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IMPACT OF SOME ECONOMIC VARIABLES ON AGRICULTURAL INVESTMENT IN IRAQ FOR THE PERIOD (1990-2017)

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ABSTRACT

Capital accumulation through net investment is one of the most important sources of growth in all economic sectors, including the agricultural sector, as it contributes to increasing production capacities and their development and thus achieving agricultural development. The study aimed to measure the impact of some economic variables that research assumes their impact on agricultural investment such as Agricultural Domestic Product, exchange rate and rate Inflation, interest rate and the size of agricultural loans in agricultural investment in Iraq for the period (1990-2017) The Autoregressive Distributed lag model (ARDL) was used after selecting the stability of the time series for the model variables using the statistical program (Eviews 10). The results showed that there is a long-term equilibrium relationship between agricultural investment and the diagnosed factors as the adjustment factor was negative and significant at the level of 1%, The agricultural domestic product and the rate of inflation also have a positive effect on agricultural investment, while the rest of the variables have a negative effect, and the effect of some variables differed in the long term from the short, The research recommended an increase in public investment spending and support for farmers by providing loans for investment projects, especially the possibility of producing seeds, fertilizers and animal mothers, raising investment in scientific research, and developing programs and policies necessary to stimulate agricultural investment.

Keywords **:** Public capital, agricultural production, Ardl, capital formation

Introduction

Economic development in developing countries, especially in its early stages, depends on the agricultural sector, which is responsible for providing the food needs of the population and the materials of local industry with its needs of raw resources necessary for its growth and development. As well as contributing to the state's foreign exchange earnings needed to bring about economic development by increasing the state's revenue from agricultural exports (Mustafa, 2015), The research problem is that despite the importance and position of the agricultural sector in the Iraqi economic structure, which represents one of the pillars upon which the process of economic development is based, it is characterized by weak investments in it (both governmental and private parts), which negatively affected the overall agricultural development processes, considering that investment is the engine of activity Economic and social, The importance of the research stems from the economic importance of the agricultural sector due to its important position within other sectors, as well as the importance of the agricultural sector in providing food for the population and materials for industry and contributing to the domestic product, where the contribution rate of agricultural output to the Agricultural Domestic Product ranged (11.6%) in 1990 and (10.8%) in 2000. And (7%) in 2010 and (5.2%) in 2017. Agricultural investment is one of the most basic means for agricultural development, where it is the main pillar for increasing production and income and creating new job opportunities. The success of the agricultural development process depends on its ability to increase the volume of agricultural investments and distribute them among the various programs to achieve the highest possible efficiency of their uses (Ismail *et al*., 2016). Agricultural is affected by many local and subjective variables and obstacles that prevent its development, This requires diagnosing the factors affecting agricultural investment according to economic theories and studies that link investment with many economic variables such as income that represents agricultural domestic product and whose effect is supposed to be positive. Exchange rate: the exchange rate affects investment. It is divided into two effects. The exchange rate may be a catalyst for domestic investment and production, or it may have a negative impact and encourage import, which leads to the transfer of capital from investment and domestic production to import. Therefore, the exchange rate may positively or negatively affect the investment. As for the rate of inflation, which represents the uncertainty and uncertainty that usually prevails in some developing countries, it may have an impact on the investment decision in these countries through an unexpected decrease in aggregate demand, and its impact negatively on investment. As for the average interest rate, the real interest rate is considered the best indicator of the cost of capital from the point of view of both Keynes and the classic. the average interest rate negatively affects investment because they reduce profits and thus investment. As for agricultural loans, their effect is positive on agricultural investment, according to economic theory.

Materials and Methods

Many researchers were interested in investing and the effect of some factors and variables in it such as income, interest rate, and inflation rate, in addition to the impact of monetary and financial economic policies, including (Al-Badri, Al-Moein, Al-Naqadi and Abdul-Shahid, Soheili, Seyed), while others were interested in studying the relationship between growth and investment and its effects on achieving development, including (Al-Hallaq, Alam, and Charles) in addition to a number of other researchers who studied the impact of government lending and investment policy on agricultural investment and the impact of Investing in raising the total productivity of resources and infrastructure, including (Al-Wadi, Muhammad), The investment was defined as a stream of spending on new fixed capital goods (such as factories, machines, roads, houses, or additions to inventory such as (raw materials, intermediate goods, or final goods) during a certain period of time (Saqr, 1983). As, it is the procurement or businessman building of factories and equipment of all kinds, as well as the construction of new housing, whether by the businessman or the family sector, and the sum of these elements, in addition to the stock in the business sector, is called the private gross domestic investment, and if the extinction is deducted, it becomes a net investment, (Ackley, 1980) And it is a key to the economic growth component or origin purchases of capital during a certain period of time, (Hail and Lieberman, 2001) and was known as the association of capital with one or more assets that will be kept for future periods (Charles, 2004), As for agricultural investment, it is the development of the material means of production and works to improve them and raise their productive efficiency (Al-Taie, 2010). Also, it is defined as all expenditures aimed at creating fixed assets or increasing a resource from the resources available for agriculture (Al-Nujaifi, 1989).In determining the factors affecting agricultural investment in Iraq, it was based on economic theories that explain the investment, and the research relied on time series data at constant prices for the period (199-2017) after revealing the stability of time series by testing both Dickie Fuller and Phillips Perron. (ARDL) model based on reconciling short-term behavior with long-term behavior of economic relations, It has been confirmed that the time series of the model variables are all stable at the first difference except for the independent variable (the exchange rate), where it is stable at the level and there is no stable variable at the second difference, and then investigating that there is a long-term equilibrium relationship between agricultural investment and all the variables explained for him, The error correction model can be applied using the (ARDL) model, which depends on the ability to test and estimate the short and long-term relationship between the variables of the (ENGLE) model. It also avoids standard problems resulting from the linear correlation, and a number of explanatory variables were adopted, which were the agricultural domestic product, the exchange rates of the Iraqi dinar against the US dollar, the inflation rate, the interest rate, and the total agricultural loans, As for the mathematical form of this model, the logarithmic formula was adopted using the statistical program (Eviews 10).

Results and Discussion

Time series data for the period (1990-2017) were used, and after determining the stability of the time series, the ARDL model was tested, which requires that some variables be stable at the level and others at the first difference, provided that there is no variable stabilizing the second difference, and the model used is as follows:

$$Lny = f(lnx1, lnx2, lnx3, lnx4, ln5)$$

Where :

LN = natural logarithmic formula

Y = agricultural investment expressed in agricultural capital formation (million dinars)

X1 = Agricultural Domestic Product (million dinars)

X2 = the exchange rate of the Iraqi dinar against the US dollar

X3 = rate of inflation

X4 = interest rate

X5 = total agricultural loans

The significance was estimated according to the following steps:

First: Stability test of time series: When testing the stability of the series with current values, some variables did not stabilize even when taking the second difference due to the presence of a large discrepancy in the values, and despite the variables being dealt with fixed values, they did not stabilize and for this reason, the logarithmic formula was taken to reduce the variance and calm it. Unit Wall Test The unit wall test aims to measure the stability of time series using the (DICKRY 4) test and the Phillips Peyron test p_p.

It is evident from the above two tests of the unit root that all the variables in the model are integrated at the first difference, i.e. of the rank I (1) except for the variable X2, so it is integrated in the rank I (0), as it is static at the level

Table 1: Unit Root Test using Extended Decy Fuller (ADF)

LY	LX1	LX2	LX3	LX4	LX5	significant	Variables the test
At level							
2.647-	-2.423	-4.066	-0.548	0.363	-1.243	t- statistic	With constant
0.096	0.145	0.004	0.866	0.977	0.640	Prob.	
*	NO	***	NO	NO	NO		
- 2.985	-2.096	-3.735	-2.489	-3.211	-1.712	t- statistic	With constant & Trend
0.154	0.524	0.037	0.330	0.103	0.716	Prob.	
NO	no	**	NO	NO	NO		
-0.306	-0.140	-3.071	-1.174	3.007	0.118	t- statistic	None
0.566	0.626	0.081	0.213	0.998	0.711	Prob.	
NO	NO	*	NO	NO	no		

At first deference							
-5.844	-5.199	/	-5.974	-8.483	-3.633	t- statistic	With constant
0.000	0.000	/	0.000	0.000	0.012	Prob.	
***	***		***	***	**		
-5.740	-5.514	/	-5.964	-8.488	-3.646	t- statistic	With constant & Trend
0.000	0.000	/	0.000	0.000	0.045	Prob.	
***	***		***	***	**		
-5.945	-5.303	/	-5.660	-6.913	-3.666	t- statistic	None
0.000	0.000	/	0.000	0.000	0.000	Prob.	
****	***		***	***	***		

*** = significant at the level of 1%
** = significant at the level of 5%
* = Significant at the level of 10%.
Reference: the researcher's work based on the statistical program EVIEWS10
That is why the ARDL model was adopted

Table 2: Autoregressive Distributed model lag (ARDL)

Dependent Variable: LY
Method: ARDL
Date: 07/30/20 Time: 14:13
Sample (adjusted): 1993 2017
Included observations: 25 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (3 lags, automatic): LX1 LX2 LX3 LX4 LX5
Fixed regressors: C
Number of models evalulated: 1024
Selected Model: ARDL(1, 3, 1, 3, 3, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LY(-1)	0.098627	0.516652	0.190897	0.8549
LX1	3.606532	0.902804	3.994813	0.0072
LX1(-1)	-0.818347	0.961712	-0.850927	0.4275
LX1(-2)	1.144834	1.543124	0.741894	0.4862
LX1(-3)	-7.735694	2.476790	-3.123274	0.0205
LX2	-1.641145	0.961644	-1.706604	0.1388
LX2(-1)	1.267860	0.855254	1.482438	0.1887
LX3	0.437672	0.320084	1.367367	0.2205
LX3(-1)	-0.969485	0.286275	-3.386555	0.0147
LX3(-2)	-0.145124	0.364950	-0.397656	0.7046
LX3(-3)	-1.141123	0.462475	-2.467425	0.0486
LX4	-6.885312	3.812033	-1.806205	0.1209
LX4(-1)	-3.956142	2.590979	-1.526891	0.1776
LX4(-2)	4.851439	2.221823	2.183540	0.0717
LX4(-3)	9.353264	4.393168	2.129048	0.0773
LX5	-0.169573	0.101132	-1.676758	0.1446
LX5(-1)	-0.460991	0.301219	-1.530418	0.1768
LX5(-2)	0.452872	0.181422	2.496229	0.0468
C	51.56491	14.63141	3.524262	0.0125

R-squared	0.955379	Mean dependent var	4.718331
Adjusted R-squared	0.821518	S.D. dependent var	0.922300
S.E. of regression	0.389646	Akaike info criterion	1.045725
Sum squared resid	0.910942	Schwarz criterion	1.972071
Log likelihood	5.928432	Hannan-Quinn criter.	1.302654
F-statistic	7.137065	Durbin-Watson stat	2.280517
Prob(F-statistic)	0.011190		

Reference: the researcher's work based on the statistical program EVIEWS10
According to Akaike standard, the model (1,3,1,3,3,2) was chosen as in Table 2

Third: bounds testing approach

Moving to the ARDL border test, Table (3), it was found that the (F) statistic of (5.32) was higher than the upper limit of the critical values in the model, which was obtained from the tables that are at significant levels (1%, 2.5%, 5%, 10). This means the possibility of rejecting the null hypothesis at the three levels of significance, meaning the existence of a long-term equilibrium relationship between agricultural investment and the factors affecting it. After making sure of the existence of a long-term equilibrium relationship through testing the limits, the equation of the model used in the study can be estimated.

Table 3: Co-integration test results using the boundary test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	5.322958	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Actual Sample Size	25	Finite Sample: n=30		
		10%	2.407	3.517
		5%	2.91	4.193
		1%	4.134	5.761

Fourth: Estimating the equilibrium relationship of the investment equation in the short and long term

After ascertaining the existence of a joint complementarity relationship between agricultural investment and the factors affecting it, the long and short term relationship was estimated within the framework of the (ARDL) model. This stage includes acquiring skills during the study period. The results indicated that some of the estimated parameters in the long run were consistent with the expected signal, such as agricultural domestic product, interest rate and inflation rate, while others, such as the exchange rate average, were contrary to what previous studies indicated, some of them were significant and others were not. As for the short term, the sign of the variables coefficient showed with the expected effect, while some others were different in terms of indicating the results of previous studies. All the variables were significant, meaning they had an impact on agricultural investment in the short term

Table 4 : Results of estimating the short and long term equilibrium relationship of the investment equation for the period 1990-2017

ARDL Error Correction Regression
Dependent Variable: D(LY)
Selected Model: ARDL(1, 3, 1, 3, 3, 2)
Case 2: Restricted Constant and No Trend
Date: 06/18/20 Time: 13:25
Sample: 1990 2017
Included observations: 25

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LX1)	3.606532	0.436795	8.256803	0.0002
D(LX1(-1))	6.590861	0.889719	7.407801	0.0003
D(LX1(-2))	7.735694	1.165400	6.637804	0.0006
D(LX2)	-1.641145	0.224322	-7.316010	0.0003
D(LX3)	0.437672	0.097893	4.470928	0.0042
D(LX3(-1))	1.286247	0.199534	6.446262	0.0007
D(LX3(-2))	1.141123	0.210714	5.415515	0.0016
D(LX4)	-6.885312	0.853863	-8.063717	0.0002
D(LX4(-1))	-14.20470	1.853976	-7.661751	0.0003
D(LX4(-2))	-9.353264	1.289465	-7.253601	0.0003
D(LX5)	-0.169573	0.062216	-2.725556	0.0344
D(LX5(-1))	-0.452872	0.096594	-4.688420	0.0034
CointEq(-1)*	-0.901373	0.104415	-8.632578	0.0001

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LX1	0.218760	3.809790	2.107347	0.0106
LX2	-0.414130	0.317893	-1.302734	0.2404
LX3	-2.016990	1.071278	-3.882789	0.0087
LX4	-2.731252	2.440185	-2.529086	0.0177
LX5	0.197135	0.213491	1.923387	0.0914
C	57.20709	40.53588	1.411270	0.2079

Fifth: misclassification tests:

After the agricultural investment equation and the factors affecting it were obtained using the (ARDL) model, the study model is evaluated to know how efficient the model is in estimating the agricultural investment function during the study period, using the following diagnostic tests:

1- The Breusch-Godfrey Serial Correlation Lm Test, which refers to a double lacrang test for self-correlation.

2- The Autoregressive conditional heteroskedasticity (ARCH) test.

3- The Jarque–Bera test.

4- Test the appropriateness of determining or designing the estimated model in terms of the semantic form of this model (Ramsey (RESET)).

5- Cumulative Sum of Squares OF Recursive Residuals (CUSUMSQ) testing for the structural stillness of the estimated parameters of the model.

Table (5) indicates that the model has passed all standard tests, such as being free from self-correlation using the (LM) test with a probability value (0.325), and from which we can accept the null hypothesis that the model does not suffer from the self-correlation problem. The condition of the normal distribution of the residues was also achieved by using (JB) with a probability value (0.425) which is greater than 5Among them we accept the null hypothesis, meaning that the remainder of the model has a normal distribution, Figure (1), while the test showed the absence of the problem of variance instability using a probability value (0.2633), and the results of the Ramsey Reset Test) indicate rejection of the hypothesis that there is an error in determining the model Finally, the structural stillness of the estimated parameters of the model is verified through the use of the cumulative sum of residual squares test (CUSUMSQ), as the CUSUMSQ statistic graph fell within the critical limits at a significance level of 5%, that is, the estimated parameters of the model used are structurally static during the study period.

Table 5 : Statistics of the diagnostic tests for the estimated

model during the study period

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.201300	Prob. F(1,5)	0.6724
Obs*R-squared	0.967545	Prob. Chi-Square(1)	0.3253
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.935171	Prob. F(18,6)	0.2120
Obs*R-squared	21.32651	Prob. Chi-Square(18)	0.2633
Scaled explained SS	0.443275	Prob. Chi-Square(18)	1.0000

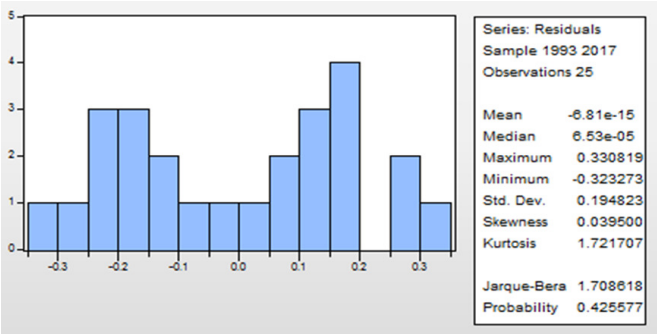

Fig. 1 : The normal distribution of residues in the estimated model during the study period

References: The researcher's work relying on the statistical program (Eviews.10).

Model Stability Test:

In order to make sure that the data used in this study are free from the presence of any structural changes in it, one of the appropriate tests must be used, such as: the cumulative sum of recurring residues (CUSUM), and the cumulative sum of the squares of recurrent residues (CUSUM of Squares). These two tests are considered among the most important tests in this field because they show two important things, which are to show the presence of any structural change in the data, and the stability and harmony of long-term parameters with short-term treatments. Many studies have shown that such tests are always associated with the (ARDL) methodology; the structural stability of the estimated treatments of the error correction formula of the self-regression model of the temporal slowdown is achieved. 5%, and in light of most of these studies, we applied (CUSUM and CUSUMSQ) tests

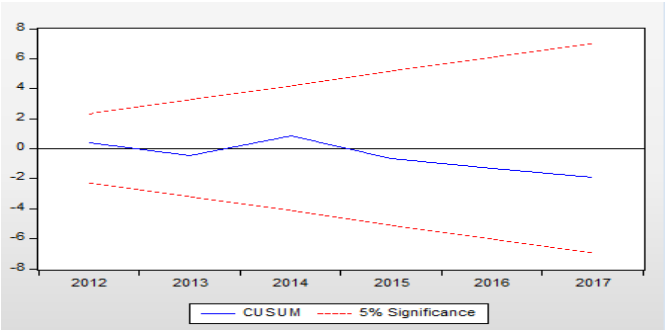

Fig. 2 : Results of the cumulative sum of the regression squares of the residual residue for the estimated model during the period (1990-2017)

References: the researcher's work relying on the statistical program (Eviews.10).

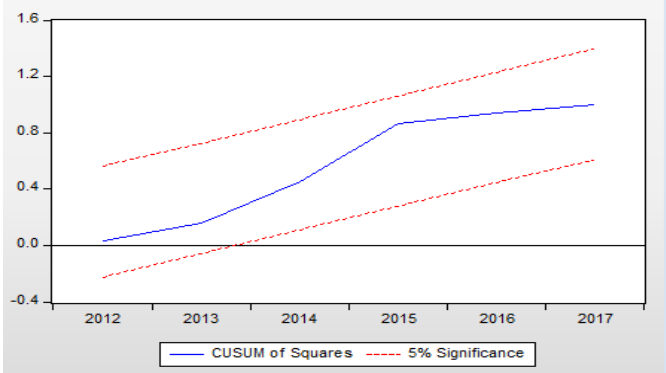

Fig. 3 : Results of the test for the cumulative sum of the regressive residues of the estimated model during the period (1990-2017)

References: the researcher's work depending on the statistical program (Eviews.10)

Through the graph of Figures (2-3), showed that the test of the cumulative sum of recursive residues CUSUM for this model, where it crosses a linear medium within the boundaries of the critical region, indicating a kind of stability in the model at 5% significance. The same for the CUSUMSQ cumulative test. These two tests show that there is stability and consistency in the model between the long-term results and the short-term results.

Discussion

It is evident from the value of the determination R ^ 2 that the model explains about 95% of the variables involved in the agricultural investment function during the study period, and this is an indication that the explained factors are the ones that have the greatest impact on the investment function, as for 5% they are not explained, i.e. are responsible for the non-input variables. In the model and represented by the random variable. When studying the overall significance of the model, we find that the calculated F value was 7.13 and the significant at the level of 5% and this is evidence that the model is statistically significant and that the variables explained in the model as a whole have an effect on the investment function. To test the statistical confidence in the estimates of the model treatments, the t-test was used. To measure the individual significance of the variables included in the investment model, as we found all the variables to be statistically significant, with a degree of 5% and 10%, except for the exchange rate, it showed insignificance in the long term. The results show that the agricultural domestic product showed a positive and significant effect in both the long and the short term, and this is consistent with the logic of economic theory, where an increase in income will lead to an increase in saving and thus investment, where its effect in the short term was greater than in the long term period. An increase in income by (1%) will increase agricultural investment by 3.60. It can also be explained that increasing the agricultural domestic product will lead to an increase in investment allocations to the agricultural sector and increase support for production inputs and their prices, as well as increase the credit directed to the agricultural sector and that all this will provide an investment environment that stimulates the increase in agricultural investment and opens new horizons and areas for investors and farmers that will raise the level of Investment. As for the exchange rate coefficient, it was significant and statistically significant in the short term, but in the long term it was not significant and the sign was negative, which explains that in

the event of devaluation of the local currency against the foreign currency, this leads to raising the prices of imported goods. And then consumers switch to local commodities, respectively, local investment rates are rising. The devaluation of the currency is the tool that leads to the equilibrium price according to the applied economic reforms, as the decrease in the exchange rate makes the prices of imported goods as if they are high in price. Thus, the demand for imported goods decreases, the demand for local goods increases, and with this increase in demand, investment increases. As for the rate of inflation, it has proven its significance in both the short and the long term, and its sign was positive in the short term, and this is consistent with the economic logic, as the rise in prices in the short term pushes investors to increase investment in the belief that they can achieve high profits due to higher commodity prices. What represents the first stage of the inflationary process called demand inflation, and after a period they feel that the increase includes production costs, i.e. the stage of cost inflation, and thus the volume of investment decreases in the long term. As for the interest rate, it has a negative and significant effect on agricultural investment in the short and long term, and this is consistent with the concept of investment being a long-term concept in which the interest rate represents the cost of capital, which is compared with the marginal efficiency of capital, which represents the marginal productivity of capital, or the expected return. From investing a certain amount of money. The relationship between the marginal productivity of capital and the money invested is a positive one. When marginal productivity increases, incomes rise, and thus the encouragement of investment increases with the increase in invested money.

When the interest rate increases by (1%), the investment will decrease by (6.8), and this means that investors in the agricultural sector cannot bear the rise in interest rates because if the interest rate rises, this will raise investment costs and reduce the profits that can be obtained, especially In the case of low returns for agricultural investments in exchange for high investment costs, and causes reluctance to borrow, a decrease in the number of investors who can afford the costs, and thus a decrease in the volume of investment. As for agricultural loans, his teacher explained a negative and significant effect in the short-term period, but in the long-term, it was a significant and positive effect. Since most of the short-term loans are loans to buy seeds and fertilizers and to cover marketing expenses, and this is at the expense of long-term loans granted for investment. As for the error correction factor (ECM), its sign was negative and significant at the level (1%) and is economically acceptable. The indicative (causal) relationship between total fixed capital formation in the agricultural sector and agricultural domestic product at constant prices, agricultural domestic product has a significant impact on the gross fixed capital formation in the agricultural sector. The results indicated a percentage (90%) of the imbalance (imbalance) in the previous period of the total fixed capital formation in the agricultural sector at constant prices that can be corrected in the current period (t), which is a large correction rate towards long-term equilibrium through a change The value of the agricultural domestic product or the occurrence of any shock or change in the agricultural domestic product.

Recommendations

1. Directing investment spending towards real agricultural investment that works to expand agricultural production capacity, perhaps the most important of which is a productive investment for the production of animal mothers and the production of seeds and plants, and focusing on increasing productive capital such as mechanization, fertilizers and animal assets.
2. Protection of agricultural production, either by imposing fees on imported agricultural commodities, determining agricultural commodities needed by the country and which are difficult to produce locally, and applying the agricultural calendar issued by the Iraqi Ministry of Agriculture, or by supporting the prices of locally produced agricultural commodities.
3. Limiting the use of agricultural loans to finance agricultural projects and not to use them for other purposes.
4. The necessity to determine the interest rate on agricultural loans in light of the size of agricultural investments needed to establish agricultural projects.
5. The need to increase investment allocations for the agricultural sector and to ensure high spending rates for these investment allocations and to use them effectively towards increasing and developing productive capacities in the agricultural sector and raising the level of support for investors to purchase modern machinery and technologies and raise the level of allocations for scientific research that would increase agricultural production capacity.
6. Improving the investment climate in general by creating an appropriate economic and political environment and institutions.

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