

## AN ECONOMIC ANALYSIS OF DETERMINANTS OF WHEAT PRODUCTION SUPPORT IN IRAQ FOR THE PERIOD 1990-2016

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### ABSTRACT

This research was aimed to identify the most important factors affecting the production of wheat crop in Iraq for the period 1990-2016. The ARDL model was used to interpret the relationship between the dependent variable and the independent variables in the search. The research concluded that the continuous increases in the population would lead to increases in support to the wheat crop due to the increase in consumer demand for this crop, which prompts the state to try to encourage producers to achieve increases in production. The research also found that increases in inflation led to higher levels of support because rising inflation rates unfairly distribute income among individuals, therefore the government is moving to increase the volume of support to address this. The research recommended the need to determine the purchase prices in a way that guarantees a fair price for farmers to cover their costs and ensure a sufficient profit to stimulate production. All this will work positively to reduce imports and achieve self-sufficiency.

**Keywords:** pricing policy, programs of support, ARDL model, inflation rates

\*Part of M.Sc. thesis of the 1<sup>st</sup> author

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تحليل اقتصادي لمحددات دعم انتاج محصول القمح في العراق للمدة 1990-2016

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باحث

المستخلص

استهدف البحث تحديد اهم العوامل المؤثرة في دعم انتاج محصول القمح في العراق للمدة 1990-2016. وقد تم استخدام نموذج ARDL لتفسير العلاقة بين المتغير التابع والمتغيرات المستقلة بالبحث. وتوصل البحث الى مجمل استنتاجات منها، ان الزيادات المستمرة بعدد السكان ستؤدي الى زيادات في الدعم المقدم الى محصول القمح بسبب الزيادة في الطلب الاستهلاكي على هذا المحصول الامر الذي يدفع بالدولة نحو محاولة تشجيع المنتجين لتحقيق زيادات في الانتاج. كما توصل البحث ان زيادات معدل التضخم ادت الى رفع مستويات الدعم بسبب ان معدلات التضخم المتزايدة تعمل على توزيع الدخل القومي بين الافراد بطريقة غير عادلة ويقع هذا الضرر على اصحاب الدخل المحدودة، وبالتالي تتجه الدولة لزيادة حجم الدعم لمعالجة ذلك. واوصى البحث بضرورة تحديد اسعار الشراء بالكيفية التي تضمن سعرا عادلا للمزارعين تغطي تكاليفهم ويضمن ربحا وافيا يحفزهم على الانتاج. وكل هذا سيعمل بشكل ايجابي على خفض الاستيرادات وتحقيق اكتفاء ذاتي.

كلمات مفتاحية: السياسة السعرية. برامج الدعم. نموذج ARDL. معدلات التضخم

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## INTRODUCTION

The programs or policies of support those adopted by successive Iraqi governments since the 1970s, which is the first period of state intervention in the price policy of the agricultural sector, are concerned with the achievement of certain objectives, the most important of which is to motivate farmers to produce sufficient quantities of major crops in order to provide food by reducing the food gap between locally produced of the main crops and what is consumed, these policies have succeeded in achieving some of their objectives and have failed to achieve the rest of them, for many reasons, including the weakness of the procedures that should accompany the implementation of these policies, as well as the social and political conditions in which the Iraq has been prevented from achieving its objectives. The implementation of these policies has led to a range of effects on the national economy from home and abroad, as well as the emergence of pros and cons of support policies. Subsidies implicitly generate direct and indirect economic effects. Agriculture has a direct impact on growth, agricultural investment and trade. Economic theory predicts that agricultural subsidies will lead to increased production, lower world prices and chaos in world markets by reducing economic efficiency. On the other hand, agricultural support has an indirect impact on the upward and downward trends in and out of the industrial sector, such as supporting production inputs (fertilizers and pesticides) and supporting agricultural and food industries. Similarly, direct support for both upward and downward trends to and from industries affects agricultural production and trade. Different forms of support can create different economic impacts depending on their impact and dynamics. several studies were carried out in this field using mathematical formulas represented by protection coefficients and subsidy benefits as well as a number of other criteria such as the policy analysis matrix (4,5,7,19). While, other studies were dealt with the determinants of the subsidy policies and the factors affecting them. Under those researches and studies were (1,2,3,6,8,9,11,12,14,15,20). While other

studies dealt with topics such as food security, inflation and financial policies and the relationship of all this to the subject of research and such studies, (10,13,17,18). The research problem was that the state's support policies for wheat yield produced a range of effects on the producer and consumer level, As well as the impact of internal and external policies on the effects of these policies, including the issue of the food gap and self-sufficiency as well as affected public expenditure of the State negatively or positively, In addition, the degree of coherence between the agricultural policy of the price and policies of financing, production and resources. The Iraqi economy was also affected by the shortcomings of the local production of the main crop group, including wheat to keep up with local consumption, which led to an increase in imports ,in a way that affects the state budget as well as large increases in the amounts of support to avoid this deficiency and stimulate the local product to increase production to affect the Iraqi economy negatively or positively and all depending on the degree of impact. The research assumes that the agricultural economic policies had a positive impact on agricultural production as well as its impact on the Iraqi economy negatively or positively affecting the general budget of the state and in the economy as a whole depending on the degree of interdependence between the sectors of the economy with the agricultural sector according to what is exported or imported from these crops or production requirements. The research aims to identify the most important factors that affect the support provided to the wheat crop in order to determine the degree of influence of these factors and then try to take advantage of those factors that had a positive impact and try to develop solutions to the problems caused by those factors which have a negative impact. The most important factors were identified are: population, ratio of local production and consumption, inflation rate and import value.

## MATERIALS AND METHODS

This research testing the existence of a long-run equilibrium relationship between the dependent variable and the explanatory variables depending on Auto regressive

distributed lag model (ARDL). This test does not require that time series be integrated from the same degree, in another meaning, it can be applied regardless of the properties of time series, whether they are stable at their levels  $I(0)$ , or an integrated degree  $I(1)$ , or a mixture of the degree two  $I(2)$ . The general formula of the model (ARDL), consisting of a dependent variable and  $k$  of the explanatory variables (21):

$$\Delta Y = \alpha_0 + \alpha_1 X1_{t-1} + \alpha_2 X2_{t-1} + \alpha_3 X3_{t-1} + \alpha_4 X4_{t-1} + \alpha_5 X5_{t-1} + \sum_{i=1}^m B_1 \Delta Y_{t-1} + \sum_{i=1}^m B_2 \Delta X1_{t-1} + \sum_{i=1}^m B_3 \Delta X2_{t-1} + \sum_{i=1}^m B_4 \Delta X3_{t-1} + \sum_{i=1}^m B_5 \Delta X4_{t-1} + \sum_{i=1}^m B_6 \Delta X5_{t-1} + Et$$

Before going to the rusestust estimation of the wheat crop using the ARDL model, the balance relationship between the variables is to be achieved (Pesaranet 2001)(20), presents a new approach within the framework of the unrestricted error correction model (UECM), This method is known as bounds testing. This method involves two steps: In the first step we test whether there is a long-term equilibrium relationship between the levels of variables. If this relationship exists we move on to the second step, which includes estimating the long-term and short-term parameters of the dynamic error correction model. We assume that the function of the wheat crop will take the logarithmic form:

$$LY = B_0 + B_1 LX_1 + B_2 LX_2 + B_3 LX_3 + B_4 LX_4$$

$LY$  = Amounts of subsidy provided for wheat crop producers (million dinars).

$LX_1$  = Population (million)

$LX_2$  = Shortage of domestic production on the adequacy of demand for wheat

$LX_3$  = Inflation rates

$LX_4$  = Value of imports of wheat crop=

According to the method of testing the limits  $F$  statistic will be calculated through the (BOND TEST) test, The null hypothesis is tested  $B_0 = B_1 = B_2 = 0$ , that there is no cointegration between model variables (there is no long-term equilibrium relationship), versus alternative imposition  $B_0 \neq B_1 \neq B_2 \neq$

0 with a long-term cointegration relationship between the model variables, hence, the estimated ( $F$ ) is compared with the suggested tabular values (Pesaranet al., 2001)(20). And not the value of the usual  $F$  of two values table, representing the value of the upper limit in the case of the model variables are integrated first-degree  $I(1)$ . The minimum value is represented in the case of zero-level integration  $I(0)$ . If the calculated  $F$  is greater than the minimum critical value, the null hypothesis is rejected, ie, we reject the hypothesis that there is no long-term equilibrium relationship; then we accept the alternative hypothesis accepts a cointegration between the variables of the research. If the calculated value is below the minimum critical value, the alternative hypothesis is accept that there is no long-term equilibrium relationship. If the value of  $F$  is located between the lower and upper limits, the results will be undeterministic, this means the inability to make a decision to determine whether there is a cointegration between the variables or not(21).

## RESULTS AND DISCUSSION

### Unit root test

There are many tests for this purpose, but the ADF test, which tests the null hypothesis of series stationary versus the alternative hypothesis that the series is static, is the most widely used method (15). Table shows the results of the ADF test for wheat crop variables according to the three formulas (Intercept, Intercept and trend, none). The stationary of most variables can be seen as the calculated ( $Tao$ ) is greater than its tabular value at the moral levels. Therefore, the null hypothesis cannot be rejected, ie, the series are not static at the level except for the time series of variable  $x_3$ , where it stabilized at the level. After applying the first difference of the variables, the results showed stability of all variables, where ( $Tao$ ) calculated value was below its critical value. This is true with standard tests that assume that most economic variables are not static at the level but become static at the first difference (16).

**Table 1. Unit Root Test results**

UNIT ROOT TEST RESULTS TABLE (ADF)							
Null Hypothesis: the variable has a unit root							
<b>At Level</b>							
		Y	X1	X2	X3	X4	X5
With Constant	t-Statistic	0.0169	-1.3868	-5.0619	-2.0448	-2.9430	1.8684
	Prob.	<b>0.9520</b>	<b>0.5730</b>	<b>0.0004</b>	<b>0.2672</b>	<b>0.0541</b>	<b>0.9995</b>
		n0	n0	***	n0	*	n0
With Constant & Trend	t-Statistic	-1.8146	0.0116	-4.9553	-2.7899	-4.2633	-5.2862
	Prob.	<b>0.6684</b>	<b>0.9936</b>	<b>0.0026</b>	<b>0.2130</b>	<b>0.0123</b>	<b>0.0014</b>
		n0	n0	***	n0	**	***
Without Constant & Trend	t-Statistic	1.0713	0.4391	-3.9845	-1.8312	-0.6116	2.2854
	Prob.	<b>0.9212</b>	<b>0.8018</b>	<b>0.0003</b>	<b>0.0646</b>	<b>0.4422</b>	<b>0.9924</b>
		n0	n0	***	*	n0	n0
<b>At First Difference</b>							
		d(Y)	d(X1)	d(X2)	d(X3)	d(X4)	d(X5)
With Constant	t-Statistic	-5.7680	-11.7830	-8.2175	-4.4865	-8.2605	-4.2622
	Prob.	<b>0.0001</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0017</b>	<b>0.0000</b>	<b>0.0033</b>
		***	***	***	***	***	***
With Constant & Trend	t-Statistic	-5.9226	-12.2523	-8.0544	-4.3692	-8.0943	-5.8477
	Prob.	<b>0.0003</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0101</b>	<b>0.0000</b>	<b>0.0007</b>
		***	***	***	**	***	***
Without Constant & Trend	t-Statistic	-5.1518	-5.3775	-8.3943	-4.5624	-8.4197	-7.7882
	Prob.	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0001</b>	<b>0.0000</b>	<b>0.0000</b>
		***	***	***	***	***	***

Source: calculated by researchers based on E-views 10

**Test cointegration test bond**

**Bond test**

Table shows that the calculated F value, which equals 5.85, is greater than the highest tabular value at the 1% significance level, which

means rejecting the null hypothesis that there is no cointegration and acknowledging the existence of a cointegration between the variables of the model.

**Table 2. Test cointegration using bounds test results**

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	5.858719	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: calculated by researchers based on E-views 10

**The Estimating results**

**Using (ARDL) Model**

Table shows the results which represent the short-term function with the lag periods where the ARDL model is highly sensitive to lag periods. When testing the goodness of test  $R^2$ , the value of the  $R^2$  (coefficient of determination) was about 0.88, which means that 88% of the fluctuations in the dependent variable are due to the explanatory variables present in the model, and 12% due to other variables not included in the model and absorbed by random variable. The t-value of the parameters of the variables are greater than the t-table value at 5%, indicating that the estimated parameters are statistically significant. The D.W statistic is unreliable due to the lags of the dependent variable, so we derived it from another test that will be

explained later. The values of parameters in the logarithmic model represent partial elasticities. In this regard, the value of the population parameter in the short term was 4.304, which is significant at 5%, this is consistent with the logic. The increase in the population necessarily entails an increase in the wheat of commodities. When talking about a commodity such as wheat, we notice that the increase of the population by 1% leads to an increase of the amounts allocated to subsidy wheat prices by more than 1%. This strongly explains the trend towards the provision of this crop to the growing population by subsidizing the farmers sector responsible for providing this crop by expanding its cultivation. This expansion does not only provide all means to promote the cultivation of this crop to be produced on a large scale, which contributes to reducing the burden on the government budget

to reduce the quantities of imports from abroad. In the long term, the results were consistent with the logic of to confirm the positive relationship between the variables (dependent and independent), where the population had a positive and strong impact of the amounts of subsid for the wheat crop in the long term. The value of the local production shortfall parameter on the adequacy of demand for wheat crop in the short term at one lag time was 0.248 and significance value at 5%. This is consistent with economic logic, which shows the positive relationship between the dependent variable and the independent variable. As the increase in production shortfalls on the adequacy of demand by 1% will lead to increased amounts of support for wheat crop 0.248%, because increasing demand from local production of wheat crop leads to a domestic deficit in the crop accompanied by the need of the crop to the external markets to meet that deficit. Taking into account the continuous increase in world prices for most consumer goods, this means increasing the government burden to bear additional support to reduce the price increase for the consumer or increase government intervention and pricing domestic production at low levels. In the long run, however, the parameter of production constraints on the adequacy of demand was not significant but its effect was positive to confirm the positive relationship between the dependent variable and the independent variable. The value of the inflation parameter in the short term was 0.17 positive and significant at 5%. This is corresponds to the logic of economic theory and shows the positive correlation between the support provided for wheat crop and the inflation rate. Where the increase in the rate of inflation by 1%, will lead to increase the amounts of support by 0.17% as the increase in the general level of prices reflects the presence of inflation in the economy or increase reflects the purchasing power of money that decreases and calls for increase support programs. The parameter of inflation rate with one lag was also positive and significant at 5%. In this regard, some studies on the relation of inflation to support , whether food support or support for major crops,

indicate that inflation rates distribute the national income among individuals in an unfair manner, as the change in incomes is not comparable to but less than the change in prices in society and therefore the state is going to increase the volume of support to address this. This is particularly important when it comes to major crops that play an important role in the consumer food basket(3). In the long term, the inflation factor has a positive and significant effect on the amounts of support provided to the wheat crop. The value of wheat imports parameter for short-term wheat (-0.47) was significant at 5% level, where an increase of 1% of the value of imports would cause a decrease in the amounts of subsidy provided to the wheat crop by 0.47%. However. when the wheat import value with one lag time, was positive and significant at 5%, that means increase of 1% of the value of imports would cause a rise in the amounts of support provided to wheat by 0.19%. This may be attributed to the fact that the volume of agricultural production is not enough to meet the needs of individuals in society. To meet these needs, the country tends to import from abroad. As world prices rise and the national currency devalues, the state increases the size of subsidy programs to help individuals buy their basic foodstuffs. As the increase in support for the purchase of the final product will certainly push to stimulate producers in order to increase their production through the adoption of modern methods of agriculture, both at the level of modern mechanization or improved seeds and others. The impact of the value of imports on the support amounts continues in the long term as the results confirm the positive and strong impact in the long run. What is important in this estimate is the value of coint Eq (-1), which is (-0.709) it is negative and very significant, as both necessary and sufficient conditions are met as negative and significant, because the rule in the cointegration, is there a relationship between dependent variable and independent variables, and so long-run relationship will continue to be the value of the error correction coefficient is negative and significant at the same time, as shown in table 3

**Table 3. ARDL model estimation results (short term equation)**

ARDL Error Correction Regression				
Dependent Variable: D(LY)				
Selected Model: ARDL(2, 1, 2, 2, 3)				
Case 2: Restricted Constant and No Trend				
Date: 03/20/19 Time: 22:52				
Sample: 1990 2016				
Included observations: 24				
ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LY(-1))	0.208057	0.117308	1.773598	0.1065
D(LX1)	4.304901	1.659608	2.593927	0.0268
D(LX2(-1))	0.248789	0.107399	2.316500	0.0430
D(LX3)	0.173904	0.073854	2.354710	0.0403
D(LX3(-1))	0.334561	0.097217	3.441387	0.0063
D(LX4)	-0.472007	0.128426	-3.675329	0.0043
D(LX4(-1))	0.191763	0.122117	2.570322	0.0244
D(LX4(-2))	-0.307156	0.086496	-3.551093	0.0053
<u>CointEq(-1)*</u>	-0.709676	0.097732	-7.261437	0.0000
R-squared	0.885975	Mean dependent var		0.211390
Adjusted R-squared	0.825161	S.D. dependent var		0.929921
S.E. of regression	0.388834	Akaike info criterion		1.228669
Sum squared resid	2.267882	Schwarz criterion		1.670440
Log likelihood	-5.744033	Hannan-Quinn criter.		1.345871
Durbin-Watson stat	2.739372			

Source: calculated by researchers based on E-views 10

**Table 4. Long run equation estimation results**

Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LX1	6.066013	1.740612	3.484989	0.0059
LX2	0.292105	0.488946	0.597418	0.5635
LX3	0.623754	0.227164	2.745829	0.0206
LX4	0.724064	0.335027	2.161209	0.0560
C	21.39300	5.863755	3.648345	0.0045
EC = LY - (6.0660*LX1 + 0.2921*LX2 + 0.6238*LX3 + 0.7241*LX4 +21.3930 )				

Source: calculated by researchers based on E-views 10

**ARDL Model Tests**

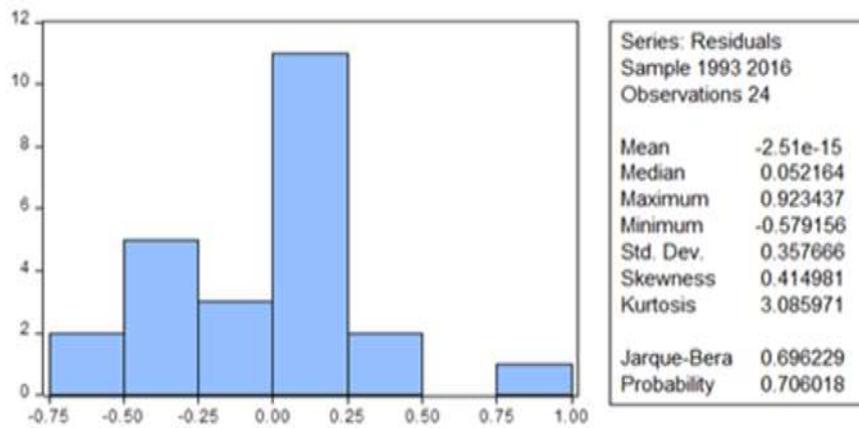
These tests include the econometrical criteria that will be used to evaluate the model of the study to determine the efficiency of the model, Table 5 shows the passing of the model for all econometrical tests, showing the Breusch-Godfrey serial Correlation Lm Test, which refers to the Lagrange multiplier test of autocorrelation, the model is free from the problem of autocorrelation with probability of 0.629, which we can accept the null hypothesis that the model does not have a problem of autocorrelation. The model did not suffer from

the problem of heteroskedasticity through the test of the heteroskedasticity Breusch-Pagan-Godfrey and the (ARCH test) with a probability of 0.769 and 0.788, which is greater than 0.05, which accepts the null hypothesis that there is no problem of heteroskedasticity. The normal distribution of the residuals is achieved by using the Jarque-Bera (JB) test with a probability value of 0.706 which is greater than 0.05, and we accept the null hypothesis that the residuals have normal distribution.

**Table 5. LM test results and test for heteroscedasticity**

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.483717	Prob. F(2,11)	0.6290
Obs*R-squared	1.940132	Prob. Chi-Square(2)	0.3791
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.434476	Prob. F(5,20)	0.8192
Obs*R-squared	2.547398	Prob. Chi-Square(5)	0.7693
Scaled explained SS	4.189129	Prob. Chi-Square(5)	0.5225
Heteroskedasticity Test: ARCH			
F-statistic	0.066750	Prob. F(1,23)	0.7984
Obs*R-squared	0.072344	Prob. Chi-Square(1)	0.7880

Source: calculated by researchers based on E-views 10



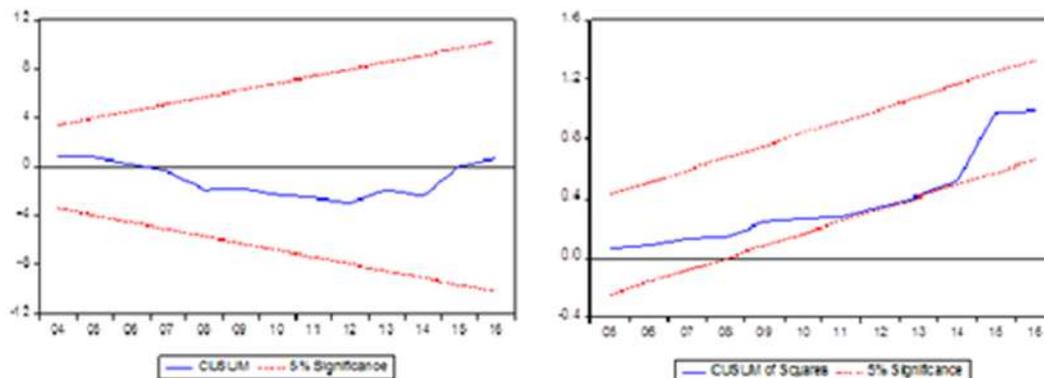
**Fig 1. Testing the distribution of residues**

Source: prepared by researchers based on E-views 10

**Cumulative sum and Cumulative sum of squares of recursive residuals (CUSUM) and (CUSUMSQ)**

The structural stability of the estimated coefficients of the ARDL model is achieved if the CUSUM and CUSUMSQ statistics are within the critical limits at a significant level of 5%, and therefore they are unstable if

the shape moves beyond these limits for the two tests (18). Figure shows that the estimated coefficients of the model used are stable, which confirms the stability between the study variables and the consistency of the model in the long and short term as the model occurred within the critical limits at a significant level of 5%.



**Fig 2. CUSUM and CUSUMSQ**

Source: by researchers based on E-views 10

The study concluded that there is a positive impact of the population to increase the amount of subsidies because the increase in population will lead to an increase in

consumption of wheat as it represents an important good in the Iraqi food basket. The research concluded that the state bears an additional burden due to the lack of local wheat production to keep pace with domestic

demand Which leads the country to increase support for the main crops, including wheat, as well as the increase in the general level of prices and expressed in inflation will reduce the purchasing power of money, which calls for increased support programs to address this increase in inflation, despite the existence of  $R^2$  is directly on the economy in general. The research also concluded that the increase in imports will increase support, although this is an additional burden on the economy, but the final outcome will stimulate farmers to increase production, which eventually leads to a reduction in imports as a final result. Based on the above conclusions, the research recommends the need to follow the policy of supporting output prices to take into account the price levels in the global market, as well as to determine the purchase prices in such a way as to ensure a fair price for farmers to cover their costs and ensure a sufficient profit to stimulate production and all this will work positively to reduce imports and achieve Self-sufficiency is reflected positively on the economy as a whole through the provision of this crop to of consumers at appropriate prices, which ensures food security contributes to the stabilization of the economic. The research also recommends expanding the scope of investment in the agricultural sector and focusing on the main crops including wheat, which will positively affect the overall activities of this sector.

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