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Egyptian food security of wheat in light of new challenges

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Abstract

The research aims mainly to study Some economic aspects of Egyptian food security of wheat in light of new challenges through studying of several sub-objectives represented in: estimating the models of the general trends function of some economic indicators of wheat in Egypt during the study period (2005-2020), estimating the size of wheat food gap and knowing the most important factors responsible for it, studying the most important indicators of Egyptian food security from wheat, studying the expected effects of the Russian-Ukrainian war on wheat supply chains in Egypt, and studying the policies and means to achieve Egyptian food security from wheat. Descriptive and quantitative analysis were used. The study depends on secondary data, which collected from local and foreign sources during the period (2005-2020). A study models of the general trend function for economic indicators showed that each of the total domestic production of wheat, domestic consumption, the average per capita share of wheat, the quantity of wheat imports, the food gap of wheat, the price of wheat Egyptian imports, the periods of covering the local production, and the quantity of imports for daily consumption of wheat, self-sufficiency ratio and the period of coverage of domestic production for daily consumption. It was found that all of these variables took a general, statistically significant, upward trend at the significant level (0.01). The statistical significance of the variables of the world import price of wheat and the total of the production and import coverage periods was not shown for daily domestic consumption of wheat, while the annual growth rates varied as shown in the research. The conduct study shows that the most important variables specific to the food gap of wheat are the local production of wheat, and the national consumption of wheat where it was found that the impact of each of these two variables on wheat gap be negative.

For the current situation of wheat production in light of 2030 strategic vision and the impact, the study showed that the strategic stock for wheat is estimated at about 1.4 million tons and the average local consumption of wheat is estimated at about 16.92 million tons during the study period (2005-2020), thus estimated food security of about 0.15 is therefore required to take various actions which lead to increase the size of the strategic stock of wheat enough for half of it needs for domestic consumption even come close to the value of suitable coefficient of wheat food security. The study showed that the policies and means to achieve wheat food security include horizontal agricultural development policy, vertical agricultural development policy, the policy of rationalizing the consumption of wheat, policy of consumer subsidy of bread, and the policy of diversifying sources of imported wheat.

For the expected effects of the Russian-Ukrainian war on wheat supply chains in Egypt, it is clear from the research that the Russian-Ukrainian conflict led to an impact on world food supplies in general, and wheat particular, and on Egypt and the Middle East. It is possible that the Russian-Ukrainian crisis will increase the food insecurity that some countries suffer from, including Egypt, as the lack of supplies and the rise in food prices will lead to food insecurity and weakness for many countries.

In the light of the results of the study illustrated by research it has been possible to reach some of the following recommendations:

-Performing laser land leveling operations to help rationalize the consumption of irrigation water.
-Work to expedite the disbursement of the price of the crop supplied to the mills.
- Intensify the efforts of agricultural extension and agricultural research centers to educate farmers about the importance of resisting pests and diseases that affect the crop, and help them obtain pesticides that are not harmful to the environment necessary for this.
- Increasing of wheat production by expanding the wheat crop in the new lands.
- Raising the productive capacity of the wheat crop by circulating high-productivity varieties that suit each of the administrative centers in Egypt.
- Rationalizing wheat consumption by reducing the volume of wasted wheat in the production and marketing stages.
- To achieve food security, it is necessary to prepare awareness programs to implement the policy of breeding control, as it is one of the most important factors determining the demand for Egyptian wheat imports.
- The state should review wheat supply prices in the coming years in order to encourage farmers to plant the largest areas allocated for wheat, and therefore, the current world prices of wheat must be considered when pricing.

Keywords: *Food gap, Food security, Wheat imports. World price, Egypt*

1. Introduction

Wheat crop is one of the main food grain crops in Egypt due to the dependence of the majority of consumers on it as a source of energy and protein. Those calories, and it also contributes about 40-45% of the total protein, and is considered one of the most important cereal crops in the world, and the demand for it is increasing in developing countries, including Egypt mainly due to the high rates of population increase on the one hand, and the support policy followed by the state on the other hand.

Wheat crop comes at the first of cereal crops, which is characterized by its insufficient production capacity to meet the consumption needs of Egyptian population, and thus resorting to importing large quantities of it to decrease the wheat gap between the production supply and the required consumption, which constitutes a significant burden on the government in managing the foreign currency needed to import it on the one hand. On the other hand, its production was concentrated in a few countries of the world. This important strategic crop was affected by many economic variables at the local and global levels, so it has become necessary to identify such variables and their future returns.

Despite the increase in production of the wheat crop in recent years, but this increase is not commensurate with the growing population needs, despite this the state is striving to adopt agricultural policies that would work to achieve self-sufficiency from it to decrease the food gap and contribute to solving the Egyptian food security problem. The cultivated area of wheat in Egypt amounted to about 3.13 million feddans (1 feddan = 0.42 hectare), with an average production of about 8.56 million tons, while the consumed amount reached about 17.78 million tons, and the self-sufficiency ratio reached about 39.03% in 2020, and the amount of imports wheat reached about 12.83 million tons, with a value of about 3021 million dollars in 2020.

Despite the great interest that Egypt gives to the agricultural sector through a set of successive policies and strategies starting from the eighties of the past century until Vision 2030, in addition to its adoption of national projects aimed at cultivating nearly 4 million feddans during the next stage to advance agricultural development in light of challenges and the risks it faces, especially water resources and limited agricultural land. In view of the limited resources in Egypt at a time when the total demand for wheat is increasing as a result of the increase in the population and the increase in their income level, which leads to an increase in the food gap of wheat, which is represented by the inability of the local production of wheat to meet the local consumer needs of it. This wheat gap is covered by wheat imports, which suffers from a negative imbalance since the seventies of the last century, and then the Egyptian balance of payments.

Despite the increase in wheat crop production in recent years, this increase is not commensurate with the growing population needs, which led to an increase in the value of imports from it, in light of the increase in the price of exchange of the dollar against the Libra Egyptian Pound, in addition to the doubling of its import bill from previous periods, especially in light of the repercussions of Covid- 19 and what followed, coinciding with the Russian-Ukrainian war, which greatly affected the shape, size and nature of food supplies in the world, especially that these two countries represent the largest part of the food basket of grain crops in the world,

which had a negative impact on the world economies, which in turn led to the occurrence of successive inflationary waves in its prices, and the ensuing effects on all other sectors, which constitutes a great burden on countries that import large quantities of it, including Egypt. Which necessitates studying the current situation of wheat production and consumption and working to reduce the impact of the Russian-Ukrainian war, finding alternatives through which to make maximum use of the local production used in the production of subsidized bread.

The main objective of this research is to study the food gap, the Egyptian food security of wheat, and impact of new challenges on food security of wheat and this objective can be achieved by achieving the following sub-objectives:
1- Estimating the models of the general trends function of some economic indicators of wheat in Egypt during the period (2005-2020).
2- Estimating the size of the nutritional gap of wheat and knowing the most important factors responsible for it.
3- Studying the most important indicators of Egyptian food security from wheat.
4- Studying the expected effects of the Russian-Ukrainian war on wheat supply chains in Egypt.
5- Studying the policies and means of achieving Egyptian food security from wheat.

To achieve objective of the research, it relies on both descriptive and quantitative statistical analysis methods, where some statistical analytical methods were used, such as time series analysis and the general trend to identify the trends of economic variables in the study and use semi-logarithmic form in the dependent variable to calculate the annual growtrh rates for those variables, as well as the multiple regression analysis method was used to find out the most important factors responsible for the size of the wheat gap, and some economic indicators were used to measure the effect of factors affecting the Egyptian food security factor of wheat. Secondary data published in various issues of the Agricultural Economics Bulletin issued by the Ministry of Agriculture and Land Reclamation, the Central Agency for Public Mobilization and Statistics, as well as the publications of the Food and Agriculture Organization of the United Nations (FAO) were also relied upon. Use the international web to obtain information related to the research.

2. Research results and discussion

2.1. Statistical analysis of some economic indicators of wheat in Egypt during the period (2005-2020)

By reviewing the received data and the statistical analysis contained in Table (1), it is generally clear in the light of the estimated trend models in their linear form for the economic indicators in question represented in the total domestic production of wheat, domestic consumption, the average per capita share of wheat, the quantity of wheat imports, food gap of wheat, price of Egyptian imports of wheat, periods of covering the local production, and the quantity of imports for daily consumption of wheat. It was found that all of these variables took a general, statistically significant, upward trend at the probabilistic level (0.01), except for the variables of the self-sufficiency ratio and the period of coverage of domestic production for daily consumption, which took a general decreasing trend. Also, the statistical significance of the variables of the world import price of wheat and the total of the production and import coverage periods was not shown. for daily domestic consumption of wheat, while the annual growth rates varied as shown in Table (1), and the preference of these models compared to the rest of the estimated models in the other models was clear based on the values of (F), and (R^2) of the estimated model, and the value of (T) for the independent variable in the model, and the following is a review for the results of these models:

2.1.1 Development of the production capacity of wheat

The production capacity of wheat ranged between a minimum of about 7.17 million tons in 2011 and a maximum of about 9.61 million tons in 2016 with an annual average of about 8.42 million tons during the study period (2005-2020). The productivity of wheat showed a general statistically significant trend at 1%, and the annual increase amounted to about 100 thousand tons, and the annual growth rate was about 1.20%.

2.1.2. The development of local consumption of wheat

It is not surprising that the domestic consumption of wheat takes a general, statistically significant upward trend at the probability level (0.01), where the annual growth rate is about 3.60% with an annual average of about 16.92 million tons, and if the passage of time is accompanied by growth, the steady increase in the population will lead to a steady increase in the consumption needs of wheat in all its forms.

2.1.3. Evolution of the average individual annual consumption of wheat

The average individual annual consumption of wheat in Egypt ranged between a ,minimum of about 155.88 Kg/person in 2005 and a maximum of about 215.70 Kg/person in 2020 with an annual average of about 191.78 Kg/person average individual annual consumption of wheat during the study period (2005-2020), and the average annual consumption of wheat took a general statistically significant trend at 1%, and the annual increase amounted to about 3.05 Kg/person, and the annual growth rate was about 1.6%.

2.1.4. Evolution of the amount of Egyptian imports of wheat

The problem of increasing Egyptian imports of wheat is one of the main problems facing the Egyptian economy because of its negative effects on the Egyptian agricultural trade balance and then the Egyptian balance of payments, especially in light of the increase in the prices of wheat imports in the world market. Which requires the expansion of the cultivation of the wheat crop in Egypt? However, the horizontal development policy faces several difficulties, the most important of which is the great competition between the area of the wheat crop and the rest of the other agricultural crops over the limited agricultural area.

The Egyptian imports of wheat also have an important role to cover the gap between the local production of wheat and the consumer needs of it. Table (1) shows that wheat imports ranged between a minimum of about 4.06 million tons in 2009 and a maximum of about 12.83 million tons in 2020, with an annual average of about 8.60 million tons during the study period (2005-2020), and Egyptian imports of wheat took a trend the year was statistically significant at 1% and the annual increase amounted to about 548 thousand tons, and the annual growth rate was about 6.7%.

2.1.5. Evolution of the prices of Egyptian imports of wheat

The prices of Egyptian wheat imports are special importance, as their increase negatively affects the Egyptian agricultural trade balance and then the Egyptian balance of payments. By reviewing the data of Table (1), it appears that the prices of Egyptian wheat imports ranged between a minimum of about 152.35 dollars per ton in 2006, and a maximum of about 326.03 dollars per ton in 2009, with an annual average of about 232.11 dollars per ton. The prices of Egyptian wheat imports took a general statistically significant trend at 1%, and the annual increase amounted to about 0.21 dollars per ton, and the annual growth rate was about 0.30 %.

Table No. (1) - Development of some economic indicators of wheat during the study period (2005 - 2020)

Years	Domestic production (10^3 tons)	National consumption (10^3 tons)	Wheat food gap (10^3 tons)	Per capita consumption (Kg/year)	Quantity of imports (10^3 tons)	Sufficiency %	World import price ($/ton)
2005	7.18	11.75	4.57	155.88	5.63	61.10	156.88
2006	8.14	13.31	5.17	173.35	5.82	61.15	152.35
2007	8.27	14.67	6.40	187.69	5.92	56.37	192.04
2008	7.38	14.37	6.99	180.66	4.08	51.36	255.21
2009	7.98	14.59	6.64	180.23	4.06	54.69	326.03
2010	8.52	14.98	6.46	181.05	9.93	56.87	224.07
2011	7.17	16.88	9.71	200.69	9.8	42.48	223.58
2012	8.37	15.66	7.29	163.3	8.25	53.45	316.26
2013	8.80	17.21	8.41	212.97	6.54	51.13	313.24
2014	9.46	17.03	7.57	189.62	8.13	55.50	312.25
2015	9.28	18.41	8.80	200.52	8.98	50.41	284.89
2016	9.61	19.41	8.80	206.97	10.79	49.51	204.45
2017	9.34	20.02	10.68	209.04	12.03	46.65	166.63
2018	8.40	19.71	11.31	201.64	12.37	42.62	174.20
2019	8.35	20.85	12.50	209.11	12.46	40.05	209.93
2020	8.56	21.93	13.37	215.7	12.83	43.59	201.69
Annual average	**8.43**	**16.92**	**8.42**	**191.78**	**8.60**	**51.06**	**232.11**
Min. limt	**7.17**	**11.75**	**4.57**	**155.88**	**4.06**	**40.06**	**152.35**
Maxi. limt	**9.61**	**21.93**	**13.37**	**215.7**	**12.83**	**61.15**	**326.03**
Amount of change	**0.096****	**0.603****	**0.494****	**3.05****	**0.548****	**-1.12****	**^{NS}0.21**

Rate of change %	**1.2****	**3.6****	**6.00****	**1.6****	**6.7****	**- 2****	**ĩ^{NS}0.3**

**: significant at 0.01 NS: non-significant

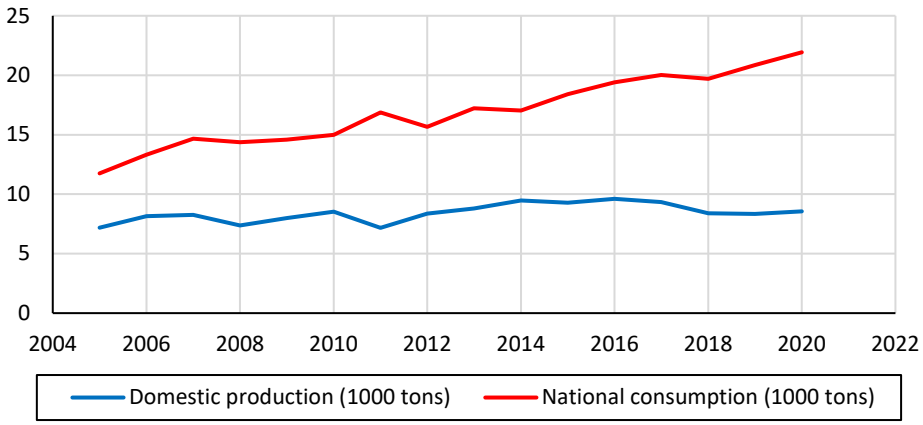
Source: Compiled and calculated from:

(1) Ministry of Agriculture and Land Reclamation, Central Administration of Agricultural Economy, Bulletin of Agricultural Economics, various issues.

(2) Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Central Administration of Agricultural Economy, Food Balance Bulletin, miscellaneous issues.

(3) The website of the Food and Agriculture Organization of the United Nations www.faoststat.org

Chart (1) - Development of Egyptian domestic production and national consumption of wheat during the study period (2005 - 2020)



2.1.6. Geographical distribution of the amount of Egyptian imports of wheat during the period (2016-2020)

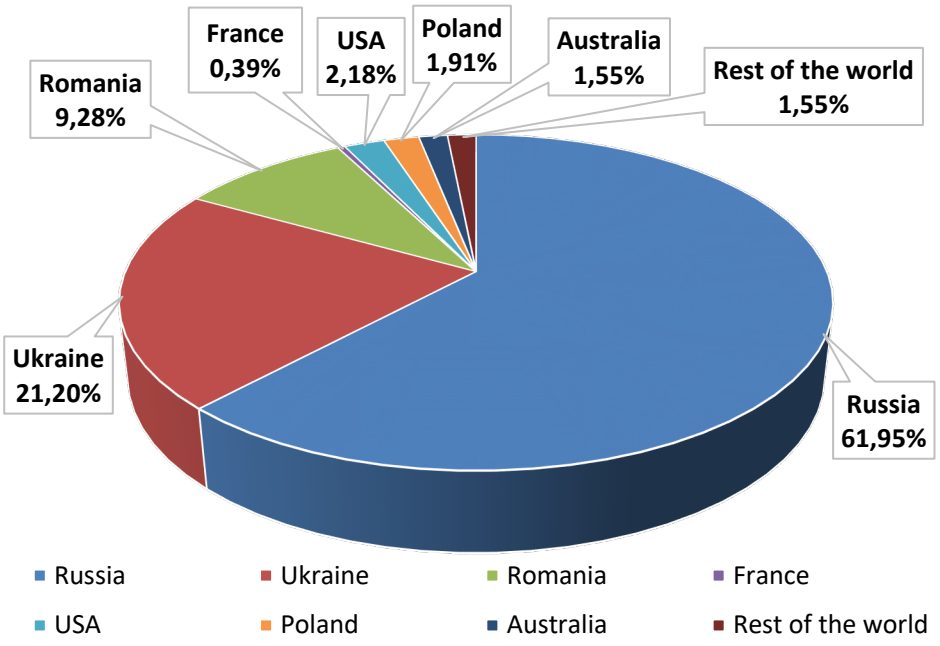
Table (2) shows the geographical distribution of Egypt's wheat imports from the world market during the period (2016-2020), as it is clear according to the relative importance of the wheat-exporting countries that Russia comes in the first place exporting wheat to Egypt with an average quantity of about 6.81 million tons, followed by the second Ukraine with an average quantity of about 2.33 million tons during the study period, while Romania, France, USA, Poland and Australia ranked from third to sixth with an average of about 1.02, 0.43, 0.24, 0.21, 0.17, 0.17 on ranking during the study period. It is clear from the above that the Russian-Ukrainian war has a significant impact on Egypt's wheat imports, as Egypt imports about 9.14 million tons on average for the period (2016-2020), at a rate of about 80.3% of Egypt's total wheat imports from the global market during that period.

Table (2) - Geographical distribution of Egypt's wheat imports in million tons during the period (2016-2020)

Countries/years	2016	2017	2018	2019	2020	Average	%
Russia	5.82	7.83	9.20	5.74	5.46	6.81	59.84
Ukraine	2.41	2.56	1.60	1.77	2.32	2.33	20.47
Romania	1.30	1.10	1.10	1.29	0.29	1.02	8.96
France	0.63	0.22	0.10	0.63	0.59	.043	3.78
USA	0.08	0.26	0.01	0.78	0.08	0.24	3.11
Poland	0.41	0.28	0.14	0.13	0.09	0.21	1.86
Australia	0.17	0.20	0.26	0.03	0.20	0.17	1.49
Rest of the world	0.31	0.47	0.09	0.06	0.00	0.17	1.49
World	**11.14**	**12.93**	**12.50**	**10.42**	**9.04**	**11.38**	**100**

Source: Compiled and computed from www.fao.org

Chart (2): Geographical distribution of Egypt's wheat imports in million tons by avarage for the period (2016-2020)



2.1.7. Development of Egyptian food gap of wheat

With regard to the wheat gap, the beginning of the gap between wheat production and consumption in Egypt began with the beginning of the economic openness policy in 1974 and the subsequent increase in the level of entry categories for many groups of Egyptians, and this policy was characterized as a consumer policy. Food gap of wheat is represented by the inability of the local production of wheat to cover the consumer needs of it. This is why this gap is considered one of the most important problems facing the planners and makers of Egyptian economic policies, because wheat is considered one of the strategic commodities in the world market, especially after the trend to use it in biofuel production. Therefore, it is necessary to identify the extent of the possibility of achieving a percentage of self-sufficiency in wheat by studying the size of the wheat gap and the factors affecting it to determine the extent of the possibility of reducing the wheat gap in the future period. Data from Table (1) indicate that the Egyptian food gap of wheat ranged between a minimum of about 4.57 million tons in 2005 and a maximum of about 13.37 million tons in 2020, with an annual average of about 8.42 million tons. Egyptian food gap of wheat took a general statistically significant trend at the annual increase amounted to about 495 thousand tons, and the annual growth rate was about 6%.

3. Determinants of the Egyptian wheat food gap

Food gap of wheat is determined from production and domestic consumption of it and is covered by an amount of imports equal to it. It is assumed that the change in production will have a negative impact opposite the direction on the amount of imports, while the effect of the change in consumption will have a positive effect in the same direction, as can be In theory, introducing the Egyptian wheat import price variable as one of the determinants of this gap, and it is assumed that it will have a negative impact on that gap.

3.1. Standard estimation of the most important variables determining the food gap of wheat

To study and measure the effect of some specific variables of the food gap of wheat, the relationship between the amount of the gap of wheat (thousand tons) as a dependent variable, and each of the local production of wheat (X_1) (million tons), and the national consumption of wheat (X_2) (kg) and the real average price of Egyptian wheat imports (X_3) ($/ton) during the study period (2005-2020). It was found that the best mathematical models that reflect this relationship are the following equation:

$$Y = 1.35 - 1.17\ X_1 + 1.02\ X_2$$

$$(1.96)^{*}\ (-\ 11.86)^{**}\ (38.84)^{**}$$

$$F = 831.15 \quad R^2 = 0.99$$

It is clear from the previous equation that the impact of each of X_1, X_2 on the wheat gap is negative, as a change in the local production sites of wheat by 1% will lead to a change of 1.17% in the amount of that gap in the opposite direction, and a change in the average consumption from Wheat by 1% leads to a change of 1.02% in the amount of that gap in the same direction.

4. Egyptian food security of wheat

Increased interest in the issue of food security in most parts of the world, which suffer from a gap between production and consumption of the main food commodities that may be caused by variables, including the continuous increase in the population and the increase in individual income levels, and the inability of agricultural resources in those countries to adequately produce these commodities to meet these numbers of the population, in addition to the increase in the prices of food commodities in the international markets, which leads to a rise in their prices in the local importing markets.

It should be noted that the concentration of surplus agricultural food production in a limited number of developed countries in North America and Europe, especially Russia and Ukraine, and the tendency of these countries to consider food surplus as one of the strategic weapons to impose the political trends of these countries on other importing countries makes the problem of providing food a major party influential to achieve the national security of those countries that import the largest amount of food, which means that the ability to purchase food from the global surplus does not necessarily mean that it can be easily obtained, and therefore food security has become a major component of the national security of the countries of the world.

The interest in food security issues has doubled after the implementation and implementation of the World Trade Organization agreements (WTO), especially the agreement on aAgriculture and its associated abolition of subsidies for food producers and consumers, as well as the abolition of food export subsidies and the transformation of all quantitative restrictions in trade into non-quantitative restrictions, which led to an increase in the value of imports for a large number of food commodities.

This part deals with an explanation of the most important indicators of Egyptian national food security of wheat. This is done by reviewing and analyzing the annual coverage period for both Egyptian domestic production and Egyptian imports for the national consumption of wheat, as well as estimating the food security factor for the statistical analysis period covered by the research (2005-2020) - Table (3). After that, a review of some aspects and means of policies to achieve Egyptian food security from wheat is presented as a top priority because it is linked to the lives of all Egyptians because it is one of the main cheap sources of energy.

4.1. The most important indicators of Egyptian food security for wheat

This part of the study deals with the most important indicators of food security for wheat in Egypt during the study period (2005 - 2020) to calculate the food security factor of this commodity, which is represented in the Egyptian production of wheat, which amounts to about 8.65 million tons in 2020, and the Egyptian national consumption of wheat, which It amounts to about 21.93 million tons in 2020, and this leads to the average Egyptian individual consumption of wheat reaching about 215.7 kg / year, and this will result in the Egyptian wheat gap reaching about 13.37 million tons in 2020, which is covered by wheat imports, which negatively affects the Egyptian agricultural trade balance and then the Egyptian balance of payments.

The length of the production coverage period and the low period of imports covering the national consumption is a good step that indicates the tendency to achieve somewhat food security, which indicates a reduction in dependence on imports from world market.

4.1.1. Daily Egyptian consumption of wheat

A review of the development of the Egyptian daily consumption of wheat during the period (2005-2020) shows that it ranges between a minimum of about 32.19 thousand tons/day in 2005 and a maximum of about 60.14 thousand tons/day in 2020 with an annual average reached about 46.36 thousand tons/day during the study period, and the Egyptian daily consumption of wheat took a general upward trend, statistically significant at 1%, estimated at about 1.7 thousand tons, representing about 3.56% of the annual average of the Egyptian daily consumption of wheat, and the annual growth rate was about 3.6%.

4.1.2. Period of covering Egyptian production for the daily consumption of wheat

This period is defined as the period in which Egyptian production of wheat can cover the daily food needs of the population, and a review of that period during the years (2005 - 2020) shows that it ranges between a minimum

of about 142.3 days The year 2020 has a maximum of about 223.2 days in 2006, with an annual average of about 185.34 days. The period of coverage of Egyptian production for the local consumption of wheat took a general decreasing trend during the mentioned period, which was statistically significant at 1%, estimated at about 4.46 days, and the annual decrease rate was about 2.6%. The decreasing period of coverage of Egyptian production of wheat for daily consumption is due to the fact that the annual growth rate in the national consumption of wheat (3.6%) exceeds the annual growth rate in the domestic production of wheat (1.2%) during the study period.

4.1.3. Period of Egyptian imports covering the daily consumption of wheat

This period is defined as the period during which annual imports of wheat can cover the daily food needs of the population, which is shown by reviewing during the period (2005 - 2020) that it ranges from a minimum of about 101.6 days in 2009 and a maximum of about 241.9 days in 2010, with an annual average of about 101.9 days during the study period, and it was found that the equation of the general temporal trend was not significant for the period of Egyptian imports covering the daily consumption of wheat.

Table No. (3) - Evolution of the period of coverage of domestic production and imports for the Egyptian national consumption of wheat during the period (2005-2020)

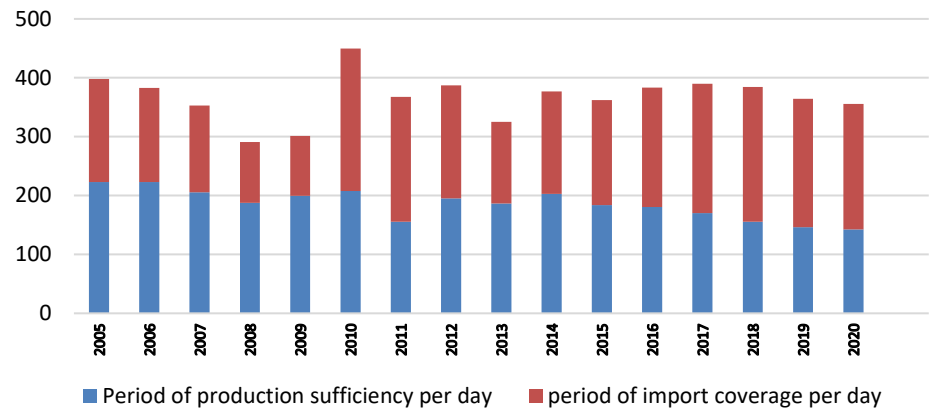
Year	Daily domestic consumption (tons)	Period of production sufficiency and import coverage for domestic consumption of wheat		
		Period of production sufficiency per day	period of import coverage per day	sum of the two periods
2005	32192	223.0	174.9	397.9
2006	36466	223.2	159.6	382.8
2007	40192	205.8	147.3	353.1
2008	39370	187.5	103.6	291.1
2009	39973	199.6	101.6	301.2
2010	41041	207.6	241.9	449.5
2011	46157	155.3	212.3	367.6
2012	42904	195.1	192.3	387.4
2013	47151	186.6	138.7	325.3
2014	46658	202.7	174.2	376.9
2015	50438	184.0	178.0	362.0
2016	53178	180.7	202.9	383.6
2017	54849	170.3	219.3	389.6
2018	54000	155.6	229.1	384.7
2019	57123	146.2	218.1	364.3
2020	60137	142.3	213.3	355.6
Annual average	**46364**	**185.34**	**181.69**	**367.04**
Min. limt	**32192**	**142.3**	**42.63**	**291.1**
Maxi. limt	**60137**	**223.2**	**241.9**	**449.5**
Amount of change	**1653.07****	**-4.46****	**5.15***	**0.68 NS**
Rate of change %	**3.6****	**-2.5****	**3.1***	**0.3 NS**

1- Daily Domestic Consumption = Domestic Consumption/365
2- Domestic production coverage period for daily consumption = local production / daily domestic consumption
3- Import coverage period for daily consumption = quantity of imports / daily domestic consumption
4- Self-sufficiency = local production / local consumption * 100.

**: significant at 0.01 * : significant at 0.05 NS: non-significant

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

Chart (3): Evolution of the period of coverage of domestic production and imports for the Egyptian national consumption of wheat during the period (2005-2020)



5. Estimation of Egyptian strategic stock of wheat

The strategic stock of a commodity is defined as the quantities maintained by the government and the private sector to meet the expected domestic and export demand for this commodity during a future period of time. The strategic stock is estimated during a certain period of time as the sum of the surplus directed to the development of the strategic stock in some years and the amount of the deficit that is withdrawn from that stock during other years in which a deficit appears in domestic consumption. Therefore, maintaining a strategic stock of wheat is one of the most important considerations for Egyptian national food security. The strategic stock is formed through local production or through imports or both.

A review of the amount of the Egyptian strategic stock of wheat during the study period (2005-2020) shows that it amounts to about 1.4 million tons, and this is enough to consume about 29.3 days, which calls for the need to increase the volume of the stock by about 8248.2 thousand tons of wheat to suffice for local consumption for a period of 6 months, according to food security considerations. Egyptian national. Table No. (4).

5.1. Surplus and deficit in wheat allocated for Egyptian national consumption during the study period (2005 - 2020)

It is clear by reviewing the surplus and deficit in wheat allocated for Egyptian national consumption during the study period (2005-2020) that there are a surpluses during the years 2005, 2006, 2010, 2011, 2012, 2014, 2016, 2017, 2018. A review of the surplus in wheat allocated for Egyptian national consumption during the study period shows that it ranges between a minimum of about 120 thousand tons in 2011 and a maximum of about 3,470.5 thousand tons in 2010, with a total of about 9.95 million tons to suffice for consumption of about 235.3 days, or about 7.8 months, this surplus is directed to the development of the strategic stock in some years in which the deficit appears, which is withdrawn from that stock during the other years, namely 2007, 2008, 2009, 2013, 2015, 2019, 2020, and the deficit in wheat allocated for Egyptian national consumption during the study period is estimated at about 8567.4 thousand tons, or about 166.4 days, or about 5.5 months, and this deficit is covered during the deficit years, either by drawing from the strategic stock or importing wheat from world market - Table No. (4).

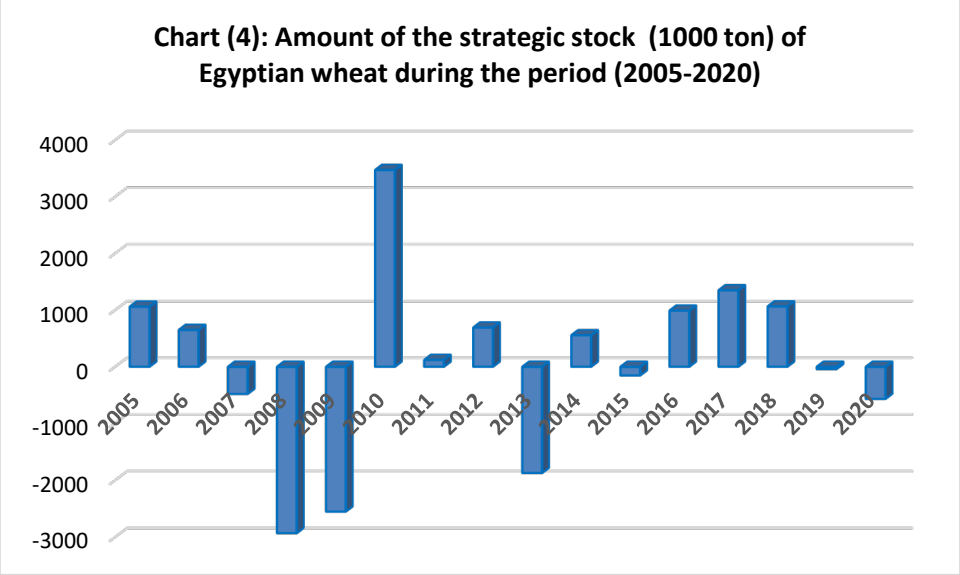
5.2. Food security coefficient of wheat in Egypt during the study period (2005 - 2020

The value of the food security coefficient for wheat ranges between zero and the one, and the closer the value is to zero, this indicates a decrease in the food security rate, and the closer the value is to the correct one, the greater the achievement of the rate Food security of wheat, and the coefficient of food security is calculated as the ratio of the strategic stock to the national consumption of wheat, and since the strategic stock of wheat is estimated at about 1359.8 thousand tons and the average national consumption of wheat is estimated at about 11.57 million tons during the study period (2005-2020) as a general average during that period, Therefore, food security is estimated at about 0.115. Therefore, it is necessary to take various measures that lead to an increase in the size of the strategic stock of wheat to suffice half of the needs of it for local consumption, so that the value of the food security factor approaches the correct one - Table No. (4).

Table No. (4) - The sufficiency period of the surplus and the deficit period of wheat allocated for daily Egyptian domestic consumption during the period (2005-2020)
quantity

Year	Surplus		Deficit		Amount of the strategic 10^3) stock (ton	Food security coefficient
	Quantity (10^3 ton)	Period of sufficiency of the surplus in daily domestic consumption	Quantity (10^3ton)	Period of the deficit in wheat allocated for daily local consumption		
2005	1059.1	32.9	-	-	1059.1	0.09
2006	649.1	17.8	-	-	649.1	0.05
2007	-	-	478.3	11.9	-478.3	-0.03
2008	-	-	2909.3	73.9	-2929.3	-0.20
2009	-	-	2550.3	63.8	-2550.3	-0.17
2010	3470.5	84.5	-	-	3470.5	0.02
2011	120.0	2.6	-	-	120.0	0.01
2012	691.0	22.4	-	-	691.0	0.04
2013	-	-	1871.9	39.7	-1871.9	-0.11
2014	555.2	11.9	-	-	555.2	0.03
2015	-	-	152.2	3.0	-152.2	-0.01
2016	989.1	18.9	-	-	989.1	0.05
2017	1349.3	24.6	-	-	1349.3	0.07
2018	1063.8	19.7	-	-	1063.8	0.05
2019	-	-	40.0	0.7	-40.0	-0.002
2020	-	-	565.3	9.4	-565.3	-0.03
Total	**9947.1**	**235.3**	**8567.4**	**166.4**	**1359.8**	**0.15-**

Surplus = (sum of the two production and import sufficiency periods - 365) * daily consumption.
Deficit = (365 - the sum of the two periods of adequacy of production and imports) * daily consumption.
Food security coefficient = the amount of strategic stock ÷ average annual national consumption
Source: compiled and calculated from table No. (3, 4).



6. Policies and means of achieving Egyptian food security from wheat

During the past decades, many attempts have been made to achieve an appropriate rate of agricultural development in Egypt, including inventorying and reclamation, then cultivating new lands and determining the available field and horticultural crops, as well as following the identification of appropriate service methods, and providing high-production strains resistant to climatic conditions in various regions of the Egyptian country.

High-efficiency irrigation networks have been established with a total length of about 40,000 km, extending from Lake Nasser in front of the High Dam to the valley and delta fields, with a land area of about 8.3 million feddan and a cropping area of about 15 million feddan. Despite all these efforts, the problem of low Egyptian food security in general has exacerbated, as the domestic product was unable to meet the needs of the population, whose number is increasing year after year, so major foodstuffs were imported, including wheat, beans, oil, maize, and animal feed in quantities that exceeded 50% of the total consumption. In the following, the most important means of achieving Egyptian food security and policies of wheat can be reviewed, as it is one of the most important problems of food security in Egypt at present, as it is linked to the daily consumption of the entire population. Egyptian food security from wheat can be achieved through the following policies:

6.1. Horizontal agricultural development policy

The horizontal agricultural development policy includes the direction of new areas for the cultivation of the wheat crop through the reclamation of arable lands with the provision of additional water resources necessary in order to achieve food security, especially in the lands currently under reform, such as the reins of the Salam Canal, which has an area of about 620 thousand feddans, of which 400,000 feddans are in Sinai, a large part of which is suitable for cultivation immediately, as well as the lands of the northern coast, in which the rainy season can be exploited in winter, except for the month of April, as well as a land area of about 540 thousand feddans in Toshka region, as well as another area in eastern Owainat amounting to about 250 thousand feddans, in addition to this, about 400 feddans are arable in Aswan, as well as about 500 feddans are cultivated annually in Egypt for the seed core, meaning that about 2 million feddans can be added to the plot, which can be allocated to the cultivation of the wheat crop, and thus we can get very close to self-sufficiency in our needs of that strategic commodity. The average annual consumption of which is about 16.92 million tons during the period (2005-2020).

6.2. Vertical agricultural development policy

This is done by continuing to develop new varieties of wheat crop that are early in maturity, resistant to diseases and other pests and resistant to environmental stress, characterized by increased yields per feddan compared to the old varieties to replace them, provided that this is accompanied by the provision of production inputs at the appropriate times. The most important of them are the good and improved seeds, especially for the newly developed varieties, and the fertilizers, especially nitrogen, taking into account the guidance of agricultural guidance to farmers on how to use them and not to exaggerate the prices of cooperative societies.

It should be noted that it is possible to reconsider the current cropping structures to increase the area planted with wheat without affecting other crops through the development of early-maturing varieties that enable successive cultivation of another crop after the wheat crop. Achieving the highest production and motivating them by using modern technology methods of irrigation systems and methods of service and care for crops to maintain high productivity.

The role of agricultural extension in achieving vertical agricultural development comes through educating farmers on the use of modern technological methods as well as the use of deep plowing instead of traditional plowing because it helps to distribute water in a way that helps to increase the percentage of germination. The tendency to irrigate by sprinkler and thus increase the amount of wheat production.

6.3. Policy of rationalizing the Egyptian wheat consumption

The policy of rationalizing Egyptian consumption of wheat is one of the most important policies that are in line with international health standards, which may result in a decrease in the size of the Egyptian consumption gap of wheat because individual consumption is one of the most important factors affecting the wheat gap, and this requires directing a great deal of awareness and government guidance directed to the Egyptian people to decrease the level of individual consumption in order to reduce the average consumption of wheat.

6.4. Consumer subsidy policy for a loaf of bread

This policy consider one of the most important factors that have a positive impact on increasing the average per capita consumption of wheat, and this may be due to the increase in the total demand for subsidized commodities due to their low price, and this would increase loaf of bread consumption at greater rates. From the increase in domestic production and thus the increase in the amount of imports to cover this wheat gap, which negatively affects the Egyptian agricultural trade balance and then the Egyptian balance of payments, which led Egyptian government to adopt a policy of deficit financing and increasing the amount of the total means of payment in a way that is not commensurate with the total increase in the national product. Which resulted in an increase in the problem of inflation as a result of an increase in aggregate demand at a faster rate than an increase in aggregate supply.

6.5. The policy of diversifying the sources of wheat import

The policy of diversifying the sources of wheat import includes all the procedures followed by the state to control and regulate its import annually in order to achieve the provision of the wheat commodity and the achievement of strategic national security, which has its impact on achieving comprehensive development and increasing investment in the agricultural, industrial and tourism fields, which leads in turn, to increase the national income, support the national economy, and achieve and raise the standard of living for all members of the national economy.

It should be noted that it is expected that there will be a significant increase in the quantity of wheat imports in the coming years - if wheat production is not expanded in Egypt - and given that the wheat import system in Egypt is subject to the phenomenon of geographical concentration, as Egypt relies on six countries, namely Russia, Ukraine, France, the United States of America, Poland, and Australia mainly, and these countries control the majority of the world market for wheat and therefore its prices and export routes, in addition to the implementation of the agreement and the establishment of the World Trade Organization is expected to result in an increase in the prices of most food commodities, including wheat.

This requires the development of a national strategy to increase the self-sufficiency rate of wheat, with the necessity of distributing and diversifying import quantities between different sources in order to avoid the political turmoil that may occur in the interest of the Egyptian economy in the event of a change in international political conditions; this is because relying on these markets to provide the Egyptian wheat consumption needs in the future makes Egypt vulnerable to many world risks that occur in world food markets or those related to possible climate changes at the world or local levels. This also entails the necessity of studying the obligations to reduce the subsidies granted to production and export in the wheat-exporting countries in order to reduce the negative effects on the Egyptian economy, and the application of a free policy in importing wheat by studying its export prices in different countries, which may be characterized by variation as a result of the different results of reducing subsidies in each of them, and increasing wheat production by expanding the area of the wheat crop in the new lands and raising the productive merit of the wheat crop through the generalization of high-productivity varieties that suit each of the administrative centers in Egypt, and rationalization of wheat consumption by reducing the volume of losses of wheat, and in order to achieve food security, it is necessary to prepare awareness programs to implement the policy of breeding control, as it is one of the most important factors determining the demand for Egyptian wheat imports.

7. The expected effects of the Russian-Ukrainian war on wheat supply chains in Egypt

Egypt relies on imported wheat to cover about 60% of domestic consumption, as Egypt's imports of wheat amount to about 13 million tons each year. It should be noted that Egypt's imports of Russian wheat amounted to about 7.8 million tons, and of Ukrainian wheat about 3.2 million tons in 2020. Russia is the world's largest wheat exporter, while Ukraine is one of the world's top 5 wheat exporters. Russia and Ukraine account for about 30% of the total wheat exports worldwide. The Russian and Ukrainian wheat is characterized by its low price compared to other wheat-exporting countries, so the crisis resulted in wheat prices reaching record price levels of about $387/ton in the European trading sessions on Thursday, February 24, 2022 with the onset of the crisis. Although Egypt is one of the largest importers of wheat in the world, it is still a major producer of it. The country has increased its storage capacity from about 1.4 million tons nearly a decade ago to more than 3 million tons now. Sufficient wheat for 9 months in silos, including about 5 months of strategic reserves and 4 months of local production.

In addition, there are 14 countries other than Russia and Ukraine approved by the Ministry of Supply to source wheat to Egypt, including Australia, America, Paraguay and Mexico. In anticipation of the possible crisis, Egypt has contracted about 180 thousand tons of Romanian wheat.

The conflict is concentrated in the northern Ukrainian regions, endowing the most productive regions in Ukraine, where more than 70% of Ukraine’s lands are allocated to agriculture. Its wheat exports amounted to about 18 million tons out of the total 24 million tons it produced in 2020. It is noteworthy that Ukrainian exports decreased as a result of the tensions witnessed by the country Ukraine during Russia's annexation of Crimea.

It is clear from the research that the Russian-Ukrainian conflict led to an impact on world food supplies in general, and wheat particular, and on Egypt and the Middle East. It is possible that the Russian-Ukrainian crisis

will increase the food insecurity that some countries suffer from, including Egypt, as the lack of supplies and the rise in food prices will lead to food insecurity and weakness for many count

7.1. The Russian-Ukrainian crisis increases the problem of food security

Before the Russian-Ukrainian war, the prices of food commodities were high at the global level as a result of the Covid-19 pandemic and its implications in terms of production interruption, disruptions in supply chains and high shipping costs, in addition to the problem of climate change that caused damage to a wide range of crops and reduced productivity of many agricultural crops. The FAO stated in January 2022 that international food prices increased by about 28% during 2021, reaching their highest levels in 10 years. The Russian-Ukrainian conflict adds a new burden to the crisis of high international prices for food commodities, as the crisis is considered a strong blow to foreign trade, and the longer the crisis period, the greater the paralysis of global supply chains and supply, as there are clear strikes in the transport and logistics industry due to the cancellation of many flights or changing their route, which led to increased pressure on cargo capacity. As a result of the Russian-Ukrainian crisis, Ukrainian ports were closed and Russian ships were banned from entering the ports of the United Kingdom, and global shipping giants announced their suspension of all shipments to and from Russia, which would make it difficult for companies to transport goods around the world, which in turn would lead to increased delivery times and increased shipping costs.

8. Facing the challenges towards achieving self-sufficiency in the wheat crop

The following figure shows the challenges that may face achieving self-sufficiency in the wheat crop.

Figure (1): the challenges that may face achieving self-sufficiency in the wheat crop

The following figure shows the mechanisms for facing the challenges that may face achieving self-sufficiency in the wheat crop.

Figure (2): the mechanisms for facing the challenges that may face achieving self-sufficiency in the wheat crop.

In light of what the study showed of research results, it was possible to reach some of the following recommendations:

1- Performing laser land leveling operations to help rationalize the consumption of irrigation water.
2- Work to expedite the disbursement of the price of the crop supplied to the mills.
3- The necessity of paying attention to the performance of agricultural operations on time, in order to increase the feddan productivity of the crop.
4- The need to intensify the efforts of agricultural extension and agricultural research centers to educate farmers about the importance of resisting pests and diseases that affect the crop, and help them obtain pesticides that are not harmful to the environment necessary for this.
5- Working to increase wheat production by expanding the wheat crop in the new lands.
6 - Raising the productive capacity of the wheat crop by circulating high-productivity varieties that suit each of the administrative centers in Egypt.
7- Rationalizing wheat consumption by reducing the volume of wasted wheat in the production and marketing stages.
8- To achieve food security, it is necessary to prepare awareness programs to implement the policy of breeding control, as it is one of the most important factors determining the demand for Egyptian wheat imports.
9- The state should review wheat supply prices in the coming years in order to encourage farmers to plant the largest areas allocated for wheat, and therefore, the current world prices of wheat must be considered when pricing.
10- Improving the value chain of wheat, which will lead to reducing losses and thus reducing wheat imports and improving the Egyptian agricultural trade balance.

9. Conclusion

Wheat crop is one of the main food grain crops in Egypt due to the dependence of the majority of consumers on it as a source of energy and protein.

Wheat crop comes at the first of cereal crops, which is characterized by its insufficient production capacity to meet the consumption needs of Egyptian population, and thus resorting to importing large quantities of it to decrease the wheat gap between the production supply and the required consumption, which constitutes a significant burden on the government in managing the hard currency needed to import it on the one hand. On the other hand, its production was concentrated in a few countries of the world. This important strategic crop was affected by many economic variables at the local and global levels, so it has become necessary to identify such variables and their future returns.

Despite the increase in production of the wheat crop in recent years, but this increase is not commensurate with the growing population needs, despite this the state is striving to adopt agricultural policies that would work to achieve self-sufficiency from it to decrease the food gap and contribute to solving the Egyptian food security problem. The cultivated area of wheat in Egypt amounted to about 3.13 million feddans (1 feddan = 1.42 hectare), with an average production of about 8.56 million tons, while the consumed amount reached about 17.78 million tons, and the self-sufficiency ratio reached about 39.03% in 2020, and the amount of imports wheat reached about 12.83 million tons, with a value of about 3021 million dollars in 2020.

The weakness of food security in order to meet the population requirements and their healthy food preferences leads to instability of society in terms of security, economics and politics. Therefore, Egypt seeks to increase self-sufficiency rates and reduce the food gap between production and consumption to achieve food security from food commodities in general and wheat in particular, where the economic progress of countries aim to achieve food security from wheat and other food commodities, so Egypt enables it to achieve high levels of wheat self-sufficiency, which amounted to about 50% according to the statistics of 2020. For the current situation of wheat production in light of 2030 strategic vision and the impact, the study showed that the strategic stock for wheat is estimated at about 1.4 million tons and the average local consumption of wheat is estimated at about 16.92 million tons during the study period (2005-2020), thus estimated food security of about 0.15 is therefore required to take various actions which lead to increase the size of the strategic stock of wheat enough for half of it needs for domestic consumption even come close to the value of suitable coefficient of wheat food security. The study showed that the policies and means to achieve wheat food security include horizontal agricultural development policy, vertical agricultural development policy, the policy of rationalizing the consumption of wheat, policy of consumer subsidy of bread, and the policy of diversifying sources of imported wheat.

For the expected effects of the Russian-Ukrainian war on wheat supply chains in Egypt, it is clear from the research that the Russian-Ukrainian conflict led to an impact on world food supplies in general, and wheat particular, and on Egypt and the Middle East. It is possible that the Russian-Ukrainian crisis will increase the food insecurity that some countries suffer from, including Egypt, as the lack of supplies and the rise in food prices will lead to food insecurity and weakness for many countries.

In light of the results obtained from the research, it recommends some recommendations may be important to develop Egyptian wheat production to achieve Egyptian wheat food security.

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