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Determining Household Preferences for Fish Consumption with Conjoint Analysis in Turkey

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Abstract: It is intended in this study to analyze household fish consumption preferences. Accordingly, the fish quality set and sales conditions that maximize consumer utility were determined. The study was conveyed in Hatay province urban area sample as a section of Turkey. The data retrieved from face to face survey implemented on household level in 2008 was used for the study. The conjoint analysis method, as a multivariate analysis was implemented for assessment of household data. Consequently, it was found that variety, supply channel, price and production method were effective and significant in purchasing preference of the consumer at rates of 29.7, 28.0, 27.2 and 15.1%, respectively. In addition, the utility maximizing fish quality set was determined as variety: gilt-head bream; production method: organic; supply chain: fish market; price: moderate.

Key words: Household, organic fish, consumption, consumption profile, conjoint analysis, Turkey

INTRODUCTION

Animal products constitute one of the essential product lines for healthy and balanced diet of societies. The population growth and rise of pressure over natural resources lead imbalanced consumption of animal products. For a sufficient and balanced diet, it is required for a person to have 70 g of protein, of which 47 g should be animal oriented. The world average of animal proteins in per capita protein consumption is 37% (28.1 g). Yet, there are significant differences across developed and developing countries in terms of animal proteins. The ratio is 56.1% (55.8 g) in developed and 29.5% (20.5 g) in developing countries. The ratio in Turkey is 24.0% (22.8 g) (depend on FAO statistic database). According to these study, it is understood that per capita animal protein consumption in Turkey in not sufficient.

Sea food is considered as an important alternative to animal protein consumption because, sea food is a major source of food. Turkey is a peninsula surrounded with the sea in three sides and it has an important potential for seafood due to lakes, streams, dams it has. Turkey has 8.333 km coastline and approximately 25.000 ha production field that is suitable for seafood production (Anonymous, 2001). Depend on FAO statistic, per capita seafood consumption in Turkey is 7.6 kg whereas, it is 23.3 kg in developed countries and 13.7 kg in developing countries and the world average is 15.9 kg. Consequently, it is understood that while Turkey holds a significant potential for fish production, per capita seafood consumption is lower than developed, developing countries and world average.

The organic production, which became prominent with the concept of healthy consumption around the world, gained attention in seafood production. The first organic fish production has begun with carp by fish producers through a certificate as organic provided by certification foundation Bio empte in Austria. After this first attempt, sterling trout and rainbow trout have entered the market. The first organic trout took place in the market in 1998 in the UK (Tacon and Brister, 2002). Organic aquaculture is one of the world's fastest growing sectors having a development phase similar to organic farming. However, today aquaculture is behind the agriculture in terms of certificated product diversity and quality (Bergleiter, 2001; Brister and Kapuscinski, 2001;

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Tekinay *et al*., 2006). Organic aquaculture develops slowly than organic farming because of the differences in consumer preferences and difficulty of using rules and standards of organic farming for aquaculture. In developed countries as Germany, the UK and the USA, there are studies on establishment of standards and regulations on aquaculture. Apparently, salmon in Germany and Holland calm in Australia, shrimp in Equator are produced organically and presented to consumers in sales markets (Cavdar, 2004).

Development and extension of ecological farming in Turkey is new and so development of organic aquaculture is at the beginning. Approximately 50% of Turkish aquaculture production is marketed abroad. When it is considered that certified organic aquaculture products that are healthy and safe could easily find market in Europe, the transition from traditional fish production methods to organic production methods in aquaculture firms is an important attempt in development of aquaculture (Tekinay *et al*., 2005). In addition, increasing consumer consciousness in domestic consumption of aquaculture products and determination of consumption tendencies pose importance in development of organic aquaculture market.

It is intended to determine the consumption preferences of fish by conjoint analysis, which is an important protein source for society nutrition. For this reason, the optimum fish quality set and sales conditions maximizing the consumer utility were researched with the Hatay province urban area as a section of Turkey. Accordingly, the consumer tendency development contributing to domestic supply and demand conditions and development of organic fish market was set forward.

Literature: Studies carried out on fish consumption and marketing are rather focused on conventionally produced fish. The studies focusing on organic fish consumption and consumer preferences have been rather limited.

In a study, which evaluates the change in the consumption patterns of animal products in Turkey, changes factors affecting consumers purchasing decisions and consumption patterns of animal products have been studied. In the study, the factors affecting demand for animal products were determined as product price and price of competitive products, social and cultural structure, demographic significance and efforts of the sales people for selling the products (Albayrak, 1999). Some studies focused on fish consumption and the socioeconomic factors affecting fish consumption (Sayili *et al*., 1999; Hatirli *et al*., 2004). In the study carried out by Herrmann *et al*. (1994), factors affecting inside and outside home fish consumption and fish buying frequency of the families were analyzed. It had been concluded that instant, stingless, delicious and nutritious attributes of the fish affects the consumption characteristics of the families inhabited in Northeastern America remarkably. Besides, it was understood that families, who consume fish outside the house are white and upper-middle class. Jenkins (1991) determined that, aquaculture industry is affected by the consumers preferences significantly. In the study, it is stated that in the health, variety, quantity, price and size were effective in sea food consumption.

Another study carried out by Al-Mazrooei *et al*. (2003) focused on behaviours and attitudes of consumers regarding fish product form and sales point. According to research findings, it is emphasized that fish-bazaars are preferred by families living in coastal regions, while fish shops are important sales points for the rural families. It was also pointed out that unprocessed fish is preferred by the low and middle income level families in the rural and urban areas, while processed fish is preferred by the high income group living in the urban areas.

MATERIALS AND METHODS

Population data regarding the research area was retrieved from the Turkish Statistics Association (TÜIK), data on socio-demographic household characteristics and their fish consumption preferences via face to face survey. In addition, related studies were used within the research. The main consumption data of the study belongs to 2008.

Determining the sample size and retrieving the data: Hatay (Antakya) city center householders constitute the research population for this study. The following sampling formula (Churchill, 1995) was utilized in order to determine the adequate sample for the study. Since, householder ratio consuming fish was not known definitely, p and Q-values were taken into consideration as 0.50 in order to reach the maximum sample size. According to this, sample household size is 400 at 95% significance level and 5% margin of error.

$$n = \left(\frac{Z_{\alpha/2}}{d}\right)^2 P.Q$$

Where:

- n = Sample size that will be applied in every city center
- P = The possibility of realization of the verified unit inside the main population (the ratio of fish-buyer consumers is 50%)
- Q = 1-P (the ratio of non-buying consumers is 50%)
- $Z_{\alpha/2}$ = Level of significance (95%, table value 1.96)
- d = 5% error term

$$n = \left(\frac{1.96}{0.05}\right)^2 0.50 \times 0.50 = 400$$

In the scope of the research, 442 public survey had been carried out taking the backup surveys into consideration. After the misleading and wrong surveys were deducted, 412 surveys were used for analysis. Face to face survey application of the research took place in Hatay city center via random selection.

Analysis and the evaluation of the data: Data retrieved from householders were evaluated with SPSS statistical package. Conjoint analysis, which is one of the most appropriate multivariate analysis were applied as a statistical method for analyzing the data in accordance with purpose and convenience of the study.

Conjoint analysis is defined as method in which a consumer or a decision-maker evaluates and estimates confined number of alternatives systematically (Joel, 2002). Conjoint analysis is applied for the fields of food product choice and marketing in the literature regarding explanation of consumer preferences on market segments, consumers willingness to pay for different product and quality attributes, local food and quality certified and ecological foods (Misra *et al*., 1991; Alvensleben and Schrader, 1999; Govindasamy and Italia, 1999; Jolly, 1999; Grannis *et al*., 2000; Cowan *et al*., 2000; Grannis *et al*., 2001; Loureiro and Umberger, 2003; Villalobos, 2005; Padilla *et al*., 2007). In this study, conjoint analysis is applied in order to determine the fish consumption preferences of the consumers. Thus, the optimum fish set, which maximizes the consumer utility and influences level of the consumers purchasing decision was explained.

Conjoint analysis is a multivariate analysis technique that is used for analyzing consumers preferences for combinations of measurable and immeasurable attributes. 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. Starting point of conjoint analysis relies on total utility theory. According to this, it can be said that total utility is a function of the price utility and quality utility (Manly, 1995).

Total utility = f (price utility + quality utility)

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 theoretically as following (Manly, 1995):

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

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 1 is expressed so

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 determination of the differences between partial utility values (part-worth values) of every feature. The other way is calculation of the relative significance levels of the combinations. The change between part-worth values of product features indicates the difference between the lowest and the highest levels of the significance levels. This value indicates the significance of every combination level within the combination. In relative significance measurement between the combinations every part-worth value is rationed against the total sum of change in partial utility values. According to this (Manly, 1995):

$$Change_i = \text{Highest part-worth value}_i - \text{Lowest part-worth value}$$

$$\text{Relative significance} = \frac{Change_i}{\sum change_i} \times 100$$

Two different types of data collection is applied in conjoint analysis. These are full concept method and double-comparison method. Full profile is rather used widely since it has more advantages (Manly, 1995). In this study, full concept method was chosen for collection of the data that will be 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.

RESULTS AND DISCUSSION

Household socio-economic profile: One of the effective factors in food consumption attitudes and purchasing preferences is the socio-demographical features of the consumer and his family. In this context, the consumer families surveyed within the scope of the research were evaluated with respect to gender, age, education, marital status and household width, number of children, household income and female labour status female in the house (Table 1). According to this, 64.1% of the respondents are male and 35.9% are female. Regarding the age variation, it is found out that 18.5% of respondents are between 18-25, 14.3% are above 50. Most of the respondents are between 26 and 50 due to the percentage distribution. It was also determined that 21.6% of the respondents are single, 75.2% are married and 3.2% are divorced-widowed. Regarding the education level of the respondents, it was figured out that most of the sample is composed of high school or college graduates and people having lower level of education compose 30% of the survey respondents. For the households that constitute the attended sample for the study has an average household size of 4.11 and one of every third of the households represent families without children. The percentage of household in which women are employed on payment basis is 24.1%. Households were classified into 5 groups regarding household income. Accordingly, the group that have expendable income of 0-499 TL has the lowest share as 7.4%, 500-999 TL income group is the one step above of the lowest group with 34.8%, 1000-1499 TL income level constitute the middle class group with 26.5%, 1500-1999 TL income group is the upper-middle with 15.4% and the 1999<TL group represents the highest income group with a share of 15.9%.

Table 1: Socio-demographical profile of the sample (n = 412)

Characteristics	Frequency	%
Gender		
Male	264	64.1
Female	148	35.9
Age group		
18-25	76	18.5
26-35	110	26.8
36-50	166	40.4
51+	59	14.3
Education		
Primary	67	16.3
Secondary	56	13.7
High	141	34.4
College	146	35.6
Marital status		
Single	88	21.6
Married	306	75.2
Divorced-widow	13	3.2
Household size (No. of people)		
1-2	56	13.6
3-4	199	48.3
5-6	135	32.7
6+	22	5.4
Number of children (0-14 age)		
0	128	31.1
1	92	22.3
2	112	27.2
2+	80	19.4
Working women in the household		
Yes	94	24.1
No	296	75.9
Monthly household income (TL)		
0-499	30	7.4
500-999	142	34.8
1000-1499	108	26.5
1500-1999	63	15.4
1999+	65	15.9

Table 2: Fish quality set composed for the conjoint analysis

Factors	Factor levels
Variety	Bream
	Bass
	Trout
Production method	Conventional
	Organic
Supply channel	Supermarket
	Fish bazaar
	Local bazaar
Price*	4.00 TL kg^{-1} (low)
	6.00 TL kg^{-1} (medium)
	8.50 TL kg^{-1} (high)

An application regarding the conjoint analysis and household fish preferences: In the study, conjoint analysis was applied for the selected model product, fish. Orthonogal design established for fish with 4 factors and 3 levels was shown in Table 2. In the study, number of combinations was calculated as 64 due to $3\times2\times3\times3 = 64$. The first 9 combinations were selected for analysis for appropriate consumer evaluation. The optimum product components of conjoint analysis were determined as variety, production method, supply channel and the price. Factor levels for the fish kinds were determined as bream, bass and trout that are considered as widely-consumed; for price level the levels were considered to be low (4.00 TL), medium (6.00 TL) and high (8.50 TL), for production method the levels were conventional and organic production and for the supply channel the levels were selected as supermarket, fish bazaar and local bazaars were fictionalized.

The orthogonal design or the conjoint question cards were designed as following in the SPSS statistical package

considering the factors and factor levels. Accordingly, the respondents were asked to evaluate each alternative. The respective consumer evaluation was made on 10-scale. The scoring relied on the principle that the consumers give the highest score to the alternative that they prefer most. In this frame, every single alternative was evaluated with respect to different scores.

Conjoint plancards:

Title: Profile number) CARD
Card 1
bkind trout
umethod organic
priced 8.50
ssource supermarket
Card 2
bkind conventional
priced 4.00
ssource fish bazaar
Card 3
bkind bass
umethod conventional
priced 8.50
ssource fish bazaar
Card 4
bkind bass
umethod conventional
priced 6.00
ssource supermarket
Card 5
bkind bass
umethod organic
priced 4.00
ssource local bazaar
Card 6
bckind bass
umethod conventional
priced 8.50
ssource local bazaar
Card 7
bkind bream
umethod conventional
priced 4.00
ssource supermarket
Card 8
bkind trout
umethod conventional
priced 6.00
ssource local bazaar
Card 9
bkind bream
umethod organic
priced 6.00
ssource fish bazaar

In the study, conformity of the model 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 fish kind is the most important factor in determination of the consumer choice. The impact of fish kind or variety factor on purchasing decision was 29.69%.

Supply channel is the second most important factor after fish kind. Fish sales point was found effective in purchasing decision at 28.04%. The third factor affecting purchasing decision was price. Price factor affects this decision with 27.19%. The fourth factor of production method affects purchasing decision with 15.07%.

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 factor level, which has the highest part-worth score under variety factor is bream with 0.2482 utility value. Part-worth score for bass is 0.2092. Part-worth score calculated for trout is relatively rather low than the others and it is around -0.4574. According to these results, primary consumer choice in fish consumption is bream. Bass is the variety that provides the second highest utility to consumers. Yet, trout is not a kind that is mostly preferred by consumers. Regarding the consumer fish consumption decision, taste and fish consumption culture can be acknowledged as effective factors. Besides, information level regarding the fish varieties is also effective in the fish consumption choices.

In supply channel factor, which was determined as the second most effective factor in fish consumption preferences, fish bazaar has the highest part-worth value with 0.3354, while supermarket has the lowest with -0.04730 when the part-worth scores are interpreted. Local bazaars as a factor level has the second effective part-worth for the consumer choices with 0.1376 score. According to these results, it is possible to say that fish bazaars are the first choice as a sales point for the fish purchasing. Contrary to that it can be said that tendency to purchase fish from supermarkets is weaker. Among the supply chain alternatives proposed to consumers, local markets-bazaars provide more utility to consumers than supermarkets. This can be attributed to accessibility and product freshness.

Price factor, which is the third most important factor affecting consumers purchasing decision is the 6.00 TL medium price level with the highest part-worth score with 0.4756. With respect to the price aspect, part-factor, which has the lowest score, is the highest price level of 8.50 TL with -0.5680 value. Accordingly, it is concluded that a considerable price level (moderate) is accepted by consumers. This result also indicates that in consumer price acceptation there are also other factors affecting the level of acceptance. When the forth highest factor effecting purchasing decision, which is production method is considered; it is understood that organic production has the highest value with 0.2718. Conventional method has the part-worth value as -0. 2718. According to this, we can say that consumer priority in fish purchasing decision is organic 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 variety and supply channel factors. Accordingly, it can be concluded that consumers have tendency to buy fish variety providing the highest value to them from the proper sale-points.

Average and total utility or worth values of the combinations, which were designed in the scope of the conjoint analysis and represented to consumers for evaluation and their priority level was demonstrated in Table 3. 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. Accordingly, the optimum fish quality set, which provides the consumers with optimum benefit is the 9th card with 1.3310 total value. The fish set that is preferred by the consumers in the second extent is the 7th card. From here, it is concluded that consumers intend to buy organically produced bream with average or medium level of price from the fish market. Second choice of the consumers is to buy conventional bream with the lowest price.

In addition, buying organically produced bass from the local market with the lowest price is considered as the third choice. The overall conclusion withdrawn is that fish kind and sales point are factor affecting the decision of consumers mostly. According to the conjoint analysis findings, 1st fish set is the one, which provides consumers the minimum benefit with -1.2266 total worth value. This result shows that consumers have no intention of buying organic produced fish with the highest price. It is also understood that willingness to pay for organic fish varies according to fish kind and sales point (Table 4).

Table 3: Conjoint analysis results

Factors	Part-worth value	Significance level (%)
Variety		
Bream	0.2482	
Bass	0.2092	29.69
Trout	-0.4574	
Production method		
Conventional	-0.2718	
Organic	0.2718	15.07
Supply channel		
Supermarket	-0.4730	
Fish market	0.3354	28.04
Local bazaar	0.1376	
Price		
4.00 TL kg^{-1}	0.0924	
6.00 TL kg^{-1}	0.4756	27.19
8.50 TL kg^{-1}	-0.5680	
Total worth (Constant)	4.7469	
Total (%)		100.00
Pearson's R = 0.998	Significance = 0.0000	
Kendall's Tau = 0.833	Significance = 0.0009	

Table 4: In conjoint analyze average and the total worth values

Kind	Production method	Supply source	Price (TL)	Awe	Total worth	Preference order
Trout	Organic	Super.	8.50	3.49	-1.2266	9
Trout	Conven.	Fish B.	4.00	4.91	-0.4137	6
Bass	Conven.	Fish B.	8.50	4.98	-0.2952	5
Bass	Conven.	Super.	6.00	5.12	-0.0600	4
Bass	Organic	Local B.	4.00	5.32	0.6187	3
Bram	Conven.	Local B.	8.50	4.17	-0.4540	7
Bream	Conven.	Super.	4.00	5.43	1.1409	2
Trout	Conven.	Local B.	6.00	3.68	-1.1600	8
Bream	Organic	Fish B.	6.00	5.75	1.3310	1

Table 5: Optimum fish quality set

Kind	**Production method**
Bream	Organic
Supply source	**Price**
Fish market	6.00 TL (medium)

According to the conjoint analysis results of the study, fish design, which maximizes the householders fish consumption and purchasing utility is demonstrated in the attached Table 5.

CONCLUSION

Regarding the fish consumption characteristics, many studies have been developed and applied by using different models and tools. But since the organic aquaculture, organic animal production, natural product sales, hormone-free and antibiotic-free fishing and shelled fish production are developing new trends, studies regarding organic aquaculture consumption and

preference is apparently limited. Aquaculture is alternative to red and white meat consumption as it is a fundamental animal protein source.

Contrary to the potential of the domestic aquaculture production, low level of per capita consumption can be explained through underdeveloped consumption patterns in Turkey. At this point, applications to stimulate domestic fish consumption gain importance.

In the recent years, environmental consciousness and interest towards healthy food consumption has been rising in Turkey as it is the case in the developed countries. This rising interest and demand also affects the producers and retailers closely. Today, there is no production neither according to local nor European Union Regulations. But studies are being carried out for rising conformity with international regulations.

Despite, certification and labeling problems have not yet solved in Turkey, improvements in organic animal production and organic aquaculture encourage producers in the sector to invest in these fields.

In the study results, it is shown that production method has 15% significance for purchasing decision of consumers and the product set, which maximizes the consumer benefit is proper priced organic fish. These outcomes encourage the organic fish sector. Variety factor, which is the most effective factor for the purchasing decision of consumers and recognition of bream and bass on the factor level as preferable varieties impose conformity of organic fish production with local demand.

It is shown that supply channels are effective on fish purchasing decision with 28%, considering the overall impact of sales point on change in consumer preferences. Fish markets are observed to be the most effective sales point when the benefit maximizing marketing sales point choice is considered. Despite, supermarkets remain weaker as a marketing area for fish sales. This situation indicates a tendency of consumers towards natural supply environments that pose freshness perception for consumers.

Fish markets shall be recommended as alternative channel for fish marketing, when the focus on accessibility perception for supply chains in accordance with frequency of buying and consumption of the good are considered.

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