

## Role of Agricultural Foreign Aid on Agricultural GDP of Nepal

Yogesh Ranjit<sup>1</sup>  
Lok Raj Dhungana<sup>2</sup>

### Abstract

*The paper mainly analyzed the trend and examined the role of agricultural foreign aid on agricultural GDP of Nepal. Although agricultural sector is taken as the backbone of Nepalese economy, its productivity is not at satisfactory level. Unless and until the market-oriented commercial farming and diversification of agriculture are initiated, the production and productivity of agriculture will not increase. But due to low national saving, it is possible only through foreign aids. Nepal started receiving foreign aid officially since 1951 from USA. The study used secondary data covering 19 years from the FY 1996/1997 AD to 2014/2015 AD. It is an analytical study using deductive method, coefficient of determinants, ARDL approach, ADF unit-root test, LM test, heteroscedasticity, Jarque-Bera statistics, and CUSUM test for short and long run effects of independent variables to the dependent variable. The study concluded that both real agricultural foreign aid and real agricultural GDP are fluctuating and the contribution of agricultural sector to GDP has continued to decline. Similarly, there is a positive impact of agricultural foreign aid on agricultural GDP. There is long run co integration between real agricultural foreign aid and real agricultural GDP. Therefore, the government of Nepal should focus on effective use of foreign aid in agricultural development.*

**Key Words:** Agricultural foreign aid; Agricultural GDP; Agricultural productivity; Auto-regressive distributed lag (ARDL) model; Co integration.

### Introduction

Nepalese economy is passing through structural changes. Contribution of agricultural sector to GDP has been gradually declining while that of non-agriculture sector has continued to rise. Contribution of agriculture sector to real GDP in FY 2000/01 stood at 36.6 percent that has come down to 33.1 percent in the FY 2014/15. Likewise, contribution of the non-agriculture has grown from 63.4 percent to 66.9 percent during the same time period (MoF, 2015). Despite agriculture sector is taken as the backbone of Nepalese economy, its productivity is not at satisfactory level.

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1 Dr. Ranjit is an Associate Professor at Central Department of Economics, Tribhuvan University, Kirtipur, Nepal. E-mail: yogeshr777@yahoo.com.

2 Dhungana is a Lecture at Goldengate College, Kathmandu, Nepal.  
E-mail: dhunganalokraj@gmail.com

It is being operated under traditional methods and subsistence farming. The yield from land is precariously low and peasants continue to live at a bare subsistence level. Similarly, the pressure of population on land has also led to fragmentation of land holding, disguised unemployment, outdated technology, insufficient land use pattern, using small amount of capital and thereby zero or even negative marginal productivity. So, not much can be achieved unless the population pressure on land is reduced and market-oriented commercial farming are initiated.

The Agricultural Perspective Plan (APP) of the Tenth Plan focused on commercialisation and diversification of agriculture by cultivating higher value crops, creating conducive environment for the participation of private sector and reducing poverty by increasing agriculture production and employment opportunities at the present situation of Nepalese economy (NPC, 2002). But due to low national saving, it is possible only through foreign aids. The attainment of the target rate of growth would require certain minimum imports of expensive capital goods and raw materials. Nepalese economy moreover is the manifestation of an acute disguised unemployment and subsistence farming with limited prospects for mechanization, where foreign aid has continued to play a vital role in sustaining the economy.

Foreign aid is the transfer of resources on concessional terms from one country to another in order to promote economic growth, development and social progress. In order to qualify foreign aid, Development Assistance Committee (DAC) and Organization for Economic Cooperation and Development (OECD) have set three criteria like - the purpose of aid should be to promote economic development and welfare; it should be undertaken by official agencies; and it should have a grant element of 25% or more. The economies of the least developed countries have been so marginalized that aid dependence of these countries is likely to persist well into the future. On the basis of its nature, foreign aid has been classified into capital aid which is provided in cash for the implementation of projects, commodity aid which is provided in the form of goods, and technical aid that includes technology and training etc. The foreign aid is made either in the form of grant or loan. The continuity in the aid flows from capable or developed to the weak or developing countries since the Second World War.

Nepal started receiving foreign aid officially since 1951 with a 'Technical Co-operation Agreement' between Nepal and United States of America under the point four programmes with the United States Agency for International Development (Dhital, 2013). Since, then foreign aid began to flow to Nepal from bilateral and multilateral agencies. The strategic location of Nepal between India and China and its non-aligned friendly relations with all countries, including the two super powers helped to increase the volume of aid from 'Trickle' to 'Torrent' after 1956. After late 1970's, Nepal has been receiving foreign aid mostly from Nepal aid group like Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Saudi Arabia, Sweden, Switzerland, United Kingdom, United States of America, and many multilateral donors like World Bank, Asian Development Bank, and International Monetary Fund etc.

### **Review of Literature**

WRBR (2011) analyzed that agricultural sector has remained a significant contributor to the Nigerian economy especially in terms of national income, output and employment generation. The study reveals that despite there is a positive relationship between gross

domestic product (GDP) and foreign direct investment (FDI) on Agriculture, Nigerian agricultural sector is still characterized by low yields.

Islam (2011) stated that the share of agriculture in total GDP in low income countries has declined over the years due to decrease in foreign aid in agricultural sector over time period. The author pointed out that the donors were increasingly providing assistance to improve institutional and human capital so that they can implement agricultural programmes effectively. Therefore, it is necessary to examine the decline foreign aid in agricultural sector in the context of assistance to institutional building. So, the national government, local governments and agricultural agencies can design, experiment and select projects that suit the local circumstances.

Alabi (2014) has found that foreign aid in agricultural sector has a positive and significant role on agricultural GDP and agricultural productivity. The study also reveals that bilateral foreign aid is more influences than multilateral foreign aid in agricultural productivity while multilateral foreign aid influences more than bilateral foreign aid in agricultural GDP. The findings of the study indicated that it is not only the amount but also the nature, origin, and purpose of foreign aid that could play a different role in agricultural sector.

Norton, Ortiz and Pardey (1992) concluded that, since 1970, foreign aid to agricultural sector has improved and also effective in agricultural productivity in the Middle East and Latin America. Additional results suggest that effectiveness of foreign aid did not vary by income level of the country.

Basnet (2002) concluded that there is a significant and positive relationship between foreign aid and agricultural GDP. A comparison is made before (1978/79-1989/90) and after (1990/91-2002/03) restoration of democracy in Nepal. The study found that elasticity, productivity and utilization of foreign aid in agricultural sector are better after the liberalization period than before.

Poudel (2006) stated that national policy, politics and political strategies have been the major determining factors for the inflow of foreign aid in Nepal. In addition, the priorities of donors, their interest and complexities have also been attributed to low absorptive capacity of foreign aid in Nepal. However, the empirical results revealed that there is a positive and significant role of foreign aid in agriculture to agricultural GDP of Nepal.

Most of given reviews examined the effectiveness of foreign aid in agricultural sector on Nepalese economic through OLS technique that only shows the short run effects. But, the study used the time series techniques of co integration through ARDL approach that shows both of short run dynamics as well as long run effects (linkages).

### **Objectives**

The main objective of the study is to examine the role of foreign aid in agriculture on agricultural GDP of Nepal. However, the study attempts the following specific objectives:

- a. To analyze the trend of agricultural foreign aid and agricultural GDP of Nepal.
- b. To examine the role of agricultural foreign aid and agricultural GDP of Nepal.

### **Hypothesis**

Considering the objectives of the study, the following hypothesis has been tested:

$H_0$  : There is no significant role of foreign aid in agriculture on agricultural GDP in Nepal.

$H_1$  : There is a significant role of foreign aid in agriculture on agricultural GDP in Nepal.

## **Research Methodology**

### **Research Design**

The main attempt of the study is to analyze the trend and examine the role of agricultural foreign aid on agricultural GDP of Nepal. The study is analytical as well as descriptive in nature. It is explanatory research using deductive method of study. Secondary data is fully used for data analysis. This study used ARDL approach proposed by Pesaran and Shin (1997) for short and long run effects of independent variables to the dependent variable.

### **Nature and Sources of Data**

The study is fully based on secondary data and information. Time series data is used in the study that have been collected from various published documents like budget speech, economic surveys, quartile economic bulletin, plan documents, national accounts of Nepal etc. published by various institutions like Ministry of Finance, Nepal Rastra Bank, National Planning Commission, and Central Bureau of Statistics, and.

### **Study Period Covered**

This study covered 19 years from the FY 1996/1997 AD to 2014/2015 AD. Because the data related to foreign aid in agriculture sector of Nepal is systematically recorded only from FY 1996/97.

### **Tools and Method of Data Collection**

The required data and information were collected by the researchers themselves by visiting concerned institutions from various published sources like Quarterly Economic Bulletin (NRB), Banking and Financial Statistics (NRB), Government Finance Statistics (NRB), Economic Survey Reports (MoF), National Accounts of Nepal (CBS), Statistical Year Book of Nepal (CBS), Statistical Pocket Book (CBS), International Monetary Fund, Red book (MoF) and World Bank Data Bank are the major sources of data and information for the study.

### **Data Organization and Processing**

The collected data and information were organized in different groups and sub-groups and processed as per the objectives and hypothesis of the study. Foreign aid in agricultural sector, agriculture GDP, government expenditure on agriculture, and foreign direct Investment (FDI) in agriculture in nominal term were converted into real term by dividing the nominal value by GDP deflector.

### **Tools and Method of Data Analysis**

Different types of statistical and econometric tools were used for data analysis and interpretation like tables, graphs, percentage, ratio, simple average, correlation, regression, coefficient of determinants, adjusted coefficient of determinants, multiple log-linear regression analysis, Auto Regressive Distributed Lag (ARDL) Model, Augmented Dickey-Fuller (ADF) unit-root test, diagnostic tests by using Breusch-Godfrey test (LM test) for serial correlation, Breusch-Pagan-Godfrey test of heteroscedasticity, Jarque-Bera (J-B) statistics of autocorrelation, and also CUSUM test.

**Specification of Models and Variables**

The study used a multiple log linear regression in which agricultural GDP is taken as dependent variable and foreign aid in agriculture is used as core independent variable whereas government expenditure on agriculture (GE<sub>t</sub>) and foreign direct investment (FDI<sub>t</sub>) on agriculture are taken as counter independent variables that can be shown as -

$$Y_t = f(FA_t, GE_t, FDI_t)$$

Taking natural log on both sides, the equation becomes

$$\ln Y_t = \alpha + \beta_1 \ln(FA_t) + \beta_2 \ln(GE_t) + \beta_3 \ln(FDI_t) + e \dots\dots\dots (1)$$

Where,

- Y<sub>t</sub> = Agriculture GDP in time period ‘t’
- FA<sub>t</sub> = Foreign aid in agriculture in time period ‘t’
- GE<sub>t</sub> = Government expenditure in agriculture in time period ‘t’
- FDI<sub>t</sub> = Foreign direct investment in agriculture in time period ‘t’
- ‘e’ = Error term
- α = Constant

β<sub>1</sub>, β<sub>2</sub> and β<sub>3</sub> = Coefficients of independent variables.

The study also used ARDL model (Pesaran & Shin, 1997) in order to test the existence of long run relationship with the help of given equation no. (2).

$$\Delta \ln Y_t = a_0 + \sum_{j=1}^p b_j \Delta \ln Y_{t-j} + \sum_{j=0}^q c_j \Delta \ln FA_{t-j} + \sum_{j=0}^r d_j \Delta \ln GE_{t-j} + \sum_{j=0}^s e_j \Delta \ln FDI_{t-j} + \gamma_1 \ln Y_{t-1} + \gamma_2 \ln FA_{t-1} + \gamma_3 \ln GE_{t-1} + \gamma_4 \ln FDI_{t-1} + e_t \dots\dots\dots (2)$$

Where,

- γ<sub>1</sub>, γ<sub>2</sub>, γ<sub>3</sub>, γ<sub>4</sub> = Long run coefficients of Y<sub>t</sub>, FA<sub>t</sub>, GE<sub>t</sub>, and FDI<sub>t</sub> respectively.
- b<sub>j</sub>, c<sub>j</sub>, d<sub>j</sub>, e<sub>j</sub> = Short run dynamics of Y<sub>t</sub>, FA<sub>t</sub>, GE<sub>t</sub>, and FDI<sub>t</sub> respectively
- and e<sub>t</sub> = Random disturbance terms respectively.

The use of ARDL model for cointegration analysis provides many advantages like it can be applied on a time series data irrespective of whether the variables are I (0) or I (1) (Pesaran & Shin, 1997); it takes sufficient number of lags to capture the data generating process in a general-to-specific modeling framework (Laurenceson & Chai, 2003); a dynamic Error Correction Model (ECM) can be derived through a simple linear transformation (Banerjee et. al., 1993).

**Data Presentation and Analysis**

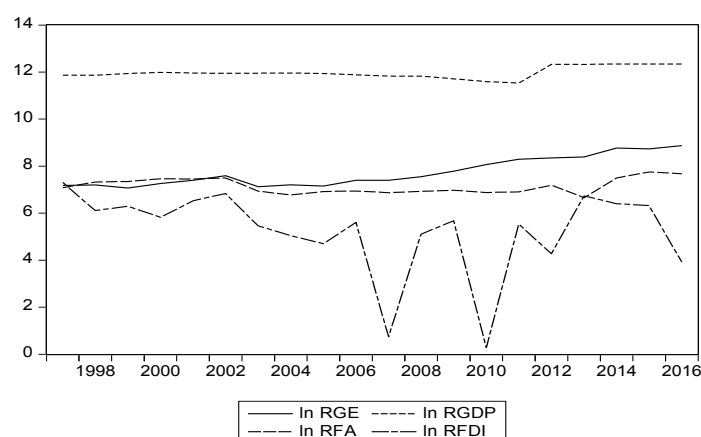
In this model, real agricultural GDP (RGDP) is the dependent variable and real foreign aid in agricultural (RFA), real government expenditure in agriculture (RGE) and real Foreign Direct Investment (RFDI) in agriculture are explanatory variables.

**Time Series Properties of the Variables**

The underlying assumption of ARDL procedure is that each variable in the model is I (1) or I (0). Thus, there is no need to check whether the variable is I (0) or I (1). However, if any variable is integrated of higher than order one, then the procedure is not applicable because if

any variable is I (2) or of some higher order, the table values given by Pesaran and Shin (1997) do not work. Thus, it is still necessary to perform unit root tests to ensure that none of the variables in equations is I (2) or higher order. Augmented Dickey-Fuller (ADF) unit-root test has been applied to test the order of integration of the variables. Before conducting the ADF test, an attempt is made on whether to include the trend as a variable in the ADF regression or not. To confirm this, the time series plot of the variables has been presented in Fig.1

Figure 1: Time Series Plot of Variables



The time series plot in Fig. 1 shows that ln RGE is trended variables whereas ln RFDI, ln RGDP and ln RFA are not trended. So, a trend is included in the ADF test for ln RGE. Since ln RFDI, ln RGDP and ln RFA have no trend only intercept is included while testing their order of integration.

Table 1: Results of the ADF Test

Description	Variables	ADF	Conclusion
<b>Levels</b>	ln rgdp	- 1.42	Non-Stationary
	ln rfa	-1.79	Non-Stationary
	ln rfdi	-4.11*	Stationary
	ln rge	-1.69	Non-Stationary
<b>First differences</b>	$\Delta$ ln rgdp	-4.24*	Stationary
	$\Delta$ ln rfa	-5.12*	Stationary
	$\Delta$ ln rge	- 4.63*	Stationary

Note: \*Represents the rejection of null hypothesis at 5% level of significance.

From the results in table 1, it becomes clear that none of the variables are integrated of higher than order one. All the variables are at most integrated of order one. To confirm the order of integration of the variables besides ADF test, the autocorrelation function for each variable has been examined which leads to the conclusion that the variables ln RGDP, ln RGE and ln RFA are integrated of order one or are I (1) processes whereas the variable ln RFDI is integrated of order zero or are I (0) processes. If the auto correlation coefficient starts with a high value and diminishes slowly, the variables are non-stationary processes at level. Since, the variables are of mixed order; the ARDL modeling will be the most appropriate approach for this analysis.

### Estimation of Results

Since the main objective of the study is to check the long run co integrating relationship between the variables included in the model and check the stability of the model, such long run relationship and stability test is made first. As this study follows the Auto Regressive Distributed Lag (ARDL) model developed by Pesaran and Shin (1997), the bounds test (F-statistics) has been applied to justify the existence of the co integration or long-run relationship among variables in the system. Table-3 provides the results of the F-statistics according to various lag orders.

**Table 2: Result of Bound Test**

ARDL Bounds Test		
Null Hypothesis : No long-run relationship exist		
Test Statistic	Value	K
F-statistic	8.02	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

The table 2 shows that the F-statistics are above the upper bounds of the critical values (CV) of standard significance levels (1% or 2.5% or 5 % or 10%) provided by Pesaran and Pesaran (1997). On the basis of these critical values, the calculated F-statistics clearly rejects null hypothesis of no co integration at 1% or 2.5% or 5 % or 10% level of significance. These values support the existence of co integration or long-run relationship between variables in the equation.

In the second step, equation (2) is estimated and different model selection criteria are used to justify the lag orders of each variable in the system. Only an appropriate lag selection criterion will be able to identify the true dynamics of the model. The maximum lag order is set to 2 following Pesaran and Shin (1997) and Narayan and Smyth (2004) as the data are annual and there are only 20 observations. With this maximum lag order, the adjusted sample period for analysis becomes 1999 to 2016. This setting also helps save the degree of freedom, as our available sample period for analysis is quite small. Using Eviews-9, all the selection criteria have given the same results. Eviews runs the  $(p + 1)^k$  numbers of regressions and selects the best model, where  $p$  is the maximum number of lags to be used and  $k$  is the number of variables in the equation. Here then number of regressions to be run are  $(2 + 4)^3 = 125$ . The ARDL (2, 2, 1, 0) model is selected on the basis of all criteria like Adjusted  $R^2$ , Schwarz Bayesian Criterion (SBC), AIC and SBC perform relatively well in small samples, although the SBC is slightly superior to the AIC (Pesaran and Shin, 1997). Besides, SBC is parsimonious as it uses minimum acceptable lag while selecting the lag length and avoid unnecessary loss of degrees of freedom. Therefore, SBC criterion has been used, as a criterion for the optimal lag selection, in all co integration estimations. After selecting the appropriate lag orders for each variable in the system, equation (2) is re-estimated. The results of such estimation along with the short run diagnostic statistics are presented in table 3.

**Table 3: Results of the Co integration Test**

ARDL Co integrating And Long Run Form				
Dependent Variable: ln RGDP				
Selected Model: ARDL (2, 1, 0, 2)				
Co integrating Form				
Variables	Coefficients	Std. Error	t-Statistic	Prob.
D(ln RGDP(-1))	0.81	0.27	3.05	0.01
D(ln RAID)	0.77	0.20	3.93	0.00
D(ln RFDI)	-0.02	0.02	-1.02	0.33
D(ln RGE)	-0.67	0.20	-3.31	0.01
D(ln RGE(-1))	-0.54	0.20	-2.78	0.02
Co integration Eq <sup>n</sup> (-1)	-1.07	0.21	-5.15	0.00
Coint. eqn = ln RGDP - (0.31*ln RAID - 0.02*ln RFDI + 0.19*ln RGE +8.50)				
Long Run Coefficients				
Variables	Coefficients	Std. Error	t-Statistic	Prob.
C	8.50	0.75	11.30	0.00
ln RAID	0.31	0.11	2.70	0.02
ln RFDI	-0.02	0.02	-1.03	0.33
ln RGE	0.19	0.07	2.87	0.02

Once co-integration is established the conditional ARDL long-run model for ln RGDP can be estimated and the result is presented in table-4. The constant term is statistically significant at 1 percent level whereas the variables ln RAID and ln RGE are only significant at the level of 5 percent. The variable ln RFDI is insignificant. Agricultural foreign aid taken separately has positive impact on RGDP, one percent increase of agricultural foreign aid results in 0.31% increase in RGDP. Similarly, the coefficient of ln RGE is 0.19 which indicates that one percent increase in ln RGE results in 0.19% increase in RGDP.

Similarly, short run coefficient of ln RGDP (-1), ln RAID, ln RGE, ln RGE (-1) are significant at the level of less than 5 percent. The variable ln RFDI is insignificant. There is positive lagged effect of agricultural GDP in short run. The coefficient of RGDP (-1) is 0.81 which indicates one percent increase in previous year agricultural GDP results in 0.81% increase in RGDP of current year. The short run coefficient of RGE is - 0.67 which indicates that one percent increase in RGE results in 0.67% decrease in RGDP. The negative impact of government expenditure on GDP may be due to high recurrent expenditure whereas the capital expenditure is low.

The lagged effect of RGE on RGDP is also found to be negative in short run. The coefficient of RGE (-1) is - 0.54 which indicates, one percent increase in previous year agricultural GE results in 0.54% decrease in RGDP of current year. Finally, the short run effect of agricultural foreign aid on agricultural GDP is also positive. One percent increase of RAID results in 0.77% increase in RGDP.

The coefficient on the lagged error-correction term is highly significant at one percent level of significance with the expected sign (negative sign), which confirms the result of the bounds test for co-integration. Its value is estimated to 1.068180 which implies that approximately 1.07% of disequilibria from the previous year's shock converge back to the long-run equilibrium in the current year.



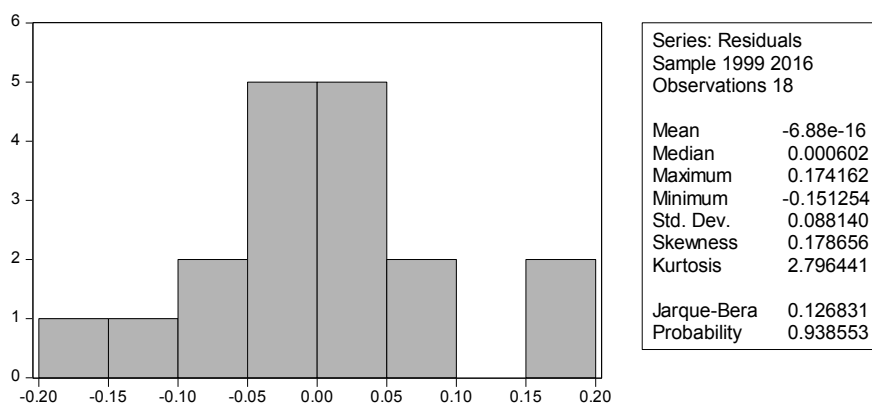
### Diagnostic Tests

**Breusch-Godfrey Test:-** It is popularly known as the LM test for serial correlation showed that observed  $R^2$  is 2.122083 with probability of 0.3461. This probability is more than 5% so, we cannot reject null hypothesis. This indicates that there is no serial correlation in the model.

**Breusch-Pagan-Godfrey Test of Heteroscedasticity:-** It is used to test the variance of error terms of autocorrelation free equation. The results showed that the observed R squared statistics equals to 10.96 and a probability of 20.39 percent. This result indicates that the residuals are homoscedastic.

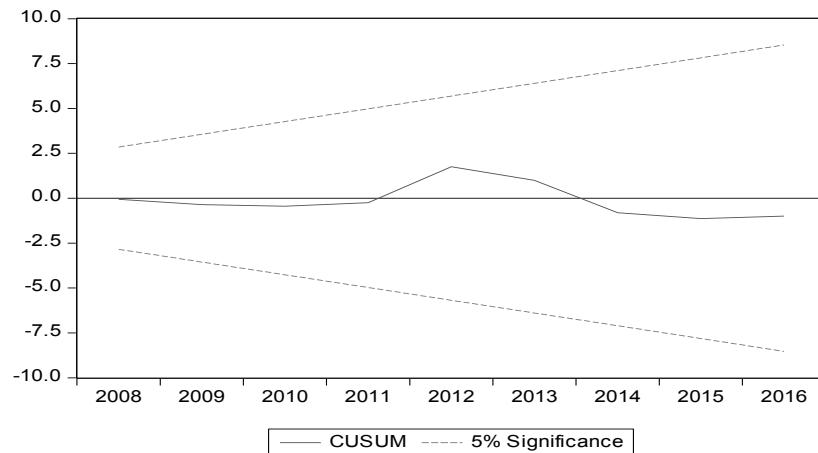
**Jarque-Bera (J-B) Statistics of Autocorrelation:-** The result of the Jarque-Bera (J-B) statistics of autocorrelation from generalized production function showed that J-B is 0.13 having probability value of 93.86 percent. As the probability value is reasonably high. Null hypothesis of error terms are normally distributed cannot be rejected. Hence, the residuals are normally distributed which is shown in figure 2.

**Figure 2: Distribution of Residuals of Estimated Equation**



**CUSUM Test:** - Finally, the stability of the long run coefficients together with the short run dynamics is examined. In doing so, Pesaran and Shin (1997) have been followed and the CUSUM test. Specifically, the CUSUM test makes use of the cumulative sum of recursive residuals based on the first set of  $n$  observations and is updated recursively and plotted against break points. If the plot of CUSUM statistics stays within the critical bounds of 5% significance level represented by a pair of straight lines drawn at the 5% level of significance whose equations are given in Brown, Durbin, and Evans (1975)], the null hypothesis that all coefficients in the error correction model are stable cannot be rejected. If either of the lines is crossed, the null hypothesis of coefficient constancy can be rejected at the 5% level of significance. Figure 4.4 shows the graphical representation of the CUSUM which shows that CUSUM plots does not cross the critical bounds, indicating no evidence of any significant structural instability.

Figure-3: CUSUM Plot



### Conclusion

In Nepal, both real agricultural foreign aid and real agricultural GDP are fluctuating. The percentage change in growth rate of both agricultural foreign aid and agricultural GDP is also observed to be negative in some fiscal years. The negative growth rate of agricultural GDP shows that the inadequate diffusion of investment within the agricultural sector, absence of proper prioritization and insufficient availability of production materials in the market due to weak sectoral policies related to agriculture have mainly been responsible for the failure of significantly increase agricultural production and productivity. Similarly, the contribution of agricultural sectors to GDP has continued to decline. Therefore, the government of Nepal should focus on effective use of foreign aid in agricultural development.

There is a positive impact of agricultural foreign aid on agricultural GDP. The increase in agricultural foreign aid leads to increase the agricultural GDP. There is long run co integration between real agricultural foreign aid and real agricultural GDP. Therefore, the government should set up the plan to increase the foreign aid in agricultural sector for increasing agricultural GDP of Nepal.

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