The Role of Organizational Trust an Empirical Estimation of Agriculture Transformation and Rural Development in Pakistan under SDGs

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A B S T R A C T

Agriculture sector still support more than half population of the country. Contribution of agriculture is important for Pakistan's development. Agriculture has been always the main sector of the economic growth of Pakistan. This study has been conducted to investigate the role of agriculture sector in rural development of Pakistan. To achieve economic sustainability and growth, Pakistan planned to adopt 17 SDGs and under that SDG 2 promote agriculture sustainability. So, it is aimed to measure the progress of Pakistan on this defined indicator to analysis the impact of structural transformation on agriculture sustainability. Time series data has been taken from 1972-2017. ARDL method of estimation has been used for the fulfilment of the objective of the study. Agriculture productivity has been taken as the dependent variable and Employment in Agriculture, Agricultural land, Agricultural Machinery and Fertilizer Consumption are taken as independent variables. For the estimation double log equation has been used. To check the co integration among the dependent and independent variables ARDL bound test has been utilized. It has been observed that through the existing body of knowledge that agriculture machinery, agriculture land and fertilizer consumption in agriculture sector has positive effect in the rural sector. But it has been observed that employment in agriculture have not significant effect on the agriculture value added in Pakistan. It is necessary to enhance the agriculture sector for the rural development which ultimately boosts the economic growth.

Keywords: Agriculture Transformation, Economic Growth, Rural Development.

INTRODUCTION

Agriculture remains the hub of the Pakistan's economy. Agriculture continuous to important instrument for the poverty alleviation in the 21st century. It is the main source of the raw material and food to industrial sector. Agriculture as actuality appreciated due to the fact because it provides extra farmstead products available for human use. Economic development will have tremendous consequences for the future structure of Pakistan's agriculture. For that we need the transformation of agriculture in Pakistan and changing nature of the Pakistan's domestic demands for food and fiber. Agriculture development can help efficiency, increment cultivate earnings and invigorate linkages amongst cultivate and non-cultivate destitution decrease programs. Ahmad (1987) Growing population, agricultural land shrinking, water resources demand

increase, degradation of land is widespread and insufficient infrastructure seem to be main apprehensions of the agriculture sector in Pakistan. An effort has been completed to scrutinize the linkages of growth of population, growth of agriculture and for the reduction in poverty.

Rural residence income widely depends on the agriculture relevant activities for the being alive. The development of the rural economy in the sustainable way can increase employment chances in the rural areas and can decrease the pre- mature rural urban migration and reduce the poverty. Development of rural areas can contribute to save the rural lands and to safe the cultures and traditions. Although in developing countries concept of progressive rural structure we have concentrated on its function in directly serving the objective agriculture growth, we should recognize that it serves other purpose

related to the rural welfare and urban industries development as well. A progressive rural structure brings urban influences into the countryside (Zaman, Khan, Ahmad, & Rustam, 2012). Study conducted by Hayati and Karami (2006) highlights the broad range of approaches that have been developed. The methods of defining and farming of sustainable agriculture fluctuate in relations of their attention of the three main magnitudes of sustainability, social, environmental, and economic that measure in term of rule with them can contact the sustainability from farm level to the globe. Growth of agriculture is also correlated with the employment in agriculture sector and sustainability of the agriculture sector. Worldwide poverty considers a rural phenomenon rather than urban areas. The concept of rural development has changed significantly during the last three decades. Until the 1970s, rural development was synonymous with agricultural development and, hence, focused on increasing agricultural production. Today's concept of rural development concerns not only with improvements in growth, income, and output but it also includes an assessment of changes in the quality of life, such as improvement in health and nutrition. With the fast grow of this sector, it will increase the welfare of the large portion of population and also for the economic growth and major economic goals achievement. It contributes to it, and it assures that the overall development shall be truly general, including within its scope the large proportion of people who live by farming and who will for many years continue to live by farming in many countries (Chandio, Jiang, & Guangshun, 2016).

Uchendu (1970) CADU was successful in promoting the adoption of new wheat technology. But this resulted in increased land values which than cause white spread eviction of small renters by landlords. Agriculture growth is primary goal for the rural development and the quality of life they can enjoy. Studies have shown that those who adopt new practices in agriculture sector have food rural development. It expands the market of the goods produced by the farm holders to the main markets of the urban areas. Roads which are used to carry the farm products and farm supplies and equipment also make easier to bring the urban products rural villages for sale. Agriculture transformation helps the rural small-scale industries it facilitates those activities which contribute directly to rural development. Recently many studies have been conducted for the agriculture

transformation and rural development. They did work on rural development or the reduction of poverty in rural areas agriculture with agriculture transformation. GDP per capita growth has been used in relation with the employment in agriculture and net exports of agriculture raw material has also been used.

There is need to fill the gap for the collection that all factors for the rural development through agriculture transformation should be considered for the sustainable development goals achievement. To investigate the role of agriculture sector in rural development of Pakistan. So, it is aimed to measure the progress of Pakistan on this defined indicator to analysis the impact of structural transformation on agriculture sustainability. So any change in agriculture policy will affect the major portion of the population and economy of the country. Use of modern technology, high yield seeds verities, and use of fertilizers will increase the value added of agriculture and GDP growth of country.

REVIEW OF LITERATURE

The main feature of this chapter is to advance the conceptual strategy related to the topic. As agriculture is the main hub of the economic growth of the country. As agriculture transformation is essential for the rural development and for the sustainable growth. For the achievement of targets research and development in technology and its implication through better practices is also very important. Number of national and international studies shows how the different agriculture transformation leads towards the rural development and towards the sustainability.

Farshad and Zinck (1993)Sustainability refers to the qualitative and quantitative continuity in the use of a resource. Sustainable agriculture is dynamic because it is coupled with both land use, which reflects the changing needs of population, and world economy. Sustainability implies a state of equilibrium between human activities as influenced by social behavior, acquired knowledge, and applied technology, on the one hand and the food production resources on the other. Most renewable natural resources are sustainable before human intervention. Sustainability does not only mean feeding the present and future population, but also requires an improved infrastructure and a stable economy. Bowers (1995) in developing countries sustainable agriculture indicates intensive pattern of farming, so efficiency increasing use of land through, such as different methods

of cropping, variety of mixed cropping and several cropping extreme use of inside resources and stable use of outside resources. The essential capacity of water and soil resources that helps production in agriculture are sustained or upgraded completed on time and productive use of knowledge and performs and innovation enhancement and request for resource preservation technologies.

Hani *et al*. (2003)Sustainable Agriculture adopts productive, competitive, and efficient production practices, while protecting and improving the natural environment and the global ecosystem, as well as the socio-economic conditions of local communities. Competitive, efficient practices of production and productive methods are adopted in Sustainable agriculture. It also improves the natural environment and ecosystem of globe as well as also increases the social economic condition of the communities of local areas. Rural development and sustainable development have a suitable balance between self-sufficiency in food and self-reliance of food, in rural areas generation of income and employment, especially to eliminate poverty, and also for the protection of natural resources and environment. Schader, Grenz, Meier, and Stolze (2014) Global community has been adopted new agenda of sustainable development goals which includes 17 transformative goals with 169 targets. It is the commitment to leave no one behind. Agenda 2030 planned to end poverty and hunger reduces in equality and attaining gender equality and for the protection of earth tackling the climate. Limitation of resources in every country needs transfer of technology and support of financial capacity enhancement with appropriately defined responsibilities so it will take to transfer consistently towards the goal of sustainable development. For achievement of sustainable development goals requires effective and strong institutional mechanism which including all stake holders, across all country public representatives.

Ding, Meriluoto, Reed, Tao, and Wu (2011) for the achievement of the poverty reduction target agriculture is critical. Still, it is the only furthermost significant creative sector in most low-income countries, frequently in relations of its portion of gross domestic product and nearly continuously in relation of the number of people it employs. In countries where the share of agriculture in general employment is huge, broad-based progress in incomes from agriculture is important to inspire overall growth of the economy, counting the non-farm segments retailing to rural people. Rosenzweig (1978) The approach of neoclassical of allocation of resources and distribution of income emphasizing full employment and the nonappearance of any connection between resources and income use effectiveness, and inappropriateness of innovativeness procedures determinedly disregards approximately basic structures of modern. Agriculture backward does occupation with an advanced market of labor wage but as below entrepreneurship also a replacement military of jobless embraced of the powerless and farmer household workers. Wages of rural are consequently resolute, in great part, by structural and institution factors. Reserve custom furthermore is subject to significantly effect on production association and distribution of wealth. However, land markets and markets of credit may effort to deteriorate these relations, the inspirations of advantage inequality and innovativeness forms persevere powerfully. This procedure has related to a piercing intensification in farm productivity of labor, the progress of the portion of farm domestic labor working off-farm, a movement near modernization, important intensifications in farm size and decreases in number of farms. Farm departures reason resources land especially to be transferred between the lasting farms permitting the procedures of farm association. In this way, remaining farms have the chance to foster in size. Certainly, size of growth is highly negatively associated with the decrease of farm number(Harris & Todaro, 1970).

Small farmers save less share of their income than large landowners. Savings in the rural areas are based on the how much acres of land holds by a farmer. Small farm sector includes the largest segment of the population the responses of small farmers to economic stimuli are especially relevant for economic and social development. Technological innovations for increasing productivity on small scale are accepted now by most development specialists as being essentials. Even so the most appropriate procedure for introducing new technology to the small farmer is not always evident (Griffin, Khan, & Ickowitz, 2002). Small farmers face many important constraints when attempting to use agriculture credit. Their farms are small and often fragmented. Little potential exists for land expansion where small farmers are located without the possibility of off farm migration. The land which small farmers do possess is often of poor

soil quality and with limited access to irrigation water. Land tenure rights often are not officially recorded and are thus insecure. Credit should be extended based on its potential for increasing farm incomes. Consequently the primary objective of credit program should be to help the farmer increase the value of output more than the increases in the input costs leaving him with a net gain (Baker, 1973).

Persistent poverty has its roots primarily in the subsistence agriculture sector. Small size and traditional production techniques have placed limitations on production possibilities and thus family incomes. Nevertheless, the small the farming sector can make a positive contribution to the developmental process if the production constraints are broken but in short run the solution of increasing the size of the operation is unfeasible for most of the countries. Introducing new technologies seems to hold the most promise for raising income levels and encouraging integration of the rural peasant with the modern society (Jones, 1972).

The level of managerial supervision as captured through farm size and plot size. It is useful to distinguish between the level and the quality of managerial supervision. Two farms of the same size and the quality of managerial supervision. Two farms of the same size with the same number of plots and similarly located, each managed by one man would be able to get the same level of managerial supervision, but if the knowledge of agriculture practices differs between farmers there could be difference in the quality of supervision. Through the farm size variable, we would only hope to capture any between farm effects of the supervision constraint which would apply uniformly to all plot on the farm, while through the plot size variable we hope to capture any within farm between plot effects as well (Rani, 1971). Agriculture is the major economics sector of virtually all less developed countries. Small farms usually dominate the agriculture sector of those economies. The role of agriculture and of small producers, in economic development is of major concern to policy makers and to development specialists. Since the small farmers sector includes the largest segment of the population the responses of small farmers to economic stimuli are specially the relevant for economic and social development. Technological innovations for increasing productivity on small scale farms are accepted now by most development specialists as being essential. Even so the most appropriate procedure for introducing new

technology to small farmer is not always evident. A review of existing small farmers programs will bring to light a multitude of institutional, organizational, financial, administrative, leadership, political, cultural (Sarkar & Prahladachar, 1966).

Among crude and laborer social orders culture esteems and mentalities convictions and personal conduct standards regularly play an equivalent or more noteworthy job than financial contemplation when choosing whether to acknowledge or not new generation rehearses. Connection commitments peer amass weight fatalistic convictions negative social assents with respect to collection or surplus independence rank contrasts and requirements and propagation of regular customary qualities through family socialization all speak to genuine difficulties to the outside change operator. Interestingly one need not seek out primitives or peasants to demonstrate that cultural factors influence economic decision making (Edwards-Jones, 2006). The characteristics of the labor market in the agrarian economy cannot be understood without an intimate knowledge of the different nature and type of risks that various sections of the peasantry face in the labor market their varying extent of mobility and freedom of decision making open to them the specialized character of agriculture operations, norms, and conventions prevalent in operation wise distribution of work and the seasonal time patterns of agriculture activity. Some indications show that norms and conventions prevalent in operation wise distribution of work and the specialized character of agriculture operations tend to play an important part (Bharadwaj, 1975).

Rural development is the requisite part of the structural transformation process due to diversification of the country from the sustainable agriculture system. Rural development process facilitated by rapid agriculture growth. It provides sustained and equitable economic growth in all the sectors of the economy. Agriculture support programs should be easily accessible to all the farmers with the district units made up of farming localities those can be easily served. Rural residence income widely depends on the agriculture relevant activities for the being alive. The development of the rural economy in the sustainable way can increase employment chances in the rural areas and can decrease the pre- mature rural urban migration and reduce the poverty (Gill, Mustafa, & Jehangir, 1999). The problem of reduction in poverty in Pakistan aimed as alleviation of

the poverty without boosting the sector of agriculture. Development of the agriculture sector is crucial for the reduction in poverty but as Pakistan has the countless potential, so it must keep on working for the development of this sector. All the strategies for the reduction of poverty should focus on the transformation of the agriculture sector and all the other issues need to be addressed. Like degradation and soil erosion, pesticide, fertilizer inappropriate use, availability of quality of seeds imperfectly. Markets structures are not proper, farm power non-availability; research and extension are weak in agriculture sector. All procedures that theoretical to lessen poverty should goal the poor sections, transformation of agriculture sector, serving them shape creative properties and make income (Datt & Ravallion, 1998).

In rural economies especially in developing countries agriculture is the main sector. Size of the local economy was mostly used to describe the reality. Agriculture development policy can lead to the rural development. With sustained improvement in the productivity in the agriculture sector welfare of the people improved and with the sustained rural development the welfare of the people was also improved. Although in developing countries e concept of progressive rural structure we have concentrated on its function in directly serving the objective agriculture growth, we should recognize that it serves other purpose related to the rural welfare and urban industries development as well. A progressive rural structure brings urban influences into the countryside (Anríquez & Stamoulis, 2007). Inclusive growth linked to the food and nutrition security. For the poverty reduction and inclusive economic growth, it is important to support small farm holders and family farmers by providing them secure excess to their lands and linkages to the national and international markets. To improve food and nutrition security and for increasing the production of food it is important to provide them excess to the input output markets, financial markets and raisings their incomes Food security can only be achieved through self-reliance which involve both the export as well as the imports of agriculture-based products. The concept of food security at the national level does not mean national food self-sufficiency. It requires that each country must produce enough food for its own expanding needs or in case where comparative advantage lies elsewhere to have sufficient foreign exchange earnings to be able to import

the required quantities of food (Godfray et al., 2010).

Agriculture is essential to the rural development of Pakistan. Agriculture extension system in Pakistan was helpful for the farmers through educational system. With improving farming methods, techniques for increasing production and income, lifting the standard of living of the rural people. Agriculture extension was very useful for lessening poverty, enhancing food and crop production, and transfer of new information among people. It provides the development of the institutions and helps people to generate income together with the crop output increased. Extensions is the mechanism by which the new technology is developed, modified, carried and translated to the farmer in coordination with the provision of the credit when needed(Baig, AlSubaiee, & Straquadine, 2009).

Argued that a new paradigm is needed for the development in the agriculture sector which leads to the multiple effects like triggering economy, rural development, and poverty alleviation, reducing income disparities and reducing food insecurity. Agriculture operations have been changed drastically due to globalization, advanced technology, more demanding markets and due to institutions. Globalizations effected agriculture production negatively and developing countries had to import food to meet the food insecurity challenges. There is the high cost of the food insecurity prevailing in the society due to inappropriate methods to control over the globalization (Byerlee, De Janvry, & Sadoulet, 2009).

Agriculture has comparatively developed advancement in West Pakistan. It includes better fertilizer seeds, chemical fertilizer, high yield variety seeds and water inputs. When agriculture advancement has been made up it is possible to segregate the social economic constraints to implement these technological advancements. Green Revolution could lead to a displacement of millions of the farmers in Pakistan unless policies to bring about modernization of small farms are followed and efficient work of the institutions, land reforms, support prices and credit programs. A change in the cropping pattern without a change in cropping intensity could also occur but only if the farmer switched one variety of crop to another without extending the area under cultivation (Nulty, 1972). Johnston and Kilby (1973) in 1870 an attempt was made for the introduction of the farming methods on the large scale which are known as the Western Modern Methods.

After that failure system again, efforts were made for the better efficiency of the prevailing small-scale farming system. That system of the farming includes the basic provision of the knowledge to the farmers and the getting credit assistances from the West. For the intimation of the knowledge to the small and local farmers was the initial point of the research in agriculture and facilities for the provision of the credits or extensions. That procedure also includes the usage of the high fertilizer's consumption for the more agriculture production. Also, more considerable importance was also given to the analysis of the types of the soils and according to the condition of the soil usage of the fertilizers for all types of the crops with different soil types and under different climate conditions.

MATERIALS AND METHODS

Theory on Structural change and agriculture transformation on the instrument by which less developed economies transform their structure of national economics form substantial importance on constituent traditional agriculture towards modern more and more rural development. The uses the instruments of neo classical for take place of the process of transformation. Hence, agricultural development theory should deliver perceptions into growth of agricultural dynamics, moreover into the altering foundations of growth in economies. The methodology is designed in such a way with the utilization of the previous ideas related to the sustainable agriculture transformation and rural development

THEORETICAL BACKGROUND
Schultz Theory on the Traditional Agriculture 1964
In 1960s theory of Schultz on the traditional agriculture became superficial had small foundation of third world. Farmers always found to answer various kinds of incentives of economic activities. Rationality became, and liberalism was out. More experimental investigations which progressively formed an unchanged substance of genuine information for the study of behavior of farmers. Schultz gives theory about agriculture theory of traditional. He discussed all farming kinds which includes all type of production factors that have been in use by generation by generation by farmers. Agriculture of this kind often but always not shows discouraging consequences in the generated incomes by it are very small.

Schultz wants to resolve the problem of in what ways transformation of the traditional agriculture can be occur with farming types which are highly productive. Solution of its not only the infusion of the capital in the sector of the agriculture but the determination of the agriculture of farms investment should take. Advancement of the traditional agriculture sector would not occur only with support of the factor of production which are traditional which are expected highly costly. There is need of also different kinds of factor of production which can increase the output or production. He discussed three types of questions. First one is, communities of agriculture who have low income with the more efficient methods of production can increase the output. Second is, different counties agriculture sector has different growth rate what is the main factor which is responsible for this, where third is related to conditions under which investment should be made in agriculture sector(Klein & Cook, 2006). In the theory of Schultz traditional agriculture would be treated as important equilibrium of economic. Agriculture progressively reaches at equilibrium after long period with the prevailing of sufficient condition. The serious conditions casual equilibrium of this type moreover historically or in future areas, arts state remains unchanged, preference state and motives for accumulating and income from farm also remains unchanged.

In the long run both states remain constant for growth of factors of agriculture, to bring them in equilibrium with the resources of zero marginal productivity which is observed as investment in streams of permanent income and with the zero-total saving. Arrangements of institutions have nothing to do with traditional arrangements. Those countries who valued more of institutional arrangements have less agriculture transformation. For example, in every country agriculture can be traditional either they have small or large farms. Together with traditional agriculture in countries with the degree of high cultivation and tenancy(Schultz, 1980).

DATA RELATED FRAMEWORK

This study employed robust least squares regression apparatus to find out the impact of agricultural crops, exports, and employment on Pakistan's economic growth by using a time series data from 2003 to 2016. The time-period is chosen due to large transformation of agricultural inputs during this period to reduce famine,

eradicate poverty, and social issues in each country context.

Data Sources
Data has been collected from the resources
World Bank Development Indicators
Food and Agriculture Organization
United Nation of Development of Pakistan

MODEL SPECIFICATION
Model of the study contains the variables of the agriculture transformation and rural development. For the achievement of the objective agriculture productivity as the dependent variable and agriculture land, agriculture technology, employment in agriculture, fertilizer consumption used as the independent variable. For the role of the agriculture sector in rural development of Pakistan. A model has been developed in

which Agriculture productivity has been taken as the dependent variable and Employment in Agriculture, Agricultural land; Agricultural Machinery and Fertilizer Consumption are taken as independent variables. For the estimation double log equation has been used.

$$\text{Ln } AP_t = \beta_0 + \ln \beta_1 EA_t + \ln \beta_2 AMT_t + \ln \beta_3 AL1_t + \ln \beta_4 FCP_t + \mu_t$$

RESULTS AND DISCUUSIONS
This section based on the results of the study and through which econometrics results these results had been obtained. For the achievement of the objective Auto Regressive Distributed Lag estimation model has been used. This explores both short and long run effects of the selected agriculture transformation and rural development. Before the application of any estimation technique stationary of each variable should be check and for this Augmented Dickey-Fuller test has been used.

ADF UNIT ROOT TEST FOR STATIONARITY
Table 1. Augmented Dickey-Fuller Test

Variables	Level	First Difference	Decision
LNGDPC	0.7261	0.0002	I (1)
LNAP	0.0000	0.0000	I (0)
LNEA	0.04	0.0254	I (0)
LNAL1(1)	0.0000	0.0000	I (1)
LNAMT	0.013	0.0000	I (0)
LNRIP1	0.005	0.0000	I (0)
LNFCP	0.6721	0.0000	I (1)

Source: Authors' Calculation

- Phillis-Perron (PP) and Augmented Dickey Fuller test are normally used for the check of the stationary. This step is necessary for the significant results; if this is not included then your results would be spurious. For this study Augmented Dicey Fuller Unit Root test has been used for the check of stationary of variables.
- Before application of the Auto Regressive Distributed Lag (ARDL) model each variable should be stationary either at level or at first difference. Make sure that any of your variable should not be stationary at second differences. Ordering of the level and first difference does not matter.
- Above table has been showed that some variables are stationary at level, and some are stationary after taking first lag at the level of difference. And nothing from them is stationary at second difference.

- When the ρ value of the variable is less than 0.05 it is considered as stationary at level or first difference. But if the ρ-value of the variable is greater than 0.05 then your variable is not stationary.
- In above table GDPCG which is GDP per capita growth is stationary at the first difference. And where its ρ-value 0.0002 which is less than 0.005 and it is stationary at fist level.
- Agriculture value added, Employment in agriculture, Agricultural land, Agricultural machinery, Net exports Agricultural raw materials are stationary at level. And there ρ-values are less than 0.005.
- Hypothesis for Unit Root
    Ho= Series has a Unit Root (non-stationary)
    H1= Series has no Unit Root (Stationary)

LAG LENGTH CRITERIA 1
Table 2. Optimal Lag Length 1

Lag	Logl	LR	FEP	AIC	SC	HQ
0	-172.444	NA	0.0016	7.7149	7.9137	7.7894
1	37.7711	365.590*	4.94e-07*	-0.3379*	0.8548*	0.1089*

Source: Authors' Calculation

AIC: Akaike Information Criterion
SC: Schwarz Information Criterion
HQ: Hannan-Quinn Criterion
- For more appropriate results selection of lags is very important. Before the application of the Auto Regressive Distributed Lag (ARDL) selection of lag length criterion is necessary.

- Akaike Information Criterion and Schwarz Information Criterion are most used criterions.
- Stearic values provide suggestions for the selection of lags.
- Akaike Information Criterion has been used in studies which shows maximum 1 lag.

ARDL BOUND TEST 1
Table 3: ARDL Bound Test Result

Test Statistics	Value	k
F-statistic	4.289439	4
Significance	**Lower Bound**	**Upper Bound**
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Source: Authors' Calculation

- Bound test is conducted when all the variables are stationary at level first. As all the variables are stationary at level first so the ARDL-Bound Test conducted.
- If the value of the F-Statistics is greater than the upper Bound value and lower Bound, then co-integration exists among the variables.
- When value of F-Statistics is greater than upper bound value then that means co integration exists among variables at 5% significance level.
- If value of the F-Statistics is lower than lower bound value that means, there is low level of co integration among variables.

- If value of the F-Statistics is in between among lower and upper bound values, then results will be inconclusive.
- Ho: There exists no long run relation
- H1; There exists long run relation
- The above table shows that value of F-Statistics is greater than upper bound value that means co integration exists among the variables.
- Above table shows that value of the F-Statistics is 4.28 which is higher than the upper Bound value. This means that there is co integration exists between dependent and independent variable.

SHORT RUN RESULTS 1
Table 4. Short Run Results 1

Variables	Coefficients	Std. Error	t-statistics	Probability
D(LAP(-1))	-0.2424	0.1206	-2.0109	0.0528
D (LAMT)	0.2022	0.0651	3.1084	0.0039
D(LFCP)	-2.0421	0.7931	-2.5730	0.0149
D(AL1)	15.9243	75.8845	0.2098	0.8351
D(EA)	-1.5925	0.6546	-2.4329	0.2070
CointEq(-1)	-0.8655	0.1668	-5.1885	0.0000

Source: Authors' Calculation

- The above table shows the short run association among the dependent and independent variables.
- Value of ECM shows the speed of adjustment and its ranges from 0 to -1.
- The above value of ECM is -0.865467 which is nearest to -1.

- Where variables agriculture machinery, and fertilizer consumption have significant and positive effect on agriculture productivity. The same relationship has been developed by (Zaman *et al.*, 2012).
- Whereas employment in agriculture and agriculture land showing insignificant effect on the dependent variable agriculture productivity but in short run.

LONG RUN RESULTS 1
Table 5. Long Run Results 1

Variables	Coefficients	Std. Error	t-statistics	Probability
AL1	0.2336	0.0867	2.6946	0.011
LAMT	0.5106	0.1738	2.9385	0.0061
LFCP	18.3998	87.2968	0.2108	0.8344
LEA	0.7559	0.1242	6.0881	0.0000
C	-1.1109	2.8479	-0.3902	0.6990

Source: Authors' Calculation

- The above table shows the long run relationship between among dependent and independent variables.
- Agriculture productivity has been used as the dependent variable and agriculture land, Agriculture machinery, fertilizer consumption, employment in agriculture are independent variables.
- Table shows that 1 percent increase in agriculture land will increase 0.23 percent in the agriculture value added or productivity. So, there is positive relationship between agriculture land and agriculture productivity in long run, they have significant relationship. Same relationship has been conducted by (Chandio et al., 2016).
- One percent increase in agriculture machinery will increase the agriculture productivity by 0.51 percent and they also have long run association. And it is positively affect the agriculture productivity this same results was also conducted by (Zuberi, 1989).
- Also, one percent increase in fertilizers consumption will leads 18.39 percent increase in agriculture productivity and they have significant long run

relationship. This relationship was also found by the (Hamid & Ahmad, 2009).
- As above table shown that one percent increase in agriculture employment will bring increase in the agriculture productivity0.755 percent. And they also have long run relationship. The same results have been concluded by (Khalid, Siddiqa, Sheraz, & Zaman, 2018).
- This shows that all the variables expect fertilizer consumption have significant and positive effect on the agriculture productivity. That means agriculture transformation which will help to increase the rural development of the country, with the help of the major intention on the agriculture machinery, agriculture land, and more opportunity in the employment in agriculture sector.

DIAGONESTIC TESTS 1
For checking the nature of the data set, current study has been used three different diagnostic tests such as Breusch-Godfrey serial correlation LM test, Breusch-Pagan-Godfrey test,and CUSUM and CUSUM of Square Test.

Serial Correlation Test 1
Table 6: Breusch-Godfrey serial correlation LM test

F-Statistics	0.387174	Prob. F (2,36)	0.6823
Obs* R-squared	1.031647	Prob. Chi-Square (2)	0.5970

Source: Authors' Calculation

- It is mandatory to check the serial correlation among the data before the application of the ARDL model.
- It is the assumption of the classical linear regression model that your data have not serial correlation term.
- If your data set have problem of the serial correlation, then your results will not be reliable. And there is also problem in the estimations of the data set.
- For that we have you Breusch-Godfrey serial correlation LM test.
- Ho: No Autocorrelation
- H1: There is problem of autocorrelation
- Above table 4.6 have shown 4.6 that the observed value of the Obs* R-squared is 0.38 which is insignificant at 5% of level that means there is no serial correlation among all the variables in the model. And your data set has no problem of serial correlation.

Heteroskedasticity Test 1
Table 7. Breusch-Pagan-Godfrey test

F-Statistics	1.395574	Prob. F (2,36)	02361
Obs* R-squared	10.60472	Prob. Chi-Square (2)	0.2251
Scaled explained SS	25.96393	Prob. Chi-Square (7)	0.0011

Source: Authors' Calculation

- According to classical linear assumptions models must have homoskedasticity.it is mandatory to check that your model should be disease free.
- Breusch-Pagan-Godfrey test has been applied to check heteroskedasticity in the as data set should not contain Heteroskedasticity.
- Heteroskedasticity has been applied to check the equal and unequal error term variance.
- Ho: There is no problem of Heteroskedasticity
- H1: There is a problem of Heteroskedasticity
- Above table shown that value of the Obs* R-squared is insignificant at 5% of level that means there is no heteroskedasticity among variables. And data set does not contain the problem of Heteroskedasticity.

CUSUM Test 1
- To check stability of the data set CUSUM Test has been applied.
- it has been applied that the data has been structural stable or not.
- Red lines show critical bound lines at 5% significant level. Blue lines show CUMSUM values.
- In graph of CUSUM blue line is within the critical bound. That means data is structurally stable.
- In the below figure blue line is lies between the below figure the boundary lines which shows data is structurally stable.
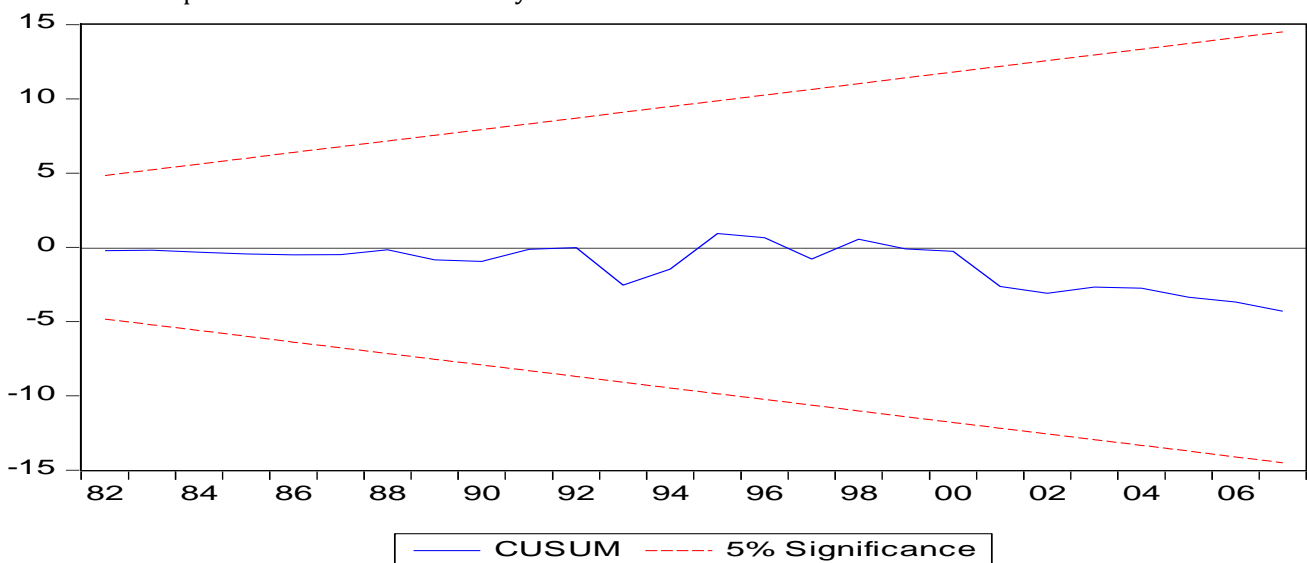

Figure 1. CUSUM Test
Source: Authors' Calculation

CONCLUSION

The core objective of the study is to explore effect of the agriculture sector on rural development and economic growth of Pakistan. Time series data has been taken from 1972-2017. It has been observed that through the existing body of knowledge that agriculture machinery, agriculture land and fertilizer consumption in agriculture sector has positive effect in the rural sector. They are significantly related with each other and have short run and long run relationship. With more arable land production or output of the agriculture sector will increase and it will affect rural development more positively. Similarly, with the more advance and suitable agriculture machinery and technology for the Pakistan agriculture will also affect the rural development significantly and will reduce poverty in the rural areas of Pakistan. Although those farmers who use fertilizers to produce the agriculture output in a bulk quantity have correlation with rural development too. But it has been observed that employment in agriculture have not significant effect on the agriculture value added in Pakistan. For the second objective which was the effect of the agriculture sector on the economic growth of Pakistan. For that all the variables including rural population has also significant relation with the GDP per capita. For the economic growth of the Pakistan GDP per capita are correlated with each other. It is necessary to enhance the agriculture sector for the rural development which ultimately boosts the economic growth.

REFRENCES

Ahmad, B. (1987). Profitability of Pakistan's Agriculture *The Pakistan Development Review, 26*(4), 457-469.

Anríquez, G., & Stamoulis, K. G. (2007). Rural development and poverty reduction: Is agriculture still key? *eJADE: electronic Journal of Agricultural and Development Economics, 4*(1), 5-46.

Baig, M. B., AlSubaiee, F. S., & Straquadine, G. S. (2009). Role of agricultural extension in sustainable rural development in Pakistan. *Agricultural Management/Lucrari Stiintifice SeriaI, Management Agricology, 11*(1).

Baker, C. B. (1973). Role of credit in the economic development of small farm agriculture. *Small Farmer Credit Analytical Papers, 919*(119), 45.

Bharadwaj, K. (1975). Production conditions in Indian agriculture. *The Economic Journal, 85*(340), 950-953.

Bowers, J. (1995). Sustainability, agriculture, and agricultural policy. *Environment and Planning A, 27*(8), 1231-1243.

Byerlee, D., De Janvry, A., & Sadoulet, E. (2009). Agriculture for development: Toward a new paradigm. *Annual Revview of Resource Economics, 1*(1), 15-31.

Chandio, A. A., Jiang, Y., & Guangshun, X. (2016). Agriculture and Economic Growth: Evidence from Pakistan. *International Journal of Advanced Biotechnology and Research, 7*(3), 1037-1045.

Datt, G., & Ravallion, M. (1998). Farm productivity and rural poverty in India. *The Journal of Development Studies, 34*(4), 62-85.

Ding, S., Meriluoto, L., Reed, W. R., Tao, D., & Wu, H. (2011). The impact of agricultural technology adoption on income inequality in rural China: Evidence from southern Yunnan Province. *China Economic Review, 22*(3), 344-356.

Edwards-Jones, G. (2006). Modelling farmer decision-making: concepts, progress and challenges. *Animal science, 82*(6), 783-790.

Farshad, A., & Zinck, J. (1993). Seeking agricultural sustainability. *Agriculture, ecosystems & environment, 47*(1), 1-12.

Gill, Z. A., Mustafa, K., & Jehangir, W. A. (1999). Rural development in the 21st century: some issues. *Pakistan Development Review, 38*(4), 1177-1192.

Godfray, H. C. J., Beddington, J. R., Crute, I. R., Haddad, L., Lawrence, D., Muir, J. F., . . . Toulmin, C. (2010). Food security: the challenge of feeding 9 billion people. *science, 327*(s5967), 812-818.

Griffin, K., Khan, A. R., & Ickowitz, A. (2002). Poverty and the Distribution of Land. *Journal of Agrarian change, 2*(3), 279-330.

Hamid, A., & Ahmad, H. K. (2009). Growth and productivity in purview of transitional dynamics in Pakistan Agriculture Sector. *Pakistan Economic and Social Review, 47*(1), 49-78.

Hani, F., Braga, F. S., Stampfli, A., Keller, T., Fischer, M., & Porsche, H. (2003). RISE, a tool for holistic sustainability assessment at the farm level. *International food and agribusiness management review, 6*(4), 78-90.

Harris, J. R., & Todaro, M. P. (1970). Migration, unemployment and development: a two-sector analysis. *The American Economic Review, 60*(1), 126-142.

Hayati, D., & Karami, E. (2006). Combining qualitative and quantitative methods in the measurement of rural poverty: the case of Iran. *Social Indicators Research, 75*(3), 361-394.

Johnston, B. F., & Kilby, P. (1973). *Agriculture and Structural Transformation: Economic Strategies in Late Developing Countries*. New York, USA: Oxford University Press.

Jones, W. I. (1972). Mexico's Puebla Project: is there hope for the minifundistas? *International Development Review, 14*(2), 395-397.

Khalid, N., Siddiqa, A., Sheraz, A. C., & Zaman, K. (2018). Impact of Agriculture Sector Development on Economic Growth: Application of Robust Linear Least Squares Regression on Pakistan's Data Set. *Acta Universitatis Danubius. Œconomica, 14*(4), 634-635.

Klein, P. G., & Cook, M. L. (2006). TW Schultz and the human-capital approach to entrepreneurship. *Review of Agricultural Economics, 28*(3), 344-350.

Nulty, L. (1972). The green revolution in West Pakistan. Implications of technological change. *The green revolution in West Pakistan. Implications of technological change.*

Rani, U. (1971). Size of farm and productivity. *Economic and political weekly, 6*(26), 85-89.

Rosenzweig, M. R. (1978). Rural wages, labor supply, and land reform: A theoretical and empirical analysis. *The American Economic Review, 68*(5), 847-861.

Sarkar, K. K., & Prahladachar, M. (1966). Mechanization as a technological change. *Indian Journal of Agricultural Economics, 21*(1), 171.

Schader, C., Grenz, J., Meier, M. S., & Stolze, M. (2014). Scope and precision of sustainability assessment approaches to food systems. *Ecology & Society, 19*(3), -.

Schultz, T. W. (1980). Nobel lecture: The economics of being poor. *Journal of political Economy, 88*(4), 639-651.

Uchendu, V. C. (1970). The impact of changing agricultural technology on African land tenure. *The Journal of Developing Areas, 4*(4), 477-486.

Zaman, K., Khan, M. M., Ahmad, M., & Rustam, R. (2012). The relationship between agricultural technology and energy demand in Pakistan. *Energy Policy, 44*(2), 268-279.

Zuberi, H. A. (1989). Production function, institutional credit and agricultural development in Pakistan. *The Pakistan Development Review, 48*(1), 43-55.