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ECONOMIC STUDY FOR ANALYZING THE GRAIN GAP AND STRATEGIC FOOD SECURITY IN IRAQ AFTER 2003

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Abstract

The grain gap and the problem of food security it was neither a problem of shortage or scarcity of available resources, nor an issue of rapid population growth nor incapable of material resources. It is primarily a matter of failure or imbalance in agricultural policies and misuse of available materials and possibilities. The research shows that the grain gap and lack of food security are not only a result of exceeding the demand growth rates on the food production growth rates, but it resulted from many factors, above all, the low production rates of grain crops, low cultivated land areas, and water scarcity. However, Iraq has enough potential and capabilities to meet its food needs by creating a correlation between population growth policy and adjusting consumption patterns and increasing the dunums productivity, which is the way to meet the food shortage in the future. In addition to restoring the prestige of the agricultural sector, that should take the lead on the strategy and policy of the state in terms of investment customizations and support in creating a stimulating environment for agricultural investment characterized by easy procedures and clear legislation to achieve self-sufficiency.

Key words: Food security, Grain gap, Agricultural investment, Self-sufficiency, Strategy

Introduction

Iraq faces several critical issues, the most important of which is food security that related to country ability to produce its own food, the indications also shows that Iraq has been unable to meet the domestic demand for agricultural commodities. The wrong agricultural policies, especially the policy of dumping the market with the imported agricultural commodities, which negatively affected on the local Iraqi product because of its inability to compete the important product. This has continuously harmed the Iraqi farmer, which may force him to leave his farm and agricultural work. Therefore, increases the number of unemployed, which resulted in a declining in the number of workers in the agriculture sector to 12.6% of the total man power in Iraq for 2016, in addition to the financial losses through the import of agricultural commodities, especially grains. Consequently, it reflected in a reduction of the investment customizations to the agricultural development process.

Materials and method

The research was based on the method of descriptive, quantitative and standardized analysis of the available data on the main crops in Iraq (wheat, barley, rice, and maize) from its primary sources, as well as, the Ministry of Agriculture, the Agricultural Statistics Department, the Ministry of Planning, the Central Statistical organization, and the Agricultural Statistics Department. Furthermore, other data were also obtained using secondary sources such as, the Arab Organization for Agricultural Development, in addition to related journals and Master's, Ph.D. thesis. The research was mainly based on data from the Ministry of Agriculture and the Agricultural Statistics Department for cultivation areas, production, and strategic crop productivity the description, quantitative and standardized analysis data were also used in this study on the main crops in Iraq to estimate the general trend and annual growth rates of areas, production, and productivity, as well as, forecast the consumed and imported quantities for the years from (2017-2022). Finally, standard models for the impact of independent variables on consumed quantities have been established for grain crops in Iraq for the period (2017-1990).

Results and discussion

Based on the problem of a food gap in the production

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of strategic grain crops and the deficit in domestic production to cover the demand for it, the research goals were to analyze and measure the consumption and the food gap of grains, in addition to determining the self-sufficiency ratio and the dependency ratio on imports. Therefore, the research included several results as follows:

First abstract : The current reality of grain production in Iraq

Grains has great economic importance in the overall agricultural production (wheat, barley, rice, maize), which they are at the forefront of plant products in terms of their importance and contribution to the daily available food components for Iraqi citizen's consumption and it's often considered as a raw material for the domestic food industry. Grain crops experienced a significant fluctuations in their domestic production in Iraq during the mid-1990s as a result of the expansion of their cultivation to secure the large part of the country's strategic grain needs, which can be described as follows:

Firstly: **The current reality of the area, production , productivity of wheat crop in Iraq**

The wheat crop occupies an important economic position in most of the world, country, especially in Iraq, where the area of wheat cultivation was (53%) of the total cultivated area (Aboud, 2016). The rate of cultivated area of wheat crop during the 1990s increased to (5700) thousand dunums, but post-2000 period has decreased to (5671) thousand dunum's (Al- Kaabi 2016), while the production increased from (1577) thousand tons in the 1990s to (2749) thousand tons after (2000)s. Moreover, the Productivity before the 1990s were (202) Kg/dunums, but after (2000)s were arisen to (313) kg/dunums. Despite the increasing in the total production, it is still below the required consumption level, Table 1 shows the production areas and productivity of wheat in Iraq before the 1990s and post-2000 period.

Table 1: Area, production and productivity of wheat crop in Iraq

Period	1990s	post-2000 period	Average
Area (1,000 dunums)	5700	5671	5686
Production (thousand tons)	1577	2749	1720
Productivity(kg/ dunums)	202	313	257

Notes: the reference of these data was calculated by the researcher based on the Ministry of Agriculture and Agricultural Statistics 2016 data.

Secondly: **The current reality of the area, production, productivity of the barley crop in Iraq**

Barley crop considered as the main source in the form of livestock diets, as well as the limited human uses, its ranks, second after wheat agriculture importance, where the area of barley cultivation was formed (43%) from the grain cultivated area (Al-Nujaifi, 2003). Where the average cultivated area during the 1990s was (4239) thousand dunums, while the inside post-2000 period, the area has been reduced to (3819) thousand dunums. The total production during the period of the 1990s was (740) thousand tons and after 2000s the total production rate increased to (1137) thousand tons, due to use this crop in feeding industry. Productivity during the 1990s was (126) Kg/ dunums, while after (2000)s was (188 Kg/ dunums), which is low productivity when compared with some Arab countries, Table 2 shows the area, production , productivity of barley crop in Iraq.

Table 2: Area, production and productivity of barley crop in Iraq

Period	1990s	post-2000 period	Average
Area (1,000 dunums)	4239	3819	4029
Production (thousand tons)	740	1137	938
Productivity(kg/ dunums)	126	188	157

Notes: the reference of these data was calculated by the researcher based on the Ministry of Agriculture and Agricultural Statistics 2016 data.

Third: **The current reality of area, production, productivity of the rice crop in Iraq**

Rice is an important economic crop which most of Iraq's population depends on it, where its cultivation is based on irrigated and abundant water lands. Despite of its food importance, its represent only (4%) from the cultivated areas with grains, while the cultivated area in 1990s reached (502) thousand dunums, and in the post-2000 period, it was (275) thousand dunums, due to the decrease in water supply and the associated drought, however, rice ranks fourth in area and production of grain crops. During the 1990s the rice production reached (130) thousand tons (Mutlik, 2016), but after 2000 it reached (167) thousand tons (Alrashim, 2010), while the productivity reached before the 1990s (706) Kg/ dunums, and after 2000 it reached (690) Kg/ dunums, Table 3

Table 3: Area, production and productivity of rice crop in Iraq

Period	1990s	After-2000s	Average
Area (1,000 dunums)	502	275	388
Production (thousand tons)	130	167	148.5
Productivity(kg/ dunums)	706	690	681

Notes: the reference of these data was calculated by the researcher based on the Ministry of Agriculture and Agricultural Statistics 2016 data.

shows the area and production , productivity of rice in Iraq.

Fourth: The current reality of area, production, productivity of the maize crop in Iraq

Maize crop is an important strategic crop, as it is involved in many industrial and food commodities, which important to humans and animals and its cultivation is based in the central and southern regions of Iraq. Despite of its nutritional importance, its represent only 10% of the cultivated area with grains (Abid 2007). While the cultivated area in the 1990s were reached (690) thousand dunums, and the post-2000 period it was (468) thousand dunums. Yellow maize rank third in area and production, while the productivity in 1990s was (534) kg/ dunums (Abdullah 2007), but after 2000 reached (570) kg/ dunums, Table 4 shows the area , production , productivity of the yellow maize in Iraq

Table 4: Area, production and productivity of maize crop in Iraq

Period	1990s	After-2000s	Average
Area (1,000 dunums)	690	468	579
Production (thousand tons)	232	291	261.5
Productivity(kg/ dunums)	534	570	554

Notes: the reference of these data was calculated by the researcher based on the Ministry of Agriculture and Agricultural Statistics 2016 data.

Second abstract : The annual growth, consumption and food gap of strategic crops in Iraq

Firstly: The general trend and annual growth rates of area, production and productivity of the grains in Iraq for the period 1990-2016

Table 5 shows that the general trend equations of wheat crop are positive, so the increase in time by one unit (a year), the area increases by (47,500) dunums and the production increases by (76,000) tons and productivity by (0.011) Kg/dunums, this rate is not reliable in the development process nor in meeting the food gap.

* $Y = B_0 + B_{it}$

$Y = Ae^{Bt}$ $InY = InA + Bt$

Where Y = represents the variable of (area, production, productivity)

B_i = General trend

Bt = Growth rate

As for barley, the signal was negative, *i.e.* it's decreasing annually, but for the rice crop it has been negative, and decreasing, and this may be due to the scarcity of water in recent years and the reduction of cultivated areas, and for yellow maize, despite that the general trend is positive, but it is below the required level. The growth rate of wheat was positive, and for barley, rice was negative, even when the growth rate for and yellow maize was positive, but it is weak, and did not meet the growing demand for these crops.

Second: the reality of the consumption and food gap of strategic crops in Iraq

Table 6 shows the good balances of the strategic crop group before the 1990s and after 2000, it was clear that there were insufficiency between production and consumption, especially wheat and rice, through a reduction in the self-sufficiency and the Rely on import from abroad depends on abroad. The food gap has reached after recent years about (1751) thousand tons of wheat and the self-sufficiency percentage was (61%), while the Rely on import from abroad was (39%). Furthermore, the food gap in rice crop reached (783) thousand tons and the self-sufficiency percentage was (17.5%), while the Rely on import from abroad was (82.5%). These indicators are dangerous in the concept of food security and the grain international prices are on the rise, which requires a serious reaction by the state to address this problem

Table 5: Annual growth rates for the area, production and productivity of grains (1990-2016)

Crop	Estimated equation	Area 1000 dunm	Production 1000 tons	Productivity Kg/ dunm
Wheat	General trend*	47.5	76.0	0.011
	Growth rate**	0.01	0.05	0.04
Barley	General trend	-163.0	-16.7	0.003
	Growth rate	-0.031	-0.018	0.017
Rice	General trend	-13.4	-1.7	0.016
	Growth rate	-0.04	-0.014	0.025
Maize	General trend	8.6	5.7	0.003
	Growth rate	0.02	0.025	0.005

Notes: the reference of these data: based on the Ministry of Agriculture, Agricultural Statistics Department data, 2016.

Third abstract : Prediction of Consumed and imported quantities for strategic crops in Iraq

First: the prediction of the consumed quantities of strategic crops in Iraq and the time series over 27 years (1990-2017).

The following linear functions were used based on (koutsoyiannis, 1977)

Y = 1897.99 + 143.55 T for wheat crop

Y = 376.1 + 34.69 T for rice crop

Table 6: Good balances for the strategic crops in Iraq (1000) ton

Date	The 1990s				After 2000s			
	Wheat	Barley	Rice	Yellow Maize	Wheat	Barley	Rice	Yellow Maize
Production	1577	740	130	232	2749	1137	167	291
Available for consumption	3996	740	480	232	4500	1137	950	291
Food gap	-2418	0	-350	0	-1751	0	-783	0
% Self sufficiency	39.5	100	27	100	61	100	17.5	100
Dependence on abroad	60.5	0	73	0	39	0	82.5	0

Y= 652.92 + 14.49 T for barley crop

Y = 489.32 + 19.66 T for yellow maize

Table 7 shows that there is an annual increase in wheat consumption of (143.55) thousand tons, so the predicted quantities for 2022 are (5917.4) thousand tons, while the barley consumption annual increasing were (14.49) thousand tons, so the annual predicted quantities in barley consumption were (34.69) thousand tons and the predicted quantities for the year 2022 was (1058.7) thousand tons. Moreover, the annual rice consumption increases ratio were (34.69) thousand tons, so the predicted quantities for 2022 are (1347.9) thousand tons. Finally, the yellow maize annual increases were (19.66) thousand tons and the predicted quantities for 2022 was (526.24) thousand tons

Table 7: Predicted quantities of strategic crop consumption (2022-2017) 1000 tons

Prediction years	Wheat	Barley	Rice	Yellow maize
2017	5199.6	986.2	1174.0	428.0
2018	5343.2	1000.7	1208.7	447.6
2019	5486.7	1015.2	1243.4	467.26
2020	5630.8	1029.7	1278.0	486.9
2021	5773.8	1044.2	1312.69	506.9
2022	5917.4	1058.7	1347.9	526.24

Notes: The reference of these data was calculated by the researcher based on the Ministry of planning and Agricultural Statistics 2016 data

Second : Prediction of imported quantities for strategic crops in Iraq

Based on the imported quantities tables of strategic crops and time series (1990-2017) and then, the following linear functions (koutsoyiannis, 1977)

Y = 1189.13 + 125.33 T for wheat crop

Y = 490.0 + 40.14 T for rice crop

Y = 38.36 - 0.65 T for barley crop

Y = 14.02 - 0.22 T for yellow maize

Table 8 shows that there was an annual increase in the imported wheat crop by (125.33) thousand tons, so the predicted quantities for the year 2022 are (4698.3) thousand tons, while the imported annual increase in rice were (40.14) thousand tons, so the predicted quantities for the year 2022 were (1613.8) thousand tons. Finally, for barley and yellow maize there was a decrease in their imports annually of (- 65) thousand tons and (-22) thousand tons respectively.

Table 8: Predicted imported quantities of strategic crop (2022-2017) 1000 tons

Prediction years	Wheat	Barley	Rice	Yellow maize
2017	4071.7	23.41	2423.2	9.33
2018	4197.0	22.26	1453.4	9.11
2019	4322.4	22.11	1493.5	8.91
2020	4447.7	21.46	1533.6	8.69
2021	4573.0	20.81	1573.4	8.47
2022	4698.3	20.16	1613.8	8.25

Notes: The reference of these data was calculated by the researcher based on the Ministry of planning and Agricultural Statistics 2016 data

Third: Estimating the standard models of the independent variables impact on the imported quantities of grain crops in Iraq for the period (1990-2017)

Depending on several numbers of economic factors that presented independent variables in their impact on the import as follows: (gross domestic product (GDP), family consumption spending, government consumption spending, average GDP per capita, and the national income), while the main dependent variables were imported quantities of grains (wheat, barley, rice)

(1): Estimate the standard models of the independent variables impact on the imported quantities of wheat crop in Iraq for the period (1990-2017)

Several standard models (linear, double- logarithmic models, semi - logarithmic, and inverse semi -logarithmic) were used based on a time series of (1990-2017) and the double-logarithmic function was the optimum one as follows.

$LNY_2 = 4.19 - 0.65\ LNX_1 - 0.32\ LNX_2 + 0.50\ LNX_3 + 1.07\ LNX_4 + 1.18\ LNX_5$

t = (1.42) (1.02) (0.92) (3.59) (0.40) (0.60)

F = 34.67 R_2 = 0.93 D.w = 2.01

Where:

Y = Imported quantities of wheat

X1=Gross domestic product (GDP)

X2= Family consumption spending

X3= Government consumption spending

X4= Average GDP per capita

X5= National income

The above estimation shows that the double-logarithmic function is the best functions according to statistical tests (R^2, F, T) through the acceptance of, its parameters to the economic logic, where the determination coefficient (R^2) has explained about (93%) of the changes in imported wheat and the remaining (7%) it was based on the other factors that didn't include in this model. The total significant of the function was calculated through the (F) test that reached (34.67), which is greater than its scheduled value of (2.96), as well as the (D.w) value of (2.01) shows that there is no problem of self-correlation, and for the economic analysis, the value of the domestic production parameter was (-0.65), and as increasing the domestic production by (%1), that reduced the wheat imports by (% 65) and it's consistent with the economic logic. The value of the family consumption spending parameter was (-0.32), as the increase of the private consumer spending (1%) leads to a decrease in the imported quantities of wheat by (32%) and it is agreed with the economic logic. Furthermore, the value of government consumption spending parameter was (0.50), and by increasing the government spending leads to increase the imported quantities by (50%) and it is consistent with economic logic, while the gross domestic product has reached at (1.07), as the gross domestic product increases by (1%) leads to an increase in the imported quantities of wheat by (107%) and it is consistent with the economic logic. Finally, the parameter of national income was (0.18%) , as the increases of national income of (1%) leads to an increase in the imported quantities of wheat by (18%).

(2): Estimate the standard models of the independent variables impact on the imported quantities of rice crop in Iraq for the period (1990-2017) the function was obtained based on the time series, and the double-logarithmic function was the optimum one.

$LNY_2 = 1.09 - 0.18\ LNX_1 - 0.67\ LNX_2 + 0.33\ LNX_3 - 0.73\ LNX_4 + 1.07\ LNX_5$

t = (0.33) (0.25) (1.66) (2.06) (0.24) (0.32)

F = 17.48 R_2 = 0.86 D.w = 2.17

The above model shows that the double-logarithmic function was the best functions after passing the statistical tests and the coefficient of determination (R^2) has explained about a (86%) of the changes in rice imports and the remaining (14%) it was based on the other factors that didn't include in this model. The total significant of the function was calculated through the (F) test that reached 17.48, which was greater than its scheduled value of (2.96) and by comparing the calculated (D.w) value of (2.17), shows that there is no problem of self-correlation, and for the economic analysis the value of the domestic production parameter was (-0.18) and by increasing the domestic production by (%1), that reduced the rice imports by (%18), which that consistent with economic logic. Value of the family consumption spending parameter was (-0.67) , as the increases of the family consumption spending of (1%), leads to a decrease in the imported quantities from rice by (67%) and it is consistent with the economic logic. Furthermore, the value of government consumption spending parameter was (0.33), and by increasing the government spending of (1%), leads to increase the imported quantities of rice crop by (33%) and it is consistent with economic logic, while the parameter of gross domestic product has reached (1.07), as the gross domestic product increases by (1%) leads to an increase in the imported quantities of rice by (107%).

(3): Estimate the standard models of the independent variables impact on the imported quantities of barley crop in Iraq for the period (1990-2017) the function was obtained based on the time series, and the double-logarithmic function was the optimum one.

$LNY_2 = 49.09 - 0.41\ LNX_1 - 4.18\ LNX_2 + 2.58\ LNX_3 - 26.34\ LNX_4 + 30.16\ LNX_5$

t = (3.03) (0.12) (2.12) (3.29) (1.78) (1.88)

F = 5.48 R_2 = 0.66 D.w = 2.56

The above model shows that the double-logarithmic function was the best functions after passing the statistical tests and the coefficient of determination (R^2) has explained about a (66%) of the changes in barley imports the remaining (34%) it was based on the other factors that didn't include in this model. The total sign of the function was calculated through the (F) test that reached (5.48), which was greater than its scheduled value of (2.96) and by comparing the calculated (D.w) value of (2.56), shows that there is no problem of self-correlation,

and for the economic analysis the value of the domestic production parameter was (-0.41) and by increasing the domestic production by (%1), that reduced the rice imports by (%18), which that consistent with economic logic. Value of the family consumption spending parameter was (-4.18), as the increases of the family consumption spending by (1%) leads to a decrease in the imported quantities from barley by (418%) and it is consistent with the economic logic. Furthermore, the value of government consumption spending parameter was (-2.58) and by increasing the government spending of (1%) leads to increase the imported quantities of barley crop by (258%) and it is consistent with economic logic, while the parameter gross domestic product has reached (-26.34), as the gross domestic product increases by (1%) leads to decrease in the imported quantities of barley by (2643%) and it is consistent with the economic logic, because barley will often be used as animal feed. While the parameter national income is (30.16) as the increases of national income of (1%) leads to an increase in the imported quantities of barley by (3016%).

The random agriculture policy and the lack of strategic planning as discussed earlier in the grain production gap and food security caused a failure in providing food for citizens from local production. In fact, there are adequate resources and material potential for food production in Iraq, but these resources suffer from omissions and misuse, and the long-term continuing of food shortages will seriously affect the country's stability and sovereignty. Therefore, it has been shown that the failure has its main reasons, the most important of which was the poorest of investment customizations that is intended for the agricultural sector as it did not exceed (2.5%) of the country budget (Abdullah 2007). The study also agrees that wheat ranks first among agricultural crops in terms of cultivated area, however, it suffers from low levels of production and productivity compared to neighboring countries, the study also showed that the growth rates were negative, especially the rice and barley crops, which led to a high dependency on abroad, and it is a clear that there is a weakness and under-development of agricultural technological methods that adopted by the farmer, which has adversely affected the production of agricultural crops. The predicted amounts up to 2022 were high for the consumption of wheat and rice and this is reflected by a high import of these type of grains, while the impact of variations in the imported quantities of grain, also it varied through the increase and decrease in the import of strategic goods wheat, rice and barley. Finally, the study comes with several recommendations, including the rehabilitation of the agricultural sector, to take the lead in the strategy and the state's policy in terms of support and investment customizations, and creating an investment-stimulating environment characterized by easy procedures and clarity of the legislation and a national program to introduce modern technology and modern agricultural irrigation techniques to reduce waste in water. The study also recommended supporting and protecting the local product through anti-dumping and smuggling policy, helping farmers to provide concessional loans, exempt them from benefits, direct them into production, and develop agricultural policy through clear targets and agricultural plans to advance the agricultural reality for food security.

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