



## **Impact of agricultural output on economic development and policymaking in Pakistan**

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### **Abstract:**

This research aims to investigate the impact of agricultural output on Pakistan's economic development and policymaking using secondary data from 1973-2020. Based on the data's behaviour, this study employed the ARDL systems for estimation. This study found that the FDI inflow, agricultural output (later on AGRI), gross fixed capital formation (later on GFCF), and human capital and labour force participation (later on LFP) are positive and significant. In contrast, the inflation rate (later on INF) has an undesirable and noteworthy effect on Pakistan's economic development in the long run. This study also found that FDI inflow, agricultural output, gross fixed capital formation, human capital and LFP have a positive and noteworthy effect. In contrast, the inflation rate has an insignificant impact on Pakistan's economic development in the short term. Furthermore, this analysis discovered that the variables had long-term co-integration and a 51 percent level of adjustment. This study concluded that the agricultural output has significantly influenced Pakistan's economic development and public policy making. The study recommends that the government ensure policymakers focus on devising long-term policies to improve agricultural productivity and enhance Pakistan's economic growth and development.

**Keywords:** FDI, ARDL, Economic development, Economic policy, Agricultural productivity, Agriculture rector reforms, Agriculture output, Human capital, Labour force.

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## 1. Introduction

Agriculture (AGRI) is a vibrant sector of Pakistan's economy, accounting for 26.0% of total GDP. Pakistan's AGRI industry directly sustains  $\frac{3}{4}$  percent of the country's population, employs workers, and adds a portion of foreign-exchange revenues. Pakistan has the world's largest system of irrigation in terms of agricultural output. The key to increasing production is to make better use of resources, particularly land and water. Change, however, is dependent on wealthy landowners who hold 50% of arable land and control the majority of the irrigation infrastructure, making comprehensive reform difficult (Pakistan Economic Survey, 2016). The agricultural sector in a developing country and its role in economic growth is defined by two fundamental and interconnected aspects. First and foremost, agriculture is a critical industry in virtually all emerging countries, and it is sometimes the only industry of any relevance. Agriculture generally contributes for 40-60% of national GDP and employs 50-80% of the labour force. Despite the fact that vast amounts of resources, namely land and labour, are dedicated to the agriculture sector, they are used at relatively low levels of productivity (Umair & Ullah, 2013).

Pakistan is a developing country that has faced the problem of poverty since its independence. People of Pakistan, especially those who live in rural areas, are mostly dependent on agriculture and lack quality education, shelter, clothes, etc. The present research shows the impact of agricultural output on Pakistan's economy, i.e., the GDP. Another noticeable element is the agriculture sector's long-term decline in relative size in Pakistan. The importance of this structural transformation process, as well as the scale of the related capital demands, places enormous strain on the agriculture sector's ability to contribute capital for the growth of other sectors (Syed & Malik, 2011).

The economic transition has noteworthy ramifications for the shifting roles of LFP and capital, as well as the methods used to improve agriculture. The agriculture sector's secular decline: the "general transformation model." The two rudimentary features generally acknowledged as being responsible for an economy's structural transformation are (1) a declining food elasticity and (2) the possibility of significant expansion of AGRI production. A third issue that has gotten less consideration is likely to be significant: current technology allows for the most extreme cost reductions in the manufacturing industry, electricity production, and long-distance transportation. Investments in contemporary, power-driven machinery and the use of sophisticated technology in these domains result in early and revolutionary cost reductions, such that price-elasticity ( $e_p$ ) and substitution effects enhance differential income elasticity's role in modifying production and consumption patterns (Anthony, 2010).

The agricultural sector's proportionate fall will be slower and less severe in nations with a significant competitive advantage in agricultural exports. However, even nations that are well positioned by their resource endowment to occur as large AGRI-exporters might be projected to see a significant fall in agricultural share if GDPpc rise significantly. New Zealand and Denmark stand out as countries that have benefitted considerably from their place as strong ADRI exporters; nonetheless, agriculture employs fewer than 20% of their workforce today. The reasons for agriculture's secular decline and significant expansion of manufacturing and other non-agricultural sectors have not been fully explained, but this type of structural transformation of an economy appears to be an essential condition for cumulative and self-sustaining growth (Anthony, 2010).

Following the industrial revaluation of the 1970s, agriculture became the second most important sector for economic growth in Pakistan. It is the primary basis for survival and growth, which produces 18.5% of the total GDP and is a key source of employment (38.5% of the total workforce) for the country's population. However, agricultural sector production has been declining in comparison to other sectors over time. Agriculture provides raw materials for the industrial sector, which is important for the country's foreign exchange profits. The division covers soil, water, and land use concerns, which are the causes of the fall in agricultural productivity. As a result, the country's GDP growth rate is reduced. In 2010-11, the agriculture sector saw modest growth of 1.2%; there is a need to expand this sector in order to improve exports; the resurgence of the industrial sector is responsible for stimulating consumption. Similarly, agriculture growth in 2018 and 2019 was significantly lower than the government of Pakistan's aim. The total growth rate of only 0.85% was less than the initial objective of 3.8%. In reality, the agricultural sector continues to give favourable assistance to other manufacturing sectors in order to expand exports (Pakistan Economic Survey, 2019).

In general, the agricultural sector contributed 53% of GDP in 1950. To be sure, decreases were observed in 2010 (21.5%) and 2018 (18.5%). Because of the green revolution in the 1950s, agriculture accounted for more than half of Pakistan's GDP growth. The contribution of the farming industry has decreased by 32% by 2018. At present, the agricultural sector's proportion is steadily declining. As a result, the GDP was rising at a slow pace. This industry remains the primary and second-largest contributor to the Pakistani economy (Pakistan Economic Survey, 2019).

Pakistan is a developing country and largely depends on agricultural production. However, due to a lack of modernisation investment in the agricultural sector, the AGRI is too low in Pakistan, and the agriculture sector is not contributing well to the economic development of Pakistan. Therefore, this research has been conducted to investigate the effects of agricultural productivity on Pakistan's economic development. The development of this sector is critical since it is the primary contributor to Pakistan's GDP growth; nevertheless, this area has received little attention in the literature, so the persistence of this research is to determine the impact of the agriculture sector on Pakistan's economic development. This study is different from other studies in different ways. Firstly, this study used the updated data set for Pakistan. Secondly, this ARDL technique for estimation which results is more reliable than other techniques. Thirdly, this study used a unique combination of variables, etc. Therefore, this research was accompanied by an examination of the effect of the agricultural sector's output on the country's economic development.

## **2. Literature review**

Henneberry et al. (2000) revealed that these sectors are mutually beneficial but that industry benefits more from agricultural expansion than vice versa. De Janvry and Sadoulet (2002) revealed that technology has the greatest impact on lack in Africa, Asia, and the rest of the world through direct effects on agricultural employment and relationship effects. Gardner (2005) analysed the data from 85 countries from 1960 to 2001 and found that farming as a sector grew at a rate that was shockingly unrelated to the increase in per capita income for individuals who work in agriculture. Neither was required or sufficient for the other. Agricultural economics was not the primary discipline in many settings when considering the economics of poverty and rural income. Hussain (2005) examined the agricultural growth of Pakistan and suggested that there was a trend toward gentler and more unbalanced development

in the yield subdivision throughout the 1990s, which played a major role in rapidly growing poverty and inequality in rural areas and concluded that micro firms and small-scale businesses in the rural subdivision. This might lead to quicker economic growth, as well as a reduction in poverty and higher job creation.

Bhutto and Bazmi (2007) suggested that AGRI is one of Pakistan's most significant economic sectors to alleviate poverty. Furthermore, Pakistan boosts agriculture output by providing a variety of inputs, including easy finance for small farmers, excellent fertilisers and insecticides, tractor and farmer services, improved irrigation system performance, and agriculturalist learning. Awokuse (2009) gave solid evidence that AGRI is a more significant source of economic growth. Anthony (2010) found that AGRI factors have an influence on GDP growth, and their influence on export growth has been positive. Cervantes-Godoy and Dewbre (2010) revealed that financial development, in general, was significant for poverty discounts; the area combination of development signified a lot, with agricultural earnings development being particularly significant. Saleem and Jan (2011) revealed that Seed credit, as well as pesticides, fertilisers, tractors, and irrigation, were shown to be substantially associated with agricultural GDP in Pakistan.

Abdullah and Kalim (2011) used data from 1972-2008 and the VECM method for estimation. Their results show that increased food prices in Pakistan are caused by both supply and demand factors. However, it corroborates the structuralised perspective of inflation, as the money supply shows unimportant results. Olajide et al. (2012) used the OLS approach for estimation and data from 1970-2010. They revealed a beneficial purpose and impact connection between Nigeria's GDP and agricultural production. Raza et al. (2012) used data from 1980-2010 and the OLS approach for estimation. They indicated that agriculture sub-sectors played a substantial role in economic development, whereas forestry showed an unemployment relationship with the GDP of Pakistan. Awan and Aslam (2015) used data from 1972-2012 and applied the ARDL techniques for estimation. They concluded that a huge percentage of agriculture contributes more to the economic development of Pakistan. Awan and Aslam (2015) used the data from 1996 to 2015 and the OLS approach for the estimation of the study and concluded that it is beneficial in increasing the agricultural sector's productivity and the small farmer's standard of living in Pakistan.

Chandio et al. (2016) used data from 1983 to 2011 from Pakistan and OLS methodology to examine the data. They found that AGRI and government spending both had a considerable influence on Pakistan's economic progress. It was also observed that the agriculture industry is still confronted with issues such as insufficient discoveries and undeveloped infrastructure, poor agriculture promotion, and a lack of irrigation, among others. They urged Pakistan's government to increase its spending on agriculture development, arguing that this would boost agricultural output and economic development. Matthew and Mordecai (2016) used data from Nigeria from 1986 to 2014 and the VAR approach for estimation. They found that farming plays a significant influence in Nigeria's GDP growth, and agriculture shocks contributed the most to economic improvement shocks, aside from comment shocks. They also revealed that the per capita income replied absolutely to surprises in the agricultural sector's production over a ten-year period, and agriculture was beneficial to the Nigerian economy and played a significant part in its growth.

Usman (2016) used the data from 1990-2014 Pakistan and used OLS for estimation and revealed that the factors of the agriculture sector and GDP rate have a substantial link. The

influence of AGRI crops on cultivation area and involvement in GDP. Livestock was also a main portion of cultivation and had an important involvement in the cultivation area. Chandio et al. (2017) stated that the agricultural sector in Pakistan played a critical role in growing agricultural efficiency and rural household income. Furthermore, the findings demonstrated a relationship between loan availability and a rise in agricultural output in the country. Azam and Shafique (2017) stated that the agriculture sector is the backbone of every financial system and a significant sector of Pakistan's economy.

Bakari (2017) used data from 1970-2015 and the Vector Error Correction Model for estimation. They found that exports of vegetables had a favourable influence on economic development in Tunisia. Ahmad et al. (2018) used the ARDL technique for estimation and data from 1973-2014 in Pakistan. An empirical approximation of the ARDL method designated the evidence of long-period co-integration of the model. They found that there is a positive link between AGRI credit and production. Labour sharing in agriculture was a positive but immaterial link to AGRI production, while trade openness had a negative and important impact on AGRI production. Karimou (2018) used data from 1960-2011 and the Granger causality test for estimation and revealed that the AGRI sector has contributed absolutely and consistently to Nigeria's economic development, underlining the sector's significance in the economy of the country. However, no opposing relationship was discovered.

Rehman et al. (2019) are of the opinion that AGRI is an imperative sector of the country's economy, thus accounting for roughly 26.0% of the GDP of Pakistan by using the data from 1978-2015 and OLS techniques for estimation. Sanyang (2018) used data from 1980-2017 and ARDL for estimation. They found an important positive result of agriculture on economic development and also determined that agriculture has a helpful influence on financial development. Tahir and Awan (2018) used data from 1972-2012 and the ARDL model for estimation and to accelerate development in each agriculture and production sector for the economic improvement of Pakistan. Idris (2020) used data from 1981-2018 and the ARDL model for estimation. They found that agriculture has a good and important influence on Nigeria's economic development. Furthermore, developing the labour force's talents and abilities concluded that building in the agricultural area would boost study and expansion, hence increasing export size, which is critical for long-term growth.

### **3. Methodology**

This quantitative study was conducted based on the data collected and analysed for the period of 1973-2020. The data was collected from World Development Indicators (WDI) issued in 2021. The study analysed seven different types of variables, which were measured using annual percentages.

#### **3.1. Model Specification**

This study used the GDP per capita growth (annual %) as a substitution for economic development; the same proxy was also used by Izuchukwu (2011), Yusuf (2014), Asteriou and Agiomirgianakis (2001), Elgin and Oztunali (2014), and (Béguin et al., 2011). The study used the following modified model to analyse the impact of agricultural output on economic development. It is written as follows: The same model was also used by Sertoglu et al. (2017), Olajide et al. (2012), and Izuchukwu (2011) as well.

$$GDPpc = f(GCF, HK, LFP, FDI, Inf, Agri) \dots\dots\dots (1)$$

$$GDPpc_t = \alpha_0 + \beta_1 Agri_t + \beta_2 FDI_t + \beta_3 LFP_t + \beta_4 HK_t + \beta_5 GCF_t + \beta_6 Inf_t + \mu_t \dots\dots\dots (2)$$

Table 1: Variables Description

S.No	Variable	Measurement	symbol
1	GDP per capita growth (annual %)	Percentage	GDPPC
2	Labor Force Participation	Percentage	LFP
3	School enrollment secondary	Percentage	HK
4	Inflation Rate	Percentage	INF
5	Foreign Direct Investment	Percentage	FDI
6	Gross Fixed Capital Formation	Percentage	GFCF
7	Agriculture output	Percentage	AGRI

### 3.2. Econometric strategy

This study used the ARDL techniques for the estimation initiated by Pesaran et al. (2001). These techniques are used because they allow a mixed order of the co-integration and give more reliable results than other techniques.

The ARDL Equation

$$GDPpc_t = \alpha_0 + \sum_{i=1}^n \beta_{1i} GDPpc_{t-1} + \sum_{i=0}^n \beta_{2i} Agri_{t-1} + \sum_{i=0}^n \beta_{3i} FDI_{t-1} + \sum_{i=0}^n \beta_{4i} LFP_{t-1} + \sum_{i=0}^n \beta_{5i} HK_{t-1} + \sum_{i=0}^n \beta_{6i} GCF_{t-1} + \sum_{i=0}^n \beta_{7i} INF_{t-1} + \mu_t \quad (3)$$

The ARDL-Bound Equation

$$\Delta GDPpc_t = \alpha_0 + \sum_{i=1}^n \beta_{1i} \Delta GDPpc_{t-1} + \sum_{i=0}^n \beta_{2i} \Delta Agri_{t-1} + \sum_{i=0}^n \beta_{3i} \Delta FDI_{t-1} + \sum_{i=0}^n \beta_{4i} \Delta LFP_{t-1} + \sum_{i=0}^n \beta_{5i} \Delta HK_{t-1} + \sum_{i=0}^n \beta_{6i} \Delta GCF_{t-1} + \sum_{i=0}^n \beta_{7i} \Delta INF_{t-1} + \gamma_1 Agri_t + \gamma_2 FDI_t + \gamma_3 LFP_t + \gamma_4 HK_t + \gamma_5 GCF_t + \gamma_6 INF_t + \omega_t \quad (4)$$

The ARDL-ECM equation

$$\Delta GDPpc_t = \alpha_0 + \sum_{i=1}^n \beta_{1i} \Delta GDPpc_{t-1} + \sum_{i=0}^n \beta_{2i} \Delta Agri_{t-1} + \sum_{i=0}^n \beta_{3i} \Delta FDI_{t-1} + \sum_{i=0}^n \beta_{4i} \Delta LFP_{t-1} + \sum_{i=0}^n \beta_{5i} \Delta HK_{t-1} + \sum_{i=0}^n \beta_{6i} \Delta GCF_{t-1} + \sum_{i=0}^n \beta_{7i} \Delta INF_{t-1} + \alpha_1 ECM_{t-1} + \mu_t \quad (5)$$

Where,  $\alpha_0$  is the intercept which shows the average effect of the other variables,  $\beta$ 's are parameters, and  $\mu$  is the random error term.

### 4. Data analysis and discussion

Table 2 shows that all the variables of this study are stationary at level, while HK is stationary at first difference.

Table 2: Unit Root Results

VARIABLES	ADF test statistics (P-value) (With trend and intercept)		Order of integration
	At level	At first difference	
	GDPpc <sub>t</sub>	-4.8992* (0.0002)	
FDI <sub>t</sub>	-3.1206** (0.0318)	_____	1 (0)
AGRI <sub>t</sub>	-8.8165* (0.0000)	_____	1 (0)
GFCF <sub>t</sub>	-5.0644* (0.0001)	_____	1 (0)
HK <sub>t</sub>	-0.1519 (0.9372)	-8.2408* (0.0000)	1 (1)
INF <sub>t</sub>	-3.6334* (0.0086)	_____	1 (0)
LFP <sub>t</sub>	-5.4714* (0.0000)	_____	1 (0)

Note: \*, \*\* & \*\*\* indicated the significant level at 1%, 5% and 10%.

In Table 3, the F-statistics value is greater than the upper-bound value, which suggests that the independent variables have a positive and significant impact on GDPpc. Thus, it can be said that a long-term link exists. In the long term, the FDI will have optimistic and noteworthy consequences for GDPpc. A % upsurge in the FDI will increase the GDP by 0.83%. The same outcomes are provided by Ayanwale (2007) and Har et al. (2008) while contradicted by Ali et al. (2019) and Phiri (2013). Agricultural production has an optimistic and noteworthy effect on GDP per capita. The  $\beta$ 's value of agricultural production is 0.19, which shows that a percent surge in agricultural production will surge the GDP per capita by 0.19. Similar results were given Awan and Khan (2015), Halliez et al. (2015), Olowofeso et al. (2017), Awan and Khan (2015), Faridi et al. (2015), Olajide et al. (2012), and Reynolds et al. (2015), While, others give opposite results were given by Umair and Ullah (2013), Matahir and Tuyon (2013), and Michael et al., (2016).

The GFCF has an optimistic and noteworthy effect on GDPpc in the long run. The  $\beta$ 's value of GFCF is 0.07, which shows that a % surge in the GFCF will upsurge the GDPpc by 0.07. The same consequence was given by Saleem et al. (2017), while the contradictory results were given by Rani and Kumar (2019). Likewise, human capital has an optimistic and noteworthy effect on the GDPpc. The  $\beta$ 's value of the human capital is 0.03, which shows that a % upsurge in the human capital will increase the GDPpc by 0.03. Liu et al. (2008), and Usman et al., (2011).

The inflation rate, as the data shows, has negative and significant consequences for GDPpc. The  $\beta$ 's value of inflation rate is -0.36, which shows that a % surge in the INF will lessen the GDPpc by 0.36. The same results were specified by (Azam & Khan, 2020 Iqbal & Nawaz, 2009), while the contradictory results were specified by (Ayyoub et al., 2011 Rizzo & Carrera, 2009). However, the LFP has an optimistic and significant effect on GDPpc. The coefficient value of labour force participation is 0.12, which shows that a % upsurge in the LFP will increase the GDPpc by 0.12. The same results are given by Paudel and Perera (2009) and Rehman et al. (2020).

Table 3: ARDL long-period results and Bound Test

Variable	Coefficient	Std. Error	t-Statistic	Probability
FDI <sub>t</sub>	0.8331*	0.255746	3.257654	0.0028
AGRI <sub>t</sub>	0.1938*	0.021804	8.887172	0.0000
GFCF <sub>t</sub>	0.1683*	0.017054	9.870421	0.0000
HK <sub>t</sub>	0.0287***	0.016560	1.734664	0.0931
INF <sub>t</sub>	-0.3586*	0.108441	-3.306787	0.0025
LFP <sub>t</sub>	0.1204*	0.028288	4.255080	0.0002
C	-3.8687*	1.285837	-3.008677	0.0053
ARDL Bounds Test	Test Statistic	Value		Df
	F-statistic	5.4977*		6
	Significance	I0 Bound		I1 Bound
Critical Values	10%	2.12		3.23
	5%	2.45		3.61
	1%	3.15		4.43

Note: \*, \*\* & \*\*\* indicated the significant level at 1%, 5% and 10%.

Table 4 demonstrates the short-run coefficient of the variables. The FDI has a positive and noteworthy effect on GDPpc. The  $\beta$ 's value of FDI is 0.78, which shows that a % upsurge in the FDI will increase the GDP per capita by 0.78. Agricultural production has an optimistic and noteworthy effect on GDPpc. The  $\beta$ 's value of agricultural production is 0.20, which shows that a % upsurge in agricultural production will surge the GDPpc by 0.20. The GFCF has positive and significant consequences on GDPpc. A % surge in the gross capital formation will increase the GDP per capita by 0.07. Correspondingly, human capital has positive and noteworthy consequences on GDPpc. The  $\beta$ 's value of human capital is 0.18, which shows that a percent surge in the human capital will surge the GDPpc by 0.18%. The inflation rate has an immaterial effect on GDPpc. However, the LFP has an optimistic and significant effect on GDPpc. The  $\beta$ 's value of LFP is 0.09, which shows that a % surge in the LFP will increase the GDPpc by 0.09. The ECM value is found to be negative and significant, which shows that there is a 51 percent level of tuning from short- to long-period equilibrium.

Table 4: ARDL Short-Period Results

Variables	Coefficient	Std error	t-statistics	Prob
D(FDI)	0.7827***	0.420218	1.862581	0.0703
D(AGRI)	0.2026*	0.032433	6.248557	0.0000
D(GFCF)	0.0747*	0.023002	3.248095	0.0024
D(HK)	0.1771**	0.067668	2.616686	0.0127
D(INF)	0.0385	0.052814	0.730290	0.4697
D(LFP)	0.0922**	0.042862	2.151368	0.0379
C	-0.1481	0.159752	-0.927122	0.3597
ECM	-0.5116*	0.062371	-8.202534	0.0000

Note: \*, \*\* & \*\*\* indicated the significant level at 1%, 5% and 10%.

## 5. Conclusion

The key objective of the study is to investigate the impact of agricultural output on Pakistan's economic development. This study used Secondary data covering the period 1973-2020 and calm from the World Development Indicators (WDI) (2021). This study used GDP per capita

as a dependent variable substitution for economic development while labour force participation, school enrolment, inflation, foreign direct investment, gross fixed capital formation, and agriculture output were independent variables. Based on the data's behaviour, this study employed ARDL techniques for estimation. This study found that the FDI inflow, AGRI output, GFCF, and human capital. Labour force participation has been positive and significant, while the inflation rate has had an undesirable and noteworthy effect on economic development in Pakistan over a long period. This study also found that FDI inflow, agricultural output, gross fixed capital formation, human capital, and LFP have optimistic and noteworthy effects, while the inflation rate has an insignificant effect on Pakistan's economic development in the short term. Furthermore, this study found that co-integration exists and a 51 percent speed of tuning. This study concluded that the agricultural output has significantly influenced Pakistan's economic development. The study recommended that the government of Pakistan ensure that policymakers focus on improving agricultural productivity to enhance Pakistan's economic development. This study recommended further that the government must make sure that the policymakers focus on making efforts and offer the necessary incentives to promote growth in both agriculture and manufacturing to improve agricultural productivity and enhance the economic development of Pakistan.

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