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Study on Demand of Animal Protein Resources in Egypt

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Abstract

Agricultural is the principal source of food and some essential raw materials for industrial development. It accounts for almost 18-20% of the Egyptian gross domestic production, for about 17-19% of export earning and employs 32% of the workforce.

Increasing Egyptian demand for food yearly, due mainly to the growth of the population considers one of the reasons which caused raising imports. The red meat of staple food commodities that meet Egypt in the proportion of sufficiency was about 73.6% in 2011, having reached the quantities available for consumption of red meat about 1251 tons, while the average individual share of 15.3 kg / year in 2011, increasing an annual rate was about 1.25% during the study period (1992-2011). This shows that the high prices of red meat that makes the consumer to alternatives available in the markets where the average individual share of fish and poultry were about 18.9, and about 13.8 kg / year in 2011 respectively, while the annual growth rate was about 4.87% and 2.04% of fish and poultry, respectively during the period (1992-2011).

The shortage of providing food from animal protein is very important because it is one of the components of the major food necessary for human nutrition and the maintenance of health, it is access to sources of animal protein from red meat, poultry and fish, it is associated with the demand by increasing population, increasing expenditure income and the level of awareness of health and nutrition of the population, and increase the average per capita, with an average individual share consumption of red meat, fish and poultry in Egypt with about 13.63, 13.18 and 10.93 kg / year during the study period (1992-2011), while the annual growth rate was about 1.48%, 5.04%, 2.3%, respectively, which demonstrates that the rate of increase in population growth exceeded the rate of increase and improve the demand for red meat due to increase the incomes as a result of continuous rise in the price of red meat and low average per capita, resulting in the transformation of consumer to the alternatives available in the market of animal protein resources such as fish meat and poultry.

The study results showed that the demand for red meat using the Almost Ideal Demand System(AIDS) in Egypt during the study period (1992-2011) as follows:

- The most important factors affecting the demand for red meat in Egypt during the study period ware the average retail price of red meat, fish, poultry and expenditure on red meat.
- High proportion of expenditure for the Egyptian consumer on the red meat for fish and poultry which amounted to about 57.97%, 23.62% and 18.41% respectively, it means that consumer preference for red meat, fish and poultry in bridging the requirements of the animal protein products.
- Most of consumer income spent on red meat because the significant value of demand elasticity expenditure coefficient.
- The research showed that the value of the signal coefficient of price elasticity of demand cross - compensated that red meat and fish are considered alternative or competing commodities, thus raising the price of fish entail a reduction in the proportion of expenditure on red meat.
- The research showed also found that red meat and poultry are considered alternative or competing commodities, which increases the price of poultry, leading to increase in the proportion of expenditure on red meat.

Keywords*: Demand elasticity, animal protein, food commodities, consumption*

1 Introduction

Agricultural is the principal source of food and some essential raw materials for industrial development. It accounts for almost 18-20% of the Egyptian gross domestic production, for about 17-19% of export earning and employs 32% of the workforce.

The problem of providing food of animal protein is particularly important when policy makers productivity because it one of the components of the major food necessary for the human nutrition and the maintenance of health. It is access to sources of animal protein from red meat, white meat and fish products, but that Egypt is currently facing a relatively high production costs of red meat and a relatively high selling prices for consumer and decrease in response to production and presentation for a considerable increase in demand, as needed to encourage greater domestic production of fish and poultry as one of those alternatives. It is noted that expenditure on a particular commodity or group of certain food heavily influenced by the level of total expenditure on the sets of commodities and services.

2 Research problem

Increasing Egyptian demand for food yearly, due mainly to the growth of the population considers one of the reasons which caused raising imports. The red meat of staple food commodities that meet Egypt in the proportion of sufficiency was about 73.6% in 2011, having reached the quantities available for consumption of red meat about 1251 tons, while the average individual share of 15.3 kg / year in 2011, increasing an annual rate was about 1.25% during the study period (1992-2011). This shows that the high prices of red meat that makes the consumer to alternatives available in the markets where the average individual share of fish and poultry were about 18.9, and about 13.8 kg / year in 2011 respectively, while the annual growth rate was about 4.87% and 2.04% of fish and poultry, respectively during the period (1992-2011). - table (1), figure (1).

3 Source of data

Research was based on secondary data obtained from various sources. The study depends on data of time-series to estimate some economical coefficients. The most regularly available data for main Egyptian production and food consumption of meat, poultry and fish are time-series. The statistical data used in this research, are collected from the following sources:

1-Local sources like: Ministry of Agriculture, and Land Reclamation Cairo, Egypt, and Central Agency for Mobilization and Statistics, Cairo, Egypt.

2-Foreign sources like Food and Agriculture Organization of the United Nations, and the Arab Organization for Agricultural Development.

3-The research depends on some researches, studies and books related to research subject.

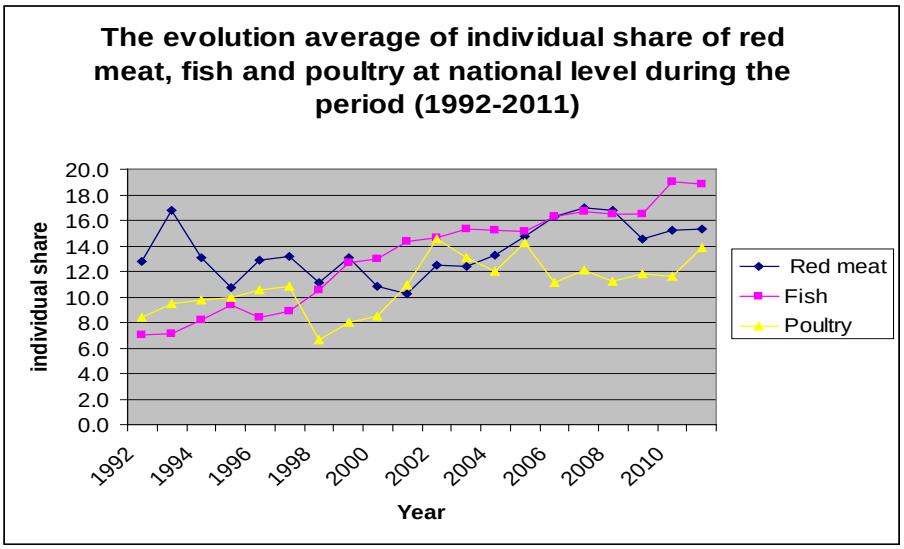
4 Research objectives

The research aims to evaluate the demand on red meat, poultry meat, and fish meat in Egypt during the period (1992-2011) using Almost Ideal Demand System (AIDS), to estimate the most important factors affecting the red meat demand based on the prices of red meat, poultry and, fish, analysis of the relationships between them in the light of competition in the percentage of expenditure them and estimate the demand elasticity on red meat, poultry and fish commodities.

Table 1. Individual share of meat group in Egypt during the period (1992-2011)(kg/year)

Years	Average of individual share		
	red meat	Poultry	fish
1992	12.8	8.4	7.0
1993	16.8	9.4	7.1
1994	13.1	9.7	8.2
1995	10.7	10.0	9.4
1996	12.9	10.6	8.4
1997	13.2	10.8	8.9
1998	11.1	6.7	10.5
1999	13.0	8.0	12.7
2000	10.8	8.5	13.0
2001	10.2	11.0	14.3
2002	12.5	14.6	14.6
2003	12.4	13.1	15.3
2004	13.2	12.0	15.2
2005	14.8	14.2	15.1
2006	16.3	11.2	16.2
2007	16.9	12.1	16.6
2008	16.1	10.8	14.9
2009	14.5	11.8	16.5
2010	15.2	11.6	19.0
2011	15.3	13.8	18.9
Average	**13.63**	**10.93**	**13.18**
Growth rate	**1.25**	**2.04**	**4.87**

Source: Compiled and computed from Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, the Central Administration Agrarian economy, Cairo, Egypt.



5 Methodology

Planning and evaluation require accurate data. Researchers, when confronted with a problem, will apply a research plan. By this plan, researchers come through a systematic approach to the desired results. The collection and analysis of data are in line which the problem defined and the objectives of the research. A general research design is given in fig. (1) (Poate & Daplyn, 1993).

Figure 1. The research plan

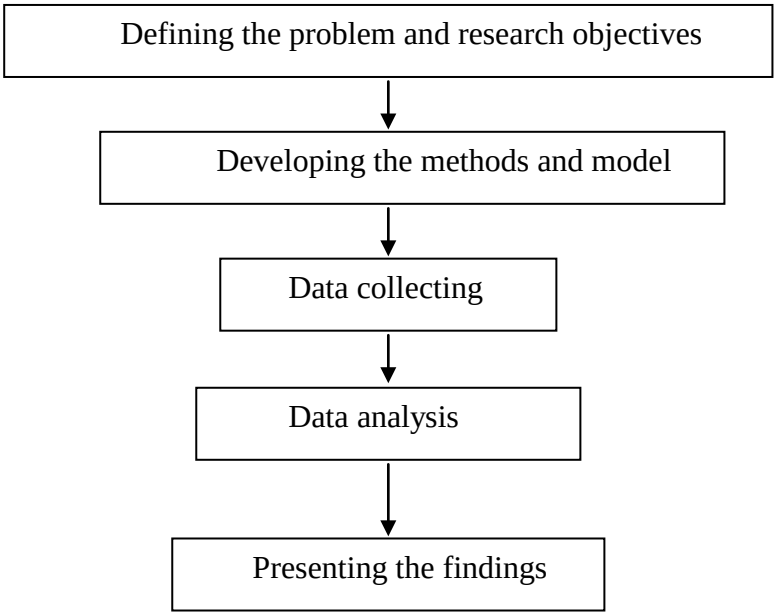


Figure 1. The research plan
Source: Kotler, P., 1988, P. 110

The research depends on descriptive and standard analysis methods, specially related to the estimation of simple and multiple regression coefficients, correlation coefficients, determination coefficients and null hypothesis tests.

The research estimate the demand of red meat, poultry and fish in Egypt during the study period (1992-2011) on the optimal use of the application form (AIDS) using the method of the Stones Price Index.

The model of (AIDS) is:

$$W_i = \alpha_i + \Sigma \gamma_{ij} \ln P_j + \beta_i \ln (E / P^*)$$

Where:

Wi : i per item of consumer expenditure on commodities in research subject.
E : total expenditure on commodities group in research subject.
Pj : current prices for a product j under consideration on the image algorithm.
γii, βi: estimated parameters of the model.
αi: fixed function.
P * : number of Stones Price Index, calculated from the following equation:

$$\ln P^* = \Sigma W_i \ln P_j$$

The research will be account some of important economic indicators such as, the demand elasticity's of price (own, cross and expenditure elasticity). Where it can not obtain these elasticity of the model estimated directly, because the coefficients of the model's response rates for income and not quantity, and these elasticity are in:

(1) Own price elasticity (εii):

It means what is known as non-compensated elasticity Marshall, which is estimated in light of changing prices without taking into account the impact on the real income of the consumer, calculated from the following model:

$$\varepsilon ii = -\delta ii + \frac{\gamma ii}{Wi} - \beta i \frac{Wj}{Wi}$$

Where:

δij = 1 if i = j, **Wi:** is the share of the item of expenditure, **γii, βi**: parameters are estimated from the model.

(2) Compensated cross price elasticity (έij):

It means what is known as compensated / elasticity Hicks - Slutsky, which are estimated in light of changing prices, taking into account the impact on the real income of the consumer, calculated from the following model:

$$\acute{\varepsilon}_{ij} = -\delta_{ij} + \frac{\gamma_{ij}}{W_i} - \beta_i \frac{W_j}{W_i}$$

Where: δij = zero if I # j.

(3) Expenditure elasticity (μi):

It is computed from the following model:

$$\mu_i = 1 + \frac{\beta_i}{W_i}$$

And the research can validate the results by making sure the relationship between the elasticity weighted share of meat commodity group as follows:

$$\sum_{i=1}^{n} \mu i \; Wi = 1$$

Where is the total elasticity expenditure of the total value of expenditure on commodity group equal the integer one?

Estimating the method the parameters of (AIDS):

To estimate the parameters of models of (AIDS) on red meat, poultry and fish in Egypt during the study period (1992-2011) is configured to three models which the dependent factor represents scale expenditure for groups of red meat, poultry and fish, whereas the independent factors were the price of red meat, fish and poultry, and the total expenditure on meat group on the case algorithm. The study has been using the following methods to estimate the model parameters to difference between them, namely:

(1) Seemingly Unrelated Regression (SUR)
(2) Three Stage Least Square (3SLS)
(3) Generalized Method of Moments (GMM)

Results and discussion:

Table (2) shows that the average expenditure on commodities under consideration during the study period (1992-2011) amounted to about 12.42, about 8.73 and about 6.80 million Egyptian pounds of red meat, poultry and fish, respectively, where the share of consumer expenditure on red meat, fish and poultry ware about 0.580, about 0.263 and about 0.184 respectively of the average total expenditure on meat group of about 36.95 million Egyptian pounds during the study period.

Table 2. The average expenditure of assessment of meat group in Egypt during the period (1992-2011)

Item	Average expenditure share (million pounds)	Expenditure share (thousand pounds)	% Expenditure share
Red meat	21.42	0.580	57.97
Fish	8.73	0.236	23.62
Poultry	6.80	0.184	18.41
Total	36.95	1.00	100

Source: Compiled and computed from table (1) in appendix.

Indicators of the demand function on meat group:

(1) Red meat

Table (3) shows that the value of determination coefficient of red meat in Egypt, was about 0.93, and this means that the changes in the prices of red meat, fish , poultry, and total consumer expenditure, explain about 93% of the changes in the proportion of expenditure on red meat and the rest of the changes are attributable to other factors. It was found that there is an inverse relationship between the price of red meat and the proportion of expenditure them, and this shows that the increase in the price of red meat by one pound / kg leads to decrease expenditure with about 0.23 pounds, assuming the stability of the rest of the other factors at a certain level, and it was also showing an inverse relationship between the price of fish and the proportion of expenditure on red meat as an increase in fish price by one pound / kg leads to lower expenditure on red meat with about 0.4599 pounds. The result of estimating showing an inverse relationship between the price of poultry and the proportion of expenditure on red meat as an increase in the price of poultry by one pound / kg leads to lower expenditure on red meat with about 0.1795 pounds, assuming the stability of the rest of other factors at a certain level.

The research showed that there is an inverse relationship between the total consumption expenditure on meat group and the proportion of consumption expenditure on red meat, which shows that an increase in total consumption expenditure on meat by one pound / kg leads to decrease consumer expenditure on red meat with about 1.1194 pounds per kg.

Table 3. Estimated parameters of (AIDS) [+] of meat group demand in Egypt during the period (1992-2011)

Item	Coefficients of logarithm expenditure	Coefficients of prices logarithm (Y_{ij})			R^2
	B_i	Meat	Fish	Poultry	
Meat	-1.1194 (7.78) **	-0.2300 (-2.57) **	-0.4599 (-15.11)**	-0.1759 (-4.39) **	0.934
Fish	1.0734 (4.72) **	-0.4599 (-15.11) **	0.4874 (12.25) **	0.0038 (0.16)	0.821
Poultry	0.0410 (0.25)	-0.1759 (-4.39) **	0.0038 (0.16)	0.1808 (5.63) **	0.481

Source: Compiled and calculated from: table (1) in Appendix.
+Search using the E-views 6.
*It significant at 0.05 level. **It significant at 0.01 level.
Numbers between bracts represent the (t) value.

The price elasticity of demand for red meat shows in table (4) , which any change in the price of red meat by 10% leads to decrease in the proportion of expenditure on red meat by 2.8%, assuming the stability of the rest of the other factors at a certain level. Therefore, the demand for red meat is not elasticity, as the relative change in the proportion of expenditure on red meat less than the relative change in the price of red meat.

Elasticity of cross demand in table (4) indicates that the change in the price of fish by 10% leads to decrease in the proportion of expenditure on red meat by 3.37% and that the relationship between red meat and fish is an alternative or competing commodities. While showing that the change in the price of poultry by 10% leads to increase in the proportion of expenditure on red meat by 5.20% and that the relationship between red meat and poultry is alternative or competing commodities.

For the elasticity of expenditure on red meat, the change in the total consumption expenditure on meat group by 10% leads to increase proportion of expenditure on red meat by 9.30%, assuming the stability of the rest of the other factors at a certain level. This shows that red meat is a necessary commodity and this means that the more consumer income greater proportion spent on that product at a greater rate than the rate of increase in income.

(2) Fish

Table (3) showed that the value of determination coefficient on fish in Egypt amounted to about 0.82, and this means that the changes in the prices of red meat, fish, poultry, and total consumer expenditure explains about 82% of the changes in the proportion of expenditure on fish, and other changes are attributable to other factors. It was found that there is a relationship between the price of fish and the proportion of expenditure them, and this shows that increasing of fish price by one pound / kg leads to increase expenditure by about 0.4874 pounds, assuming the stability of the rest of the other factors at a certain level. While showing an inverse relationship between the price of red meat and the high proportion of expenditure on fish as an increase in price of red meat by one pound / kg leads to reduce expenditure on fish with about 0.4599 pounds. While showing a positive relationship between the price of poultry and the proportion of expenditure on fish as an increase in the price of poultry by one pound / kg leads to increase expenditure on fish with about 0.0038 pounds, assuming the stability of the rest of other factors .

The study showed that there is a positive relationship between total consumption expenditure on meat group and the proportion of consumer expenditure for fish, suggesting that an increase in total consumption expenditure on meat by one pound / kg lead to increase in consumer expenditure for fish of about 1.0734 pounds per kg. The results showed the price elasticity of demand for fish that any change in fish prices by 10% leads to decrease in the proportion of expenditure on fish by 10% and assuming the stability of the rest of other factors at a certain level. Therefore, the demand for fish is not elasticity, as the relative change in the proportion of expenditure on fish less than the relative change in fish price - table (4).

For the cross - elasticity of demand, the change in the price of red meat by 10% leads to decline proportion of expenditure on fish by 4.58%, and therefore the relationship between red meat and fish are alternative or competing commodities. While the change in the prices of poultry by 10% leads to decrease proportion of expenditure on fish by 8.2% – table (4). For the elasticity on the expenditure of fish, the change in the total consumption expenditure on meat group by 10% leads to increase proportion of expenditure on fish by 55.4%, assuming the stability of the rest of the other factors at a certain level. This shows that the fish is a necessary commodity and this means that the more consumer income greater proportion spent on those commodities at a lower rate than the rate of increase in income.

(3) Poultry

Table (3) showed that the value of determination coefficient on poultry in Egypt amounted to about 0.481, and this means that the changes in the prices of red meat, fish, poultry, and total consumer expenditure, explain about 48.1% of the changes in the proportion of expenditure on poultry and other changes are attributable to other factors. It was found that there is a positive relationship between the price of poultry and the proportion of expenditure them, and this shows that the increase in the price of poultry by one pound / kg, leads to increase expenditure by about 0.1808 pounds, assuming the stability of the rest of the other factors at a certain level. While showing an inverse relationship between the price of red meat and the high proportion of expenditure on poultry as an increase in price of red meat by one pound / kg leads to reduce expenditure on poultry around 0.1759. As it turns out there is a positive relationship between the fish price and the proportion of expenditure on poultry as an increase in fish price with one pound / kg leads to increase expenditure on poultry around 0.0038 assuming the stability of the rest of the other factors at a certain level.

The study showed that there is a positive relationship between the total consumption expenditure on meat group and the proportion of consumer expenditure on poultry, which shows that an increase in total consumption expenditure on meat by one pound / kg leads to increase consumer expenditure on poultry with about 0.0410 pounds per kg.

Table (4) shows that the price elasticity of demand for poultry that any change in the prices of poultry by 10% leads to decrease in the proportion of expenditure on poultry by 5.90%, assuming the stability of the rest of the other factors at a certain level. Therefore, the demand for poultry is not elasticity, as the relative change in the proportion of expenditure on poultry less than the relative change in the prices of poultry.

As indicated from table (4), cross-elasticity of demand showed that a change in the price of red meat by 10% leads to lower expenditure on poultry by 10.8%, and therefore, the relationship between poultry and red meat is a complementary relationship. While the

change in fish prices by 10% leads to decrease proportion of expenditure on poultry by 3.20%.

For elasticity on the expenditure of poultry, the change in total consumer expenditure on meat group by 10% leads to an increase proportion of expenditure on poultry by 12.20%, assuming the stability of the rest of the other factors at a certain level. This shows that poultry is a competing commodity and this means that the more consumer income greater proportion spent on that product at a greater rate than the rate of increase in income.

Table 4. Expenditure and price elasticity of the (AIDS) on meat group in Egypt during the period (1992-2011)

Item	Expenditure elasticity M_i	Own price elasticity– non Compensated(E_{ii})			Cross Price elasticity - Compensated (E_{ij})		
		Meat	Fish	Poultry	Meat	Fish	Poultry
Meat	0.93	-0.28	0	0	0	0.337	0.052
Fish	5.54	0	-0.010	0	-4.58	0	-0.82
Poultry	1.22	0	0	- 0.059	-1.08	-0.032	0

Source: compiled and computed from: table (3) using the E-views 6.

Test results verify the conditions demand function of the estimated models:

Test is used Hausmann to detect the presence of relationship between the internal variables in the model real-time or not, on the basis of instrumental variables, which reflects the exogenous variables in the model variables in the right flank Right Hand Side, and the variable on the left can be one of the internal variables, then we experience significant transactions if it was not significant, it indicates that there was no relationship between them, and then estimated in a manner (OLS) without the need for real-time assessment of two phases.

Since there were quality test specifications for a form AIDS - test using Hausman Specification Test method OLS estimates of the stability of the application form for optimal AIDS. Which implies that the price variables internal variables Endogenous Variables, equilibrium value is determined through a system of appreciation as it is non-predetermined variables.

The results indicate that the greatest potential ratio test LRT to the possibility of rejecting hypotheses are enshrined both a lack of similarity or homogeneity, since the greatest probability ratio test LRT less than the calculated value of Chi square (χ^2) spreadsheets in the significant level 0.05. So it has been estimated consumption of red meat in Egypt during the period (1992-2011) using (AIDS) under the symmetry and homogeneity condition together - Table (5).

Table 5. Results of test requirements demand function using Almost Ideal Demand System (AIDS) on red meat in Egypt during the period (1992-2011)

AIDS Model	Logarithm of probability function LK	ratio test probability LRT	value of chi square χ^2
Without condition	97.8	-	-
With Homogeneity Condition	98.5	1.40	12.59
With Homogeneity and Symmetry Condition	98.5	1.40	16.92

Source: Compiled and computed from research results.

6 Research recommendations

(1) Related to the high elasticity expenditure of red meat should be requirement to expand the production of red meat to ensure their availability at prices suited to consumers with low incomes, as well as to encourage the breeding, production and fattening calves, and working to devise calves improved genetically and high productivity to ensure increased production of red meat.

(2) Interest in rearing calves, cows, sheep, and poultry to increase the production of them to achieve consumer requirements.

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Appendix 1. Evolution of Expenditure and retail prices of meat group in Egypt during the period (1992-2011)

Years	**Expenditure** (million LE*)			**Average Retail Prices** (LE / kg)		
	Red meat	**Fish**	**Poultry**	**Red meat**	**Fish**	**Poultry**
1992	7.655	1.796	2.832	10.50	4.50	5.90
1993	11.919	2.202	3.354	12.20	5.30	6.11
1994	10.075	2.827	3.674	12.90	5.80	6.35
1995	8.476	3.483	3.875	13.00	6.10	6.40
1996	11.709	3.346	4.236	14.60	6.40	6.45
1997	12.314	3.825	4.689	14.80	6.80	6.85
1998	10.883	4.952	3.053	15.20	7.30	7.10
1999	13.198	6.521	3.770	15.40	7.80	7.19
2000	11.154	7.017	4.056	15.60	8.20	7.25
2001	10.692	9.095	5.368	15.92	9.65	7.44
2002	14.287	8.094	7.344	17.28	8.35	7.60
2003	13.463	8.730	7.303	16.27	8.51	8.32
2004	17.537	9.138	9.628	18.92	8.59	11.48
2005	23.174	9.449	7.743	22.01	8.79	7.63
2006	25.772	10.310	7.168	21.88	8.79	8.90
2007	29.237	13.158	8.493	23.45	10.74	9.56
2008	42.091	13.629	10.378	33.65	11.84	12.40
2009	41.308	15.049	11.430	37.40	12.01	12.70
2010	47.888	19.786	11.582	40.48	13.36	12.84
2011	65.497	22.120	16.082	53.73	14.73	14.62
Average	**21.42**	**8.77**	**6.80**	**21.26**	**8.68**	**8.65**
Growth rate	**2.29**	**0.923**	**0.553**	**1.63**	**0.435**	**0.402**

(*) LE: Egyptian pound

Source: (1) Central Agency for Public Mobilization and Statistics, **Monthly Bulletin of the Average Food Prices at the Consumer in Egypt**, different volumes, Cairo, Egypt.

(2)Central Agency for Public Mobilization and Statistics, **Consumption of Goods in Egypt**, different volumes, Cairo, Egypt.