A Study of the Effect of Some Variables on Agricultural GDP in Libya

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Abstract

The study aimed to estimate the effect of some variables on agricultural GDP in Libya. An Autoregressive Distributed Lag (ARDL) during the period (1999-2019) was used. Initially Phillips Perron test is used and it concluded that agricultural GDP, agricultural capital formation (ACF), and agricultural labour are found stationary at first difference I(1). Since another variable namely agricultural area (ACA) is stationary at level I(0). For the co-integration test indicated that there is a co-integration between the study variables. The results of estimated coefficients in long run relationship reveal that the agricultural cultivated area and agricultural labour have a positive sign with agricultural GDP and non-significant influence. Likewise, agricultural capital formation is found to be a negative sign and not significant. In the short-run, the agricultural cultivated area and agricultural capital information have positively effect on agricultural GDP while, the labour coefficient has negative effect.

Keywords: Agricultural Cultivated Area; Agricultural Capital Formation; Agricultural Labour; Agricultural GDP; Con-integration; ARDL; Libya.

Introduction:

Agricultural is the largest sector in many developing countries. Most of the developing countries depend much upon the development of agriculture for their economic development in order to meet the demand for food and agricultural raw-materials, to earn foreign exchange for overhead investment and expansion of industries, to meet the growing demand for employment and to raise cash income of rural people to stimulate industrial expansion (Narasaiah and Suresh, 1999). Also, agriculture is an accelerator of the overall economic progress of the country (Yadav and Solanki, 2008).

The Libyan agricultural sector was the oldest and the main activity prior to the discovery of oil as a source of income by exporting some agricultural products and ingested 70% of the population in workforce (Al-Msalati, 2012). From discovery of oil onwards, the agricultural sector has been taken great attention during various agricultural development plans, it led to the reclamation of agricultural lands and extensive agricultural development included most of the country parts. These efforts have been made to achieve self-sufficiency in agricultural products, diversification of income sources to an increase in the contribution of this sector in the GDP, and consequently reduce the oil dominations in this GDP, where the contribution of agricultural GDP was 3.69% of the country's GDP in 2019 (Libyan Central Bank, 2022). In the field of migration and job creation, the Libya state sought to stop population migration by various means and development of villages and rural areas in the hope achieving reverse migration particularly migration from urban areas to the

rural areas and created an agricultural workforce, which was 6% of the total labor force in 2000 and 2.1 % in 2019 (Arab Monetary Fund, 2021).

Table (1):Share of Agriculture in GDP, Employment, and Export

Year	Share of Agriculture in GDP (%)	Share of Oil in GDP (%)	Share of Agriculture in Employment (%)	agricultural trade balance ($)
2000	8.17	37.8	6.0	-1679
2005	2.17	66.11	4.3	-774
2010	2.48	59.30	3.0	-2224
2015	3.80	22.14	2.4	-1885
2019	3.69	22.99	2.1	-1795

Source: Libyan Economic Bulletin (Various issues), Join Arab Economic Report (Various reports).

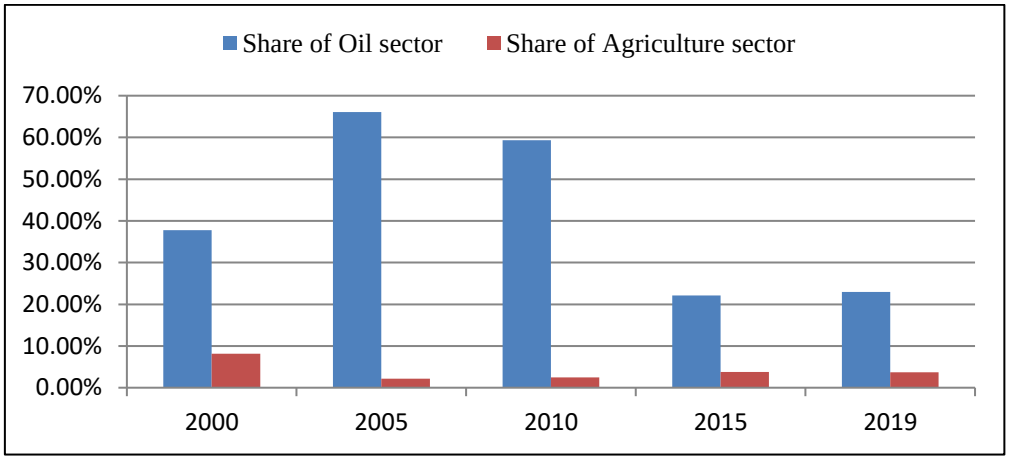


Figure (1): Share Agriculture in Libyan GDP.

Moreover, The Libyan government has put efforts to liberalize the agricultural sector through the development and diversification of export activity in order to improve the terms of trade for the benefit of the national economy that generates about 15 million dinars in 2019 of the country's foreign exchange (Arab Monetary Fund, 2021) to replace imported products and to achieve self-sufficiency in the production of goods locally. Finally, it provides raw materials for the industrial sector (Al-Lafi, 2018).

2. Research problem:

The agricultural sector is one of the productive sectors that depend on it to provide food commodities for Libyan nation, as well as providing job opportunities. In addition, its contribution to diversifying sources of income in the economy. From the 1960s onwards, the country focused on the agriculture sector for providing the food necessary for the Libyan population; as a result, income per capita increased from 3246.9 Libyan Dinar (LYD) in 2000 to 16864.01 LYD in 2019 (Libyan Central Bank, 2022). The financial allocations that obtained from the oil returns played a key role in the reconstruction of the agricultural sector by designing development plans to meet the growing demand for food and export wheel. Apart for that, the sector also provided employment to farmers in order to reduce migration to cities. In addition, agriculture has contributed to the diversification of Libyan national income; it is believed that this sector and others could reduce Libya's reliance on oil as the main source of income. Consequently, Libya strives to develop a reform program to balance population growth and provide food stocks by reducing the food deficit. However, this sector didn't respond to these goals, which its contribution to the Libyan GDP was a small margin 3.69% in 2019 (Libyan Central Bank, 2022). Over of that, this sector not achieving self-sufficiency in agricultural commodities, where the trade balance deficit was1795 million dollars (Arab

Monetary fund, 2021). Besides that, its contribution in total force work was 2.1 % in 2019 (Arab Monetary fund, 2021). Therefore, the research problem of the study lies in the weak contribution of agricultural GDP to the Libyan GDP. Thus, research is necessary for historical understanding by studying the effect of some variables on agricultural GDP.

3. Research Objectives:

The research is conducted to investigate the effect some variables on agricultural GDP through these specific objectives:-

1- Analysis trends of agricultural GDP and the variables affecting it during the period (2000-2019).
2- Investigate the short-run dynamic and long-run for some variables affecting the Libyan agricultural sector.

4. Research limitation:

This paper encountered obstacles represented in the lack of data on some variables such as agricultural loans, rains and other data due to stopped the Libyan government and international institutions on issuing these data after 2011, and the Libyan agricultural bank stopped granting agricultural loans after 2011 until now, which led to the non-use these variables in this paper.

5. Research method and data resources:

The research relied on the quantitative analysis method, using the ARDL model method. It also relied on secondary data during (1999-2019) issued by the bulletins and reports of the Libyan Central Bank, Ministry of Planning, Arab Organization for Agricultural Development, food and Agriculture organization (FAO), and Arab Monetary Fund reports. In addition, this study depended on the related literature review.

5.1. Model specification:

According to (Jha and Dhakal, 2020), (Odhiambo et al, 2004), and (Phiri, 2018) among all; the agricultural output function conventionally depends on the number of inputs to process the production operation. These include agricultural cultivated area, agricultural capital formation, and agricultural labors. In this research, agricultural GDP is used as a dependent variable. Therefore, the agricultural GDP is a function (f) of agricultural cultivated area, agricultural capital formation, and agricultural labors. The function relationship and the detailed specifications of the different variables included can be formulated as fallowing:

$$AGDP_t = \beta_0 + \beta_1 ACA_t + \beta_2 ACF_t + \beta_3 AL_t + e_t \quad (1)$$

where:

AGDP= Agricultural GDP;
ACA = Agricultural cultivated area;
ACF = Agricultural Capital Formation;
AL = Agricultural Labour;
e = error term; and
t = 1999, …, 2019

By converting Model No. (1) to logarithmic form, the model can be written in the following form: -

$$\ln Y_t = B_0 + B_1 \ln X_{1t} + B_2 \ln X_{2t} + B_3 \ln X_{3t} + \varepsilon_t \quad (2)$$

In addition, this study adopted one of the recent developed estimation method- the Autoregressive-Distributed lag ARDL approach which can be represented by the following equation:

$$\Delta lnAGDP = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta lnY_{t-1} + \sum_{i=0}^{n} \beta_2 \Delta lnACA_{t-1} + \sum_{i=0}^{n} \beta_3 \Delta lnACF_{t-1} + \sum_{i=0}^{n} \beta_4 \Delta lnAL_{t-1} +$$
$$+ \beta_5 lnY_{t-1} + \beta_6 lnACA_{t-1} + \beta_7 lnACF_{t-1} + \beta_8 lnAL_{t-1} + \varepsilon_t \quad (3)$$

where:

$AGDP$ = Agricultural GDP;
Δ = First Difference of Variable;
ln = Natural Logarithmic Transformation;
β_0 = Constant; and
ε_t = White Noise error term.

Besides that, a dynamic error correction model can be obtained from the ARDL model through a simple linear transformation; thus, the error correction version of the ARDL model can be expressed as fallowing:

$$\Delta AGDP_t = \alpha + \sum_{i=1}^{P} \beta_{1i} \Delta \ln AGDP_{t-i} + \sum_{i=1}^{P} \beta_{2i} \Delta lnACA_{t-1_{t-i}} + \sum_{i=1}^{P} \beta_{3i} \Delta lnACF_{t-1} + \sum_{i=1}^{P} \beta_{4i} \Delta \ln AL_{t-i} + \eta ECT_{t-1} + \quad (4)$$

where:

ECT = Error Correction Term
e_t = Disturbance Term

5.2. Definition of study variables:

Based on the availability of data, we considered three variables to explain the changes in Agricultural GDP as a dependent variable. These variables were agricultural cultivated area, agricultural capital formation, and agricultural labor.

5.2.1. Agricultural GDP

Agricultural gross domestic product (AGDP) refers to the total market value of all final various agricultural activities consist of the agricultural commodities and livestock which produced by the agricultural sector in a year. Agricultural gross domestic product is an important indicator of growth in the volume of production in agricultural sector. Agricultural gross domestic product is measured by market prices. It is measured in millions of Libyan dinars and AGDP used as a symbol for agricultural gross domestic product.

5.2.2. Agricultural Cultivated Area

Agricultural cultivated area refers to all land under the production of both seasonal and permanent crops plus pasture. It is meaning, the sum of land that is potentially cultivable during the study period. It is measured in thousand hectares and ACA used as a symbol for Agricultural cultivated area.

5.2.3. Agricultural Capital formation

Agricultural Capital formation (ACF) refers to net addition made to the existing stock of capital goods in a given period of time formation in agriculture comprises asset creation, directly and indirectly, for augmenting production. Land reclamation, preventing soil erosion, irrigation and flood control directly add to the existing stock of capital, inputs, such as equipment, animals, fertilizer, storage, transport and communication. Also, non-material goods like knowledge, technical skill and health of people. It is measured in million LYD and ACF used as a symbol for Agricultural Capital Formation.

5.2.4. Agricultural Labour

Agricultural Labour is the sum of the people who are acting in different crops, reaping the fruits, and conducting animal husbandry. It also helps in doing general business in the farm field by growing vegetables. It is measured in thousand workers and AL used as a symbol for agricultural labour.

Table (2): Variables of study and their measurement

Variable	Type	Symbol	Measurement
Agricultural Gross Domestic Product	Dependent	AGDP	Million LYD
Agricultural Cultivated Area	Independent	ACA	Thousand Hectares
Agricultural Capital formation	Independent	ACF	Million LYD
Agricultural Labor	Independent	AL	Thousand Workers

6. The results and discussion:-

6.1. Descriptive analysis of the study variables

Based on table 3 agricultural GDP increased from 1449.9 million LYD in 1999 to 2543.6 million LYD in 2010. Thereafter, agricultural GDP decreased to 572.4 million LYD in 2011, and then it reached to 3852.8 million LYD in 2019. Also, the table 4 shows that the mean of AGDP was 2072.42 million LYD, the minimum was 572.4 million LYD and the maximum was 3852.8 million LYD. The standard deviation was 935.44; it is lower than the mean. That is means that, the data are more reliable or clustered closely around the mean. The agricultural cultivated area increased from 1573 thousand hectares in 1999 to 2773 thousand hectares in 2013 and then decreased to approximately 2050 in 2019 with a mean of about 2433.38 thousand hectares, its minimum was 1360 thousand hectares, and the maximum was 2773 thousand hectares, whereas the standard deviation was 424.78.

In addition to that, it is noted from table 3# the value of agricultural capital formation was 257.5 million LYD in 1999 and increased to 1350.6 million LYD in 2002 and then decreased to 676.2 in2004 until it reached to 72.93 million LYD in 2019. that the values of agricultural capital formation increase and descreases from year to year; with mean of 617.71 million LYD, minimum of 37 million LYD and maximum of 1483 million LYD, while the standard deviation was 539.79. On top of that, the table shows that the agricultural labour decreased from 232 thousand workers in 1999 to 54.87 thousand workers in 2015. Thereafter, agricultural labour increased to 340.47 thousand works in 2016 and then decreased again. The maximum of workers was 340.47 thousand workers and the minimum of workers was 54 thousand workers with standard deviation 106.09.

Table(3): The values of the study variables during the period (1999-2019).

Year	Agricultural GDP (AGDP) Millions of LYD	Agricultural Cultivated Area (ACA) Thousand Hectares	Agricultural Capital Formation (ACF) Millions of LYD	Agricultural Labor (AL) Thousand Workers
1999	1449.9	1573	257.5	232.0
2000	1439.7	1632.86	508.7	239.1
2001	1392	2642	1483.2	104
2002	1348.8	2642	1350.6	101
2003	1375.8	2642	906.3	97
2004	1328.5	2642	676.2	93
2005	1447.5	2644	1226.7	91
2006	1643.1	2645	1126.6	89

2007	1905.3	2645	1126.6	87
2008	2247.9	2646.8	1142.08	87
2009	2382.7	2644	1164	84.8
2010	2543.6	2645	1185.9	82.9
2011	572.4	2646.1	125.22	60
2012	744.8	2646.3	231.768	57
2013	2244.2	2773	116.1181	54
2014	2469.2	2644	65.5412	54.16
2015	2832.4	2644	37.2118	54.87
2016	3057.1	2644	37.46826	340.47
2017	3522.3	1360	57.68747	334.41
2018	3720.9	2050	73.70619	329.23
2019	3852.8	2050	72.9306	324.63

Resources: Arab Monetary Fund. Annual Conjoined Arab Economics Report (Various reports), Arab Organization for Agricultural Development, Agricultural Statistics Yearbook, (Various reports), Food and Agriculture Organization of the United Nations, Faostat, https://www.fao.org/home/en, Libyan Central Bank, Economic Bulletin (Various Bulletins), and Ministry of Planning (2003) Economics and Social Transformation 1970-2000, Libya.

Table(4): Descriptive statistical analysis of the study variables

Variable	Mean	Maximum	Minimum	Std. Dev.
Agricultural Gross Domestic Product	2072.42	3852.800	572.4000	935.44
Agricultural Cultivated Area	2433.38	2773.00	1360.000	424.78
Agricultural Capital formation	617.71	1483.20	37.21180	539.79
Agricultural Labor	143.03	340.47	54.00000	106.09

Source: Author compilation from E-views version 12

6.2. Unit Root Tests Results

Unit root tests are important in examining the stationarity of a time series because non-stationary regressors invalidates many standard empirical results and thus requires special treatment; it can be said that the time series data is stationary if the mean and variance are constant in respect of time (Gujarati & Porter, 2010). Phillips-Perron (1988) unit root test has been employed for detect the stationary of the variables [(1)]. The PP unit root tests differ from the ADF tests mainly in how they deal with serial correlation as well as heteroskedasticity in the errors.

As given in table 5# the test results are found to have a different integrated order in Model. Series that weren't stationary in the level and became stationary in the first difference such as agricultural GDP, agricultural capital formation (ACF), and agricultural labour are found stationary at first difference I(1). Since another variable namely agricultural cultivated area (ACA) is stationary at I(0). Therefore, the variables are mix of integrated orders and no variables is integrated of order2 and it allows to estimating the (ARDL) model.

Table(5): Results of Unit Root Test for PP Tests

Variables	Level	First Difference	Decision
AGDP	-1.7503	-5.9867***	**1(1)**
ACA	-3.1317**	---------	**1(0)**
ACF	-0.8160	-4.5604***	**1(1)**

AL			-1.5175		-4.0805***			**1(1)**
Critical Values								
1%			-3.8085			-3.8315		
5%			-3.0206			-3.0299		
10%			**-2.6504**			**-2.6551**		

Source: Author compilation from E-views version 12
*** Indicates the rejection of null hypothesis at 1% level of significance.
** Indicates the rejection of null hypothesis at 5% level of significance.

6.3. Lag order selection

Prior to estimation, we determine potential number of lags to be included in the model with the help of AIC. The ARDL method estimate $(p+1)^k$ number of regressions to obtain the optimal lag length, with p being the maximum number of lags and K is the number of variables. The lag length in the variables is decided with the help of the Aikaike information criterion (AIC). In this research, the optimal model is selected on the basis of AIC in which it can be performed in a small sample (Enders, 2004). Following the AIC, the optimal lag for the model is two as shown in

[(1)]This is a test of stationarity (or nonstationarity) that has become widely popular over the past several years (Voumik et al., 2020).

table 6.

Table (6): VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-44.8930	NA	0.0020	5.1466	5.3464	5.1802
1	6.5665	75.8353	5.08e-05	1.4140	2.4081	1.5822
2	32.3480	27.1384*	2.40e-05*	-0.3844*	2.1738*	-0.6872*

Source: Author compilation from E-views version 12

Table # 6 reports lag-order selection statistics lag from Akaike's information criterion by an asterisk"*", this is lag with the smallest value of the criterion. Thus, optimal lag for our model is two and optimal ARDL model selection was (1, 2, 2, 2) as shown in figure (2).

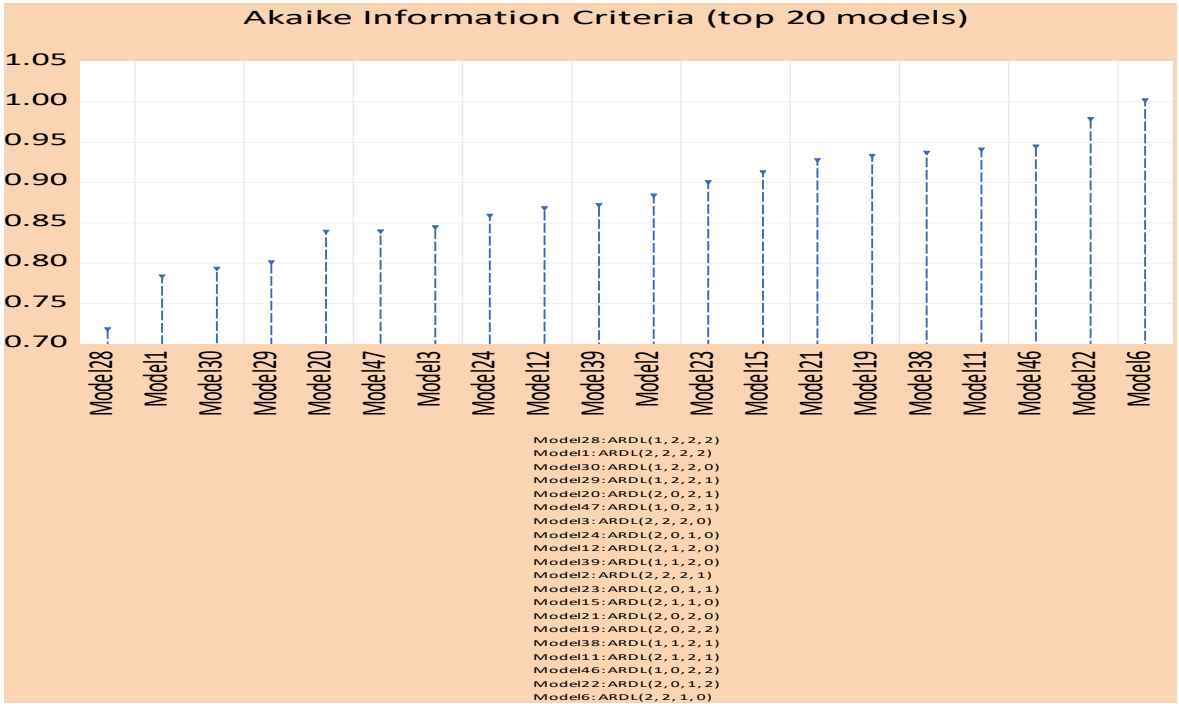


Figure (2): Optimal model selection

6.4. Bound Test Approach:

To investigate the presence of long-run relationships among the variables, the bounds testing procedure is utilized. The bound testing procedure is based on the F-statistic (Wald) to be considered whether there is long run relationship through co-integration approach. If the F-statistic is larger than the upper-bound critical value, then there is a long-run association among the variables. On the contrary, there is no long-run relationship if the F-statistic lies below the lower bound critical value and the test statistic lies between the lower and the upper limits, the result is inconclusive.

Table (7): Significance of F-test for Cointegration

Model AGDP= f (ACA, ACF, AL)	F- statistic = 4.2376	
Critical Value	Lower bound	Upper bound
10%	2.37	3.20
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

Source: Author compilation from E-views version 12

The results in Table 7 show that the (Wald) F-statistic value was (4.23) is greater than the lower bound critical value (3.67) at 5%. This illustrates further that a long-run relationship is exist. This implies the rejection of the null hypothesis of no cointegration among the variables. Therefore, the Bounds test confirms that there is a long-run association among the variables.

6.5. Results of the ARDL Approach:

Since the study results show that there is co-integration between the variables. Thus, the short-run and long-run will be estimate ARDL (1, 2, 2, 2). The ARDL long-run estimates for agricultural GDP model is shown in Table 8.

Table (8): Coefficients of Long-run estimation from ARDL results (1, 2, 2, 2)

Variable	Coefficient	T-ratio value	P- value
ACA	28.7366	{1.1154}	[0.2970]
ACF	-1.6729	{-1.2897}	[0.2332]
AL	3.9023	{1.0128}	[0.3408]
C	-224.8055	{-1.0651}	[0.3179]

Source: Author compilation from E-views version 12

Based on the above table 8#, the coefficient of agricultural cultivated area and agricultural labour are positive in the long-run but statistically not significant. Interestingly, the coefficient of the agricultural capital formation (ACF) variable is showing a negative sign and statistically not significant in the relationship with the agricultural GDP. The negative sign implies to disposals of fixed assets which can be either sold, surrender in barter or surrendered as capital transfer in kind. Disposals of fixed assets which are recorded as negative acquisitions and exclude consumption of fixed capital and exceptional losses, such as those due to drought or other natural disasters. In another viewpoint, the negative sign may be due to the large depreciation of capital assets during the production process. The negative sign result of (ACF) affirms or consistent with past studies, such as Aslan and Altinoz (2021) and Kanu and Emmanuel (2015).

With regard to the short-run results, they were shown that the coefficient of agricultural cultivated area (ACA) is positive and statistically significant at 1%. Thus, an increase in the ACA by 1% leads to an increase in AGDP by 3.80 %. As for the coefficient of agricultural capital formation (ACF), it is positive and statistically significant at a 1% level. Thus, an increase in agricultural capital formation (ACF) by 1% leads to an increase in AGDP by 0.48%. On the contrary, the agricultural

labour coefficient was found negative and significant at 10%. That is meaning, it has adverse effect on agricultural GDP, where an increase in agricultural labour by 1% leads to decrease in AGDP by 0.32%. This negative and unexpected sign occurs when there is an old labor force working in the agricultural field and the young labor force goes to work in the public sectors with a fixed salary. This result is consistent with Ongo and Vukenkeng (2014), Chang at el (2022) and Shahid (2014).

Table(9): Short-run estimation results and the Error Correction Model (1, 2, 2, 2)

Variable	Coefficient	T-ratio value	P- value
D(ACA)	3.8029	4.011***	0.0039
D(ACA(-1))	-2.0234	-4.165***	0.0031
D(ACF)	0.4868	5.210***	0.0008
D(ACF(-1))	0.5819	4.518***	0.0020
D(AL)	-0.3235	-2.135*	0.0653
D(AL(-1))	-0.5076	-2.215*	0.0576
CointEq(-1)*	-0.3339	-5.637***	0.0005

Source: Author compilation from E-views version 12

Note: The figures in {…} and […] refer to the t-statistics and probabilities, respectively. (*), (**) and (***) means statistically significant at 10%, 5%, and 1% level, respectively.

Whereas, the error correction coefficient has a highly significant 1% and the correct sign (negative), it shows that the speed back to equilibrium is 33.33 % and implies low speed of adjustment to equilibrium after a shock happens in the previous period it decreases by 33.33% in the current period.

6.6. Diagnostic tests:

The diagnostic and the stability tests will be conducted to determine the suitability of ARDL model as well as to serve for robustness check purposes. In addition, diagnostic and stability tests are utilized to ascertain the goodness-of-fit of ARDL model. The diagnostic checking consists of tests on serial correlation, normality as well as heteroskedasticity for the model.

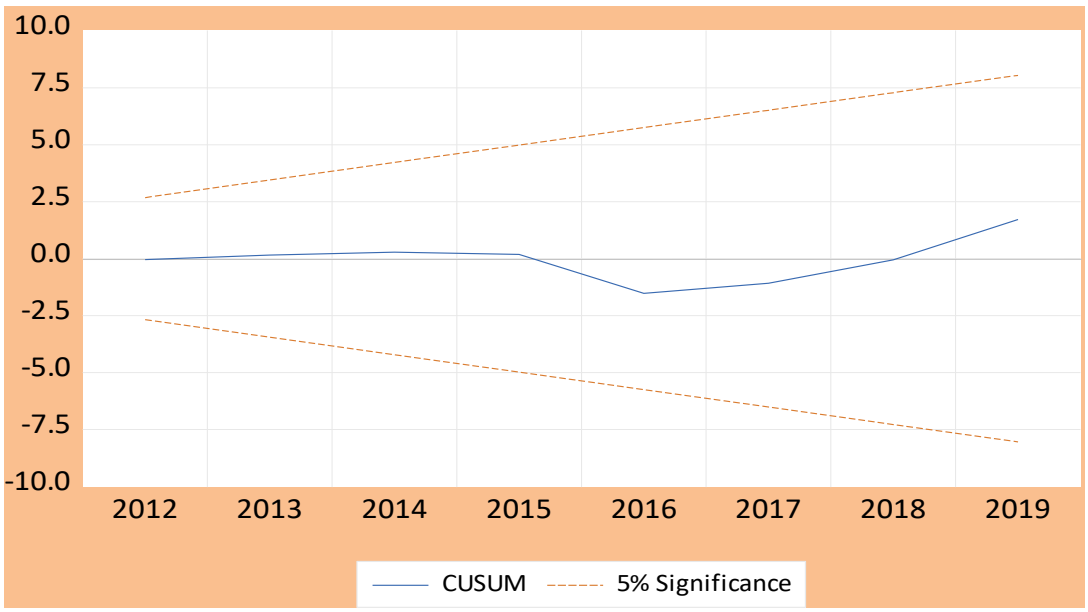
Table (10): Diagnostic test results

R^2	0.85
F	4.59
Serial correlation	2.74 [0.142]
Normality	0.947 [0.622]
Heteroscedasticity	0.229 [0.891]

Source: Author compilation from E-views version 12

Note: The figures in […] refer to the probabilities.

Besides that, stability tests are performed by utilizing the cumulative sum of recursive residuals (CUSUM) to examine if the obtained parameters are stable over time during the sample period of the study. As shown in table 10 # the R^2 was 0.85, which means that about 85 % of total change in agricultural gross domestic product is explained by the selected independent variables. As for the value of F, it was 4.59 and it imply to good fit of model. On the other hand, the serial correlation test, heteroscedasticity test indicate the model does not suffer from any problem and residuals are normally distributed.



Figure(3): CUSUM Stability test

Moreover, the stability test is done by the CUSUM test which it based on the cumulative sum of recursive residuals and it plotted with the 5% critical line. The instability parameter occurs when the cumulative sum lay outside the area between two critical boundaries line, revealing that the estimated parameters are stable over the period of study at the 5% significance level as shown in figure #5.

7. Conclusion and Recommendations:

The main objective of this research was to examine the effect of some explanatory variables on agricultural gross domestic product in Libya by using Autoregressive distributed lag (ARDL). The PP unit root test results revealed that the variables are stationary in I(0) and I(1) but no variables is integrated of order2. Meanwhile, the cointegration analysis result indicates that there is a long-run cointegration relationship among the variables.

In long-run estimation, the coefficients sign of agricultural cultivated area, agricultural labour variables were correct expected sign but not statistical significance. For the agricultural capital formation variable, its coefficient was negative related to the agricultural gross domestic product and not significant. As for the short- run estimate. The results clarified the effect of agricultural cultivated and agricultural capital formation is positively associated with agricultural GDP and significant at 1%. In another side, the labour coefficient has a negative effect on agricultural GDP and significant at 10%. Moreover, the error correction coefficient has a highly significant 1% with correct sign (negative), it shows that the speed back to equilibrium is 33.33 % and implies low speed of adjustment to equilibrium after a shock happens in the previous period it decreases by 33.33% in the current period.

The paper recommends a number of recommendations that will improve the participation of agricultural GDP, which is to maintain the integrity of capital assets during the production process. In addition to promote capital investments in the agricultural sector by private sector through saving that will be converted in to investment and government through monetary policy to enhance the agricultural GDP. Furthermore, increase labour skills of agricultural labor and encouraging the young agricultural workforce to work in this filed and providing fiscal support to them to reduce their transition to the public sector for a fixed income and resume granting agricultural loans since its suspension after 2011until now.

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دراســـة تاثير بعض المتغيـــرات علـى النـــاتج المحـــلي الزراعـــي في ليبيـــا

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الملخص :

هدفت الدراسة لتقدير تأثير بعض المتغيرات على الناتج المحلي الزراعي في ليبيا. تم استخدام نموذج الانحدار الذاتي للابطاء الموزع (ARDL) خلال الفترة (1999–2019). بينت نتائج اختبار فليبس بيرون للاستقرارية أن الناتج المحلي الإجمالي الزراعي (AGDP) والتكوين الرأس المال الزراعي (ACF) والعمالة الزراعية (AL) مستقرة عند الفرق الأول I(1). اما بالنسبة الى المساحة الزراعية (ACA) مستقر عند المستوى I(0). فيمايتعلق بإختبار التكامل المشترك أشارات النتائج إلى وجود تكامل مشترك بين متغيرات الدراسة. علاوة على ذلك بينت نتائج المعلمات المقدرة في العلاقة طويلة الاجل إلى أن المساحة الزراعية المزروعة والعمالة الزراعية لها تأثير إيجابي على الناتج المحلي الإجمالي الزراعي وغير معنوي احصائيا. من ناحية اخرى ، نتائج الدراسة وجدت أن تكوين رأس المال الزراعي ذو علامة سالبة بعلاقته بالناتج المحلي الإجمالي الزراعي وغير معنوي احصائيا. فيما يتعلق بنتائج الاجل القصير تبين ان المساحة الزراعية المزروعة و التكوين الراسمالي الزراعي اثرت بشكل إيجابي على الناتج المحلي الإجمالي الزراعي عند مستوى معنوية 1٪. اما متغير العمالة الزراعية له تأثير سلبي ومعنوي عند مستوى 10٪.

الكلمات المفتاحية: المساحة الزراعية المزروعة، التكوين الراسمالي الزراعي، العمالة الزراعية، الناتج المحلي الإجمالي الزراعي، التكامل المشترك، نموذج الانحدار الذاتي للابطاء الموزع (ARDL)، ليبيا.