

# Assessing demand drivers in augmenting fish consumption in Ernakulam

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## Abstract

**Objectives:** Assessing the fish consumption pattern, with special focus on analysing the trends and pattern of fish consumption and to identify the factors that drives people for fish consumption.

**Methods/Statistical analysis:** The primary statistical tool of percentage analysis, conjoint analysis, Garrette ranking etc. have been carried out to assess various parameters of the study. One of the major analyses such as conjoint analysis and preference assessment index methods are carried out to find out the consumer preferences and pattern of fish consumption among the respondents.

**Findings/Application:** The study points out that the average monthly income of the respondents has a very good role on the fish consumption as about 38% of the income is used for purchasing fish. 54.2% of the total respondents were purchasing fish on a daily basis and about 72% of the respondents depend on the retail centres for purchasing fish. Conjoint analysis results indicates that the optimum fish quality set, which provides the consumers with optimum benefit is the variety of fish from the retail fish markets which are highly fresh and good quality. Mackerel remains the most preferred fish with a high score of 0.577 followed by Sardine 0.561 in the preference index analysis and it has been found that the highest preference index is given for the availability of the fish species. Despite of any income group there exists a high uniformity between the respondents in buying mackerel as well as sardine. From Garrette ranking technique for constraints in fish consumption found that lack of fresh fish, high price and irregular supply as the major constraints for fish consumption.

**Keywords:** Fish consumption, Conjoint analysis, Preference index, Garrette ranking.

## 1. Introduction

Fisheries sector contributes significantly to the national economy while providing livelihood to approximately 14.49 million people in the country. It has been recognised as a powerful income and an employment generator as it stimulates growth of a number of subsidiary industries and is a source of cheap and nutritious food besides being a source of foreign exchange earner. Among the nine coastal states of India, Kerala holds the second position in terms of fisher folk population [1]. The fisheries sector in India has undergone rapid changes over the last six decades to develop from a sustenance fishing to the status of a multi-crore fishing industry. The economy of Kerala relies heavily on fishing for subsistence, livelihood and employment. Within Kerala, consumption of fish is four times the national average [2] and the state produces 16.6% of the shares of India's total marine exports, the second largest [3] in the country. Kerala has a coastal line of over 590 km covering over nine coastal districts with 222 fishing villages and 187 landing centres [4]. The fisheries sector offer promising future for the livelihood, employment and food security.

Kerala is considered as the greatest fish consuming state in the country and the average per capita fish consumption is 27-30 kg. The hike in fish consumption is mainly associated with the upsurge in income, increasing health consciousness and changing life style of the people. While considering the domestic fish market which is managed not only by the purchasing power of the consumers but also mostly by their taste and preferences. The fisheries sector is adding employment to about 2.14 lakh people and it also supports the livelihood for more than 10 million people.

Fish has become an indispensable part in the food basket of the Keralites as it is considered as a healthy food which is rich in edible protein. It is considered as the poor man's protein and it is a source of cheap and nutritious food assuring food security. During the early 70's fish consumption pattern stood at 15kg per annum were it declined, but the reality is that at each household there is at least one meal with fish every day [5]. About 80-85% of India's population are non – vegetarians and with the shift in lifestyle and upsurge in the cost of meat, the fish intake in Kerala is flourishing [6] and the fish consumption in rural areas is higher than the urban areas in Kerala [7]. There also exists a wide competition among the buyers for fish. It was noticed that for certain species like sardine, mackerel, seer fish, squid, cuttle fish and ribbon fish the domestic market price is higher when compared to the export market price. Even though the export earns us a valuable income, the diversification of fish and fishery from local communities thus there is a prevailing question on the availability and affordability of fishes in the domestic market. In this context the present study delves to assess the trends and pattern of fish consumption, factors that drive the people to consume fish and to assess the major constraints faced by the consumers in fish consumption.

## 2. Data and Methodology

The study was based on the primary data collected from various parts of Ernakulam district during March-April 2017 about total of 360 respondents with a well-structured questionnaire. These respondents were randomly selected from rural as well as urban areas of Ernakulam since it is the mainland portion of the city of Kochi in Central Kerala. It is the commercial capital of the state of Kerala with a quite equal proportion of rural as well as urban people.

Figure 1. locale of the study



The study was conducted with a pilot study for assessing the fish consumption pattern, the factors which affect the consumption and the major fish species preferred. One of the major objectives of the study was to assess the trends and pattern of fish consumption and to analyse factors that drives people to consume fish and also to assess the major constraints faced by the consumers. The present study delves into the details on of on age, education, income, expenditure, fish consumption pattern, major preferred species, major buying source, the factors which drives people to consume fish and the major constraints in fish consumption. In order to analyse the data, the primary statistical tool of percentage analysis, conjoint analysis, garrette ranking etc. have been carried out to assess various parameters of the study. One of the major analyses such as conjoint analysis and preference assessment index methods are carried out to find out the consumer preferences and pattern of fish consumption among the respondents. Conjoint analysis is defined as the method in which a consumer or a decision-maker evaluates and estimates confined number of alternatives systematically [8].

The analysis is applied for the fields of food product choice, marketing, consumer preferences on market segments, consumers' willingness to pay for different product and quality attributes [9],[10]. Conjoint analysis mainly consists of three fundamental processes. First of these is defining the ideal product features set, which provides the consumer with maximum utility. Second is determining the level of relationship between combinations of the product. Third is usage after the market margin simulation, profitability analyses and segmentation analysis. The starting point of conjoint analysis relies on total utility theory, according to which it can be said that total utility is a function of the price utility and quality utility. Two different calculation methods are used in the conjoint analysis in order to determine the significance levels of the product characteristics. First of them is the determination of the differences between partial utility values (part-worth values) of every feature. In partial utility model, every feature level of the product is free from each other and regarding feature level partial benefits constitute the total utility of the consumer. General consumer evaluation on the product or service and thus, contribution of every characteristic to his preference is determined by partial utility (part-worth). Part-worth contribution model (additive part-worth), which is used widespread in the conjoint analysis can be explained as follows:

$$Pref_{ijkl} = a_i + b_j + c_k + d_l$$

Where,

- $Pref_{ijk}$  =Consumer preference or total utility
- $a_i$  =Product A feature part-worth in level i
- $b_j$  =Product B feature part-worth in level j
- $c_k$  =Product C feature part-worth in level k
- $d_l$  =Product D feature part-worth in level l is expressed so

In this study, the full concept method was chosen for the collection of data that is evaluated in the conjoint analysis. Accordingly, question cards are prepared for every feature level and are provided to consumers, which include features that are determined regarding the product and level of every feature. Thus, the degree of participation of consumers to every alternative and the level of perception for each alternative are determined. A composite preference assessment index (PAI) approach was also used in this study to evaluate driving forces that influence consumer preference which lead to an increase in the demand for various types of fishes. The composite index approach calculates preference indices using aggregate data for a set of indicators. An indicator represents a characteristic or a parameter of a system and it is a pragmatic, observable measure of a concept. Using the set of indicators described, we quantitatively assessed the preference index based on the systems using the combination of individual indicators. Since each indicator was measured on a different scale, they were normalised (rescaled from 0 to 1) by using the following equations

$$x_{ij} = \frac{X_{ij} - \min_i \{X_{ij}\}}{\max_i \{X_{ij}\} - \min_i \{X_{ij}\}}; \text{ if } x_{ij} \text{ increases with preference .....(1)}$$

$$y_{ij} = \frac{\max_i \{X_{ij}\} - X_{ij}}{\max_i \{X_{ij}\} - \min_i \{X_{ij}\}}; \text{ if } y_{ij} \text{ decreases with preference .....(2)}$$

Where,  $x_{ij}$  and  $y_{ij}$  are the variables representing effects on the preference indices. The values after normalisation were transformed into a four point Likert scale, categorised as 0-0.25, 0.26-.5, 0.6-0.75 and 0.76-1 which are assigned score values 1 (low), 2 (moderate), 3 (high) and 4 (very high) respectively. The mean values of the different species as well as the different parameters of preference were calculated and were combined to develop a composite preference index.

### 3. Results and Discussions

The data was collected, analysed and the results are discussed under the following heads

#### 1. Demographic profile

A total of 360 respondents were included in the study. Respondent socio-demographic information is summarised. Among these respondents 55.3% were males and 44.7% were females. The age-wise distribution of respondent's results indicated that 43.9% of the respondents came under the age group frequency of 35-55 in the study, followed by a total of 33.9% coming within less than 35 age group and 22.2% under more than 55 age group. Moreover the educational status of the respondents shows that most of them are collegiate (32.2%). Among the respondents only 15.8% possessed primary education and 14.4% are professionals. The level of education level was high as indicated by a low level of illiterates (2.8%) in the sample.

Moreover the religious orientation of the respondents shows that 52.5% of the respondents belong to Hindu religion followed by Christians 31.7% and only 15.8% of the total respondents belong to Muslims. The results are in tandem with the demographic profile of the Ernakulam district where Hindus (46.53) account for the largest community followed by Christians (38.78) and Muslims (14.55%). The average family size of the respondents was 4.10 where the adult children ratio was found to be 3:1.

#### 2. Income and expenditure pattern

The average income has a very good role in the fish consumption pattern, demand and preference of fish. Despite of the income most of the respondents purchase and consume fish on a daily basis. Ernakulam district is the richest district in Kerala in terms of GDP and per capita income. The average monthly income of the respondents was found as Rs. 26,810. The monthly mean expenditure on food is Rs. 5,636 where it ranges from 12,000. The monthly mean expenditure on fish is Rs. 2,149 where it ranges from 5,700 to a minimum of 300. The relationship between annual income and consumer preference on marine fish over fresh water fish was also assessed which shows that marine fish is more preferred by most of the consumers the respondents were categorized into four on the basis of their annual income and it can clearly be noted that except those from the below 10,000 category, marine fish is preferred more

#### 3. Fish consumption profile

1. Frequency of consumption: The Frequency of consumption of the respondents is furnished. Most of the respondents (54.2%) consumes fish daily followed by alternatively (75)%. 50% of the respondents consume fish once in a week and only 0.6 per cent consumes fish seasonally. This Figure 1 clearly indicates that fish has become an integral part of their daily diet in Ernakulam district.
2. Quantity of fish consumption: The assessment of the weekly consumption across the district indicates that 53.6% of the respondents consume 1 - 2 kilogram whereas 28.3% consume about 2-3 kg of fish. 3.1% of the respondents consume about 3-5 kg and 3.9% consume about more than 5 kg of fish on weekly basis. The in-depth analyses with the family size of the corresponding respondents indicate that the results are in tandem with the average per capita fish consumption of about 27-30 kg. This indicates the corresponding weekly fish consumption of the respondents.
3. Access to buying fish: The access of the buying source of fish adds to its increased demand and is depicted. The analysis showed that 170 sample respondents (47.2%) were in close access to fish buying source of less than a km. A total of 151 respondents (41.9%) and 30 respondents (8.3%) were in access to fish buying source of 1-2 km and 2-5 km respectively. It was found that 1.4% of the respondents had to access the fish buying source from more than 5km and only 1.1% depends on online source. The results indicate consumers were able to access fish within a short distance.
4. Source of purchase: Source of purchase is found to be multiple across different consumers. Among the respondents most of them are depending on more than one source of purchase that 72% of the total respondents choose to buy fish from retail markets and 38% of the total respondents depend on fish vendors at door step. Only 7% depend on online purchase.

- Reason for choosing the buying source: The reason for choosing the buying source is furnished. The reason for buying source is found to be multiple across different samples. Most of them prefer the buying source because majority of the respondents (58)% consider the fish as fresh and 51% choose as the distance is comparatively less.

**4. Major drivers in buying fish –Conjoint Analysis**

In order to find the consumer preference, conjoint analysis was carried out with 3 factors of 24 different factor levels giving 3<sup>24</sup> different combinations. However using the fractional factorial design the combinations were greatly reduced to 25 which appear to be manageable for further analysis. The fish quality set composed for the conjoint analysis is given in the Table 1.

*Table 1. Drivers of buying fish*

Factor	Factor Levels
Drivers for buying fish	Price/ Affordability Quality Nutrition Species Taste and preference Substitute to meat Persuasion Tradition Availability Accessibility
Sources of Purchase	Landing Centre Retail Market Wholesale Market Online Fish vendors at door step Supermarkets Wayside Market
Attributes leading to purchasing decision	Distance Freshness Variety of species Credit Cheap Trust Time

In the study, the conformity of the model was estimated under the conjoint analysis with the actual consumer preferences were evaluated as 0.998 according to the Pearson R. and 0.833 according to the Kentall’s Tau. These statistics show the relationship between the applied model and the observed outcomes. When the outcomes of the analysis were interpreted, it was found out that the drivers for buying fish is the most important factor in determination of the consumer choice in fish consumption. The impact of drivers for buying fish on purchasing decision was about 38.43%. Sources for buying fish is the second most important factor followed by the drivers for buying fish of about 32.58% significance. The third factor affecting consumption pattern is the reason for the source of purchase place. Place of purchase affects the consumer decision about 28.99% significance. The result of the conjoint analysis is clearly depicted.

Part-worth or marginal utility value of every factor level shows the effect of the concerning level on consumer preferences. The factor level, which has the highest part-worth, is the most preferable alternative by consumers. The drivers for buying fish which is the highest factor have the highest part worth value for quality (0.5656) followed by the tradition (0.5510). The taste and preference have a part worth value of about 0.5112 whereas substitute for meat records 0.5100 utility values. Accessibility holds 0.4112 parts worth score followed by variety of species of about 0.4003 parts worth value. Nutrition and price/affordability holds the lowest impact in for buying fish with part worth values about 0.2331 and 0.1152 respectively. Hence most of the consumers buy fish in regards of the quality of fish and tradition in buying fish.

In the sources of buying fish, which is the second most important factor in consumption preference, have the highest part-worth score for the retail market (0.5652) followed by the fish vendors at the door step (0.4356). The consumers preferred to buy fish from the whole sale market have a part worth score of about 0.3354 and that of landing centre have a score of about 0.1680. Supermarkets hold for about 0.1146 parts worth value whereas online services have got only 0.0051 parts worth score in the consumer preference for the sources of buying fish. The results indicate that majority of the consumers choose retail markets for buying fish regardless of other sources. The quality, good taste and cheap rate may be the reasons that can be acknowledged as the effective factors in the consumers' decision in the preference of the buying place. The results also indicate that fish vendors at doorstep, whole sale markets etc. and even the online services have considerable importance in choosing the purchase place by the consumers for fish consumption. The third and the last important factor in consumer preference, the reasons for choosing the place of purchase has got freshness of the available fish in the purchase place has got the first place with highest part worth value about 0.4545. The convenience to the purchase place is the second most with part worth value 0.4333. The cheap rate and variety of species hold the next in consumer preference with part worth values of about 0.3013 and 0.2569 respectively. The trusts among the fish vendors and consumers have got 0.2213 of the part worth value in the consumer preference. Whereas credit accounts about 0.2011 of the part worth score. Among the reasons time has the lowest part worth score of about 0.1328 which indicates that time has no relevance in the reasons of buying fish.

In conjoint analysis, the difference between factor levels as much as the part-worth of every factor level represents the impact of regarding factors on consumer preferences. When the results are interpreted, it is concluded that the largest difference between the part-worth values are in the reasons for buying fish and the preferences in the important parameters to buy fish. Accordingly, it can be concluded that consumers have tendency to buy fish variety providing the highest value due to these reasons. Average and total utility or worth values of the combinations, which were designed in the scope of the conjoint analysis and total worth value is composed of sum of factor level scores. The combination, which has the highest total worth, is defined as the product feature set providing the consumers with optimum utility. Feature set, which has the lowest total worth value, provides the consumers with minimum level of benefit. In other words, the factor and factor level having the highest total utility is preferred by consumers with priority. The combination, which has the lowest total utility value, is the product set that consumers prefer least. And from these the overall results interpret that the optimum fish quality set, which provides the consumers with optimum benefit is the variety of fish from the retail fish markets which are highly fresh and good quality. i.e., the study explored that the optimum fish quality set, which provides the consumers with optimum benefit is the variety of fish from the retail fish markets which are highly good quality and fresh as presented. The product feature set furnished is scrutinized as the optimum fish quality set of the study area with the highest total worth utility score of 1.2340.

## 5. Preferred species and major drivers in fish consumption

Preference assessment index is the composite index which takes in to account numerous parameters which determine fish consumption like availability, accessibility, quality, nutrition, tradition etc. The preference index for the different species of fish by the respondents is furnished. The results indicate that among the different species Mackerel remains the most preferred fish with a high score of 0.577 followed by Sardine (0.561), Stolephorous (0.557), Tuna (0.551), Prawn (0.550), Solefish (0.510), Threadfin breams (0.489), Seer fish (0.480), Pomfret (0.472), Crab (0.410) of score 0.561. Despite of any income group there exists a high uniformity between the respondents in buying mackerel as well as sardine. The most preferred species in fish consumption is indicated. The nutritional values of mackerel (0.84) as well as the tradition in eating sardine (0.85) are the major reasons of the respondents in consuming mackerel as well as sardine. The taste and preference (0.72) and the tradition (0.72) are marked as the important drivers in the consumption of Stolephorous whereas for tuna, availability (0.83) is the major reason for preference. The taste and preference (0.69) of prawns and the accessibility (0.79) of sole fish are the reasons for their preference by the respondents. Also the availability (0.81) of threadfin breams, quality (0.80) of seer fish and crab (0.75), taste and preference (0.82) of pomfret etc. are the major reasons for the consumption of these species by the respondents. Driving forces that influence consumer preference which lead to an increase in the demand for various types of fish can be determined through their preferences index. The consumers are diverse in their consumption preferences.

The preference index approach used for analysing the choices of the respondents in the consumption study identifies the different drivers and the major fish species preferred by the consumers. The preference indices for the different drivers as well as the preferred species were found out in this study. The results indicate the major reasons for the drivers in fish consumption. Among the nine parameters given respondents score the highest preference index for the availability of the fish species (0.671) followed by accessibility (0.663), quality (0.623), taste and preference (0.615), Nutrition (0.564), Tradition (0.508). The factors price and persuasion accounts only low impact among the respondents in fish consumption. Also the least preference is given for persuasion and more over the study analysed that most of the respondents do not consume fish as a substitute to meat. The different reasons for the fish consumption are clearly indicates. However, the respondents have also mentioned that availability of most of the fishes became rare at present which indirectly indicating the loss of fish diversity and abundance in water bodies nearby, loss of fishes in natural waters due to degradation of natural habitats, excess exploitation, use of illegal fishing gears, expansion of aquaculture into natural waters etc.

## 6. Constraints in fish consumption

The garrette ranking results for the constraints in fish consumption is clearly furnished. The main constraint in the consumption of fish was observed to be the lack of fresh fish, followed by consumption restricted due to high price, irregular supply, wide fluctuations in price and poor access to fish. Even though Kerala is a consumer state the issue of lack of fresh fish is very common. The fish production issues, middle men problems, impacts of climate change are some reasons for this lack of fresh. Though the high price and wide fluctuations in price are some major constraints for fish consumption, they create only small impact in the fish consumption pattern of the respondents. The respondents opined that purchase and demand of the fish have not been yet reduced due to these reasons and their fish consumption has only increased fairly in despite of the high prices. But the irregular supply as well as the poor access and other reasons have a good role in the consumption pattern of the consumers. This makes them to depend on the fish products and other sources for the consumption of fish. The study could easily interpret that fish have become one of the inevitable food among the people.

## 4. Conclusion

The academicians, media, and public institutions often mention the association between fish consumption and health; it has been revealed that fish consumption is far above the average consumption in and around Kerala. Another important issue that it is as important as the level of consumption and the frequency of consumption. The increase in fish consumption is distributed equally throughout the year. Because of the existing traditional eating habits, low price and demand elasticity for purchasing fish, a more remarkable increase in fish consumption should expected in the near future. Despite of this there exists some structural problems in the fishing industry. The non-availability of fish in the domestic fish market will lead to a situation where in the domestic consumers are devoid of fish in the market at affordable prices. Thus it is important to ensure that the availability and affordability of fishes whose consumption could be augmented by creating awareness campaigns. Government agencies, private sector, and occupational organizations can play an active role in reducing the problems in fishing industry and also in the changing consumption habits preferences of consumers. The availability of chemical-free seafood in the state, the need for proper cold chains facilities, hygienic markets, proper training to fishermen in handling fish, and better infrastructure facilities are also the need of the hour. The local fishermen of the area should be made aware of following good handling practices in order to fetch quality standard and price. Moreover priority should be given to training and mass advertising campaigns with the goal of increasing consumption and improving hygiene standards in the fish supply chain.

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