

Analysis of Agricultural Credit for inclusive Agricultural Growth: A VECM Approach

Aims: To explore the agricultural credit potential, performance and relationship with agricultural growth in India's.

Study design: The study is based on secondary data of agricultural GDP and agricultural credit (Direct Institutional Credit). At first, the performance of agriculture credit is conferred using compound annual growth rate of credit disbursement over the time and analyses the disbursement of agricultural credit of scheduled commercial banks to marginal, small, medium and large farmers. Further, the empirical research has conducted to explore the relationship between agriculture credit and economic growth in long-short run using time series data.

Place and Duration of Study: Time series data of Agricultural gross domestic product and farm credit has been taken from Hand Book of RBI and National Account Statistics (CSO) from the period of 1980 to 2011.

Methodology: The study uses Johansen Co-integration test to analyze the long term association between agriculture gross domestic product (AGDP) and Agriculture Credit. Moreover, Vector Error Correction Model is applied for understanding the long run and short run causality.

Results: Findings from the analysis suggest that over the period, agriculture gross domestic product is highly responsive to an increase in agricultural credits. A unidirectional causality is running from Agricultural credit to Agricultural Gross Domestic Product.

Conclusion: It can be concluded that Agricultural credit is a necessary input for inclusive agricultural sector growth. For financial and social inclusion, the government should take strong steps to disburse credit to agricultural sector as agricultural credit leads to production of agriculture and agriculture has the power to cause growth to all sectors of the economy inclusively.

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61. INTRODUCTION

7 A well-established agriculture sector has the power to reduce the problems of poverty, unemployment
8 and raw material supply. GDP growth originating in agriculture has been more successful in raising
9 the income of the poorest 40% of the population than rest of the economy [1] (Byerlee, et at,2009) .It
10 can also improve the position of foreign exchange. In India agriculture sector determine growth and
11 sustainability. In this era of globalization agriculture is also affected. Globalization leads the demand
12 of agricultural increment [2](Siddaraju, 2013).in context of India agriculture has a great importance
13 because India is 2nd largest populated country in the world and agriculture sector has the
14 responsibility to feed this population. Most of the Indian population lives in rural area directly and
15 indirectly depends on agriculture for the livelihood. Starting from Pandit Nehru's exhortation soon after
16 independence that "everything else can wait, but not agriculture", agricultural growth has all along
17 been central to India's efforts at poverty reduction. The importance of agriculture can be understood
18 by its contribution in the GDP in the year 2012-13 is 13.7% [3](Economic survey). Food grain
19 production reaches its record level in the year 2013-14 is 264.38(3rd advance estimate by union

ministry of agriculture).many factors such as rain fall irrigation facility quality of seed, MSP have important role in increasing production and productivity but timely availability of credit is most essential factor specifically for small and marginal farmer and in many cases may be a limiting factor for farmers having small land holdings [4](Naidu et al., 2013).

Providing credit to the farmers are main concern issue in country like India for enabling farmers to purchase key inputs and thus increase their income over time [5] (Kumar , 2012).agriculture credit borrower allocate more land to crops as compared to non-borrower which leads to the significant increase in the income of the borrower [6] (Shah et al., 2008).Government policies focus on providing rural credit at low rate through formal financial institutions to reduce the influence of money lender [7] (Satyasai, 2008).Credit schemes related to agriculture are increased agricultural production and farmers' income [8] (Sjah et al., 2003). The Government of India introduces different scheme and policies to improve the accessibility of credit to the farming community. Focus of these policies has been for providing timely and adequate credit support to all farmers. The Kisan Credit Card (KCC) introduced in August 1998 has emerged as a modern credit delivery system to meet the farm credit requirements of the farmers in a timely and easy way for Crop loans, upto an amount of `3.00 lakh, are being provided effectively at an interest rate of 4 per cent per annum - accounting for the rebate of 3 per cent for timely repayment of loans, besides the interest subvention [9] (NABARD, 2012-13). But Irrigation, rain-fed farming, wasteland development, soil and water conservation, animal husbandry and fisheries are the thrust areas for immediate attention for increase the output in the agriculture sector and need public investment of the order of Rs. 4,388 crore annually also emphasis, private sector has been also worked out in the agriculture investment .Empirically it was found that credit has positive relationship output but insignificant impact on agricultural output because credit helps to buy the various inputs, therefore it has indirect role [10] (Ahmad, 2011). From the above literature it found out that Agricultural credit has a great importance in agriculture. So, there is need to empirically analyze the relationship between agricultural credit and Agricultural gross domestic production over the year and its impact on the development of agricultural sector. To analyze the long run and short run causality between these two variable vector error correction model is one of the suitable approach, because it considers better than Engle-granger approach and easy to analyzed bidirectional causality also.

2. OBJECTIVE OF THE STUDY

Specific objectives are

- To analyze the performance of agriculture credit in India
- To analyze the co integration between Agricultural GDP and Agricultural credit
- To analyze long run and short run causality between Agricultural GDP and Agricultural credit
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3. ECONOMETRICS METHODOLOGY

3.1 Data Collection:

The present study has conducted in 2015 to find out the short run and long run causality between Agricultural gross domestic product and Yearly Disbursement of Agricultural credit. Study is based on

secondary data. Time series data of Agricultural gross domestic product and farm credit has been taken from Hand Book of RBI and National Account Statistics (CSO) from the period of 1980 to 2011.

3.2 Analytical Approach

To analyze the growth of credit disbursement over time Compound Annual Growth rate is calculated. For time series analysis, series should be stationary. Therefore to check the stationarity of the series, Augmented Dicky-Fuller test is used [11] (Dicky and Fuller, 1979) is used. From the ADF test, if it is found that all series are integrated at the same order than we can proceed for Johansen test of co integration. Juselius (1992) procedure has superior properties than the Engle-Granger two-step procedure[12] . If Johansen test of co integration provides that there is long run co integration among the variable than we can use vector error correction model is used for error correction term. For granger causality among the variable the VEC Granger Causality/Block Exogeneity Wald Tests is conducted.

Compound Annual Growth rate

$$CAGR = \left(\frac{\text{Ending value}}{\text{intial value}} \right)^{1/n} - 1 \dots \dots \dots (1)$$

Augmented Dicky-Fuller test

$$\Delta Y_t = \alpha + \delta Y_{t-1} + \sum \Delta Y_{t-1} + et$$

$$H_0: \delta = 0 \text{ (non stationary series)} \quad \text{and} \quad H_1: \delta \neq 0 \text{ (stationary)}$$

Vector Error correction model

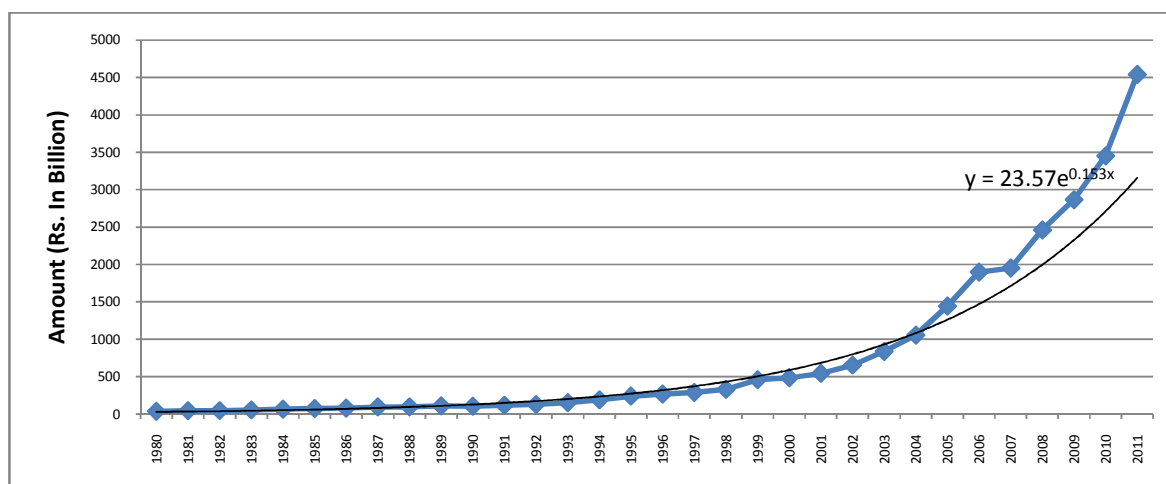
$$\Delta AGDP_t = \beta_0 + \sum_{j=1}^M \beta_{1j} \Delta CR_{t-j} + \sum_{j=1}^N \beta_{2j} \Delta AGDP_{t-j} + \alpha E_{t-1} + u_{1t} \quad (2)$$

$$\Delta CR_t = \delta_0 + \sum_{j=1}^K \delta_{1j} \Delta CR_{t-j} + \sum_{j=1}^K \delta_{2j} \Delta AGDP_{t-j} + \lambda C_{t-1} + u_{2t} \quad (3)$$

Where AGDP is Agricultural Gross Domestic Product and CR is yearly Agricultural Credit Disbursement

4. PERFORMANCE OF AGRICULTURE CREDIT IN INDIA

There are many formal and informal agencies are involved in provide agriculture credit in India i.e. commercial bank, cooperative bank regional rural bank, moneylender. Over the year percentage share in the credit disbursement by the commercial bank increase with significant rate and agricultural credit disburse by the cooperative bank has been declining.



Source: Rbi.org.in (Handbook of statistics on Indian economy)

Figure1. Year-wise All-India Direct Institutional Credit for Agriculture and Allied Activities

From the figure 1 it is perusal that exponential growth in Direct Institutional Credit for Agriculture and Allied Activities from 1980 to 2011 had been 23.57 %. From the graph it can be seen that in the decade of 1980's and 1990's there was no much yearly increment in the agricultural credit disbursement. But after 2000 there was sharp increment in the disbursement of institutional credit because government and commercial bank gave too much emphasis on agricultural lending. In 2004, the Government of India announced that it intended to double the flow of credit to agriculture over a period of three years (Ministry of Agriculture 2007). A "comprehensive credit policy" was announced in June 2004. It included promises to raise agricultural credit by 30 per cent a year; to finance 100 farmers per bank branch (and thus five million, or fifty lakh, farmers in a year);[13] (Ramakumar and Chavan,2014)

Each year Govt makes planning for agriculture credit and set the target credit flow to agriculture sector but the in the previous year the achievement has been more than the target. It shows that there is more need of credit in agriculture. From the figure 1 it can be easily understand that achievement of agricultural credit is more than the target. In 2004-05 the target of agricultural credit was Rs. 1050 (billion) while achievement was 1253.09 (billion). The target credit flow to agriculture) and allied sector had been fixed at Rs.7000 billion during 2013-14 in union budget which is seven times more than 2004-05.In 2013-14 also achievement Rs. 7307.7 (billion) was more than the target Rs7000 (billion).

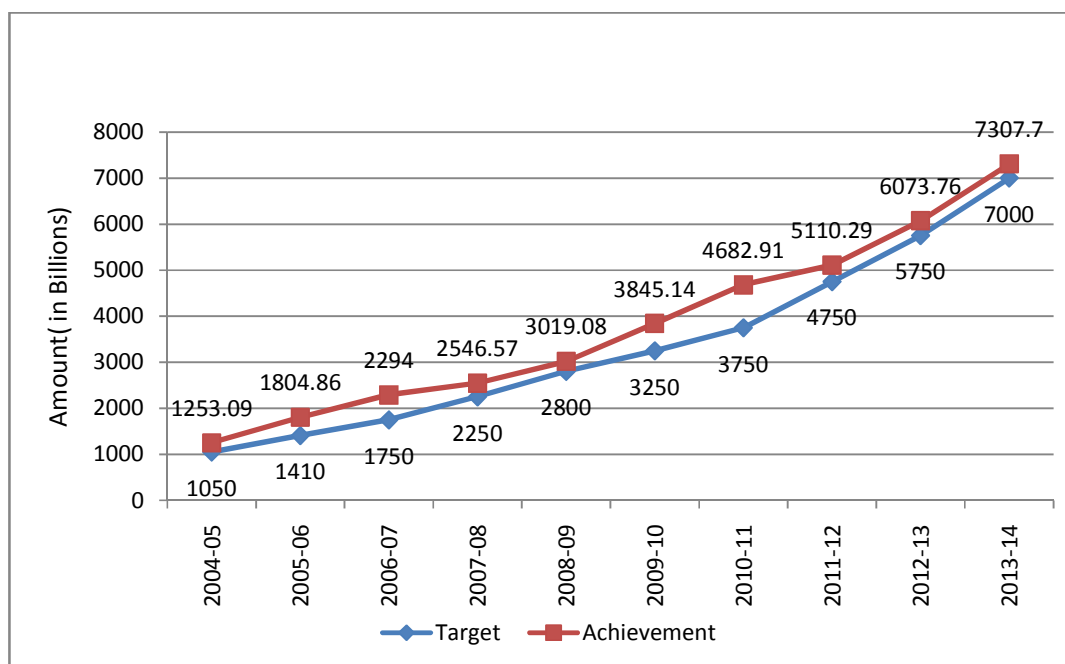


Figure 2. Year-wise Target and Achievement of Agricultural Credit Flow in India

Compound annual growth rate of agricultural credit is depicted in table 1 from 1980 to 2010 in six sub periods. The perusal of Table 1 reveals that there has been not much clear trend in agricultural credit disbursement. But it can be seen that except 1986-90, in each sub-period CAGR in Agricultural Credit Disbursement is more than 10 per cent. After liberalization there was huge structural change in banking industry. In 1991 report of the Narasimham Committee brought many reform in Indian banking sector such as deregulation of interest rates, an easing of directed credit rules under the priority sector lending arrangements and reducing the entry barriers for both domestic and foreign players [14](Hanson, 2001). Impact of these reforms can be seen in the compound annual growth of credit disbursement to agricultural sector. Growth in sub-period of 1990th decade was 19.71 percent and 16.29 percent respectively. But huge jumped in the increment of agricultural credit disbursement had taken place in 2001-2005. The CAGR in this sub-period was very high 27.68 percent while next subsequent sub-period growth was 16.15 percent. It indicates that from 2001 onwards huge rise in credit to agricultural sector. The reason behind this huge growth was in 2004 announced that it would have intention to increase the credit to agricultural sector by two times. The increase in the supply of credit to agriculture has been claimed to be one of the most significant achievements of the UPA

Table 1. Five-yearly compound annual growth rates of agricultural credit

year	CAGR of Agricultural Credit Disbursement
1981-85	13.60
1986-90	7.18
1991-95	19.71

1996-00	16.29
2001-05	27.68
2006-10	16.15

Table2. Scheduled commercial banks' direct finance to farmers according to size of land holdings (short-term and long-term loans (Number of accounts in thousands; Amount in Rupees Billion)

Type of Farmers	Factors					Ratio of		
		1980-81	1990-91	2000-01	2010-11	1990to 1980	2000to 1990	2010to 2000
Marginal	No. of A/c	1586.8	1960.2	2382.4	9253	1.24	1.22	3.88
	Amount	2.524	11.808	37.396	460.19	4.68	3.17	12.31
Small	No. of A/c	692.6	1218.8	1860.3	9690	1.76	1.53	5.21
	Amount	1.683	9.522	36.416	574.36	5.66	3.82	15.77
Medium and large	No. of A/c	790.2	898.8	1598.6	6044	1.14	1.78	3.78
	Amount	5.938	17.818	71.349	854.55	3.00	4.00	11.98

Source:Hand book of RBI,

Table 2 shows the farmers wise amount disbursement and number of farmers benefitted from 1980-81 to 2010-11. From 1980 to 1990 number of marginal farmers benefitted increased by 1.24 times while the amount disbursement to them were increased by 4.68 times. In the year 2000-01 loan amount disbursement to marginal farmers reached to Rs.37.396 billion. It was 3.17 times increase compare to 1990-91. There was huge increment in agricultural credit beneficiaries among the marginal farmers in 2010. It was increased by 3.88 times compare to 2000. As far as disbursement loan amount was concern it was also increased by 12.31 times from 2000. In 1980-81 amounts Rs1.683 billion was disbursement to small farmers, the amount was very low vis-à-vis number of beneficiary are also lowest. But in this decade beneficiaries are increased by 1.76 times and amount of credit was increased by 5.66 times. In this decade small farmers are benefitted maximum. In 2000 not very much change had occurred in the situation of small farmers, but 2000 onwards huge emphasis had given to small farmers in providing agricultural credit. Number of small farmers benefitted from agricultural credit facility was increased by 5.21 times and amount disbursement to them sharply increased by 15.77 times in 2010 compare to 2000. there was not so much increment in medium and large farmers in the decade of 1980's and 1990's. But in 2010, beneficiaries of agricultural credit among medium and large farmers stood at 6044 thousand, 3.78 times of 2000 and the amount disbursement to them was Rs. 854.55 billion which was 11.98 times compare to 2000. From the above analysis it can be concluded that from 2000 onwards beneficiaries of agricultural credit are increased specially small and marginal farmers and the magnitude of loan amount is also increases sharply.

5. RESULTS AND DISCUSSION

Table 3. Augmented Dicky-Fuller Test

ADF Test	LAGDP		LCR	
	intercept	Trend and intercept	intercept	Trend and intercept
At Level	2.063798	-2.208156	2.058912	-0.633002
At first difference	-8.288953	-9.072611	-5.021259	-6.122109

ADF test results have been presented in table 1. stationarity has checked with a constant and no time trend and with a constant and time trend. It can be seen from the table that all the series are non stationary at level but stationary at first difference at constant and no time trend. Now both series Agricultural gross domestic product (AGDP) and Agricultural credit (CR) are integrated on same order I (1) it confirms that Johansen test of co integration can be applied.

Table4. Johanson Test of Co-integration

Hypothesized No. of CE(s)	Trace Statistic	5 % Critical Value	Max-Eigen Statistic	5 % Critical Value
None *	22.915	15.494	21.788	14.264
At most 1	1.1274	3.8414	1.1274	3.84146

* denotes rejection of the hypothesis at the 0.05 level

Trace and Max-Eigen Statistic value indicate that there is one co –integration equation

To select the appropriate test lag selection test such as Akaike Information Criterion (AIC), Schwarz information criterion (SC), Final prediction error (FPE) and Hannan-Quinn information criterion HQ has been done. FPE, AIC and HQ indicate that optimum lag is 3 while SC shows 2. So it should be better to go with optimum lag 3, because it is suggested by more number of tests. It is advisable to take 1 less than the suggested lag by the different lag selection test. From the Trace (22.915) and Max statistics (21.788) value is more than the critical value which shows that the hypothesis there is no long term association or co-integration between the variable is rejected and there is a long term association between Agricultural gross Domestic Product and Agricultural Credit. Normalized equation indicates there is positive relationship between both the variable.

Table 5: Long run causality and Error correction term

	β	S.E	t-Statistic	P-value
ECT	-0.006	0.005	-1.351	0.1898
GDP(-1)	-0.697	0.187	-3.729	0.0011
GDP(-2)	-0.184	0.194	-0.950	0.352
CR(-1)	80.050	48.786	1.641	0.1144
CR(-2)	112.029	46.218	2.424	0.0236
Intercept	7887.332	10274.920	0.768	0.4505

From table 5 it is found that error correction term is negative and but not significant which indicate that there is convergence between the variable and long run causality exist. From F- statistics (F= 5.124552, P= 0.002655) it can be reveals that agricultural credit cause agriculture gross domestic in the long run. Value of R-square is 52.69% is indicate that agricultural credit explain AGDP by 52.69%. For analyze the while Durbin-Watson statistics used to detect the presence of autocorrelation. The value of Durbin-Watson statistics is 1.84 which shows that there is no autocorrelation which is desirable.

Table 6. Model Summary

R-squared	52.69%
Adjusted R-squared	42.41%
Log likelihood	-319.1892
F-statistic	5.124552
Prob(F-statistic)	0.002655
Durbin-Watson stat	1.849111

5.1 Short Run causality

Table 7.VEC Granger Causality/Block Exogeneity Wald Tests

Null Hypothesis	Wald test/ χ^2	P-Value	Conclusion
D(LCR) does not Granger cause of D(LAGDP)	6.245*	0.044	Causality
D(LAGDP) does not Granger cause of D(LCR)	1.386	0.499	No Causality

* indicate significant at 5 %

Granger Causality test has been conducted for short run. From the table 7 it is indicate that Agricultural Credit (chi-sq =6.245, $P < 0.5$) is Granger cause of Agricultural Gross Domestic Product. It is significant at 5 %. While Agricultural Gross Domestic Product (chi-sq= 1.386, $P = 0.4999$) does not Granger cause of Agricultural Credit. Therefore it can be concluded that a unidirectional causality running from Agricultural credit to Agricultural Gross Domestic Product is found.

5.2 Model Stability Test

Table8. Table Breusch-Godfrey Serial Correlation LM Test:

Null : There is no serial correlation	Values	Value
F-statistic	0.1412 Prob. F*(2,21)	0.869
Obs*R-squared	0.3850 Prob. Chi-Square*(2)	0.824

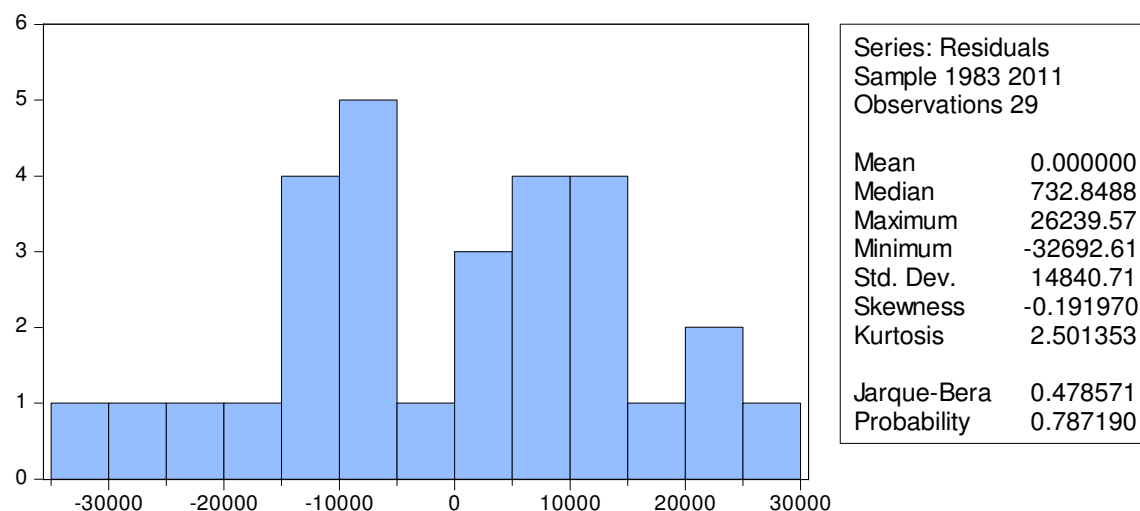
* indicate that P-value is more than 5%

Table9.Breusch-Pagan-Godfrey Test for Heteroskedasticity

Null: Model is homoskedastic	Values	Value
F-statistic	0.7177 Prob. F*(6,22)	0.639
Obs*R-squared	4.7473 Prob. Chi-Square*(6)	0.576
Scaled explained SS	2.2416 Prob. Chi-Square*(6)	0.896

* indicate that P-value is more than 5%

Jarque- bera Test for Normality



Diagnostic test like serial correlation, homoscedasticity and test for residual normality are also conducted and the results are desirable, means there is no serial correlation and heteroscedasticity in the model and residual is normality distributed. Results of diagnostic test are given in the table 5.

6. CONCLUSION

GDP growth originating in agriculture has been more successful in raising the income of the poorest 40% of the population than rest of the economy. Agriculture is the main sector which can play important role in financial and social inclusion. Providing credit to the farmers is the main concern to government in country like India for empowered the farmers to purchase key inputs and thus increase their income over time. Taking the importance of agricultural credit So, there is need to empirically analyze the relationship between agricultural credit and Agricultural gross domestic production. Vector error correction model is one of the suitable approach of time series analysis, because it considers better than Engle-granger approach and easy to analyzed bidirectional causality also. It is found that every year government achieve is more than the target of credit disbursement which indicate that that there is more need of agricultural credit. From Johansen test Trace (22.915) and Max statistics (21.788) of co integration it had been found that there has been a co-integration in AGDP and agricultural credit while from VEC Granger Causality/Block Exogeneity Wald Tests is conducted. Normalized equation indicates there is positive relationship between both the variable and from F- statistics, it can be reveals that agricultural credit cause agriculture gross domestic in the long run. Short run causality running from agricultural credit to Agricultural GDP is found, however, opposite is not found. Therefore it can be concluded that a unidirectional causality running from Agricultural credit to Agricultural Gross Domestic Product. Finally it can be concluded that Agricultural credit is a necessary input for inclusive agricultural sector growth. For financial and social inclusion government should take strong steps to disburse credit to agricultural sector, because agricultural credit lead to production of agriculture and it has been proven by many economist that agriculture has the power to grow all sector of the economy inclusively.

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