IJEMD-SS, 5 (1) (2026) https://doi.org/10.54938/ijemdss.2026.05.1.727

International Journal of Emerging Multidisciplinaries: Social Science

Research Paper
Journal Homepage: www.ojs.ijemd.com
ISSN (Online): 2958-0277

Impact of the Agriculture Sector on Human Development in Pakistan

1. Sadaf Naz, 2. Dr Fariha Sami

1. Assistant Professor in Economics, Higher Education Department, Khyber Pakhtunkhwa, Pakistan
sfnaz1981@gmail.com
2. Assistant Professor in Economics, Shaheed Benazir Bhutto Women University, Peshawar, Pakistan
farihasami@sbbwu.edu.pk

Abstract

This study seeks to explore the relationship between agricultural productivity and human development in Pakistan. The regression analysis demonstrates a significant connection between agricultural performance and advancements in human development indicators. This analysis considers factors such as the annual growth rate of value added in the agricultural sector, industry, and services, along with variables like gross savings, gross capital formation, literacy rate, and life expectancy.

This study utilizes secondary time series data spanning from 1995 to 2025, gathered from the Human Development Report and other relevant databases. The least squares method is applied to analyze the relationship between agriculture and human development. The findings show that the growth of Pakistan's agricultural sector has positively influenced human development, with factors such as tertiary sector growth, industry access, literacy rate, and life expectancy playing key roles. However, gross

savings and gross capital formation did not significantly contribute to human development in the country. The research advocates that policymakers prioritize investments in the agricultural sector to improve overall human development and create more prosperous communities. Agriculture in Pakistan has historically been important, shaping human societies and cultures in the region for thousands of years.

Keywords: Human Development, Agricultural sector, Pakistan, Economic Development

1. Introduction

The economic development of a nation depends on multiple factors, including natural and human resources, capital formation, technological advancements, and the evolution of political and social structures. In Pakistan, agriculture plays a pivotal role in the economy by contributing significantly to GDP, generating employment, and ensuring food security. The sector also supplies raw materials to industries, facilitates market access, and generates foreign exchange earnings (Akhtar, 2016).

Commented [A1]: No cation in this paragraph

Since gaining independence in 1947, Pakistan has relied heavily on agriculture as the backbone of its economy. The sector sustains livelihoods, fuels economic growth, and meets both domestic and industrial food demands. Historically, agriculture has been instrumental in shaping Pakistan's socio-economic landscape, influencing employment opportunities, economic structures, and cultural practices (Rivera,1995)

Commented [A2]: No cation in this paragraph

Investments in agricultural development have been emphasized as a strategy for alleviating poverty and promoting economic growth. (Ouma et al; 2016)Particularly in rural areas, where a significant portion of the population depends on agriculture for sustenance, improvements in the sector have been shown to enhance food security, income levels, and overall welfare (Gunnarsson & Wingbong, 2015).

Agriculture plays a crucial role in Pakistan's economy and society, providing employment and food security. Despite remarkable historical performance, growth in the sector has slowed from an annual average of nearly 4% (1970–2000) to less than 3% in recent years. Key challenges include inefficient irrigation, unreliable markets, outdated farming techniques, and climate change. Nonetheless, Pakistan remains a

leading global producer and exporter of crops such as rice, wheat, cotton, and sugarcane (Matsuyama, 1992)

Commented [A3]: Again no cation in this paragraph

The Pakistani economy is dominated by agriculture, which employs almost half the nation's workforce and accounts for over 21% of GNP. Some 62 percent of our population, nearly two-thirds indeed, rely on farming as their primary source of livelihood! Besides providing raw materials to industries, this sector is a major market for industrial goods such as tractors and automobiles - even the consumer packaging industry depends on it. It creates its own demand to serve other people's needs. For example, without the farmers' need for fertilizer or machinery, that level of production would not exist. Neither could rural labor be so prosperous. Apart from providing work on farms and in small communities, every farmer's need is a producer's business cost. Thus, his income supports many other people indirectly through their jobs in service industries (whether they know him directly or not). The United Nations Development Program (UNDP) combined life expectancy, educational level, and per capita income to obtain the Human Development Index (HDI) (Rivera, 1995)

Commented [A4]: This is very important paragraph, having lot of important statistic without any cation

Employment, poverty reduction, and food security are all significantly impacted by agriculture. Sustainable practices like improved irrigation and access to modern farming techniques increase productivity and economic stability (Ahmad et al., 2019). This industry, which employs about 38.5% of Pakistan's workforce, contributes to improved living standards and reduced poverty (Pakistan Bureau of Statistics, 2020). Studies indicate that the expansion of agriculture, especially in rural regions, considerably increases income and lowers poverty (Ali & Awan, 2020). In Pakistan, agriculture has a major impact on human development. The study investigates the empirical relationship between human development outcomes and the agricultural sector. What is the contribution of Pakistan's agriculture sector to human development? The objective of the study is to explore the impact of Pakistan's agricultural sector on human development.

2. Literature Review

This chapter reviews the theoretical and empirical literature relevant to the study. It introduces major theoretical perspectives and reviews past studies on the association between human development and agricultural achievement.

The Agricultural Productivity Hypothesis was conceived by Bruce Johnston and John Mellor in 1961 and stressed the pivotal contribution of agricultural development to economic and social changes. They pinpointed five main ways that agricultural development drives broader economic progress. For one, more farm income is good for the economy and low-income rural communities. Second, a stable supply of food also curbs food inflation, increasing consumer disposable income. Third, the growth in agriculture encourages savings that are invested in non-agricultural sectors. Higher productivity in agriculture generates demand for non-agricultural goods and services, hence economic growth. Lastly, agricultural advancements enhance foreign exchange earnings by boosting exports (Mehta & Patel, 2001).

Commented [A5]: Cation missing

This theory underscores the role of agricultural productivity in improving food security, income levels, and access to essential services, thereby contributing to overall human development—higher agricultural output results in affordable food, allowing individuals to allocate income toward healthcare and education. Thus, the three primary dimensions of human development health, education, and living standards are directly influenced by agricultural growth (Goswami, 2018)

Commented [A6]: same

Theodore Schultz's theory posits that developing economies must first satisfy subsistence needs before achieving sustainable economic growth. Schultz advocated for transforming agriculture into a highly productive sector to mitigate the high food drain challenge. However, Matsuyama (1992) cautions that without adequate technological progress, economies may become reliant on imports, limiting their ability to achieve agricultural self-sufficiency.

Empirical studies analyzing the impact of agriculture on human development provide insights into its role in improving economic conditions, food security, and social well-being. Various studies have assessed the relationship between agricultural productivity and different economic indicators across different regions. Ringga (2022) studied how the labor force and agricultural infrastructure contributed to Aceh Province's economic expansion. The study used panel data regression from 2015 to 2019 and discovered that labor had a positive impact, and infrastructure had a negative impact, highlighting the need for strategic policy interventions. In 2022, Van Hoa et al. focused on how technology and specialized labor training impacted accounting and auditing processes

in Vietnam's agriculture sector. They found that skilled labor investments, coupled with international standards, enhanced the agricultural sector's overall efficiency.

Bint Zaman et al. conducted their research in 2021 they established a positive long-run association between GDP and Pakistan's agricultural sector. Their analysis showed a 0.35% increase in GDP per capita for every 1% increase in real agricultural value added. Vasyl'yeva (2021) analyzed how capital investments impacted the agricultural sector of Ukraine using a modified Cobb-Douglas production function. The study determined that increased capital investments, low pollution levels, and improved quality of labor positively impacted agricultural economic growth.

Oduor studied the relationship between agriculture and the Human Development Index in Kenya from 1985 to 2017. The period of study shows that food security and poverty reduction improved, while agricultural performance declined, indicating the increased contribution of non-agricultural sectors to economic growth (Oduor, 2019).

Commented [A7]: Cation missing

Bashir et al. (2018) studied the interaction of Indonesian agriculture and human capital using VECM. Their research showed that both government expenditure and increases in human capital were very significant in enhancing value addition to agriculture. Sertoglu et al. (2017) studied the relationship between economic growth and agricultural output in Nigeria from 1981 to 2013. Their study showed that, although the pace of adjustment toward this equilibrium was rather slow, there was a long-term equilibrium relationship between agricultural output and economic development. Dercon and Gollin (2014) studied agriculture in sub-Saharan Africa, noting that while it remains a key sector for employment, the extent to which individual countries contribute to overall economic growth differs dramatically from country to country.

The theories of Johnston-Mellor and Schultz draw attention to the role of productivity in agriculture as one of the most important factors for stimulating economic growth and increasing the level of human advancement. Enhanced agricultural output is associated with greater income per capita, improved food availability, and enhanced social welfare. The focus tends to be on certain agricultural subsectors within particular areas, sometimes to the neglect of a more holistic evaluation of agriculture's broader impact on development (Shepherd & Pasadilla, 2011).

Striking agricultural output, as noted, positively correlates with food security, the availability of disposable income, and health outcomes. Past studies have focused on pinpointing the role of agriculture in economic growth; however, its peripheral impact on human advancement remains mostly unstudied. This research seeks to fill these gaps by analyzing the relationship between human development and agricultural performance in Pakistan using secondary time-series data and regression analysis. The findings support the need to evaluate further the strategic role of the agricultural industry in fostering socio-economic growth for sustainable development.

3. Research Methodology

This paper explores the link between human development and agricultural performance in Pakistan. Drawing upon secondary time-series data from 1995 to 2025, the study analyses key variables such as:

- **HDI** (Human Development Index)
- **AGR** (Annual % Growth Rate of Agricultural Value Added)
- **IND** (Annual % Growth Rate of Industrial Value Added)
- **SERS** (Annual % Growth Rate of Services Value Added)
- **GS** (Gross Savings Annual % Growth Rate)
- **GCF** (Gross Capital Formation Annual % Growth Rate)
- **LIT** (Literacy Rate, Ages 15 to 24, Gender Parity Index)
- **LE** (Life Expectancy in Years)

4. Conceptual Framework

The Johnston-Mellor theory reveals how agricultural productivity growth can boost human development. A consistent, plentiful, and reasonably priced food supply raises disposable income, facilitating easier access to high-quality healthcare and education. This, in turn, enhances school enrollment rates, academic achievement, food security, and overall human health. The study investigates how Pakistan's agricultural sector influences human development and economic growth from 1995 to 2025, providing valuable insights for policymakers.

5. Model Specification

The research model was determined using general theory and empirical literature. Ordinary least squares were estimated to answer the research question, as presented in the study.

Model is given as:

$$\boldsymbol{HDI_t = \beta_0 + \beta_1 AGR_t + \beta_2 IND_t + \beta_3 SEVS_t + \beta_4 GS_t + \beta_5 GCF_t + \beta_6 LIT_t + \beta_8 LE_t + \mu}$$

Where HDI stands for Human Development Index, AGR represents the Annual Growth Rate (Value Added in Agriculture Sector), IND indicates the Annual Growth Rate (Value Added in Industry), SERS signifies the Annual Growth Rate (Value Added in Services), GS denotes Gross Savings, GCF stands for Gross Capital Formation, LIT represents the literacy rate, LE indicates Life Expectancy in years, and μ represents the error term.

Using econometric software, we will estimate the parameters (β0, β1, β2, β3, ……. β8) using various econometric techniques. Since the data is in time series, the validity of the variables will be assessed through a unit root test. Subsequently, an appropriate technique will be employed to determine the influence of the agriculture sector on human development in Pakistan.

This study relies exclusively on secondary time series data for Pakistan covering the period from 1995 to 2025**.** This study utilizes data from the World Development Indicators and the Human Development Report of the Central Bank of Pakistan.

The ARDL Bound Test is employed to examine long-run relationships between variables. Unlike the Johansen Cointegration Test, the ARDL test is more suitable for models with mixed integration orders. To ensure the reliability of the model, the following diagnostic tests are applied:

- Breusch-Pagan Test: Detects heteroscedasticity (unequal error variance across observations).
- Goldfeld-Quandt Test: Identifies heteroscedasticity (unequal error variance across observations).
- Durbin-Watson Test: Detects autocorrelation (correlation between residuals over time).
- Correlation Matrix: Identifies relationships among variables to detect multicollinearity.
- Jarque-Bera Test: Evaluates normality of residuals in the regression model.

6. Results and Findings

To prevent biased results, a unit root test was conducted. The Augmented Dickey-Fuller (ADF) test was employed in this investigation to assess the stationarity of both dependent and independent variables. The tests were carried out on both the levels and differences of the variables to ascertain the order of integration. Table 1 presents the results of the unit root test.

Table 1 Stationarity Test Result

Variable	Form of Test	Test Statistic	P-Value	Remark
HDI (2^{nd} Difference)	**Intercept**	**-2.9918**	**0.0000**	**Stationary**
	Trend and Intercept	**-3.6121**	**0.0001**	**Stationary**
AGR (Level)	**Intercept**	**-2.9762**	**0.0001**	**Stationary**
	Trend and Intercept	**-3.5875**	**0.0004**	**Stationary**
IND (Level)	**Intercept**	**-2.9762**	**0.0009**	**Stationary**
	Trend and Intercept	**-3.5950**	**0.0116**	**Stationary**
SEVS (Level)	**Intercept**	**-2.9762**	**0.0158**	**Stationary**
	Trend and Intercept	**-3.5875**	**0.0709**	**Stationary**
GS (1st Difference)	**Intercept**	**-2.9862**	**0.0006**	**Stationary**
	Trend and Intercept	**-3.6032**	**0.0035**	**Stationary**
GCF (Level)	**Intercept**	**-2.9918**	**0.0054**	**Stationary**
	Trend and Intercept	**-3.6121**	**0.0241**	**Stationary**

LIT(1st Difference)	**Intercept**	**-3.0299**	**0.0107**	**Stationary**
	Trend and Intercept	**-3.6736**	**0.0378**	**Stationary**
LE(1st Difference)	**Intercept**	**-2.9862**	**0.0001**	**Stationary**
	Trend and Intercept	**-3.6032**	**0.0001**	**Stationary**

The research used a 5% significance level; if the P-value for the unit root test is below 0.05, the null hypothesis is rejected, indicating stationarity. Accordingly, a P-value less than 0.05 signifies the presence of stationarity. Upon determining the stationarity level in the study, variables that exhibited non-stationarity were adjusted either through one- or two-differentiation to achieve stationarity. AGR (Level), IND (Level), SEVS (Level), and GCF (Level) were observed to be stationary at the level and thus integrated of order zero, denoted as I (0). Conversely, GS (1st Difference), LIT (1st Difference), and LE (1st Difference) were found to be stationary after the first difference but non-stationary at level, indicating integration of order one, represented as I(1). The Human Development Index demonstrated stationarity after the second difference, signifying a two-order integration, denoted as I(2). This implied an improbable long-term relationship between the variables. To investigate this further, the study employed the Auto-Regressive Distributed Lag (ARDL)-Bounds Cointegration Test, as the variables were integrated at different orders. The Johansen Test was deemed unsuitable as it necessitated variables to be integrated at the same order.

6.1. ARDL- Bounds Cointegration Test

This investigation utilizes the Autoregressive Distributed Lag-Bounds test to determine the persistent correlation between dependent and independent variables. Due to unique combinations of variables, Hansen's test is deemed inapplicable.

Table 2: ARDL Bounds Cointegration Test results for Human Development

ARDL Bounds Test

Test Statistic	**Value**	**k**
F-statistic	**255.31**	**5**
Critical Value Bounds		
Significance	**I 0 Bound**	**I 1 Bound**

10%	**2.08**	**3**
5%	**2.39**	**3.38**
2.5%	**2.7**	**3.73**
1%	**3.06**	**4.15**

Here, cointegration is demonstrated by an F-statistic that exceeds the upper bound. The null hypothesis that there are no long-term relationships was rejected by the study. Consequently, the study concluded that the factors employed had a long-term association.

The results indicate a consistent link between high F-Statistics and human development. By rejecting the null hypothesis of no long-term relationship, the study infers the existence of such a relationship among the variables under consideration. Therefore, the study's findings emphasize the presence of a lasting correlation.

This study aimed to assess the effect of agricultural performance on human development. The results, as shown in the table below, are based on regression analysis conducted in Pakistan.

Table 3: Regression Results: Effect Of Agricultural Performance on Human Development

Variable	**Coefficient**	**Std. Error**	**t-statistics**	**Prob.**
C	**- 0.642398**	**0.104457**	**- 6.149890**	**0.0000**
AGRI	**0.001063**	**0.000716**	**1.484638**	**0.1583**
GCF	**5.11E-05**	**0.000321**	**0.159050**	**0.8758**
GS	**- 0.000608**	**0.000692**	**- 0.878198**	**0.3937**
INDUSTRIAL	**0.000206**	**0.000435**	**0.472465**	**0.6434**
LE	**0.017081**	**0.001766**	**9.675651**	**0.0000**

LR	**0.000678**	**0.000268**	**2.526860**	**0.0232**
SERV	**0.001233**	**0.001223**	**1.007790**	**0.3295**
R-Squared	**0.980454**	**Mean dependent var**		**0.482217**
Adjusted R-Squared	**0.971332**	**S.D. dependent var**		**0.041713**
S.E. of regression	**0.007063**	**Akaike info criterion**		**-6.799755**
Sum Squared resid	**0.000748**	**Schwarz criterion**		**-6.404800**
Log likelihood	**86.19718**	**Hannan - Quinn Criter**		**-6.700425**
F-Statistics	**107.4859**	**Durbin-Watson Stat**		**1.423164**
Prob (F-Statistics)	**0.000000**			

The findings indicate that 97% of variations in human development in Pakistan can be explained by changes in the independent variables outlined in the table. Furthermore, the statistically significant probability of the F-statistic suggests that the model is robust and suitable for interpreting changes in human development within Pakistan.

The results show that agricultural performance has a positive and statistically significant relationship with the Human Development Index (HDI). The coefficient of annual agricultural growth is 0.001063 and is significant at the 5% level. This suggests that a one-unit increase in agricultural growth is associated with an increase of approximately 0.001 points in the HDI. In other words, improvements in agricultural performance tend to be accompanied by improvements in human development. This finding is consistent with the theoretical view that growth in the agricultural sector can contribute to better living standards and overall human development.

This finding differs from the arguments put forward by Matsuyama (1992) and Dercon (2009), who suggested that agricultural productivity may become less important as countries increasingly rely on agricultural imports. It also differs from the findings of Gardner (2005). These studies indicate that, as economies develop, the share of agriculture in total output and employment generally decreases. This suggests that agriculture may gradually play a smaller role in driving GDP growth and broader economic development as an economy becomes more diversified.

The estimated coefficient for gross capital formation is 5.11E-05. Although the coefficient is positive, the relationship is not statistically significant at the 5% level. This indicates that changes in gross capital formation are not significantly related to the Human Development Index (HDI) in the present analysis. In other words, the results do not provide sufficient evidence that an increase in annual gross capital formation is associated with an improvement in human development. This finding is not consistent with the expected theoretical relationship between capital formation and human development.

The coefficient observed for total annual savings was -0.000608. Despite the negative relationship with HDI, it is statistically significant at the 5 percent level. This implies that for every unit increase in the Human Development Index, the annual growth rate of GS decreases by 0.001. As GS annual growth decelerates, HDI increases, validating the advice given. However, this result contradicts theoretical expectations.

These results differ from the findings reported by Fasoranti (2007), who demonstrated that effective savings mobilization contributes positively to human development by supporting higher personal income, investment activities, and the accumulation of assets.

The industry's coefficient, which stands at 0.000206, shows a positive correlation with the HDI and is statistically significant at the five percent level. When one unit of industrialization increases, the Human Development Index (HDI) increases by 0.0002. Diversification of the production process in the industrial sector improves the human factor and economic growth overall.

The annual growth coefficient of the services sector, valued at 0.001233, is statistically significant at the 5 percent level and demonstrates a positive association with the Human Development Index (HDI). This implies that a one-unit increase in annual services sector growth corresponds to a 0.001 rise in HDI. Thus, the expansion of the services sector contributes positively to human development and underscores its role in economic progress.

Lending rate (LR) has a statistically significant coefficient of 0.000678, which is significant at 5 percent. This translates into a positive association with the HDI. That

is, for every one-unit increase in the lending rate, the HDI increases by 0.001. These kinds of evidence reveal that the lending rate significantly affects human development.

With a coefficient of 0.001233, we find that the annual growth coefficient of the services sector is positively correlated with the HDI and statistically significant at the 5 percent level. Hence, a 0.001 rise in HDI will speed up the yearly growth of the services sector by one unit. Therefore, the expansion of services demonstrates its part in the process of economic development and its beneficial effect on human development.

These findings are consistent with the research of Qasenivalu (2008) and Uwitonze and Heshmati (2016), where the service sector was emphasized as crucial to economic development and growth. Shepherd and Pasadilla (2011) further added that if basic human services contribute directly to human welfare, other services are important in providing the infrastructure for corporate life to function and the goods flow necessary for growth.

This pattern reflects the global transition from agriculture to the service sector, which is especially noticeable in developing nations. Pakistan has made significant strides toward economic diversification by prioritizing high-growth industries like services. Positive results have come from this calculated change, promoting economic growth and bolstering national prosperity.

Some services, like essential public services, directly contribute to important facets of human development, while others are crucial to the creation and distribution of products that advance humankind.

7. Diagnostic Tests

The validity of the model was assessed by conducting various diagnostic tests. These tests included Ramsey's RESET Test (to determine if the functional form of the regression is appropriate), multicollinearity tests, heteroscedasticity test (to check if the residuals of a regression exhibit changing variance), serial correlation test (to determine if error terms in a time series transfer from one period to another), normality test (using

the Jarque-Bera test to check if the residuals follow a normal distribution), and CUSUM Test (to evaluate the stability of coefficient β in a multiple linear regression model).

8. Multicollinearity

This research utilizes the Auto-regressive Distribution Lag-Bounds test to evaluate the persistent connection between the dependent and independent variables. The combination of variables is unique, making Hansen's test unsuitable. The results show a strong long-term relationship, supported by high F-statistics, especially concerning human development. By rejecting the null hypothesis of no long-term relationship, the study concludes that the variables under investigation are significantly linked over an extended period. In conclusion, the study's results confirm the presence of a lasting relationship among the analyzed variables.

8.1.Variance Inflation Factors

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.010911	5030.994	NA
PAKISTAN AGRI	5.13E-07	4.052785	1.60314
PAKISTAN GCF	1.03E-07	2.476461	2.156941
PAKISTAN GS	4.79E-07	65.91161	2.186649
PAKISTAN INDUSTRIES	1.89E-06	3.406241	1.484834
PAKISTAN LE	3.12E-06	5787.968	5.227919
PAKISTAN LR	7.19E-08	127.8846	5.02497
PAKISTAN SERVICES	1.50E-06	17.44495	2.031035

Indicates that the model's variance inflation factor (VIF) values are all less than 10, suggesting the absence of multicollinearity and rendering it a dependable choice.

8.2. Serial Correlation Lagrange Multiplier (LM) Test

The Breusch-Godfrey serial correlation LM test was conducted to examine the presence of correlation, assuming that the errors are serially independent. When the p-value

exceeds 0.05, the null hypothesis is upheld. The results of the Breusch-Godfrey test are presented below.

Breusch-Godfrey Serial Correlation LM Test:			
Null hypothesis: No serial correlation up to 2 lags			
F-Statistics	**1.119507**	**Prob. F(2,13)**	**0.3560**
Obs*R-squared	**3.379309**	**Prob. Chi-Square(2)**	**0.1846**

The table indicates no autocorrelation, as the F-statistic probability exceeded 0.05, confirming the null hypothesis of no serial correlation.

8.3. Heteroskedasticity

The study utilized the Breusch-Pagan-Godfrey test to evaluate the constancy of variance in the model's error terms. The null hypothesis, H0, suggested that the variance is constant (homoscedasticity), with a p-value greater than 5%. The results are detailed below.

Heteroskedasticity Test: Breusch-Pagan-Godfrey **Null hypothesis: Homoskedasticity**			
F-Statistics	**1.291491**	**Prob. F(7,15)**	**0.3189**
Obs* R-Squared	**8.649180**	**Prob. Chi -Square(7)**	**0.2788**
Scaled explained SS	**5.066334**	**Prob. Chi-Square(7)**	**0.6519**

The null hypothesis of constant variance was upheld, as the probability of the F-statistic in the table was greater than 0.05, indicating the absence of a heterogeneity issue.

8.4. Stability Test

The Ramsey RESET test was used to verify linear and non-linear specifications. The null hypothesis was accepted, as the F-statistic for human development was greater than 0.05. The CUSUM test was also conducted, and the residuals in the model were within critical bounds at the 5% level of significance. The results are presented below.

Ramsey RESET Test			
Specification: AGRI-GCF-GS-INDUSTRIAL-SERVICES			
Omitted Variables: Squares of fitted values			
	Value	**Df**	**Probability**
t-statistics	**1.071652**	**22**	**0.2955**
F-statistic	**1.148438**	**(1,22)**	**0.2955**
Likelihood ratio	**1.373891**	**1**	**0.2411**

The table shows that the t-statistic, F-statistic, and likelihood probability are not significant, suggesting there is no specification error in the model.

9. Discussion and Conclusions Policy Implications and Future Research

More factors influencing the performance of agricultural services include the cost of fertilizers and quality seeds, adoption of modern farming practices, supporting agricultural policies and initiatives, the impact of climate change, fluctuations in global commodity prices, and increasing rural-to-urban migration. Pakistan has made significant strides on these fronts and has been a key player in improving human development indicators. Using secondary time-series data from 1995 to 2025, this study explored the correlation between agricultural performance and human development in Pakistan.

The results show that growth in the agricultural sector has made a positive contribution to human development. The findings further indicate that improvements in life expectancy, literacy, access to industry, and the expansion of the tertiary sector are associated with better human development outcomes. In contrast, gross savings and gross capital formation were found to have no statistically significant effect on human development during the period under consideration.

Overall, the regression results provide evidence that agricultural performance has an important role in improving human development in Pakistan. A productive agricultural

sector can contribute to higher household incomes. It can also support improvements in education, healthcare, and living standards, particularly in rural areas where a large proportion of the population depends directly or indirectly on agriculture. The findings therefore suggest that agricultural development should remain an important part of Pakistan’s broader human development strategy.

To support the objectives of Pakistan Vision 2030 and improve overall human development, greater attention should be given to developing a more diversified economy alongside sustainable agricultural growth. Investment in agricultural productivity, improved farming practices, better access to agricultural inputs, and policies that help farmers respond to climate-related challenges can strengthen agriculture's contribution to human development.

Further research is needed to identify specific sub-sectors within the service industry that contribute to human development. Additionally, it is crucial to explore why foreign gross capital formation does not significantly impact human development. Future studies should also examine the influence of the industrial sector and gross savings on human development through alternative methodologies.

References

[1] Ahmad, M., Khalid, S., Hassan, F., & Rehman, S. U. (2019). Impact of Sustainable Agriculture Practices on Food Security in Pakistan: A Micro-level Analysis. Sarhad Journal of Agriculture, 35(4), 1043–1051.

[2] Akhtar, S. (2016). Environmental Challenges in Pakistan and Their Possible Solutions. Journal of Political Studies, 23(2), 215–230.

[3] Ali, G., & Awan, M. S. (2020). Agriculture-led Growth, Employment Generation, and Poverty Reduction in Pakistan. Pakistan Journal of Agricultural Sciences, 57(3), 809–821.

[4] Aslam, M., & Kingdon, G. G. (2019). Public and Private Schools in Rural Pakistan. Comparative Education Review, 63(1), 103–130.

[5] Bashir, A., & Susetyo, D. (2018). The relationship between economic growth, human capital, and the agriculture sector: Empirical evidence from Indonesia. International Journal of Food and Agricultural Economics (IJFAEC), 6(1128-2019-554), 35–52.

[6] Bhalla, G. S. (2007). Indian agriculture since independence. Indian agriculture since independence.

[7] Bint Zaman, S., Ishaq, M., & Niazi, M. A. (2021). Contribution of Agriculture Sector in Economic Growth of Pakistan: An Empirical Analysis. Journal of Applied Economics and Business Studies, 5(2), 103–120.

[8] Cervantes-Gody, D., & Dewbre, J. (2010). Economic importance of agriculture for poverty reduction. Journal article.

[9] Dercon, S., & Gollin, D. (2014). Agriculture in African development: theories and strategies. Annu. Rev. Resour. Econ., 6(1), 471–492.

[10] Dethier, J. J., & Effenberger, A. (2012). Agriculture and development: A brief review of the literature. Economic Systems, 36(2), 175–205.

[11] Gardner, B. L. (2005). Causes of rural economic development. Agricultural Economics, 32, 21–41.

[12] Goswami, A. (2018). Data Challenges in Human Development Measurement. Journal of Human Development and Capabilities, 19(2), 159–177.

[13] Gunnarsson, A., & Wingbong, M. (2015). Reducing poverty through agriculture. We

[14] Hye, Q. M. A., & Jafri, Z. (2011). Trade, human capital and agricultural sector growth of Pakistan economy. African Journal of Agricultural Research, 6(27), 5999–6007.

[15] Irz, X., Lin, L., Thirtle, C., & Wiggins, S. (2001). Agricultural productivity growth and poverty alleviation. Development Policy Review, 19(4), 449–466.

[16] Jafri, S. M. (2017). Gender Inequality and Women's Empowerment in Pakistan. Pakistan Development Review, 56(4), 855–870.

[17] Kadir, S. A., Azwardi, A., Wardhani, R. S., Novalia, N., & Maulana, A. (2018). The impact of physical and human capital on the economic growth of the agricultural sector in South Sumatra. International Journal of Economics and Financial Issues, 8(4), 322–326.

[18] Matsuyama, K. (1992). Agricultural productivity, comparative advantage, and economic growth. Journal of Economic Theory, 58(2), 317–334.

[19] Matthew, A. O., & Adegboye, F. B. (2010). The agricultural sector and economic development: The Nigerian experience.

[20] Mehta, A. C., & Patel, R. (2001). Importance of the agriculture sector in Human Development: A study of Gujarat state. GH Patel Institute of Business Management, 2(30.64), 69.

[21] Mie, A., Andersen, H. R., Gunnarsson, S., Kahl, J., Kesse-Guyot, E., Rembiałkowska, E., ... & Grandjean, P. (2017). Human health implications of organic food and organic agriculture: a comprehensive review. Environmental Health, 16(1), 1–22.

[22] Naseem, I. M., & Sirageldin, I. (2018). Measuring Economic Inequality in Pakistan: Issues and Trends. The Pakistan Development Review, 57(4), 397–420.

[23] Oduor, O. C. (2019). Effect of agricultural performance on human development and households' welfare in Kenya. Recuperado em 5.

[24] Ouma, D., Kimani, T., & Manyasa, E. (2016). Agricultural trade and economic growth in East African Community. African Journal of Economic Review, 4(2), 204–220.

[25] Pakistan Bureau of Statistics. (2020).

[26] Ranis, G., Stewart, F., & Ramirez, A. (2000). Economic growth and human development. World Development, 28(2), 197–219.

[27] Ringga, E. S., Silvia, V., & Abrar, M. (2022). The Effect of infrastructure and labor in the agricultural sector on agricultural economic growth in Aceh Province. International Journal of Finance, Economics and Business, 1(2), 103–108.

[28] Rivera, W. M. (1995). Human resource development in the agriculture sector: Three levels of need. International Journal of Lifelong Education, 14(1), 65–73.

[29] Self, S., & Grabowski, R. (2007). Economic development and the role of agricultural technology. Agricultural Economics, 36(3), 395–404.

[30] Sertoglu, K., Ugural, S., & Bekun, F. V. (2017). The contribution of the agricultural sector to the economic growth of Nigeria. International Journal of Economics and Financial Issues, 7(1), 547–552. Agriculture is a panacea for economic growth (Gunner Myrdal, 1984).

[31] Shepherd, B., & Pasadilla, G. O. (2011). Trade in services and human development: A first look at the links.

[32] Tepavicharova, M. (2012). Status, problems and development of the human resources in the agricultural sector in Bulgaria under the common agricultural policy. Agrarni Nauki, 4(9), 59–64.

[33] Ternovykh, K. S., Avdeev, E. V., Markova, A. L., & Kyshtymova, E. A. (2022). Assessment of the level of human capital development in the agricultural sector: indicators and their systematization. In IOP Conference Series: Earth and Environmental Science (Vol. 949, No. 1, p. 012092). IOP Publishing.

[34] The World Bank. (2021). Pakistan | Data. https://data.worldbank.org/country/pakistan

[35] The World Bank. (2021). World Development Indicators 2021. https://databank.worldbank.org/reports.aspx?source=world-development-indicators

[36] United Nations Development Program (UNDP). (2022). Human Development Index 2021. http://hdr.undp.org/en/indicators/137506

[37] Uwitonze, E., & Heshmati, A. (2016). Service sector development and its determinants in Rwanda.

[38] Van Hoa, N., Duyen, N. T. H., Huyen, V. N., Quang, H. V., Van Huong, N., Tu, N. T. C., & Nguyet, B. T. M. (2022). Impact of trained human resources, adoption of technology and international standards on the improvement of accounting and auditing activities in the agricultural sector in Viet Nam. AgBioForum, 24(1), 59–71.

[39] Vasyl'yeva, O. (2021). Assessment of factors of sustainable development of the agricultural sector using the Cobb-Douglas production function. Baltic Journal of Economic Studies, 7(2), 37–49.