

## AN ECONOMIC ANALYSIS OF THE EFFECT OF SOME ECONOMIC VARIABLES ON THE STRUCTURE OF AGRICULTURAL EMPLOYMENT IN IRAQ FOR THE PERIOD 1990-2017

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### ABSTRACT

The research aimed at analyzing the structure of agricultural employment in Iraq as well as analyzing the current status of economic variables related to agricultural employment during the period 1990-2017, including the agricultural workforce, agricultural wages, agricultural investment and agricultural GDP. In the achievement of its objectives, the research relied on descriptive and quantitative analysis, as well as the use of some modern econometric methods in estimating models. The results using the ARDL methodology in the analysis indicate a long-term relationship between the volume of agricultural employment and each of the explanatory variables included in the model, which are (agricultural GDP, agricultural investments, agricultural wages and technological development). The research concluded that the negative effects of the policies pursued towards the agricultural sector to a large extent have been reflected on the size of the demand for agricultural employment and the productive efficiency of agricultural labor. The research recommended that investments should be directed to developing human resources, aiming to raise their efficiency, and encouraging the private sector to increase investments in various fields that would open new labor markets in order to accommodate the various types of unemployment that exist in the state's economic structure.

**Key words:** Agricultural wages; agricultural investments; agricultural GDP; ARDL methodology

\*Part of Ph.D. Dissertation of the 1<sup>st</sup> author

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مجلة العلوم الزراعية العراقية - 2021: 52 (3): 682-690

تحليل اقتصادي لأثر بعض المتغيرات الاقتصادية على هيكل العمالة الزراعية في العراق للمدة 1990-2017

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الباحث

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المستخلص

استهدف البحث تحليل هيكل العمالة الزراعية في العراق فضلاً عن تحليل الوضع الراهن للمتغيرات الاقتصادية المتعلقة بالعمالة الزراعية خلال المدة 1990-2017 ومنها القوى العاملة الزراعية والاجور الزراعية والاستثمارات الزراعية والناتج المحلي الزراعي، واعتمد البحث في تحقيق اهدافه على التحليل الوصفي والكمي فضلاً عن استخدام بعض الاساليب القياسية الحديثة في تقدير النماذج. تشير النتائج باستخدام منهجية ARDL في التحليل الى وجود علاقة تكاملية طويلة الاجل بين حجم العمالة الزراعية وكل من المتغيرات التوضيحية الداخلة في الانموذج والمتمثلة بـ(الناتج المحلي الزراعي، الاستثمارات الزراعية، الاجور الزراعية والتطور التكنولوجي). واستنتج البحث ان الآثار السلبية للسياسات المتبعة تجاه القطاع الزراعي بدرجة كبيرة قد انعكست على حجم الطلب على العمالة الزراعية والكفاءة الانتاجية للعمالة الزراعية. واوصى البحث بضرورة توجيه الاستثمارات الى تنمية الموارد البشرية مستهدفة رفع كفاءتها، وتشجيع القطاع الخاص على زيادة الاستثمارات في مختلف المجالات والتي من شأنها فتح اسواق عمل جديدة وذلك لاستيعاب مختلف انواع البطالة الموجودة في البنيان الاقتصادي للدولة.

الكلمات المفتاحية: الاجور الزراعية، الاستثمار الزراعي، الناتج المحلي الزراعي، منهجية ARDL

\*البحث مستل من اطروحة الدكتوراه للباحث الاول

Received:3/6/2020, Accepted:16/8/2020

## INTRODUCTION

The agricultural sector is one of the pioneering sectors for economic development, so it requires the necessity of advancing agricultural development through achieving the maximum efficiency for the use of available agricultural resources in general and human resources represented in agricultural employment in particular (6). Agricultural employment is an important part of the overall employment in Iraq. This human resource is important because it is one of the tools for achieving economic development goals in general and agricultural in particular, also, achieving agricultural production efficiency depends on the efficiency of using the human labor component as it is the cornerstone in developing agricultural production because of its effective role in employing the production elements and directing them in an optimal way to achieve economic efficiency in the agricultural sector (5). With the emergence of the concept of economic globalization, the interest in developing and investing human resources, improving the quality of the workforce, and raising its productive efficiency to develop its creativity and innovation capacity, especially when it comes to introducing modern technologies, which is an important means of absorbing and applying scientific developments, has increased(4). The topic of employment, whether agricultural or total employment, or that related to the efficiency of the human element in the agricultural sector, dealt with a set of research, including (1, 3,6,7,8,9,12,14,15, 16,18,19, 20, 21).

As that:

*LnLagri*: The natural logarithm of the of the agricultural labor for the period (1990 - 2017).

*LnADP*: The natural logarithm of the agricultural GDP for the period (1990 - 2017).

*LnIagri*: The natural logarithm of the size of the agricultural investment for the period (1990 - 2017).

## MATERIALS AND METHODS

The research relied on extracting its results by using advanced econometric methods in analyzing time series. Stationary tests were used to adopt the model that serves the research goal. After analyzing stationary, it was found that all the variables are stable at the first difference using the PP (Phillips – Perron) test. The best results were obtained according to (Autoregressive distributed lag model (ARDL) and methodology. The ARDL model takes a sufficient number of time lags to obtain the best set of data from the general framework model, it also gives the best results for parameters in the long run, also diagnostic tests are highly reliable (11), therefore, the ARDL model is the most suitable model that served the purpose of the research ,as well as its suitability with the sample size used, which amounted to 28 observations, period (1990-2017). Therefore we find that a large group of research has used this model in analyzing its data for the great ability in complying with research data and reaching satisfactory results, and from this research (2 ,17)

## RESULTS AND DISSCUSSION

Results of a quantitative analysis of the effect of some variables on agricultural employment in Iraq during the study period 1990-2017. In this part, the relationship between the size of agricultural employment as a dependent variable and both (the value of agricultural GDP, agricultural investments, agricultural wages and technological development) will be studied as independent variables to demonstrate the impact of each of these independent variables on the agricultural employment, and for this a mathematical model has been formulated to clarify this relationship and as it comes:

$$LnLagri = b_0 + b_1LnADP + b_2LnIagri + b_3LnWagri + b_4LnTC + e_i$$

*LnWagri*: The natural logarithm of agricultural wages for the period (1990 - 2017).

*LnTC*: The natural logarithm of the technological evolution of the period (1990 - 2017).

After estimating the model using ARDL method, we obtained the following results:

**Short run equation:** The short-run function was estimated for ARDL estimates and results as shown in Table 1.

Table 1. ARDL model estimation results

Dependent Variable: LNLAGRI				
Method: ARDL				
Date: 06/29/20 Time: 19:22				
Sample (adjusted): 1991 2017				
Included observations: 27 after adjustments				
Maximum dependent lags: 1 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (1 lag, automatic): LNADP LNIAGRI LNWAGRI LNTC				
Fixed regressors: C				
Number of models evaluated: 16				
Selected Model: ARDL(1, 1, 0, 1, 0)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNLAGRI(-1)	0.343578	0.138800	2.475351	0.0229
LNADP	-0.344651	0.118480	-2.908951	0.0090
LNADP(-1)	-0.550799	0.124968	-4.407503	0.0003
LNIAGRI	0.049020	0.017162	2.856280	0.0101
LNWAGRI	0.282366	0.122619	2.302795	0.0328
LNWAGRI(-1)	0.611176	0.123807	4.936517	0.0001
LNTC	-0.069537	0.110048	-0.631883	0.5350
C	5.364843	1.063251	5.045696	0.0001
R-squared	0.965273	Mean dependent var	7.282097	
Adjusted R-squared	0.952479	S.D. dependent var	0.145679	
S.E. of regression	0.031757	Akaike info criterion	-3.820208	
Sum squared resid	0.019162	Schwarz criterion	-3.436257	
Log likelihood	59.57281	Hannan-Quinn criter.	-3.706040	
F-statistic	75.44605	Durbin-Watson stat	1.408257	
Prob(F-statistic)	0.000000			

Source: Prepared by the researcher using EViews.10

The results of the short-run equation showed that the agricultural GDP came with a negative and significant signal at the level of 1% and its value is equal to (0.344) and means that the increase by 1% in the agricultural GDP leads to a decrease in agricultural employment by (0.344), it is contrary to the logic of economic theory, which assumes that with the increase in agricultural GDP, agricultural employment increases in the same direction, However, the policy adopted by the state relying on other non-agricultural sectors for resources, especially the oil sector, consequently, satisfying the country's food needs through import, made the increase in the agricultural output lead to employing agricultural labor from outside the country and creating unemployment within the country, in addition to inappropriate agricultural policies, including a random import policy that led to dumping the local market with agricultural products at competitive prices, it is difficult for the local product to compete due to the increase in production costs, including the cost of the labor component which made most agricultural workers leave the agricultural profession, which is the main source of employment opportunities in rural areas and the transition to other sectors such as services or joining the army or the police in order to improve their entry levels, so the signal came negative. As for the agricultural investment coefficient, it came with a positive and

significant at the level of 1% to show the direct relationship between investments in the agricultural sector and the size of agricultural labor, which is a logical relationship and identical to the economic theory, the value of the coefficient reached (0.049), which means if investment in the agricultural sector increased by 1%, it leads to an increase in the agricultural employment by (0.049), but it is considered a low percentage, indicating a decrease in the volume of investments directed to the agricultural sector, and despite the investment amounts spent, there are deficiencies in the absorption of agricultural labor in the areas of multiple agricultural projects, perhaps this is due to an imbalance in the distribution of investments in the agricultural sector, which is supposed to attract agricultural labor, reduce unemployment rates and improve the standard of living for rural residents. As for the parameter of agricultural wages, it came with a positive signal, which indicates a direct and significant relationship at the level of 5% of the impact of agricultural wages on the size of agricultural labor, the value of the parameter was (0.282), which means that an increase in agricultural wages by 1% leads to an increase in the volume of agricultural employment by (0.282), which is a logical relationship and is identical to the economic theory, therefore, it is noticed that when agricultural wage rates rise, most farmers tend to grow crops that are not dense

in use for agricultural work and focus on growing crops with high profitability in order to reduce the cost of costs, however the value of the parameter is low, which is a clear indication that the effect of wages, although positive, was not Enough to affect the volume of agricultural employment. As for the parameter of technological development, it came with a negative signal to reflect an inverse relationship between technological development and the agricultural employment, the value of the parameter was about (0.069), which means that with an increase of technological progress by 1%, it leads to a decrease in the volume of agricultural employment by (0.069), that is, the more agricultural processes that use technology increase, the volume of agricultural employment used is expected to decrease, which is a logical relationship indicating that

technological development has an impact on reducing employment used in farm work, but the relationship between the two variables has not proven significant at acceptable statistical levels.  $R^2$  values(0.96), indicate that 96% of changes in the dependent variable are due to the independent variables included in the model. The values of ( $F$ ) indicate the significance of the model as a whole and at the level of significance 1%.

### B. Long-run equation and error correction factor:

In order to demonstrate a long-run integrative relationship between the agricultural employment and each of the explanatory variables included in the model, the long-run function and the error correction factor were estimated as shown in table 2.

**Table 2. long-run equation using the ARDL model**

ARDL Cointegrating And Long Run Form				
Dependent Variable: LNLAGRI				
Selected Model: ARDL(1, 1, 0, 1, 0)				
Date: 06/29/20 Time: 19:24				
Sample: 1990 2017				
Included observations: 27				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNADP)	-0.344651	0.118480	-2.908951	0.0090
D(LNIAGRI)	0.049020	0.017162	2.856280	0.0101
D(LNWAGRI)	0.282366	0.122619	2.302795	0.0328
D(LNTC)	-0.069537	0.110048	-0.631883	0.5350
CointEq(-1)	-0.656422	0.138800	-4.729271	0.0001
Cointeq = LNLAGRI - (-1.3641*LNADP + 0.0747*LNIAGRI + 1.3612*LNWAGRI - 0.1059*LNTC + 8.1729 )				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNADP	-1.364139	0.344317	-3.961870	0.0008
LNIAGRI	0.074677	0.035413	2.108767	0.0485
LNWAGRI	1.361232	0.350716	3.881290	0.0010
LNTC	-0.105934	0.183373	-0.577697	0.5703
C	8.172859	0.357070	22.888644	0.0000

Source: Prepared by the researcher using EViews.10

It is clear from table (2) that the value of the error correction factor (CoinEq (-1)) reached (-0.656), which is significant at the level of 1%, and this means that 65% of fluctuations and deviations in the short term will be corrected in the long term. The results of the long-run equation also showed that the agricultural GDP parameter came with a negative and significant at the level of 1% which is contrary to the logic of economic theory, which confirms that the continuation of the current policy followed by the state towards the agricultural sector and not going to the policy to support this sector in the long run will lead to an increase in unemployment rates in rural

areas and an increase in the problem of rural poverty and an increase in immigration rates, and other problems related to the agricultural sector, as the value of the agricultural GDP was about (-1.364), which means that the increase of 1% in the agricultural GDP leads to a decrease in agricultural employment by (1.364)%. The value of the agricultural investment coefficient in the long term was about (0.074%) and it came with a positive signal to show the existence of a statistically significant direct relationship at the level of 5%, which is identical to the economic theory, as the increase in agricultural investments in the long run by 1% leads to an increase in the volume of agricultural employment by (0.074),

which confirms the importance of the role of investments in the agricultural sector because of its positive effects, the most important of which is attracting agricultural labor and reducing the unemployment problem in the countryside and meeting local food needs instead of relying on imports as well as providing advanced financial and technical resources and highly experienced human cadres. The relationship of agricultural wages with the size of agricultural employment continued to be positive in the long term, as the value of the factor reached 1.361, which indicates that an increase in wages by 1% will increase the volume of employment by 1.361%, meaning that the effect of wages was effective in the size of agricultural employment. As for the parameter of technological development, it came with a negative signal in the long term, its value reached (0.105), which means that whenever the technological development increased by 1%, the agricultural employment decreased by (0.105 %) and this is identical to the economic theory, However, its significance has not significant at the accepted statistical levels, this is due to the nature of agricultural production in Iraq as it is characterized by its

dependence on traditional methods of agriculture and the low educational level of workers in the agricultural sector, and the contribution of modern technology to production is still modest, especially in the areas of scientific research, statistical techniques, improved seeds, chemical fertilizers and the use of modern methods of irrigation as well as mechanization and modern and advanced agricultural equipment, which means the difficulty of managing this technology by unqualified cadres, in other words, this technology requires a balanced efficiency with the arrangement of the farm, and this will not be unless the human component is developed at the same time through knowledge, efficiency and training of the agricultural worker himself to ensure benefit from the advantages and benefits of automated work, in addition to the high prices of machines, which leads to an increase in the costs of production of agricultural crops when trying to introduce this technology within the costs in light of the relative stability of the prices of those crops.

### C. Cointegration testing using the bounds test approach

**Table 3. shows the cointegration test according to the Bounds test approach**

ARDL Bounds Test		
Date: 05/27/20 Time: 18:51		
Sample: 1991 2017		
Included observations: 27		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	10.72237	4
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

**Table 7. Bounds test**

Source: Prepared by the researcher using EViews.10

Table (3) showed that the statistical value of F was about (10.722), which is higher than the upper limit of the critical limits at the level of 1%, and this proves the existence of a cointegration or long-run balance relationship

between the variables included in the model and the dependent variable.

### D. Model validity tests

**1- Autocorrelation test:** LM Test was relied on to detect the problem of Autocorrelation, as the test showed that the significance of  $\chi^2$  was about (0.178) which is greater than 0.05,



which means acceptance of the null hypothesis shown in table (4):  
that the residuals are free of autocorrelation as

**Table 4. LM test results**

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.243700	Prob. F(2,17)	0.3133
Obs*R-squared	3.446319	Prob. Chi-Square(2)	0.1785

Source: Prepared by the researcher using EViews.10

**2- Heteroskedasticity test**

By adopting the Breusch –Pagan- Godfrey test to detect the problem of heteroskedasticity, the test showed that the significance of  $\chi^2$  was about (0.117) which is greater than 0.05,

which means that the residuals have homogeneous variation (homoscedasticity) and that the model does not suffer from the problem of heteroskedasticity, as shown in table (5).

**Table 5. Heteroskedasticity test**

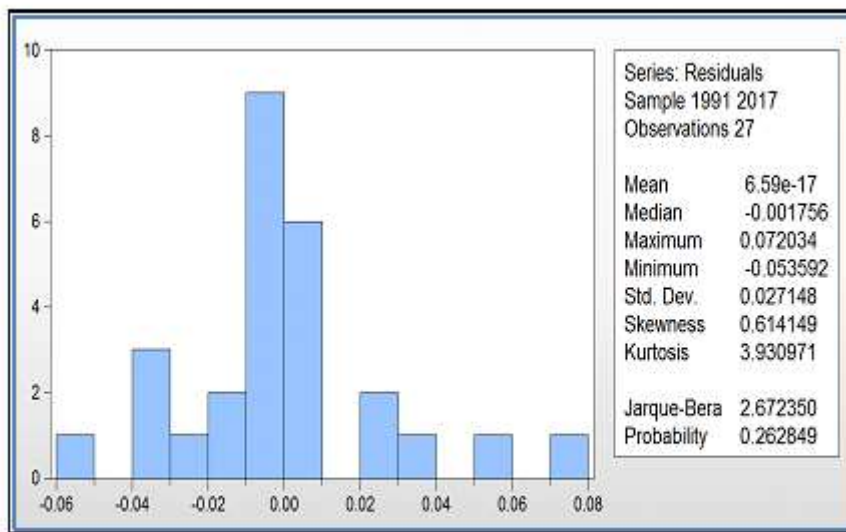
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	2.020033	Prob. F(7, 19)	0.1057
Obs*R-squared	11.52033	Prob. Chi-Square(7)	0.1175
Scaled explained SS	8.360378	Prob. Chi-Square(7)	0.3019

Source: Prepared by the researcher using EViews.10

**3- Test the normal distribution**

**of the random variable:** The JARQUE – BERA statistic was relied upon to test the normal distribution of the random variable, as its value reached (2.672) and at a significant

level (0.262) which is greater than 5%. This means accepting the null hypothesis that the random variable is distributed naturally and this is evident through Figure (1) .

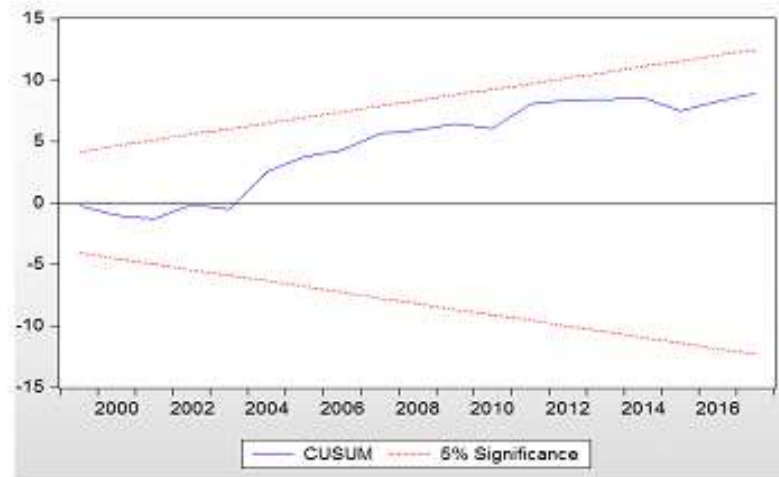


**Figure 1. Normal distribution test**

Source: Prepared by the researcher using EViews.10

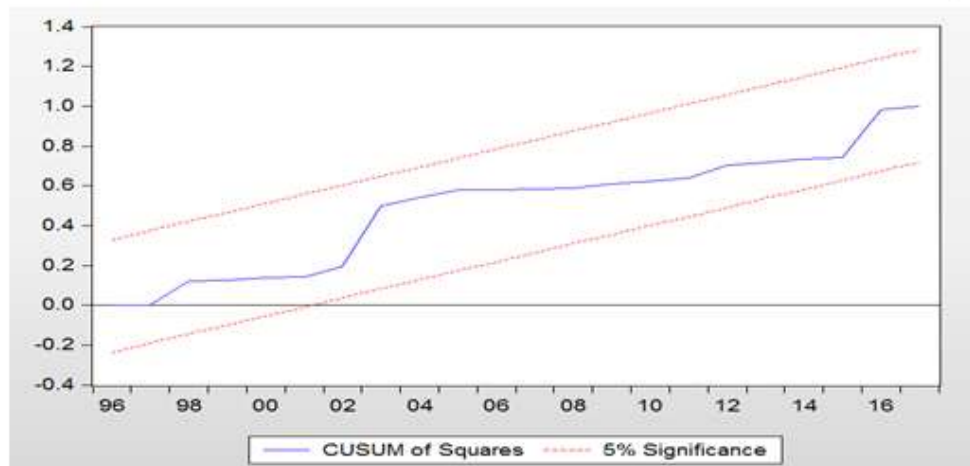
**4- Structural stability test for ARDL estimates**

For ARDL model parameter stability test using the CUSUM and CUSUMSQ tests shown in Figs (2) and (3).



**Figure 2. CUSUM test**

Source: Prepared by the researcher using EViews.10



**Figure 3. CUSUMSQ test**

Source: Prepared by the researcher using EViews.10

Figures (2) and (3) indicate that the ARDL model estimates are stable over time due to the fact that the graph falls within critical limits. The research concluded that The seriousness of the decline in the contribution of the agricultural sector to the gross domestic product is not measured only from an economic point of view, although the economy has a great importance in developing rural areas as the main reason for creating job opportunities and income there, but there are two effects that are no less important than the economic impact and they are important The effect of agriculture in slowing migration from rural to urban areas, which exacerbates the problems of poverty and unemployment therein, in addition to the importance of agriculture in preserving natural resources

(land, water, and vegetation) and preventing the deterioration of its properties if it does not exploit the optimal exploitation, also the policies adopted towards the agricultural sector have had a significant impact, and their negative effects have been reflected on the volume of demand for agricultural employment and the productive efficiency of agricultural labor, as these policies have led to the emergence of a parameter of agricultural GDP with a negative and moral significance, which is contrary to the logic of economic theory, and this means that increasing the agricultural domestic product leads to the employment of agricultural labor outside the country and the creation of unemployment within the country. In addition to, agricultural employment is directed to sectors with the greatest economic return and with less

physical exertion, such as services, with the aim of improving their income levels. Also the small volume of investments directed to the agricultural sector, as despite the investment amounts spent, there are deficiencies in the absorption of agricultural labor in the fields of multiple agricultural projects, and this may be due to an imbalance in the distribution of investments in the agricultural sector, this is what the agricultural investment parameter showed, about (0.04). Finally, one of the most important difficulties that hinder the spread of agricultural technology is the lack of awareness of farmers, the high price of the machine, as agricultural production in Iraq still depends on traditional methods of agriculture, and that the contribution of modern technology to production is still modest, which means the difficulty of applying this technology by cadres not eligible unless the human element is developed at the same time through knowledge, competence and training of the agricultural worker himself. Depending on the conclusions above, research is recommended to direct investments to develop human resources aimed at raising their efficiency by increasing the knowledge, skills and capabilities of the community's population in general and the rural population in particular in a way that suits the needs of the labor market and which contributes to building educated individuals through preparing advanced systems in this regard, as the worker The more skilled is more productive than the less skilled worker, and the educated individual is more productive than the illiterate individual. Also, encouraging the private sector to increase investments in various fields that would open new labor markets in order to accommodate the various types of unemployment found in the country's economic architecture. In addition to, the necessity for the state to pay more attention to agricultural investment in planning for development by increasing the share of investments in this sector from the total activities of the productive sectors in order to prevent deepening the apparent imbalances in the sectorial distribution of production. Applying and using modern technological methods and advanced mechanization and investing in dense agricultural projects using

the human labor component and the little use of the capital component to take advantage of the abundance of labor and the scarcity of capital in the agricultural sector, and the need to expand education and technical training centers to provide the skilled labor necessary to operate agricultural machinery at a high level efficiency. Also establishing appropriate agricultural policies for the real advancement of the agricultural sector in a manner compatible with the importance of this sector and working to increase domestic product, which would solve problems related to agricultural labor markets. Finally, Encouraging scientific research in order to help find practical solutions appropriate to the problems facing labor markets, and to search for how to find new job opportunities in a manner that does not contradict the benefit from modern technology, as scientific research in developed countries is mainly based on solving the outstanding problems effectively on the needs of the market, which, in turn, provides the necessary financing.

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