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Agricultural Formal Credit Distribution and Agricultural GDP in Pakistan: A Granger Causality Approach

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Abstract

The agricultural sector of Pakistan has been playing an important role in boosting the agricultural production as well as income of the farmers. In agriculture sector, demand for credit has increased over the past few decades due to increased prices of major agricultural inputs. The purpose of this study was to examine the direction of causality between agricultural formal credit distribution and agricultural GDP in Pakistan over the period 1992-2016. Augmented Dickey Fuller (ADF) and P-P unit root tests have been applied to check the stationarity of the data and Co-integration test has been used to determine the long run relationship between dependent and independent variables. An estimation method Ordinary Least Square (OLS) was applied to investigate the relationship between agricultural formal credit distribution and agricultural GDP in Pakistan. Furthermore, the causality relationship between variables is examined by Granger causality approach. The results of ADF and P-P unit root tests revealed that all variables become stationary at first difference which confirm to co-integration test. Similarly, the results of Johansen Co-integration test showed that there is existence of a long run relationship between dependent and independent variables. The results of regression analysis showed that the coefficient of agricultural formal credit distribution is highly significant at both 1% and 5% of significance level, which indicates that there is a strong positive and significant relationship between agricultural formal credit and agricultural GDP. This means that one percent increase in agricultural formal credit will enhance agricultural GDP by 0.93%. Granger causality consequences suggest that there is bi directional causality relationship exists among agricultural formal credit distribution and agricultural GDP.

Keywords: Agricultural Credit, Agricultural GDP, Formal Financial Sources, Granger Causality, Pakistan.

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Introduction

Pakistan is an agricultural country with almost sixty percent of its population living in rural areas which are depending on agricultural activities for their livelihood. The total geographical area of Pakistan is 79.61 million hectares, where about 22.08 million hectares are cultivated while about 23.01 million hectares are uncultivated (GOP (2014-15)). Agriculture is the main sector of the country's economy, which contributes more than 20 percent to the GDP and absorbs 43.5 percent of the labor-force. The sector provides raw materials to agro-based domestic industries and it is a major source of export earnings of the country. This sector consists of four subsectors such as livestock, crops, fisheries and forestry. During 2014-15, this sector recorded a positive growth of 2.9 percent in general, and growth rates of crops production, livestock, forestry and fisheries are 1.0, 4.4, 3.2 and 5.8 percent respectively (GOP(2014-15)).

In different aspects, Pakistan's agriculture sector is confronted by several challenges such as less availability of credit, shortage of water, increasing prices of major agricultural inputs and shortage of electricity (Magsi and Atif (2012)).

However, due to less availability of agricultural credit facilities, the small scale farmers are facing more difficulties in adopting new technologies to increase their agricultural productivity (Faridi *et al.*, (2015)) even though there is more growth potential in this sector (Magsi (2012), Mengal *et al.*, (2014)). Credit plays a vital role in enhancing agricultural productivity, therefore, timely availability of credit allows farmers to purchase major agricultural inputs and make use of modern agricultural technology for carrying out farm operations (Saboor *et al.*, (2009)). Lack of credit and finance is one of the main reasons for low agricultural productivity in the agriculture sector. The increase in agricultural productivity, consequently, largely depends on the availability of credit facilities to the small and marginalized farmers in their respective areas (Arif (2004)). To overcome these problems by providing agricultural credit to small farmers, is the reinforced effort towards maximum productivity and economic

development. Based on the above background of the present study, the main purpose of this study is to examine the direction of causality between agricultural formal credit distribution and agricultural GDP in Pakistan over the period 1992-2016.

Agricultural Credit Types and Sources

In this subsection we will discuss following types of agricultural loans being credited in Pakistan, informal and formal sources of credits to the agriculture sector;

Types of Agricultural Loans

There are three types of agricultural loans, and are provided by the all formal financial institutions in Pakistan (Fayaz *et al.*, (2006)), such as (1) short term loan scheme is being provided for the purchase of farm inputs like improved seed varieties, fertilizers, pesticides, etc.

Where the maximum duration of this credit scheme is 18 months. Furthermore, (2) medium-term loan scheme provides for the purchase of cattle, modern implements and improvements in water courses, etc. The period of this medium-term loan scheme is 1 to 5 years. Whereas, (3) long-term loan scheme is provided for the purchase of tube wells, reclamation of land, building, purchase of machinery, farm implements and the period of this scheme is period 5 – 7 years (Iqbal *et al.*, (2003), Miah *et al.*, (2006)).

Informal Sources of Credit

The informal credit market is playing a vital role in rural Pakistan since prehistoric times (Amjad and Hasnu (2007)). Informal sources of credit have many advantages in providing better services at lower cost than formal sources of credit. In rural areas landlord farmers have better access to formal source of credit as compared to small farmers and the majority of small farmers depend on informal sources of credit (Nouman *et al.*, (2013)). Furthermore, informal sources of credit include money lenders, friends/relatives shopkeepers, landlords, arthis, input suppliers and commission agents (Jan and Khan (2012)). The input suppliers, commission agents and arthis have been providing lending for consumption as well as production purposes and in return gets repaid majority in

kind in terms of input. Whereas, landlords and commission agents force the small farmers to sell the produce to them, which generally is purchased at low rates compare to market price. The informal lenders such as (friends, relatives, etc) have various benefits over the formal

financial sources of credit. The lenders of informal sources of credit personally know the borrowers very well. For advancing loans they have required a little security Nouman *et al.*, (2013). The detailed financial sources in Pakistan are depicted in the figure 1.

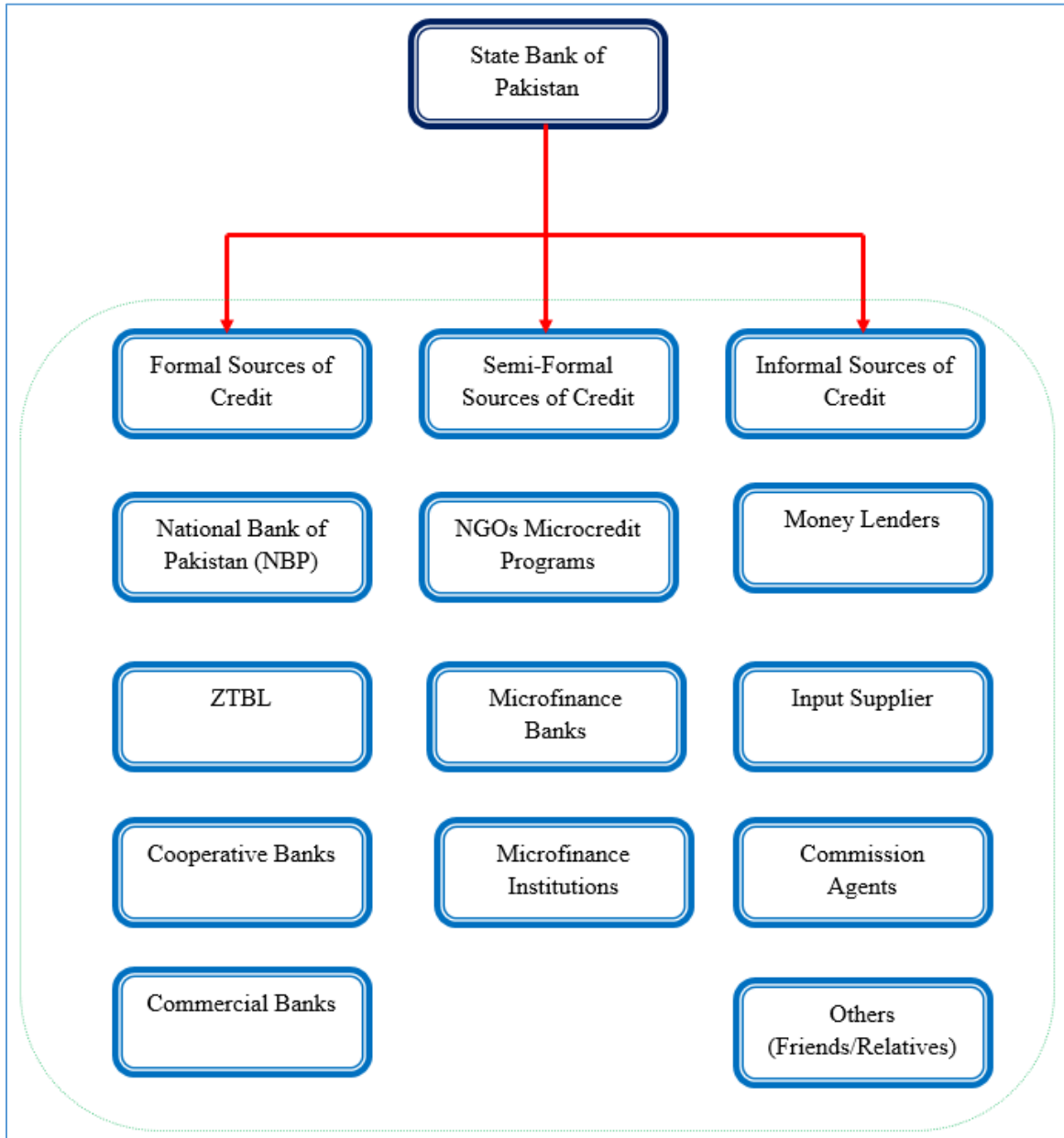


Fig. 1: Agricultural credit markets in Pakistan.

Source: Own presentation.

Formal Sources of Credit

In Pakistan, for the growth and development of agriculture sector, about 3,900 agriculture designated branches are financially facilitating to provide agricultural credit for increasing the agricultural productivity and

income of the farmers Khandker and Faruqee (2003). The major financial sources of agricultural credit are twenty six banks, these are working in different areas of the country, five commercial banks include ABL, HBL, MCB, NBP and UBL, two specialized banks, ZTBL and

Corporate Bank Limited. On the other hand, fourteen domestic private banks, five microfinance banks which are also supplying agricultural credit to farmers for several types of agricultural activities like as crop cultivation, domesticated animals, poultry farming and fish farming etc Jan and Khan (2012). These formal financial sources of agricultural credit have been playing a key role in providing financial support to the agricultural sector and rural households in Pakistan Hussain and Thapa (2012). Under the parasol of the State Bank of Pakistan, the ZTBL bank provides some special loans schemes including production loans, development loans, agribusiness loans, off-farm Income generating loans and cottage industry loans. In order to enable farmers can be purchase modern inputs and technology to enhance farm productivity and improve their life standard. But these loans scheme are

not cost effective due to covariate risk Khandker and Faruquee (2003).

Agricultural Credit Essential in Pakistan

This section will provide the review about on the performance of the agriculture sector, the need and disbursement of agricultural credits and their impacts on the economy of country.

Agriculture Sector Performance

In Pakistan, the growth rate of agriculture sector was 2.7 percent in 2013-14 and was slightly increased to 2.9 percent in the year of 2014-15 due to positive growth of its sub-sectors GOP (2014-15) as given in figure 2. During, 2014-15, the crops contributed about 25.6 in the overall agriculture in the country, where livestock, fisheries sub-sector has contributed about 56.3 and 2.1 percent respectively GOP (2014-15).

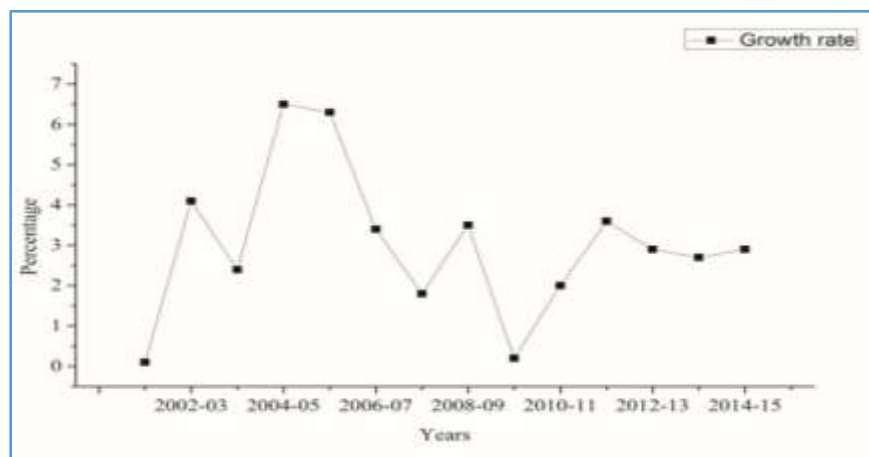


Fig. 2: Agriculture growth percentages (Base=2005-06).

Source: Pakistan Bureau of Statistics.

Since a decade, the agricultural productivity of Pakistan has been increased due to enlarged agro-input application caused by inflow of agricultural credit from various financial institutions. These financial institutions including ZTBL, Cooperative Bank, Commercial Banks and NOGs have been playing an essential role to enhance the agricultural productivity and improve the living standard of farmers in Pakistan.

Like the other business activities the agribusiness also needs capital for its operations. Timely availability of agricultural credit leads to adoption of modern technologies, sufficient use of primary inputs which raise the farm productivity Magsi (2012). Consequently, credit is an important component for modernization in agriculture Iqbal *et al.*, (2003), Mengal *et al.*, (2014). In the past few decades, the demand for agricultural credit was rapidly increased due to rising prices of farm inputs Ahmed and Gill (2007). In developing countries like Pakistan, formal

Credit Disbursement in the Country

and informal financial credit markets play an important role in rural areas. Informal financial credit markets consist of relatives, friends, private money lenders, Input supplier and Shopkeeper. Furthermore, formal financial credit markets consist of specialized banks like ZTBL,

Commercial Banks and Co-operative societies (Jan *et al.*, 2011). These formal financial sources provide credit for the growth and development of agriculture sector. The contribution of these formal financial institutions is increasing day-by-day as given in figure 3.

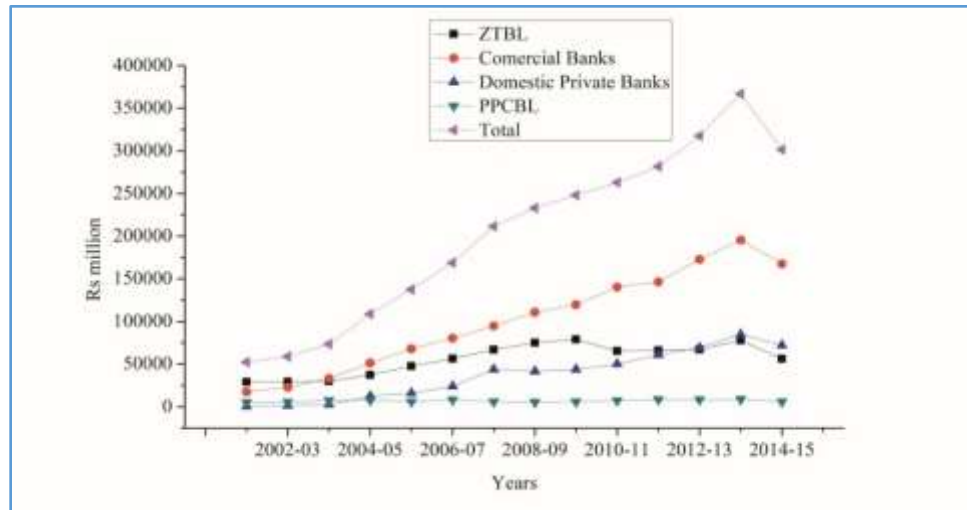


Fig. 3: Credit disbursed by different agencies (Rs Million)

Source: Economic survey of Pakistan (2014-15).

Agricultural credit becomes more important when it moves from traditional agriculture to modern agriculture (Abdullah *et al.*, (2009). However, small farmers have quiet small land holding, low income and small saving. In Pakistan, agricultural productivity is low due to certain problems such as less availability of credit, less use of inputs. Therefore, small farmers need to credit to increase agricultural productivity and income (Abdullah *et al.*, (2015), Awan and Mustafa (2013), Khalid Bashir and Mehmood (2010).

Current Situation of Agricultural Credit in the Country

Agriculture sector is the backbone of Pakistan economy. Over the time need of credit has been increased due to rising prices of primary inputs likewise fertilizers, hybrid seeds and biochemical. During 2014-15, the State Bank of Pakistan has allocated indicative agricultural credit disbursement targets of 500 billion rupees to twenty commercial banks, two specialized banks, four Islamic banks and seven micro-finance banks which are providing financial support for the development and growth of

agriculture sector. In 2015 the target of agricultural credit disbursement was 31.5 percent higher as compare to last year. The total target 500 billion rupees of agricultural credit disbursement has distributed to several banks, 252.5 million rupees to five commercial banks, 90.0 billion rupees to Zarai Taraqati Bank Limited (ZTBL), 115.6 billion rupees to fifteen domestic private banks, 11.5 billion rupees to Cooperative Bank, 28.2 billion rupees to seven micro-finance banks and 2.3 billion rupees to four Islamic banks for this year. Furthermore, the agricultural loans disbursement of five commercial banks Rs, 167.4 billion, which is higher as compare to last year's loan disbursement in the agriculture sector. The contribution of five major commercial banks, UBL 76.7 percent, NBP 55.3 percent, HBL 75.3 percent, and MCB 80.5 percent have achieved its annual target, whereas, the 45.2 percent annual target achieved by ABL (GOP, 2014-15). Moreover, under the two specialized banks ZTBL was disbursed 56.2 billion rupees against its annual target of 90.0 billion rupees. The ZTBL 62.4 percent has achieved its annual targets of agricultural loan disbursement. Whereas PPCBL

was disbursed 5.9 billion rupees against its target of 11.5 billion rupees and 50.9 percent had achieved its annual target of loan disbursement in July-March 2014-15 GOP (2014-15). Furthermore, under the fifteen Domestic Private Banks, Faysal Bank have achieved its annual target of loans disbursement 81.1 percent, JS Bank 64.8 percent, Silk Bank 48.8 percent, Soneri Bank 50.6 percent, Bank of Khyber 90.4 percent, Sindh Bank have achieved its annual loan disbursement 56.3 percent, Bank Al Habib and Bank Alfalah 54.9 percent, Silk Bank 48.8 percent, Summit Bank 46.8 percent, Askari Bank and Bank of Punjab 40.9 percent have achieved each of their annual targets of agricultural credits disbursement respectively in July-March 2014-15. However Standard Chartered Bank has already surpassed its annual target of 2.5 billion rupees by disbursing 3.8 billion rupees during July-March 2014-15. Whereas, under

the seven micro-finance banks, category, seven micro-finance banks as a group has agricultural loan disbursed 20.7 billion rupees against their annual target of 28.2 billion rupees, while under Islamic Mode of Financing, four Islamic banks jointly have agricultural credit disbursed 3.7 billion rupees against their targets of 2.3 billion rupees. The actual disbursement of banks against the annual indicative targets during July-March 2014-15 is given in Table 1. The governments of Pakistan have made different credit programs aimed to improving agricultural productivity and increase income of rural households. But, most of the programs were not successful due to several reasons, including rising prices of major agricultural inputs and high interest rates etc Iqbal *et al.*, (2003).

Table 1: Supply of Agricultural Credits by Institutions.

Banks	2013-14 (July-March)				2014-15 (July March)			
	Target 2013-14	Flow	percentage Achieved	percent Share in Total	Target 2014-15	Flow	percentage Achieved	percent Share in Total
Major Commercial Banks (5)	188	133.5	71	52.2	252.5	167.4	66.3	51.3
ZTBL	69.5	45.9	66	17.9	90	56.2	62.4	17.2
DPBs (15)	90.4	54.2	60	21.2	115.6	72.1	62.4	22.1
PPCBL	10	5.4	54.5	2.1	11.5	5.9	50.9	1.8
MFBs (7)	21.6	16.2	75.1	6.3	28.2	20.7	73.6	6.3
Islamic Banks (4)	0.5	0.5	94.6	0.2	2.3	3.7	162.2	1.1
Total	380	255.7	67.3	100	500	326	65.2	100

Source: State Bank of Pakistan GOP, (2014-15).

Agricultural Credit Impact on Agricultural Productivity

Modern agriculture is an important for the growth and economic development of the country. Utilizing of advanced technologies is possible when growers are being provided financial facilities for purchasing of farm inputs Sjah *et al.*, (2003). According, Ahmed and Gill (2007) provide evidence that institutional credit disbursed by commercial banks had a positive impact on the agricultural economy of Pakistan. On the other hand, Obilor (2013) found that formal credit of commercial banks has positive impacts on agricultural development. In Pakistan several researchers have found a positive and significant impact of formal credit, seed, inorganic fertilizers, and availability of water on agricultural output

Akram *et al.*, (2008), Iqbal *et al.*, (2001), Malik *et al.*, (1991), Zuberi (1990). Furthermore, Jan and Manig (2008) found that credit disbursed by ZTBL has a significant and positive impact on field crops production and income of farmers. Similarly, Abedullah *et al.*, (2009) state that flexible and easy term of agricultural is the best way of raising farm productivity. Meanwhile, Bashir *et al.*, (2010) explored the impact of institutional credit on wheat productivity in district Lahore using Cobb Douglas Production Function (CDPF) and found that credit has a positive impact on productivity of wheat. The results revealed that credit raised the socioeconomic conditions of the rural household. It was concluded that the productivity of wheat can increased by use of sufficient inputs like as seed, land preparation, modern technologies and fertilizer

if credit is available to farmers at the time of wheat cultivation.

Bashir *et al.*, (2007) have tried to explore the impact of formal credit on output of sugarcane crop in Faisalabad district by using field survey data of 114 loanee and non-loanee farmers. The findings of the study show that the formal credit has a positive impact on the output of sugarcane crop.

Ahmad *et al.*, (2015) have analyzed the impact of agricultural credit on wheat productivity in district Jhang, Pakistan by using field survey of 160 beneficiaries and non-beneficiaries farmers. Cobb-Douglas production function was utilized to analyze the data. The findings of the study show that agricultural credit has a positive and significant effect on wheat productivity.

Data Source and Econometric Analysis (Methodology)

Data Sources

The data has been collected from the secondary source known as Economic Survey of Pakistan (various issues) over the period of 1992-2016 GOP (2014-15). Basically there are two variables included in the model that are agricultural GDP in million rupees and total agricultural formal credit disbursed in agricultural sector of Pakistan in million rupees.

Econometric Methodology

To check the stationarity of each variable ADF (1984) and P-P (1988) unit root test has been used including trend and intercept which is appropriate for such finite sample (Mallik and Chowdhury, 2001). After checking stationarity of the series Johansen Co-integration (1990) test has been applied to find out the long-run relationship between Agricultural GDP and Total agricultural credit disbursed in agricultural sector of Pakistan. Furthermore, Granger Causality approach (1988) has been used to determine the directions of relationship among Agricultural credit disbursed by all banks and agricultural gross domestic product (GDP).

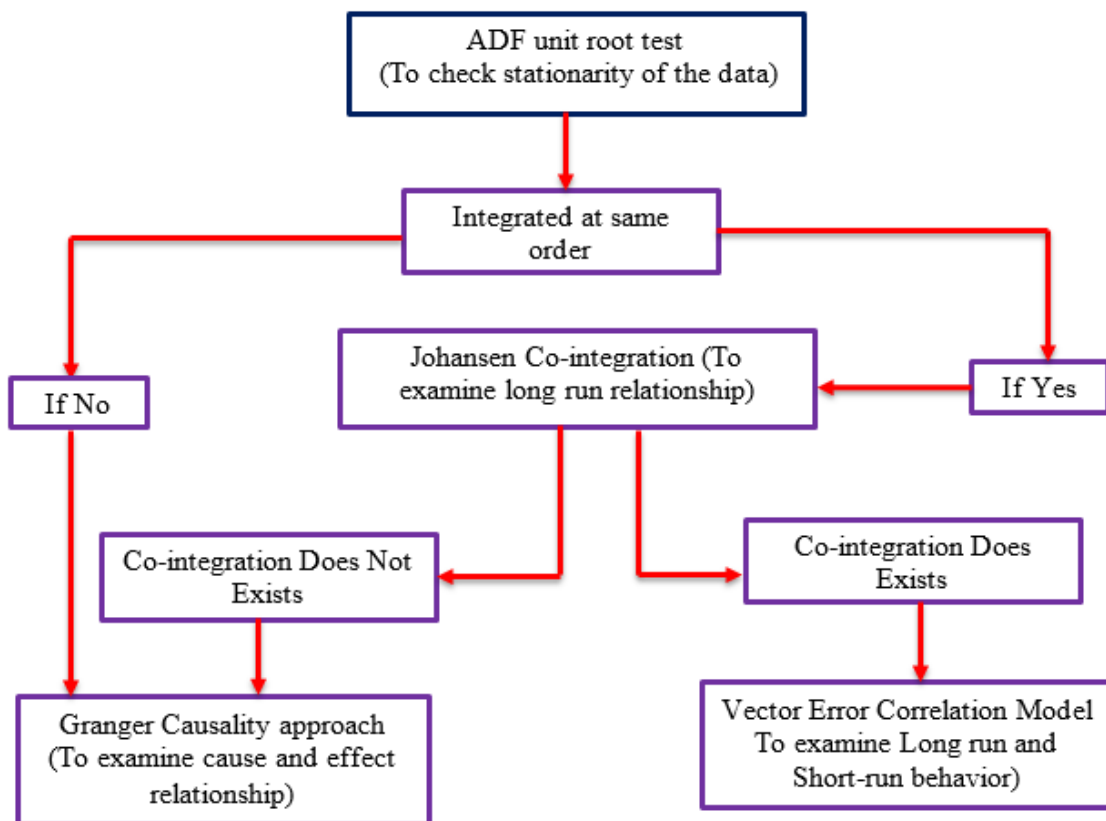


Fig. 4: Represent the Diagram of Research Methodology.

Finally, to investigate the impact of agricultural credit distributed by all banks on Agricultural Gross Domestic Product (GDP), an econometric OLS method has been applied and the following model has been estimated:

$$\ln (AGRGDP) = \beta_0 + \beta_1 \ln (CR) + \mu \dots \quad (1)$$

Where

$\ln (AGRGDP)$ = Natural Log of Agricultural Gross Domestic Product per Year in (Million rupees).

$\ln (CR)$ = Natural Log of Agricultural Credit Disbursed by all banks per Year in (Million rupees).

μ = error term.

Results and Discussion

ADF and P-P Unit Root Tests

The results of ADF and Phillips Perron (PP) unit root tests are presented in Table 2 and 3. In Table 1 and 2 the stationary of the data has been checked including trend and intercept. According to Table 1 and 2 reveal that (AGRGDP) and (CR) are non-stationary in their level form. Furthermore, for stationary of (AGRGDP) and (CR) we have again checked and AGRGDP and CR are found stationary after taking the first difference.

Table 2: ADF unit root test including (Trend and Intercept).

Variables	At level		First Difference	
	T-Statistic	Critical Values	T-Statistic	Critical Values
LnAGRGDP	-1.914754 (0.6158)	1% -4.394309	-4.992359* (0.0029)	1% -4.416345
		5% -3.612199		5% -3.622033
		10% -3.243079		10% -3.248592
LnCR	-0.857816 (0.9416)	1% -4.498307	-3.835019** (0.0360)	1% -4.498307
		5% -3.658446		5% -3.658446
		10% -3.268973		10% -3.268973

Note: *, **, *** shows at 1%, 5%, 10% level of significance.

Table 3: Phillips Perron (PP) unit root test including (Trend and Intercept).

Variables	At level		First Difference	
	Adj. t-Stat	Critical values	Adj. t-Stat	Critical values
LnAGRGDP	-1.914754 (0.6158)	1% -4.394309	-5.014300* (0.0028)	1% -4.416345
		5% -3.612199		5% -3.622033
		10% -3.243079		10% -3.248592
LnCR	-2.654451 (0.2620)	1% -4.394309	-5.202883* (0.0019)	1% -4.416345
		5% -3.612199		5% -3.622033
		10% -3.243079		10% -3.248592

Note: *, **, *** shows at 1%, 5%, 10% level of significance.

Johansen Co-Integration Test

The regression results may be spurious due to no co-integration between the study variables. For this purpose, Johansen co-integration approach including Trace statistic and Max-Eigen Statistic have been used to estimate the long run relationship between total agricultural credit distributed and the agricultural GDP of Pakistan over the

period of 1992-2016. The results of Co-integration analysis are present in Table 4 and 5, which showed that there exists a long run relationship among dependent and independent variables. The null hypothesis of no co-integration is rejected. Because the values of trace statistic and Max-Eigen statistic are larger than their relevant

critical values which shows the existence of two co-

integrating equation at 5 percent.

Table 4: Johansen Co-integration test using Trace Statistic.

Eigenvalue	Trace Statistic	5 Percent Critical Value	Prob.**	Hypothesized No.of CE(s)
0.607156	28.41024	15.49471	0.0003	None *
0.385022	9.723388	3.841466	0.0018	At most 1 *

*Indicates at 5% level of significance.

Table 5: Johansen Co-integration test using Max-Eigen Statistic.

Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	Prob.**	Hypothesized No.of CE(s)
0.607156	18.68685	14.26460	0.0094	None *
0.385022	9.723388	3.841466	0.0018	At most 1 *

* indicates at 5% level of significance

Table 6: Regression Analysis.

Dependent Variable: Ln(AGR GDP)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.717731***	0.854776	3.179466	0.0042
Ln(CR)	0.936662***	0.074942	12.49856	0.0000

R-squared 0.871662 Adjusted R-squared 0.866082
 F-statistic 156.2140 Prob(F-statistic) 0.000000
 Durbin-Watson stat 0.790472

*** indicates at 1% level of significance.

To examine the impact of agricultural formal credit distribution on agricultural GDP in Pakistan over the period of 1992-2016, Ordinary Least Square (OLS), an econometric method has been applied. The regression results which are presented in Table 6 shows that the coefficient of agricultural formal credit distribution is highly significant at both 1% and 5% of significance level, which indicates that there is a positive and significant relationship between agricultural GDP and agricultural credit distribution. This means that a 1 percent increase in agricultural formal credit distribution agricultural GDP increased by 0.93%. The results are according to (Ahmad, 2011; Iqbal *et al.*, 2003; Sial *et al.*, 2011). They found that the positive impact of agricultural formal credit distributed

by all banks on agricultural productivity. The high value of F-statistics indicates that the explanatory variable agricultural credit disbursed by all banks have significant impact on agricultural GDP. The high R² suggest that over 87percent variations in the agricultural GDP is explained by the explanatory variable included in the model.

Granger Causality Test

Table 7 revealed that the null hypothesis of the model is that CR does not Granger-cause AGRGDP is rejected, which is evidence of bi-directional causality runs from agricultural credit disbursed by all banks to Agricultural GDP.

Table 7: Pairwise Granger Causality Test.

Null Hypothesis	Obs.	F-Statistic	Prob.
LnCR does not Granger Cause LnAGR GDP	19	14.6926	0.0023
LnAGR GDP does not Granger Cause LnCR		3.86344	0.0623

Conclusion and Implication

This study has examined the relationship between agricultural formal credit distribution and agricultural GDP in Pakistan over the period 1992-2016. Time series data was collected from Economic Survey of Pakistan (various issues). To check the stationarity of the series ADF and Phillips Perron (PP) unit root tests have been applied. Furthermore, Johansen Co-integration test have been used to examine long run relation between dependent and independent variables. An econometric, Ordinary Least Square (OLS) method was applied to investigate the relationship between Agricultural credit distribution by banks and agricultural GDP. Similarly, Granger Causality approach has been used to determine the direction of the long run relationship between Agricultural credit disbursed by banks and agricultural GDP. The results of Johansen Co-integration test revealed that; there exists a long-run relationship among agricultural formal credit distribution and agricultural GDP. The results of regression analysis showed that the coefficient of agricultural formal credit distribution is highly significant at both 1% and 5% of significance level, which indicates that there is a strong positive and significant relationship between agricultural formal credit disbursed by banks and agricultural GDP. This means that a 1 percent increase in agricultural formal credit agricultural GDP increased by 0.93%. Furthermore, the results of Granger Causality approach which shows that there is a causality relationship which is bi-directional running from agricultural formal credit distribution to agricultural GDP. Based on the findings of the study, the following recommendations were therefore made;

The procedure for getting credit should be made simple and flexible so that small farmers may benefit it.

Electronic and print media should be used for the awareness of farmers about the importance of agriculture credit.

Government of Pakistan should establish new Village Township Banks in rural areas which will be a useful for

financial mechanism to solve the problems of small rural households.

Government of Pakistan Should introduce new types of credit schemes such as in kind through Khushhali Bank Limited on low interest rate because it will be easy to access for small farmers to increase agricultural productivity.

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