

## An Economic Study of the Demand Function for Wheat Imports in Egypt

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### ABSTRACT

The wheat crop is one of the most important strategic food grain crops in Egypt. Besides, it is considered the main food for all classes of the Egyptian people, especially those with limited income. It is used in the bread loaf industry in addition to the dependence of many food industries on wheat and its flour. The problem is that the local production of wheat crop is unable to meet local consumption. The ratio of its self-sufficiency reached 42%. In order to fill this gap, the country resorts to import from abroad by about 2432 million dollars in 2018. Moreover, the study aims to show the development of the productive situation of the wheat crop, the development of the food gap of the wheat crop and some factors affecting it in Egypt. This is in addition to estimating the self-sufficiency ratio, the quantity, and value of imports during the period and studying the demand function for wheat imports and the food security factor of wheat. Besides, the study used both descriptive and quantitative analysis to study the previous factors

.Consequently, the study showed an increase in the total production, total consumption and average per capita with a statistically significant increase of about 160.2, 507.57 thousand tons, 1,41 kg, respectively. This is in addition to the increase in the size of the gap, the amount of imports and the stock size with a statistically significant increase estimated at 316.72, 402.43, 222.97 thousand tons annually, respectively. Moreover, the value of imports increased with a statistically significant increase during the study period by about 134.93 million dollars.

By estimating the function of the demand for imports of wheat using the logarithmic state, it became obviously clear that the most important determinants of the quantities imported from wheat are the population, the amount of consumption, and the amount of production. It is important to mention in this context that it has been proven that there is a direct relationship between the population and the quantity of imports and an inverse relationship between the quantity of production and both consumption and production. Besides, by estimating the food security coefficient of wheat, it turned out to be about - 0.051. This indicates that the value of the food security coefficient is less than zero, which reflects the food insecurity situation of wheat. Therefore, it is necessary to work with the relevant state agencies to increase the food security factor of wheat. This can be done by expanding its cultivation and working to raise its productivity. This is in addition to find a fair price for farmers to encourage its cultivation and supply to the state and attention to rationalizing consumption and finding appropriate alternatives, in order to create an accumulation in the strategic stock that is sufficient for local consumption to achieve food security of wheat in Egypt.

**Keywords:** Wheat, Demand Function, Food Security Factor

### Introduction

The wheat crop is one of the most important strategic food grain crops in Egypt. Besides, it is considered the main food for all classes of the Egyptian people, especially those with limited income. It is used in the bread loaf industry in addition to the dependence of many food industries on wheat and its flour. Moreover, the demand for it is conspicuously increasing, especially with the steady population increase and the limited resources in Egypt. Egypt suffers from a continuous gap in this crop. It is noteworthy that increasing production, whether by vertical and horizontal expansion, consumption rationalization, and reducing losses, is the way to increase the self- sufficiency and reducing its food gap. Additionally, the wheat crop is considered one of the most important commodities of agricultural food imports.

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### **Problem of the Study**

The problem is that the local production of wheat crop is unable to meet local consumption. The ratio of its self-sufficiency reached 42% in 2018. Consequently, the result is a food gap from the wheat crop. In order to fill this gap, the country resorts to import from abroad. The value of wheat imports is estimated at about 2.43 billion Egyptian pound in 2018. Thus, it may increase the burden on the balance of payments. This necessitates studying the current situation of the wheat crop in Egypt and various ways to reduce its food gap.

### **Objective of the Study**

Here is a statement of the development of the productive situation of the wheat crop, the development of the food gap of the wheat crop and some factors affecting it in Egypt. This is in addition to estimating the self-sufficiency ratio, the quantity, and value of imports during the period (2000 - 2018), and studying the demand function for wheat imports and the food security factor of wheat.

### **Methodology and Data Sources of the Study**

The study used the descriptive analysis approach in describing the problem. This is in addition to the quantitative analysis using some different measurements such as the general trend that was used in studying the development of some productive and consumer indicators of wheat, as well as the multiple regression in its double logarithmic state to estimate the demand function for wheat imports in Egypt. Moreover, the study relied on secondary data collected from the Central Agency for Public Mobilization and Statistics, the Ministry of Agriculture and Land Reclamation as well as the secondary data published on the websites of the international networks of information.

### **Economic Indicators of Wheat Crop in Egypt**

#### **Total Production**

Table (1) shows an increase in wheat production from about 6255 thousand tons in 2001, as a minimum, to about 9608 thousand tons in 2015 as a maximum. The increase in production is with a statistically significant annual increase by about 160.2 thousand tons. Table (2) shows an increase by about 1.99% of the average of about 8054 thousand tons. This increase is mainly due to the increase the area during the study period 2000-2018.

#### **Total Consumption**

Table (1) data indicates an increase in the total consumption of wheat by about 9819 thousand tons in 2001, as a minimum, to about 19975 thousand tons, as a maximum, in 2018. This was with a statistically significant annual increase of a total of about 507.75 thousand tons per year and a growth rate of about 3.41% of the annual average that was about 14887 million tons as shown in Table (2). This is due to the high population in the first place. Besides, we have the consumer preference for wheat crop as a food pattern for the majority of the Egyptian people. Moreover, there is the expansion of the food industry, which depends on the wheat crop and its products as a raw material.

#### **Average per Capita**

Table (1) shows that the average per capita share of wheat ranged between a minimum of about 163 kg / year in the year 2000, and a maximum of about 186 kg / year in 2015, with an average period of study by about (175.92 kg). Table (2) shows that the increase of annual average per capita of wheat with a statistically significant increase by about 1.41 km1. It is equivalent to about 0.80% of the average of about 175.92 kg / year during the study period (2000-2018).

#### **Size of the Wheat Gap**

Table (1) shows an increase in the gap size of wheat crop from about 3564 thousand tons in 2001 as a minimum to about 10092 thousand tons in 2018 as a maximum during the study period. Besides, Table (2) shows an increase in the gap size of wheat crop by about 316.72 thousand tons per year. It is equivalent to about 4.38% of the average of about 7224 thousand tons.

**Table 1:** Economic Indicators of Wheat Crop in Egypt during the Period (2000-2018)

Year	Total Production (Thousand Tons)	Available for Consumption (Thousand Tons)	Share Per Capita / kg	Self-sufficiency %
2000	6564	11114	163.0	59.1
2001	6255	9819	165.2	63.7
2002	6625	11625	169.0	57.0
2003	6845	10936	167.1	62.6
2004	7178	11754	166.7	61.1
2005	8141	13353	165.0	61.0
2006	8274	14257	167.2	58.0
2007	7379	13773	170.2	53.6
2008	7977	14546	177.0	54.8
2009	8523	14592	181.9	58.4
2010	7169	14978	180.4	47.9
2011	8370	16878	182.2	49.6
2012	8795	15657	183.7	56.2
2013	9460	17210	179.7	55.0
2014	9280	17025	182.3	54.5
2015	9608	17800	186.0	54.0
2016	9355	18000	184.1	52.0
2017	8770	18723	185.9	45.0
2018	8450	19975	186.0	42.0
Average	8054	14887	175.92	55.2

**Table 1:** Continued

Year	Wheat Gap (Thousand Tons)	Amount of Imports (Thousand Tons)	Value of Imports (Million Dollars)	Stock (Thousand Tons)
2000	4550	4896	713	1910
2001	3564	4413	667	1795
2002	5000	5575	816	1532
2003	4091	4057	607	1254
2004	4576	4367	728	1977
2005	5212	5688	924	3258
2006	5983	8004	1368	4011
2007	6395	8242	2160	4208
2008	6569	8328	2462	4566
2009	6069	9121	2570	5231
2010	7809	10594	2598	5557
2011	8508	9800	3331	6113
2012	6862	8300	2511	5918
2013	7750	10170	3139	6710
2014	7745	9423	2994	7148
2015	8192	9686	2569	4336
2016	8645	10788	2254	4052
2017	9368	11026	2355	3902
2018	10092	11200	2432	4568
Average	7224	8088	1963	1910

**Source:**

- Ministry of Agriculture and Land Reclamation - Economic Affairs Sector - Agricultural Economics Publications - Various Issues
- Central Agency for Public Mobilization and Statistics - Annual Statistical Book - Various Issues

**Table 2:** Equations of the General Time Trend of Economic Indicators of Wheat in Egypt during the Period (2000-2018)

Indicator	Equation	R <sup>2</sup>	F	T
Production (Thousand Tons)	$\hat{Y}=6451.74+160.18x_i$	0.726	44.973	6.706**
Consumption (Thousand Tons)	$\hat{Y}=9765.44++507.75x_i$	0.958	383.933	19.594**
Share Per Capita (kg / Year)	$\hat{Y}=161.80+1.41x_i$	0.874	117.821	10.855**
Self-sufficiency %	$\hat{Y}=63.22-0.82x_i$	0.628	28.702	-5.357**
Wheat Gap (Thousand Tons)	$\hat{Y}=3515.95+316.72x_i$	0.904	161.111	12.653**
Amount of Imports (Thousand Tons)	$\hat{Y}=4064.05+402.43x_i$	0.853	86.020	9.257**
Value of Imports (Thousand Tons)	$\hat{Y}=608.49+134.93x_i$	0.654	32.193	5.674**
Stock (Thousand Tons)	$\hat{Y}=1877.95+222.97x_i$	0.493	16.559	4.669**

Where  $\hat{Y}$  indicates the estimated value of the dependent variable.

$X_i$  denotes the time element as an independent variable where  $i$  (1, 2, 3, 4 ... 19)

\*\* Significant at the level of 1%.

Source: Calculated from Table (1) .

### Import Quantity

Table (1) shows an increase in the amount of imports of wheat crop from about 4057 thousand tons in 2003, as a minimum, to about 11200 thousand tons in 2018, as a maximum, during the study period. Besides, Table No. (2) Shows a statistically significant increase in the amount of imports by about 402.43 thousand tons per year. It is equivalent to about 4.98% of the average of 8088 thousand tons.

### Import Value

Table (1) conspicuously shows an increase in the value of imports of wheat crop from about 607 thousand tons in 2003, as a minimum, to about 3331 million dollars in 2011, as a maximum, during the study period. Moreover, Table (2) shows a statistically significant increase in the value of imports by about 134.93 million dollars annually. It is equivalent to about 6.87% of the average of about 1963 million dollar.

### Stock Size

Table (1) shows an increase in the volume of the wheat crop from about 1254 thousand tons in 2003, as a minimum, to about 7148 tons in 2014, as a maximum, during the study period. Besides, Table (2) shows a statistically significant increase in -the volume of stock by about 222.97 thousand tons per year. It is equivalent to about 11.67% of the average of about 1910 thousand tons.

### Statistical Estimation of the Demand Function for Wheat Imports in Egypt

Through studying the relationship between the amount of wheat imports at the national level as a dependent variable, and the most important explanatory factors whose effect on this dependent variable is believed to be represented in (production, consumption, stock size, price per ton of imports, population) during the period ( 2018-2001) .

It turns out that the most appropriate mathematical formula expressing this relationship is (Stepwise), which can be written in the following form:

$$\ln Y = 0.010 + 1.538 \ln X_6 - 0.282 \ln X_3 - 0.904 \ln X_1$$

$$(6.001)** \quad (3.757)** \quad (-2.452)**$$

$$R^2 = 0.938 \quad F = 75.123$$

Whereas:

$Y$  = wheat imports by thousand tons

$X_1$  = the amount of wheat production by thousand tons

$X_3$  = wheat consumption by thousand tons

$X_6$  = population by million people

The results of this model conspicuously indicate that the most important determinants of imported quantities of wheat are population, consumption, and amount of production.

The value of the determining factor for the estimated model was about 0.938, which means that about 93.8% of the changes that occur in the quantity of wheat imports are due to the change in these

independent variables. Moreover, the model shows that there is a direct relationship between the population and the amount of imports. With a population increase of 1%, the amount of imports increases by 1.538%. Besides, the results indicate an inverse relationship between the consumption of wheat and the amount of imports as an increase of the variable by 1% leads to a decrease in the amount of imports by 0.282%. There is also an inverse relationship between the amount of wheat production and the amount of imports as an increase of a variable by 1% leads to a decrease in the amount of imports by 0.904%.

#### **Food Security Coefficient:**

By estimating the food security coefficient of wheat, as a ratio between the sum of the strategic stock size of about 1910 thousand tons to the annual local consumption average estimated at 14887 thousand tons, or as a ratio between the annual change in the volume of the strategic stock to the annual local consumption. It turned out to be about - 0.051. This indicates that the value of the food security factor is less than zero, which reflects the food insecurity situation of wheat. Therefore, it is necessary to work with the relevant state agencies to increase the food security factor of wheat. This can be done by expanding its cultivation and working to raise its productivity. This is in addition to find a fair price for farmers to encourage its cultivation and supply to the state and attention to rationalizing consumption and finding appropriate alternatives, in order to create an accumulation in the strategic stock that is sufficient for local consumption to achieve food security of wheat in Egypt as shown in **Table (3)**.

**Table 3:** Strategic Stock and Food Security Coefficient for Wheat during the Period (2000-2018)

Years	Stock Size (Thousand Tons)	Stock Change (Thousand Tons)	Available for Consumption (Thousand Tons)	Food Security Coefficient*
2000	1910	-	-	-
2001	1795	-115	9819	-0.012
2002	1532	-263	11625	-0.022
2003	1254	-278	10936	-.025
2004	1977	723	11754	0.062
2005	3258	1281	13353	0.096
2006	4011	753	14257	0,053
2007	4208	197	13773	0,014
2008	4566	358	14546	0.025
2009	5231	665	14592	0.046
2010	5557	326	14978	0.022
2011	6113	556	16878	0.033
2012	5918	-195	15657	- 0.012
2013	6710	792	17210	0.046
2014	7148	438	17025	0.026
2015	4336	-2812	17800	-0.158
2016	4052	-284	18000	-0.0158
2017	3902	-150	19558	-0.008
2018	4568	666	19975	0.0333
<b>Average</b>	1910	-762	14887	-0.051

(\*) The ratio of Stock Change to consumption.of production.

Source: Collected and calculated from Table No. (1)

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