# An Analytical Economic Study of Wheat Gap in Egypt

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**Abstract:** The wheat crop one of the most important strategic crops in the Egyptian agriculture, the area represents about 18% of the total crop area, and more than 43.9% of the winter crop area, where the total area cultivated with wheat was about 3.23 million Feddan in 2012, with an increase of approximately 39.6% of what was in 1991. The output reached about 8.07 million tons, with an increase of about 28.7% for the same year. The state aims to use modern techniques in agriculture to increase production and stability through more efficient using of production factors, improving the management and maintenance of the available farm resources. The study aims is to analyze the economic situation of the wheat crop including the cost structure of wheat distributed on the production requirements, as well as to estimate the function of the cost of wheat. In addition to, the analysis of the structure of production and yields of wheat crop and assess the function of wheat consumption in Egypt, as well as estimating the wheat gap, the proportion of self-sufficiency and means of narrowing the wheat gap in Egypt. The study showed that the most important elements of the cost of production of wheat in terms of the relative importance is human labor, employment and automated work, chemical fertilizer and seed, expenses, pesticides, farmyard manure, and animal working, which contribute to those elements in the variable costs of Feddan of wheat, equivalent to approximately 33.9%, 22.7%, 18.1%, 9.7%, 9.2 %, 4.2%, 3.5%, 0.3%, respectively. The study found that the fixed costs (rental value), and variable costs of Feddan of wheat accounted for about 40.5%, 59.5%, respectively of the average of the total costs for wheat. Also, contribute to farm work, and production requirements in the variable costs of wheat per Feddan estimated at 56.9%, 43.1 %, respectively. This means that the higher total costs for Feddan of wheat in Egypt came from higher variable costs and fixed costs (rental value), especially after the application of the law relating to rental between landlord and tenant. As the study showed that, the average yield per Feddan amounted to about 17.76 ardabs / Feddan (ardab=179kg), which means that all farmers outnumbered the ideal size, and they can use high levels of technology to increase production , reduce costs, and maximize profit.The average net return of Feddan of wheat is about 2674.5 Egyptian pounds, represents about 42.9 % of the total return, the net return per Feddan of wheat amounted to about 58.2 %, and to 42% of the total return of Feddan of wheat in both 1991 and 2012. This explains the decrease in net earnings for Feddan of wheat changing high production costs in general, the most important production inputs, high fixed costs represented in the rent.It was found that the most important factors affecting the overall wheat production is the amount of seed (X3) in kg, chemical fertilizer (x4) by Nitrogen unity, each of which increased by 10 % leads to an increase in total output by about 5.2 %, 4.8 %, respectively. The consumption of wheat crop amounted to 8.87 million tons in 1991, and grew until it reached about 18.10 million tons in 2012, with an increase of about 6.40 %, and the national consumption of wheat decreased with an annual rate of statistically significant amounted to 6.3 million tons, representing about 40.1 % of the average national consumption of wheat crop and of around 15.1 million tons. The most important factors affecting the consumption of wheat is 1 - Inhabitants: - has increased from 55.6 million in 1991 as a minimum to about 87.2 million people in 2012 as Maximum with an increase percentage of 63.7%, 2 - personal income : has increased from 824.4 Egyptian pounds in 1991 to about 1902.5 Egyptian pounds in 2012, with an increase percentage of about 33.8% ,3 - retail Price: the ardab of wheat in real terms has decreased from 43 Egyptian pounds in 1991 to about 35.9 Egyptian pounds in 2012, a reduced rate of about 22.8 % .The average per capita consumption of wheat: - has amounted to about 159.5 kgs in 1991, and then taking in volatility, rose to about 207.5 kgs in 2012, with an increase of about 30.1%. which, show that there is an annual increase statistically significant in average per capita consumption of wheat amounted to about 1.7 kgs, and the influential factors on the national consumption of wheat is to increase the population by 10 % leading to an increase in the amount consumed of wheat by 13.8 % . As the personal income increased by 10 % leads to an increase in the amount consumed of wheat by 5.3 %, as well as, the increase of the price of wheat per ardab in real terms by 10% leads to a lack of quantity consumed of wheat increased by 13.5%. While, the wheat gap amounted to 4.39 million tons in 1991, and then took in the oscillation until amounted to 10.03 million tons in 2012, with an increase of about 28.5 %, and the proportion of wheat self - sufficiency in these two years amounted to about 50.5 %, 44.6 %, respectively. That means to overcome the wheat gap is the supply response to the wheat crop: i.e. the increase in the price of ardab of wheat by about 100 Egyptian pounds, leads to increase the area of wheat by about 818 thousand Feddans in the following year. This area leads to increase the total production of wheat, which estimated at 2.17 million tons, which works to fill about 30 % of the size of the wheat gap in Egypt. In addition to reduce the area of alfalfa sustained, where they can bring untraditional feed especially maize silage instead of clover, where a high nutritional value. A feddan corn gave about 15 tons of silage of corn

after transactions by venire and urea. The study concluded that the state, must apply growing of the horizontally expansion of wheat crop in each of the new reclaimed land to increase the cultivated area, and the abolition of compulsory supply. While, in the old lands reducing alfalfa area by cultivating area with wheat. In addition to apply the vertical expansion in wheat by following the technical recommendations on new varieties, irrigation, fertilization, planting dates and reducing production costs. Also, increasing the awareness of farms to reduce wastage of wheat during and after harvest, rationalizing consumption of wheat and adoptting appropriate pricing policy to increase the cultivated area, the announcement of the price of wheat before the date of agriculture by enough time and replacement of silage maize instead of alfalfa in animal feed. Finally the full emancipation of the prices of production inputs and the abolition of support in return for full liberalization of the final product prices according to market mechanisms and the abolition of the crop composition, as well as the expansion in the development of new varieties and breeds suitable for high productivity and bear the high temperature region of Upper Egypt and the desert land.

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**Introduction:-**

The problem of food shortage in Egypt is one of the main problems facing the national economy, due to the widening gap between production and consumption, trying to overcome this gap by increasing imports, which require a great deal of foreign exchange as reflected in its impact on the rates of economic development. A wheat crop plays a key role in the value and size of the food gap, where the wheat crop is one of the main crops, in the Egyptian agriculture, representing a total area of about 18 % of the crops, and more than 43.9 % of the winter crop area. Wheat crop represents a particular importance of the Egyptian society, where the bread is presenting the main meal of the population, and the main source of energy that they receive.

The amount of wheat imports are counted by about 11.7 million tons, as wheat imports represent the greatest value of total food imports which are counted by about 13241.4 million Egyptian pounds in 2012, which is one of the burdens of the state.

To cultivate larger areas of wheat, it require changing some of the agricultural policies, and cutting off some winter crops which compete with wheat. Where the total area cultivated with wheat was about 3.23 million Feddans (Feddan=4200 $m^2$) in 2012, the production of wheat has reached about 8.07 million tons in the same year.

The study shows the relative importance of the provinces of wheat production grown in the Valley about 2.81 thousand Feddans (represent about 91.5 %), while the remaining were distributed by (8.5 %) outside the Valley. The Sharqia Governorate has come successfully ranked as the first. The wheat area had a relative importance of 12.25 %, followed by the Dakahlia Governorate with a relative importance of 9.77 %, then the Beheira Governorate by about 9.49%, and Kafr el - Sheikh Governorate by about 7.57%. The results showed that the Giza Governorate has achieved a maximum productivity per Feddan, amounting to an average of about 2.99 tons / Feddan.

The State aims at using modern techniques in agriculture to increase production and stability, through more efficient use of factors of production, improving the management and maintaining the available farm resources.

**Problem of the study: -**

The state now attaches great expansion in the cultivation of wheat in the new lands or the expansion of the old land at the expense of reducing some competition winter crops areas, like barely, faba bean, and alfalfa or vertical expansion of the cultivation of high productive modern varieties. However, the quantity of wheat production was still unable to pursue the continuous increase in the consumption, where the total amount of wheat output was of about 8.07 million tons, while the quantities consumed from wheat was about 18.1 million tons. This means that the deficit amounted to about 10.03 million tons of wheat, which equates to about 55% of the amount of domestic consumption during the period 1991-2012. This deficit forced the state to import wheat to cover the deficit, and this requires a great deal of foreign exchange annually, which is a burden on the state budget and balance of payments in the Egyptian economy.

**Objective of the study: -**

The study aims at identifying the productive alleged situation for the wheat crop and the determinants of its production in Egypt, including that the development of each of the area, productivity and production. As well as, the possibility to increase productivity to meet the growing demand, in addition to analyze the economic situation of the wheat crop including the cost structure of wheat distributed production requirements. Also, to estimate the function of the cost of wheat, and the analysis of the structure production and wheat crop yields. In

addition to estimate the functions of wheat consumption, the wheat gap, self-sufficiency and the means of narrow wheat gap in Egypt.

**Methodology and data sources:-**

The study relied on methods of descriptive and quantitative economic analysis, in addition to methods of statistical analysis, style of the general trend and simple and multiple regression to estimate the production function. As the study relied on secondary published and unpublished data, which was assembled as a series of time during the period 1991 - 2012 through bulletins of Central Agency for Public Mobilization and General statistics, bulletins of economic sector of the Ministry of Agriculture and land Reclamation. The real income indices were calculated for living expenses, and the real price indices for wholesale prices.

**Discussion of Results: -**

**First: the analysis of production and returns of wheat crop: -**

**The development of the area of the wheat crop:**

As shown in Table (1) that, the area of wheat in Egypt amounted to about 2.22 million Feddans in 1991, and increased until it reached 3.2 million Feddans in 2012, with an increase of about 39.6% in 1991. As shown in equation (1) and in table (2) that there is a general trend Ascending statistically significant at the level (0.01) in the wheat area of 0.061 million Feddans, representing about 1.8% of the average area of wheat in Egypt and about 2.9 million Feddans during the study period, as the coefficient of determination rate ($R^2$) was about 0.07.

**Development of the wheat Productivity per Feddan:**

As shown in Table (1) that, the productivity of wheat per feddan amounted to 2.02 tons in 1991, and increased amounted to about 2.60 tons in 2012, with an increase of about 28.7%. As shown in equation (2) and Table (2) that, there is a growing trend, statistically significant at the level of significance (0.01) in the production of wheat in Egypt by 0.031 ton/Feddan, representing about 1.16% of the average productivity of wheat per Feddan of about 2.66 tons during the study period, the total rate coefficient of determination ($R^2$)was about 0.0712.

**Development of the overall productivity of wheat:-**

As shown in Table (1) that the total production of wheat amounted is about 4.48 million tons in 1991, and is growing to 8.07 million tons in 2012, with an increase of approximately 80.1%. As shown in equation (3) and in table (2) that, there is a general trend of growing and statistically significant at the level of (0.01). The total production of wheat increased by 0.188 million tons, representing about 2.98% of the average wheat production in Egypt of about 6.3 million tons during the study period. Moreover, the coefficient of determination $R^2$ was around 0.884

**The development of total yield of wheat crop:**

As shown in Table (1) that the overall return of wheat amounted to about 1345 Egyptian pounds in 1991, and grew until it reached about 7953 Egyptian pounds in 2012 with an increase of approximately 591.3%. As shown by equation (4) and table (2) that, the total return of wheat increased at an annual rate, statistically significant at the level of significance (0.01) amounted to 300.94 Egyptian pounds/Feddan, representing about 4.82% of the average of the total return of the wheat crop of about 6235.1 Egyptian pounds/Feddan during the study period, as the coefficient of determination rate ($R^2$) was about 0.951.

**Evaluation of the net yield of wheat crop:**

As shown in Table (1) that, the net yield of wheat crop amounted to about 782.6 Egyptian pounds / Feddan in 1991, and grew until it reached about 3221 Egyptian pounds / Feddan in 2012, with an increase of about 411.5%. As shown by equation (5) and in the table (2) that, the net yield of wheat crop increased with an annual rate, statistically significant at the level of significance (0.01) amounted to 131.35 Egyptian pounds/Feddan, representing about 4.91% of the average net yield of wheat crop of about 2674.5 Egyptian pounds/Feddan during the study period, which represent around 42.8% of the total yield of wheat Feddan. As the coefficient of determination rate $R^2$ was about 0.715. It is clear that the net Feddan of wheat yield of about 58.2%, 42% of the total yield of wheat per Feddan in 1991, 2012, respectively, and explains this decline in net Feddan of wheat yield high production costs in general, and changing the most important production inputs, high fixed costs represented in the rent.

**Second:**

**Analysis of the costs of wheat production in Egypt:**

Wheat production costs consist of human, animal and automated works, and production supplies include seed, farmyard manure, chemical pesticides and others.

**Evaluation of farm labor costs: -**

As seen from the table (3) that, the cost of farm labor amounted to about 289.9 Egyptian pounds/Feddan for the wheat crop in 1991, then rose to about 1583 Egyptian pounds / Feddan in 2012, with an increase of about 54.6 %. The average cost of labor farm during the study period (1991 -2012) was about 1196.3 Egyptian pounds / Feddan of wheat, accounting for about 56.9 % of the average variable costs of Feddan of wheat, of about 2101.7 Egyptian pounds. As the human cost of the work, was about 170 Egyptian pounds / Feddan of wheat in 1991, then

rose to around 975 Egyptian pounds / Feddan in 2011, representing an increase of about 57.4 %. As shown in equation (1) and in the table (4) that, the cost of human labor for wheat was cultivated with an annual rate of at statistically significant at level (0.01) amounted to about 33.50 Egyptian pounds/Feddan, representing about 7.7% of average human work the cost of about 707.6 Egyptian pounds Feddan, which represents about 33.9 % of the average variable costs for wheat Feddan of about 2101.7 during the same study period, as the coefficient of determination rate $R^2$ was about 0.77. Moreover, the cost of animal work was about 5.2 Egyptian pounds / Feddan of wheat in 1991, and rose to about 8.0 Egyptian pounds / Feddan in 2012, with an increase of about 15.4 %. As shown in equation (2) and in the table (4) that, the cost of animal work for wheat was declining at an annual rate not statistically significant. Moreover, the cost of the automated work is about 114.7 Egyptian pounds / Feddan of wheat in 1991, rose to about 600 Egyptian pounds / Feddan in 2012, with an increase of about 52.3%. As illustrated in equation (3) and in the table (4) that, the cost of automation for cultivating wheat, with annual rate statistically significant at the level of significance (0.01) was about 4.1 % of the average labor cost for automated wheat crop of about 476.7 Egyptian pounds / Feddan, which represent about 22.7 % of the average variable costs for wheat Feddan, during the study period as coefficient of determination rate $R^2$ was about 0.84. So, it is clear that the cost of human labor and automation is the most influential factor in the cost of farm labor and hence in variable costs.

**Development of production supplies:**

As seen from the table (3) that the cost of production inputs amounted to about 176.9 Egyptian pounds / Feddan of wheat crop in 1991, then rose to about 1229 Egyptian pounds / Feddan in 2012, with an increase of about 69.5% .

These costs are distributed over seeds, farmyard manure, chemical pesticides and total cost of seed for about 44.4 Egyptian pounds / Feddan in 1991, then rose to around 246 Egyptian pounds / Feddan in 2012, an increase of about 55.4 % .

As shown equation (4) in the table (4) that the cost of seed of wheat is cultivated had an annual rate, statistically significant at the level of significance (0.01) was about 53.4 Egyptian pounds / Feddan , representing about 26.1% of the average cost of wheat seeds of about 204.2 Egyptian pounds / Feddan, which represents about 9.7 % of the average variable costs of wheat per Feddan of about 2101.7 Egyptian pounds during the same period of the study, as was the coefficient of determination $R^2$ average was about 0.79.

The total cost of farmyard manure about 20.5 Egyptian pounds / Feddan of wheat in 1991, rose to about 128 Egyptian pounds / Feddan in 2012, an increase of about 62.4 %.

As illustrated in equation (5) in the table (4) that the cost of farmyard manure for wheat is growing at an annual rate significant statistically at level of significance (0.01), was about 9.4 Egyptian pounds / Feddan (represent about 12.5% of the average cost of farmyard manure for wheat) of about 74 , 5 Egyptian pounds / Feddan, which represents 3.5 % of the average variable costs for wheat Feddan during the same study period, as was the coefficient of determination $R^2$ average was about 0.77.

The total cost of chemical fertilizer for wheat is about 73.1 Egyptian pounds / Feddan of wheat in 1991, then rose to about 465 Egyptian pounds / Feddan in 2012, with an increase of about 63.6 %.

As shown in table (3) and the equation (6) in the table (4) that the cost of chemical fertilizer for wheat is growing at an annual rate of statistically significant at the level of significance (0.01) was about 3.24 Egyptian pounds / Feddan (represents about 0.85% of the average cost of chemical fertilizer for wheat) of about 379.1 Egyptian pounds / Feddan, which represent 18.1 % of the average variable costs of wheat per Feddan during the same study period, as was the coefficient of determination average $R^2$ was about 0.62.

The total cost of pesticides, about 2.3 Egyptian pounds / Feddan of wheat in 1991, then rose to about 125 Egyptian pounds / Feddan in 2012, with an increase of about 54.3%.

As shown in table (3) and equation (7) in the table (4) that the cost of pesticides for wheat is growing with an annual rate statistically significant at the level of (0.01), amounted to about 16.75 Egyptian pounds / Feddan, (represents about 19.1 % of the average cost of pesticides for wheat) of about 87.8 Egyptian pounds / Feddan , which represent 4.2 % of the average variable costs of Feddan of wheat during the same study period , as was the coefficient of determination average $R^2$ was about 0.74.

The total cost of overheads is about 36.6 Egyptian pounds / Feddan of wheat in 1991, then rose to about 265 Egyptian pounds / Feddan in 2012, with an increase of about 73%.

As shown in table (3) shows equation (8) table (4) that the expenses of wheat which is growing, at an annual rate statistically significant at the level of significance (0.01) was about 5.19 Egyptian pounds / Feddan, (represents about 2.6 % of the average cost of overheads for wheat) of about 193.1 Egyptian pounds / Feddan, which represents 9.2 % of the average variable costs per Feddan of wheat during the study

period, as was the coefficient of determination average $R^2$ was around 0.78.

As seen from the foregoing that the most important elements of the cost of production of wheat in terms of the relative importance is human labor and employment, automated, chemical fertilizer and seeds. As well as, the expenses, pesticides, farmyard manure, and working animal, which contribute to those elements in the variable costs of Feddan of wheat equivalent to about 33 , 9% , 22.7 % , 18.1 % , 9.7 % , 9.2 % , 4.2 % , 3.5 % , 0.3 % , respectively.

**Average variable costs for wheat crop:**

As seen from Table (5) that the average variable costs for the crop of wheat amounted to about 466.8 Egyptian pounds / Feddan in 1991, and grew until it reached about 2634 Egyptian pounds / Feddan in 2012, with an increase of about 56.4%.

As shown by equation (1) in the table (6 ) the variable costs of the wheat crop increased with an annual rate, statistically significant at the level of significance (0.01), was about 95.4 Egyptian pounds / Feddan, (representing about 4.5% of the average variable costs for the wheat crop) of about 2101.8 Egyptian pounds / Feddan during the study period, which in turn represents about 59.5% of the average total costs of wheat, which amounted to about 3523.2 Egyptian pounds / Feddan, as the coefficient of determination rate $R^2$ was about 0.79.

**Average fixed costs for wheat crop:**

As seen from Table (5) that the average fixed costs of crop of wheat amounted to about 95.8 Egyptian pounds / Feddan in 1991, and grew until it reached about 1860 Egyptian pounds / Feddan in 2012, with an increase of approximately 194.5%. As shown by equation (2) in table (6) that the fixed costs of the wheat crop increase with an annual rate of significant statistically at the level of significance (0.01), was about 77.1 Egyptian pounds / Feddan, (representing about 5.4% of the average fixed costs of the wheat crop) of about 1427.94 Egyptian pounds / Feddan during the study period, which is in turn about 40.5% of the average total cost of wheat as the coefficient of determination rate $R^2$ was about 0.89.

**Average total costs for wheat crop:**

As seen from Table ( 5) that the average total costs of the crop of wheat amounted to about 562.4 Egyptian pounds / Feddan in 1991, and grew until it reached about 4672 Egyptian pounds / Feddan in 2012, with an increase of about 830 %.

As shown by equation (3) in Table (6) that the total cost of the wheat crop is growing at an annual rate insignificant statistically significant at the level of significance (0.01) amounted to 172.13 Egyptian pounds / Feddan of wheat, (representing about 4.9 % of the average total costs of the wheat crop) of about 3523.2 Egyptian pounds / Feddan during the study period from 1991 to 2012 as coefficient of determination rate was about 0.84.

As shown above, that the cost structure, of Feddan of wheat production in Egypt has several changes during the study period and the most important of these changes that have occurred in fixed production costs, which is represented in the rental value , where it reached its relative importance to 40.5 % of the average total costs for the production of Feddan of wheat , representing the total costs of Feddan of wheat, which is the most important work farm, production requirements as contribute to the variable costs of wheat crop at about 56.9%, 43.1 %, respectively.

As can be seen that the rise in the total costs of the production of Feddan of wheat may be due to the rise in all of the variable costs, the most important the human labor, the automation, the value of chemical fertilizers, and fixed costs (rental value) after the liberation of the relationship between landlord and tenant.

**Wheat crop production costs function:-**

As show in the following equation that the relationship between the total costs of Feddan of wheat and production in the image of Cubism, and the value of calculated (F) stresses about 38.142 statistically significant function. While, showing the value ($R^2$) that changes in production explain about 78% of the changes in the overall costs, and finding the middle of the total costs, then find first derivative costs of the medium and equal it by zero, found the optimal amount for wheat production estimated at 14.554 ardabs / Feddan. It can be obtained the marginal cost of calculus first function of the total costs and equality of marginal cost price and then find the maximum amount of profit, which was estimated at 42.19 ardebs / Feddan. Comparing the maximum amount for profit of average productivity per Feddan of about 17.7 ardabs / Feddan, showing that the average productivity per Feddan of wheat decreased for the amount by about 1.4 ardabs. Which, means that farmers still able to use high levels of technology until increasing production and less costs and thus increase net revenue and profit maximization, while it was observed that the average productivity per Feddan of wheat exceeded the optimal amount of production.

$$TC = 808.815 + 22.758\,y - 13.186\,y^2 + 0.560\,y^3$$
$$(0.598) \quad (-0.351) \quad (0.364)$$
$$R = 0.815 \quad R2 = 0.851 \quad "R2 = 0.782 \quad F = (38.142)\ **$$

**Production function:**

The most important factors estimated affecting of the total output of wheat were: the work of human (X1), automated work (X2) per hour, the amount of

seeds (X3) in kg, and chemical fertilizers (X4) per unit of nitrogen, and the soil (X5).

The trade-off between models was estimated according to the logic of economic, the logarithmic form was the best models as in the equation: -

***Log Y = 0.57 + 0.62 Log X3 +0.59Log X4***

***(3.56)** (3.21) ****

***R2 =0.95, F = 759.1, Overall flexibility=1.00***

It was found that the total flexibility amounted to about 1.0 means that, the function of the type-win, means that the increase in resources of the function by 10% leads to an increase in the output of wheat, with an increase of 10%. It has been shown that the most important factors affecting the total wheat production is the amount of seeds (X3)kg, chemical fertilizer (x4) nitrogen units, if each of them increased by 10% leads to an increase in total output by about 6.2%, 5.9%, respectively. The function was statistically significant at the level of significance (0.01) and the value of calculated (F) for the model was 759.1 as the coefficient of determination rate was about 0.95. This means that these factors function, explain about 95% of the changes in the total output of wheat Feddan in Egypt.

**National consumption of wheat:**

As shown in Table (7) that, the consumption of the crop of wheat amounted to 8.87 million tons in 1991, and grew until it reached about 18.1 million tons in 2012, with an increase of about 40.6%.

As shown by equation (5) in table (8) that, the national consumption of wheat crop decreased with an annual rate of statistically significant amounted to 6.3 million tons, accounting for about 40.1% of the national average consumption of wheat crop of about 15.6 million tons during the study period, as the coefficient of determination rate $R^2$ was about 0.016

**Third:**

**factors affecting the wheat consumption in Egypt:** Average per capita consumption of wheat in developed countries is estimated at 121 kg / year, while in developing countries, about 137 kg / year. Nevertheless, in Egypt is estimated at 190 kg / year at the discretion of the year 2011, which requires the rationalization of consumption of wheat in Egypt. The demand influenced by any several factors that may be different, political, social, economic, and behavioral, as well as the number of consumers and their incomes and commodity prices and competition, the following is addressing the most important of these factors then estimating the consumption function for wheat in Egypt.

**The Evaluation of the most important factors affecting the consumption of wheat: -**

1 - **Inhabitants**:

As it can be seen from Table (7) that, the population has increased from 55.6 million in 1991 as minimum, to about 87.2 million people in 2012 as maximum, with an increase of 63.7%. The equation (1) in the table (8) shows that the population in Egypt is growing by significant annual rate of about 1.2 million, representing about 1.9% of the average population of about 81.4 million people during the study period from 1991 to 2012. The coefficient selection amended ($R^2$) has reached to 0.98.

2 - **Personal income**: -

As can be seen from in Table (7) the personal income increased from 824.4 Egyptian pounds in 1991, to about 1902.5 Egyptian pounds in 2012, with an increase of about 33.8%. The equation (2) in table (8) shown that, there is a statistically annual significant increase in per capita income amounted to about 44.1 Egyptian pounds, representing about 2.8% of the average per capita income of about 1565.6 Egyptian pounds during the study period has reached the rate coefficient of determination (R2) to 0.85.

**3 - The retail price of wheat: -**

As seen from Table (7) that the retail price of ardabs of wheat in real terms has decreased from 43 Egyptian pounds in 1991, to about 35.9 Egyptian pounds in 2012 by decreasing amounted to about 22.8%. equation (3) in table (8) shows the retail price of one ardab of wheat has decreased annually by 0.47 Egyptian pounds, this decline statistically significant and represents about 1.31% of the average price of wheat ardabs of about 35.8 Egyptian pounds in real terms, has reached the rate of the coefficient of determination (R2) to 0.57.

**4 - The average per capita consumption of wheat:**

As shown in Table (7) that the average per capita consumption of wheat has reached about 159.5 kg in 1991, and then taking in volatility, rose to about 207.5 kg in 2012, with an increase of about 30.1%. As shown in equation (4) in table (8) that, there is a statistically annual increase statistically insignificant for the average per capita consumption of wheat amounted to about 1.7 kg. The coefficient of determination rate (R2) has reached around 0.34, it is worth mentioning that per capita wheat consumption in developed countries is estimated at 121 kg per year, while in developing countries is estimated to about 137 kg per year, while the average in Egypt about 190 kg in 2011.

**Estimate the wheat consumption function:**

As it turns out that's logarithmic form is the best form from a statistical point of view, the author will address the impact of each of the above factors on the national consumption of wheat individually and collectively.

**1 - The impact of population on the quantity of wheat consumed:**

Study of the equation (1) in table (9) shows that the amount of consumption estimated from wheat (Yi)

as the dependent variable, and the number of population (X22) independent variable, it may indicate that the function is significant at the level (0.01). Also, shows a direct correlation between the number of residents and the amount consumed of wheat, with a models of elasticity to 1.38, i.e. the increase in population by 10% leads to increase the quantity consumed of wheat by 13.8%, as the coefficient of determination (R2) was 0.51. That means that the 51% of the changes in the quantity consumed wheat are due to the change in the number of population, while about 49% of those variables are due to other variables not included in the model.

**2 - Effect of average income per capita on the quantity of wheat consumed:**

As seen from equation (2) in table (9), the existence of a positive relationship between the amount of wheat consumption estimated (Yi) as the dependent variable, and the average income per capita real (X2i) in pound is an independent variable. It has been shown to function is significant at the level (0.01). The total explanatory elasticity factor of the variable 0.531, i.e. that increased personal income by 10% leads to increase the quantity consumed of wheat by 5.3%, as the coefficient of determination (R2) was 0.65. This means that 65% of the changes in the quantity consumed of wheat were due to the change in personal income, assuming all other factors were constant.

**3 - The impact of the real price of wheat ardabs on the quantity of wheat consumed:**

As seen from equation (3) in table (9) that there is an inverse relationship between the amount of wheat consumption estimated (Yi) per million tons as the dependent variable, and the real price (P2) Egyptian pound as an independent variable, the function was significant at the level (0.01). The total explanatory models of elasticity of the variable 1.356, i.e. that the wheat ardabs price increase in real terms by 10% leads to a lack of quantity consumed of wheat increased by 13.56%. The total coefficient of determination ($R^2$) was about 0.82 i.e. 82% of the changes in the quantity consumed of wheat due to change in the real price of wheat ardabs assuming all other factors are constant.

**4 - The effect of the above factors combined:**

To study the relationship between the amount of the total consumption of wheat (Yi) per million tons as the dependent variable, and the number of population (X1) independent variable, real income per capita (X2i), the real price of wheat ardebs (X3i) pound variables explained, and the annual per capita consumption (X4), it shows that the existence of a positive relationship between the amount of consumption estimated wheat and population density. as demonstrated the existence of a positive relationship between the amount of consumption estimated of wheat and the real per capita income, while the relationship is inverse between the estimated amount of wheat consumption and the real ardab price of wheat. While, the relationship direct correlation between the amounts of the estimated wheat consumption and annual per capita, the function was significant at the level (0.01), and reached the coefficient of determination (R2) to 0.95 i.e. 95% of the changes in the quantity consumed of wheat was due to the change in the previous factors combined.

$$Yi = -9.25 + 0.64\,X1 + 0.08\,X2 - 0.41\,X3 + 0.85\,X4$$
$$(17.2)^{**}\ (2.9)^{*}\ (-2.6)^{*}\ (38.2)^{**}$$
$$R2 = 0.95 \qquad F = 215.6$$

As shown above, that the most important factors affecting the consumption of wheat in Egypt are the number of the population, the average real income per capita, the price of ardabs of wheat in real terms and annual per capita consumption, where the consequent increase in any of them by one unit, increase in the total consumption of about 0.64, 0.08, -0.41, 0.85.respectively.

**• Wheat gap in Egypt:**

Wheat gap is estimated by the difference between the amount consumed of wheat and the quantity produced. As seen from the table (10) that the wheat gap amounted to 4.39 million tons in 1991, and then took in the oscillation until amounted to 10.03 million tons in 2012, with an increase of about 28.5%, the percentage of self-sufficiency in wheat in those two years amounted to about 50.5%, 44.6%, respectively.

**Means to overcome the wheat gap:**

**1 - Response of the supply to the wheat crop: -**

The model of the supply response to the wheat crop in Egypt was estimated during the study period using the method of multiple regressions in the following equation, which included model explanatory variables that affect the cultivated area, such as net earnings and price-farm of wheat crop in the previous year and net yield of crops competition for wheat. The equation illustrated a positive relationship between the cultivated area with wheat in the current year and the farm price of wheat in the previous year at current prices. As the price of ardab of wheat increase by about 10 Egyptian pounds leads to an increase in the Feddan of wheat estimated at 81.8 thousand per Feddan in the next year, and that this increase is statistically significant at the level (0.01) as shown above. It must follow the pricing policy to increase the Feddan of wheat, as the increase in the ardab price of wheat by about 100 Egyptian pounds, leads to increase feddans of wheat by about 818 thousand Feddan in the following year, and this area leads to increase total production of wheat by

about 2.17 million tons, which works to fill about 30% of the volume of wheat gap in Egypt.

$$Yi = 1570.215 + 8.180\ Pi$$
$$(5.914)\ **$$
$$F = 57.85 \quad R2 = 0.87$$

**2 - Reducing the area of sustainable clover:**

Study the needs of green forage in the winter season for cows and buffaloes in Egypt, where it was converted as numbers of cows and buffaloes to the unit's animal, the typical needs of those units of animal to winter fodder was estimated. As illustrated in table (12) that the total number of units of cows and buffalos animals was about 7538 thousand units in 2001 estimated the needs of green forage in the winter season about 45.23 million tons, as the number of units of animal cows and buffalos around 10054 thousand units, the estimated needs of green forage in the winter season of 2012 to 60.324 million tons. By comparing the needs of forage green product of this feed shows that the amount produced from these feeds in excess of actual needs, but this increase is not dependent upon in overcoming the wheat gap.

To minimize the area of clover, we can cultivate untraditional feed and silage like corn, rather than where the clover has a high nutritional value. The corn production per feddan is about 15 tons of corn silage per feddan after transactions by venaise and urea. Therefore every feddan of corn silage leads to dispense with 1.27 feddan of alfalfa. The reducing alfalfa area and planted with wheat works to fill about 63 % of the volume wheat gap. As well as, a quantitative hay and what is produced from coarse bran (apostasy) and can be made in manufacturing concentrated feed for the animals.

**Table (1): The area, production, total production, total return and net return per feddan of wheat in Egypt during the period (1991 -2012)**

| Years | Area (Million/Feddan) | Productivity (ton/Feddan) | Total production (Million/Feddan) | total return Egyptian pound/Fed)dan) | Net return (Egyptian pound/Feddan) | Farm price (Egyptian pound/ardab) |
|---|---|---|---|---|---|---|
| **1991** | **2.22** | **2.02** | **4.48** | **1345** | **782.6** | **74.72** |
| **1992** | **2.09** | **2.21** | **4.62** | **1435** | **770.6** | **79.02** |
| **1993** | **2.17** | **2.23** | **4.84** | **1582** | **641.3** | **79.33** |
| **1994** | **2.11** | **2.10** | **4.43** | **1566** | **58.0** | **80.17** |
| **1995** | **2.51** | **2.28** | **5.72** | **1717** | **681.3** | **8.40** |
| **1996** | **2.42** | **2.37** | **5.74** | **2009** | **922.1** | **96.06** |
| **1997** | **2.49** | **2.35** | **5.85** | **2090** | **963.4** | **100.04** |
| **1998** | **2.42** | **2.52** | **6.10** | **2258** | **705.1** | **102.00** |
| **1999** | **2.28** | **2.67** | **6.09** | **2409** | **876.3** | **103.40** |
| **2000** | **2.46** | **2.67** | **6.57** | **2408** | **897.6** | **104.20** |
| **2001** | **2.34** | **2.67** | **6.25** | **2419** | **896.4** | **105.10** |
| **2002** | **2.45** | **2.70** | **6.62** | **2530** | **972.6** | **107.70** |
| **2003** | **2.51** | **2.73** | **6.85** | **2731** | **1016** | **114.00** |
| **2004** | **2.45** | **2.75** | **6.74** | **3570** | **1666** | **150.00** |
| **2005** | **2.95** | **2.73** | **8.05** | **3937** | **1956** | **186.00** |
| **2006** | **3.06** | **2.70** | **8.26** | **4006** | **1863.0** | **169.00** |
| **2007** | **2.71** | **2.71** | **7.34** | **4213** | **1769** | **173.00** |
| **2008** | **2.92** | **2.73** | **7.97** | **7101** | **3956** | **383.00** |
| **2009** | **3.14** | **2.71** | **8.52** | **5649** | **2190** | **242.00** |
| **2010** | **3.22** | **2.75** | **7.25** | **6624** | **2483** | **272.00** |
| **2011** | **3.04** | **2.71** | **8.30** | **7600** | **3140** | **352.00** |
| **2012** | **3.10** | **2.65** | **8.07** | **7953** | **3221** | **380.00** |
| average | **2.9** | **2.66** | **6.3** | **6235.1** | **2674.4** | **289.1** |

Source: - collected and calculated from the Central Administration of the Agricultural Economy, the Economic Affairs Sector, records of the General Administration of Statistics.

**Table (2) Equations factors for the general temporal trend of the evolution of both area, productivity, total production, total return and net return per feddan of wheat in Egypt during the period (1991 -2012)**

| Dependent variable (Yi) | Equation no. | Yi =A +BXi | | Average | The relative rate of change | R2 | Calculated F | F modeling | Significance |
|---|---|---|---|---|---|---|---|---|---|
| | | A | B | | | | | | |
| Area (million/Feddan) | 1 | **2.020** | **0.04** | **2.9** | **1.68** | **0.798** | **9.17** | **84.1** | ** |
| Productivity (tone/Feddan) | 2 | **2.182** | **0.03** | **2.66** | **1.16** | **0.712** | **7.28** | **53.099** | ** |
| Overall production (million/Feddan) | 3 | **4.404** | **0.18** | **6.30** | **2.98** | **0.884** | **12.72** | **161.99** | ** |
| total return (Egyptian pound/Feddan) | 4 | **46** | **300.9** | **6235.1** | **4.82** | **0.833** | **10.310** | **106.31** | ** |
| Net return (Egyptian pound/Feddan) | 5 | **36.63** | **131.3** | **2674.4** | **4.91** | **0.715** | **7.329** | **53.72** | ** |

Source: - collected and calculated from the table (4) study.

Xi= The estimated value of each of the area of wheat, productivity per feddan, the total production of wheat, total return and net yield of wheat per feddan in the first year; Xi= Variable time, (I) 1, 2 ..... 21

A, B = refer to constant and the regression coefficient of the equation, respectively.

(**) Indicates significant regression or form when the level of significance (0.01)

(*) To indicate when the significant level of significance (0.05)

(**) Indicates a lack of significance; $R^2$= coefficient Rate of determinatio

**Table (3) the average cost of production of wheat per Feddan spread over production requirements in Egypt during the period (1991 -2012)**

| Years | Human work cost | Animal work cost | Automated work cost | Total cost of farm work | Seed cost | Manure fertilizers cost | Chemical fertilizer cost | Pesticide cost | Expenditure | Production requirement cost | Average variable cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1991** | **170** | **5.2** | **114.7** | **289.9** | **44.4** | **20.5** | **73.1** | **2.3** | **36.6** | **176.9** | **466.8** |
| **1992** | **187.3** | **4.1** | **144.0** | **335.4** | **54.5** | **19.8** | **105.3** | **11.4** | **42.6** | **233.6** | **569.0** |
| **1993** | **200.2** | **5.6** | **160.8** | **366.6** | **57.8** | **27.9** | **116.9** | **7.7** | **63.8** | **274.1** | **640.7** |
| **1994** | **218.2** | **7.0** | **175.5** | **400.7** | **56.1** | **33.2** | **132.5** | **9.0** | **48.5** | **279.9** | **680.6** |
| **1995** | **216.6** | **8.2** | **202.4** | **437.2** | **64.3** | **31.2** | **133.5** | **9.3** | **72.8** | **307.9** | **735.1** |
| **1996** | **228.2** | **7.6** | **212.3** | **448.1** | **71.8** | **40.4** | **136.0** | **15.3** | **77.5** | **333.5** | **781.6** |
| **1997** | **239.2** | **7.1** | **218.6** | **464.9** | **78.9** | **42.1** | **136.9** | **21.4** | **80.9** | **353.1** | **818.0** |
| **1998** | **244.2** | **3.1** | **241.2** | **488.5** | **68.0** | **32.2** | **152.5** | **13.2** | **84.2** | **361.5** | **849.5** |
| **1999** | **256.2** | **2.7** | **264.5** | **523.4** | **67.8** | **35.5** | **145.5** | **18.5** | **86.8** | **354.3** | **877.7** |
| **2000** | **265.0** | **2.4** | **253.4** | **520.8** | **75.0** | **45.1** | **134.5** | **19.4** | **86.6** | **353.2** | **874.2** |
| **2001** | **283.9** | **2.8** | **234.2** | **520.9** | **79.0** | **41.3** | **131.8** | **20.3** | **87.5** | **355.9** | **876.8** |
| **2002** | **292.6** | **2.7** | **233.2** | **528.5** | **89.0** | **50.5** | **138.6** | **24.0** | **91.2** | **383.3** | **911.8** |
| **2003** | **332.0** | **3.0** | **254.0** | **589.0** | **97.0** | **55.0** | **150.0** | **28.0** | **100.0** | **422.0** | **1011.0** |
| **2004** | **359.0** | **4.0** | **282.0** | **645.0** | **97.0** | **55.0** | **177.0** | **31.0** | **100.0** | **460.0** | **1105.0** |
| **2005** | **376.0** | **4.0** | **292.0** | **672.0** | **115.0** | **37.0** | **188.0** | **36.0** | **105.0** | **481.0** | **1153.0** |
| **2006** | **411.0** | **5.0** | **322.0** | **738.0** | **123.0** | **49.0** | **200.0** | **46.0** | **115.0** | **533.0** | **1271.0** |
| **2007** | **476.0** | **6.0** | **345.0** | **827.0** | **126.0** | **69.0** | **255.0** | **58.0** | **134.0** | **642.0** | **1469.0** |
| **2008** | **593.0** | **7.0** | **428.0** | **1028** | **201.0** | **39.0** | **378.0** | **103.0** | **171.0** | **692.0** | **1720.0** |
| **2009** | **648.0** | **7.0** | **456.0** | **1111** | **216.0** | **54.0** | **404.0** | **75.0** | **182.0** | **931.0** | **2042.0** |
| **2010** | **845.0** | **7.0** | **557.0** | **1409.0** | **278.0** | **78.0** | **435.0.** | **93.0** | **222.0** | **1106.0** | **2515.0** |
| **2011** | **935.0** | **8.0** | **587.0** | **1530.0** | **206.0** | **108.0** | **445.0** | **109.0** | **235.0** | **1104.0** | **2634.0** |
| **2012** | **975.0** | **8.0** | **600.0** | **1583.0** | **246.0** | **128.0** | **465.0** | **125.0** | **265.0** | **1229.0** | **2812.0** |
| **Average** | **707.6** | **6.25** | **476.73** | **1196.3** | **204.2** | **74.55** | **379.1** | **87.8** | **193.01** | **905.48** | **2101.7** |
| **The relative importance** | **33.9** | **0.3** | **22.72** | **56.92** | **9.7** | **3.5** | **18.03** | **4.17** | **9.18** | **43.08** | **100** |

Source: - collected and calculated from the Central Administration of the Agricultural Economy, the Economic Affairs Sector, records of the General Administration of Statistics.

**Table (4) Equations factors of general time trend of variable cost items for wheat production per Feddan spread over labor costs and production requirements in Egypt during the period (1991 -2012)**

| Dependent variable (Yi) | Equation no. | Yi =A +BXi | | The relative variable rate | mean | $R^2$ | T calculated | T (modeling) | Significant |
|---|---|---|---|---|---|---|---|---|---|
| | | A | B | | | | | | |
| Human work cost | 1 | **12.53** | **33.50** | **7.7** | **707.6** | **0.768** | **8.414** | **70.79** | ** |
| Animal work cost | 2 | **4.56** | **0.067** | **1.07** | **6.25** | **0.015-** | **0.98** | **0.966** | ** |
| Automated work cost | 3 | **69.65** | **19.94** | **4.1** | **476.6** | **0.836** | **10.40** | **108.30** | ** |
| Seed cost | 4 | **88.04** | **53.435** | **26.1** | **204.2** | **0.795** | **9.091** | **82.65** | ** |
| Manure fertilizers cost | 5 | **6.532** | **9.35** | **12.5** | **74.5** | **0.768** | **8.398** | **70.53** | ** |
| Chemical fertilizer cost | 6 | **12.316** | **3.24** | **0.85** | **379.1** | **0.618** | **5.92** | **35.05** | ** |
| Pesticide | 7 | **17.91** | **16.75** | **19.07** | **87.8** | **0.742** | **7.84** | **61.58** | ** |
| Expenditure | 8 | **18.84-** | **5.099** | **2.64** | **193.1** | **0.784** | **8.79** | **77.43** | ** |

Source: - collected and calculated from the table (3) study.
(**) Significant at the level of significance (0.01)
(*) Significant at the level of significance (0.05)
Yi = the estimated value of the terms of the costs of production in the first year
(**) Indicates significant regression or form when the level of significance (0.01)
(*) To indicate when the significant level of significance (0.05)
$R^2$= coefficient Rate of determination

**Table (5) Average total and fixed costs and variable for wheat per Feddan in Egypt during the period (1991 - 2012)**

| Years | Variable cost (Egyptian pound) | Fixed cost (Egyptian pound) | Total cost (Egyptian pound) | Productivity (Egyptian pound/feddan) |
|---|---|---|---|---|
| **1991** | **466.8** | **95.6** | **562.4** | **13.47** |
| **1992** | **569.0** | **95.4** | **664.4** | **14.73** |
| **1993** | **640.7** | **300.0** | **940.7** | **14.87** |
| **1994** | **680.6** | **300.4** | **981.0** | **14.00** |
| **1995** | **735.1** | **300.6** | **1035.7** | **15.20** |
| **1996** | **781.6** | **305.3** | **1086.9** | **15.80** |
| **1997** | **818.0** | **308.3** | **1126.6** | **15.67** |
| **1998** | **849.5** | **703.4** | **1552.9** | **16.80** |
| **1999** | **877.7** | **655.0** | **1532.7** | **17.80** |
| **2000** | **874.2** | **636.2** | **1510.4** | **17.80** |
| **2001** | **876.8** | **645.8** | **1522.6** | **17.80** |
| **2002** | **911.8** | **646.6** | **1558.4** | **17.80** |
| **2003** | **1011.0** | **704.0** | **1715.0** | **17.80** |
| **2004** | **1105.0** | **799.0** | **1904.0** | **18.0** |
| **2005** | **1153.0** | **828.0** | **1981.0** | **18.20** |
| **2006** | **1271.0** | **872.0** | **2143.0** | **18.00** |
| **2007** | **1469.0** | **975.0** | **2444.0** | **18.07** |
| **2008** | **1720.0** | **1260.0** | **2980.0** | **18.21** |
| **2009** | **2042.0** | **1456.0** | **3459.0** | **18.06** |
| **2010** | **2515.0** | **1626.0** | **4141.0** | **18.30** |
| **2011** | **2634.0** | **1826.0** | **4460.0** | **18.52** |
| **2012** | **2812.0** | **1860.0** | **4672.0** | **17.33** |
| **Average** | **2101.8** | **1427.9** | **3523.2** | **17.76** |
| **The relative importance** | **59.5** | **40.50** | **100** | **-** |

Source: - collected and calculated from the table (3) study

**Table (6) factors of time trend equations to the terms of the costs, fixed and variable costs and total production of wheat acres in Egypt during the period (1991 -2012)**

| Dependent variable (Yi) | Equation no. | Yi =A +BXi | | The relative variable rate | mean | $R^2$ | T calculated | T (modeling) | Significant |
|---|---|---|---|---|---|---|---|---|---|
| | | A | B | | | | | | |
| Variable cost per pound | 1 | **121.94** | **95.37** | **2101.8** | **4.5** | **0.791** | **8.97** | **80.54** | ** |
| Fixed cost per pound | 2 | **-104.72** | **77.08** | **1427.9** | **5.4** | **0.890** | **13.13** | **172.57** | ** |
| Total cost per pound | 3 | **19.275** | **172.13** | **3523.2** | **4.9** | **0.844** | **10.734** | **115.23** | ** |

Source: - collected and calculated from the table (3) study. (**) Significant at the level of significance (0.01)
(*) Significant at the level of significance (0.05); Yi = the estimated value of the terms of the costs of production in the first year
(**) Indicates significant regression or form when the level of significance (0.01)
(*) To indicate when the significant level of significance (0.05); $R^2$= coefficient Rate of determination

**Table (7): shows the national and individual consumption, the retail price, the number of population and average per capita income in Egypt during the period (1991 -2012)**

| Years | National consumption of wheat (Million ton) | Population (million) | Average per capita real income in pounds ** | Real retail price* (Pounds/ardab ) | Average per capita consumption of wheat Kg |
|---|---|---|---|---|---|
| **1991** | **8.87** | **55.6** | **824.40** | **43.0** | **159.5** |
| **1992** | **9.29** | **56.9** | **936.20** | **46.0.** | **163.3** |
| **1993** | **8.45** | **58.3** | **918.70** | **41.1** | **144.9** |
| **1994** | **11.93** | **59.6** | **961.20** | **40.8** | **200.0** |
| **1995** | **10.52** | **60.8** | **943.70** | **39.6** | **173.0** |
| **1996** | **1083** | **62.1** | **953.90** | **41.0** | **174.4** |
| **1997** | **10.41** | **63.2** | **1012.90** | **42.0** | **164.7** |
| **1998** | **11.19** | **64.5** | **981.40** | **43.6** | **173.5** |
| **1999** | **9.63** | **65.7** | **995.70** | **42.5** | **146.6** |
| **2000** | **11.11** | **66.2** | **1010.20** | **42.0** | **167.8** |
| **2001** | **9.82** | **66.7** | **1030.20** | **43.7** | **147.2** |
| **2002** | **11.63** | **70.5** | **1075.30** | **40.9** | **165.0** |
| **2003** | **10.94** | **71.3** | **1105.4** | **38.3** | **153.4** |
| **2004** | **11.75** | **71.9** | **1250.80** | **44.0** | **163.4** |
| **2005** | **13.36** | **73.0** | **1283.50** | **37.6** | **183.0** |
| **2006** | **13.67** | **74.3** | **1307.4** | **33.9** | **184.0** |
| **2007** | **14.60** | **76.7** | **1385.40** | **33.2** | **190.4** |
| **2008** | **14.94** | **79.5** | **1415.46** | **33.7** | **187.9** |
| **2009** | **15.16** | **81.7** | **1522.50** | **33.9** | **185.6** |
| **2010** | **16.92** | **83.8** | **1696.50** | **34.3** | **201.9** |
| **2011** | **17.16** | **85.9** | **1799.45** | **35.2** | **199.7** |
| **2012** | **18.10** | **87.2** | **1902.55** | **36.9** | **207.5** |
| **Average** | **15.6** | **81.4** | **1565.64** | **35.8** | **191.75** |

Source: -
1 – Central Agency for Public Mobilization and Statistics, Bulletin consumption numbers are different.
2 - Central Agency for Public Mobilization and Statistics, Statistical Yearbook, various issues.
3 - Central Agency for Public Mobilization and Statistics, the quarterly bulletin for retail prices, different numbers *
- the real price indices weighted wholesale prices 1986/1987 = 100
** - Real personal income figures for standard living expenses 1986/1987 = 100

**Table (8) equations factors of general temporal trend of the evolution of the number of population and national income, national and per capita consumption and retail price in real terms and per capita wheat in Egypt during the period (1991 -2012)**

| Dependent variable Yi) | Equation no. | Yi =A +BXi | | The relative variable rate | mean | $R^2$ | T calculated | T (modeling) | Significant |
|---|---|---|---|---|---|---|---|---|---|
| | | A | B | | | | | | |
| Population (million) | 1 | 133.11 | 1.26 | 7.69 | 81.4 | 0.981 | 32.20 | 1036.92 | ** |
| Real per capita income (pound) | 2 | 689.95 | 44.06 | 2.81 | 1565.6 | 0.85 | 11.12 | 123.77 | ** |
| Real retail price * (pound/ardab) | 3 | 44.48 | 0.47- | 1.31 | 35.8 | 0.57 | 5.40 | 29.24 | ** |
| Per capita consumption (million tons) | 4 | 154.12 | 1.76 | 0.92 | 191.70 | 0.340 | 3.44 | 11.83 | ** |
| National consumption (million tons) | 5 | 133.11 | 6.26- | 40.1- | 15.6 | 0.016- | 0.811- | 0.606 | ** |

Source: - collected and calculated from Table (6) study.

Yi = all of the population (Millions), per capita income (Egyptian pound) and average per capita consumption in kg and the retail price in real terms Pounds / ardebs and the amount of wheat consumed in the first year per Million Tons.

Xi= Variable time, (I) 1, 2 ..... 21

A, B = refer to constant and the regression coefficient of the equation, respectively

P2i = ardab price of wheat in real terms pounds / ardebs in the year (I)

(**) Indicates significant regression or form when the level of significance (0.01) (* Indicates a significant at the level of significance (0.05)

(**) Indicates a lack of significance, $R^2$= coefficient Rate of determination

**Table (9) Regression equations of the most important factors affecting the quantity of wheat consumed in Egypt during the period (1991 -2012)**

| Dependent variable | Equation no. | Equation | Elasticity | $R^2$ | F Calculated | Significance |
|---|---|---|---|---|---|---|
| Population /wheat consumption | 1 | LYi = -1.181 + 1.238L X 1 i (-2.575)** (5.221)** | 1.389 | 0.512 | 25.188 | ** |
| Real per capita income (pound) | 2 | LY i = -1.19 + 0.58 X 2 i (-2.349)** (4.584 )** | 0.531 | 0.65 | 45.658 | ** |
| Real price for wheat consumed per ardab | 3 | LY i = 4.165 - 1.278 L P2 i (6.754)** (-4.350 )** | 1.356 | 0.812 | 18.515 | ** |

Source: - collected and calculated from Table (7) of the study.

Yi = amount of discretionary wheat consumed in Egypt million tons in the year I

X1i = number of the population in Egypt million people a year (I), X2i = average per capita income in pounds per year (I)

P2i = ardab price of wheat in real terms pounds / ardab in the year (I), I = years 1, 2 ..... 21

L = Log

(**) Significant at the level of significance (0.01), (*) Significant at the level of significance (0.05)

**Table (10) the development of both consumption and wheat gap in Egypt during the period (1991 -2012)**

| Years | Total production (million ton /1) | Total consumption of wheat (million tone/2) | Self-sufficiency % (2/1) | wheat gap (million tone)1 - 2 |
|---|---|---|---|---|
| 1991 | 4.48 | 8.87 | 50.51 | 4.39 |
| 1992 | 4.62 | 9.29 | 49.73 | 4.67 |
| 1993 | 4.84 | 8.45 | 57.28 | 3.61 |
| 1994 | 4.43 | 11.93 | 37.13 | 7.50 |
| 1995 | 5.72 | 10.52 | 54.37 | 4.80 |
| 1996 | 5.74 | 10.83 | 53.00 | 5.09 |
| 1997 | 5.85 | 10.41 | 56.20 | 4.56 |
| 1998 | 6.10 | 11.19 | 54.51 | 5.09 |
| 1999 | 6.09 | 9.63 | 63.24 | 3.54 |
| 2000 | 6.57 | 11.11 | 59.14 | 4.54 |
| 2001 | 6.25 | 9.82 | 63.65 | 3.57 |
| 2002 | 6.62 | 11.63 | 56.92 | 5.01 |
| 2003 | 6.85 | 10.94 | 62.61 | 4.09 |
| 2004 | 6.74 | 11.75 | 57.36 | 5.01 |
| 2005 | 8.05 | 13.36 | 60.25 | 5.31 |
| 2006 | 8.26 | 13.67 | 60.42 | 5.41 |
| 2007 | 7.34 | 14.60 | 50.27 | 7.26 |
| 2008 | 7.97 | 14.94 | 53.33 | 6.97 |
| 2009 | 8.52 | 15.16 | 56.20 | 6.64 |
| 2010 | 7.25 | 16.92 | 42.84 | 9.67 |
| 2011 | 8.03 | 17.16 | 46.79 | 9.13 |
| 2012 | 8.07 | 18.10 | 44.58 | 10.03 |
| mean | 7.66 | 15.55 | 49.89 | 7.39 |

Source: - Ministry of Agriculture - and Land Reclamation, Economic Affairs Sector, Records of the General Administration of Statistics.

**Table (11) the area in the sustainable production of alfalfa in Egypt during the period (1991 -2012)**

| Years | Clover (thousand Feddan) | Production quantity (thousand tons) |
|---|---|---|
| 2001 | 1935 | 54655 |
| 2002 | 1996 | 58583 |
| 2003 | 1966 | 57916 |
| 2004 | 1906 | 56946 |
| 2005 | 1603 | 48714 |
| 2006 | 1657 | 49530 |
| 2007 | 1689 | 450487 |
| 2008 | 1619 | 48554 |
| 2009 | 1518 | 43997 |
| 2010 | 1813 | 69425 |
| 2011 | 1588 | 46342 |
| 2012 | 1539 | 46121 |
| Mean | 1650 | 51379 |

Source: - Ministry of Agriculture - and Land Reclamation, Economic Affairs Sector, Records of the General Administration of Statistics.

**Table (12) seasonal needs of the animal units of green fodder in Egypt during the period (1991 -2012)**

| Years | Sum of animal units per thousand unit | Requirement of winter and summer of green fodder | | |
|---|---|---|---|---|
| | | Winter green fodder* (Thousand tons) | Summer green fodder* (Thousand tons) | Total requirement of fodder for animal during one year |
| **2001** | **7538** | **45338** | **3015** | **48243** |
| **2002** | **8012** | **48072** | **3205** | **51277** |
| **2003** | **82.3** | **49218** | **3281** | **52499** |
| **2004** | **8413** | **50478** | **3365** | **53743** |
| **2005** | **8557** | **51342** | **3423** | **54765** |
| **2006** | **8724** | **49344** | **3490** | **53834** |
| **2007** | **9019** | **54114** | **3608** | **57722** |
| **2008** | **9345** | **56070** | **3738** | **59808** |
| **2009** | **9598** | **57588** | **3839** | **61427** |
| **2010** | **9850** | **59100** | **3940** | **63040** |
| **2011** | **9978** | **59868** | **3991** | **63859** |
| **2012** | **10054** | **60324** | **4021.6** | **64345.6** |
| Mean | **9529.5** | **60324** | **4021.6** | **64345.6** |

* Calculated on the basis of seasonal needs: the need for winter animal unit = 6 tons of green fodder, the summer need for animal unit = 0.4 tons of green fodder.

Source: - Animal Production Research Institute, Department of Animal and Poultry feed, the foundations of modern scientific and feed and fodder.

**Recommendations: -**

**The study recommends the following: -**

- Must expansion in grow horizontally for wheat crop in each of the new reclaimed land by increase the cultivated area, and the abolition of compulsory supply. As well as, in the old lands reducing alfalfa area and cultivated with wheat.
- Vertical expansion in wheat and following the technical recommendations on new varieties, irrigation, fertilization, planting dates and reducing the cost of wheat production using mechanization in production, and take care of the dates of planting, harvesting and purity of weeds.
- Farms awareness to reduce wastage of wheat during and after harvest, as well as rationalize consumption of wheat and adopt appropriate pricing policy to increase the cultivated area. In addition to the announcement of the price of wheat before the date of cultivation by enough time as well as the replacement of corn silage instead of alfalfa in animal feed.
- Full emancipation of the prices of production inputs and the abolition of support in return for full liberalization of final product prices according to market mechanisms and the abolition of the crop composition, as well as leave complete freedom in determining the spaces of farms cultivated crop.
- Expansion in the development of new varieties and breeds with suitable and high productivity, as well as bear the high temperature region of Upper Egypt and the desert territory.

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**References: -**

1 - Central Agency for Public Mobilization and Statistics, Bulletin of consumption, different numbers.
2 - Central Agency for Public Mobilization and Statistics, Statistical Yearbook, various issues.
3- Central Agency for Public Mobilization and Statistics, the quarterly bulletin for retail prices, various issues.
4 - Ibrahim Abdel Moneim Aljaar, and others: An analytical study of the costs and revenues of wheat crop in the Egyptian agriculture, Egyptian Journal of Agricultural Economics, Volume 15, Issue 4th December 2005.
5- Tarek Nour. Analysis of the current status of the system local bread in Egypt, Journal of the thirteenth Conference of the agricultural economy, and contemporary issues in the Egyptian agriculture, September 2005.
6- Ferial Banna, Isabel Fouad. An economic study of the response of the wheat in Egypt, Egyptian Journal of Agricultural Economics, Vol 10, No. 2, September 2009.
7 - Mohamed Sayed Said and Adly Saadawi Tulba. An economic study of the supply response to the most important cereal crops in light of the economic reform policy, Egyptian Journal of Agricultural Economics, Vol 11, No. 1, March 2009.
8 -Mohamed Abdel Hafiz Mohammed. An analytical study of the production and consumption of wheat in Egypt, Egyptian Journal of Agricultural Economics, Volume 15 , Issue 4 December 2005.
9 -The Ministry of Agriculture and Land Reclamation - Central Department for Economic Affairs - Bulletin of the agricultural economy - different numbers until 2012.
10 - The Ministry of Agriculture and Land Reclamation - Economic Affairs Sector, records of the General Administration of Statistics.
11 - Internet information network. www.fao.org.