Journal of Advanced Zoology

ISSN: 0253-7214

*Volume **43** Issue **S -01 Year 2022** Page 386**:397***

An Economic Study Of The Repercussions Of The Wheat Gap In The Arab Republic Of Egypt

Salah S. Abd El-Ghani [(1), (2)]

[1]*Associate Professor of Economics - College of Economics and Administrative Sciences, Imam Mohammad Ibn Saud Islamic University (IMSIU)*

[2]*Assistant, Professor of Agricultural Economics, Institute of Agricultural and Biological Research, National Research Centre, El Buhouth St., Dokki, Giza 12622, Egypt.*

***Corresponding Author:** Salah S. Abd El-Ghani*
drsalahsaid@yahoo.com

Abstract:

Despite an increase in wheat-farmed area and, as a result, an increase in total wheat crop yield. Because of the annual population increase, the consumed quantities of it continue to rise at rates faster than the rates of expanded production. As a result, the nutritional gap in wheat has widened and the sufficiency ratio has decreased. As a result, the study's primary goal is to investigate and estimate the most relevant indicators of food security for Egypt's wheat crop, which is one of the country's most essential strategic crops, during the study period (2001-2020). To achieve the research's goals, it relied heavily on descriptive and quantitative data analysis, including the employment of a linear regression model of the general trend equations to calculate the annual growth rate of the study variables' evolution. When the food gap for Egypt's wheat harvest was calculated, it was discovered to have a general increasing tendency, with an annual increase rate of roughly 5.2%. The annual percentage of wheat self-sufficiency, with an annual growth rate of roughly 1.3%. It also revealed a decline in the value of the wheat crop's food security coefficient, which was around 0.26. The drop is attributable to a greater reliance on imports to meet the essential needs, as well as a reduction in strategic stock. As a result, in order to increase the area of wheat, the value of the food security coefficient must be increased, as well as horizontal expansion. Taking a variety of agricultural strategies and growth plans into consideration.

Keywords: (Food Gap, Cereal Crops, Wheat Gap, Self-sufficiency, Food Security).

1. Introduction

One of the most critical concerns that the state strives to address is attaining food security and meeting the demands of the population by enacting policies that enhance self-sufficiency rates, reduce the size of the food gap, and achieve food security, particularly from strategic commodities. Wheat is regarded as one of Egypt's most important grain crops due to its wide range of applications. Because wheat is the main source of food for the population and many food industries rely on it, the cultivated area expanded to approximately 1.4

million hectares in 2020, resulting in an increase in production kidneys to about 9.4 million tons in the same year. Despite the fact that total production has increased year after year due to an expansion in the area intended for wheat crop cultivation. The wheat crop is one of the deficit crops that does not fulfill the population needs, with an average self-sufficiency 55%, necessitating the purchase of about 45% of the crop from abroad. As a result, the Ministry of Agriculture and Land Reclamation is working hard to achieve its ambitious long-term strategic plan goal of increasing self-sufficiency to almost 80% by 2030. (Ministry of Agriculture and Land Reclamation, 2018)

2. Studying the current reality of the wheat crop and its strategic dimensions

Wheat yields could suffer because of increased short-term warming. Heat stress, water scarcity, and a rapid increase in dangerous insects and soil-borne viruses are projected to wreak havoc on wheat lands across South and West Asia and North Africa. The Ganges plains in India, South Asia, are today a hugely beneficial environment for wheat, but by 2050, more than half of its total area may be subjected to heat stress and high rates of fungal infections, and climate change may impair wheat's nutritional value. (Shiferaw, et al., 2013)

Increased demands to limit agriculture's contribution to climate change will have an impact on grain production. To adapt to and mitigate climate change, grain growers will need to limit farmland development, use fewer mineral fertilizers, and utilize less carbon dioxide in rice fields to reduce methane emissions. It is not required to increase maize, rice, and wheat yields at the same dizzying rates as during the Green Revolution in order to meet the objective of delivering 3.3 billion tons of grain annually by 2050. The question is how cereal production and food security have been affected by grain yield stagnation and an "unprecedented mix of stresses" - natural resource degradation, limited extension of cultivated area, water scarcity, and the terrible effects of climate change. (FAO, 2013)

Future scenarios indicate that pressure to reduce grain production will disproportionately affect those most at risk. These make up a large portion of the 500 million smallholder and family farmers in developing countries who produce an estimated 80% of the world's food, and the billions of low-income people who depend daily on grain for survival. The decline in wheat productivity and its high prices will have a severe impact on countries with high rates of poverty and the degree of dependence on it to achieve their food security. (FAO, 2014a)

African countries are becoming increasingly reliant on wheat imports, which reached a new high of 41 million tons in 2013/2014. (FAO, 2014b)

With the exception of wheat, Egypt was self-sufficient in practically all primary food commodities in 1960, with a self-sufficiency ratio (domestic production in relation to consumption) of 70%. During the 1970s and 1980s, the self-sufficiency ratio for most items fell drastically, and economists began to talk about a serious food gap in Egypt. Cereal crops, oil crops, sugar crops, legume crops, and pasture crops currently have a gap between production and consumption. One of the key focuses of Egypt's food security research is to close yield disparities. (Metz, 1990)

Because we dwell on barely 4% of Egypt's land, we have plenty of land resources. Our water supplies, on the other hand, have become scarce. Egypt has reached a point when the amount of available water is limiting the country's economic progress, and it has crossed the scarcity threshold. Nonetheless, on-the-ground water management is inadequate, with low application efficiency and substantial water losses to the ground. (Ministry of Irrigation and Water Resources, 2014)

Wheat is produced in Egypt between the latitudes of 25 and 31 degrees north latitude. The Nile Delta accounts for the majority of wheat production (57%) although there are also modest areas in Middle Egypt (18%) and Upper Egypt (18%), (17%), Wheat is Egypt's most important staple crop and a critical commodity, as well as a key component of the Egyptian diet. As a result, customers have little choice but to eat bread because it is still the cheapest food. Wheat consumption is increasing as the yearly population rise exceeds 2.0 million people per year. (Mansour, 2012)

In 2012, Egyptians, on average, consume up to 200 kg of wheat per capita per year. (Aegic, 2015)

Egypt's wheat shortage is likely to be exacerbated by two factors: population increase and the impact of climate change on wheat production and water demand. Egypt's population is expected to reach 125,870,736 people by 2030, necessitating increased wheat production. Furthermore, prior research on the impact of climate change on wheat water requirements in 2030 using AR4 climate change scenarios found that water requirements for wheat will increase by 9% in the Nile Delta and 18% in both Middle and Upper Egypt. As a result, it is projected that the wheat deficit will widen in 2030. (Ouda and Abd El-Latif, 2015)

After Nigeria and Ethiopia, Egypt has the third-largest population on the African continent. The Egyptian government is concerned about food security. Wheat is Egypt's major food and the country's first grain crop.

The wheat grains are consumed by humans, while the straw is utilized as animal fodder. (Mujeeb and Mohammad, 2008)

Wheat contributes 40% of the protein and 37% of the calories in the Egyptian diet, according to reports. Wheat and wheat products are consumed at a rate of roughly 200 kg per inhabitant per year, which is among the highest in the world. (Kherallah, et al., 2003)

The wheat crop takes up 47% of the farmed land during the winter season (Fig. 1). The overall area farmed with wheat in Egypt is about 1.26 million hectares, with a yield of about 8.1 million tons, but there is still a large discrepancy between production and consumption, roughly 50%. Egypt is the world's largest wheat importer, importing 9 to 10 million tons (approximately 38 percent) of wheat annually from various nations. (FAO, 2017)

The largest amount of imported wheat comes from Russia, USA, France, Ukraine, Romania, Australia, Germany, Canada, Brazil, and Poland. (Salem, et al., 2015)

Wheat imports and wheat consumption in Egypt during 1960 to 2017. Since 1960, great efforts have been made to regulate population growth, which steadily declined from an annual rate of 2.8% during the decade from 1974 to 1984, to 2.1% between 1985 to 1995 to 1.9% between 1998 to 2013. (Yanni, et al., 2016)

Between 1980 and 1993, yield climbed at a rate of 4.7 percent per year, while wheat area increased from 32 percent in 1980 to 83 percent in 1991, according to the report. While average yield grew from 3 300 kg ha–1 in 1981 to 1983 to 5 400 kg ha–1 in 1990 to 1992 to 6 500 kg ha–1 in 2017, this was due to the introduction of new excellent cultivars. The entire population, on the other hand, grew from 28.0 million in 1960 to 82.0 million in 2013, and 104 million in 2016. Egypt has been reliant on imports for around half of its food supply since the late 1980s due to overcrowding. Given present patterns, population growth will outpace wheat productivity, making it vital to find measures to boost wheat production. Most of Egypt's land has a desert climate, with the winter season being suitable for wheat production, and land and water are the main elements of sustainable development. (Anwar, et al., 2016)

3. Research problem

Despite the increase in the cultivated area of wheat and consequently the increase in the total production of the wheat crop. The consumed quantities of it are still heading towards a continuous increase at rates higher than the rates of production increase due to the annual population increase, which led to an increase in the size of the wheat food gap and a decrease in the self-sufficiency ratio. Therefore, the country tends to import large quantities of wheat annually to cover this deficit.

4. Research Objectives

The research mainly aims to study and estimate the most important indicators of food security for the wheat crop in Egypt as one of the important strategic crops during the study period (2001-2020), by studying the following axes:

- Studying the current reality of the wheat crop and its strategic dimensions.
- Studying the productivity indicators of wheat crop in Egypt.
- Estimation of food security indicators for wheat crop.
- Estimation of the strategic stock size and the food security factor of the wheat crop in Egypt.

5. Research Methodology and Data Sources

To achieve the objectives of the research, it was mainly relied on the descriptive and quantitative analytical method for the data, including the use of the linear regression model of the general trend equations to measure the annual growth rate of the development of the study variables:

Annual growth rate model to measure the evolution of study variables:

$$Y_t = e^{\alpha+\beta xt} \qquad (1)$$

By taking the natural logarithm of both sides, the model becomes:

$$ln\, Y_t = a + \beta\, ln\, X_t \quad (2)$$

5.1. Where:

- (Y) The variable whose annual growth rate is to be measured.
- (ln) natural logarithm

- (X) Variable time
- (t) Years 1, 2, 3...N
- (α) Constant or Intercept It represents the absolute number in the equation referring to the cut-off part of the Y-axis.
- (β) The slope of the regression coefficient, which indicates the annual growth rate.

5.2. Many economic indicators also have been used in the field of food security through the following equations:

- Dependence on abroad = (amount of imports ÷ domestic consumption) x 100
- Daily domestic consumption = total annual domestic consumption ÷ 365 days.
- The period of production sufficiency for consumption = total domestic production ÷ total daily domestic consumption.
- Import coverage period for consumption = quantity of imports ÷ total daily domestic consumption.
- The amount of surplus in domestic consumption = (the sum of the two periods - 365) x daily domestic consumption.
- Surplus sufficiency period for domestic consumption = the amount of surplus consumption ÷ daily domestic consumption
- The amount of the deficit in daily domestic consumption = (365 - the sum of the two periods) x daily domestic consumption.
- The period of deficit in consumption = the amount of deficit in domestic consumption ÷ daily domestic consumption.
- The quantity of the strategic stock volume = the quantity of the surplus in domestic consumption - the quantity of the deficit in domestic consumption.
- Food security factor = the size of the strategic stock ÷ local consumption.

In obtaining the necessary data for the study, the research relied on secondary data issued by government institutions, including the Ministry of Agriculture and Land Reclamation and the Food and Agriculture Organization of the United Nations (FAO), and many references and studies related to the subject of the study.

6. Results and discussions

6.1. The development of productive indicators for the wheat crop in Egypt during the period: (2001-2020)

6.1.1. Evolution of the cultivated area

Table 1. Productive indicators of the wheat crop during the period (2001-2020)

year	Area (1000 hectares)	Productivity (Ton)	Production (1000 tons)
2001	996.9	6.6	6552.3
2002	947.7	6.6	6252.6
2003	991.7	6.7	6616.2
2004	1014.2	6.7	6841.9
2005	1054.4	6.8	7165.1
2006	1208.1	6.7	8149.8
2007	1239.8	6.7	8272.0
2008	1098.9	6.7	7386.2
2009	1181.8	6.7	7972.6
2010	1273.6	6.7	8528.5
2011	1214.6	5.9	7173.3
2012	1233.7	6.8	8383.7
2013	1279.1	6.9	8786.6
2014	1367.0	6.9	9458.0
2015	1373.1	6.7	9262.9

2016	1112.8	7.1	7864.7
2017	1357.0	6.9	9355.3
2018	1182.4	7.2	8414.5
2019	1277.5	6.5	8334.0
2020	1358.0	6.9	9355.3
Average	**1188.1**	**6.7**	**8006.3**

Source: Compiled and calculated from the Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Agricultural Statistics Bulletin, separate issues.

Table 1 shows that the area planted with wheat in Egypt fluctuated up and down during the study period (2001-2020), with a minimum of about 947.7 thousand hectares in 2002 and a maximum of about 1373.1 thousand hectares in 2015. The annual average of the cultivated area was estimated by about 1188.1 thousand hectares, and by estimating the general trend equation (Equation 1. in Table 2.) it is clear that the area of wheat increased. With a statistically significant annual growth rate at the level of 1%, which amounted to about 1.5%, equivalent to about 17.9 thousand hectares of the annual average, and the coefficient of determination shows that about 59% of the changes that occur in the area planted with wheat are due to changes that are reflected in the element of time.

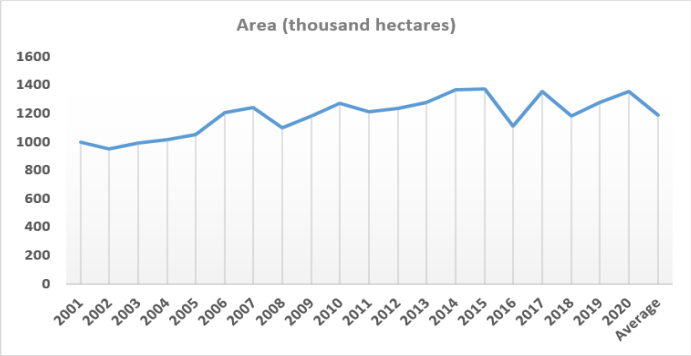

Figure 1. Evolution of the area of wheat using Excel based on the data of Table 1.

6.1.2. Productivity per acre

By reviewing the data in Table 1. It was found that the productivity per hectare of wheat crop ranged between a minimum of 5.9 tons in 2011 and a maximum of about 7.2 tons per hectare in 2018, with an average of about 6.7 tons per hectare for the study period, and the statistical significance of the annual growth rate in productivity has not been proven.

6.1.3. Total production

Table 1 shows that the average total production of the wheat crop for the study period amounted to about 8006.3 thousand tons, with a minimum of about 6252.6 thousand tons in 2002, and a maximum of about 9458.0 thousand tons in 2014, and by estimating the general trend equation (Equation 2. Table 2.) The annual increase in the total production of wheat is evident with a statistically significant increase, with an annual rate of about 1.7%, equivalent to about 136 thousand tons, and the coefficient of determination reached about 63%.

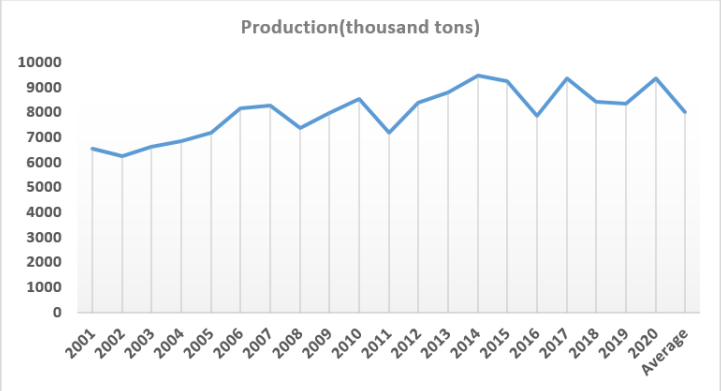

Figure 2. The evolution of wheat production using Excel based on the data of Table 1.

Table 2. Shows the general time trend equations for the development of some variables related to during the period (2001-2020)

Item	Equation No.	The equation	Rate of change for average%	R2
Area (1000 hectares)	1	ŷ =-34760.8 +7.71x (5.3)**	1.5	0.61
Production (1000 ton)	2	ŷ =-265884+3.5 x (5.8)**	1.7	0.65
Consumption (million ton)	3	ŷ =-871.4+0.44x (7.8)**	3.3	0.77
Average per person (kg/year)	4	ŷ =-1461.6+0.79x (2.7)**	0.6	0.29
Food gap (million ton)	5	ŷ = 495.1- 0.249x (-3.5)**	4.8	0.41
Self-sufficiency*(%)*	6	ŷ = 1621.4 - 0.78x (-2.8)**	1.3	0.30
Imports (million ton)	7	ŷ = -792.5 + 0.40x (8.5)**	4.7	0.80
Imports value (billions of pounds)	8	ŷ = -117.7 + 0.06x (10.4)**	5.2	0.86
External dependence (%)	9	ŷ = -2564.6 + 1.31x (2.4)*	2.1	0.25
Daily Domestic Consumption (Thousand Ton)	10	ŷ = -2081.5+ 1.053x (6.5)**	2.9	0.70
production sufficiency period For consumption (per day)	11	ŷ = 4417.3 - 2.085x (-2.0)*	9.0	0.19
Import coverage period For consumption (per day)	12	ŷ = -11187.3 + 5.680x (3.1)**	2.4	0.35

Source: collected and calculated from Tables No. (1, 3, 4). ŷ= the estimated value of the area in the year (t), X = variable time, (t) = 1, 2, 3...N), (**) Indicates a significant regression model or when the level of significance (0.01), (*) Indicates a significant regression model or when the level of significance (0.05), R2 = R Square.

6.2. Estimating the food security indicators of the wheat crop in Egypt during the period (2001-2020)

6.2.1. Domestic consumption

By studying the data in Table 3. On the development of local consumption of the wheat crop during the period (2001-2020), it was found that it ranged between a minimum of about 9.2 million tons in 2002, while a maximum of about 20 million tons in 2018, and an average for the period of about 13.4 million tons. By studying the growth equation (Equation 3. in Table 2.), it was found that there is a statistically significant annual increase in the local consumption of wheat crop. With an annual growth rate estimated at about 3.3%, equivalent to about 0.44 million tons of the annual average and this coefficient of determination reached 77% of the changes occurring in consumption, it is due to the time factor because of population increase, and the rest is due to other factors.

6.2.2. Average per capita share

By reviewing the data in Table 3. It was found that the average per capita consumption of wheat during the study period ranged between a minimum of about 111.9 kg/year in 2002, and a maximum of about 151 kg/year in 2018, as shown by the growth equation (Equation 4. Table 2.) Significance of the estimated model at a significant level of 1% with an annual growth rate of about 0.6% of the annual average of about 132.3 kg/year.

Table 3. Evolution of food security indicators for the wheat crop in Egypt during the period (2001 - 2020)

year	Consumption (million tons)	Average per person (kg/year)	Food gap (million tons)	Self-sufficiency (%)	Imports (million tons)	Imports value (billions of pounds)	External dependence (%)
2001	10.5	129.6	-3.9	62.6	4.9	0.6	46.7
2002	9.2	111.9	-3.0	67.7	4.4	0.5	47.8
2003	11.0	128.0	-4.4	60.2	5.6	0.7	50.6
2004	10.3	121.4	-3.5	66.2	4.1	0.5	39.2
2005	11.1	127.3	-3.9	64.6	4.4	0.6	39.3
2006	12.0	135.0	-3.9	67.8	5.7	0.8	47.4
2007	12.7	141.2	-4.4	65.1	8.0	1.1	63.0
2008	12.2	132.9	-4.8	60.4	8.2	1.1	67.4
2009	12.8	136.6	-4.8	62.5	8.3	1.1	65.3
2010	12.8	135.4	-4.3	66.6	9.1	1.2	71.2
2011	12.9	133.9	-5.8	55.5	10.6	1.4	82.0
2012	13.3	135.0	-4.9	62.9	9.8	1.3	73.6
2013	12.3	121.7	-3.5	71.4	11.4	1.4	92.8
2014	13.7	132.3	-4.3	68.9	10.3	1.4	74.9
2015	13.6	127.5	-4.3	68.4	11.2	1.4	82.2
2016	14.1	128.8	-6.2	56.0	10.7	1.4	75.8
2017	14.9	133.0	-5.5	62.8	11.1	1.5	74.9
2018	20.0	151.0	-11.6	42.1	10.2	1.5	50.8
2019	19.7	145.7	-11.4	42.4	10.7	1.6	54.0
2020	18.8	138.0	-5.5	48.5	10.5	1.5	57.5
Average	13.4	132.3	-5.2	61.1	8.5	1.1	62.8

Source: Compiled and calculated from: Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Agricultural Statistics Bulletin, miscellaneous issues.

6.2.3. The size of the food gap

Table 3. It is evident that the nutritional gap of the wheat crop in Egypt during the study period (2001-2020) ranged between a minimum of about 3 million tons in 2002, and a maximum of about 11.6 million tons in 2018, with an average of about 5.2 million tons. The growth equation (Equation 5. in Table 2.) is a general upward trend with an annual growth rate of about 5.2%. The statistical data confirm that Egypt suffers from a large nutritional gap in the wheat crop during the study period.

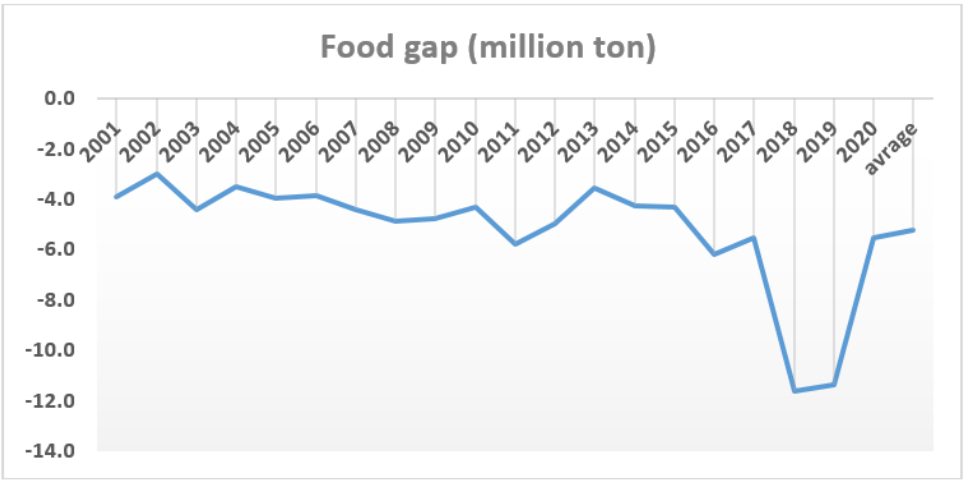

Figure 3. Evolution of the food gap of the wheat crop using Excel based on the data of Table 3.

6.2.4. Self-sufficiency ratio

By estimating the self-sufficiency rate of the wheat crop during the study period (2001-2020) as shown in Table 3. It ranged between a minimum of about 42.1% in 2018, and a maximum of about 71.4% in 2013, with an average of about 61.1% and an estimate of the growth equation (Equation 6. in Table 2.) The percentage of self-sufficiency in wheat decreases annually, with an annual growth rate of about 1.3%.

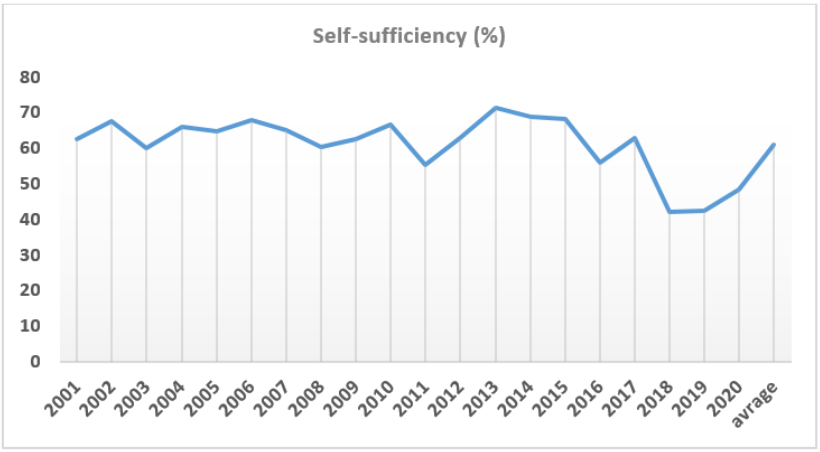

Figure 4. Evolution of the self-sufficiency rate of wheat crop using Excel based on the data of Table 3.

6.2.5. Quantity of Imports

The data in Table 3. Indicate that the quantity of wheat imports during the study period (2001-2020) ranged between a minimum of about 4.1 million tons in 2004, and a maximum of about 11.4 million tons in 2013 with an average of about 8.5 million tons. Increasing the amount of annual imports to Egypt of wheat crop with an annual growth rate of about 4.7%, and the significant increase of the growth equation was confirmed (Equation 7. in Table 2.) at a significant level of 1% and a limitation coefficient of about 80%.

6.2.6. The value of imports

Table 3. Shows the evolution of the value of wheat imports during the study period mentioned in the research. It was found that it ranged between a minimum of about 0.5 billion pounds in 2002, and a maximum of about 1.6 billion pounds in 2019 with an average of about 1.1 billion pounds, and the significance of the estimated model was confirmed. The growth equation (Equation 8. in Table 2.) at a significant level of 1% with an annual growth rate of about 5.2%.

6.2.7. Percentage of dependence on abroad

By reviewing the data in Table 3. It was found that Egypt relied on abroad to meet its needs of the wheat crop, as the percentage ranged between a minimum of about 39.2% in 2004, and a maximum of about 92.8% in 2013 with an average of about 62.8% during the study period. The significance of the estimated model was confirmed at the significance level of 0.05, the growth equation (Equation 9. Table 2.) With an annual growth rate of about 2.1%.

6.3. The current situation of the strategic stock and the food security factor of the wheat crop:

6.3.1. Daily Domestic Consumption

The data in Table 4. Indicate that the daily local consumption of the wheat crop reached about 36.2 thousand tons as an average for the period (2001-2020), as it ranged between a minimum of 25.3 thousand tons in 2002, and a maximum of about 54.85 thousand tons in 2018. Through the growth equation (Equation 10. Table 2.) It was shown that the daily local consumption of wheat increased with an annual growth rate of about 2.9%, and the significance of this increase was confirmed at a significant level of 1% with a limitation factor of about 70%.

Table 4. Evolution of daily domestic consumption, production adequacy period for consumption, import coverage period for consumption, and estimation of the amount and period of surplus and deficit in domestic consumption of wheat in Egypt during the period (2001-2020)

year	Daily Domestic Consumption (Thousand Tons)	production sufficiency period For consumption (per day)	Import coverage period For consumption (per day)	The sum of the two periods (per day)	Amount of surplus in consumption (million tons)	The period of sufficiency of surplus consumption (per day)	Deficit in consumption (million tons)	The period of deficit in consumption (per day)
2001	28.75	228.33	170.31	398.64	0.97	33.6	-	-
2002	25.32	247.02	174.28	421.3	1.43	56.3	-	-
2003	30.16	219.63	184.81	404.44	1.19	39.4	-	-
2004	28.34	241.55	143.18	384.72	0.56	19.7	-	-
2005	30.42	235.92	143.53	379.45	0.44	14.5	-	-

2006	32.88	247.58	172.97	420.55	1.83	55.6	-	-
2007	34.81	237.73	229.97	467.69	3.57	102.7	-	-
2008	33.48	220.38	246.16	466.54	3.40	101.5	-	-
2009	34.95	228.26	238.29	466.55	3.55	101.6	-	-
2010	35.09	242.91	259.94	502.85	4.84	137.9	-	-
2011	35.41	202.48	299.21	501.69	4.84	136.7	-	-
2012	36.47	229.51	268.7	498.22	4.86	133.2	-	-
2013	33.76	260.54	338.53	599.07	7.90	234.1	-	-
2014	37.62	251.49	273.51	525.0	6.02	160.0	-	-
2015	37.2	249.48	299.99	549.47	6.86	184.5	-	-
2016	38.54	204.27	276.61	480.88	4.47	115.9	-	-
2017	40.73	229.35	273.44	502.79	5.61	137.8	-	-
2018	54.85	153.54	185.32	338.86	-	-	1.43353	26.1
2019	54.01	154.57	197.21	351.78	-	-	0.714	13.2
2020	40.73	229.35	273.44	502.79	5.61	137.8	0.714	13.2
Average	36.2	225.7	232.5	458.2	3.70	104.5	1.1	19.6

Source: collected and calculated from the data in Table 3.

6.3.2. The period of sufficiency of local production for consumption

It can be seen from Table 4. By studying the development of the period of sufficiency of domestic production for consumption of wheat during the period (2001-2020), it was found that it ranged between a minimum of 153.54 days in 2018, and a maximum of about 260.54 days in 2013 with an annual average of about 225.7 day, and by estimating the growth equation (Equation 11. Table 2.) It was found that the period of production sufficiency for consumption tended to decline at an annual growth rate of 0.9%. This is not a good indicator that indicates the low level of food security for the wheat crop.

6.3.3. The period of import coverage for consumption

By studying and analyzing the import coverage period for the local consumption of the wheat crop during the study period (2001-2020) as shown in Table 4. It was found that it ranged between a minimum of about 143.18 days in 2004 and a maximum of about 338.53 days in 2013 with an average annually, it reached about 232.5 days, and by estimating the period of import coverage for consumption by the growth equation (Equation 12. Table 2.) It was shown that the period increased with an annual growth rate of about 2.4%.

6.3.4. Quantity and period of surplus in domestic consumption

By reviewing the data in Table 4. It was found that the quantity and the period of the surplus in the local consumption of the wheat crop ranged between a minimum of about 0.44 million tons in 2005. Sufficient for a period of about 14.5 days, and a maximum of about 7.9 million tons in 2013 that sufficed for a period of about 243.1 days. With an annual average, it reached about 3.7 million tons, enough for a period of about 104.5 days.

6.3.5. Quantity and period of deficit in domestic consumption

By studying the data in Table 4. It was found that the average deficit in the local consumption of wheat during the study period (2001-2020) amounted to about 1.1 million tons, which is sufficient for a period of about 19.6 days.

6.3.6. The size of the strategic stock

It can be seen from Table 4. The estimation of the average surplus in the wheat crop over local consumption during the study period (2001-2020). Shows that it amounted to about 3.7 million tons, sufficient for the consumption of approximately 104.5 days. In addition, this surplus is used to withdraw during the period in which a deficit appears. This was evident in the years (2018, 2019). When the amount of the deficit in both of them was estimated at an average of about 1.1 million tons, with a period estimated at about 19.6 days, and then it is clear from Table 5 that the average size of the strategic stocks of the wheat crop during the study period amounted to about 3.45 million tons.

Table 5. Estimated strategic stock size and food security factor for wheat crop in Egypt during the period (2001-2020)

year	Amount of change in the volume of strategic stocks (million tons)	Domestic consumption (million tons)	The value of the food security factor
2001	0.97	10.5	0.09
2002	1.43	9.2	0.15
2003	1.19	11.0	0.11
2004	0.56	10.3	0.05
2005	0.44	11.1	0.04
2006	1.83	12.0	0.15
2007	3.57	12.7	0.28
2008	3.40	12.2	0.28
2009	3.55	12.8	0.28
2010	4.84	12.8	0.38
2011	4.84	12.9	0.37
2012	4.86	13.3	0.36
2013	7.90	12.3	0.64
2014	6.02	13.7	0.44
2015	6.86	13.6	0.51
2016	4.47	14.1	0.32
2017	5.61	14.9	0.38
2018	1.43	20.0	0.07
2019	0.71	19.7	0.04
2020	4.47	18.8	0.24
Average	3.45	13.4	0.26

Source: collected and calculated from the data in Table 3.

6.3.7. Food Security Factories

The value of the food security coefficient ranges between zero and the correct one. The closer the value of the coefficient is to zero, it indicates a decrease in the state of food security, and the closer the value of the coefficient is to the correct one, the higher the food security status of the commodity in the country. The food security of the wheat crop during the study period (2001-2020) amounted to about 0.26. The decrease in the value of the food security factor of this crop is due to the reliance on imports to meet the required needs, in addition to the decrease in the strategic stock. Therefore, it becomes necessary to increase the value of the food security factor until it reaches about 0.5 in order to increase the size of the strategic stock to suffice the local consumption of the population for a period of at least six months, according to food security considerations, through the adoption of several policies and operational programs.

Figure 5. Evolution of the food security factor of wheat crop using Excel based on the data of Table 5.

7. Conclusion

By estimating the food gap for the wheat crop in Egypt, it was found that it took a general upward trend with an annual growth rate of about 5.2%. The percentage of self-sufficiency of wheat annually, with an annual growth rate of about 1.3%. It also showed a decrease in the value of the food security coefficient for the wheat crop, which amounted to about 0.26. The decrease is due to the reliance on imports to meet the required needs, in addition to the decrease in the strategic stock. Therefore, it becomes necessary to increase the value of the food security coefficient and horizontal expansion to increase the area of wheat and the vertical to increase its productivity through the development of high-productivity varieties. By taking many agricultural policies and development plans.

References

1. Ministry of Agriculture and Land Reclamation, Agricultural Strategy until 2030.
2. Shiferaw B., Smale, M, Braun H-J., Duveiller, E., Reynolds M. & Muricho, G. (2013). Crops that feed the world 10. Past successes and future challenges to the role-played by wheat in global food security, 5:291-317.
3. FAO. (2013). Climate- smart agriculture Sourcebook. Rome
4. FAO. 2014. The State of Food and Agriculture (2014). Innovation in family farming. Rome.
5. FAO. 2014. Food Outlook. Biannual report on global Food Markets. Rome
6. Metz, H. C. (1990). Egypt: A country study. Washington: GPO for the Library of Congress.
7. Ministry of Irrigation and Water Resources. (2014). Water Scarcity in Egypt: The urgent need for regional cooperation among the Nile Basin Countries. Technical report.
8. Mansour, S. (2012). Global agriculture information system; Egypt: Wheat and corn production on the rise: Grain and feed annual. Annual report.
9. Aegic. (2015, April). Global grain market series: Egypt. Australian Export Grain Innovation Center, Australia.
10. Ouda, S. A., Noreldin, T., & Abd El-Latif, K. (2015). Water requirements for wheat and maize under climate change in North Nile Delta. Span. *Journal of Agricultural Research, 13 (1), 1–7.*
11. Mujeeb R, Umed A S, Mohammad Z, Shereen G. (2008). Effects of NaCl salinity on wheat (Triticum aestivum L.) cultivars. *World Journal of Agricultural Sciences, 4, 398–403.*
12. Kherallah M, Minot N, Gruhn P. (2003). Adjustment of wheat production to market reform in Egypt. Emerald Group Publishing Limited, 5, 133–159.
13. FAOSTAT (Food and Agriculture Organization of the United Nations). (2017). Food and agriculture organization of the United Nations statistics. [2015-06-12].
14. Salem K F M, Röder M S, Börner A. (2015). Assessing genetic diversity of Egyptian hexaploid wheat (Triticum aestivum L.) using microsatellite markers. Genetic Resources and Crop Evolution, 3, 377–385.
15. Yanni Y G, Dazzo F B, Squartini A, Zanardo M, Zidan M I, Elsadany A E Y. (2016). Assessment of the natural endophytic association between Rhizobium and wheat and its ability to increase wheat production in the Nile Delta. Plant and Soil, 1–2, 367–383.
16. Anwar A, Fawzy M K, Hesham M G, Abdulrasoul M A. (2016). Long-term detection and hydrochemistry of groundwater resources in Egypt: Case study of Siwa Oasis. *Journal of the Saudi Society of Agricultural Sciences, 1, 67–74.*
17. Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, *Agricultural Statistics Bulletin, miscellaneous issues*

دراسة اقتصادية لتداعيات فجوة القمح في جمهورية مصر العربية*

د. صلاح سعيد عبدالغني [1]، [2]

[1] أستاذ الاقتصاد المشارك– كلية الاقتصاد والعلوم الإدارية
جامعة الإمام محمد بن سعود الإسلامية (IMSIU)

[2] أستاذ الاقتصاد الزراعي المساعد، معهد البحوث الزراعية والبيولوجية، المركز القومي للبحوث، ش البحوث، الدقي، الجيزة 12622، مصر.

البريد الإلكتروني للمؤلف: ***drsalahsaid@yahoo.com**

المستخلص: على الرغم من زيادة المساحة المزروعة بالقمح، وزيادة إنتاجية محصول القمح الكلي. ولكن بسبب الزيادة السكانية السنوية فإن الكميات المستهلكة منه تستمر في الارتفاع بمعدلات أسرع من معدلات الإنتاج. ونتيجة لذلك، اتسعت الفجوة الغذائية في القمح وانخفضت نسبة الاكتفاء منه. ونتيجة لذلك، فإن الهدف الأساسي للدراسة هو دراسة وتقدير أهم مؤشرات الأمن الغذائي لمحصول القمح في مصر خلال فترة

الدراسة (2001-2020)، حيث يعد أحد أهم المحاصيل الاستراتيجية في البلاد، ولتحقيق أهداف البحث اعتمد البحث على تحليل البيانات الوصفية والكمية، بما في ذلك توظيف نموذج الانحدار الخطي لمعادلات الاتجاه العام لحساب معدل النمو السنوي لتطور متغيرات الدراسة. وعندما تم حساب الفجوة الغذائية لمحصول القمح في مصر، تبين أنها ذات اتجاه عام متزايد بمعدل زيادة سنوي يبلغ حوالي 5.2%. وتبلغ النسبة السنوية للاكتفاء الذاتي من القمح، بمعدل نمو سنوي يقارب 1.3%. كما كشفت الدراسة عن انخفاض قيمة معامل الأمن الغذائي لمحصول القمح بنحو 0.26. ويعزى هذا الانخفاض إلى زيادة الاعتماد على الواردات لتلبية الاحتياجات الأساسية، فضلا عن انخفاض المخزون الاستراتيجي. ونتيجة لذلك، ومن أجل زيادة مساحة القمح، لابد من زيادة قيمة معامل الأمن الغذائي، وكذلك التوسع الأفقي، وأخذ مجموعة متنوعة من الاستراتيجيات الزراعية وخطط النمو بعين الاعتبار.

الكلمات المفتاحية: (الفجوة الغذائية، محاصيل الحبوب، فجوة القمح، الاكتفاء الذاتي، الأمن الغذائي)