



# EVALUATION OF THE FOOD SECURITY SITUATION OF CEREAL CROPS IN SOME ARABIC COUNTRIES

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## Abstract

There is no doubt that food insecurity is considered one of the most important threats to stability and security at all levels of the state. The increase in consumption coinciding with the increase in the population and the productive and climatic conditions and other reasons cause a challenge in achieving high levels of self-sufficiency in cereal crops and depends on filling the shortage from abroad, especially the most important of which is the wheat crop, which witnesses a large nutritional gap between production and consumption. The problem lies in the presence of a deficit in the production of wheat crop, as the rate of growth of its production is not sufficient to meet the needs of the population, that is, there is an imbalance between production and consumption. The research aims at measuring the factors of food security and strategic stock for wheat in Iraq during the period (1990-1998). The research in achieving its goals relied on economic equations, standard economic analysis of indicators and determinants of food security for this crop. The most important research's results were the increase in the food gap of wheat by about 1.28%, as well as the rate of self-sufficiency increased annually by about 0.10 % during the study period. Iraq relied on the outside to meet its needs of the crop by about 38.41%, and it was found that the wheat crop achieved a period of sufficient production for consumption estimated at 225.98 days, and achieved an increased growth rate for this period of 0.79%, and therefore this indicator indicates a decline in food security for the study yield until the period of import coverage for consumption of wheat in Iraq reached about 140.41 days. The total strategic stock size of the crop reached about 1.296 million tons, enough for about 147.58 days, which is approximately 5 months, and the data indicate a decrease in the food security factor for the wheat crop in Iraq, as the average coefficient for the crop was about 0.14.

**Key words :** Iraqi food security, The Iraqi economy, Wheat crop, Strategic inventory.

## Introduction

The wheat crop is one of the strategic crops that is of interest to economic policy makers, and it has a strategic importance in achieving food security as Iraqi governments have sought through successive agricultural policy to raise the production of the crop in the hope of reaching self-sufficiency, but this goal has not been achieved, as accreditation prevailed for importing to meet the deficit of the crop despite placing it at the top of the state's priorities. Food security definitions are multiple, but they always revolve around the ability of society to meet the needs of all its residents of adequate and healthy

food during any period of time (2010, FAO). While the concept of food security means, from the point of view of those interested in strategic sciences, that providing a strategic stock which covers the nutritional needs of individuals either by producing food commodities locally or the state may have to provide cash returns that can be used to import the deficit from domestic production from those needs (Hamida and others, 2017), and achieve food security is built Main dimensions are availability, stability, access and utilization (9,2016, FAO). Food security remains a major concern in developing countries (2017, Boraty & Tofiq). Thus, the reality of food security in the Arabic world is unstable and volatile (2016, Al-Fawwaz

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& Ahmed).

Since wheat is an important strategic commodity in Iraq, which is one of the most important cereal crops at all and it is the main source of the loaf of bread, which is one of the basic components of the Iraqi individual's meal, the focus will be on assessing the food security status of the wheat crop, which is one of the important economic indicators that show the current situation for Iraqi food security. Although Iraq possesses economic factors that enable it to achieve high levels of self-sufficiency for most agricultural crops, including grains, it possesses enormous human energy, a vast geographical area, and a diversity of natural resources. In addition to enjoying comparative advantages in natural resources, such as fertile lands, agricultural and animal products, as well as to technological and industrial capabilities and a workforce, there are challenges that prevented the exploitation of those energies and capabilities, as the stressing of (Abdul Rahman, 2016) that the food gap for strategic crops in Iraq for the period (2000-2013) due to a shortage of local production of strategic crops and failure to keep pace with the increase in demand growth, and the economic blockade had negative effects that were reflected in reducing the percentage of the contribution of agriculture to GDP from 20.1% in 1990 to 5.7% in 2006 as well as an increase in poverty rate M. Food Security (Musa and Haqi, 2013).

### **The Problem**

The presence of a gap from the major cereal crops in Iraq, which is part of the food gap in it, that is, the problem lies in the existence of a deficit in the production of these crops and that this deficit is increasing because the rate of crop production growth is not sufficient to meet the population's need, i.e. a defect between production and consumption and an attempt knowing this amount of deficit, as the Iraqi economy clearly depends on external markets to secure a large part of its food needs in general and cereal crops in particular, that is, the level of food security for cereals in general in Iraq is low. Therefore, the research attempts to address part of the strategic crops (the crop yield) related to the lives and livelihoods of citizens in Iraq. Thus, the food in the case -Do supplied or adequacy - constitutes a relevant political dimensions, economic and social problem and health.

### **Objective**

The research aims at assessing the state of food security for the most important strategic crop of cereal crops in Iraq, which is wheat, during the period (1990-2018) by studying the following sub-goals:

1. The economic analysis of the factors affecting the production and consumption of wheat in Iraq for the period (1990-2018).
2. Estimating the indicators of food security for the wheat crop in Iraq to reach the value of the food security factor for this crop and then its interpretation.
3. Analysis of determinants of food security plants for wheat crop in Iraq for the studied period.

### **Materials and Methods**

The research relied mainly on the descriptive and quantitative analytical method of data, including general time trend equations in knowing the temporal development and annual growth rates of the study variables. Food security indicators for wheat crop in Iraq were studied through several equations leading to the calculation of the food security coefficient.

### **Data Sources**

The research was mainly based on the data for the period (1990-2018) published which was obtained from the various economic bulletins issued by the Iraqi Central Bureau of Statistics and the Arabic Organization for Agricultural Development. Some data and statistics published for some entities on the internet were also used on the internet, as well as some published studies and research related to the research topic.

### **Results and Discussion**

#### **First: The econometric analysis of the factors affecting the economics of wheat crop in Iraq**

As a result of the multiple instances of instability in the local market for wheat, and because of the existence of interrelated and interrelated relationships between production and consumption that are reflected in the stability and balance of supply and demand for wheat in the local market. In order to analyze the effect of changes in the local market for wheat, a study has been applied on the most important factors which affect those changes. The functions were estimated using different mathematical models according to economic logic and the results of statistical tests.

#### **A. The amount of local production of wheat and the most important economic factors affecting it:**

Table 3 shows the increase in the quantity of local production of wheat during the period (1990-2018), and that this quantity is the result of changes in several factors, as follows:

1. The cultivated area of wheat (Kadem & Afaf, 2011): From table 1, the fluctuation in the

cultivated area of wheat is shown to increase and decrease until it reached its lowest in 2018 to reach about 788 thousand hectares and a maximum of about 2549 thousand hectares in 2005, with an annual average of 1502 thousand hectares during a period The study (1990-2018), and it showed that the cultivated area decreased annually by 16.3 thousand hectares, which is equivalent to a decreasing annual growth of 4.35% during the study period.

2. Hectare productivity of wheat crop: productivity also fluctuated with increasing and decreasing during the study period, and as a minimum it reached 0.59 tons / hectare in (1991) and a maximum of about 6.16 tons / hectare in 1998 with an annual average of 1.66 tons / hectare, and productivity increases annually by 3.52 tons / Ha with an annual growth rate of 4.80% of the annual average.
3. The farm price: The farm prices for the wheat crop during the study period ranged between a minimum of 360,000 dinars / ton in 1990 and a maximum of about 812,500,000 dinars / ton in 2013, at an annual average of 367138 thousand dinars / ton, and the growing farm price of the crop was shown annually By 7.87 thousand dinars / ton, with an equivalent statistically significant annual growth of 31.7% of the annual average.

#### **B. The amount of wheat consumption and the most important economic factors affecting it:**

Table 3 shows the increase in the consumption of wheat crop during the study period, and that this quantity is the result of changes in the population (Ahmad & Ithmar, 2017), the average individual consumption, the price of imports of global wheat and the amount of imports for the same crop. The time development of these variables can be studied as follows:

1. Population: The population of Iraq has increased and ranged between a minimum of about 17.4 million in 1990 and a maximum of about 38.4 million in 2018, with an average annual rate of 26.8 million, and this variable has increased annually by 1.30 million, including Equivalent to a statistically significant annual growth of 2.86% of the annual average.
2. Individual consumption rate per kg / person: it became clear that the annual per capita consumption rate increased by 6.46 kg / person, equivalent to an annual statistically significant

growth of 0.76% during the study period, and ranged between a minimum of about 37.3 kg / person in 1992 and a maximum It reached about 560.8 kg / inhabitants in 1998 and an annual average of 146.6 kg / inhabitants.

3. The price of imports of wheat: the price and revenue fluctuation of wheat fluctuated between a minimum of about 366.00 thousand dinars / ton in 1990 and a maximum of 4263211 thousand dinars / ton in 2012, at an annual average of 470714.6 thousand dinars / ton, and this price increased annually by 6.46 thousand dinars / Ton.

To determine the impact of these factors on local production, it has been assumed that the quantity produced of wheat (Y) is a function of both the cultivated area (X1), hectare productivity (X2), the farm price (X3), and the amount of consumption (X4), this On the one hand, we assumed that the quantity consumed of wheat (C) is a function of each population (X5), the average consumption per capita (X6), the price of imports of wheat (X7), and the quantity of imports (X8) for the studied period (2018) 1990), and the results were as follows (Table 2).

From the results of the analysis of the equation of the most important factors affecting the amount of domestic production of wheat in Iraq, as is evident from table 2 Equation No. 1 using the regular least squares method and the choice of the half-logarithmic model as the best estimated function., where the moral direct relationship between the quantity produced of wheat (dependent variable) and both the cultivated area and hectare productivity and the farm price as well as the amount of consumption (independent variables), i.e. an increase of 1% in each of (X4), (X3), (X2), (X1) leads to an increase in the quantity of wheat produced (Y) by about 0.002%, 0.12%, 0.003%, 0.001, and flexibly (0.83), (0.82), (0.12), (0.39) each, respectively, and the changes in these factors explained about 92% of the changes in the amount of domestic production of wheat during the study period (1990-2018).

From table 2 Equation No. (2), we observe the results of the analysis of the domestic consumption equation for wheat. The linear function was chosen as the best estimated function, and it was found that the dependent variable (C) is affected both morally and positively in both population, average individual consumption, and the price of imports of wheat. And the quantity of imports, meaning that an increase of 1% in the independent variables (X8), (X7), (X6), (X5) will lead to an increase in the amount of domestic consumption of wheat by about 121%, 21.8%, 0.001%, 0.08% And with flexibility

**Table 1:** Economic factors affecting the amount of production and the amount of domestic consumption of wheat crops for a period (1990-2018).

The year	Cultivated area thousand hect.	Productivity Ton / hect.	Farm price One thousand dinars / ton	Population (one million)	Per capita consumption in Iraq (Kg / inhabitants)	The price imports of wheat (thousand dinars/ton)
1990	1195	1.00	360	17.4	155.3	366.00
1991	2517	0.59	800	17.9	153.7	1831.00
1992	1000	0.60	4000	18.4	37.3	6237.00
1993	1414	0.70	5000	19.1	81.9	35000.00
1994	1439	0.69	35000	19.6	88.8	157006
1995	1471	0.62	105000	20.2	53.0	549130
1996	1493	0.60	400000	20.8	66.0	231773
1997	1564	0.63	100000	21.5	138.0	331882
1998	1642	6.16	114000	22.2	560.8	380218
1999	1685	0.60	121000	22.8	125.6	482181
2000	1077	0.96	144000	23.5	179.7	562109
2001	1304	1.70	133000	24.5	212.0	512253
2002	1648	1.57	145000	24.2	205.3	318845
2003	1734	1.34	160000	24.9	139.9	41390
2004	1539	1.19	175000	25.6	160.0	305622
2005	2549	0.86	224000	26.3	180.4	378116
2006	1513	1.37	450000	27.7	177.4	318825
2007	1569	1.40	342000	28.4	162.8	394662
2008	1435	0.87	458000	29.1	144.9	534550
2009	1262	1.34	488000	29.9	158.8	413921
2010	1386	1.98	600000	30.8	102.2	412014
2011	1635	1.71	800000	31.8	89.6	415120
2012	1728	1.77	800000	32.7	49.6	4263211
2013	1844	2.26	812500	33.7	125.2	431160
2014	2132	2.37	806250	34.8	150.0	430050
2015	1036	2.90	804311	36.9	82.8	430050
2016	924	3.79	807687	36.6	155.8	430420
2017	1054	3.13	806082	37.5	144.2	440213
2018	788	3.37	806026	38.4	125.2	442569
The average	1502	1.66	367138	26.8	146.6	470714.6
The amount of change	16.3	3.52	7.87	1.30	6.46	7.98
Annual growth rate%	4.35	4.80	31.7	2.86	0.76	13650724

Source:

Ministry of Planning (1990,1991,1992,.....2019) Central Statistical Organization ,field price report for agricultural products.

Ministry of Planning (1990,1991,1992,.....2019) Central Statistical Organization ,wheat and barley production.

Ministry of Planning and Development cooperation (1990,1991,1992,.....2019) Central Statistical Organization and Information Technology.

**Table 2:** Results of the OLS estimation of the variables used in the models during the period (1990-2018).

	Dependent Variable	Estimated models	R <sup>2</sup>	F	D.W
1.	The amount of domestic production of wheat (Y)	$\text{Log } Y^{\wedge} = 2.52 + 0.002X_1 + 0.12 X_2 + 0.003X_3 + 0.001 X_4$ (t) (36.76) (5.34) (4.38) (2.00) (4.66)	0.92	73.81	1.81
2.	The amount of domestic consumption of wheat (C)	$Y^{\wedge} = -2.71 + 121X_5 + 21.8X_6 + 0.001X_7 + 0.08X_8$ (t) (-14.28) (18.34) (42.11) (3.09) (2.09)	0.99	701.43	2.36

Source: Prepared by the researcher using Eviews 9.

**Table 3:** Development of economic variables of wheat crop in Iraq during the period (1990 - 2018) (thousand tons).

The year	Production	Consumption	Exports	Imports	The food gap	Self-sufficiency ratio	The dependence ratio on the outside
1990	1195	2703	0.00	1508.6	(1508.0)	44.2	55.8
1991	1476	2752	0.00	1276.0	(1276.0)	53.6	46.3
1992	600	687	0.00	87.5	(87.5)	87.2	12.7
1993	996	1565	0.00	568.5	(568.5)	63.6	36.3
1994	989	1742	0.00	752.3	(752.3)	56.8	43.1
1995	908	1071	0.00	163.5	(163.0)	84.7	15.2
1996	894	1374	0.00	480.1	(480.0)	65.0	34.9
1997	993	2968	0.0	1975.5	(1975.0)	33.4	66.5
1998	10128	12451	2.84	2326.0	(2323.1)	81.3	18.6
1999	1027	2865	2.03	1840.0	(1837.9)	35.8	64.2
2000	1041	4223	3.06	3185.2	(3182.1)	24.6	75.4
2001	2219	5194	24.89	3000.0	(2975.1)	42.7	57.7
2002	2589	4969	36.74	2417.4	(2380.7)	52.0	48.6
2003	2329	3484	121.02	1276.6	(1155.5)	66.8	36.6
2004	1832	4097	236.33	2501.5	(2265.1)	44.7	61.0
2005	2212	4747	0.00	2535.5	(2535.5)	46.5	53.4
2006	2086	4914	5.00	2833.8	(2828.8)	42.4	57.6
2007	2203	4626	0.57	2424.7	(2423.1)	47.6	52.3
2008	1255	4217	0.58	2963.3	(2962.7)	29.7	70.2
2009	1700	4749	0.59	3050.5	(3049.9)	35.7	64.2
2010	2748	3149	0.00	400.2	(400.2)	87.2	12.7
2011	2808	2852	0.58	44.6	(44.1)	98.4	1.5
2012	3062	3106	0.60	44.9	(44.9)	98.5	1.4
2013	4178	4222	0.58	44.6	(44.1)	98.9	1.0
2014	5055	5223	0.12	168.6	(168.5)	96.7	3.2
2015	3009	3058	0.58	50.0	(49.5)	98.3	1.6
2016	3504	5703	0.00	2199.9	(2199.9)	61.4	38.5
2017	3302	5410	0.02	2109.0	(2108.9)	61.0	38.9
2018	2657	4810	0.01	2154.0	(2153.9)	55.2	44.7
The average	2379	3894	15.03	1530.43	(1515.3)	61.85	38.41
The amount of change	20.3	18	(4.16)	(2.05)	0.002	0.10	(5.96)
Annual growth rate%	2.89	2.07	8.1	1.28	1.28	0.79	(0.78)

The numbers in parentheses are negative values.

Source :

Ministry of Planning (1990,1991,1992,...2019). Central Statistical Organization, Trade Statistics and the National Accounts Directorate. AOAD (1990,1991,1992.....2018) .Arab Agricultural Statistics Yearbook.

(0.0008), (0.005), (0.001), (4.20) each, respectively, this positive relationship is consistent with economic logic. These changes have explained about 99% of the changes in the quantity consumed during The study period.

### **Second: Calculating the food security coefficient of the wheat crop in Iraq:**

The food security coefficient of the wheat crop in Iraq during the period (1990-2018) is estimated by several steps to estimate the economic variables related to how

to estimate the food security coefficient, so that in the end the value of this coefficient and its interpretation of the wheat crop can be reached, as follows:

1. Development of wheat production in Iraq: The average of wheat production in Iraq during the study period was estimated at 2.37 million tons. The production amount ranged between a minimum of about 6.0 million tons in 1992 and a maximum of about 10.12 million tons in (1998),

**Table 4:** General time trend equations for the evolution of economic variables of the wheat crop in Iraq during the period (1990-2018).

	Dependent Variable	The model	R <sup>2</sup>	F
1	Domestic Production	$\hat{Y} = -51.8 + 20.3 \log X_9$ (-3.43) (4.44)	0.42	19.69
2	Domestic Consumption	$\hat{Y} = -48.5 + 18.0 \log X_{10}$ (-2.49) (3.26)	0.28	10.65
3	Exports	$\hat{Y} = 19.3 - 4.16 \log X_{11}$ (18.98) (-4.67)	0.58	21.84
4	Imports	$\hat{Y} = 21.0 - 2.05 \log X_{12}$ (2.85) (-0.83)	0.11	0.03
5	The food gap	$\hat{Y} = 14.6 + 0.002 X_{13}$ (5.30) (0.19)	0.11	0.04
6	Self-sufficiency ratio	$\hat{Y} = 8.58 + 0.104 X_{14}$ (1.94) (1.75)	0.82	1.80
7	Dependence rate on the outside	$\hat{Y} = 2.23 - 5.96 X_{15}$ (6.09) (-2.33)	0.17	5.43

Source: Calculated from the data of Table 3.

as shown in Table 3. It has been shown that the amount of wheat production annually increases by 20.3 thousand tons, which equals a statistically significant annual growth rate of 2.89% of the annual average, as shown in table 3.

- Evolution of wheat crop consumption: The amount of domestic consumption of wheat crop during the study period ranged between a minimum of 6.87 million tons in 1992 and a maximum of about 12.45 million tons in 1998 and an average of about 3.89 million tons. Statistically significant statistic confirmed the time trend model. The estimated year for this variable, as the annual increase reached 18000 tons, at an annual increase rate of 2.07% of the annual average.
- Development of wheat crop exports: The average quantity of exports of wheat crop during the study period was about 15.03 thousand tons and it was found that Iraq had not exported any amount of wheat during the period (1997-1990) and the years 2005, 2010 and 2016. The maximum amount exported from the crop reached about 236.33 thousand tons in 2004, and it was found that the quantity of wheat exports decreased annually by 4.16 thousand tons.
- The evolution of imports of wheat crop: It was found that the average quantity of Iraqi imports of wheat during the study period amounted to about 1.53 million tons, and the amount of imports of this crop ranged from a minimum of about 44.6 thousand tons in 2011, and a maximum of

3.18 million tons in 2000, The significance of the estimated overall trend of time trend model for imports during the study period was not statistically confirmed, as is evident in table 3.

From the previous results, it is noted that the quantity of the annual increase in consumption of wheat crop exceeds that of production, and although production is increasing at an annual growth rate greater than its counterpart for consumption, the average amount of consumption exceeds that of production by about 1515 thousand tons. The previous results indicated low and low Iraqi

wheat exports, even if they increased during the period (1999-2004) and then decreased in recent years. The Iraqi imports of the crop were characterized by fluctuation between rise and fall during the study period in order to meet the requirements required for consumption. Thus, the production is not enough for consumption.

- Evolution of the food gap for the wheat crop: Iraq suffered from a food gap in the wheat crop in all years of the study period, ranging from a minimum of about 4.41 million tons in 2011 and 2013 to a maximum of about 3.182 million tons in 2000, with an annual average It reached 1.515 million tons. It showed an annual food gap of wheat of 0.002 thousand tons, or an average annual growth rate of 1.28.
- Evolution of the self-sufficiency ratio for the wheat crop. According to table 3, it is clear that Iraq was unable to achieve self-sufficiency in the wheat crop during the study years, and it did not reach high levels except in the years between (2011-2015) where the average ratio self-sufficiency of this crop is about 61% as an average in the study period, ranging from a minimum of about 24.6% in 2000 to a maximum of 98.8% in 2013. The percentage of self-sufficiency in wheat annually increased by 0.10%.
- Evolution of dependency ratio on wheat crop: As an average, Iraq relied on abroad to meet its needs of wheat by 38.4% during the study period. This percentage decreased in the period (2011-2015) and reached its maximum in the year 2000

**Table 5:** Development of economic variables of wheat crop in Iraq during the period (1990-2018)(Quantity in thousand tons) (period per day).

The year	Daily domestic consumption	Sufficient production period for consumption	The period of import coverage for consumption	The sum of the two periods
1990	7.40	161.36	203.71	365.08
1991	7.53	195.76	169.27	365.03
1992	1.88	318.77	46.48	365.26
1993	4.28	232.29	132.58	364.88
1994	4.77	207.22	157.62	364.85
1995	2.93	309.44	55.72	365.17
1996	3.76	237.48	127.53	365.02
1997	8.13	122.11	242.94	365.06
1998	34.11	296.90	68.18	365.08
1999	7.84	130.83	234.41	365.25
2000	11.57	89.97	275.30	365.27
2001	14.23	155.93	210.82	366.75
2002	13.61	190.17	177.57	367.74
2003	9.54	243.99	133.74	377.73
2004	11.22	163.21	222.85	386.06
2005	13.00	170.08	195.95	365.03
2006	13.46	154.94	210.48	365.43
2007	12.67	173.82	191.31	365.13
2008	11.55	108.62	256.48	365.11
2009	13.01	130.65	234.45	365.11
2010	8.62	318.52	46.38	364.90
2011	7.81	359.36	5.70	365.07
2012	8.50	361.19	5.27	365.10
2013	11.56	353.25	3.85	365.05
2014	14.31	359.15	11.78	364.04
2015	8.37	224.26	5.96	365.11
2016	15.62	222.77	140.79	365.05
2017	14.82	201.62	142.28	365.06
2018	13.18	201.5	163.45	364.07
The average	10.66	225.98	140.41	366.49
The amount of change	0.47	0.02	(0.02)	.....
Annual growth rate%	2.08	0.79	0.78	.....

The sum of the two periods = the period of sufficiency of production for consumption + the period of import coverage for consumption.

when the dependency ratio reached about 75.4%. This percentage was shown to decrease by an annual statistically significant amount of about 5.96% during the study period.

Previous results indicate that the percentage of self-sufficiency in wheat increased annually by about 0.10%, and in contrast, the dependence rate on abroad to meet the needs of Iraq decreased annually by about 5.96%. In addition to that the food gap of wheat decreased

somewhat, as Iraq has the advantage of having a comparative and competitive advantage for this. The crop needs a strategy to reduce dependence on the outside because it represents food exposure on the outside and an indication of low Iraqi food security for the crop. In the sense that it is necessary to find ways to increase production of wheat to reduce dependence on the abroad because this is a threat to food security.

#### 8. Evolution of domestic consumption of daily wheat

**Table 6:** General time trend equations for the evolution of economic variables of wheat crop in Iraq During the period (1990-1990).

	Dependent Variable	The model	R <sup>2</sup>	F
1	Daily domestic consumption of wheat per thousand tons	$\hat{Y}=9.92+0.47X_{16}$ (3.12) (1.82)	0.10	3.32
2	The period of of sufficient production for consumption of wheat per day	$\hat{Y}=10.2+0.02X_{17}$ (2.22) (1.85)	0.5	2.39
3	The period of import coverage for wheat consumption per day	$\hat{Y}=18.9-0.02 \log X_{18}$ (6.35) (-1.55)	0.81	5.43

Calculated from the data of Table 5.

= (total local consumption / 365 days): It is clear from table 3 that the amount of daily domestic consumption of wheat in Iraq during the study period ranged between a minimum of about 1.88 thousand tons in 1992. Whereas maximally the amount is about 34.11 thousand tons in 1998, with an annual average of 10.66 thousand tons. It was shown that the amount of daily local consumption of wheat crop annually increased by 0.47 thousand tons, which is equivalent to an increasing annual statistically significant annual growth rate of 2.08% of the average as in table 6 and Equation 1. This increase came from the needs of Iraq, due to the increasing population and the increasing demand for it, whether for human consumption or other areas in which they are used.

9. Development of the period of production sufficiency for wheat consumption = (gross domestic production / total daily local consumption): The period of sufficiency of production for consumption of wheat in Iraq during the study period ranged between a minimum of about 89.97 days in 2000 and a maximally of about 361.19 days in the year of 2012, a decrease of about 158.69 days compared to that in 2018, with an annual average for the period amounting to about 226.98 days. An increase in the period of sufficient production for consumption of the crop annually showed about 0.02 days, which equals a statistically significant annual growth rate of about 0.79% of the annual average, as in table 6 and Equation 2, the increase in this indicator indicates improved security loyalty.
10. Evolution of the period of import coverage for wheat consumption = (annual import amount / total daily local consumption): By studying the evolution of the period of import coverage for consumption as in table 3, it was found that the period of import coverage for wheat consumption

during the study period ranged between a minimum of about 3.85 Days in 2013 and a maximum of about 275.30 days in 2000 with an annual average for the period of 140.41 days. The significance of the estimated time trend model was not statistically confirmed as shown in table 6 and Equation 3. Previous results indicate an

increase in the adequacy period production for consumption and the decrease in the period for imports to cover consumption of wheat Iraq annually.

11. Evolution of the surplus amount in local consumption = ((the sum of the two periods - 365) \* (daily local consumption)) and the adequacy period of the surplus for local consumption (the amount of the surplus in consumption / daily local consumption): The total amount of surplus in the local consumption of wheat in Iraq during The study period is 1.249 million tons, enough for about 143.51 days. The amount of surplus in the local consumption of wheat ranges between a minimum of about 10 thousand tons in 1996 which was enough for about 2.65 days, and a maximum of about 236.50 thousand tons in 2004, which was enough for about 2106.96 days, as in table 3. The previous results indicate that the amount of surplus in the local consumption of wheat crop under study is the period that can be covered by the amount estimated at about 143.51 days, and there are factors that affect the amount of surplus, including the possibility of higher prices in the future and the desire for storage and uses of the crop and others.
12. The evolution of the amount of the deficit in local consumption (365) - the sum of the two periods) \* (daily local consumption)) and the period of sufficiency of the deficit (the amount of the deficit in local consumption / daily local consumption): The total amount of deficit in local consumption of wheat crop during the study period was about 200 million tons which is enough for about 41.53 days. From observing the amount of the deficit, it is necessary to raise production through its variables as it is one of the crops of strategic importance for human consumption and many industries. These results also show that we need



**Table 7:** Development of economic variables of wheat crop in Iraq during the period (1990-2018) (Quantity in thousand tons) (period per day).

The year	Amount of surplus in domestic	Sufficiency period for the domestic consumption	The amount of the deficit in local consumption	The period of local consumption deficit	*Volume of strategic inventory	The period that the stock is sufficient for depreciation	Food security factor
1990	60	8.10			60	8.10	0.007
1991	30	3.97			30	3.97	0.003
1992	50	26.56			50	26.56	0.02
1993			(50)	11.66			(0.010)
1994			(70)	14.66			(0.013)
1995	50	17.04			50	17.04	0.01
1996	10	2.65			10	2.65	0.002
1997	50	6.14			50	6.14	0.005
1998	300	8.79			16	0.46	0.008
1999	200	25.47					0.02
2000	320	27.65			14	1.21	0.02
2001	2500	175.68			11	0.77	0.16
2002	3740	274.72			66	4.84	0.25
2003	12160	1273.93			58	6.07	1.19
2004	23650	2106.96			17	1.51	1.97
2005	50	3.84			50	3.84	0.003
2006	580	43.08			80	5.94	0.04
2007	170	13.41			113	8.91	0.01
2008	130	11.25			72	6.23	0.01
2009	150	11.52			91	6.99	0.01
2010			(80)	15.27			(0.014)
2011	60	7.67			2	0.25	0.007
2012	90	10.57			30	3.52	0.009
2013	60	5.18			49	4.23	0.004
2014	60	4.19			48	3.35	0.003
2015	100	11.93			42	5.01	0.01
2016	90	5.76			90	5.76	0.005
2017	100	6.74			98	6.61	0.006
2018	100	7.58			99	7.51	0.007
Total	1249	143.51	200	41.59	1296	147.58	
The average							0.14

\* Strategic stock: This is what is stored from food for the purpose of using it in emergency cases only, and depends on the goals of the country based on the types of risks expected and surrounding the country, and the ratio of the stock of agricultural crops is one of the most important criteria that show the availability of food security or not, as the governments of the countries of deficit seek The food, including the Arab countries, is to create a strategic stockpile of food in order to avoid the occurrence of food crises that they are exposed to due to an acute shortage in food production as a result of natural disasters such as drought and desertification, or because of the interruption of food import as a result of war, the economic blockade, or the disruption of water means Asala (Al-Banna, 2007) & (Zakaria, 2016) & (Mudhi & Others, 2012) .

**Table 8:** Results of OLS Method for Food Security Factories for Wheat Crop in Iraq During the period (1990-1990).

	Dependent Variable	The model	R <sup>2</sup>	F	D.W
1	Food security factor	$S^{\wedge}=0.01 + 0.008 P - 0.006 C + 0.008 I$ t (1.05) (62.12) (-62.23) (62.62)	0.99	1330.45	2.96

Source: Prepared by the researcher using Eviews 9.

to raise the food security rate of the studied crop to overcome the food gap and achieving a strategic surplus that can use it in periods of disability.

13. Evolution of the strategic stock size ((the sum of the two periods -365) \* (daily local consumption) - the amount of exports)) and the adequacy period of the stock for daily consumption (the size of the strategic stock / daily local consumption): the total volume of the strategic stock of wheat during the study period was about 1.249 million tons which is enough for 32.23 days, and the stock size ranged between a minimum of about 2 thousand tons in 2011, which is enough for about 0.25 days and a maximum of 113,000 tons, which is enough for 8.91 days, indicating that there is an interest in raising the strategic stock of the crop and the strategic stock is used to cover part of consumption in periods of disability.
14. The food security coefficient of wheat crop in Iraq = (the amount of the annual change in the size of the strategic stock / annual local consumption) or the outcome of the change in the size of the strategic stock / average annual local consumption) and the value of food security ranges between zero and the correct one, as it is closer to zero the food security coefficient decreases and vice versa. By estimating the food security coefficient of wheat in Iraq during the study period, as in table 7, it becomes clear that the coefficient of food security of wheat is relatively high in Iraq, and this is a good indication that reduces wheat crises or high prices in a abnormal way, average of wheat food security is about 0.14, and its value ranged between a minimum of (0.014) in 2010, and a maximum of about 1.97 in 2004, due to the high food security coefficient of wheat due to the high amount of production of the crop.

These results indicate that the decrease in the value of the laboratories constitutes a threat to the Iraqi food security, as it means a food exposure on the outside, and then taking into account these results and with them the development of agricultural policies that are in harmony with them.

### **Third: Determinants of food security plants for wheat crop in Iraq:**

To study and measure the effect of some specific variables of the food security coefficient of wheat

crop in Iraq, the relationship between the value of this parameter as a dependent variable (S) and each of the amount of wheat production per thousand tons (P) and the amount of wheat consumption per thousand tons (C) and the amount of imports of wheat per thousand tons were estimated. (I) as independent variables during the study period (1990-2018). Using the OLS method, it is clear that the best estimated economic models are the linear model shown in table 8.

It is clear from the equation that the food security coefficient (S) is affected both spiritually and positively by both the amount of wheat production (P) and the amount of wheat imports (I). The milestone signals were in agreement with the economic logic, meaning that a 1% increase in the independent variables will lead to an increase in the food security coefficient about 0.008% and 0.008 with flexibility (158.6) and (102.0) for each respectively, and the changes in these two factors explained about 99% of the changes in the dependent variable during the study period, while the amount consumed of the crop (C) has an adverse effect on the coefficient of Food security of wheat crop, which means that a change of 1% in the quantity consumed of wheat crop leads to a change negative and significant effect of food security coefficient reached 0.006% and elasticity coefficient of (194.7). This is logic and it is compatible with economic logic.

### **Recommendations**

The research recommends several recommendations, namely:

1. Taking into account the high strategic stock of wheat in Iraq, which is sufficient for six months, as research has shown that the strategic stock of wheat is sufficient only for 147 days.
2. Increasing domestic production to reduce dependence on the outside, as this is a food exposure that has a risk to food security, as it turns out that Iraq depends on the outside to meet its wheat needs by about 38.41%, which is a high rate.
3. Reconsidering the agricultural policies, the self-coefficient percentage increased annually in 0.10% but with a little percentage. The strategic storage is enough only for 147.58 days of consumption.
4. The usage of increasing the productivity for wheat crop in Iraq to increase the local production. Thus, it has been noticed that the local production of wheat is enough only to 225.98 days only.

5. Following economic policies to increase the percentage of food security for wheat.
6. The productions, imports and consumption are considered as the main factors which specify the factor of food security of the product.

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