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DOES AGRICULTURE SECTOR HAVE MOMENTOUS EFFECT  
ON PAKISTAN'S ECONOMIC GROWTH? AN EMPIRICAL  
INVESTIGATION FROM 1972-2016

**Abstract**

Agriculture sector prolong to play a vital role in economic growth, development, build-in infrastructure, industrial fabricate up, reduction in poverty, providing employment opportunities, foreign trade, balance of payment and stabilizing the economy of Pakistan. This study applied ARDL model, ARDL Co-integration and Long form co-efficient, Johansen Co-integration and Bound testing approach as analytical techniques to empirically investigate the effect and role of agriculture sector in Pakistan's economic growth from 1972-2016. The study found co-integration between contribution of agri-sector, exports of agri-sector and trade balance of agri-sector with Pakistan's economic growth. Further, the study also found short run relation among agriculture sector contribution, exports and economic growth of Pakistan. The stability and diagnostic test were also applied and their results showed reliability and goodness of fit of the model. This study recommends that as a great proportion of Pakistan's population is directly or indirectly associated with agriculture sector production and earnings, the utmost desire to enhance economic growth of conventional economy like

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Pakistan is to modernize and transform agriculture sector to international stratum.

**JEL CLASSIFICATION:** F13, F55, Q17.

**KEYWORDS:** AGRICULTURE SECTOR, ECONOMIC GROWTH, AUTO-REGRESSIVE DISTRIBUTED LAG (ARDL) MODEL, STABILITY AND DIAGNOSTIC TEST, CO-INTEGRATION AND ARDL LONG FORM COEFFICIENT.

## 1. Introduction

### 1.1 Background of the Study

Pakistan is known as agriculture country and the government of Pakistan making efforts to make this sector more efficient, contribute-full, productive and fruitfully. The sub-sector of agriculture that significantly contributes to agriculture and GDP of Pakistan during 2014-15 includes crops, cotton ginning and livestock, forestry and fisheries. Crops are the important element of agri-sector of Pakistan and thus to economic growth too via agriculture. The contribution of crops to Pakistan's agriculture sector during 2014-15 was 39.6 percent and 8.3 percent to GDP of Pakistan. Cotton ginning is the important part of agri-sector and it was included to agriculture sector in 2004-05, formerly it was the part of industrial sector of Pakistan. Cotton ginning effectively contributed to GDP and agriculture sector of Pakistan during 2014-15 an approximately 2.9 percent and 7.4 percent. The important crops contain wheat crop, maize crop and sugarcane and its contribution to GDP is 5.3 percent and 25.6 percent to agriculture sector during 2014-15. Livestock, Forestry and Fisheries are the important component of agriculture sector of Pakistan. The contribution of Livestock to GDP and to agri-sector is 11.8 percent and 56.3 percent while Fisheries contributes to an about 2.1 percent to agriculture sector and 0.98 percent to GDP of Pakistan during 2014-15.

Agriculture sector prolong to play a vital role in economic growth, development, build-in infrastructure, industrial fabricate up, reduction in poverty, providing employment opportunities, foreign trade, balance of payment and stabilizing the economy of Pakistan. Agriculture is one of the largest contributing sector's accounting for an annual average growth of twenty percent to overall Gross Domestic Product (GDP) of Pakistan. The enthusiastic with dynamic strengthening and spiraling growth of agriculture sector persuade the momentous contribution to the employment opportunities engaging more than forty-five percent of labor force. More than sixty percent of the total population is living in the rural areas of Pakistan utterly dependent on the agriculture sector directly or indirectly, thus Agriculture sector has sturdy relation with economy.

Pakistan was principally agricultural country now transforming to semi-industrial economy. Pakistan's average economic growth rate has been

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higher than the growth rate of the world economy during the first five decades (1947–1997). In 1960s Average annual real GDP growth rates were 6.8%, for 1970's it was 4.8%, and 6.5% in the 1980s. While in 1990's average annual growth rate declined to 4.6% with considerably lower growth in the second half. Though agriculture sector of Pakistan playing the central role in the economic growth and exports of the country, but the facts and figures are witnessed from few decades that exports were not at the desirable level as the imports of agriculture products of Pakistan were more than the exports causing deficit in the trade balance of the agriculture sector. In order to offset this deficit, the public sector needs to provide an enabling environment to the private sector to promote exports related to agriculture products and leads to rapid economic growth. Most importantly, public sector needs to play a capacity building role to improve the quality and quantity of agriculture products as well as access of farmers to international market enhancing greater exports with surplus in the trade balance.

World trade has been greatly influenced by global economic activities. In 2012 the pace of International trading activities slow down to 2.0 percent from 5.2 percent in 2011 and was projected to be around 3.3% in 2013 attributed towards economic crisis in Europe sluggish economic growth in developed countries. The main reason behind Pakistan's low export earnings is export concentration in few items i.e., cotton and cotton manufactures, rice, leather, chemicals & pharmaceuticals products and sports goods, which contributed about seventy percent of total exports for FY14 (Jul-March) with cotton products contributing 52.9 percent, rice (8.7 percent) and leather (4.9 percent). The extent of concentration of these items is projected to be amplifying in future. To increase export earnings and avoid uncertain supply of exportable items Pakistan has to modify the pattern and nature of its trade.

The government of Pakistan launching prototype growth strategy to boost agriculture sector growth by doing different reforms in agriculture sector, providing facilities to the farmers sector, replacing old technical ways with the modern technical and way of farming to enhance the agriculture productivity, improving the quality of the agricultural products enabling to compete with foreign products and in markets, providing agricultural credits to the farmer and encouraging the private sector invest in agriculture sector. For this purpose, the policy framework must be supportive for the private sector investment accompanying with friendly socio, economic and political conditions. The main cause of slow economic growth and limited investment of private sector in agriculture of Pakistan are the traditional technology, low

quality and quantity of agriculture products, limited access to domestic and foreign markets, problems of credit availability, unavailability of the skilled and train labor, unavailability new equipments and machinery of agriculture sector as well as limited capacity of resources and infrastructures. This study is an empirical attempt to investigate the effect and contribution of agriculture sector to economic growth of Pakistan from 1972-2016.

### *1.2 Objective of the Study*

The main objectives of this study are:

- Does agriculture has momentous effect on economic growth of Pakistan?
- To investigate the relation (short/ long run) between agriculture sector and Pakistan's economic growth.
- To find out that both agri-sector and economic growth of Pakistan is co-integrated or not?

## **2. Literature Review**

Agriculture sector production and contribution playing a fundamental role to capture capital stock, sustain the economic growth, increase in exports to contribute in foreign trade and earning, development of the country and in providing employment opportunities as well as in reduction in poverty in Pakistan. The agriculture sector has significantly contributed to economic growth (Fan *et al.* 2010; Rattso and Stokke 2003; Ahmed and Amjad 1984; and Josling *et al.* 2010).

The agriculture exports also playing a dominant role in foreign trade, development and growth of the country especially for developing countries. The exports of developing countries mostly consist on agriculture and primary products. A lot of studies have found considerable and noteworthy effect of agriculture exports that effectively contribute to growth and development of the country. The studies of (Fabiosa 2008; Hatab *et al.* 2010; Kargbo 2007; Kwa, and Bassoume 2007; Erdem and Nazliglu 2008; Dawson 2005; Sanjuan-Lopez and Dawson 2010; and Faridi 2012) have found

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significant effect of agriculture sector and primary products exports on economic growth and development of different countries.

The government policies and political condition also affects the role of agriculture sector in economic growth and development of the country. The studies of (Ahmad *et al.* 2008; Zaidi 2005; Jehangir *et al.* 1998; Hamid and Ahmad 2009) have found an influential role of political conditions and government policies in contribution of agri-sector.

Trade liberalization and trade openness policies have considered as engine for growth and it effectively bring increase in growth of many countries. Some of the studies have found significant effect of trade liberalization on economic growth via agriculture sector and the well known studies in this regard are (Akhtar 1999; Robbins and Ferris 2003; Ahmad *et al.* 2008; Anwar *et al.* 2010; and Malik 2010).

Technology and technological change also have dominant role in agriculture sector. Ali and Hamid (1996), Kemal and Ahmed (1992), Kemal *et al.* (2002) and Hamid and Ahmad (2009) have found constructive and momentous effect of technology and total factor productivity on agriculture sector that leads to significant contribution of agri-sector to economic growth and development of the countries.

### **3. Econometric Model and Data Description**

#### *3.1 Econometric Model*

In order to empirically analyze that does agriculture sector of Pakistan has playing momentous effect in Pakistan's economic growth this study used fixed effect econometric model and the idea for developing of the model is taken from the past studies of (Moulton 1986; Santos *et al.* 2006; Mehlum *et al.* 2006; Kolstad 2009; and Burger *et al.* 2009). The model used in this study is the combination of different properties contains basic growth variables, specification, characteristics and proxy variables. The econometric model that represents the combination of dependent and independent variables is:

$$GDP_t = \alpha_0 + \alpha_1 Bg_t + \alpha_2 Pv_t + \alpha_3 C_t + \alpha_4 Z_t + \mu_t \quad (3.1)$$

In the above econometric model “GDP<sub>t</sub>” is the economic growth of Pakistan that are taken as a function (combination) of some basic growth variables “B<sub>gt</sub>”, Proxy Variables “P<sub>vt</sub>”, Characteristics variables “C<sub>t</sub>” and Instrumentals variables as “Z<sub>t</sub>”. While the “μ<sub>t</sub>” is the error term also known as white noise. From the above model (3.1) the theoretical and econometric model for this study is developed by placing the agri-sector variables as basic, proxy, characteristics and instrumental variables that effect the economic growth of Pakistan.

Agriculture sector has played an important role in economic development and growth of Pakistan since independence. But from the last decades this sector has shown downward trends in its contribution to growth. That’s why this study is an empirical attempts to investigate role of agriculture sector and its main determinants in economic growth of Pakistan from 1972-2016. For this purpose, this study assume Pakistan’s economic growth as dependent variable and agriculture sector production and contribution to GDP (P<sub>agri</sub>), exports of agriculture sector (X<sub>agri</sub>), imports of agriculture sector (M<sub>agri</sub>), Trade balance of agriculture sector (B<sub>oT</sub><sub>agri</sub>) and calculated as (X<sub>agri</sub>-M<sub>agri</sub>), Terms of Trade of agriculture sector (TOT<sub>agri</sub>) and calculated as {relative price of X<sub>agri</sub> / relative price of M<sub>agri</sub>\*100}and also used proxy variables for agriculture sector (TOP<sub>agri</sub>) of Pakistan and calculated as {X<sub>agri</sub>+M<sub>agri</sub>/GDP} are taken as independent variables. Though the included variables may not be the whole factors but these may be give help to policy makers. Consequences of decline in the growth of agriculture will harm most of economic sectors and exports as well income, employment and poverty too, especially in the rural areas of Pakistan where the main income and employment generating activity is the agriculture sector.

The theoretical model for the relationship between economic growth and agriculture sector of Pakistan will be:

$$GDP = f(P_{agri}, X_{agri}, M_{agri}, BoT_{agri}, TOT_{agri}, TOP_{agri}) \quad (3.2)$$

The econometric model can be forms of the above theoretical model (3.2) as:

$$GDP_t = \alpha_0 + \alpha_1 P_{agri} + \alpha_2 X_{agri} + \alpha_3 M_{agri} + \alpha_4 BoT_{agri} + \alpha_5 TOT_{agri} + \alpha_6 TOP_{agri} + \mu_t \quad (3.3)$$

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The expected sign of the co-efficient will be:

$$\alpha_1 > 0, \alpha_2 > 0, \alpha_3 > 0, \alpha_4 > 0, \alpha_5 < 0, \alpha_6 > 0$$

The Auto-Regressive Distributed Lag (ARDL) model of the above econometric model (3.3) can be form as:

$$GDP_t = \alpha_0 + \alpha_1 P_{agri} + \alpha_2 X_{agri} + \alpha_3 M_{agri} + \alpha_4 BoT_{agri} + \alpha_5 TOT_{agri} + \alpha_6 TOP_{agri} + \sum_{t-1}^{t=n} \beta_0 \Delta GDP_{t-1} + \sum_{t-1}^{t=n} \alpha_1 \Delta P_{agri,t-1} + \sum_{t-1}^{t=n} \alpha_2 \Delta X_{agri,t-1} + \sum_{t-1}^{t=n} \alpha_3 \Delta M_{agri,t-1} + \sum_{t-1}^{t=n} \alpha_4 \Delta BoT_{agri,t-1} + \sum_{t-1}^{t=n} \alpha_5 \Delta TOT_{agri,t-1} + \sum_{t-1}^{t=n} \alpha_6 \Delta TOP_{agri,t-1} + \mu, \dots \dots \dots (3.4)$$

### 3.2 Data description and Sources

This research study uses annual time series data to empirically evaluate the role of agriculture sector and its determinants in economic growth of Pakistan. The period of analysis selected for empirical regression of the variables data is from 1972-2016, as prior to 1972 Pakistan consisted of two parts (East and West Pakistan). The data is collected from different sources, that are Federal Bureau of Statistics, State Bank of Pakistan, Agriculture Development Bank of Pakistan (ZTBL), National Accounts of Pakistan, World Development Index, World Bank, World Economic data Indicator, Global Economy, World Development Index (WDI), Ministry of Finance Pakistan, Economic Affairs Division Pakistan, World Trade Organization (WTO) Statistics Database and Economic Surveys of Pakistan.

## 4. Methodology, Results and Discussions

Firstly, the data used in this study were tested for unit root, spurious relation and for outliers by applying the Augmented Dicky-Fuller (ADF) unit root test. It is important to check the data for level of integration as well as for level of stationarity since the economist and researchers has mainly



remains doubtful about the problem of unit root especially in time series data. As the data used in this study is also consists on annual time series data for all the including variables having period of analysis from 1972-2016, therefore, before going to regression analysis of the variables data it is tested for stationarity and the results of ADF test is incorporated in below table (1).

**Table 1. Augmented Dicky-Fuller Unit root Test Results**

Variables	Acronyms	ADF Values		ADF Critical Values
		At Level	At 1 <sup>st</sup> Difference	
Economic Growth	GDP	2.232998	-5.290931*	-2.948404
Agriculture Production	P <sub>agri</sub>	-0.391463	-5.127740*	-2.948404
Exports of Agri-goods	X <sub>agri</sub>	-2.997342*	-7.209565*	-2.948404
Imports of Agri-goods	M <sub>agri</sub>	-0.751947	-3.443178*	-2.948404
Balance of Trade	BoT <sub>agri</sub>	-1.103501	-4.978477*	-2.948404
Terms of Trade	TOT <sub>agri</sub>	-3.166714*	-5.309475*	-2.948404

Critical value selected at 5% significance level. (\*) showing rejection of null hypothesis at 5%.

The results integrated in above table (1) shows that the variables included in this study shows their stationarity at I(0) and some variable at I(1). Moreover, the data didn't show any spurious relation, outliers or any other sever problem. Whenever, the variables data in the included model has shown stationarity of some variable at I(0) and I(1), the method for this circumstances that best fitted is Auto-Regressive Distributed (ARDL) model for regression analysis of the study developed by (Pesaran *et al.* 2001). The econometric model further developed with ARDL approach (3.4) applied for regression analysis of the variables data through (E-Views 9) and the results are integrated in table (2).

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**Table: 2: Regression Results of Agri-Sector and its Determinates as Independent variables and Economic Growth of Pakistan as Dependent Variable**

<b>Variables</b>	<b>Acronyms</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.</b>
Constant	C	0.304918	0.756988	0.402804	0.6916
Agricult. Production	D(P <sub>agri</sub> )	0.234785	0.090927	2.582124	0.0183
Agricult. Production	D(P <sub>agri(-1)</sub> )	0.172597	0.146498	1.178148	0.2533
Exports of Agri-goods	D(X <sub>agri</sub> )	0.426427	0.183950	2.318165	0.0317
Exports of Agri-goods	D{X <sub>agri(-1)</sub> }	0.558962	0.225238	2.481648	0.0226
Imports of Agri-goods	D(M <sub>agri</sub> )	0.346792	0.150642	2.302091	0.0352
Imports of Agri-goods	D{M <sub>agri(-1)</sub> }	0.535461	0.233039	2.297731	0.0331
Balance of Trade	D(BoT <sub>agri</sub> )	0.162805	0.053258	3.056877	0.0065
Balance of Trade	D{BoT <sub>agri(-1)</sub> }	0.106592	0.049960	2.133540	0.0461
Terms of Trade	D(TOT <sub>agri</sub> )	0.109219	0.083234	1.312188	0.2051
Error Correction Term	D(ECT)	0.461496	0.212809	2.168590	0.0430
Error Correction Term	D{ECT <sub>(-1)</sub> }	0.546423	0.283336	1.928532	0.0689
Lag Value of GDP	D(GDP <sub>(-1)</sub> )	0.548768	0.148422	3.697344	0.0015
R-squared		0.927397		Durbin-Watson stat	1.9746 48
Adjusted R-squared		0.894395		Prob(F-statistic)	0.0000

The econometric and ARDL developed for this study has been regressed by applying Auto-regressive distributed Lag (ARDL) model selecting automatic lag length criteria. The model followed AIC and BIC criterion adopting the lag-length as (1, 1, 1, 1, 1, 0, 1). The results integrated in table (2) indicate that the performance of the model is satisfactory as the overall model is highly significant (Prob. F-Stat value is 0.0000). Moreover, there negligible chances of auto-correlation as the Durbin-Watson value is very close to desired value rejecting the chances of auto-correlation and spurious relation {R-squared value is less than Durbin-Watson value ( $R^2 < DW$ )}. The model also explains ninety-two variations between Pakistan's economic growth and agriculture sector proving goodness of fit of the model. The effect of co-efficient estimators of agriculture sector on economic growth of Pakistan is briefly explains one by one below.

Agriculture sector has remains the most important and contributing sector to growth and development for most of the developing countries and for Pakistan too. Agriculture sector of Pakistan has significantly contributing an approximately twenty percent to Pakistan's economic growth since last decade. This study empirically analyze the contribution of agriculture sector in economic growth of Pakistan from 1972-2016 and the ARDL regression results incorporated in table (2) indicates that agriculture sector is significantly contributed up to twenty-three percent at an aggregate level from 1972-2016. The empirical result for the contribution of agriculture sector contribution to economic growth of Pakistan is very close to theoretical and real facts and figures of Pakistan economy. Further, the results of this study regarding the contribution of agriculture sector in Pakistan's economic growth are consistent with the past studies of (Ahmed and Amjad 1984; Rattso and Stokke 2003; Fan *et al.* 2010; and Josling *et al.* 2010).

Exports of agriculture goods in general is considered to be progressive and beneficial for economic development of any economy but it is constrained by the level and condition of economic growth of any economy. Exports of agri-sector works in a constructive way if the economy is competent in quality production of much exportable merchandise, however for less developed countries that are incompetent in manufacturing sector and relies on conventional agriculture sector and imports from other countries cannot easily grab the advantages of open economy. This study empirically analyze the role of agriculture sector exports of Pakistan applying ARDL approach and the regression results integrated in table (2)

shows found positive and noteworthy role of agriculture exports on Pakistan's economic growth. The theoretical literature and real facts and figures of Pakistan's economy also supports the constructive role of agri-sector and sustain the empirical results of this study. The empirical findings of this study for the role of agriculture exports in Pakistan's economic growth is consistent with the earlier studies of (Dawson 2005; Kargbo 2007; Kwa and Bassoume 2007; Fabiosa 2008; Erdem and Nazliglu 2008; Sanjuan-Lopez and Dawson 2010; Hatab *et al.* 2010; and. Faridi 2012).

Pakistan is basically agricultural economy, most of its financial and economic activities directly or indirectly depends on agriculture production. Agriculture facilitates a major part of labor force as well as provides food and besides that also supplies raw materials to industrial production. To have flawless production of agri-products Pakistan relies on the import of fertilizer, insecticides, and medicinal products from other countries. The results integrated in table (2) showing that imports of agriculture related goods have positive effect that can significantly contribute to economic growth. The empirical results of this study for effect of agricultural imports on economic growth of Pakistan is consistent with the earlier studies of (Buzby and Unnevehr 2004; Blalock and Veloso 2007; Kargbo 2007; Erdem and Nazliglu 2008; Dengfeng 2008; Sharif *et al.* 2010; Buzby and Robert 2010; and Faridi 2012).

Trade balance shows the overall strength and performance of the economy in terms of its dependence on foreign imports and self-sufficiency in terms of exports. Generally in old times countries struggled to achieve and maintain favorable/surplus trade however with the passage of time economies realized the importance of equilibrium trade balances for the maximum utilization of available resources. In short BOT is one of the most important and significant indicator of economic growth and development of any economy. This study endeavors the effect of trade balance of agriculture sector on economic growth of Pakistan. The empirical results obtained from ARDL regression analysis of the study shows that trade balance of agri-sector of Pakistan has playing an important and momentous role in economic growth to offset the trade deficit and sustain favorable foreign trade. The result for trade balance via agri-sector of Pakistan and its contribution to economic growth is consistent with the past studies of (Ostry 1988; Egwaikhide 1999; Sugema 2005; Mbayani 2006; Peter and Sarah 2006; Saadullah and Ismail 2012; Shawa and Shen 2013; and Abbas 2013).

Terms of trade (TOT) is simply the comparative value of exports in terms of imports and described as the ratio between prices of export and prices of imports. In other words it is inferred as the quantity imported by an economy against per unit of export merchandise. An improved term of trade is advantageous for the economy, as it can purchase more imports for some certain amount of exports. The terms of trade might be inclined by exchange rate as an increase in the rate of a economy's currency, decrease the import prices domestically however doesn't directly influence the export prices of the country. This study didn't found any significant effect of terms of trade on economic growth of Pakistan, though some studies have found significant effect as the studies of (Cheong and D'Silva 1984; Qureshi 1985; Khan and Ahmed 2005; Hossain 2008; and Niazi *et al.* 2010). The main reason of insignificant result for terms of trade may be that exports of Pakistan is much less as compared to imports (either that of agri-sector or overall imports) and persistently facing trade deficit that may be the cause of insignificant empirical results for terms of trade in case of Pakistan.

The error correction term or speed of adjustment (ECT) is also significant and negative that indicates that the model will come back to its original and equilibrium state at a speed of forty-six percent. The constant term is insignificant while the lag value of GDP is positive and significant indicating that previous year growth has considerable effect on current year growth as integrated in table (2).

#### 4.1 Stability and Diagnostic Tests

To check the sensitivity, goodness of fit, reliability and specification of the model, different stability and diagnostic tests were applied and their results are integrated in tables (3), (4) and (5).

**Table 3. Results of Breusch-Godfrey Serial Correlation LM Test**

F-statistic	0.410437	Prob. F(1,21)	0.6833
Obs*R-squared	1.135270	Prob. Chi-Square(1)	0.5789

**Table 4. Results of Breusch-Pagan-Godfrey Heteroskedasticity Test**

F-statistic	1.659294	Prob. F(11,21)	0.1533
Obs*R-squared	15.34495	Prob. Chi-Square(11)	0.1672
Scaled explained SS	4.755011	Prob. Chi-Square(11)	0.9424

**Table 5. Results of Ramsey RESET Test**

	Value	Df	Probability
t-statistic	1.360662	20	0.4285
F-statistic	2.572725	(1, 20)	0.4285

F-test summary:

	Sum of Sq.	Df	Mean Squares
Test SSR	3.77E+11	1	3.77E+11
Restricted SSR	1.73E+12	21	8.23E+10
Unrestricted SSR	1.35E+12	20	6.76E+10

The results Breusch-Godfrey Serial Correlation LM test is integrated in above table (3) showing the variables data didn't suffers from serial or auto-correlation. Further, the test results also confirm that data is free from spurious relation and the error term is randomly distributed independently of each year.

The model was also check for Hetro-skedasticity and the results integrated in table (4) didn't show any probability of Hetro-skedasticity in the variables data. The results of Breusch-Pagan-Godfrey test integrated in table (4) shows that the variance among the variables data is constant and test results rejects the chances of Hetro-skedasticity in the model. Further, Ramsey RESET test was applied to check the specification and reliability of the model and the results incorporated in table (5) indicates that the model is stable and free from mis-specification or any biasness in selecting variables. In short, the diagnostic and stability analysis of the model confirms that the variable data and regression analysis of the study is reliable and proving goodness of fit of the model.

#### 4.2 Co – integration and ARDL Long Form

This study also applied ARDL co-integration and long form test to check the co-integrating variable and long-run relation among the agriculture sector and economic growth of Pakistan and the results obtained from regression analysis of these tests are incorporated in below table (6) and (7).

**Table 6. Results of ARDL Co-integrating Test**

Variable	Cointegrating Form			
	Coefficient	Std. Error	t-Statistic	Prob.
D(AGRI, 2)	0.334785	0.129654	2.582124	0.0183
D(X, 2)	0.427043	0.184215	2.318165	0.0317
D(M, 2)	0.346792	0.266335	1.302091	0.2085
D(BOT, 2)	-0.162847	0.053272	-3.056877	0.0065
D(TOT, 2)	-0.109921	0.083769	-1.312188	0.2051
D(ECT)	0.461649	0.212879	2.168590	0.0430
CointEq(-1)	-0.451232	0.148422	-3.040192	0.0067
Cointeq = D(GDP) - (0.791743*D(AGRI) + 0.385827*D(X) -0.494333*D(M) -0.124566*D(BOT) -0.243603*D(TOT) + 0.404523*ECT +0. 675747)				

**Table 7. Results of ARDL Long Form Co-efficient Test**

Variable	Long Run Coefficients			
	Coefficient	Std. Error	t-Statistic	Prob.
D(AGRI)	0.791743	0.183574	4.312918	0.0004
D(X)	0.385827	0.137403	2.807979	0.0112
D(M)	-0.494333	0.887041	-0.557283	0.5838
D(BOT)	-0.124566	0.168695	-0.738409	0.4693
D(TOT)	-0.243603	0.206458	-1.179912	0.2526
ECT	-0.404523	0.152066	-2.660163	0.0155
C	0.675747	0.481137	1.404479	0.2904

The results integrated in table (6) shows that there are three co-integrating variables among the selected model of agriculture sector and Pakistan's economic growth. In other words, the results incorporated in table (6)

indicate that contribution of agri-sector, exports of agriculture sector and trade balance of agri-sector has strong co-integration with economic growth of Pakistan. Further, the ARDL long form test was also applied to test the long-run relation between agri-sector and economic growth of Pakistan. The results integrated in table (7) indicating that contribution of agri-sector and exports of agri-sector has short run relation with economic growth of Pakistan, while other variables have found insignificant relation. The Johansen co-integration and ARDL bound testing approach were applied to further confirms the co-integrating relation and long or short relation among the agriculture sector and economic growth of Pakistan. The results of these tests are incorporated in table (8), (9) and (10).

**Table 8. Results of ARDL Bound Testing Approach Test**

Bounds Test Value		Critical Value Bounds	
Test Statistic	Value	I0 Bound	I1 Bound
F-statistic	2.126439	2.45	3.61

*Critical value selected at 5% significance level.*

**Table 9. Results of Unrestricted Co-integration Rank Test (Trace Stat Value)**

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.857799	195.3022	125.6154	0.0000
At most 1 *	0.797566	134.8363	95.75366	0.0000
At most 2 *	0.741937	85.31869	69.81889	0.0018
At most 3	0.501185	43.32756	47.85613	0.1248
At most 4	0.348609	21.76641	29.79707	0.3117
At most 5	0.236327	8.478392	15.49471	0.4157
At most 6	0.003873	0.120298	3.841466	0.7287

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values



**Table 10. Results of Unrestricted Co-integration Rank Test (Maximum Eigen value)**

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.857799	60.46587	46.23142	0.0009
At most 1 *	0.797566	49.51763	40.07757	0.0033
At most 2 *	0.741937	41.99113	33.87687	0.0043
At most 3	0.501185	21.56115	27.58434	0.2437
At most 4	0.348609	13.28802	21.13162	0.4261
At most 5	0.236327	8.358094	14.26460	0.3435
At most 6	0.003873	0.120298	3.841466	0.7287

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

The results of ARDL Bound testing approach integrated in table (8) verify that there is short run relation between agri-sector and economic growth of Pakistan. Further, the results incorporated in tables (9) and (10) of Johansen Co-integration test confirms that there are three co-integrating factors between Pakistan's economic growth and agriculture sector of Pakistan. the co-integration results of Johansen test is consistent with the results of ARDL co-integration and the results of Bound Testing approach is consistent with ARDL long form results accepting Null hypothesis<sup>1</sup>.

## 5. Conclusions

Agriculture is the main and important sector of the economy for all countries and especially for developing countries. Due to low capital structure, lake of industrial development and heavy machinery developing countries utterly dependent on agriculture sector. Pakistan too, is a developing country dependent on the agriculture sector and known as agriculture country. Though from several decades and increasing problem of the agriculture sector its contribution decreases time to time and stuck to an

<sup>1</sup> Null hypothesis  $H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6$  (There is no Long run relation)  $\alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6$  (There is Long run relation)

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average of 20% to overall gross domestic product (GDP) of Pakistan. It engages about 45% of the country labor force providing employment opportunities not only helping in reduction in poverty but also in providing food items, improving standard of living especially in rural areas of Pakistan and elevate the economic growth of Pakistan.

To formulate the agriculture sector of Pakistan assisting effectual and fruitful economic growth and development, fulfill the domestic need and requirements of daily food necessities, became more profitable and injective to the economy, considerable effective in poverty reduction and engaged more labor by providing greater employment opportunities, government of Pakistan and policy makers needs to encourage the private sector for investment to enlarge their role to enhance rapid progress and development of agriculture sector in Pakistan. For this purpose, the policy framework must be supportive for the private sector investment accompanying with friendly socio, economic and political conditions. The main cause of slow economic growth and limited investment of private sector in agriculture of Pakistan are the traditional technology, low quality and quantity of agriculture products, limited access to domestic and foreign markets, problems of credit availability, unavailability of the skilled and train labor, unavailability new equipments and machinery of agriculture sector as well as limited capacity of resources and infrastructures.

### **Implications of the study**

The main implications drawn from empirical analysis of this study are:

- There is need of private and public sector investment partnership in agri-sector to support each other for enhances growth of this sector.
- The public sector needs to support private sector morally, financially and providing technical facilities and knowledge of agri-sector.
- Agriculture can be more productive and contributive by increasing domestic purchasing power, by export expansion, by import substitutions through assets redistribution. Government should take into consideration not only the conditions in domestic economy but also the international economy and finally the assets redistribution may be difficult politically.
- Creation of agri-sector demand should be supplemented by the provision of enough fiscal and monetary incentives to the investors. So government

policies, e.g. fiscal, monetary and trade policies should be design in such a way that the investment climate becomes favorable.

- Agri-sector Investment is influenced by the prevailing macroeconomic environment is conducive to public and private investment and therefore to growth. Complete and stable information, sustainable budget, stable and predictable exchange rate, low real interest rate and comfortable foreign reserves are among the indicators of a stable macroeconomic environment.

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