

## DEMAND FOR CHEMICAL FERTILIZERS FOR WHEAT CROP IN SALAH AL-DIN FOR THE PRODUCTION SEASON 2020-2021

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### Abstract

The research dealt with the subject of the demand for chemical fertilizers for the wheat crop, and it was relied on three main types of fertilizers, namely nitrogen, phosphate and potassium. Which studies some statistical measures such as multiple regression. The research also relied on the questionnaire, which was represented by 152 forms, at a rate of 10%. The research concluded that organic fertilizer has a positive effect on the productivity of wheat crop by (0.095%), as well as the compound fertilizer showed its significance on the productivity of the wheat crop. In the same proportion, as for urea fertilizer, it was found that it has a negative impact on the productivity of the wheat crop, meaning that there is an extravagance in the used amount of this fertilizer. Especially in the field of using fertilizers and the necessary quantities of fertilizers for the wheat crop to mitigate irrational use and encourage related research in the fields of fertilizer development, as well as studies related to the demand in the field of chemical fertilizers.

**Keywords:** demand estimation, wheat crop

### Introduction:

Given the importance of agriculture in solving the food problem in proportion to the increase in demand for it so that the food gap does not grow and exacerbate with time to become a problem related to food security, which cannot be achieved without increasing agricultural production to match the demand for wheat, and since agriculture is directly dependent on the soil And the extent of its fertility, which represents the optimal and natural medium for plant growth, and to increase the productivity of arable areas, and it is necessary to use fertilizers of all kinds (Nelson, 1990: p1). Nitrogenous fertilizers in particular are considered an important factor in increasing and improving the quality of wheat grain productivity (Zhang et al., 2017: p1), as chemical fertilizers are one of the most important production requirements, as they affect their quality and method of use in the production of one acre and the costs and net return of agricultural production. Fertilizers in general in recent times, due to the depletion of the fertility of agricultural lands and to reclaim agricultural lands and restore soil fertility, large quantities of fertilizers have been used. Phosphate, nitrogen and potash fertilizers are the most used fertilizers. Nitrogenous fertilizers occupy the largest share of consumption, their consumption rate reaching 60% of the volume of fertilizer consumption, as for phosphate fertilizers, their consumption rate is 24%, and phosphate fertilizers occupy the lowest percentage in terms of consumption, which is 16%. Effective in increasing the productive efficiency of the agricultural resource used (Salman and Mustafa, 2019: 195).

### Research problem:

There are many difficulties and obstacles facing farmers of the wheat crop in Salah El-Din Governorate, where the crisis of chemical fertilizers is one of the crises that recur annually, and its danger is in its connection with the important sectors of the economy, which is the agricultural sector, in addition to the high prices of fertilizers, due to the increase in the consumption of fertilizers, due to land cultivation on a large scale, and expansion in agriculture, working on agricultural adjustment programs and planting high-productivity varieties to confront the problem of food shortages in front of the increase in population numbers, in addition to the lack of interest in fertilization methods, and the reason for this is that the farmer believes when using large quantities of fertilizers will lead to an increase in crop production and obtain the highest profit possible, but this high addition of fertilizer affected soil fertility, which caused problems, including instability in the fertilizer marketing system due to high prices, in addition to the monopolistic practices practiced by some monopolists to speculate on their prices, and high transportation costs.

**Research importance:**

The importance of the research lies in studying the demand for chemical fertilizers, which is one of the important productive elements in agricultural production, as there are only a few researches and journals related to the study of the required quantities of them, and given the increased demand for chemical fertilizers and their use, as determining the factors affecting the consumption of chemical fertilizers and their estimation is one of the planning priorities of great importance in the agricultural sector.

**Research aims:**

The main objective of the research is to determine the most important factors that affect the local demand for chemical fertilizers in Salah al-Din for the sample areas (Al-Tharthar, Tigris, Al-Mu'tasim, Samarra) for the agricultural season 2020-2021.

**Research Hypothesis:**

Not all farmers of the research sample are committed to using the recommended quantities of chemical fertilizers, the high prices of fertilizers and the absence of many fertilizers in the market, the research assumes that the production of chemical fertilizers is affected by a set of factors that led to the fluctuation of the productivity of the wheat crop.

**Data sources:**

The primary data was obtained from its field sources and the personal interview of the wheat growers by conducting a field survey by distributing a form for the sample of wheat farmers with a percentage of 10% for the research sample (Al-Tharthar, Al-Mu'tasim, Samarra, Tigris) in Salah Al-Din Governorate for the agricultural season (2020-2021).

**Previous studies:**

(Al-Qahtani et al., 1992) conducted a study entitled (The Derived Demand for Chemical Fertilizers in the Kingdom of Saudi Arabia), the study aimed to determine the most important factors that affect the consumption of chemical fertilizers, using the dynamic and static model, as the study showed that the demand for chemical fertilizers is affected by it. Factors including fertilizer prices and government support for the agricultural sector represented by loans and

subsidies. The demand for fertilizers is also affected by the crop area, and the prices of other inputs such as agricultural tractors. In the end, the future expectations of demand for chemical fertilizers were estimated until the year 2000 using the static model after the stability of its predictive ability. (Al-Dest, 1999), conducted a study entitled (The Derived Demand for Chemical Fertilizers in Jordan), the thesis aimed at the most important factors affecting the consumption of chemical fertilizers in Jordan. Among the most important results extracted is the highest quantity of fertilizers used, the compound fertilizer according to the listed categories, then nitrogen fertilizer, then phosphate fertilizer, and finally potassium fertilizer. Self-sufficiency in chemical fertilizers. ) (Al-Shimy et al., 2016) indicated a study entitled (Production and consumption of chemical fertilizers and the seasonality of their production in Egypt). The desert lands lack nutrients necessary for plant growth, as the crisis of chemical fertilizers is one of the crises that are repeated annually, and this crisis appears annually as a result of the lack of quantities produced from them and which the lands need for consumption needs. The study aimed to study the local market for chemical fertilizers through the quantities produced for consumption from Fertilizers and quantities estimation, as it showed the productivity in the local markets of chemical fertilizers, and data were obtained from the official authorities, including the Central Statistical Organization and the Ministry of Agriculture, studies and research related to this research. phosphate annually, and one of the most important recommendations reached by the researcher is Providing fertilizer production companies with the quantities needed by the farmer and in appropriate quantities so that the recurring crises of chemical fertilizers can be eliminated.

Both (Salman and Mustafa, 2019) presented a study entitled (The Economic Effects of Using Chemical Fertilizers in Egyptian Agriculture), as the research aimed to study the most important factors that affect the local demand for chemical fertilizers in Egyptian agriculture. Using some mathematical and statistical measures such as percentages, regression and correlation methods, and one of the most important research results reached by the researcher is that chemical fertilizers are one of the most important elements of production requirements in Egyptian agriculture. The consumption of chemical fertilizers in agricultural production that.

) (Abu El-Goud and others, 2020) presented a study entitled (Statistical Estimation of the Demand Functions for Chemical Fertilizers Used in Egyptian Agriculture). In achieving its goals, the research relied on the method of quantitative and descriptive analysis, and the measurement of general trends of the economic variables under study and their growth rates during the study period was used. The most important results are the development of the use of the values and quantities of chemical fertilizers in Egyptian agriculture, and the estimation of the functions of demand for chemical fertilizers used in Egyptian agriculture.

### **Demand concept:**

There are many definitions related to demand. It can be defined as the desire supported by purchasing power so that a certain commodity can be obtained in order to satisfy the human desire.

Derivative demand such as the demand for money or the demand for machinery and equipment, as both provide the necessary and sufficient condition.

(Al-Qargoli et al., 2007: 28).

### Law of Demand: 2-1-2

The law of demand, which is the relationship between the change that occurs in the price of a particular good or service and the quantity demanded of it, assuming the stability of other factors, this relationship is what links the dependent variable (the quantity demanded) and the independent variable (the price), and it is also known that it shows the relationship The inverse between the required quantity of a particular commodity and its price, with the condition that other factors remain the same, and among these factors are: consumer income, consumer taste, prices of other commodities, and consumer expectations,

(Al-Maghribi, 51: 2019).

### Schedule and Curve of demand

The demand schedule is the table that shows the quantities demanded of a commodity at different levels of prices at a specific time and in a particular market, with other factors remaining unchanged. curve) and it is defined as the relationship between the quantities demanded in the commodity and the commodity price during a specific period of time, with other factors remaining constant (Al-Taqi, 2014: 23).

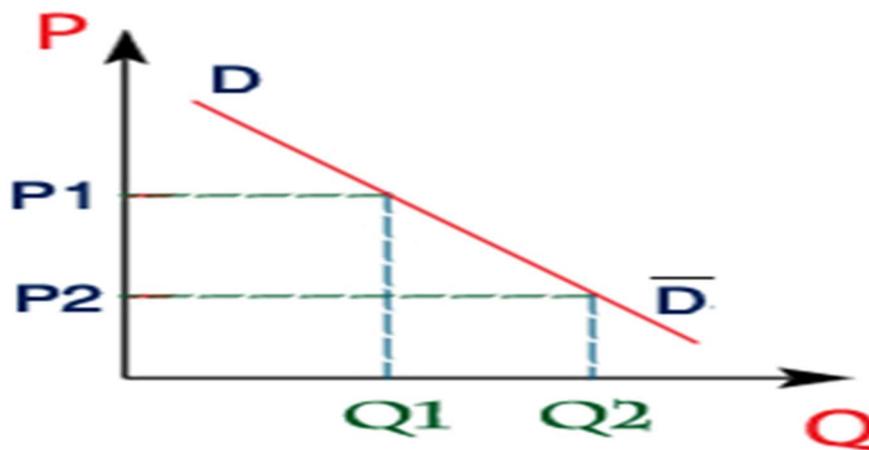
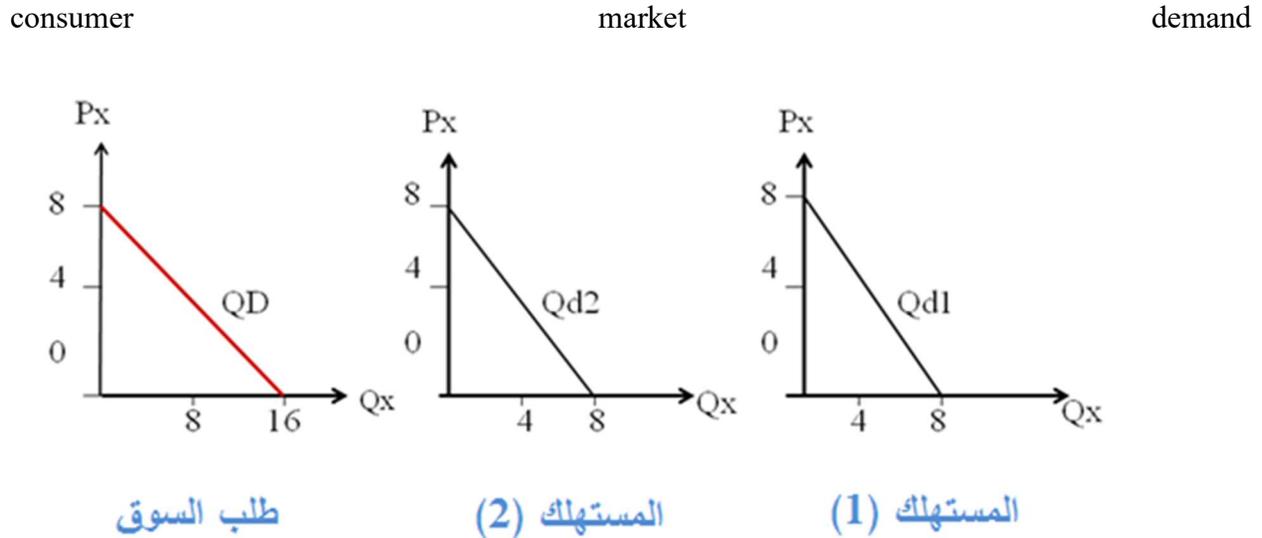


Figure (1) Demand curve for a commodity

Source / (Al-Taqi, 2014: 23)

The demand curve  $DD^{-}$  is negatively sloped, which shows the inverse relationship between the price of commodity  $P$  and the quantity demanded  $Q$  with the remaining factors affecting the same. From Figure (1) it is clear that the demand curve slopes from top to bottom and from left to right and this indicates that the quantity demanded of A particular commodity increases with a decrease

in price and decreases with a rise in price. We derive the market demand curve through the consumer demand curves and the market demand curve (what is the horizontal aggregation of individual consumer demand curves), (Muqlad, 2018: 100) as shown in Figure( 2):



market demand CONSUMER2 consumer1  
 consumer1

Figure (2) Market Demand Curve

Source / (Maqlid, 2018: 101)

The above figure shows that the market demand curve is a horizontal aggregation of consumers' demand curves. At price (8) the quantity demanded by the consumer is (1) (8) units, and the quantity demanded by the consumer (2) is also (8) units, while the market demand curve is at the price ( 8) He demanded a quantity of (16) units, and it is expected that the market demand curve will take the same shape as the consumer demand curve, i.e. negatively sloped, and this can be clarified by the previous figure, which consists of three parts, where the first two parts of which represent the consumer demand curves (2), 1) Respectively, the third part represents the market demand curve. In economics, the demand curve represents a graph that shows the relationship between the price of a particular commodity (the y-axis) and the quantity of that commodity demanded at that price (the x-axis). Demand curves may be used to model the price-relationship Quantity For a given consumer (individual demand curve), or more commonly for all consumers in a given market (market demand curve), demand curves are generally assumed to be decreasing downward, as shown in the adjacent picture, due to the law of demand: For most commodities, The quantity required will decrease in response to the increase This will increase in response to the decrease in prices (Al-Badour, 2013: 56).

**Estimation of the demand function for urea fertilizers:**

he demand function was estimated on the required quantities of urea fertilizer using the least squares method (OLS) to estimate the model parameters, as this method is one of the most important and most important methods applied in estimating the economic model, The reason is due to its characteristics such as the small variance (Minimum) and the (Unbiased) bias. Several models (linear, logarithmic, double logarithmic, and inverse logarithmic function) were formulated in order to represent the relationship to the demand for fertilizers. The results of the analysis showed that the double log function is the most consistent with the economic logic and representative of the relationship in terms of passing the statistical and standard tests. After conducting the statistical analysis process using the (SPSS 25) it was possible to estimate the demand function on the required quantities of urea fertilizer according to the following model:

$$\ln Y_1 = 13.684 + 0.161 \ln X_1 + 0.654 \ln X_2 + 1.664 \ln X_3 - 0.269 \ln X_4 + 0.572 \ln X_5 + 0.184 \ln X_6$$
$$t = (2.655) (-6.440) (4.809) (2.884) (-4.203) (3.365) (4.488)$$
$$R^2 = 0.77 \quad R-2 = 0.73 \quad F = 83.5 \quad D.W = 2.160$$

From the above equation it appears from the (t) test the significance of the estimated parameters. The (F) test proved the significance of the function as a whole with a level of significance (5%). The results showed that the value of the coefficient of determination reached (0.77), which means that (77%) From fluctuations in the required amounts of urea fertilizer were caused by the independent variables included in the model, while the remaining percentage (23%) of those fluctuations are due to other variables that were not included in the estimated model. From the results of the estimated function to estimate the parameters of the used resources included in the estimated function in its double logarithmic form, which represents the elasticities, it was found that there is a positive and direct relationship between the price of urea fertilizer and the amount of fertilizer required from it. The value of the urea fertilizer price factor (X1) was equal to (0.161), which means that an increase in this resource by (1%) leads to a decrease in the amount of urea fertilizer by (0.161%), ceteris paribus. That is, the higher the price of urea fertilizer, the lower the required quantities.

Also, the value of the parameter value of the wheat production variable (X2) equals (0.654) shows that there is a positive direct relationship to the variable due to the intensification of the use of this resource per unit area, assuming the stability of other factors. The higher the production value of the wheat crop, the result, the higher the required quantities of fertilizers.

As for the parameter value of the cultivated area variable (X3), it reached (1.664), which indicates a positive relationship, as the increase in the cultivated areas of the wheat crop by (1%) leads to the required quantities of urea fertilizer by (1.664%), assuming the stability of other factors, i.e. The relationship is direct between this variable and the amount of fertilizer required, meaning that the increase in the amount of fertilizer positively affects the growth of the plant. When using the quantities of fertilizers according to the quantity determined for the plant's need, it leads to an increase in the production quantity. The value of the parameter price of alternative fertilizers (X4) is about (0.269. -) We found that a decrease in the prices of alternative fertilizers by (1%) will lead to an increase in the required quantity of urea fertilizer by (-0.269 %), assuming the stability of other factors.

The value of the farmer's income parameter (X5) is about (0.572), meaning that an increase in this resource by (1%) leads to an increase in the required quantity of urea fertilizer by 0.572 percent), assuming other factors remain constant. As for the parameter of the support variable (X6), it reached (0.184), and we found that the effect of this variable is positive and direct, which means that an increase in this resource by (1%) leads to an increase in the required quantities of urea fertilizer by (0.184) assuming the stability of the other factors involved in form

#### **Standard tests of the demand function for urea fertilizer:**

In order for the model to be acceptable and approved in the interpretation of the studied phenomenon, it is necessary to conduct the necessary standard tests related to the standard problems (second-order problems), which are:

##### **A. Autocorrelation problem**

(D.w) test showed that the model is free from the problem of autocorrelation between random variables. And at the level of significance (5%), where its value reached about (2.160), and that the value is greater than the value of (du) which is (1.78) and smaller than (4-du) which is (2.22), meaning that  $1.78 > 2,160 > 2.22$  at a significant level (5 %). This means that it falls in the area of rejection of the alternative hypothesis and acceptance of the null hypothesis by the absence of this phenomenon, that is, the absence of a self-correlation between the random variables.

##### **B. Heteroskedasticity problem**

Given the study's dependence on cross-sectional data, it is expected that there is a problem of inconsistency of variance homogeneity that often accompanies the cross-section (Cros - Section data), the presence or absence of this problem was revealed through the (Park) test, which included estimating the square regression equation Error as a dependent variable, and both labor and capital are independent variables. The estimated relationship was as follows:

$$\begin{aligned} \text{Lnei}^2 &= 1.206 + 0.051 \text{Ln } Y_1 \\ t &= -1.744 \quad 0.061 \\ R^2 &= 0.025 \quad R^{-2} = -0.023 \quad F=0.016 \\ \text{Lnei}^2 &= -0.288 - 0.019 \text{Ln } X_1 \\ t &= -0.011 \quad -0.716 \\ R^2 &= 0.061 \quad R^{-2} = -0.059 \quad F=0.229 \end{aligned}$$

*1- Square error bounds test with the variable) X<sub>2</sub>:(*

$$\begin{aligned} \text{Lnei}^2 &= -0.262 - 0.212 \text{Ln } X_2 \\ t &= -0.032 \quad -0.111 \\ R^2 &= 0.055 \quad R^{-2} = -0.053 \quad F=0.476 \end{aligned}$$

*1- Square error bounds test with the variable) X<sub>3</sub>:(*

$$\begin{aligned} \text{Lnei}^2 &= -0.651 - 0.255 \text{Ln } X_3 \\ t &= -0.234 \quad -0.916 \\ R^2 &= 0.041 \quad R^{-2} = -0.039 \quad F=0.312 \end{aligned}$$

*1- Square error bounds test with the variable) X<sub>4</sub>:*

$$Lnei^2 = -0.761 - 0.225 Ln X_4$$

$$t = -0.081 - 0.036$$

$$R^2 = 0.075 \quad R^{-2} = -0.073 \quad F = 0.255$$

*1- Square error bounds test with the variable) X<sub>5</sub>:*

$$Lnei^2 = -0.411 - 0.306 Ln X_5$$

$$t = -1.081 - 0.226$$

$$R^2 = 0.053 \quad R^{-2} = -0.048 \quad F = 0.119$$

*1- Square error bounds test with the variable) X<sub>6</sub>:*

$$Lnei^2 = -0.207 - 0.313 Ln X_6$$

$$t = -1.012 - 0.771$$

$$R^2 = 0.066 \quad R^{-2} = -0.029 \quad F = 0.129$$

We note from the test results of the models that the regression coefficients for the estimated factors are not significant at the level of significance (5% and 1%) according to the t-test, as well as the case for the F-test, and this indicates that there is no problem of instability of variance.

### **c- The problem of multicollinearity**

There are some sources in which it is mentioned that the problem of linear correlation (Multicollinearity), only exists when the relationship between the variables is linear, and there are many ways to detect this phenomenon, the most important of which are (Farrar - Clobber escape method, definite matrix, delete R<sup>2</sup>, in addition to the Klein test). To detect the problem of linear correlation, the (Klein-Test) test (Gujarati, 2004: 350) is used, and as noted by the simple partial correlation matrix (correlation coefficient matrix), between variables and comparing the square root of the coefficient of determination with the simple correlation coefficient between any two independent variables. If the value of (R<sup>2</sup>) is greater or equal to the value of the correlation coefficient between any two variables, we infer that the problem does not exist and vice versa. The simple correlation matrix between the independent variables included in the model as shown in the table below.

Table (39) shows the simple correlation matrix between the independent variables included in the estimated model

**Correlations**

		LnY1	LnX1	LnX2	LnX3	LnX4	LnX5	LnX6
LnY1	Pearson Correlation	1	.429**	.771**	.638**	.450**	.219	.745**
	Sig. (2-tailed)		.005	.000	.000	.003	.169	.000
	N	151	151	151	151	151	151	151
LnX1	Pearson Correlation	.429**	1	.405**	.372*	.124	.103	.532**
	Sig. (2-tailed)	.005		.009	.017	.439	.520	.000
	N	151	151	151	151	151	151	151
LnX2	Pearson Correlation	.771**	.405**	1	.680**	.349*	.353*	.791**
	Sig. (2-tailed)	.000	.009		.000	.026	.023	.000
	N	151	151	151	151	151	151	151
LnX3	Pearson Correlation	.638**	.372*	.680**	1	.214	.202	.692**
	Sig. (2-tailed)	.000	.017	.000		.180	.204	.000
	N	151	151	151	151	151	151	151
LnX4	Pearson Correlation	.450**	.124	.349*	.214	1	.149	.420**
	Sig. (2-tailed)	.003	.439	.026	.180		.351	.006
	N	151	151	151	151	151	151	151
LnX5	Pearson Correlation	.219	.103	.353*	.202	.149	1	.292
	Sig. (2-tailed)	.169	.520	.023	.204	.351		.063
	N	151	151	151	151	151	151	151
LnX6	Pearson Correlation	.745**	.532**	.791**	.692**	.420**	.292	1
	Sig. (2-tailed)	.000	.000	.000	.000	.006	.063	
	N	151	151	151	151	151	151	151

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

**Second: Demand for compound fertilizers in Iraq, Salah al-Din**

Compound fertilizers The required quantity of compound fertilizers is affected by several factors, namely the prices of the compound fertilizers, the value of production in tons, the area planted with wheat in dunums, the price of alternative fertilizers, the farmer's income, and subsidies.

The relationship between the demand for compound fertilizers as a dependent variable and the set of the previously mentioned independent variables for the 2021 agricultural season was estimated. Under the comparison between these different mathematical models based on economic logic and statistical logic, it was found that the double logarithmic model has the best relations to represent the demand function for compound fertilizers, and it was possible to obtain the following function

$$\text{Ln}y_2 = 22.482 - 0.631\text{Ln}X_1 + 0.715\text{Ln}X_2 + 0.072\text{Ln}X_3 - 0.312\text{Ln}X_4 + 0.159\text{Ln}X_5 + 0.139\text{Ln}X_6$$

$$T = (4.89) \quad (-5.893) \quad (2.767) \quad (2.562) \quad (-7.610) \quad (4.676) \quad (3.757)$$

$$F = 127.042 \quad R^2 = 0.83 \quad R^2 = 0.80 \quad D.W = 1.86$$

From the above equation it appears from the (t) test the significance of the estimated parameters. The (F) test proved the significance of the function as a whole with a level of significance (5%). The results showed that the value of the coefficient of determination reached (83), which means that (83%) of the fluctuations in the demand for fertilizers were caused by the independent variables included in the model, while the remaining (17%) of those fluctuations are due to other variables that were not included in the estimated model. The results of the estimated function to estimate the parameters of the used resources included in the estimated function in its double logarithmic form, which represents the elasticities, it was found that there is a negative and inverse relationship between the price of fertilizer and the amount of fertilizer required, the value of the fertilizer price factor (X1) is (-0.631), which means that the increase This resource by (1%) leads

to a decrease in the amount of urea fertilizer by (0.631%), assuming the stability of other factors. That is, the higher the price of fertilizer, the lower the required quantities.

Also, the value of the parameter value of the wheat production variable (X2) equals (0.751) shows that there is a positive direct relationship to the variable due to the intensification of the use of this resource per unit area, assuming the stability of other factors. The higher the production value of the wheat crop, the result, the higher the required quantities of fertilizers.

As for the value of the parameter of the cultivated area variable (X3), it reached (0.072), which indicates a positive relationship, as the increase in the cultivated areas of the wheat crop by (1%) leads to the required quantities of urea fertilizer by (0.072) assuming the stability of other factors, i.e. The relationship is direct between this variable and the amount of fertilizer required, meaning that the increase in the amount of fertilizer positively affects the growth of the plant. When using the quantities of fertilizers according to the quantity determined for the plant's need, it leads to an increase in the quantity of production, and the value of the parameter parameter the price of alternative fertilizers (X4) is about 0.312. -) And we found out that an increase in the prices of alternative fertilizers by (1%) will lead to a decrease in the required quantity of urea fertilizer by - 0.312%, assuming the stability of other factors.

The value of the farmer's income parameter (X5) was about 0.159), meaning that an increase in this resource by (1%) leads to an increase in the required quantity of urea fertilizer by 0.159%), assuming the stability of other factors. As for the parameter of the support variable (X6), it reached (0.139), and we found that the effect of this variable is positive and direct, which means that an increase in this resource by (1%) leads to an increase in the required quantities of urea fertilizer by (0.139%), assuming the stability of other factors involved in form.

### **Standard tests of the fertilizer demand function**

In order for the model to be acceptable and approved in the interpretation of the studied phenomenon, it is necessary to conduct the necessary standard tests related to the standard problems (second-order problems), which are:

#### **The problem of autocorrelation**

)D.w) test showed that the model is free from the problem of autocorrelation between random variables. And at the level of significance (5%), where its value was about (1.867), and that the value is greater than the value of (du) which is (1.65) and smaller than (4-du) which is (2.22) that is, there is no self-correlation between the random variables.

#### **C- The problem of heteroscedasticity**

Given the study's dependence on cross-sectional data, it is expected that there is a problem of inconsistency of variance homogeneity that often accompanies the cross-section (Cros - Section data), the presence or absence of this problem was revealed through the (Park) test, which included estimating the square regression equation Error as a dependent variable, and both labor and capital are independent variables. The estimated relationship was as follows:

*Square error bounds test with the variable) X<sub>1</sub>(*

$$\text{Lnei}^2 = 0.713 - 1.002 \text{ Lny}$$

$$T = (0.540) (-0.303)$$

(X Square error bounds test with the variable 2 ) -2

$$\text{Lnei}^2 = -1.553 - 0.512 \text{ Ln } X_1$$

$$T = (-0.033) (-1.644)$$

(X3 Square error bounds test with the variable ) -3

$$\text{Lnei}^2 = -1.046 - 0.091 \text{ Ln } X_2$$

$$T = (-0.022) (-0.137)$$

(X4 Square error bounds test with the variable ) -4

$$\text{Lnei}^2 = 1.411 - 0.902 \text{ Ln } X_3$$

$$T = (0.018) (-0.052)$$

( X5 Square error bounds test with the variable) -5

$$\text{Lnei}^2 = -0.087 - 0.129 \text{ Ln } X_4$$

$$t = (-1.023) (-0.151)$$

(X6) Square error bounds test with the variable-6

$$\text{Lnei}^2 = 1.447 - 0.258 \text{ Ln } X_6$$

$$T = (-0.092) (-0.061)$$

- (X7) Square error bounds test with the variable- 7

$$\text{Lnei}^2 = -1.099 - 0.057 \text{ Ln}$$

$$T = (-1.100) (-1.041)7$$

### c- The problem of multicollinearity

There are some sources in which it is mentioned that the problem of linear correlation (Multicollinearity), only exists when the relationship between the variables is linear, and there are many ways to detect this phenomenon, the most important of which are (Farrar - Clobber escape method, definite matrix, delete R2, in addition to the Klein test). To detect the problem of linear correlation, the (Klein-Test) test (Gujarati, 2004: 350) is used, and as noted by the simple partial correlation matrix (correlation coefficient matrix), between variables and comparing the square root of the coefficient of determination with the simple correlation coefficient between any two independent variables. If the value of (R2) is greater or equal to the value of the correlation

coefficient between any two variables, we infer that the problem does not exist and vice versa. The simple correlation matrix between the independent variables, as shown in the table below.

Table (40) simple correlation matrix between the independent variables included in the model as shown in the table below

		Correlations						
		LnY2	LnX1	LnX2	LnX3	LnX4	LnX5	LnX6
LnY2	Pearson Correlation	1	.874**	.535**	.190	.131	-.145	.590**
	Sig. (2-tailed)		.000	.000	.234	.414	.365	.000
	N	151	151	151	151	151	151	151
LnX1	Pearson Correlation	.874**	1	.584**	.251	.189	-.050	.636**
	Sig. (2-tailed)	.000		.000	.114	.238	.755	.000
	N	151	151	151	151	151	151	151
LnX2	Pearson Correlation	.535**	.584**	1	.866**	.814**	.262	.797**
	Sig. (2-tailed)	.000	.000		.000	.000	.099	.000
	N	151	151	151	151	151	151	151
LnX3	Pearson Correlation	.190	.251	.866**	1	.792**	.333*	.839**
	Sig. (2-tailed)	.234	.114	.000		.000	.034	.000
	N	151	151	151	151	151	151	151
LnX4	Pearson Correlation	.131	.189	.814**	.792**	1	.247	.787**
	Sig. (2-tailed)	.414	.238	.000	.000		.120	.000
	N	151	151	151	151	151	151	151
LnX5	Pearson Correlation	-.145	-.050	.262	.333*	.247	1	.241
	Sig. (2-tailed)	.365	.755	.099	.034	.120		.129
	N	151	151	151	151	151	151	151
LnX6	Pearson Correlation	.590**	.636**	.797**	.839**	.787**	.241	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.129	
	N	151	151	151	151	151	151	151

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

### Demand for organic fertilizers in Salah al-Din:

Organic fertilizers The required amount of organic fertilizers is affected by several factors, namely the prices of organic fertilizers, the value of wheat production in tons, the area cultivated with wheat in dunums, farmer income, support, and the relationship between the demand for organic fertilizers as a dependent variable and the previously mentioned set of independent variables for the agricultural season 2021 was estimated. Several models were formulated, including (linear, logarithmic, double logarithmic, and inverse logarithmic) so to try in an attempt to reach the best formulas representing the relationship between the demand for (organic) fertilizers and the previously mentioned variables. The results of the analysis I showed that the double logarithmic function is the most common function In line with economic logic and a representation of the relationship in terms of passing statistical and standard tests. The following function can be obtained

$$\ln y_3 = 3.371 - 0.195 \ln x_1 + 0.326 \ln x_2 + 0.216 \ln x_3 - 0.101 \ln x_4 + 0.103 \ln x_5$$

)

$$T = (1.572) \quad (-3.300) \quad (3.791) \quad (3.224) \quad (-5.095) \quad (4.000) \quad (5.066)$$
$$F = 101.590$$
$$D.W = 1.843$$

$$R^2 = 0.805 \quad R^2 = 0.770$$

From the above equation it appears from the (t) test the significance of the estimated parameters. The (F) test proved the significance of the function as a whole with a level of significance (5%). The results showed that the value of the coefficient of determination reached (80), which means that (80%) of the fluctuations in the demand for organic fertilizers were caused by the independent variables included in the model, while the remaining (20%) of those fluctuations are due to other variables that were not included in the estimated model. From the results of the estimated function to estimate the parameters of the used resources included in the estimated function in its double logarithmic form, which represents the elasticities, it was found that there is a negative and inverse relationship between the price of organic fertilizer and the amount of fertilizer required from it.

The value of the organic fertilizer price factor (X1) is (-1.195) This means that a decrease in this resource by (1%) leads to an increase in the amount of organic fertilizer by (1.195%), assuming the stability of other factors. That is, the lower the price of organic fertilizer, the higher the required quantities, and this is in accordance with the economic logic. Also, the value of the parameter value of the wheat production variable (X2) equals (0.326) shows that there is a positive direct relationship to the variable due to the intensification of the use of this resource per unit area, assuming the stability of other factors. The higher the production value of the wheat crop, the result, the higher the required quantities of organic fertilizer.

As for the value of the parameter of the cultivated area variable (X3), it reached (0.216), which indicates a positive relationship, as the increase in the cultivated areas of the wheat crop by (1%) leads to an increase in the required quantities of organic fertilizer by (0.216%), assuming the stability of other factors That is, there is a direct relationship between this variable and the amount of fertilizer required, meaning that the increase in the amount of organic fertilizer positively affects the growth of the plant. (107) -) We found that a decrease in the prices of alternative fertilizers by (1%) will lead to an increase in the required quantity of organic fertilizer by -0.107%, assuming that other factors remain constant.

The value of the farmer's income parameter (X5) was about 0.108), meaning that an increase in this resource by (1%) leads to an increase in the required amount of organic fertilizer by 0.108%), assuming the stability of other factors. As for the parameter of the support variable (X6), it reached (0.309), and we found out that the effect of this variable is positive and direct, which means that an increase in this resource by (1%) leads to an increase in the required quantities of organic fertilizer by (0.309%), assuming the stability of the other factors involved in Sample.

#### **Standard tests of the demand function for organic fertilizers:**

In order for the model to be acceptable and approved in the interpretation of the studied phenomenon, it is necessary to conduct the necessary standard tests related to the standard problems (second-order problems), which are:

### c- The problem of autocorrelation

)D.w) test showed that the model is free from the problem of autocorrelation between random variables. And at the level of significance (5%), its value amounted to about (843-1) less than the value of (du) which amounted to (3.291) and greater than (4-du) which amounted to (2.22), meaning that there is no self-correlation between the random variables.

### H- Heteroskedasticity problem

Given the study's dependence on cross-sectional data, it is expected that there is a problem of inconsistency of variance homogeneity that often accompanies the cross-section (Cros - Section data), the presence or absence of this problem was revealed through the (Park) test, which included estimating the square regression equation Error as a dependent variable, and both labor and capital are independent variables. The estimated relationship was as follows:

-1 *Square error bounds test with the variable ) X1(*

$$\text{Lnei}^2 = -1.222 - 0.418 \text{ Ln } X_1$$

$$T = (-1.082) (-0.0211)$$

*variable*

*)Square error bounds test with the*

$$\text{Lnei}^2 = -0.434 - 0.0185 \text{ Ln } X_2$$

$$(T = (-1.321) (-0.135))$$

*(X3 Square error bounds test with the variable) -2*

$$\text{Lnei}^2 = -1.551 - 1.847 \text{ Ln } X_3$$

$$T = (-0.900) (-1.020)$$

*-(X4) -Square error bounds test with the variable 4*

$$\text{Lnei}^2 = 0.219 - 0.177 \text{ Ln } X_4$$

$$T = (0.034) (-0.18)$$

*(X5) Square error bounds test with the variable -5*

$$\text{Lnei}^2 = -1.409 - 0.138 \text{ Ln } X_5$$

$$T = (-1.080) (-0.491)$$

*(X6 Square error bounds test with the variable) -6*

$$\text{Lnei}^2 = -0.516 - 0.713 \text{ Ln } X_6$$

ε- T = (-1.197) (-0.621)

**The problem of multicollinearity**

There are some sources in which it is mentioned that the problem of linear correlation (Multicollinearity), only exists when the relationship between the variables is linear, and there are many ways to detect this phenomenon, the most important of which are (Farrar - Clobber escape method, definite matrix, delete R2, in addition to the Klein test). To detect the problem of linear correlation, the (Klein–Test) test (Gujarati, 2004: 350) is used, and as noted by the simple partial correlation matrix (correlation coefficient matrix), between variables and comparing the square root of the coefficient of determination with the simple correlation coefficient between any two independent variables. If the value of (R2) is greater or equal to the value of the correlation coefficient between any two variables, we infer that the problem does not exist and vice versa. The simple correlation matrix between the independent variables included in the model as shown in the table below.

Table (41) shows the simple correlation matrix between the independent variables included in the model

		<b>Correlations</b>						
		Y3	LnX1	LnX2	LnX3	LnX4	LnX5	LnX6
Y3	Pearson Correlation	1	.623**	.789**	.848**	.799**	.210	.888**
	Sig. (2-tailed)		.000	.000	.000	.000	.188	.000
	N	151	151	151	151	151	151	151
LnX1	Pearson Correlation	.623**	1	.584**	.251	.189	-.050	.636**
	Sig. (2-tailed)	.000		.000	.114	.238	.755	.000
	N	151	151	151	151	151	151	151
LnX2	Pearson Correlation	.789**	.584**	1	.866**	.814**	.262	.797**
	Sig. (2-tailed)	.000	.000		.000	.000	.099	.000
	N	151	151	151	151	151	151	151
LnX3	Pearson Correlation	.848**	.251	.866**	1	.792**	.333*	.839**
	Sig. (2-tailed)	.000	.114	.000		.000	.034	.000
	N	151	151	151	151	151	151	151
LnX4	Pearson Correlation	.799**	.189	.814**	.792**	1	.247	.787**
	Sig. (2-tailed)	.000	.238	.000	.000		.120	.000
	N	151	151	151	151	151	151	151
LnX5	Pearson Correlation	.210	-.050	.262	.333*	.247	1	.241
	Sig. (2-tailed)	.188	.755	.099	.034	.120		.129
	N	151	151	151	151	151	151	151
LnX6	Pearson Correlation	.888**	.636**	.797**	.839**	.787**	.241	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.129	
	N	151	151	151	151	151	151	151

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

### Conclusions:

1. The standard model for the demand for urea fertilizer shows that the independent factors affecting the required quantity of urea fertilizer are the weighted real price of urea fertilizer
2. It was found from the results of the urea fertilizer function that one of the most important factors affecting the demand for urea fertilizer is the price of urea fertilizer (X1) with an amount of (0.161-%), as well as the value of wheat production (X2), the parameter of the cultivated area variable (X3) and also the parameter of the fertilizer price variable Alternative (X4) with a percentage of (0.024-%) as all the parameters' signals were identical to the economic and moral logic below the 1% level.
3. The organic fertilizer has a positive effect on the productivity of the wheat crop by (0.095%), as well as the compound fertilizer showed its significance on the productivity of the wheat crop the productivity of the wheat crop in the same percentage, as for the urea fertilizer, it was found to have a negative effect on the productivity of the wheat crop, meaning that there is waste In the used amount of this fertilizer.

### Recommendations:

1. Directions of plant producers and growers in the use of recommended fertilizer doses.
2. Rehabilitation of local factories producing fertilizers and support the prices of locally produced fertilizers
3. Determining the quantities required to import all kinds of fertilizers in order to meet the agricultural requirements in order to reduce the large quantities

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