Effect of Government Support on Agricultural production Growth and selected Macroeconomic Variables in Algeria

أثر الدعم الفلاحي ومتغيرات الاقتصاد الكلي على نمو القطاع الفلاحي في الجزائر

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***Abstract*:**
The paper aims to investigate the impact of government support and macroeconomic variables on agricultural production growth in Algeria annually data spanning the period 1987 to 2018, by employing the ARDL/ bounds test approach. The empirical results revealed the agricultural support has a negative Impact on agricultural growth in the short-run and long-run in Algeria, On the other hand the impact of macroeconomic variables on agricultural production is negative and positive in the short-run and long-run.

keyword: Government Support; Macroeconomic Variables; Agricultural production Growth; Ardl approach; Algeria
JEL classification code : C19,Q19,O49

ملخص: تهدف هذه الورقة البحثية إلى قياس أثر الدعم الفلاحي ومتغيرات الاقتصاد الكلي على نمو القطاع الفلاحي خلال الفترة من 1987 إلى 2018 ولتحقيق هذا المبتغى تم استخدام منهجية الانحدار الذاتي للفجوات الزمنية الموزعة المتباطئة (ARDL)، وتوصلت النتائج إلى أن للدعم الفلاحي أثر سلبي على نمو القطاع الفلاحي في المدى القصير والطويل، كما أن لمتغيرات الاقتصاد الكلي أثار سلبية وايجابية على نمو القطاع الفلاحي في المدى القصير والطويل

الكلمات المفتاحية : الدعم الفلاحي ؛ متغيرات الاقتصاد الكلي ؛ نمو القطاع الفلاحي ؛ منهجية ARDL ؛ الجزائر
تصنيف JEL: O49 ، Q19، C19

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1. Introduction :

The economic literature has recently been enriched by important contributions in the analysis of growth processes and agriculture.

Several authors have addressed the issue of the contribution of agriculture to economic growth by taking cases from a number of countries. We can quote (Mellor, J. W., 1966), (Lawrence W, 1965), (Eyo E, 2008) with the case of Argentina, (Kamil, S., & al, 2017) for Nigeria ; these authors have shown the existence of a very significant causal link between agriculture and economic growth and that in a first stage of economic development, which must go through economic growth, the use of agriculture is imperative. Also the contribution of agricultural sector to the economy cannot be overemphasized when considering its building roles for sustainable development, in terms of employment potentials, export and financial impacts on the economy. In the world today therefore, agricultural sector acts as the catalyst that accelerates the pace of structural transformation and diversification of the economy, enabling the country to fully utilize its factor endowment, depending less on foreign supply of agricultural product or raw materials for its economic growth, development and sustainability. Apart from laying solid foundation for the economy, it also serves as import substituting sector, providing ready market for raw materials and intermediate goods.

This study examines the impact ofgovernment support and macroeconomic variables toward agricultural productivity in Algeria. The specific aim of this study is to examine the short run and long run association between agricultural productivity and some key macroeconomic fundamentals in Algeria. Agricultural productivity is said to be one of the important sectors that can really contribute to economic growth. As we know, agricultural productivity is likely to be affected by the overall Agricultural support of the country. However, another factor such as macroeconomic indicator is also an important determinant of agricultural productivity. In addition, the changes of macroeconomic indicator directly come from implementation of monetary and fiscal policies that affect agricultural productivity. In this regard, this study will focus more on the agricultural growth and agricultural support and Selected macroeconomic variables. Accordingly, the following question is posed: To what extent agricultural support and macroeconomic variables have contributed to improving the growth of the agricultural sector.

1.1. The hypotheses of the study:

The agricultural support and Selected macroeconomic variables has a effect on agricultural growth

1. 2. The approach and objectives of the study:

This study followed a quantitative approach to test the existence of effects of Agricultural support and macroeconomic variables on Agricultural growth by using the Autoregressive distributed lag (ARDL) bounds approach for co- integration in order to test the long run relationship between the variables subject of study. and test the existence of Agricultural support hypothesis in Algeria during the period 1987-2018. The rest of the paper is organized as follows. Section 2 provides a brief review of the literature. Section 3 explains the model specification, data and methodology. Section 4 discusses the empirical results. Section 5 concludes the paper

2. Literature Review:

Many empirical studies have examined whether or not there exists a mutual relationship between agricultural growth, agricultural support . Some empirical studies found a direct relationship that comes from agricultural support and macroeconomic variables to stimulate the agricultural growth of a country. Other studies viewed the relationship between these variables from another aspect; particularly that agricultural support induces agricultural growth. However, still other studies found inconclusive results about this relationship. This difference in results is due to different economic conditions of different countries in addition to the studied period and the used variables.

(Ogunlesi, Ayodeji, 2018, p13) , examined dynamic relationships among fiscal, trade policies and agriculture productivity for 37 selected countries in SSA in the period of (1990-2016) through Panel Structural Vector Error Correction Model (PSVECM) method. Based on the analysis results, the findings reveal a temporary impact of both government expenditure and terms of trade; and a stable impact of crop production in the long run in SSA. The Johansen test reveal the presence of cointegration among the variables. Furthermore, The PSVECM analysis show that government expenditure does not have an immediate effect on terms of trade in the short run. The analysis further reveals that crop production has a temporary effect on government expenditure while terms of trade responds instantaneously to a transitory shock in government expenditure. In the long run, crop production and government.

(Noor, Z. T., & Shariff Umar Sh, A. K., 2015, p22) explored the effect of macroeconomic variables toward agricultural productivity in Malaysia, employing the autoregressive distributed lag (ARDL) cointegration test with error correction model (ECM) on an annual data from 1980 to 2014. The Ardl-ECM analysis show that there exist a negative long-run relationship between exchange rate and agricultural productivity. Conversely, the other variables do not have a significant impact on agricultural productivity in the long run. Based on the results of error correction model (ECM) approach, only net export, government expenditure, and interest rate are found to have a significant impact on the agricultural productivity in the short run while the rest of the variables do not show a significant impact upon agricultural productivity. Overall, we can conclude that the performance of the agricultural productivity in the short run seems to be influenced by macroeconomic variables, namely the net export, government expenditure and interest rate whereas only the exchange rate affects agricultural productivity in the long run.

(Jean J., & Laure L., 2016, p1), examines how subsidy payments influence farm productivity and technical efficiency in Norvège in the period of (1991-2006), The study is based on an unbalanced panel data from Norwegian; Furthermore, The data used in our meta-analysis consist of 195 observations (i.e. 195 distinct results about the effect of subsidies) extracted from a set of 68 studies which were carried out during the period 1991–2014. The studies were collected in March 2014 from a systematic review of the existing empirical literature on the links between public subsidies and farm technical efficiency.we use probit models to investigate the determinants of the sign of the coefficient associated with the subsidy variable. This was done by using the method of meta-analysis. Results show that subsidies negatively affected farm productivity but had a positive influence on technical efficiency. (Victor S., & Roman K , 2017, p1),employed the SVAR to examine the effects of fiscal policies upon agriculture and industry in Ukraine from 2001 to 2016 The result indicate a positive effect of the government spending on both agricultural production and industrial output, while an increase in the government revenue is of the same expansionary impact for the latter only. Among other results, withdrawal of government financial support could be harmful for both agriculture and industry. Assuming a possibility of the taxfinanced budget deficit, a higher tax burden seems not to be a big problem as a correspondent increase in the government revenue has no any restrictionary effect. However, the policy of higher government revenue and spending seems to bring about a nominal exchange rate depreciation which is likely to depress agricultural production in the short run.

(Adedoyin Isola L., & al, 2015, p15), examine the influence of fiscal policy on agricultural growth for Nigeria by using Error Correction Model (ECM) of data from 1981to 2013. The disaggregate analysis reveals that gross government expenditure has a negative effect on agricultural development; and that government expenditure on the agricultural sector has not succeeded in growing the sector because it had no direct effect on local farmers.The study recommended effective management of public agricultural spending and reduced agriculture export tax to support increased local agricultural production in the economy.

3. Agricultural support Policy in Algeria:

The transition to a market economy in the early 1990s significantly affected Algerian agriculture. In fact, the prices of imported agricultural inputs have increased significantly as a result of the abolition of subsidies and the liberalization of foreign trade. In addition, the BADR will significantly restrict the credits granted to farmers following the reform of the banking system by Law 90-10 of 14 April 1990 on money and credit. Finally, the placement of Algeria under the Structural Adjustment Program will further increase fiscal austerity resulting in a significant decrease in the budget allocated to agriculture. (Pluvinage, 1990) ; All of these elements had the main consequence of a trend of disinvestment in the agricultural sector. The Structural Adjustment

Program expired at the end of the 1990s and Algeria's financial situation improved significantly thanks to the increase in the price of oil. This allowed for the establishment of a project for the development of the agricultural sector through the National Agricultural Development Program, renamed the National Program for Agricultural and Rural Development in 2002. This program had for main axes the reconversion of soils (especially through the shifting of cereal crops to more favorable areas and land use under harsh conditions for less demanding uses such as rustic arboriculture, viticulture and small livestock); improving the productivity and productivity of work in strategic sectors (cereals, milk, potatoes); the extension of the irrigated area; land development through concessions in mountain areas, foothills, steppe lands and Saharan areas; the start.

The Agricultural and Rural Renewal Policy launched in 2009 is supposed to remedy these shortcomings. Broader and more ambitious than previous programs, this policy highlights the urgent need to revitalize Algerian agriculture in order to ensure food security but also to make it an engine of economic growth. The first phase of this policy is part of the 2010-2014 five-year plan. It is structured around an Incentive Framework and three main pillars: Rural Renewal, Agricultural Renewal and the Human Capacity Building and Technical Assistance Program. Rural Renewal aims to develop and improve living conditions in rural areas by meeting the needs of their populations in terms of employment, housing and servicing. This is indeed a sine qua non for a stable and sustainable development of agriculture threatened by the rural exodus and the continuous decline in the proportion of active agricultural labor force in the total active population. Agricultural Renewal focuses on the economic criteria of the agriculture sector. Its main objective is the modernization and intensification of production through an approach of integration and strengthening of upstream and downstream sectors. The third pillar, the PRCHAT, sets itself the goal of developing and upgrading the skills of all stakeholders. It focuses in particular on the modernization of agricultural administration techniques, a substantial investment in training and agricultural extension, Research and Development, as well as the strengthening of the health services of the agricultural sector. Unlike the three pillars, the Incentive Framework is exclusively the responsibility of the state. It concerns the improvement of the legislative measures, the public financing policy of the agricultural sector, the regulation of the markets as well as the monitoring of the mechanism of control and protection of the consumer (MADR, 2012). Figure 01; shows agricultural production growth in algeria. Agriculture contributed 12% to GDP in 2017, down from 8% in 2000.

4. Study Methodology :

This study aims to examine of the impact of government support and macroeconomic variables on agricultural production growth in Algeria using annual data over the period 1987-2018. The data is derived from Ministry of Finance Statistics and World Bank . The selected macroeconomic variables consist of the; Agricultural support (AS), trade openness (TO), exchange rate (EXC), financial development index (M2/GDP), government expenditure (GEXP), inflation rate (INF), government expenditure (GE), technical efficiency (TE). which classify as independent variables whereas dependent variable is agricultural productivity (AG). Following the empirical literature in the previous section , we formulated the following equation:

$$AG = f(AS, TR, EXC, INF, M2/GDP, GE, TE)……..(01)$$

By using the natural logarithmic transformation on Equation (01), we obtain the following specification:

$$\ln AG=\alpha_0 + \alpha_1 \ln AS + \alpha_2 \ln TR + \alpha_3 \ln EXC + \alpha_4 \ln INF + \alpha_5 \ln M2/GDP + \alpha_6 \ln GE + \alpha_7 \ln TE + \varepsilon_t …..(02)$$

To estimate equation (2) in the long run, we will use the ARDL model used by Pesaran and Shin (1999) and then extended by Pesaran et al. (2001), as the ARDL methodology does not require that the time series of the variables under study are not of the same rank, ie, both the I (0) and the I (1) Provided that the time series of the variables under study are not in the second difference I (2). The ARDL methodology is characterized by a set of characteristics that distinguish it from other standard methods. (Pesaran, M. H., & Shin, Y, 1998) ; (Gujarati, D. N., & Porter, D. C., 2009) All variables of the model are assumed to be endogenous.

- ✓ Bounds test method for cointegration is being applied irrespectively the order of integration of the variable.
- ✓ There may be either integrated first order I(1) or I(0).
- ✓ The short-run and long-run coefficients of the model are estimated simultaneously. An ARDL representation of equation (1) is formulated as follows:

$$\Delta LNAG_t = c + \alpha_1 LNAG_{t-1} + \alpha_2 LNAS_{t-1} + \alpha_3 LNTR_{t-1} + \alpha_4 LNEXC_{t-1} + \alpha_5 LNINF_{t-1} + +\alpha_6 LNM2/GDP_{t-1} + \alpha_7 LNGE_{t-1} + \alpha_8 LNTE_{t-1} + \sum_{i=0}^{p} \beta_{1i}\, \Delta LNAG_{t-i} + \sum_{i=0}^{p} \beta_{2i}\, \Delta LNAS_{t-i} + \sum_{i=0}^{p} \beta_{3i}\, \Delta LNTR_{t-i} + \sum_{i=0}^{p} \beta_{4i}\, \Delta LNEXC_{t-i} + \sum_{i=0}^{p} \beta_{5i}\, \Delta LINF_{t-i} + + \sum_{i=0}^{p} \beta_{6i}\, \Delta LNM2/GDP_{t-i} + \sum_{i=0}^{p} \beta_{7i}\, \Delta LGE_{t-i} + \sum_{i=0}^{p} \beta_{8i}\, \Delta LTE_{t-i} + break_t + \gamma_t + \varepsilon_t \quad 03$$

Where Δ denotes the first difference operator ; break is the dummy varaible that captures the regime change in the model, c is an intercept, t refers to time period in years from 1990 to 2018 and ε_t is the usual white noise residuals. The left hand side is the agricultural productivity (AG), the first until fourth expressions $(\alpha_1 - \alpha_8)$ on the right hand side correspond to the long run relationship.the remaining expressions with the summation sign $(\beta_1 - \beta_8)$ represent the short run dynamics of the model, to investigate the presence of long relationships among the (AS, TR, EXC, INF, M2/GDP, GE, ED), the lag (p) is determined using the VAR optimal model, which means that the lag minimizes the Akaicke (AIC), Schwarz (SIC) and Hannan-Quinn (HIC) information criteria.

After regression of Equation (03), the Wald test (F-statistic) was computed to differentiate the long-run relationship between the concerned variables, bound testing under Pesaran et al (2001) procedure is used , the bound testing procedure is based on the F test. The F test is actually a test of the hypothesis of on coinetegration among the variables against the existence or presence of cointegration among the variables denoted as : Ho: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 =$

$\alpha_7 = \alpha_8 =$ 0, i.e., there is no cointegration among the variables Ha : $\alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6 \neq \alpha_7 \neq \alpha_8 \neq 0$, i.e., there is cointegration among these varibles. Therefore, if the computed F-statistic is smaller than the lower bound value, then the null hypothesis is not rejected and we conclude that there is no long-run relationship between agricultural productivity and its determinants. Conversely, if the computed F-statistic is greater than the upper bound value, then agricultural productivity and its determinants share a long-run level relationship. On the other hand, if the computed F-statistic falls between the lower and upper bound values, then the results are inconclusive.

Once the null hypothesis of no cointegration is rejected, and cointegration is established, in the second step, the conditional ARDL long-run model that captures the long-run dynamic may be estimated as (04) where the orders of the ARDL(q1,q2, q3, q4,q5,q6,q7,q8) model are selected by using AIC.

$$\begin{aligned} LNAG_t = {} & c + \sum_{i=1}^{q1} \alpha_{1i} LNAG_{t-i} + \sum_{i=0}^{q2} \alpha_{2i} LNAS_{t-i} + \sum_{i=0}^{q3} \alpha_{3i} LNTO_{t-i} \\ & + \sum_{i=0}^{q4} \alpha_{4i} LNEXC_{t-i} + \sum_{i=0}^{q5} \alpha_{5i} LNINF_{t-i} \\ & + \sum_{i=0}^{q6} \alpha_{6i} LNM2/GDP_{t-i} + \sum_{i=0}^{q7} \alpha_{7i} LNGE_{t-i} \\ & + \sum_{i=0}^{q8} \alpha_{8i} LNTE_{t-i}\, break_t + \gamma_t + \varepsilon_t \ldots\ldots\ldots (04) \end{aligned}$$

Finally, the end step aims to estimate the error correction model for the short-run by using the ordinary least squares method and the AIC and SIC to select the order of the ARDL (p1, p2, p3, p4, p5,p6,p7,p8). This model may be written as follows:

$$\begin{aligned} \Delta LNAG_t = {} & c + \alpha_1 + \sum_{i=1}^{p1} \beta_{1i} \Delta LNAG_{t-i} + \sum_{i=0}^{p2} \beta_{2i} \Delta LNAS_{t-i} + \sum_{i=0}^{p3} \beta_{3i} \Delta LNTO_{t-i} + \sum_{i=0}^{p4} \beta_{4i} \Delta LNEXC_{t-i} \\ & + \sum_{i=0}^{p5} \beta_{5i} \Delta LNINF_{t-i} + \sum_{i=0}^{p3} \beta_{3i} \Delta LN\mathbf{M2/GDP}_{t-i} + \sum_{i=0}^{p4} \beta_{4i} \Delta LNGE_{t-i} + \sum_{i=0}^{p5} \beta_{5i} \Delta LNTE_{t-i} \\ & + \Delta break_t + \gamma_t + \mu ECM_{t-1} + \varepsilon_t \ldots\ldots\ldots (05) \end{aligned}$$

In addition, the stability of the error correction model (eq.05) was checked by the Cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests.

5. Study Results :

The results of the analysis are organized in a sequential order as first some importante descriptive stats are presented second the test of Stationary is applied through (ADF), we have to check for the lag selection criteria and in the end we examine the long-run relationship of the model through (ARDL) and short-run relationship of the variables through (ECM), and stability of the functions was also tested by CUSUM and CUSUMSQ.

The series for agricultural productivity, Agricultural support and trade openness are presented in the figure1.

5.1Result of Descriptive Statistics :

Table 1 in Appendice shows the summary statistics of the variables used in the study. There is significant variations in minimum and maximum values of different measures of exchange rate as in case of agricultural productivity minimum value is 0.845098 while maximum value is 1.115278, minimum value of exchange rate is 0.685742 and maximum value is 2.045206, minimum value of trade openness is 1.518514 while maximum value is1.886491. The variable which shows the maximum variation is Agricultural support which has lowest value 3.858898 and highest value 5.595218

5.2Result of Unit Root Test Results:

According to the Table 2 in Appendice, it is clear that 05 series , agricultural productivity (AG) exchange rate (EXC), financial development index (M2/GDP), inflation rate (INF), technical efficiency (TE) are stationary in first difference I(1), and Agricultural support (AS) and trade openness (TR) are stationary at level I(0). Therefore, the study variables are stationary in different levels of I (0) and I (1). These results confirm the possibility of applying the ARDL approach for co-integration.

5.3 Result of ARDL Bound Test

The next step is to conduct the ARDL bound test for cointegration, In order to verify a long-run relationship between the considered agricultural productivity (AG) and its determinants. To determine the lag structure for the regressors in the model, the ARDL(1, 0, 1, 1, 0, 1, 0, 1) model is chosen that minimizes the Schwarz criterion (SC). (Table 03 and figure2); presents several of the combination sets of lags,

including the selected one: (1, 0, 1, 1, 0, 1, 0, 1) . In two-step, the estimated ARDL(1, 0, 1, 1, 0, 1, 0, 1) model was used as basis for applying the bounds test to examine the lon-run cointegration relationship among agricultural productivity and its determinats. The results of the bounds test are presented in Table 04.

In Table 04; the results of the bounds cointegration test demonstrate that the null hypothesis of against its alternative is easily rejected at the 5% significance level, the computed F-statistic of 5,45 is greater than the lower critical bound value of 2.32 thus indicationg the existence of a steady state long-run relationship among agricultural productivity and its determinats.

5.4 Result of Long and short-Run relationship

In the fourth step. The long run results of ARDL method of estimation is displayed In Table 05 the long-term relationship among the variables is estimated through the OLS the coefficients obtained from the model are all significant and shows the long-run relationship of the variables. Also, Long-run results revealed a positive impact ofexchange rate (EXC), financial development index on agricultural productivity (AG).whereas Agricultural support (AS), and trade openness (TO),government expenditure (GE), technical efficiency (TE), inflation rate (INF), have a negatively impact on agricultural productivity (AG). This result is consistent with the finding of (Ogunlesi, 2018, p13) ; (Noor & Shariff, 2015, p22) ; . (Victor & Roman, 2017, p1), Moreso, the parsimonious model is free of serial correlation going by the value of the Durbin-Watson statistics of 1.96. The coefficient of determination (R-square) which was used to measure the goodness of fit of the estimated model, indicates that the model is reasonably fit in prediction, that is, 77.18 percent change in agricultural productivity (AG) was due to Agricultural support (AS), trade openness

(TO), exchange rate (EXC), financial development index (M2/GDP), government expenditure (GEXP), inflation rate (INF), government expenditure (GE), technical efficiency (TE) collectively, while 0.12percent unaccounted variations was captured by the white noise error term. It showed that Agricultural support (AS), trade openness (TO), exchange rate (EXC), financial development index (M2/GDP), government expenditure (GEXP), inflation rate (INF), government expenditure (GE), technical efficiency (TE) had strong and significant impact on the agricultural productivity (AG) in Alderia. The short run results of ARDL method of estimation is displayed in Table 06. The findings displayed a valid short run relationship between agricultural productivity (AG) and its determinats in Algeria. the coefficient of error term is displaying the value of around -0.92 propose that around 92% of instability is adjusted in the present year. Results also error correction coefficient (ECTt-1), is negative and significant at 5%, the coefficient indicates the adjustment speed to restore equilibrium in the dynamic model, that is the effect of a shock will be corrected by 92% with a year.

5.5 Result of Stability Test

The results of the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) of the standardized recursive residuals are used to check the stability of the ARDL error-correction model as proposed by (R. L. Brown, 1975). The plots of both CUSUM and CUSUMSQ statistics are provided in Figure 04. As it is clear from Figure. 04, the plots of both the CUSUM and CUSUM square within the boundaries and hence these statistics confirm the stability of the long run coefficients of regressors.

5.6 Result of Diagnostic Test

Normality test : to examine the normality of the model we used Jarque-Bera test the result of this test is shown in table 00; the result of Jarque Bera test shows that the value of the test is 0.45 and p-value is 0.79 which is greater that 0.05 that means we cannot reject the null hypothesis that sates the model is normally distributed Hence the estimated model is normally.

Test for serial correlation the existence of serial correlation is tested by Breusch-Godfrey Serail Correlation LM test the result of this test is shown in table 00; the result indicates that the p-value is greater than 0.05 that is no serial correlation.

6. Conclusion :

This paper has estimated the Effect of Government Support on Agricultural production Growth and selected Macroeconomic Variables in Algeria by using time series data from 1987-2018 by employing ARDL and Error Correction Model approach. The result of ARDL approach shows that an a positive impact ofexchange rate , financial development index on agricultural productivity .whereas Agricultural support , and trade openness ,government expenditure , technical efficiency , inflation rate , have a negatively impact on agricultural productivity. Based on the results of error correction model (ECM) approach, the agricultural support has a negative Impact on agricultural growth in the short-run in Algeria. Overall, we can conclude that the performance of the agricultural productivity in the short run seems to be influenced by macroeconomic variables, namely the Agricultural support , and trade openness ,government expenditure , technical efficiency , inflation rate whereas only the exchange rate affects agricultural productivity in the long run and short run. Based on these findings, it is therefore recommendedthat, The government should ensure the sustainability of the scheme by playing its specified roles as obligated, especially in the areas of timely subsidy payments to agro-dealers.

7. References :

Mellor, J. W. (1966). The Economics of Agricultural Development . *Journal of Farm Economics Vol49(02)* :

Lawrence, W.. (1965). Role of Agriculture in Economic Development: A Review. *Journal of Farm Economics Vol47(01)* :

Eyo, E. (2008). Macroeconomics environment and agricultural sector growth in Nigeria. *World Journal of Agricultural Sciences 4(6)* ;

Kamil, S., & al. (2017). The Contribution of Agricultural Sector on Economic Growth of Nigeria. *International Journal of Economics and Financial vol 7(01)* ;

Ogunlesi, Ayodeji (2018). Agricultural Productivity, Fiscal and Trade Policies Nexus in Sub-Saharan Africa: A Panel Structural Vector Error Correction Model Analysis. MPRA Paper No. 90202

Noor, Z. T., & Shariff Umar Sh, A. K. (2015). THE IMPACT OF macroeconomic variables towards agriculturel productivity in Malaysia. *South East Asia Journal of Contemporary Business; Economics and Law Vol8(03)* ;

Jean J., & Laure L. (2016). Effect of public subsidies on farm technical efficiency: a meta-analysis of empirical results2016*Applied Economics, Taylor & Francis (Routledge) vol 49(02)* ;

Victor S., & Roman., K,. (2017). modelling of fiscal policy effects on agriculture and industry in UK 2017*managementInformation Systems in Management vol6(02)* ;

Adedoyin Isola L., & al. (2015). Impact of Fiscal Policy on Agricultural Output in Nigeria. *European Journal of Educational and Development Psychology vol3(04)* ;

MADR. (2012, 05). Le renouveau agricole et rural en marche : revue et perspectives », MADR, mai 2012. *revue et perspectives*

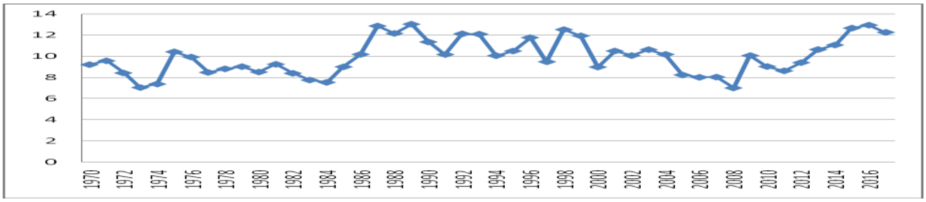
Pesaran, M. H., & Shin, Y. (1998). An autoregressive distributed-lag modelling approach to cointegration analysis . *(S. E. Strom Ed.). Cambridge, MA:Cambridge University Press.* , 1.

Gujarati, D. N., & Porter, D. C. (2009). *Basic Econometrics.* New York: 5th Edition McGraw Hill Inc.

Pluvinage, J. (1990). Contribution à l'analyse des premiers résultats de la réorganisation des exploitations agricoles algériennes . *(1987) Cahiers du CREAD n°23-24* ;

8. Appendices :

Fig.1; shows agricultural production growth in algeria



The source : Excel 10 output

Table 1 : Descriptive Statistics

	AG	AS	EXC	GE	INF	M2_GDP	TE	TR
Mean	1.01	4.77	1.66	10.6	0.74	1.76	0.12	1.75
Median	1.02	4.87	1.85	10.6	0.69	1.79	0.11	1.77
Maximum	1.11	5.59	2.04	11.0	1.50	1.92	0.17	1.88
Minimum	0.84	3.85	0.68	7.47	-0.52	1.51	0.04	1.51
Std. Dev.	0.07	0.57	0.38	0.61	0.43	0.11	0.03	0.08
Skewness	-0.55	-0.18	-1.46	-4.34	-0.33	-0.56	0.03	-0.76
Kurtosis	2.52	1.77	3.87	22.8	4.05	2.24	1.96	3.34
Observations	31	31	31	31	31	31	31	31

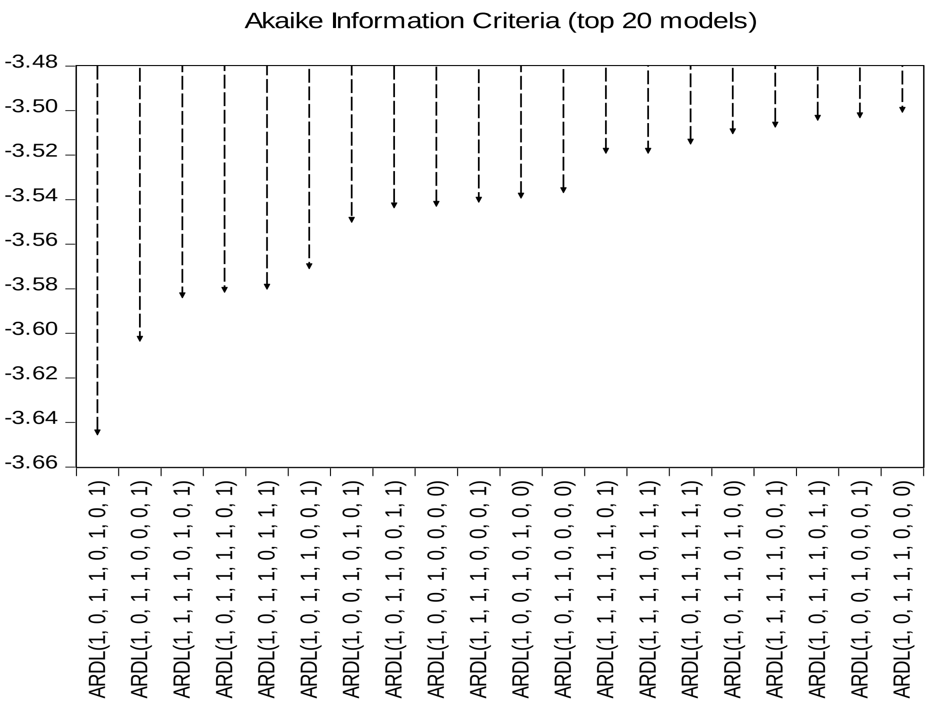
The source : Eviews 10 output

Table 2 : Unit root test;(ADF)

Variables	TR	TE	M2_GDP	INF	GE	EXC	AS	AG
Degree of integration	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(0)	I(1)

The source : Eviews 10 output

Fig.2 : The lag order selection by Akaike criteria



The source : Eviews 10 output

Table 3 :. The estimates of the ARDL(1.0.1.1.0) model.

Selected Model: ARDL(1, 0, 1, 1, 0, 1, 0, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
AG(-1)	0.073715	0.228864	0.322092	0.7513
AS	-0.016350	0.047689	-0.342845	0.7359
EXC	0.434659	0.159525	2.724714	0.0144
EXC(-1)	-0.274222	0.158537	-1.729708	0.1018
GE	-0.015482	0.015373	-1.007059	0.3280
GE(-1)	-0.032295	0.013889	-2.325258	0.0327
INF	-0.029480	0.028202	-1.045344	0.3105
M2_GDP	0.270958	0.215541	1.257106	0.2257
M2_GDP(-1)	0.327983	0.234762	1.397087	0.1804
TE	-1.002717	0.485491	-2.065368	0.0545
TR	-1.610170	0.367709	-4.378928	0.0004
TR(-1)	0.712293	0.365292	1.949931	0.0679
C	1.918692	0.622408	3.082694	0.0068

R-squared	0.866248	Mean dependent var	1.016640
Adjusted R-squared	0.771835	S.D. dependent var	0.070541
S.E. of regression	0.033695	Akaike info criterion	-3.644263
Sum squared resid	0.019301	Schwarz criterion	-3.037077
Log likelihood	67.66394	Hannan-Quinn criter.	-3.450019
F-statistic	9.175096	Durbin-Watson stat	1.962986
Prob(F-statistic)	0.000032		

*Note: p-values and any subsequent tests do not account for model selection.

The source : Eviews 10 output

Table 04. The results of the ARDL/bounds test.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	5.450859	10%	2.03	3.13
k	7	5%	2.32	3.5
		2.5%	2.6	3.84
		1%	2.96	4.26

The source : Eviews 10 output

Table 05. Results using ARDL Approach (Long and short-Run relationship)

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
AG(-1)*	-0.926285	0.228864	-4.047309	0.0008
AS**	-0.016350	0.047689	-0.342845	0.7359
EXC(-1)	0.160437	0.061566	2.605944	0.0185
GE(-1)	-0.047777	0.023711	-2.014988	0.0600
INF**	-0.029480	0.028202	-1.045344	0.3105
M2_GDP(-1)	0.598940	0.135375	4.424290	0.0004
TE**	-1.002717	0.485491	-2.065368	0.0545
TR(-1)	-0.897877	0.276053	-3.252555	0.0047
D(EXC)	0.434659	0.159525	2.724714	0.0144
D(GE)	-0.015482	0.015373	-1.007059	0.3280
D(M2_GDP)	0.270958	0.215541	1.257106	0.2257
D(TR)	-1.610170	0.367709	-4.378928	0.0004
CointEq(-1)*	-0.926285	0.118055	-7.846186	0.00000

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

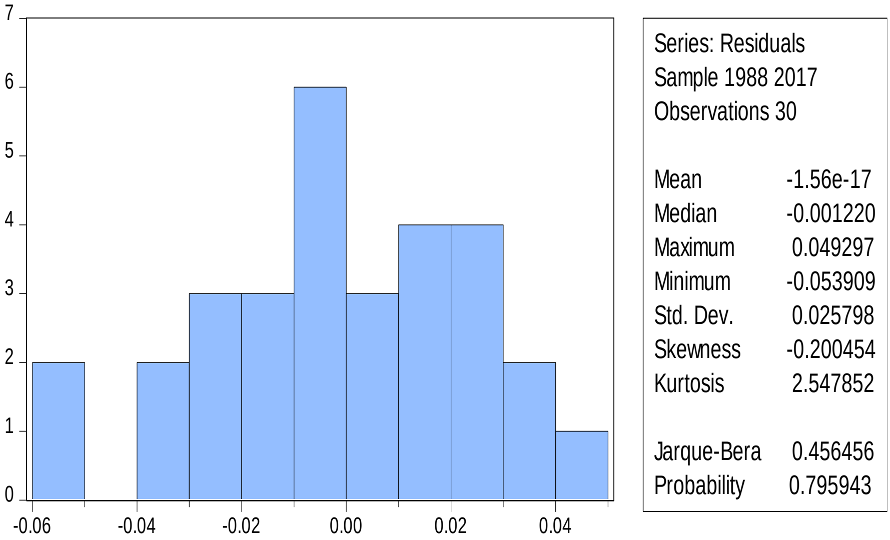
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
AS	-0.017651	0.049928	-0.353529	0.7280
EXC	0.173205	0.052815	3.279466	0.0044
GE	-0.051579	0.031589	-1.632824	0.1209
INF	-0.031827	0.030131	-1.056282	0.3056
M2_GDP	0.646605	0.191983	3.368027	0.0037
TE	-1.082515	0.631273	-1.714814	0.1045
TR	-0.969332	0.192078	-5.046541	0.0001
C	1.918692	0.622408	3.082694	0.0068

The source : Eviews 10 output

- **Fig 3. Plot of cumulative sum (CUSUM) and CUSUM of squares tests for the equation of CO2 emission**

The source : Eviews 10 output

Table 06 ; Resultd of Diagnostic Test



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.020189	Prob. F(1,16)	0.8888
Obs*R-squared	0.037807	Prob. Chi-Square(1)	0.8458

Heteroskedasticity Test: ARCH

F-statistic	2.960995	Prob. F(1,27)	0.0967
Obs*R-squared	2.866022	Prob. Chi-Square(1)	0.0905

The source : Eviews 10 output