intake. The people consumed small fish (50%), large fish (44%), and dried fish (6%) of both indigenous and exotic species. This study indicates that the people of higher income consumed both small and large fish frequently in each month, whereas, those of lower income consumed the dried and small fishes occasionally.

Significant advances have been made in some of the developing countries in more intensive way. For example, techniques have been developed to increase production in pond culture of milkfish from an average of 600 kg/ha to 2000 kg/ha. Similarly, polyculture methods have been devised to increase production of carp ponds from an average 900 kg/ha to 8000 kg/ha. But the application of these techniques in the field has not kept pace or contributed substantially to increased

production. Well organized extension services and provision of inputs and credit were considered the major constraints. The availability of trained technicians varies considerably between countries, but in almost all there is an urgent need for field personnel with adequate practical experience and ability to establish and manage aquaculture enterprises. Fish farmers in some of the countries of the region have shown their receptiveness to new technologies and have even brought about innovations of their own to suit local conditions. On the other hand, in some countries the farmers have been reluctant and slow to change the traditional methods and adopt improved techniques, particularly when additional inputs are required. This attitude is not always because the economic viability of the operations has not been demonstrated. In countries like Thailand, it has been shown that the average income of fish farmer is about six times more than that of an agriculture farmer and substantially higher than that of a coastal small-scale fisherman. This fact has to be given better publicity, particularly because most countries of the region wish to develop aquaculture as a means of generating employment for the unemployed and underemployed people in the rural sector or as a means of employment for people who have to be relocated or rehabilitated, e.g., coastal fisherman losing employment due to changes in the fishing industry or people displaced due to river basin or industrial development projects.

The most significant to expansion or intensification of aquaculture in the region is the production and distribution of fish fingerlings. Most countries experience difficulties in even maintaining the present level of fish fingerlings production, and still depend to a large extent on collection of wild fish fingerlings even where methods of artificial propagation have been developed. Suitable organization of fish breeding, larval rearing, transport and distribution need high-priority attention in most countries of the region. Technical assistance and cooperation between countries in the exchange of expertise, pituitary material for breeding fish, brood fish and even fry, were measures considered by the workshop to be-important in solving this problem.

Farm-fish and wild caught fish make a good contribution to human well-being, food security and removing poverty in Rajshahi city, Bangladesh. The more detailed our understanding of consumption patterns, the more effective our management actions will be, potentially to the benefit of millions. In Bangladesh, mostly tilapia and catfish production comes from aquaculture. Farmed tilapia production reached 4.8 million tonnes in 2013. Production of farmed catfish-like species 9 in the same year reached almost 4.2 million tonnes, including 2.0 million tonnes of pangassius family catfishes (FAO, 2015a). Farmed catfish from *Ictalurus* family production reached 419 000 tonnes, all of it belonging to channel catfish (*Ictalurus punctatus*) (FAO, 2015a). To protect the United States domestic

catfish industry, the United States Congress passed a law in December 2001 restricting use of the label 'catfish' in the United States market to only the species from the *Ictalurus* family farmed in the United States of America (Narog, 2003). A significant part of catfish and tilapia wild capture catches come from culture-based fisheries. In 2013, wild tilapia production reached 715 000 tonnes, while catfish from *Ictalurus* family production reached 13 000 tonnes – 667 000 tonnes when we apply a less-strict definition of catfish (so that other species are included, such as those from the pangassius family (FAO, 2015a). International tilapia trade has expanded significantly, from less than 1 000 tonnes in 1995 to almost 800 000 tonnes (live weight equivalents) in 2011, valued at about US\$1.4 billion (FAO, 2015a). China is the main exporter, with more than 80 percent of world exports in 2011, while the United States of America is the main importer with almost 80 percent of global imports (FAO, 2015a).

Some developing countries mostly consider a future increase in food demand and consumption in view of the population increase. Seafood industry will evolve as a consequence of specific consumer demands, both in developing and developed countries. Many retailers, particularly in Western Europe, have conceived private labels for fish, aiming to a better food products qualification than in the past. During the 1990s, retail sale of processed food products grew rapidly in Eastern Europe. At the same time, consumers have become increasingly conscious of their needs and they frequently ask for healthy and cheap products. In Latin America, similarly to Eastern Europe, wealthy people prefer timesaving products and food having high healthy attributes, high quality and variety. Latin America, some developing countries and Asia are undergoing changes, similarly to Eastern Europe (Regmi and Gehlhar, 2005). British consumers are concerned for bovine spongiform encephalopathy and for hormones and antibiotics use in farms and biotechnological applications are not always accepted in food production (Spencer, 2001). On the contrary, in the USA, these aspects are a concern only for a few people; furthermore food quality, price and the ability to supply a needed food volume have a low significance (Skytte and Blunch, 2001). Consumers' idea about food quality is complex, indeterminate and uncertain and it is sometimes not congruent.

Fish farming has expanded in Paba, Mohanpur, Durgapur and Tanore Upazilas of Rajshahi district and Manda, Badalgacchi and Mohadevpur Upazilas of Naogaon and Bonpara, Lalpur and Boraigram Upazilas of Natore district over the last few years. Several hundreds of large ponds have been excavated where fishes are being cultivated commercially. During the last ten years, several thousand tons of carp and other varieties of fish were produced in the three districts of the Rajshahi division. According to the sources of the Department of

Fisheries, live fishes which are produced in Rajshahi areas are being supplied to different areas across the country including the capital city daily. Around 250 truck-loaded live fishes are being supplied from Rajshahi region to other part of the country. Every truck carries 500 to 600 kegs of live fish. Carp varieties like rui, katla, mirage, silver carp and grass carp are the most popular. Rezaul Islam, deputy director of DoF, Rajshahi, said Rajshahi was pioneer in achieving self-sufficiency in fish production. Many people in Rajshahi have improved their financial condition by fish farming on a large scale.

Most of the consumers in Rajshahi city preferred wild fish compare with farm fish. The consumers believe that farm fish are not nutritious and also not good for their health. Although the consumers buy farm raised fish for their daily consumption due to its cheaper price and availability. The educated and rich people prefers to eat wild fish rather than farm fish. The main objectives of this study is to identify the factors influencing of consumers' preference for farm-raised fish in Rajshahi city. To achieve the main objective, this research sets some specific objectives. The specific objectives of the study are as follows:

1. To describe the socio-economic characteristics of the study households
2. To identify the factors influencing the consumers' preferences for farm-raised fish in Rajshahi city.
3. To forward some policy suggestions.

This study tries to achieve the above objectives and answer the related research questions by conducting a primary survey on the sample households living in Rajshahi city. To pursue this study data has been collected from different markets of Rajshahi city. An analysis of data is performed by using simple descriptive statistics and logistic regression model.

## **2. Methodology**

### **2.1 Selection of the study area, number of sample and data collection procedure**

In this study, the Rajshahi district is chosen which is situated in northern part of Bangladesh. The data collected for this particular research can play a vital role in the development of fisheries and natural resource policies that may have considerable impact on the most low-income/poor segments of the population of this area. This study, examines survey data related to farm-fish and wild caught fish consumption in Rajshahi city, Bangladesh. This information is collected directly from the specific group of people who consumes fish. It is hoped that this

study can help shine the light on consumption patterns of wild caught-fish and farm-fish products in Rajshahi city at household level. The data collection procedure occurred from September 2019 to November 2019. A total of 100 survey responses (100 in-persons) were randomly collected. Eighty-two observations included in-person surveys collected from fish markets and rest of the information collected from around the city in-person.

## **2.2 Data analysis**

In this study, after receiving the survey responses, the raw data were checked to identify any inconsistencies and potential errors. The quantitative data collection phase was completed after retrieving the raw data. This study utilized a logistic regression model or logit model to measure consumers' willingness to pay a premium price for farm-raised fish. To do so, at first, the sample data were entered into a Statistical Package for Social Science (SPSS) software, version 15 and then the descriptive analysis and the statistics of responses was produced by using SPSS software.

From previous studies, the demographic factors, including gender, age, and family size, and socioeconomic variables, such as education level and family income, were taken as the factors that influence of consumer's preference. These variables are directly mentioned in some of the literatures (Haghiri, 2014, Rigueira et al., 2014). Here, it is hypothesized that, with larger family size, a household will be less willing to pay a 6 to 10 per cent price premium for farm-raised fish because it will be expensive for them. On the other hand, with a higher education level, a person will be more likely to pay 6 to 10 per cent more as a price premium, as it is expected that they are more concerned about the traceable fish.

Besides socio-economic and demographic factors, this study also focused on a number of behavioural factors and knowledge variables and hypothesized that they are relevant to identifying consumer's preference for farm raised fish. For example, it can be predicted that a consumer who searches for food-safety information frequently, will be more concerned about origin of the fish and will show a negative reaction for farm-raised fish.

## **2.3 Empirical specification**

The logit model is estimated to find the effects of the different factors on consumer's fish preference at household level. The model used fish preference status of the households as a dichotomous dependent variable. The empirical relationship between dependent variable and explanatory variables is specified using the following relationship.

$$Li = \ln[\pi/(1-\pi)] = \beta_1 + \beta_2 GHH + \beta_3 HMI + \beta_4 EHH + \beta_5 AHH + \beta_6 HS + \beta_7 NF + \beta_8 TF + \beta_9 FS + \beta_{10} QF + \beta_{11} MPF + \beta_{12} NA + \mu_i \quad (1)$$

Where,  $Li$  is the log

$GHH$  = Gender of the household head

$HMI$  = Household monthly income

$EHH$  = Education level of the household head

$AHH$  = Age of the household head

$HS$  = Household Size

$NF$  = Nutrition level of fish

$TF$  = Taste of fish

$FS$  = Food security

$QF$  = Quality of fish

$MPF$  = Market price of fish

$NA$  = No alternative to Fulfil the demand of protein

$B_1$  are regression coefficients and  $B_2, B_3, \dots, B_{12}$  is the random error term. The coefficients of the regression model are estimated by applying the maximum likelihood estimation (MLE) technique.

#### 2.4 Measurement of dependent and explanatory Variable

In this section the units of the variable their measurement procedure is discussed. The dependent variable was dichotomized with a value.

Based on these studies, expected signs were hypothesized for the selected variables. This lists definitions of variables and measurement methods the expiration of the dependent variable and the explanatory variables included in the model are described below:

**Gender of the household head:** The gender of the household head is denoted as  $GHH$ . It is a dummy variable. The variables take the value 1 if the household is male headed and 0 if the household is female headed or others.

**Income:** Total monthly consumer income refers to the total earnings of the consumer in a month. The basis for the selection of variable to examine empirical factors of earlier studies (Okwudilio et al., 2006; Babaunde et al., 2007; Omonona et al.; Babatuned et al., Ahungwa et al., 2013; Yusuf et al.; Adeniyi and Ojo 2013; Iorlamen et al., 2013; Kuwornu et al., 2013), The expected effect of this variable on farm fish preferences is negative. This variable is denoted this study. If the income of the consumer is higher than the consumer is willing to buy wild fish at a higher price rather than farm fish. On the other hand, if the income of the consumer is lower, the consumer will buy farm fish at a cheap price.

Table 2.1: Description of Variables Using the Logit Model

	Variable	Type	Measurement
Dependent Variable	Consumer preference	Dummy	1 if farm fish and 0 otherwise
	Gender of the household head	Dummy	1 if male headed, 0 otherwise
Explanatory variables	Income	Continuous	Amount of money earned by the consumer
	Education	Continuous	Formal education level of the consumer
	Age	Continuous	Age of the consumer
	Household size	Continuous	Total number of members in the family
	Taste of fish	Dummy	1 if household preferred farm fish, 0 otherwise
	Food security	Continuous	Food security level of the consumers
	Size and Quality	Continuous	Size and quality of fish
	Nutrition of fish	Dummy	1 if fulfil the demand of protein, 0 otherwise
	Market Price of fish	Continuous	Market price of fish.
	No alternative of farm raised fish	Dummy	1 if there is alternative of farm fish, 0 otherwise

Source: Author's design, 2019

**Education:** Education is a human capital which helps human to get better job and an educated one earns more income compared to an uneducated one. With more income a household can afford more food for family (Babatunde et al., 2007). Moreover, an educated household head can arrange balanced and nutritional diet for his/her family. Moreover, education influences access to knowledge, increases opportunities of income, development of nutritional status and access to benefits and resources. According to Shaikh (2007), the educated individuals have capacity to process and apply the information passed on to them. An increase in public education not only increases their returns but also improves their productivity as well as contributes positively to the national growth (Kuwornuet al., 2013). Some earlier studies (Babatunde et al., 2007; Shaikh, 2007; Okwudilioet al., 2006; Omononaet al., 2007; Adeniyi and Ojo, 2013; Yusuf et al., 2011; Ahungwaet al., 2013; Iorlamenet al., 2013; Babatunde et al., 2010) have found that education is important in choosing the right fish of household. Thus, education of household head could have negative effects on choice of fish of household. In the present study educational status of household head is expressed by EHH.

**Age:** The age of the consumer is expected to have negative impact on consumer preferences. The consumer's having high age may like wild fish rather than farm fish. Thus the expected effect of age on consumer preferences could be positive too. This variable is denoted as AHH in this study.

**Household Size:** Generally, household size means total members of the household. However, a household may comprise of children, middle aged and adult members and the consumption of all of them are not same. Some earlier studies (Babatunde et al., 2007; Omonona et al., 2007; Adeniyi and Ojo, 2013; Iorlamente et al., 2013; Yusuf et al., 2011; Babatunde et al., 2010) have found that household size is important in choosing the fish items for the consumer. This variable is denoted by HS.

**Taste of Fish:** If there is no difference between the taste of farm fish and wild fish, then the price does not matter. Sometimes the consumer prefers to buy fish which is tastier and also full of nutrition's. The wild fish is tastier than the farm fish so this variable has a positive effect on consumer preferences. This is denoted as TF in the model.

**Food security:** This variable has a positive effect on consumer fish preferences. If the fish is good for health, then the consumer willing to buy the fish. This variable is denoted as FS in this study.

**Quality of fish:** The size and quality of fish also affects consumer preferences positively. Consumers love to buy big size of fish if the quality is good. This is denoted as QF.

**Nutrition of fish:** If the fish can fulfil the demand of protein of the consumers, that means the fish item is full of nutrition then the consumers have no problem to buy farm fish. So this variable has a positive effect on consumer preferences to buy farm fish. This is denoted as NF.

**Market Price of fish:** This is an important variable for this study. The market price of fish may have a positive impact on consumer's choice of farm fish. If the price of farm fish is higher than wild fish, then the consumer choose to buy wild fish and if the price of farm fish is lower than the wild fish then the consumer choose to buy farm fish. This variable is denoted by MPF.

**No alternative of farm raised fish:** It is a dummy variable denoted as NA in the model. This variable takes the value 1 if there is alternative of farm fish, and 0 for otherwise.

### 3. Result and Discussion

This section presents the finding of the study and the presentations of the results are expressed tabulated form.

### 3.1. Age of the sample households

Table 3.1 shows the age group and descriptive statistics of the sample households. The households in the study area were aged between 20 years to 60+ years old. These ages were arranged into three age groups. The youngest range was 20-40 years being 52 percent of the total households, 41-60 years (33 percent), and the oldest representing 15 percent of the total households were 60+ years. This grouping is important because in this study it is used to determine the preferences of the consumer in choosing the fish or fish item for their family consumption.

### 3.2 Distribution of consumer's family members surveyed

From Table 4.2, it is clear that most of the families lie between 5 to 8 members that is 55 percent of the total sample households. This results indicates that the family size of the consumer's is medium. The table shows that, 30 percent family has 1 to 4 members and only 15 percent family has 9 to 12 members.

*Table 3.1 Age Distribution of the sample households surveyed*

Family member	Frequency	Percentage
20-40	52	52.0
41-60	33	33.0
60+	15	15.0
Total	100	100

Source: Field survey, 2019

### 3.3 Distribution of the level of education of respondents surveyed

In this study, education level of the households is classified into seven categories such as 0 (illiterate) primary, secondary, S.S.C., H.S.C., bachelor and Masters. The findings show that among the sample household, 7 percent lies up to Bachelor level, and followed by 23% and 4% are having SSC and HSC degree respectively. A very small number of the respondents which education level between class 6-9 only 1% of total respondents given their opinion about this topic. Among these

*Table 3.2: Distribution of consumer's family members*

Family member	Frequency	Percentage
1-4	30	30.0
5-8	55	55.0
9-12	13	15.0
Total	100	100.0

Source: Field survey, 2019

only 4 percent respondents were illiterate and the highest number around 46 percent of the respondents have their master degree.

### 3.4 Distribution of income level of the consumers

In figure 4.1, the bar diagram shows the monthly income of the consumers. The income is divided into four main income groups. According to the figure, 30 percent respondents earns less than 25000 tk. in a month. Most of the respondents i.e., 61 percent earns 25000 to 50000 Tk in a month and 8 percent earns 50,000 to 100000 Tk whereas only 1 percent earns 100,000 to 150000 Tk in a month.

*Table 3.3 Distribution of respondents by the level of education*

Education level	Frequency	Percentage
0	4	4.0
1-5	15	15.0
6-9	1	1.0
SSC	23	23.0
HSC	4	4.0
Bachelor	7	7.0
Masters	46	46.0
Total	100	100

Source: Field survey, 2019

### 3.5 Choice for fish

The histogram below indicates that among the 100 respondents 87 percent consumers prefer to eat fish and only a few number i.e., 13 percent don't prefer to eat fish as a meal. So, it is clear from the findings that in Rajshahi city most of the consumers prefers every kind of fish (both farm raised and wild) fish rather than meat.

### 3.6 Consumption of wild fish

Table 4.4 indicates that 42 percent family consumes 1 to 5 kg wild fish in a month while 40 percent consume 5 to 10 kg and only 18 percent consume 10 kg or more wild fish in a month. The reasons behind this low consumption of wild fish is the higher price. The wild fish is expensive compare to the farm raised fish so most of the people cannot able to afford the cost.

### 3.7 Consumption of farm fish

The following table 4.4 indicates the consumption of farm fish in a month. The table shows that, 45 percent consumers eat 1 to 5 kg fish in a month and 29

percent eat 5 to 10 kg in each month. The rest of the consumers i.e., 26 percent eat 10 kg or more farm fish in a month. The reasons behind this is that the farm raised fish is cheaper than the wild fish.

*Table 3.6 Quantity of consumption of wild fish*

Amount of wild fish consumption monthly (kg)	Frequency	Percentage
1-5	42	42.0
5-10	40	40.0
10 +	18	18.0
Total	100	100.0

Source: Field survey, 2019

### 3.8 Consumer interest for farm fish

The table 4.6 shows that 72 percent of the total respondents have interest for farm raised fish because of the low cost for fish where 28 percent choose wild fish. This is because they believed that wild fish tastier than farm fish and full of nutrition's. The following figure i.e., the histogram shows the percentage of interest of the consumer for farm fish.

*Table 3.7 Quantity of consumption of farm fish*

Consumption of farm fish monthly (kg)	Frequency	Percent
1-5	45	45.0
5-10	29	29.0
10+	26	29.0
Total	100	100.0

Source: Field survey, 2019

### 3.9 Is the farm raised fish is a threat for the wild fish?

Table 4.7 explain that 53 percent consumers believe that farm raised fish is a threat for the wild fish. On the other hand, 47 percent consumers believe that there is no problem in the supply of wild fish because of farm fish. But most of the consumers believe that firm raised fish is threat for the wild fish. This is also shown in figure 4.4 with the help of a pie chart.

*Table 3.8 Interest for farm fish*

Consumer interest	Frequency	Percent
Yes	72	72.0
No	28	28.0
Total	100	100.0

Source: Field survey, 2019

### 3.10 Description of Logistic Regression Model Results

The estimation of the results of logistic regression model are presented in Table 4.8. From the table it has been seen that out of eleven variables four variables are statistically significant at different levels which are education of household head, market price of fish, quality of fish and no alternative of farm fish to fulfil the lack of protein. Age and gender of the household head, household income, household

Table 3.9: Is the farm raised fish is a threat for the wild fish?

	Frequency	Percent
Yes	53	53.0
No	47	47.0
Total	100	100.0

Source: Field survey, 2019

size, nutrition of fish, taste of fish, food security are not statistically significant. Table 4.8 has shown that the value of Pseudo R<sup>2</sup> is 0.415, which means that 41.5% variation of farm fish preference is explained by the considered explanatory variables. The obtained log likelihood ratio is -32.109 and LR Chi-square statistic for the goodness of fit of the model is 12.50.

Gender of household head (GHH): The gender of the household head has positive coefficient (0.5087218) but not statistically significant. This indicate that

Table 3.10 Results of Logistic Regression Model Analysis of Consumer Preferences

Variable	Coefficient	Std. Error	z-statistic	Prob.
C	8.796253***	2.546539	3.45	0.001
GHH	0.5087218	1.324923	0.38	0.701
HMI	-2.0325307	.0000211	-0.01	0.992
EHH	-0.3303195**	.1383981	-2.39	0.017
AHH	0.1498449	.2996329	0.50	0.617
HS	-0.0644506	.2238246	-0.29	0.773
NF	-1.246233	1.205447	-1.03	0.301
TF	-1.477909	1.552782	-0.95	0.341
FS	-1.640024	1.377654	-1.19	0.234
QF	-2.278457*	1.143378	-1.99	0.046
MPF	-2.490365*	1.227567	-2.03	0.042
NA	-6.269357***	1.755331	-3.57	0.000

Log likelihood = -32.109094, LR Chi-square (10) =12.50, and Probability Chi-square =0.2532, Pseudo R<sup>2</sup>= 0.4153Source:

Note: \*\*\* Significant at 1% level; \*\* Significant at 5% level; \* Significant at 10% level

Author's own calculation, 2019

a household with male headed are more likely prefer farm raised fish compare to female headed household head. Like other city, most of the households of the Rajshahi city are male dominated and basically male people bear all expenses. To manage family expenditure, the low and middle income people have no option to buy wild fish as it is very expensive and shift their preference to buy farm raised fish.

**Household monthly income (HMI):** From Table 3.10 it is found that the coefficient (-2.0325307) of the variable 'household monthly income' is negative but not statistically significant. This report also supports the expected outcome the researchers mentioned earlier. If the respondent's income increases, then they would prefer wild fish which is caught from open sources rather than farm raised fish.

**Education of the household head (EHH):** Education increases household's knowledge and preference of good and nutritious food. Educated consumers are more conscious about the fish quality, and how and where it is farming. The regression results express that the coefficient of education (-0.3303195) is negative but statistically significant at 5% level. At present, farmers who raised farm fish used fish feed which is produced by different chemicals. Sometimes the produces used tannery waste to produce fish feed which is also harmful for human health. Educated consumers collect information about the quality and nutrition of the fish and if they have any doubt then they take decision to buy more wild fish.

**Age of household head (AHH):** The Table 3.10 has shown that the coefficient of the variable age of the household head (0.1498449) is positive but statistically not significant. This means that the higher the age of the respondents, farm fish is more preferable to them. The per capita income of the people of Rajshahi city is low compare to Dhaka, and Chittagong and there is no employment or old age benefits. Therefore, due to low income and wealth the old age people prefer farm raised fish which is cheaper than wild fish.

**Household size (HS):** The coefficient of the household size is negative and not significant and the value of the coefficient is -0.0644506. The negative result indicates that with large households are more likely to buy more fish and they prefer farm raised fish for low cost. This finding is supported by the expected outcome. Fish is a valuable and safe food item for the source of protein of the family members. Therefore, consumers try to keep some protein items in everyday food menu. It is very expensive to buy wild fish everyday due to high price and because of this reason respondent choose farm raised fish as alternative.

**Nutrition of fish (NF):** Nutritious food is very important for our daily life. To maintain good health people should careful before choose any food item. All kind of fishes are not nutritious. Nutrition of fish also depends on how it is raised.

When fishes are growing in open water bodies and take feed from natural sources then the nutrition level of these fish is high compare to farm raised fish. The coefficient of the variable 'nutrition of fish' is negative and the value is -1.246233 indicates that though the nutrition level is high of farm raised fish but due to food safety consumer would buy less farm raised fish.

**Taste of fish (TF):** The regression result of the coefficient of variable 'taste of fish' (-1.477909) is negative as the taste of farm raised fish is low compare to wild fish but due to low cost and fulfil the demand of protein, the general consumers buy more farm raised fish. Day by day the supply of farm raised fish is increasing but people are not satisfied with the taste of fish.

**Food security (FS):** It is found that the coefficient of the variable food security (-1.640024) is also negative and statistically not significant. This result expressed that food security variable has negative effect on the preference of farm raised fish. If the consumers are more food secured, then they will choose more wild fish rather than farm raised fish. On the hand, the marginal people whose food security level is low, they will consume more farm raised fish as it is cheap and available.

**Quality of fish (QF):** The value of the regression coefficient of variable 'quality of fish' (-2.278457) has negative effect on farm raised fish preference but statistically significant at 10% level. The quality of farm raised fish is low compare to wild fish. After catching the farm raised fish is decaying very quickly. Sometimes, farm raised fish has infection in their body but due to large number of consumers and demand people ignore the equality of farm raised fish and buy and consume them.

**Market price of fish (MPF):** The coefficient of 'market price of fish' is negative but statistically significant at 10% level and the value is -2.490365. The negative result point out that if the market price of farm raised fish is high then consumer will not prefer to buy farm raised fish. With same price consumer will prefer to buy wild fish which is tastier and nutritious.

**No alternative of farm raised fish (NA):** The coefficient of the variable 'no alternative of farm raised fish' (-6.269357) is negative but statistically significant at 1% level. When the number of alternative fish (wild fish) is reducing then people will buy more farm raised fish. In fact, the number of fish species is reducing and less wild fish is caught at present time due to siltation in river, canal and pollution. If there are more variety of wild fishes, then consumers will buy less farm raised fish.

The above variables have positive or negative effect on farm fish preference significantly or insignificantly. Some variables match with our expectation and

some are not. Therefore, the considered variables are important factors that influence consumer's preference of farm fish and wild fish.

## **4. Recommendation and Conclusion**

### **4.1 Policy Recommendations**

As the population is increasing rapidly, so it is very difficult to fulfil the demand of fish of all consumers at a time. Although most of the people prefers wild fish compare to farm fish but to fulfil the demand of future population the contribution of farm raised fish is increasing day by day. By maintaining some rules like giving proper and healthy fish feed to the fish farm and implementing the existing rules related to farm cultivation will be helpful to maintain the quality of farm fish.

General people lost their interest on farm fish as the fish producers use chemical mixed unhealthy fish feed which ultimately transfer to human body and cause of different diseases in human health. Proper monitoring and action is needed to punish the dishonest fish feed producers as well as need clear levelling on the feed bags mentioning the ingredients and their effects on the health of fish and human body.

People afraid of eating farm fish as the dishonest whole sellers or retailers add excess formalin with farm fish which is dangerous for human health. Proper market inspection and checking the quality of fish by Bangladesh Standards and Tasting Institutions (BSTI) is necessary for ensuring the quality of fish.

Taste is an important factor of purchasing and consuming farm fish. The respondents suggest cultivating fish in open water bodies like in beels, haors, baors and river in a close way and using less chemical food. So, the taste of farm fish will increase as well as the demand.

Income is negatively related with the preference of farm fish as income increase people will buy less farm fish and more wild fish but if the producers maintain proper guidelines and standards of producing fish then the demand of farm raised will not reduce.

Market price of fish is negatively related with consumer preference of farm fish. The price of farm fish increases due to high price of fish feed and medicine and the tendency of making unusual profit of middlemen. The authority should control the price of fish feed and medicine and break the syndicate of middlemen to supply fish with affordable price.

### **4.2 Conclusion**

The study has found that 42% family consumes 1-5 kg of wild fish and 40% family consumes 5-10 kg wild fish in a month, while 45% consumers eat 1-5 kg farm fish and 29% eat 5-10 kg farm fish in a month. It is also found that 72 percent

of the total respondents have interest on farm raised fish because of low price and available every market, where 28 percent choose wild fish. This is because they believed that wild fish tastier than farm fish and full of nutrition's. The estimation of the results of logistic regression model indicates that out of eleven variables four variables are statistically significant at different levels which are education of household head, market price of fish, quality of fish and no alternative of farm fish to fulfil the lack of protein. Age and gender of the household head, household income, household size, nutrition of fish, taste of fish, food security are not statistically significant. The value of Pseudo R<sup>2</sup> is 0.415, which means that 41.5% variation of farm fish preference is explained by the considered explanatory variables. Strict monitoring and regulation is needed to ensure feed quality and supply formalin free farm fish to the consumer level. To reduce the market price of farm fish, authority should control the feed price as well as the profit of middlemen.

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