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Edible Oil and Fat Consumption and Income-Expenditure Elasticity: A Cross Section Study

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Abstract: The aim of this study was to determine the amount of edible oil and fat consumption and income-expenditure elasticities of households in central county of Tokat province, Turkey. Monthly oil and fat consumption per household was determined as 0.98 kg cultured butter, 0.40 kg margarine, 0.83 kg olive oil, 1.57 kg sunflower oil, 1.30 kg corn (grem) oil, 0.46 kg hazelnut oil, 0.04 kg mixed vegetable oil and 0.02 kg soybean oil. It was calculated that 1.95% of household income (\$15.38) was spent on edible oil and fat consumption. Taking into total oil and fat consumption, income-expenditure elasticity and marginal propensity to consume were calculated as 0.8493 and 0.0017, respectively.

Key words: Oil consumption, income, expenditure, elasticity

INTRODUCTION

Oils together with carbohydrates and proteins are very important within the basic food materials. Fat is expensive and also its production is inadequate in many countries, compared to oils. Therefore, the consumption of oils is more than fats^[1]. Although fat and oils are complex mixtures of fatty acids, each fat or oil has its characteristics fatty acid composition. Dairy fat, for example, is relatively rich in fatty acids with 14 or fewer carbon atoms, while olive oil has a high oleic content. Sunflower oil, on the other hand, is rich in linoleic acid, although certain varieties exist that contain large amounts of oleic acid. In normal, regular diets, palmitic and stearic acids are the most prevailing saturated fatty acids, while oleic and linoleic acids are, respectively, the most widespread dietary monounsaturated and polyunsaturated fatty acids. About 30 to 40% of total energy intake is provided by fat^[2]. However, in 2000, oils constituted 76.2% of total world consumption (83.3 million tons). This means that per capita consumption as food was about 12.9 kg (oils: 10.4 kg, fat: 2.5 kg)^[3]. Although butter and olive oil were consumed in huge amounts by Turkish people in 1950s^[4], there is a shift from fat to oils as a result of increase in coronary heart disease^[5,6]. A recent trend is the increased importance of the nutritional aspects of food oils and fats. High quality food oils should have a low level of trans fatty acids, a high level of poly-unsaturated fatty acids (omega-3 and omega-6 acids) and no contaminants (i.e. pesticides, polycyclic aromatic hydrocarbons, PCB, dioxin)^[7].

Although, in the past, researchers accepted the income as the main factor in the determination of consumer preferences, today socio-cultural factors (age, gender, size of family, educational level, occupation of consumer etc.) are taken into consideration in the food demand studies^[8].

The aim of this study was to determine the amount of oils, margarine, olive oil and butter consumption and expenditure of consumers and calculate income-expenditure elasticity. Because, this type of study is very important for a country having developed and changed socio-economic structure day by day.

MATERIALS AND METHODS

Data were obtained via questionnaire in the central county of Tokat province, Turkey. Surveys were conducted with consumers in the household. In addition, information obtained from the other studies carried out in different parts of the country were used as secondary data in the study.

Questionnaire were consisted of social and demographic characteristics of the households and persons, household income, kind and amount of fat and oils consumed by households and marketing place of commodities.

Sample size was determined as 206 using the method of NEYMAN^[9,10].

While determining the income groups, a rank order was categorised as the lowest (Group I), the second lowest (Group II), medium (Group III) and the highest (Group IV).

Table 1: Models and formula used in the study

Models	Equation	Slope	Elasticity
Double logarithmic	$\log Y = \log \beta_1 + \beta_2 \log X$	$\beta_2 (Y/X)$	β_2
Semilogarithmic	$Y = \beta_1 + \beta_2 \log X$	β_2/X	β_2/Y
Logarithmic reciprocal	$\log Y = \beta_1 - \beta_2 (1/X)$	$\beta_2 (Y/2)$	β_2/X

The double log, semilog and reciprocal specifications have a long history in the food consumption literature^[11-13]. Therefore, in the determination of the relationship between household income and oils and fat consumption (income-expenditure elasticity) these functions were used.

Marginal Propensity to Consume (MPC=Slope) and Coefficient of Elasticity (CE) belonging to above functions are given in Table 1^[14,15].

Coefficient of determination (R^2) was used to check and determine which function was suitable for analysis. It measures the proportion of the total variation in Y that is explained by the regression since the regression model explains the values of Y on the basis of the given values of X.

Three models were fitted to the data using Minitab Release 12.1.

RESULTS AND DISCUSSION

Socio-economic characteristics of households: Average income per household was calculated as \$303.99 for the lowest income group and \$1331.88 for the highest income group (Table 2).

In the investigated households, average family size was determined as 4.14 person. Female constituted the majority of the respondents (79.13%). The rest (20.87%) was male. Average age was 40.31 years (41.93 years for male, 39.88 years for female) (Table 3).

Nearly one-third of the respondents (33.98%) graduated from a university (college: 2 years, faculty: 4 years). This was followed by high school (22.81%), primary school (22.33%), secondary school (9.71%) and postgraduate-M.Sc and Ph.D (5.34%) (Table 3).

Nearly half of the respondents (50.97%) were public officer. Housewives constituted the second largest group (35.92%) among the respondents. Ratio of the self-employed, workers and farmers were 8.74, 3.88 and 0.49%, respectively. About 89% of the respondents were married. Findings show that majority of the respondents (85.92%) were living in the city centre. The ratio of living in the suburb was only 14.08% (Table 3).

Oils and fat consumption of households: Findings show that the most preferred oils and fat was butter (71.36%). It was followed by olive oil (62.62%), corn oil (47.57%), sunflower oil (46.60%), margarine (33.98%), hazelnut oil (17.48%), mixed vegetable oil (71.36%) and soybean oil

Table 2: Distribution of households income

Income groups	Income range (\$ month ⁻¹)	Number of households		Average household incomes (\$ month ⁻¹)
		Number	%	
I	< 350	26	12.62	303.99
II	351-700	74	35.92	545.45
III	701-1050	55	26.70	837.71
IV	1051 >	51	24.76	1331.88
Total/Average		206	100.00	787.70

Table 3: Socio-economic profile of the respondents

	Income Groups				
	I	II	III	IV	Average
Family size	4.50	4.14	4.20	3.90	4.14
Number of respondents (%)					
Male	23.08	20.27	23.64	17.65	20.87
Female	76.92	79.73	76.36	82.35	79.13
Age (years)					
Male	44.67	43.20	40.69	39.78	41.93
Female	37.40	40.20	41.95	38.52	39.88
Average	39.08	40.81	41.65	38.75	40.31
Education level (%)					
Literate	15.38	6.76	3.64	1.96	5.83
Primary (5 years)	38.46	29.73	18.18	7.84	22.33
Secondary (3 years)	15.38	13.51	9.09	1.96	9.71
High school (3 years)	23.08	22.97	23.64	21.57	22.81
University (2 and 4 years)	7.70	25.68	38.18	54.90	33.98
Master and Ph.D	0.00	1.35	7.27	11.77	5.34
Occupation (%)					
Public officer	26.92	37.84	58.18	74.51	50.97
Housewife	53.85	51.35	29.09	11.77	35.92
Self-employed	7.69	8.11	10.91	7.84	8.74
Worker	11.54	1.35	1.82	5.88	3.88
Farmer	0.00	1.35	0.00	0.00	0.49
Place of residence (%)					
City centre	65.38	79.73	90.91	100.00	85.92
Suburb	34.62	20.27	9.09	0.00	14.08

Table 4: Fat and oils consumption per households and per capita

Fat and oils	Income groups									
	I		II		III		IV		Average	
	A	B	A	B	A	B	A	B	A	B
Butter	1.06	0.24	0.81	0.20	1.08	0.26	1.09	0.28	0.98	0.24
Margarine	0.58	0.13	0.45	0.11	0.45	0.11	0.21	0.06	0.40	0.10
Olive oil	0.28	0.06	0.77	0.19	1.00	0.24	1.02	0.26	0.83	0.20
Sunflower oil	2.08	0.46	1.38	0.33	1.33	0.32	1.80	0.46	1.57	0.38
Corn oil	2.16	0.48	1.38	0.33	1.32	0.31	0.74	0.19	1.30	0.31
Hazelnut oil	0.15	0.03	0.71	0.17	0.41	0.10	0.32	0.08	0.46	0.11
Mix. veg. oil	0.00	0.00	0.16	0.04	0.05	0.01	0.00	0.00	0.06	0.01
Soybean oil	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.02	0.02	0.01
Total	6.31	1.40	5.66	1.37	5.64	1.34	5.25	1.35	5.62	1.36

*Oils were calculated as kg by multiplying 0.910 the amount of liter
A: Per households (kg month⁻¹), B: Per capita (kg month⁻¹)

(0.97%). Oils and fat consumption per households and capita was calculated as 5.62 kg month⁻¹ and 1.36 kg month⁻¹, respectively (Table 4). Oils (i.e. sunflower oil, corn oil, hazelnut oil, mixed vegetable oil and soybean oil) constituted the majority of the total edible oils and fat consumption (3.41 kg month⁻¹). This was followed by butter (0.98 kg month⁻¹), olive oil (0.83 kg month⁻¹) and margarine (0.40 kg month⁻¹).

Table 4 shows that as income level of households increase, consumption of butter and olive oil increase but consumption of other oils decrease as it is expected. This means that households having high level income prefer consuming more natural and healthy oils and fat. The answers of the households to the question “why you prefer liquid oil?” were being healthy, light and delicious.

According to a study carried out in Adana province, total amount of edible oils and fat consumption per household was determined as 4.98 kg month⁻¹ (oils: 2.16 kg, margarine: 1.50 kg, olive oil: 0.69 kg and butter: 0.63 kg)^[8].

According to TR Prime Ministry State Planning Organization, edible oils and fat consumption per household in Turkey was 6.57 kg month⁻¹ (oils: 2.49 kg, margarine: 2.68 kg, butter: 0.83 kg and olive oil: 0.57 kg). On the other hand, per capita oil and fat consumption was 1.36 kg month⁻¹.

It is a fact that edible oils and fat consumption in Turkey is low, compared to western countries. Because, while per capita oils and margarine and olive oil consumption in Turkey were 12.50 kg year⁻¹ and 1.10 kg year⁻¹, the values were 26.70 kg year⁻¹ and 10.50 kg year⁻¹ in Spain and 27.90 kg year⁻¹ and 11.40 kg year⁻¹ in Italy, respectively ^[16]. Moreover, the amount of edible oils and fat consumption is lower in Tokat province than the average of Turkey. The survey of this research was conducted in winter season. Therefore, the amount of oils and fat consumption can be higher than other seasons.

Expenditure of households for edible oils and fat:

According to the results of the study, oils constituted the highest component of total edible oils and fat expenditure. It was followed by butter, olive oil and margarine. Monthly expenditure for edible oils and fat was calculated as \$15.38 per household and \$3.71 per capita (Table 5). Expenditure of households for edible oils and fat constituted 1.95% of the total household income (Table 6).

In the survey, households were asked to state “where they buy edible oils and fat”. As a result, following places were top three: supermarket (margarine, sunflower oil, corn oil, hazelnut oil, mixed vegetable oil, soybean oil and olive oil), local market (butter) and consumer cooperatives, respectively (Table 7). Nearly half of the consumers bought cultured butter from local market because they prefer consuming butter as fresh.

While purchasing edible oils and fat, consumers took into consideration following criteria: quality (66.02%), healthy (57.77%), packing (55.83%), low cholesterol (48.06%), brand (42.23%), being a known product (22.82%)

Table 5: Expenditure of households for oils and fat

Fat and oils	Income Groups									
	I		II		III		IV		Average	
	A	B	A	B	A	B	A	B	A	B
Butter	6.20	1.38	4.74	1.14	6.32	1.51	6.38	1.63	5.73	1.38
Margarine	0.85	0.19	0.66	0.16	0.66	0.16	0.31	0.08	0.59	0.14
Olive oil	1.16	0.26	3.18	0.77	4.13	0.98	4.21	1.08	3.43	0.83
Sunflower oil	3.04	0.67	2.02	0.49	1.94	0.46	2.63	0.67	2.29	0.55
Corn oil	4.00	0.89	2.55	0.62	2.44	0.58	1.37	0.35	2.41	0.58
Hazelnut oil	0.27	0.06	1.27	0.31	0.73	0.17	0.57	0.15	0.82	0.20
Mix. veg. oil	0.00	0.00	0.18	0.04	0.06	0.02	0.00	0.00	0.07	0.02
Soybean oil	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.04	0.04	0.01
Total	15.52	3.45	14.60	3.53	16.28	3.88	15.61	4.00	15.38	3.71

A: Per households (\$ month⁻¹), B: Per capita (\$ month⁻¹)

Table 6: Ratio of expenditure for oils and fat in total households income (%)

Fat and oils	Income Groups				
	I	II	III	IV	Average
Butter	2.04	0.87	0.75	0.48	0.73
Margarine	0.28	0.12	0.08	0.02	0.07
Olive oil	0.38	0.58	0.49	0.32	0.44
Sunflower oil	1.00	0.37	0.23	0.20	0.29
Corn oil	1.32	0.47	0.29	0.10	0.31
Hazelnut oil	0.09	0.23	0.09	0.04	0.10
Mix. veg. oil	0.00	0.03	0.01	0.00	0.01
Soybean oil	0.00	0.00	0.00	0.01	0.00
Total	5.11	2.67	1.94	1.17	1.95

Table 7: Places where households bought fat and oils (%)

Fat and oils	Local market Consumer			
	market	cooperatives	Supermarket	Others
Butter	46.93	5.44	45.58	12.93
Margarine	11.43	5.71	94.29	0.00
Olive oil	11.63	4.65	93.02	0.00
Sunflower oil	13.54	7.29	90.63	0.00
Corn oil	17.35	3.06	84.69	0.00
Hazelnut oil	5.56	8.33	91.67	0.00
Mix. veg. oil	0.00	0.00	100.00	0.00
Soybean oil	0.00	0.00	100.00	0.00

Table 8: Income Expenditure Elasticity (IEE) and Marginal Propensity to Consume (MPC)

Fat and oils	Functions	R ²	IEE	MPC
Butter	log y=-1.840±0.89 log x	0.523	0.8902	0.0067
Margarine	y=3.480±1.81 log x	0.218	2.1948	0.0049
Olive oil	log y=-2.380±1.07 log x	0.363	1.0715	0.0072
Oils*	log y=-0.543±0.467 log x	0.258	0.4669	0.0041
Total	log y=-1.290±0.849 log x	0.521	0.8493	0.0017

* Sunflower oil, corn oil, hazelnut oil, mixed vegetable oil and soybean oil

and cheap (19.42%), respectively. On the other hand, purchasing preferences of consumers were not affected by promotion (69.90%) and advertisement (66.02%). This means that consumers are conscious about oil and fat consumption.

Type of packaging preferred by households according to their importance order can be summarised as follows: 5 L plastic pet (52.43%), 250 g packet for margarine (32.52%), 5 L tin-box (25.54%), 2 L plastic pet (16.99%), 3 L plastic pet (13.59%), 1 L plastic pet (7.77%), 18 L tin-box (2.91%), 1 L tin-box (1.94%), 10 L tin-box (1.46%) and 10 L plastic pet (0.97).

Income-expenditure elasticity: In the calculation of income-expenditure elasticity; it was accepted that expenditure of households for oils and fat as dependent variable (Y) and income of households as independent variable (X).

Coefficient of determination (R^2) was calculated as 0.523 for butter, 0.218 for margarine, 0.363 for olive oil, 0.258 for oils and 0.521 for total edible oils and fat (Table 8). This means that, in the regression, household income explains about 52.10% of the variation in edible oils and fat expenditure (Table 8).

Income-expenditure elasticity was calculated as 0.8902 for butter, 2.1948 for margarine, 1.0715 for olive oil, 0.4669 for oils and 0.8493 for edible oils and fat as a whole. This means that if income of households increases by 1%, then expenditure of households for butter, margarine, olive oil, oils and whole of edible oils and fat will increase by 0.8902, 2.1948, 1.0715, 0.4669 and 0.8493%, respectively.

As a result of a study carried out in Adana province, income-expenditure elasticity were estimated as 0.67 for margarine, 0.72 for oils, 1.60 for olive oil, 1.78 for fresh butter and 0.90 for edible oil and fat as a whole^[3].

In the study, Marginal Propensity to Consume (MPC) for edible oils and fat consumption of households were estimated as 0.0067 for butter, 0.0049 for margarine, 0.0072 for olive oil, 0.0041 for oils and 0.0017 for edible oils and fat as a whole. This implies that if income of consumers increases by 1 USD, then oil expenditure of households (as USD) will increase by coefficient of MPC for all kinds of edible oil.

CONCLUSIONS

Findings show that edible oils and fat consumption per household and capita was lower in the study area than the average of Turkey. Oils has an important place in the composition of edible oils and fat consumption of households, but in recent years, there is a tendency towards olive oil and fresh butter. This situation explains that as parallel to increase in the conscious of consumers to health issues and information about contents of edible oils and fat, preferences of consumers have been changed.

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