

The Impact of Some Agricultural Economic Variables on the Value of Plant Production in Iraq: An Econometric Study Using the ADRL Autoregressive Distributed Time Lag Model for the Period (1990-2021)

Prof Dr. Basim Fadhil Latteef AL Douri

Taha Muhammad Idan Al-Jarjari

Tikrit University, faculty of Agriculture, Department of Economics and Agriculture Extension

Abstract:

The study aimed to identify the most important agricultural economic variables that have an impact on the trends in the value of plant production in Iraq during the period (1990-2021) using the ADRL model. The results showed the existence of a co-integration relationship between the study variables in the long term, and the variables (cultivated area, grain quantity, mechanical technology, chemical technology) are associated with a positive and statistically significant relationship with the value of plant production in Iraq in the long term, while the mechanical technology had an impact Negative significant on the value of plant production in Iraq during the study period. This may be due to the inability of farmers to use this technology (harvesters) in agricultural activities other than harvesting, or due to the agricultural lands not being suitable for using this type of modern agricultural mechanization, all of which led to the negative impact of this indicator on the value of plant production in Iraq.

Keywords: value of plant production, cultivated area, grain quantity, chemical technology, chemical technology.

Introduction:

The value of plant production contributes significantly to the formation of the value of the agricultural domestic product, as this percentage is estimated at about (66%) of the value of the Iraqi agricultural domestic product, so plant production occupies a great economic importance from the total Iraqi agricultural production, and this importance comes through agricultural commodities and products Which are included in agricultural production, such as grains, vegetables, legumes, fodder crops, fruits, dates, and others. Being one of the necessary necessities for human food through supplying it with calories and protein on which its life depends, as well as its prominent role in achieving food security at the national and national levels due to its contribution to securing food and industrial needs and reducing dependence on imports by providing these needs. The state of fluctuation in the volume of production is one of the basic characteristics of agricultural production in general and in Iraq in particular (Al-Hakim, 2013: 50).

The study Problem:

A problem in the study was that the value of plant production became low and did not contribute to the required extent in the formation of the value of the Iraqi agricultural domestic product, which resulted in an increasing degree of Iraq's

dependence on external sources to meet its needs and requirements of commodities and food products, which reflected negatively on the Iraqi economy, which necessitates the necessity Knowing the factors or variables that affect the value of plant production in Iraq and the extent of their impact and contribution to this value in light of the fluctuations and current economic conditions.

The importance of the study:

The importance of the study comes from the importance of the variables it contains (the cultivated area, the quantity of grains, the mechanical technology, the chemical technology. Agricultural, natural and human economic is still facing low efficiency of its use.

Purpose of the study:-

This study aims to measure and analyze the relationship between agricultural economic variables and the value of plant production in Iraq during the period (1990-2021).

Study hypothesis:

The study relied on the hypothesis that the value of plant production in Iraq is low due to a group of factors affecting it. A group of agricultural economic variables have been studied that vary in their impact on the value of plant production in Iraq, namely (the cultivated area, the amount of grain, mechanical technology, chemical technology.)It is possible that these variables lead to the advancement of plant agricultural production in Iraq because they are the main indicators of the growth trends of plant production in Iraq, and the researcher seeks to prove this hypothesis or not.

The limits of the study:-

- 1-The researcher will study the research inside Iraq.
- 2- Time limits: The problem will be studied for the period(1990-2021).

Study methodology:

The study relied on the Bound or ARDL autoregressive model, an approach to analyze the function of the study in the long and short term.

Economic characterization of the economic variables used in the analysis

The concepts of the dependent and independent variables that were used in the standard models and the impact of each of them on the dependent variable should be recognized:

Variables used in the analysis:

Value of plant production: PPV_t

Plant production represents a great economic importance in the overall agricultural production, and this importance comes through the agricultural crops that are included in plant production such as grains, fruits, dates, vegetable, legume, fodder, industrial and other crops, being the main source of calories and protein, on which human life depends, as well as its prominent role in achieving Food security at the national and national levels, for its contribution to securing food and industrial needs and reducing dependence on imports by providing these needs. The value of plant

agricultural production comes first in terms of its contribution to the Iraqi agricultural domestic product, as its contribution reaches about (66%) of the value of the Iraqi agricultural domestic product. The economic potential, natural resources, and climate diversity in Iraq allow the production of a variety of grain crops, vegetables, legumes, tubers, fruits, dates, and other crops. The indicators of area, production, and productivity of the agricultural sector in Iraq reflect the state of fluctuation of agricultural production in the country during the study period.

Cultivated Area: CUA_t

It refers to all arable lands exploited in the field of vegetable production, estimated at 1,000 dunums, regardless of the irrigation method or the degree of fertility of the cultivated lands (Arab Organization for Agricultural Development, 1994:91). The agricultural development strategy of most developing countries, including Iraq, depends on two main axes: achieving horizontal development through the reclamation and exploitation of new lands, and achieving vertical development by raising the productive efficiency of production factors used in agricultural production (Juili, 2003: 55).

The economic theory assumes that there is a positive relationship between the cultivated area variable and the value of the agricultural domestic product.

Grain Quantity: GRQ_t

They are small, strong and dry seeds that are grown for the purpose of human or animal consumption, and grain crops are considered one of the main foods in most peoples of the world, especially Iraq, as grains and their derivatives are the main food for these peoples and still occupy a prominent place in human food and animal food, so grain crops account for up to more than (84%) of the total cultivated area in the country. Cereal crops are characterized by their high percentage of starch, which is necessary to provide man with energy, in addition to an appropriate amount of proteins, minerals, and vitamins. The most important of these crops are (wheat, barley, rice, yellow corn, and white corn).

The economic theory assumes a positive relationship between the variable quantity of grain and the value of plant production.

Mechanical Technique: MET_t

It is the total number of modern machines, machines and equipment represented by multiplying the total number of harvesters and pullers used in the production process by their horsepower (Hussein and Saeed, 2017: 256). Which is used in the implementation of farm operations, whether in terms of plowing or the rest of the operations and until the harvest process, and thus it seeks to replace mechanization with agricultural work (Al-Najafi, 1999: 77). This indicator reflects the technical efficiency of the agricultural sector, as the higher the rate of mechanization use per unit area (dunums, hectares), this indicates the development of the agricultural sector, and vice versa.

Economic theory assumes that there is a positive relationship between the mechanical technology variable and the value of the agricultural domestic product.

Chemical Technique: CHT_t

The term chemical technology refers to a set of accumulated knowledge and experience, material and organizational means that are used in agricultural activities in order to achieve the maximum possible production. This technique relies mainly on

intensifying the use of fertilizers, pesticides and fungicides, and this is what is called "vertical development" (Al-Najafi, 1999:77).

There are two forms of chemical technology used in agricultural activities:

- ❖ The first: It is the fertilizer that is used to improve soil fertility and increase the productivity of agricultural crops, as it reflects its effects on plant production by providing it with the necessary nutrients for the plant, and the three types of fertilizers used in agriculture are mostly nitrogen fertilizers, phosphate fertilizers and potash fertilizers.
- ❖ The second: It is the pesticides used in the protection of crops and the control of insect and fungal pests, etc. At the present time, this technology has been widely used, which has made a wide progress in the efficiency of agricultural production.

The economic theory assumes a positive relationship between the chemical technology variable and the value of the agricultural domestic product.

Description of the study model

Plant Production Value Model: PPV_t

$$PPV_t = F(CUA_t, CHT_t, MET_t, GRQ_t) + U_{2,t} ; t = 1, 2, \dots, n \quad \dots\dots\dots(1)$$

Since:

PPV_t : The dependent variable represents the value of plant production (million dinars).

CUA_t : The first independent variable represents the cultivated area (thousand dunams).

CHT_t : The second independent variable represents the chemical technology (thousand tons).

MET_t : The third independent variable represents the mechanical technology (one thousand horsepower).

GRQ_t : The fourth independent variable represents the amount of grain used in agriculture (thousand tons).

$U_{2,t}$: It is the error variable in the second model (2) and includes all unmeasured variables and those that are not included in the model and that affect the value of plant production, and it has the same characteristics as the variable $U_{1,t}$.

Testing the stability of the study variables:

Table (1) presents the results of the Phillips-Perron (PP) test for the stability or stillness of the variables studied during the period (1990-2021). We note from the results of the table that the grain quantity variable was static at the level, that is, its degree of integration was zero, I (0), while it was Each of the variables (the value of plant production, the cultivated area, the amount of fodder, the chemical technology, the mechanical technology) was not static at the level, but became static at the first difference, that is, the degree of integration of each of them is the one I (1), and thus the conditions for building models (ARDL).

Table (1): Results of the unit root (PP) test for all study variables

	Original Variable (Level)		After one Difference	
	Intercept	Inter. & Trend	Intercept	Inter. & Trend
PPV_t	-2.284 ^{n.s} (0.183)	-3.753** (0.033)	-14.026*** (0.000)	-17.356*** (0.000)
CUA_t	-1.762 ^{n.s} (0.391)	-1.810 ^{n.s} (0.675)	-5.807*** (0.000)	-6.323*** (0.000)
CHT_t	-2.525 ^{n.s} (0.119)	-2.663 ^{n.s} (0.257)	-6.155*** (0.000)	-6.083*** (0.000)
MET_t	-0.873 ^{n.s} (0.783)	-1.506 ^{n.s} (0.806)	-5.881*** (0.000)	-5.858*** (0.000)
GRQ_t	-3.225** (0.028)	-4.546*** (0.005)		
*** significant at 1% level ** significant at 5% level * significant at 10% level n.s not significant			The values in parentheses represent the probability value P-value	

Source: prepared by the researcher based on the data of the study and using the Eviews-12 program

ARDL autoregressive estimation of lagging distributed time lags

We noticed from the above and based on the fact that all the variables of the plant production value model were static at the first level or difference, for this we will use the ARDL method to test the existence of the long and short term relationship between the variables.

1- Estimating and analyzing the long-term relationship:

Table (2) presents the results of estimating the ARDL standard model (1,4,4,4,1), which shows the impact of economic variables on the value of plant production in the long term.

Table (2): Results of estimating the long-term relationship between economic variables and the value of plant production for Iraq during the period (1990-2021)

ARDL Long Run Form				
Dependent Variable: PPV_t				
Selected Model: ARDL(1,4,4,4,1)				
Case 3: Unrestricted Constant and No Trend				
Sample: 1990 2021				
Included observations: 28				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
CUA_t	0.133036	0.011899	11.1808**	0.000
CHT_t	1.019286	0.247270	4.12216**	0.003
MET_t	-0.970960	0.027251	-35.6308**	0.000
GRQ_t	0.059540	0.020686	2.87828*	0.018
C	4872.502	214.6512	22.6996**	0.000

R-squared	0.952681	Mean dependent var.	2912.914
Adjusted R-squar.	0.858042	S.D. dependent var.	1022.558
S.E. of regression	385.2717	Akaike info criterion	14.96794
Sum squared resid.	1335909.	Schwarz criterion	15.87193
F-Stat.	10.0665**	Hannan-Quinn criter.	15.24430
Sig. (F-Stat)	0.000	Durbin-Watson stat	2.319760
** significant at 1% level			
* significant at 5% level			

Source: prepared by the researcher based on the data of the study and using the Eviews-12 program

It can be seen from Table (2) that the standard model estimated in the long run is:

$$P\hat{P}V_t = 4872.502 + 0.133036CUA_t + 1.019286CHT_t - 0.97096MET_t + 0.059540GRQ_t \quad \dots \dots \dots (2)$$

As shown in the following table:

- ❖ **Cultivated Area:** based on the value of the (t) test for this variable amounting to (11.1808) and its probability value (0.000), which is less than the significance level (1%), this indicates that there is a positive significant effect of the cultivated area on the value of plant production in the long term and at Significant level (1%), which means that when increasing the cultivated area by one thousand dunums, this leads to an increase in the value of plant production in the long term by (0.133036) million dinars. This result is consistent with the findings of the study of (Qutb,2017: 14), (Taqi and Ahmed, 2018: 59), and (Ruby, 2021: 169).
- ❖ **Chemical Technology:** based on the value of the (t) test for this variable, amounting to (4.12216) and its probability value (0.003), which is less than the significance level (1%). This means that there is a positive significant effect of the chemical technology on the value of plant production in the long term and at the Significant (1%), this means that when increasing the amount of chemical technology by one thousand tons, this leads to an increase in the value of plant production in the long term by (1.019286) million dinars. This result agrees with what was reached by (Abdul, 2009:4), (Ghazal et al., 2012:186), and (Ahmed, 2020:98).
- ❖ **Mechanical Technology:** based on the value of the (t) test for this variable amounting to (-35.6308) and its probability value (0.000), which is less than the significance level (1%). A significant level (1%), which means that when mechanical technology is increased by a thousand horsepower, this leads to a decline in the value of plant production in the long run by (0.970960) million dinars (ie 970.960 dinars). It is clear from this result that this indicator is not able to positively affect plant production, unlike the logic of the economic theory, which assumes that mechanical technology works to increase plant production. The reason for this may be attributed to the inability of farmers to exploit this technology (harvesters) in agricultural activities other than harvesting, or due to the inadequacy of agricultural lands in them for using this type of modern agricultural mechanization, all of which led to the negative impact of this indicator on the value of production vegan. This result is consistent with the findings of the study of (Abdul, 2009: 4) and (Ahmed, 2020: 98).
- ❖ **Grain Quantity:** Based on the t-test value of this variable amounting to (2.87828) and its probability value (0.018), which is less than the significance level (5%), this means

that there is a positive significant effect of the grain quantity on the value of plant production in the long term and at the Significant (5%), this means that when increasing the amount of grain by one thousand tons, this leads to an increase in the value of plant production in the long term by (0.059540) million dinars (ie 59.540 dinars).

- ❖ **Constant (intersection):** Based on the value of the t-test for this constant, amounting to (22.6996) and its probability value (0.000), which is less than the level (1%), this means that there is a significant positive effect of the constant on the value of plant production in the long term and at the level of Concerning (1%), this means that when all the value of the independent variables in the model are equal to zero, the average value of plant production will be (4872.502) million dinars.
- ❖ **Significance of the model:** Referring to the test value (F) of the model, which is (10.0665) and its probability value (0.000), which is less than the level of significance (1%), this means that in general, the estimated standard model is statistically significant and at the level of significance (1%), meaning that the variables of the agricultural sector collectively affect significantly the value of plant production in the long term. In addition, the model has good explanatory power, as (86%) of the changes in the value of plant production are caused by the variables mentioned in the model (2).

2- Estimating the short-run equation:

Table (3) presents the results of estimating the ARDL standard model (1,4,4,4,1), which shows the impact of economic variables on the value of plant production for Iraq in the short term.

Table (3): Results of estimating the short-term relationship between the variables of the agricultural sector and the value of plant production in Iraq during the period (1990-2021)

ARDL Short Run Form				
Dependent Variable: $\Delta(\text{PPV}_t)$				
Selected Model: ARDL(1,4,4,4,1)				
Case 1: No Constant and No Trend				
Sample: 1990 2021				
Included observations: 28				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\Delta(\text{CUA}_t)$	0.083903	0.014636	5.73268**	0.0003
$\Delta(\text{CUA}_{t-1})$	-0.245979	0.030899	-7.96079**	0.0000
$\Delta(\text{CUA}_{t-2})$	0.033274	0.043879	0.75830 ^{n.s}	0.4677
$\Delta(\text{CHT}_t)$	-0.270001	0.033986	-7.94446**	0.0000
$\Delta(\text{CHT}_{t-1})$	-3.813392	0.944053	-4.03938**	0.0029
$\Delta(\text{CHT}_{t-2})$	1.524013	0.741281	2.05591 ^{n.s}	0.0699
$\Delta(\text{MET}_t)$	-3.287073	0.817330	-4.02172**	0.0030
$\Delta(\text{MET}_{t-1})$	2.936281	0.596822	4.91986**	0.0008
$\Delta(\text{MET}_{t-2})$	-0.543641	0.561209	-0.96869 ^{n.s}	0.3580
$\Delta(\text{GRQ}_t)$	4.116901	0.572125	7.19580**	0.0001
R-squared	0.939459	Mean dependent var.		-36.09643

Adjusted R-squar.	0.883242	S.D. dependent var.	904.0277
S.E. of regression	308.9046	Akaike info criterion	14.61079
Sum squared resid.	1335909.	Schwarz criterion	15.27690
F-Stat.	26.0833**	Hannan-Quinn criter.	14.81443
Sig. (F-Stat)	0.000	Durbin-Watson stat	2.319760
** significant at 1% level			
n.s not significant			

Source: prepared by the researcher based on the data of the study and using the Eviews-12 program

It is clear from the results of Table (3) that the estimated standard model in the short term is:

$$\begin{aligned} \Delta(P\hat{P}V_t) = & 0.083903\Delta(CUA_t) - 0.245979\Delta(CUA_{t-1}) + 0.033274\Delta(CUA_{t-2}) \\ & - 0.270001\Delta(CHO_t) - 3.813392\Delta(CHO_{t-1}) + 1.524013\Delta(CHO_{t-2}) \\ & - 3.287073\Delta(MET_t) + 2.936281\Delta(MET_{t-1}) - 0.543641\Delta(MET_{t-2}) \\ & + 4.116901\Delta(GRQ_t) \dots \dots \dots (3) \end{aligned}$$

It is also clear from the above table that there is a significant effect on the value of plant production for Iraq in the short term by each of: the cultivated area in the current and previous years, chemical technology in the current and previous years, mechanical technology in the current and previous years, and the amount of grain in the current year. It also shows the significance of the standard model estimated in the short term and at a significant level (1%), meaning that all economic variables in the current year and the previous year combined have a significant impact on the value of plant production in the short term. In addition, the model has good explanatory power, as (88%) of the changes in the value of plant production are caused by the variables mentioned in the model (3).

Cointegration test using the Bound Test method

As for testing the presence of co-integration between the economic variables and the value of plant production in the long run, we use the limits test, as the results of this test are as shown in Table (4). We note from the table that the value of (F) amounting to (16.0315), which is greater than the upper limit of integration I (1) at all levels of significance, therefore, the null hypothesis is rejected and the alternative hypothesis is accepted that the coefficients of the long-term relationship are not equal and equal to zero, meaning that there is co-integration between the economic variables (Cultivated area, chemical technology, mechanical technology, grain quantity) and the value of plant production in the long term.

Table (4): The results of the joint integration test between the economic variables and the value of plant production in Iraq for the period (1990-2021) using the limits test

F-Bounds Test Null		Hypothesis: No levels relationship		
Test Statistic	Value	Sig. F	I(0)	I(1)
F-statistic	16.0315**	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
** significant at 1% level				

Source: prepared by the researcher based on the data of the study and using the Eviews-12 program

Model Diagnostic Tests:

Table (5) shows the results of the diagnostic tests of the estimated standard model ARDL(1,4,4,4,1), which includes the normal distribution test for model residuals or errors, the autocorrelation test for the model residuals, the heterogeneity test for the residual variance, in addition to the stability and structure test of the model estimated. As it appears from Table (5) and Figure (1) that the probability value of the Jarque-Bera test amounted to (0.678), which is greater than the level of significance (5%), which means that the test is not significant and thus accepting the null hypothesis, and this confirms that the residuals generated from the model The estimated standard ARDL (1,4,4,4,1) follows a normal distribution with a mean (0) and a standard deviation (222.437).

Table (5): The results of the diagnostic tests of the agricultural production value model in Iraq (ARDL (1,4,4,4,1))

Test		Statistic	Value	Prob.
Normality	Jarque-Bera	Jarque-Bera	0.77604 ^{n.s}	0.678
Autocorrelation	Breusch-Godfrey	F-Statistic	0.2643 ^{n.s}	0.775
		Chi-Square	1.9660 ^{n.s}	0.374
Heteroskedasticity	ARCH	F-statistic	0.0702 ^{n.s}	0.793
		Chi-Square	0.0756 ^{n.s}	0.783
Model's Stability	Ramsey-Reset	t-Statistic	0.1193 ^{n.s}	0.908
		F-Statistic	0.0142 ^{n.s}	0.908
n.s not significant				

Source: prepared by the researcher based on the data of the study and using the Eviews-12 program

Table (5) also shows that the residuals or errors of the estimated standard model ARDL (1,4,4,4,1) are not correlated with each other based on the two Breusch-Godfrey autocorrelation tests, as the probability values of the two tests were greater than (5%). As well as the homogeneity of the residual variance through the two ARCH tests, whose

probability values were greater than (5%). The model was also characterized by structural stability in the form of the function based on the results of the two Ramsey-Reset tests, whose probability values were greater than (5%).

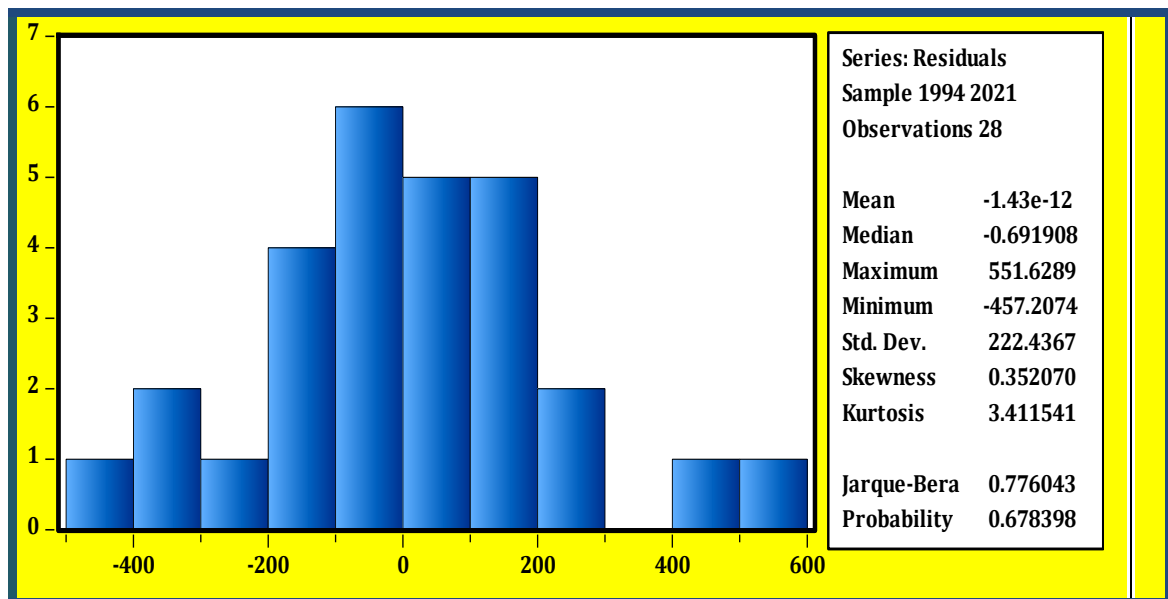


Figure (1): The normal distribution of the remainder of the value of plant production model in Iraq (ARDL (1, 4, 4, 4, 1))

Source: prepared by the researcher based on the data of the study and using the Eviews-12 program

In addition, the model witnessed structural stability in the long- and short-term coefficients by drawing the functions of the cumulative sum of the residuals (CUSUM) and the cumulative sum of the squares of the residuals (CUSUM of Squares), as in Figures (2) and (3), respectively, as it is clear from the two figures that all values of The two functions are within a (95%) confidence interval and there is no departure from the period in any year of the study. Therefore, the estimated standard model ARDL (1,4,4,4,1) is stable over the entire time period and there are no structural discontinuities. It can be said There is harmony and consistency in the model between the results of the long and short term.

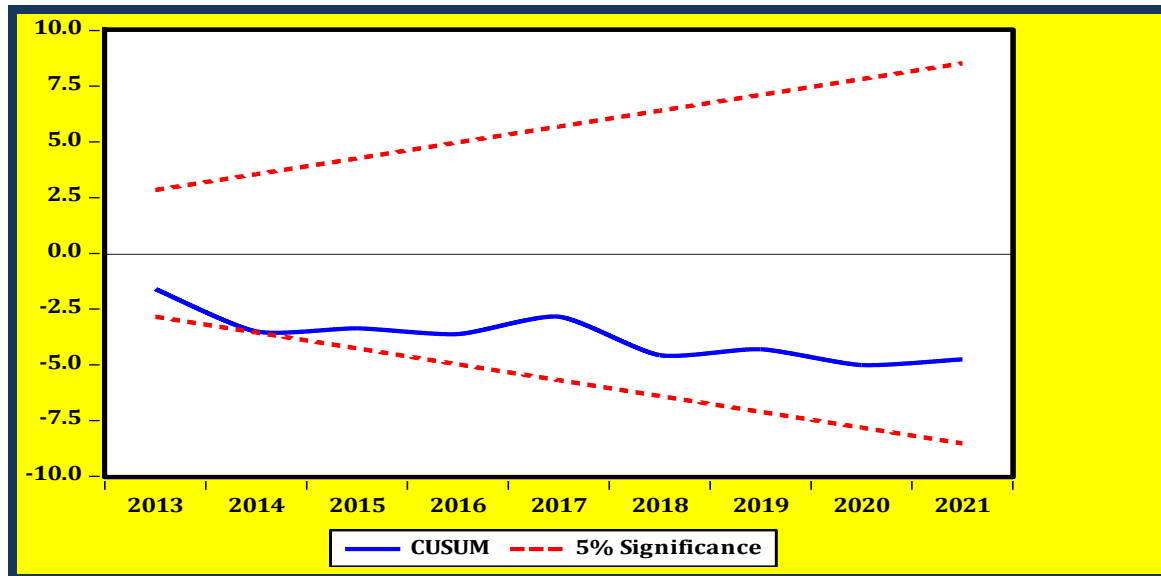


Figure (2): CUSUM function for the remainder of the ARDL model (1,4,4,4,1)

Source: prepared by the researcher based on the data of the study and using the Eviews-12 program.

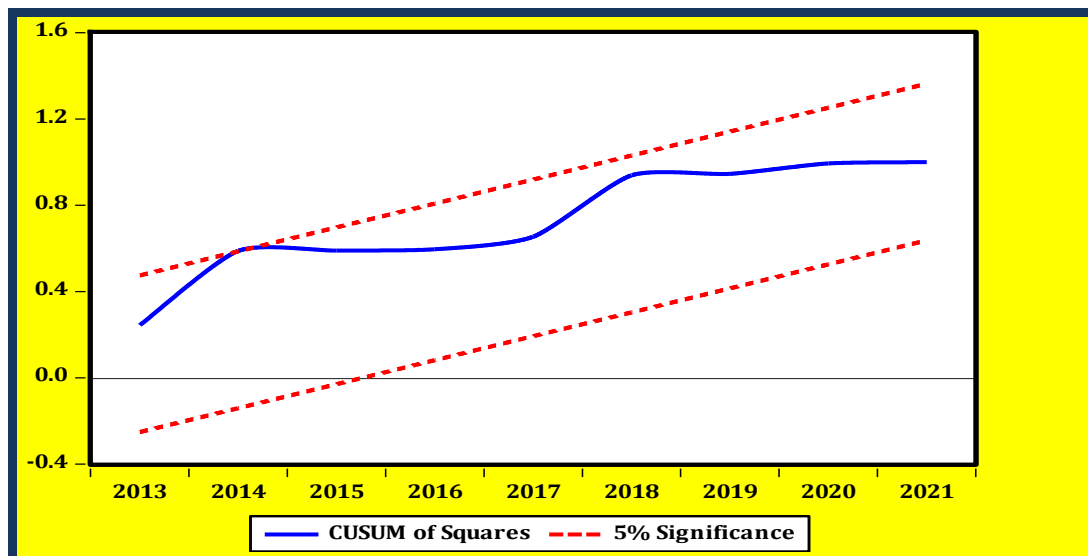


Figure 3: CUSUM of Squares function for the remainders of the ARDL model (1,4,4,4,1)

Source: prepared by the researcher based on the data of the study and using the Eviews-12 program

As for testing the multiple linear overlap problem, Table (35) shows the matrix of simple linear correlation coefficients (Pearson) between each of the two variables of the agricultural sector.

Table (6): Matrix of simple correlations between the variables of the plant production value model in Iraq

	CUA _t	CHT _t	MET _t	GRQ _t
CUA _t	1.0000	0.1689	0.0853	0.2426
CHT _t		1.0000	0.2538	0.2870
MET _t			1.0000	0.5905
GRQ _t				1.0000

Source: prepared by the researcher based on the data of the study and using the EvIEWS-12 program

And based on the Kline test, and when comparing the coefficient of determination of the ARDL (1,4,4,4,1) model of plant production value, whose value is mentioned in Table (2), and which amounts to (86%), with the squares of the correlation coefficients in the matrix above, we find that the coefficient of determination It is greater than all the squares of the simple correlation coefficients, and this indicates that the estimated standard model is free from the problem of multilinear interference between the independent variables.

Findings and recommendations

Results: -

From the results of the quantitative analysis of the impact of some economic variables on the value of plant production in Iraq, we show that:

1. The existence of a long-term equilibrium relationship between the economic variables and the value of plant production, as the chemical technology is considered one of the most important economic variables affecting the value of plant production, followed by the mechanical technology in the second rank, then the cultivated area variable comes in the third rank, and finally the variable of the amount of grain used in agriculture . As for the short term, the amount of grain is considered one of the most important economic variables affecting the value of plant production, followed by chemical technology in the second rank, then mechanical technology in the third rank, then the cultivated area in the fourth rank.
2. The use of chemical technology in agriculture is one of the main determinants of agricultural domestic product as well as plant production, which is reflected in its positive impact on increasing agricultural domestic product.
3. The inability of the mechanical technology indicator to positively affect the value of plant production, and this result may be due to the inaccuracy of the available data in this regard, or perhaps that intensive agriculture may generate problems as a result of the excessive use of mechanical technology to enhance production, while agricultural land It has met its need for inputs, which means that it will enter the stage of decreasing returns when using this new technology, and adding them means remaining in the stage of contraction from performing its remaining action to reach the stage of intensive production. Or it may be attributed to the peculiarity of the Iraqi agricultural sector because a large number of small farmers own machines and machines with high horsepower that are not suitable for the owned agricultural areas that they exploit, and then there is a huge amount of this power idle during the year, in addition to allocating these machines and machines For a specific work and not the other, such as the inability

to use harvesters in other agricultural activities (other than harvesting), which increases their distance from their contribution to increasing the value of plant production, and this explanation may give more clarity to the negative sign of the parameter of this variable.

4. The existence of a long-term co-integration relationship between (the cultivated area, chemical technology, mechanical technology, grain quantity) and the value of plant production.
5. Each of the mechanical technology and chemical technology are among the most important economic variables for the Iraqi agricultural sector contributing to the interpretation of the error variation related to the value of plant production in the long term.
6. The degree of integration of the time series of the variables of the Iraqi agricultural sector (the value of plant production, the cultivated area, the chemical technology, the mechanical technology) is one, meaning that it was unstable at the level, but it became stable at the first differences.
7. The results of the analysis also showed the significance of each of (the cultivated area, the chemical technology, the amount of grain). The aforementioned variables contributed positive effects in increasing the value of plant production. The significance of the mechanical technology variable did not appear in the estimated standard model.

Recommendations

Second: Recommendations:

Based on the aforementioned conclusions, the following was recommended:

1. The necessity of rebuilding the structure of the Iraqi agricultural sector, as it is the sector that abounds with many natural, material and human resources and capabilities, as well as the accumulated experiences that qualify it to advance the reality of the Iraqi economy.
2. Enhancing the role of agricultural economic variables that contribute to raising the value of plant production, because of its crucial role in diversifying sources of national income, increasing agricultural and gross domestic product, and shifting from a rentier economy to a productive economy.
3. Working to increase the role of the agricultural domestic product in achieving food security by providing basic requirements for the agricultural sector, both plant and animal, and making the best use of its natural, human and financial resources.
4. The need to expand the use of mechanical technology in Iraqi agriculture and according to the actual need for each agricultural activity, due to its important and positive role in increasing the value of agricultural domestic product, after providing technical information with this technology, providing backup tools and training agricultural labor so that it is able to absorb this Technology.
5. The need to expand the use of chemical technology because of its great role in increasing agricultural production, since this sector is highly vulnerable to technological changes, taking into account the need to spread awareness among farmers about the use of this technology with its specific times and quantities.
6. The need for specialized and qualified cadres to collect data on the agricultural sector, classify it, and prepare it in detail for the researchers who need it, due to the difficulty of obtaining this data, its dispersion, the multiplicity of publishers, and its conflicting often, which is considered a major reason for many researchers to refrain from accessing

a study. The Iraqi agricultural sector at a time when it is in dire need of study and development.

7. Expansion of cultivated areas annually (horizontal expansion) due to the important role of these areas in increasing agricultural production and thus increasing the value of agricultural domestic product.
8. I recommend that the researchers expand the study of agricultural economic variables, especially studies related to the value of agricultural domestic product, because of their importance in planning and managing future agricultural economic development in Iraq.
9. Liberating Iraqi agriculture from existing administrative restrictions and obstacles by the various official and semi-official government agencies that interfere in economic life, which makes it easier for farmers to play their role in increasing and developing agricultural production.

Sources

- [1] Ahmed, Roy Muhammad Khader (2020), the main determinants of agricultural production in Iraq for the period (1985-2016), an analytical study, master thesis, College of Agriculture and Forestry, University of Mosul, Iraq.
- [2] Taqi and Ahmed, Farah Anwar, Aida Fawzi (2018), Measuring total productivity and the percentage of the contribution of production factors to the growth of agricultural domestic product for the period (1990-2015), Al-Muthanna Journal of Agricultural Sciences, Volume (6), Number (2), Iraq.
- [3] Gouili, Ahmed Ali (2003), The draft regional strategy for agricultural development and food security in the countries of the Council of Arab Economic Unity, Economic Unity Magazine, Issue (27), Arab Republic of Egypt
- [4] Hussein and Saeed, Burhan Othman and Samal Yusef Muhammad (2017), The impact of price policies and their efficiency on the development of agricultural output in Iraq for the period (1980-2013), Kirkuk University for Administrative and Economic Sciences, Volume (7) Number (2), Iraq.
- [5] Al-Hakim, Abdul-Hussein (2013), Agriculture and the Future, Part One, First Edition. Iraq.
- [6] El-Rouby, Eman Tawfiq Hamed (2021), Standard Estimation of the Impact of the Most Important Economic Variables on the Value of Egyptian Agricultural Domestic Product Using the Autoregressive Distributed Lag Time Model (ARDL) Egyptian Journal of Agricultural Economics, Volume (31) Issue March, Arab Republic of Egypt.
- [7] Abd, Zuwaed Fathiyi (2009) Factors determining agricultural production in Iraq for the period (1985-2005), Al-Rafidain Agriculture Journal, Volume (37), Number (1), College of Agriculture and Forestry, University of Mosul, Iraq.
- [8] Ghazal et al., Qais Nazim, Bashar Mohsen Muhammad, Doaa Qassem Sabry (2012), Measuring and analyzing the impact of agricultural technology on agricultural growth in selected developing countries for the period (1990-2010), Al-Rafidain Journal of Agriculture, Volume (40), Appendix (4), Iraq.
- [9] Qutb, Ahmed Alaa (2017), An econometric analysis of the most important factors affecting the value of the Egyptian agricultural domestic product, Journal of Economics and Social Sciences, Volume (8), Issue (2), Mansoura University, Arab Republic of Egypt.
- [10] Arab Organization for Agricultural Development (1994), Agricultural Policies, The Nineties, Republic of Iraq, Khartoum, Republic of Sudan.
- [11] Al-Najafi, Salem Tawfiq (1999), Agricultural Economics (Foundations and Application), Ministry of Higher Education and Scientific Research, University of Mosul, Iraq.