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# An Economic Analysis of the Most Important Factors Affecting the Agriculture Domestic Product in Iraq for the Period 2000-2023

Aseel. T. Mohammed Ali. S. Shukr
Dept. of Agri. Econ.\ Coll. of Agri. Engi. Sci. – University of Baghdad.

## ABSTRACT

The research aims to study the impact of economic variables on agricultural output in Iraq for the period (1990-2023), the research used quantitative methods in the analysis of GDP, the water supply of the Tigris and Euphrates rivers, cultivated areas, agricultural labour force, and other variables and to know on the agricultural product in Iraq. The parameters were estimated within the framework of the autoregressive model of autoregressive distributed lag model-ARDL, and the results found that each of the cultivated areas, agricultural labour, mechanical technology, per capita GDP and agricultural investments were indicated in conformity with economic logic and statistically significant, the results found that there is a long-term equilibrium relationship between agricultural product and the study variables, and the error correction coefficient came with a negative sign of -1.013851 and a significant at 1%, and the research found that water supply is the largest and prominent role and determinant of products, the research recommended the need to improve the efficiency of water by ensuring the use of modern irrigation technologies, especially in irrigated areas in central and southern of Iraq.

**Keywords:** agricultural labour, mechanical technology, ARDL model, water Supply.



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## INTRODUCTION

The agricultural sector inhabits a distinguished position in the economic structure of most countries of the world, especially developing countries, including Iraq, in terms of providing job opportunities and achieving self-sufficiency in food commodities and products and its contribution to the revitalization of manufacturing industries by providing them with production requirements (Abdel Nabi, 2021), in addition to its contribution to the formation of GDP (Al-Jarjari, & Al-Douri. 2023.), The agricultural Product is one of the most important economic indicators through which the performance of the agricultural sector is inferred (Reddy, & Dutta. 2018). GDP expresses the sum of the values of final goods and services produced by the economy during a certain period, usually one year (Shihab, & Rahim. 2024.). The agricultural sector contributes about 2.84% of the GDP for the year 2022 in Iraq, and this percentage is very low compared to the available human and land resources, this would make the development of the agricultural sector important and must grow at rates that exceed the growth of the population (Jumaili, 2023.), As it is well known, agricultural activity in Iraq is witnessing a continuous decrease in Plauted and cultivated land as a result of pollution and urbanisation. Agricultural production consists of two parts: plant production and animal production (Chandio, et al. 2021). So, agricultural Product represents the totality of plant and animal products, which can be measured in known units of measurement in terms of quantity and value, and due to the difference in quantitative units of measurement, the agricultural product is estimated in monetary units such as dinars or dollars and others. GDP is one of the most important indicators that are used in addition to other indicators to formulate economic policies and conduct international and local comparisons,

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and the growth and development of GDP as a general trend expresses economic efficiency and the development of the standard of living and then as a measure of well-being. It is also one of the most important indicators used in economic analysis as it measures the efficiency of the country's economic performance during periods (Al-Kinani, 2013). Investment is one of the important factors affecting agricultural production because it works to increase employment and growth rate and works in the future to expand production capacity (Muleta, & Gebremariam. 2023.). As, well as gives the private sector the field and works to privatize the economy, and this to achieve investment and productivity development for the private sector (Agba, et al. 2017). Investment takes several financial, accounting and economic areas, which is frequently used and is one of the well-known terms. Two reasons play a role in economic life, namely, the investment demand and demand for investment commodities constitute a large part of the total demand (Erekat, 2014.). In particular, consumption increases as the population increases, and the proportion of investment allocated to income decreases, this means that investment is negatively affected when population growth rates increase (Muhammad, 2020.). The Iraqi agricultural sector has great importance for food, which is represented in crops, especially cereals (Hussein, 2024). As a result of the failure to keep pace with the production of these crops with the population increase of about 3% annually, imports were relied on to fill the deficit between production and consumption. Agriculture plays an important role in terms of its ability to provide difficult foreign currency. The problem of the research lies in the steady increase in the demand for food products, both plant and animal, resulting from the increase in the population, in addition to the high average per capita income and the improvement of consumption patterns in Iraq, offset by a deficiency in agricultural output in Iraq, which reflected negatively on economic development in general and agricultural in particular, the research aims to conduct economic and econometric analysis of the most important economic indicators affecting Iraq's agricultural output for the period 1990-2023.

## MATERIALS AND METHODS

The agricultural sector is one of the most important economic activities that contribute to the national economy and food security and is related to national security, meaning that achieving food security depends on food in the agricultural product, and the agricultural sector contributes to diversification in the economy and poverty levels, improving the trade balance and the movement of other economic sectors, combating unemployment, reducing the volume of imports and relying on local production (Naresh, et al. 2024). The national product is safer and more reassuring for the health and safety of the consumer than the imported product, and the development of the agricultural economic sector will reflect positively on improving the environmental reality (Hassan, 2023). Agricultural production consists of two parts: plant production and animal production, plant production expresses the group of field crops, and animal production is represented by cows, sheep, goats, hunting animals, poultry, fish and marine animals (Mammo, 2022). Therefore, the agricultural product represents the total plant production and animal production and the growth rates in the agricultural product reflect the response of the agricultural sector to productive incentives, that is, when growth rates increase or when they are volatile, this means the sector's ability to increase the domestic product of agricultural production to meet the requirements and needs of local consumption or export and reflects the extent of the development of the level of income, which is the level of economic well-being of members of society.

**Gross Domestic Product - GDP**

GDP is represented as the total value of goods and services produced and marketed within the borders of a country during a certain period (Erekat, 2014), and the importance of GDP lies in assessing the economic situation of the state and making investment decisions, as well as its special importance in the economic environment. GDP is used in economic activities and in economic analysis to compare the economic performance of countries, and there are several methods for calculating GDP (final product method, value-added method,

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earned income method, and final expenditure method.

**Agricultural investment**

Investment is generally defined as money that is used in different areas of investment (surplus funds) (Hussein, et al. 2020), while agricultural investment is the set of expenditures that lead to the increase, development and direction of capital assets of agricultural projects (Ali, 2014). That is, agricultural investment is a positive economic action that results in increasing the productive capacity and productive capacity of agricultural communities (Al-Wardi, 2014). The importance of agricultural investment is mainly related to the investment decisions made by the farm manager and the investment decision affects the status of the farm (Janabi, 2021) the investment decision is what determines the subsequent decisions, i.e. it is a basic decision (Obaid, 2008).

**Water Supply of Tigris and Euphrates Rivers**

Large parts of Iraq's territory are located within the arid and semi-arid belt, so it is necessary to rely on several sources in agriculture (Shukr, 2023). The water sources in Iraq include three sources, the first source represents the Tigris and Euphrates rivers and the second source is rainwater, usually relied upon in demi-agriculture (Dumrul, & Kilicaslan. 2017.). It is characterized by this water in the fluctuation of precipitation rates from one region to another region in Iraq, and the third source is groundwater, which is a strategic source of water resources in Iraq. The tributaries of the Tigris River are limited to Khabur, Great Zab, Little and Diyala (Rehman, et al. 2021). The Euphrates River has no tributaries within Iraqi territory. The total annual revenue of the Tigris River with its tributaries is estimated at 40 billion $m^3$, while the annual revenues of the Euphrates River have been estimated at 18 billion $m^3$. If we look at the percentage of supply of the two rivers from the source, we see that for the supply of the Tigris River, 12% of Iran and 56% come from Turkey and 32% from inside Iraq, as for the water revenues of the Euphrates River, 88% of them come from Turkey, 9% from Syria and 3% from Iraq (Ismail, 2008).

## RESULTS AND DISCUSSION

**The model:** We used the following model that describes the most effecting variables of agricultural products:

$$Y = B_0 + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6 + B_7 X_7 + B_8 X_8 + u_i$$

**Where:**

Y: Agricultural Product (Million Dinars)
X1: GDP (Million I.D)
X2: Water supply of the Tigris and Euphrates Same (billion m3)
X3: Cultivated area (million dunums).
X4: Agricultural labour force (thousand workers).
X5: Investment allocations for the agricultural sector (million dinars).
X6: Mechanical technology (thousand units).
X7: GDP per capita (million dinars).
X8: Agricultural investment (million dinars).

**Time Series Stationarity (Unit root test)**

The economic variables in general are usually characterized by instability due to their economic nature and this is confirmed by most studies and research, there are several methods to detect the stability of time series and the most important of these methods is through the graph to draw the time series for each variable as well as the Diciky Fuller Augmented Test (ADF) has been tested the variables included in the model after taking the linear formula.

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**Table 1.** Results of stationary of variables using (ADF) test

| | | Y | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 |
|---|---|---|---|---|---|---|---|---|---|---|
| **At Level** | | | | | | | | | | |
| **With Constant** | t-Statistic | -1.436156 | 0.286927 | -5.6238 | -2.7317 | -1.2864 | -1.3960 | -1.4339 | -1.24406 | 0.9808 |
| | **Prob.** | 0.5527 | 0.9740 | 0.0000 | 0.0795 | 0.6231 | 0.5722 | 0.5538 | 0.6432 | 0.7485 |
| | | no | no | *** | * | no | no | no | no | no |
| **With Constant &Trend** | t-Statistic | -2.888872 | -3.095076 | -7.68746 | -2.73693 | -3.9906 | -1.10865 | -0.7735 | -1.0053 | -1.8715 |
| | **Prob.** | 0.1787 | 0.1245 | 0.0000 | 0.2294 | 0.0190 | 0.9123 | 0.9581 | 0.929 | 0.6464 |
| | | no | no | *** | no | ** | no | no | no | no |
| **Without Constant &Trend** | t-Statistic | -0.110513 | 1.708651 | -1.361444 | -0.67581 | 0.8263 | -0.9903 | -0.86447 | 0.1407 | 0.00379 |
| | **Prob.** | 0.6381 | 0.9764 | 0.1569 | 0.4166 | 0.8850 | 0.2820 | 0.3339 | 0.7202 | 0.6767 |
| | | no | no | no | no | no | no | no | no | no |
| **At First Differec** | | | | | | | | | | |
| | | D(Y) | d( X1) | d(X2) | d(X3) | d(X4) | d(X5) | d(X6) | d(X7) | d(X8 ) |
| **With Constant** | t-Statistic | -6.506519 | -5.34479 | -5.7893 | -6.3509 | -7.72247 | 5.5032 | -1.84754 | -4.1668 | -6.0211 |
| | **Prob.** | 0.0000 | 0.0001 | 0.0001 | 0.0000 | 0.0000 | 0.0001 | 0.3418 | 0.0027 | 0.0000 |
| | | *** | *** | *** | *** | *** | *** | no | *** | *** |
| **With Constant &Trend** | t-Statistic | -6.408712 | -5.5064 | -5.7893 | -6.32446 | - 7.71486 | -5.5418 | -1.75413 | -4.20996 | -5.9156 |
| | **Prob.** | 0.0000 | 0.0005 | 0.0001 | 0.0001 | 0.0000 | 0.0004 | 0.7030 | 0.0116 | 0.0002 |
| | | *** | *** | *** | *** | *** | *** | no | ** | *** |
| **Without Constant &Trend** | t-Statistic | -6.406602 | -4.53976 | -7.2752 | -6.431011 | -7.60394 | -5.5903 | -2.0069 | -4.10633 | -5.9093 |
| | **Prob.** | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0444 | 0.0002 | 0.0000 |
| | | *** | *** | *** | *** | *** | *** | ** | ** | *** |

**(*) Significant at the 10%, (**) Significant at the 5%, (***) Significant at the 1% and (no) Not Significant.**
**Source: By Authors using Eviews 13.Determination of lag periods: Vector Autoregressive (VAR):**

Before starting the model test, the period of the lags must be determined according to the most accurate criteria used in Table (2). It turns out that the appropriate lag time for the model is 2 based on the five criteria (LR, FPE, AIC, SC, HQ).

**Table 2.** Determination of the lag period

VAR Lag Order Selection Criteria
Endogenous variables: Y X1 X2 X3 X4 X5 X6 X7 X8
Exogenous variables: C
Date: 12/28/24 Time: 20:29
Sample: 1 34
Included observations: 32

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -3748.705 | NA | 8.03e+90 | 234.8566 | 235.2688 | 234.9932 |
| 1 | -3549.902 | 273.3538 | 6.19e+87 | 227.4939 | 231.6163 | 228.8604 |
| 2 | -3398.641 | 122.8999* | 3.17e+86* | 223.1026* | 230.9351* | 225.6988* |

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

**Resource: By Authors using Eviews 13.**

## Autoregressive Distribution Lag

After confirming the stability of the time series of variables at the level and the first difference, the initial estimate of the ARDL, via using the statistical program (Eviews 13) which automatically determines the optimal lags period according to the AIC criterion where we can see from table 3. The value of the coefficient of R-squared is equal to 0.99, meaning that the independent variables

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included in the estimated model explain about 99% of the changes in the dependent variable, and this is an indication of the interpreted factors that have the greatest impact on the function, while 1% is not explained, i.e. responsible for the variables not included in the model or represented by the random variable, while the calculated F value is equal to 265, which is significant at 1%, and this means that the estimated model is significant as a whole.

**Table 3.** Results of the lag Distribution Autoregressive Model (ARDL)

Automatic-lag linear regressors (2 max. lags): X1 X2 X3 X4 X5 X6 X7 X8
Deterministics: Restricted constant and no trend (Case 2)
Model selection method: Akaike info criterion (AIC)
Number of models evaluated: 13122
Selected model: ARDL(2,2,1,1,2,2,2,1,1)

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|---|---|---|---|---|
| Y(-1) | 0.049407 | 0.095986 | 0.514736 | 0.6191 |
| Y(-2) | 0.722413 | 0.089323 | 8.087650 | 0.0000 |
| X1 | -0.060257 | 0.008711 | -6.917308 | 0.0001 |
| X1(-1) | 0.014505 | 0.007378 | 1.965884 | 0.0809 |
| X1(-2) | -0.030726 | 0.005572 | -5.514062 | 0.0004 |
| X2 | -27357.69 | 6832.990 | -4.003766 | 0.0031 |
| X2(-1) | -29879.90 | 7506.820 | -3.980367 | 0.0032 |
| X3 | 0.526739 | 0.045674 | 11.53249 | 0.0000 |
| X3(-1) | 0.078443 | 0.058467 | 1.341673 | 0.2126 |
| X4 | 1524.303 | 360.5829 | 4.227329 | 0.0022 |
| X4(-1) | 464.2634 | 417.8694 | 1.111025 | 0.2954 |
| X4(-2) | 423.2476 | 478.5662 | 0.884408 | 0.3995 |
| X5 | 0.262122 | 0.695935 | 0.376647 | 0.7152 |
| X5(-1) | -6.068122 | 0.774948 | -7.830363 | 0.0000 |
| X5(-2) | -2.228830 | 0.264742 | -8.418890 | 0.0000 |
| X6 | 7.069610 | 2.889147 | 2.446954 | 0.0369 |
| X6(-1) | 20.00538 | 5.204845 | 3.843606 | 0.0039 |
| X6(-2) | 4.694944 | 5.557042 | 0.844864 | 0.4201 |
| X7 | 2.114178 | 0.347678 | 6.080846 | 0.0002 |
| X7(-1) | -0.635313 | 0.335991 | -1.890862 | 0.0912 |
| X8 | 0.146770 | 1.078305 | 0.136112 | 0.8947 |
| X8(-1) | 9.239373 | 1.232922 | 7.493885 | 0.0000 |
| C | -8604429. | 1313900. | -6.548772 | 0.0001 |

| | | | |
|---|---|---|---|
| R-squared | 0.998463 | Mean dependent var | 5588674. |
| Adjusted R-squared | 0.994706 | S.D. dependent var | 3826281. |
| S.E. of regression | 278410.0 | Akaike info criterion | 28.08057 |
| Sum squared resid | 6.98E+11 | Schwarz criterion | 29.13406 |
| Log likelihood | -426.2891 | Hannan-Quinn criter. | 28.42977 |
| F-statistic | 265.7388 | Durbin-Watson stat | 2.117663 |
| Prob(F-statistic) | 0.000000 | | |

**Resource: By Authors using Eviews 13.**

As shown in Table (3). the gross domestic product represented by X1 was -0.060 has proven its statistical significance at the level of 1%, as for its signal, it came with a negative sign, which is contrary to economic logic, the reason for this may be because most of the expenditures have gone to sectors other than the agricultural sector, which negatively affected the agricultural GDP during the period studied, as for the variable water supply of the Tigris and Euphrates rivers X2 was 27357.69 has proven its significance at the level of 1% also came with a negative signal contrary to the economic logic and the reason is due to the scarcity of incoming water in addition to the effects of climate such as the lack of rain, which is reflected in agricultural output, especially since water Supply is one of the most important determinants of agricultural output. As for the cultivated areas, X3 amounted to 0.526739, it also came significant at the level of 1% and came with a positive signal identical to the economic logic, which shows that the increase in cultivated areas increases agricultural output, as for the variable agricultural employment X4 was 1524.303 it also came significant at the level of 5% and a positive sign identical to the economic logic through that the increase in the number of agricultural workers reflects positively on the agricultural output in Iraq during the study period. As for the variable of investment allocations for the agricultural sector X5, it reached -6.068122, it was also significant at the level of 1%, but its signal was negative, which is contrary to economic logic. The reason for this may be that most of these allocations go to other sections other than the agricultural sector and the lack of follow-up and scrutiny in the aspects of disbursement of these allocations, which negatively affected the agricultural output in Iraq. As for the variable X6 has

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reached 7.0696, which is represented by agricultural technology and mechanization, it came significantly at the level of 5% and with a positive signal corresponding to the economic logic, which reflects the importance of agricultural technology, represented by agricultural pullers and harvesters on agricultural production. As for the variable X7, which is represented by the per capita agricultural GDP, it reached 2.114178, it came with a positive signal, which is consistent with the economic logic, and it also came significant at the level of 1%, which shows that increasing the per capita GDP leads to an increase in agricultural output. As for the variable (X8), which is represented by agricultural investments for the agricultural sector, it reached 0.146770 came with a signal positive and significant at the level of 1%, and this is identical to the economic logic, and this means an increase in agricultural investments by 1% leads to an increase in agricultural output by 9.239373%.

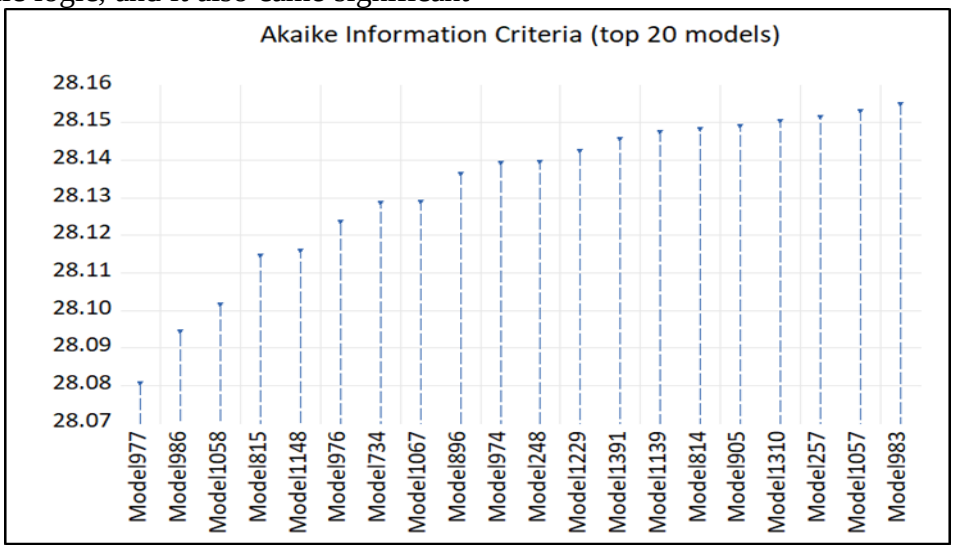


**Figure 1.** Best 20 models according to the Akaike criterion.

**Resource: Program Outputs Eviews.13.**

**Bounds Test**

Through Table 4. the F statistic amounted to 31.2041, which is greater than the value of the upper limit of critical values in the model at the levels of significance 1%, 5% and 10%, and the results of this test support the rejection of the null hypothesis and thus confirm the existence of a long-term equilibrium relationship between the economic variables used in the model and agricultural Product.

**Table 4.** Cointegration test results

| ARDL Bounds Test<br>Date: 12/30/24 Time: 18:54<br>Sample: 3 34<br>Included observations: 32<br>Null Hypothesis: No long-run relationships exist | | |
|---|---|---|
| Test Statistic | Value | k |
| F-statistic | 31.20419 | 8 |
| Critical Value Bounds | | |
| Significance | I0 Bound | I1 Bound |
| 10% | 1.95 | 3.06 |
| 5% | 2.22 | 3.39 |
| 2.5% | 2.48 | 3.7 |
| 1% | 2.79 | 4.1 |

**Resource: By Authors using Eviews 13.**

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**Short-term equation**

As shown in Table (5), the error correction coefficient CoinEq (-1) is -1.013851, and as long as it has a negative and significant sign at the level of 1%, the value of *E* is interpreted as 1% of the deviations in the short term will be corrected in the long term.

**Table 5. Short-term model/ error correction model – ECM**

ARDL Cointegrating And Long Run Form
Dependent Variable: Y
Selected Model: ARDL(2, 2, 2, 1, 2, 2, 1, 2, 2)
Date: 01/06/25 Time: 15:13
Sample: 1 34
Included observations: 32

Cointegrating Form

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(Y(-1)) | -0.385849 | 0.150799 | -2.558690 | 0.0376 |
| D(LOGX1) | -7390149... | 4198685.7... | 0.000000 | 0.0000 |
| D(LOGX1(-1)) | 1392984... | 8850569.4... | 0.000000 | 0.0000 |
| D(LOGX2) | -733555.... | 1173134.5... | 0.000000 | 0.0000 |
| D(LOGX2(-1)) | 858498.0... | 909640.49... | 0.943777 | 0.3767 |
| D(LOGX3) | 6012533.... | 1269119.2... | 0.000000 | 0.0000 |
| D(LOGX4) | 2924948.... | 1966676.5... | 0.000000 | 0.0000 |
| D(LOGX4(-1)) | -3971597... | 2314431.6... | 0.000000 | 0.0000 |
| D(LOGX5) | 909504.7... | 878909.02... | 1.034811 | 0.3352 |
| D(LOGX5(-1)) | 1792299.... | 1198701.0... | 0.000000 | 0.0000 |
| D(LOGX6) | -2294355... | 1453644.7... | 0.000000 | 0.0000 |
| D(LOGX7) | 6423064.... | 4562204.3... | 0.000000 | 0.0000 |
| D(LOGX7(-1)) | -1408639... | 8994749.4... | 0.000000 | 0.0000 |
| D(LOGX8) | 332835.4... | 1285956.4... | 0.000000 | 0.0000 |
| D(LOGX8(-1)) | -1776215... | 1335106.7... | 0.000000 | 0.0000 |
| CointEq(-1) | -1.013851 | 0.250588 | -4.045879 | 0.0049 |

Cointeq = Y - (-17571092.7880*LOGX1 -1375163.5083*LOGX2 + 7866348.6259*LOGX3 + 10720101.0521*LOGX4 -3217698.2361 *LOGX5 + 4135945.9944*LOGX6 + 17566154.0096*LOGX7 + 5034093.7105*LOGX8 -207614258.4947 )

**Resource: By Authors using Eviews 13.**

**Table 6.** Equation of the model in the long run

Long Run Coefficients

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOGX1 | -1757109... | 8332378.5... | -2.108773 | 0.0729 |
| LOGX2 | -1375163... | 1809754.3... | -0.759862 | 0.4721 |
| LOGX3 | 7866348.... | 1779641.1... | 4.420188 | 0.0031 |
| LOGX4 | 1072010... | 3563553.6... | 3.008261 | 0.0197 |
| LOGX5 | -3217698... | 1552329.2... | -2.072819 | 0.0769 |
| LOGX6 | 4135945.... | 766646.02... | 5.394857 | 0.0010 |
| LOGX7 | 1756615... | 8276096.4... | 2.122517 | 0.0715 |
| LOGX8 | 5034093.... | 2163805.0... | 2.326501 | 0.0529 |
| C | -2076142... | 38069166.... | -5.453607 | 0.0010 |

**Resource: By Authors using Eviews 13.**

As for the long-term equation, the signs and significancy of the illustrative variables appeared as follows: X1 indicator represented by the gross domestic product appeared at the level of 10% and with a reference contrary to the economic logic, which reflects the impact of agricultural product on GDP in the long run and thus dependence on other sources such as loans or other agricultural initiatives, as for the variable of water imports in Iraq X2 it came non-significant and is the only one that did not prove its significance in the long term , while the variable of cultivated area X3 came significant and matches the economic logic and this reflects the importance of this variable in and long term, as for the agricultural workforce X4 It has proven its significant also and a reference identical to the economic logic and this is a clear indication that farm work has an important and clear role on the agricultural product in Iraq, which is one of the important determinants approved by the economic theory, as for the variable investment allocations for the agricultural sector X5 it came significant at the level of 10% and a reference contrary to the economic logic and it is clear through the reference, that there is a negative role for agricultural investment allocations on agricultural output in the long term and here it seems that there are other sources other than agricultural investment allocations can enhance the value of agricultural output in Iraq, as for mechanical technology X6, it came with high

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significant and a reference identical to economic logic, and this is evident from the important role of technological progress in raising the process of agricultural development forward in general and agricultural output in particular,X7 as for the variable per capita GDP, it also came significant at the level of 10% and came with a positive sign identical to the economic logic, as for the variable X8 agricultural investment, it also came significant and with a positive sign identical to the economic logic and significant at the level of 5%, which reflects the role of agricultural investment in the long term.

**Diagnostic tests**

**1. Autocorrelation test**

Table (7) shows. That model does not suffer from the problem of autocorrelation, as the value of the *F* statistic reached 3.239 at the probability level 0.1009, which is a significant level greater than 5%, as the corresponding value of (Obs*R-Squared) reached 15.381 at the probability level 0.0005, which is less than 5%, meaning that we accept the null hypothesis that there is no self-correlation problem for the remainders of the regression equation**.**

**Table 7.** Auto Correlation LM Test

| Breusch-Godfrey Serial Correlation LM Test: Null hypothesis: No serial correlation at up to 2 lags | | | |
|---|---|---|---|
| F-statistic | 3.239282 | Prob. F(2,7) | 0.1009 |
| Obs*R-squared | 15.38102 | Prob. Chi-Square(2) | 0.0005 |

**Resource: By Authors using Eviews 13.**

**2. Heteroscedasticity test**

The calculated value of *F* was 0.446960 with a significant level of 0.5091, as well as the value of (Obs*R-Squared) amounted to about 0.4705 and a significant level of 0.4927, which means accepting the hypothesis that the random error variance in the estimated model is fixed as shown in Table (8).

**Table 8**. Heteroscedasticity test result for the detection of variance instability problem

| Heteroskedasticity Test: ARCH | | | |
|---|---|---|---|
| F-statistic | 0.446960 | Prob. F(1,29) | 0.5091 |
| Obs*R-squared | 0.470533 | Prob. Chi-Square(1) | 0.4927 |

**Resource: By Authors Via using Eviews 13.**

**3. Normal distribution test**

The condition of the normal distribution of the residuals was achieved using (JB) with a p-value of 0.8951, which is greater than 5%, from which we accept the null hypothesis, that is, the residuals of the model have a normal distribution as shown in figure (2).

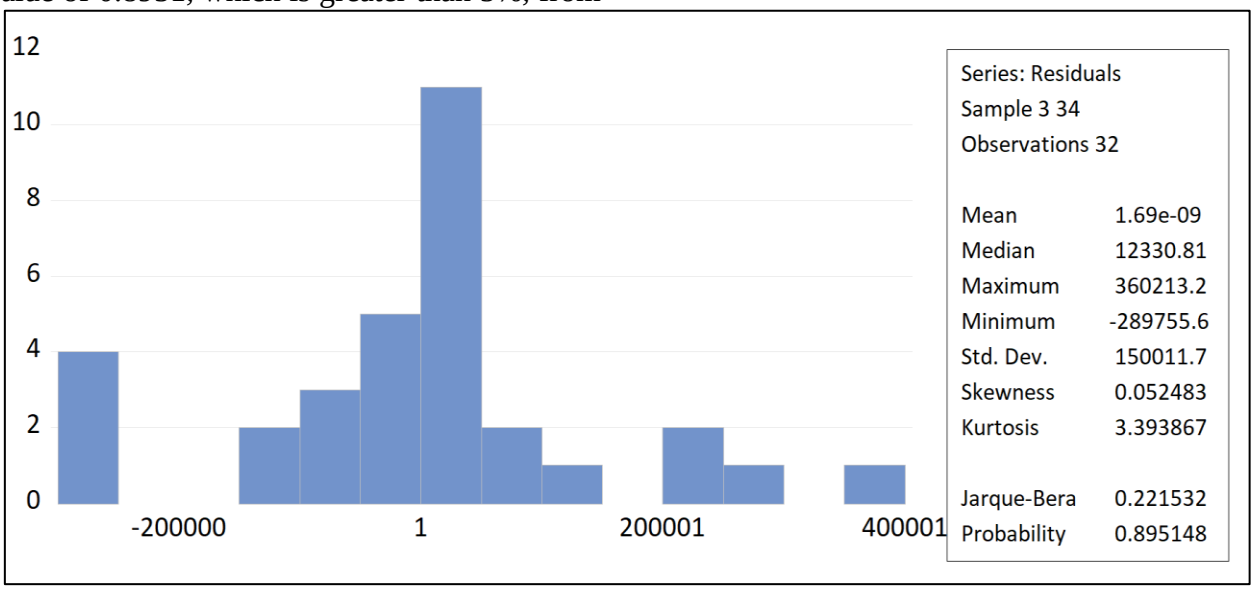


**Figure 2.** The normal distribution of residuals**.**

**Resource: By Authors using Eviews 13.**

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## CONCLUSIONS

We conclude that there is a clear deficiency in directing state resources to the agricultural sector and use to other sectors, and that there is a scarcity of water shares due to the water policies of neighbouring countries as well as the dry seasons and rain decline during the study period and there is a clear role for agricultural technology represented by tractors, harvesters and agricultural irrigation systems, which was reflected in the increase in agricultural output. The research recommends highlighting the increase in investment allocations and budgets for the agricultural sector as it is the most important economic sector after the energy sector (oil) and work on the use of modern irrigation sectors to raise the efficiency of water use e and reduce the role and activate the role of the state in providing agricultural mechanization to farmers with simple procedures.

## CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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# تحليل اقتصادي لأهم العوامل المؤثرة على الناتج المحلي الزراعي في العراق للمدة 2000-2023

اسيل تكليف محمد ، علي صلاح شكر
قسم الاقتصاد الزراعي / كلية علوم الهندسة الزراعية – جامعة بغداد

**المستخلص**

يهدف البحث الى دراسة تأثير المتغيرات الاقتصادية على الناتج الزراعي في العراق للمدة (1990-2023)، أستخدم البحث الاساليب الكمية في تحليل أثر الناتج المحلي الاجمالي، الواردات المائية لنهري دجلة والفرات، المساحات المزروعة، القوى العاملة الزراعية، وغيرها من المتغيرات على الناتج الزراعي في العراق. تم تقدير المعلمات في أطار أنموذج الانحدار الذاتي للإبطاءات الموزعة، توصلت النتائج الى أن كل من المساحات المزروعة، والعمالة الزراعية، والتكنلوجيا الميكانيكية، ونصيب الفرد من الناتج المحلي الاجمالي والاستثمارات الزراعية جاءت اشارتها مطابقة للمنطق الاقتصادي ومعنوية احصائياً، كما توصلت النتائج ان هناك علاقة توازنية طويلة الاجل بين الناتج المحلي الزراعي ومتغيرات الدراسة، وجاء معامل تصحيح الخطأ بإشارة سالبة بلغت -1.013851 وبمعنوية 1%، وتوصل البحث الى ان للواردات المائية الدور الاكبر والبارز والمحدد للناتج الزراعي خلال المدة، وأوصى البحث بضرورة تحسين كفاءة استخدام المياه من خلال التأكيد على استخدام تقانات الري الحديثة وخاصة في المناطق المروية في وسط وجنوب العراق .

**الكلمات المفتاحية**: القوى العاملة الزراعية، التكنلوجيا الميكانيكية، انموذج الانحدار الذاتي للإبطاءات الموزعة، عرض المياه.