

# Importance of the Dairy Industry and Economic Growth in Pakistan: An Empirical Study

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## ABSTRACT

The basic objective of this study is to examine the importance of dairy industry and economic growth in Pakistan over the period 1975-2015. Augmented Dickey Fuller (ADF) unit root test, P-P unit root test, Co-integration test, Granger causality approach and OLS statistical tools are used to analyze the data from 1975-2015. The results of ADF and P-P unit root tests including trend and intercept revealed that all variables become stationary at first difference. Whereas, the results of co-integration test showed that there is existence of long term relationship between the variables. Furthermore, the result of OLS method showed that it is evident that output of dairy industry is highly significant and showing to enhance the agricultural GDP. The coefficient of dairy production is 0.368500, this means 1% increase in output of dairy production will enhance the agricultural GDP by 0.36%. Additionally, Granger causality consequences suggest that there is bidirectional causality relationship exists among output of dairy production and agricultural GDP. Consequently, our findings recommended that the ZTBL and commercial banks should launch new credit schemes for providing financial facilities to the dairy farmers.

**KEYWORDS:** Dairy Production, Agricultural GDP, Co-integration, Granger causality, Pakistan

## 1. INTRODUCTION

Agriculture is backbone of Pakistan economy, and livestock in its economy plays a vital role in providing the required hominoid milk in the diet, eggs and meat form of the improvement. The estimated population of Pakistan is 195.4 million and nearly 8 million families is directly depending on the livestock and dairy industry in rural areas. Recently Pakistan remained rated as the third-largest milk producer in the world, and per capita production of milk is being determined by strengthening in the numeral of dairy cows rather than the recent increase in milk production (FAO, 2010). The current population growth and increased demand of food formed the requirement to produce more milk. The dairy farmers in Pakistan must be aware of the key drivers of future changes, so that they can plan for an ever increasing demand. Pakistan is a main agriculture based country and plays a significant role in livestock, in the form of meat, milk and eggs in its economy, providing the necessary human diets (Ahmed et al 2012, Ali and Ahmed, 2014). At present, the contribution of livestock accounted about (58.6%) and (11.6 %) of the agricultural added value to the gross domestic product (GDP) (GOP, 2015-16). In 2015-16, the estimated total number of livestock was 186.2 million. The livestock sector's foreign exchange earnings exceed 770 million USD. The per capita production of Pakistan is about 230 kg in form of milk, more than twice a year in India and about 70% in the USA. The recent increase in milk production from dairy livestock amounts increased rather than increased milk production per animal (FAO, 2001). The most frequently mentioned measure of the significance of an economic sector or industry is its contribution to the size of national gross domestic product (GDP). For most of small scale farmers, animals are the main source of income and food throughout the country. The increase in demand for animal products also constitutes a monetary prospect for many people (GOP, 2010-11). Growing livestock production is vital to many poor people in the developing world, often with numerous livelihood goals contributing and providing a path out of poverty. Feeding livestock also distresses crucial properties of the poor, and their human capital, through its own impact of nutrition and health. The general credibility in the connections between poverty and the livestock, somatic well-being and the analysis of these linkages creates a number of distorting livestock development issues. These principles bound the scope of intervention programs to promote livestock and limit their potential involvement to poverty reduction. The role of identifying the complexities of livestock in domestic decision making and the opportunities for abandonment these misunderstandings can enhance the ability of livestock to contribute the well-being of the human developing world. The development of livestock proceeds place as a part of development of overall economic (Delgado et al., 1999).

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The main source of milk production in Pakistan is from buffalo 66 percent, cattle 32 percent and milk from sheep and goats about 2 percent. The varieties of buffalo are Ni-Ravi which is 79 percent of the total population of buffalo, Sahiwal, Kundhi and Red Sindhi although dominated by cow breeds. The enormous majority about 80 percent of dairy farmers in Pakistan is small farmers and 43 percent of dairy farmers in Pakistan maintain group-size 1-2 animals while another 37 percent keep 3-5 animals. About 90 percent of total dairy production emanates from these small farmers. Milk marketing is a major issue in Pakistan concerned with dairy production, about 97 percent of dairy farmers has not linkage to the formal dairy market and therefore are not contributing to the growth for economic development (2006, PDDC).

The contribution of livestock in agriculture almost to the gross domestic product (GDP), and is about 30% of the global agricultural sector, which is also the fastest-growing sub-sector. The potential for poverty reduction is significant if the growth of the livestock sector is labor-intensive and small-scale farmers increase productivity. Similarly, the single large livestock sector has less potential for rural poverty reduction (S. Ashley, 1999). Livestock is an imperative for the livelihood of the poor rural households in the developing economies (FAO, 2012; Delgado et al., 1999; FAO, 2002). Livestock is a main source of income for the small scale farmers. This subsector provides them food security as the small farmers can exchange products of livestock and livestock for grain (FAO, 2012; Qureshi et al., 1996; Holden and Coppock 1992). The role of dairy farms with supplementary highlighted milk producing countries, it is necessary to quantify the economic contribution of livestock sector to these countries. This quantification is important for different reasons. Policy makers may use this information to identify the potential impact on the economy (Helmberger and Chen, 1994), the contribution of dairy farms and their overall benefits related to industries and societies (Balagtas et al., 2003).

For the production of livestock, there are several reasons that cause the animal's production low. It includes the low genomic potential of cattle; the realization of adolescence, the lack of forage resources, high incidence; delayed the chaotic marketing system, and the conservation of outmoded farming methods (Bilal and Ahmed, 2004). When make comparison with the major crops, milk has a superior value than twice the value of wheat and cotton, sugarcane and rice combinations (Bilal and Sai, 2005; Chandio, et al; Rehman et al, 2016). The development of market infrastructure and institutions is a necessary component for economic growth. Meat, milk and eggs cost more energy per unit than staple crops, so consumption is low in poor developing countries. The increase in income and population led to a rapid increase in demand. Market demand is concentrated in urban interiors and transportation costs as compared to consumable livestock products from remote areas of production are high. So it is also the manufacturing input cost. Peri-Urban producers are in the edge. Poultry meat can be commercially produced cheaper than other meats, so the market for these products derived from land-lost systems is growing rapidly. Through vertically integrated smallholder producers with large cities based on processors and input suppliers or producer cooperatives, it is possible to derive economies of scale in processing and marketing. To strengthen smallholder dairy products, they have formed dairy processing cooperatives in countries like India that face similar problems in this sector (FAO, 2010).

(FAO, 2000) report shows that present population growth of Pakistan and the increasing food demand has created the need to produce more milk. The human population has overdone than 7 billion recently, which is expected to reach 7.6 billion by 2020. This increase of 85 percent will occur in developing countries. According to the United Nations, (2011) report; Pakistan is the seventh most populous country in the world, and according to the UN forecast, it will become the third most populous by the year 2050. The contribution of the dairy sector to the national economy was Rs 540 million, with 97 percent of the informal economic activity recorded as no verified and this value is expected to grow at the rate of 4 percent per year (2006, PDDC) The main reasons linked with economically underdeveloped farms of buffalo have been identified as: irregular breeding, calf losses, unbalanced feeding; clumsy loans; and aggressive marketing systems. In Pakistan, three causes of the extinction of commercial bovine herds resulted in an annual loss of Rs.1043.67 (Kureshi, 2000). Therefore, the purpose of this article reports is to examine the importance of the dairy industry and economic growth in Pakistan over the period of 1975-2015.

## 2. Animal Wise Dairy Production in Pakistan

The dairy production in Pakistan animal wise from 2005- 2011 are showed in table1.

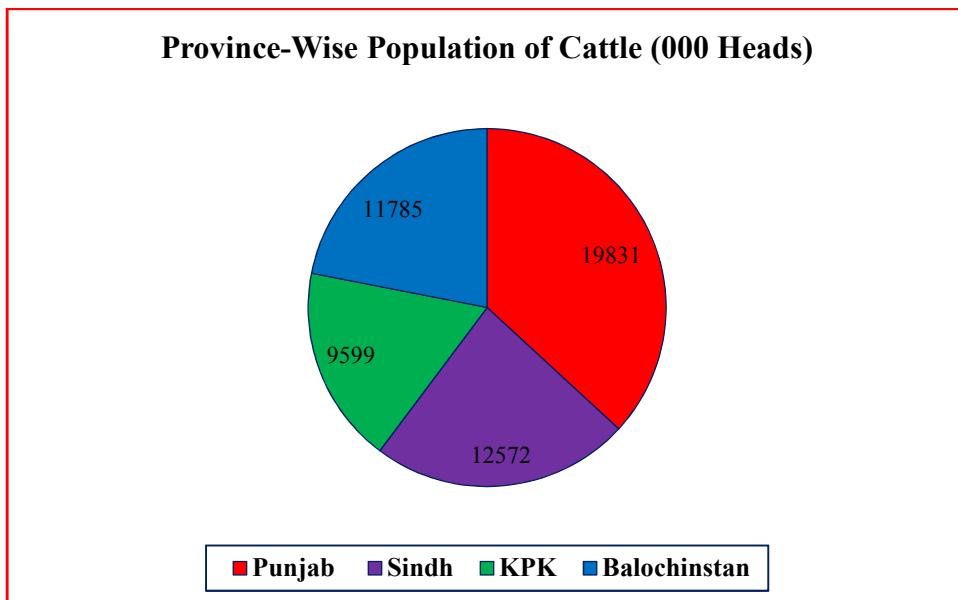
**Table 1: Estimated Milk Production by Animal Wise (000 tones)**

Animals	2005-06		2006-07		2007-08		2008-09		2009-10		2010-11	
	I	II										
<b>Buffaloe</b>	24724	19779	25455	20364	26214	20971	27028	21622	27848	22279	28694	22955
<b>Cows</b>	13408	10726	13912	11129	14435	11548	14982	11985	15546	12437	16133	12906
<b>Goats</b>	664	664	682	682	701	701	719	719	739	739	759	759
<b>Sheep</b>	34	34	35	35	35	35	36	36	36	36	36	36
<b>She camel</b>	767	767	776	776	786	786	798	798	808	808	818	818
<b>Total</b>	<b>39597</b>	<b>31970</b>	<b>40860</b>	<b>32986</b>	<b>42171</b>	<b>34041</b>	<b>43563</b>	<b>35160</b>	<b>44977</b>	<b>36299</b>	<b>45622</b>	<b>36656</b>

Note: I= Gross Production, II= Human Consumption

Source: - M/o National Food Security and Research

Table 1 shows that the dairy products including buffaloes, cows, goats, sheep and she camel population census from 2005 to 2011. Estimated data shows that dairy products population increased every year. The province wise population census of cattle is showed in the figure 1.

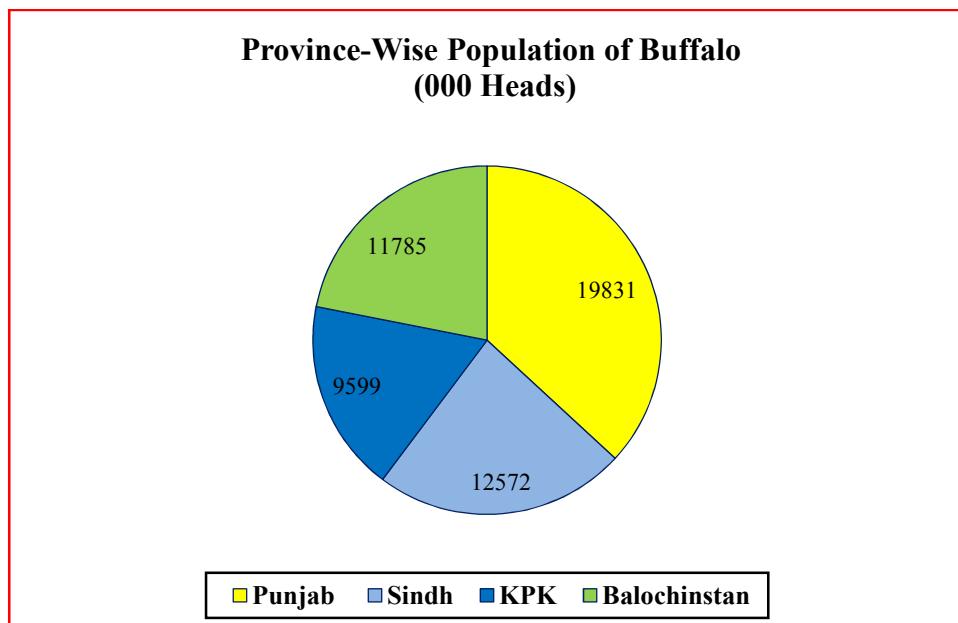


**Fig 1: Province wise population of cattle**

Source: Agriculture Statistics of Pakistan 2010-11

It is cleared that in the figure 1, cattle production census is higher than as compared to other provinces of Pakistan including Sindh, KPK and Balochistan.

The population census of buffalo province wise is showed in the figure 2.

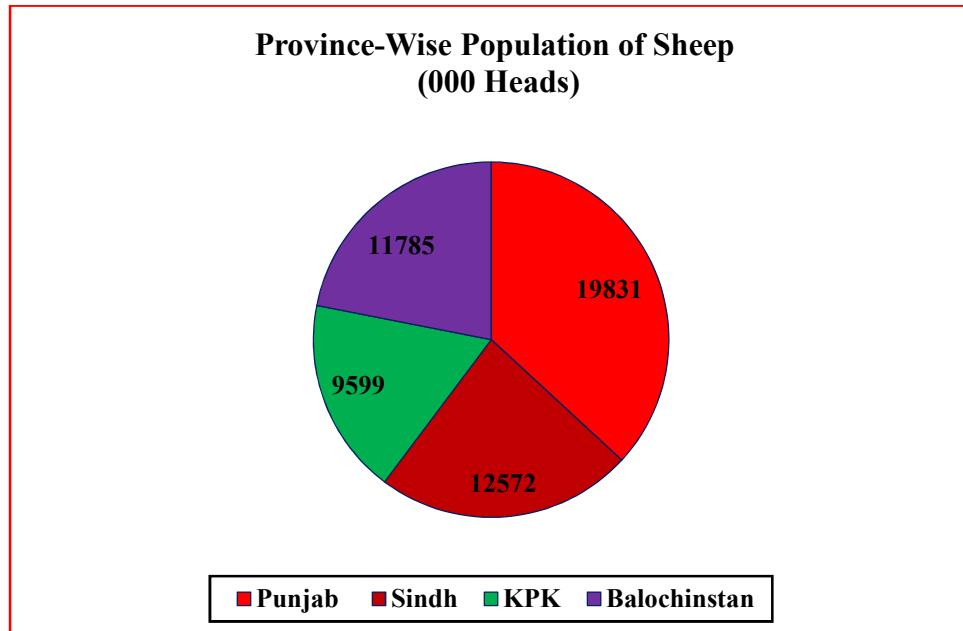


**Fig 2: Province wise population of buffalo**

Source: Figure Agriculture Statistics of Pakistan 2010-11

Figure 2 shows that population census of buffalo province wise in Pakistan; Punjab province of Pakistan is leading in production of buffalo as compared to Sindh, KPK and Balochistan.

Sheep production in Pakistan province wise is showed in the figure 3.

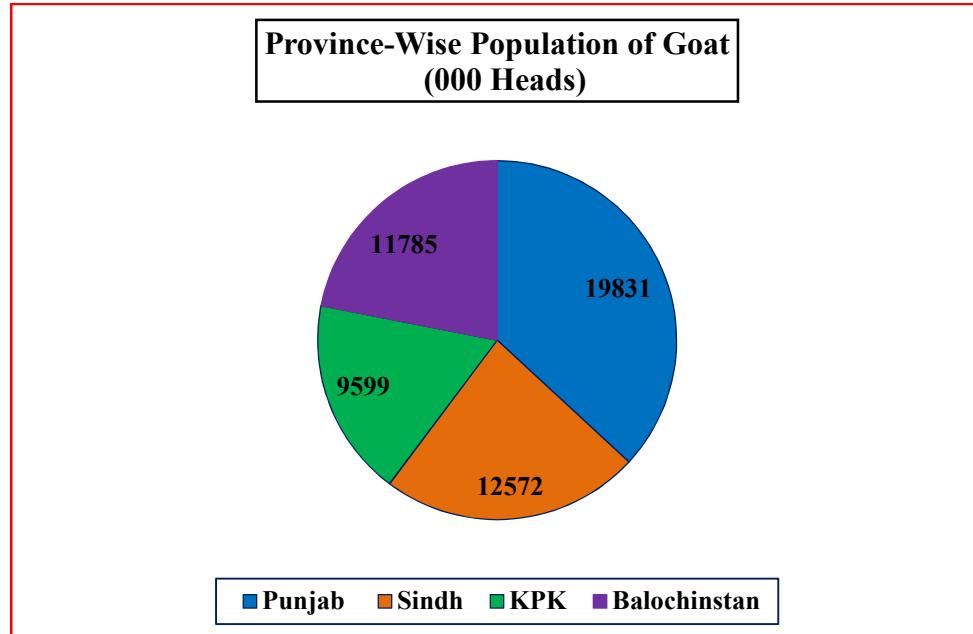


**Fig 3: Province wise population of sheep**

Source: Agriculture Statistics of Pakistan 2010-11

Figure 3 indicates that province wise sheep production in Pakistan; estimated data shows that Punjab province has virtuous production as compared to other provinces.

Province wise goat population census is showed in the figure 4.

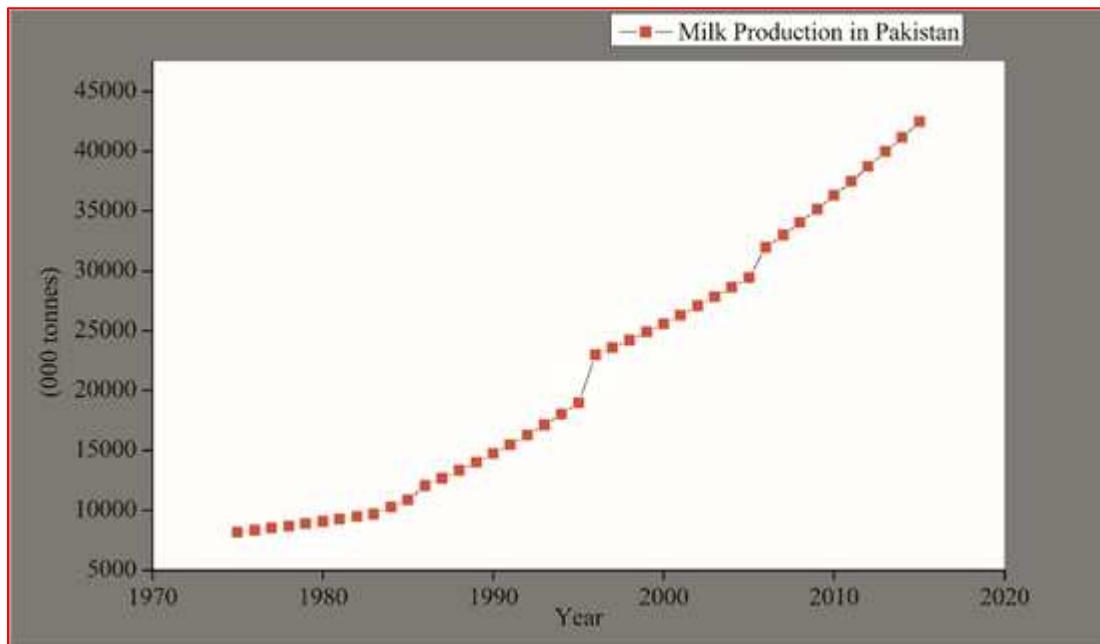


**Fig 4: Province wise population of goat**

Source: Agriculture Statistics of Pakistan 2010-11

In figure data shows that goat production in Punjab province of Pakistan is foremost as compared to Sindh, KPK and Balochistan provinces of Pakistan.

In figure data shows that goats production in Punjab province of Pakistan is foremost as compared to Sindh, KPK and Balochistan provinces of Pakistan. Hence, the milk production in Pakistan from 1980 to 2015 is showed in the figure 5.



**Figure 5: Trend of milk production in Pakistan**

### 3. MATERIALS AND METHODS

#### 3.1 Data Sources and Study Variables

The main objective of this article reports is to examine the importance of the dairy industry and economic growth in Pakistan over the period of 1975-2015. The annual time series data over the period 1975-2015 has been used. Data has been collected from Pakistan Bureau of Statistics (various publications) and National Food Security and Research. In this study, dependent variable is agricultural output in (Rs.million) and independent variable is milk production in (000, tones).

#### 3.2 Econometric Methodology

The Augmented Dickey Fuller (ADF, 1981), and Phillips Perron (P-P, 1988) unit root test has been used to check the stationarity of the study variables. After checking stationarity of the study variables Johansen Co-integration (1990) test have been utilized to examine the long term association between dairy industry and agricultural GDP of Pakistan over the period of 1975-2015. Moreover, Granger Causality approach (1988) has been applied to determine the directions of relationship among dependent and independent variables. Furthermore, in order to evaluate the relationship between output of dairy industry and Agricultural GDP, OLS method, an econometric technique has been used and the following model estimated is specified as;

$$\ln \text{AGRGP} = f(\text{OPDI})$$

With a linear relationship such as:

$$\ln \text{AGRGP} = \beta_0 + \beta_1 \ln (\text{OPDI}) + \mu \dots (1)$$

Where

$\ln \text{AGRGP}$  = Agricultural GDP in (million rupees)

$\beta_0$  = Intercept

$\beta_1$  = estimated coefficient

$\ln \text{OPDI}$  = Output of dairy industry in (000, tones)

$\mu$  = error term

## 4. RESULTS AND DISCUSSION

### ***ADF and P-P Unit root tests including (trend and intercept)***

The estimated results of ADF and P-P unit root tests are represented in table 2. Results revealed that all variables are not achieved stationarity at their level, while all variables became stationary after taking the first difference I(1), as representative the values of ADF statistics and Adj.t.Stat tests are bigger than the critical values at the 5% of significance level.

**Table 2: Results of ADF Unit root test**

<b>ADF Unit root test</b>					
<b>Variables</b>	<b>ADF Statistic</b>	<b>Critical value</b>	<b>Probability</b>	<b>Level of significance</b>	<b>Order of Integration</b>
<b>AGR GDP</b>	-5.090863	-3.529758	0.0010	5%	1(1)
<b>OPDI</b>	-6.529586	-3.529758	0.0000	5%	1(1)
<b>P-P Unit root test</b>					
<b>Variables</b>	<b>Adj. t-Stat</b>	<b>Critical value</b>	<b>Probability</b>	<b>Level of significance</b>	<b>Order of Integration</b>
<b>AGR GDP</b>	-5.075536	-3.529758	0.0010	5%	1(1)
<b>OPDI</b>	-6.592101	-3.529758	0.0000	5%	1(1)

Source: Author's own calculation

### ***Johansen Co-integration test including (Trace statistic and Max-Eigen Statistic)***

The regression results may be spurious due to no co-integration between the study variables. For this purpose, Johasan co-integration tests containing trace statistic and max-eigen statistic have been used to determine the long term association between dairy industry and agricultural output of Pakistan over the period of 1975-2015. The estimated results of this approach are presented in table 3 and 4. The values of trace statistic (23.42379) and the values of max-eigen statistic (22.76821) are bigger than their critical values (15.49471) and (14.26460), which shows that there exists a long-term relationship between dependent and independent variables. This rejects the null hypothesis of no co-integration.

**Table 3: Johasan co-integration test using Trace Statistic**

<b>Johasan co-integration test using Trace Statistic</b>				
<b>Eigenvalue</b>	<b>Trace Statistic</b>	<b>5 Percent Critical Value</b>	<b>Prob**</b>	<b>Hypothesized No.of CE(s)</b>
0.459552	23.42379	15.49471	0.0026	None *
0.017562	0.655575	3.841466	0.4181	At most 1

Source: Author's calculation.

\* indicates at 5% level of significance

**Table 4: Johasan co-integration test using Max-Eigen Statistic**

<b>Johasan co-integration test using Max-Eigen Statistic</b>				
<b>Eigenvalue</b>	<b>Max-Eigen Statistic</b>	<b>5 Percent Critical Value</b>	<b>Prob**</b>	<b>Hypothesized No.of CE(s)</b>
0.459552	22.76821	14.26460	0.0018	None *
0.017562	0.655575	3.841466	0.4181	At most 1

\* indicates at 5% level of significance

Source: Author's calculation

Table 5 presents the results of regression analysis by using the OLS estimator. The coefficient of dairy industry shows that the significance relationship with agricultural GDP which is 0.368500, this means 1% increase in dairy industry will enhance the agricultural GDP almost by 0.36%. Pakistan is generally an agricultural based country, and livestock plays an important role in its economy by providing essential items of the human diet in the form of milk, meat and eggs. During 2014-15, gross value addition of livestock has been increased from 778.3 billion rupees to 801.3 billion rupees, recorded an increase of 3.0 percent as compared to last year (GOP, 2014-15). Furthermore, in this model R square is 0.85 which explains that 0.85 percent variation in agricultural output is due to independent variable.

**Table 5: Regression Analysis**

<b>Regression Analysis</b>				
<b>Dependent Variable: ln (AGR GDP)</b>				
<b>Method: Least Squares</b>				
<b>Sample: 1980 2015 Included observations: 41</b>				
<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.</b>
C	5.215764	0.306348	17.02562	0.0000
In (OPDI)	0.368500	0.024277	15.17914	0.0000

<b>R-squared</b>	0.855237	Mean dependent var	9.838513
<b>Adjusted R-squared</b>	0.851525	S.D. dependent var	0.551300
<b>S.E. of regression</b>	0.212429	Akaike info criterion	0.212867
<b>Sum squared resid</b>	1.759917	Schwarz criterion	0.129278
<b>Log likelihood</b>	6.363779	Hannan-Quinn criter.	0.182429
<b>F-statistic</b>	230.4062	Durbin-Watson stat	0.270341
<b>Prob(F-statistic)</b>	0.000000		

Source: Author's calculation.

**Table 6: Pairwise Granger Causality Test**

Null Hypothesis	Obs.	F-Statistic	Prob.
In OPDI does not Granger Cause In AGRGDP	30	4.03846	0.0375**
In AGRGDP does not Granger Cause In OPDI		9.09869	0.0037**

\*\*indicates at 5% level of significance

Table 6 represents the results of Granger Causality test indicating that the null hypothesis of the model is that OPDI does not Granger-cause AGRGDP is rejected, which is evidence of bi-directional causality runs from output of dairy production to Agricultural GDP.

## 5. CONCLUSION AND POLICY IMPLICATIONS

Livestock plays an imperative role in economic accomplishment and development in rural areas of Pakistan. The aims of this study was to examine the importance of dairy industry and economic growth in Pakistan over the period 1975-2015. Annual time series data have been used in this study and this data is collected from Pakistan Bureau of Statistics (PBS) and Nation Food Security and Research (various publications). The ADF and P-P unit root tests containing trend and intercept have been applied to check the stationary of the study variables. Furthermore, Johansen Co-integration test has been used to examine long run relation between dependent and independent variables. The Ordinary Least Square (OLS), an econometric technique has been applied to examine the relationship between output of dairy industry and agricultural GDP. Similarly, Granger Causality approach has been used to determine the direction of the long run relationship between output of dairy industry and agricultural GDP. The results of ADF and P-P unit root tests shows that all study variables become stationary at first difference. Whereas, the results of Johansen Co-integration test revealed that; there exists a long-run relationship among output of dairy industry and agricultural GDP. The results of OLS model showed that the coefficient of output of dairy production is highly significant at both 1% and 5% of significance level, which indicates that there is a positive and significant relationship between output of dairy production and agricultural GDP. This means at 1% increase in output of dairy production will enhance the agricultural GDP almost by 0.36%. Additionally, the results of Granger Causality approach which revealed that there is a causality relationship which is bi-directional running from output of dairy industry to agricultural GDP. Based on the findings of this study, the following recommendations were therefore made;

1. Extension services are most important for the development of dairy industry. Therefore the study suggests that extension services provide effective delivery of the services in rural areas.
2. ZTB and commercial banks should launch new credit schemes for providing financial facilities to dairy farmers.
3. Government of Pakistan needs to encourage investment in dairy industry and announce new dairy programs through extension services in across the country.

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