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The Effect of Foreign Direct Investment (FDI) and Labor on the Gross Regional Domestic Product of the Agricultural Sub-Sector

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Abstract:

This study aims to analyze the impact of Foreign Direct Investment (FDI) and labor on the Gross Regional Domestic Product (GRDP) of the agricultural subsector in Indonesia. FDI plays a crucial role in providing resources, technology, and infrastructure necessary to enhance efficiency and productivity in the agricultural sector. On the other hand, labor is a key factor in supporting the operations and management of this sector. This study uses a quantitative approach with purposive sampling to select relevant data according to the research objectives. The analysis technique includes panel data regression testing, hypothesis testing, and the determination coefficient analysis to examine the relationship between the variables studied. The data used is secondary data covering FDI realization, labor, and GRDP of the agricultural subsector from 2019 to 2022. This study is expected to provide a clearer picture of the contribution of FDI and labor to the economic growth of the agricultural subsector and offer useful recommendations for developing more effective agricultural sector policies.

Keywords: *Agricultural Subsector, Foreign Direct Investment, GRDP, Labor.*

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1. Introduction

Economic growth plays a vital role in enhancing social welfare, as it serves as a key driver for improving our standard of living (Kusairi et al., 2023). Economic growth is a continuous process of increasing output over time and serves as one of the key benchmarks for evaluating the success of a country's development (Ma'ruf & Wihastuti, 2008). In line with this perspective, Gross Domestic Product plays a crucial role in a nation's economic framework as it reflects the total market value of all goods and services produced within a specific region over a given period. It functions not only as a primary indicator to assess a country's economic progress but also as a tool to understand the economic structure and as a foundation for policy

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formulation. Consistent with this theoretical understanding, the Central Statistics Agency explains that the economic condition of a region can be measured through its economic growth, which is indicated by an increase in the production of goods and services over a certain time frame. This production is assessed using the concept of added value generated by various economic sectors, which together comprise the Gross Domestic Product (Central Statistics Agency, 2024). Therefore, economic growth is closely related to the increase in Gross Domestic Product, which serves as a performance indicator of national economic health and reflects the government's success in advancing key economic sectors.

Economic growth plays a vital role in determining a country's welfare and progress, as reflected in the increase of national output. One of the main indicators used to measure this is Gross Domestic Product, which represents the total value of goods and services produced over a certain period. In the second quarter of 2024, Indonesia's economy grew by 5.05 percent, showing a positive trend driven by contributions from strategic sectors, including agriculture (Coordinating Ministry for Economic Affairs, 2024). This highlights the importance of managing key sectors to sustain economic growth.

The agricultural sector particularly agriculture, forestry, and fisheries contributed more than 13 percent to Indonesia's Gross Domestic Product (Central Statistics Agency, 2023). In addition to being the largest source of employment, especially in rural areas, this sector also plays a key role in strengthening food security, reducing poverty, and promoting regional development. Community development is a process of utilizing existing resources and engaging local people in collaborative actions to improve the economic and social well-being of their communities (Wahyuningtyas et al., 2023). Every nation, but particularly developing nations, struggle with poverty and unemployment as obstacles to economic progress (Indrajaya & Iskamto, 2023). Thus, enhancing productive sectors such as agriculture can serve as a strategy to tackle these persistent challenges.

Table 1. Percentage Contribution of the Agricultural Sector to Gross Domestic Product

Years	Agriculture GDP Share (%)
2019	12,71%
2020	13,69%
2021	13,28%
2022	12,40%

Source: Central Statistics Agency (2024)

The table illustrates the agricultural sector's contribution to Indonesia's Gross Domestic Product from 2019 to 2023, based on data from the Central Statistics Agency (2023). The highest contribution occurred in 2020 at 13.69 percent, largely due to the sector's resilience during the COVID-19 pandemic when others declined. However, contributions gradually declined, reaching 12.40 percent in 2022. This decrease may reflect economic recovery in other sectors, climate challenges, and

reduced investment. Despite fluctuations, agriculture remains a vital component of Indonesia's economy.

Table 2. Foreign Direct Investment Contribution in the Agricultural Sector

Year	Foreign Direct Investment Contribution in the Agricultural Sector
2019	US$ 946.87 million
2020	US$ 1,184.21 million
2021	US$ 950.65 million
2022	US$ 1,789.40 million

Source: Central Statistics Agency (2024)

In recent years, Indonesia's economic relations with other nations have grown stronger and expanded significantly (Astuti, 2020). This growing cooperation has been reflected in the increasing trend of Foreign Direct Investment (FDI), particularly in strategic sectors like agriculture. The table above presents the contribution of Foreign Direct Investment in Indonesia's agricultural sector from 2019 to 2023, measured in million US dollars. In 2019, investment reached 946.87 million US$, increasing significantly to 1,184.21 million US$ in 2020. However, it declined to 950.65 million US$ in 2021. This trend reversed in 2022, with a sharp increase to 1,789.40 million US$. These fluctuations reflect the dynamic nature of foreign investor interest in the agricultural sector, influenced by various economic and global factors.

In addition to Foreign Direct Investment, labor is a crucial factor in supporting productivity within the agricultural sector. Labor refers to the working-age population individuals aged 15 to 64 who are capable and willing to participate in the production of goods and services, provided there is demand for their work (Fitria et al., 2022; Sayifullah & Emmalian, 2018). According to Rizkina et al. (2023), labor plays a significant role in influencing fluctuations in national income. An increase in the labor force, up to a certain level, can stimulate production growth and ultimately raise national output. However, if not optimally utilized, labor may yield suboptimal results. Moreover, low-quality labor can hinder production and reduce overall output and consumption levels. Therefore, labor is a key driver in promoting both Gross Domestic Product and Gross Regional Domestic Product, particularly in the agricultural sector.

In Indonesia, agriculture remains one of the largest employment sectors. Based on data from the Central Statistics Agency, in 2019 the agricultural sector employed around 35.45 million people, or 26.04% of the national workforce. This number rose to 38.22 million people (27.64%) in 2020, largely due to the COVID-19 pandemic, which caused a labor shift from the formal sector to agriculture, which was perceived as more resilient during the crisis (Central Statistics Agency, 2020). Although the number declined to 37.13 million (26.49%) in 2021 as formal sectors began to recover, it increased again in 2022 to 38.92 million (27.41%) (GoodStats, 2023). These figures

highlight that agriculture continues to serve as a primary employment option, especially for rural communities.

Despite its large labor absorption, the agricultural sector still faces productivity challenges. Limited access to training and technology, along with a labor force dominated by older workers, has hindered performance. Yuniarti and Sukarniati (2021) reported that most agricultural workers are over the age of 50, while younger generations tend to avoid the sector due to perceptions of low income and limited welfare prospects. This situation emphasizes the need to enhance human capital quality within agriculture. Consequently, organizations must enhance their adaptability in managing human resources to meet the demands of the digital age (Firmansyah & Wahyuningtyas, 2025). Improving agricultural productivity now depends not only on labor quantity, but also on the quality of skills, access to technology, and the ability to adjust to digital transformation.

Melati & Idris (2023) noted that low levels of education and skills remain key issues among agricultural workers, requiring targeted policies and training programs to improve labor capacity. Therefore, this study aims to provide a deeper understanding of the significant roles played by Foreign Direct Investment and labor in enhancing the agricultural sub-sector's contribution to national economic growth. The findings are expected to serve as a basis for formulating strategic policies that promote sustainable economic development, particularly through optimized investment and the development of a more skilled and productive agricultural workforce.

2. Theoretical Background

Economic Growth: Economic growth reflects a region's increasing capacity to produce goods and services in a sustainable manner, contributing to higher income levels and overall societal well-being (Asada 2020; Darise, 2023). This process involves the optimal use of resources, supported by effective income structures, spending patterns, and financing mechanisms. Beyond its statistical value, economic growth also represents the success of development efforts that directly improve the quality of life, particularly for vulnerable and low-income groups (Ernita et al., 2013). Therefore, economic growth serves as a vital benchmark for evaluating the effectiveness of long-term and inclusive development.

Foreign Direct Investment (FDI): According to Alam et al., (2013), Foreign Direct Investment includes the establishment of new companies, the procurement of production equipment, the purchase of fixed assets such as land and buildings, as well as the acquisition of raw materials and other capital goods. Moreover, this investment is not only financial in nature but also involves the active participation of foreign investors in the management and supervision of the operational activities of the companies in which they invest (Nguyen et al., 2021).

Labor: The Department of Manpower and Transmigration (2006) states that the workforce refers to individuals, both male and female, who have engaged, are currently engaged, or plan to engage in productive activities, either formally or informally, to produce goods or services in order to meet societal needs. In the context of economic development, labor plays a vital role as one of the factors of production

that can enhance efficiency, accuracy, and speed in the process of creating goods and services (Arfah, 2021; Nordin et al., 2022).

3. Methodology

This research is classified into several types based on its purpose and approach. It is a descriptive study, aiming to explain in detail the relationship between Foreign Direct Investment (FDI) and labor on Gross Regional Domestic Product (GRDP) in the agricultural sub-sector. The goal is to provide a clear overview of how these variables are connected based on available data.

The research uses a deductive approach and a quantitative method. It starts from existing theories and develops hypotheses that are tested using statistical analysis. The case study strategy is applied to gain a deeper understanding of how FDI and labor influence economic growth in a specific region. This strategy helps explore real conditions in a focused area.

In terms of research setting and involvement, this study has minimal researcher involvement, meaning the researcher only observes and analyzes without direct intervention. The research is conducted in a natural setting (noncontrived) to reflect real-life conditions. It uses a cross-sectional design, where data is collected at one specific point in time to describe the current relationship between variables without tracking changes over time

Data

This study uses secondary data to gather information on three main variables: Foreign Direct Investment (FDI), labor force, and Gross Regional Domestic Product (GRDP) in the agricultural sub-sector. Data were collected from official documents and statistical reports published by credible institutions such as the Central Bureau of Statistics (BPS), the Investment Coordinating Board (BKPM), and other government agencies. The data include information on the amount of FDI in the agricultural sector, the number of workers in the sub-sector, and the GRDP value of agriculture in the study area. All data were adjusted to match the research period to ensure relevance and accuracy in the analysis.

One challenge in this study is the limited availability of FDI data specifically for the agricultural sub-sector at the provincial level. Official institutions like BPS and BKPM generally publish only aggregate data either national totals by sector or provincial totals for all sectors without specific details by sub-sector per province. To address this, the researcher estimated the distribution of national agricultural FDI to each province using a regional economic approach as outlined by Sjafrizal (2014). This approach assumes that provinces contributing more to the agricultural sector's output (based on GRDP) are more likely to attract higher investment in that sector.

4. Empirical Findings/Result

Descriptive Data Characteristics

This study uses quantitative secondary data consisting of three variables: GRDP of the agricultural sub-sector, Foreign Direct Investment (FDI) in the agricultural sub-sector, and the number of workers in the agricultural sub-sector. The data cover 34 provinces in Indonesia over a period of 4 years, resulting in a total of 136 observations.

Table 3. Descriptive Statistics of Research Variables

Variable	Obs.	Mean	Std. Dev	Minimum	Maximum
GRDP (Billion IDR)	136	40.193,89	43.931,77	1.398	173.748
FDI (Billion IDR)	136	560,11	661,01	15,35	3.487,64
Labor (People)	136	1.092.912	1.364.132	22.678	6.919.467

Source: Author's processed data (2025)

Based on Table 3, the average GRDP of the agricultural sub-sector during the study period was Rp40,193.89 billion, with a wide range from a minimum of Rp1,398 billion to a maximum of Rp173,748 billion. This indicates significant disparities (heterogeneity) in agricultural economic output across provinces in Indonesia. The FDI and labor variables also show substantial variation. Further analysis reveals that the between-province variation is much larger than the within-province variation over time, supporting the use of the Fixed Effects panel data model to control for unobserved heterogeneity across provinces.

Panel Data Estimation Model Selection

The selection of the best estimation model between the Fixed Effect Model (FEM) and the Random Effect Model (REM) was conducted using the Hausman test, as summarized in Table 4

Table 4. Summary of Estimation Model Selection Results

Test Type	Test Statistic	Probability Value	Decision
Hausman Test	chi2(2) = 90.78	0.0000	Use Fixed Effect Model (FEM)

Source: Author's processed data (2025)

The test result shows a p-value of 0.0000, which is below the 0.05 significance level. Therefore, the Fixed Effect Model (FEM) is deemed the most appropriate and consistent model for further analysis.

Classical Assumption Tests

After selecting the Fixed Effect Model (FEM), a series of classical assumption tests were conducted to ensure that the regression model satisfies the criteria of the Best Linear Unbiased Estimator (BLUE).

Table 5. Results of Classical Assumption Tests

Classical Assumption Test	Result	Conclusion	Follow-up Action
Multicollinearity	Mean VIF = 2.85	No multicollinearity detected (VIF < 10)	Model can be continued
Heteroscedasticity	Prob > chi2 = 0.0000	Heteroskedasticity detected	Using Robust Standard Errors (vce(robust))
Autocorrelation	Indication of the xtscc test	Indication of autocorrelation	Reported as a note/sensitivity test of the model

Source: Author's processed data (2025)

As summarized in Table 5, the model meets the non-multicollinearity assumption. However, heteroskedasticity was detected; therefore, the final model was re-estimated using Robust Standard Errors to ensure the validity of the analysis.

Regression Analysis and Hypothesis Testing

The final estimation results of the Fixed Effect Model with Robust Standard Errors are presented in Table 6 This table serves as the primary basis for testing the research hypotheses.

Table 6 Regression Estimation Results of the Fixed Effect Model with Robust Standard Errors

Dependent Variable: GRDP	Coefficient	Robust Std. Err.	t	P>|t|
FDI	4.952302	0.6874818	7.2	0.000
Labor	0.0024242	0.0006368	3.81	0.001
Constant (_cons)	34770.61	935.3908	37.17	0.000
R-squared (within)	0.5555			

Source: Author's processed data (2025)

Based on the results in Table 6 the following conclusions can be drawn:

Hypothesis 1 (H1) Testing: The FDI variable has a positive and significant effect on the GRDP of the agricultural sub-sector (p-value = 0.000 < 0.05). Therefore, H1 is accepted.

Hypothesis 2 (H2) Testing: The labor variable also shows a positive and significant effect on the GRDP of the agricultural sub-sector (p-value = 0.001 < 0.05). Thus, H2 is accepted.

5. Discussion

The Effect of Foreign Direct Investment (FDI) on the GRDP of the Agricultural Sub-Sector

The findings show that Foreign Direct Investment (FDI) has a positive and statistically significant effect on the GRDP of the agricultural sub-sector in Indonesia. This result aligns with development economics theory, which views investment especially from foreign sources as a key driver of economic growth. A positive coefficient of 4.95

indicates that for every IDR 1 billion increase in FDI in the agricultural sector, the GRDP of the sector could increase by approximately IDR 4.95 billion.

FDI can boost agricultural output through various channels, such as the transfer of modern technology, improvements in agricultural infrastructure, supply chain efficiency, and better access to global markets. These findings support previous studies by Dinh et al. (2019) and Popescu et al. (2019), which also found a positive impact of FDI on regional economic growth. This highlights the importance of pro-investment policies that attract foreign capital into strategic sectors like agriculture as an effective strategy to stimulate sectoral economic growth.

The Effect of Labor on the GRDP of the Agricultural Sub-Sector

This study also finds that labor has a positive and significant effect on the GRDP of the agricultural sub-sector. This confirms the fundamental role of labor as one of the key factors of production in economic theory. Historically, the agricultural sector in Indonesia has been the largest absorber of labor. The results suggest that increasing the number of workers in this sector continues to contribute positively to output growth.

The significance of this variable became evident after the model was corrected using robust standard errors, highlighting the importance of controlling for heteroskedasticity to ensure accurate results. These findings are consistent with previous studies by Sayifullah & Emmalian (2018) and Maharani (2016), which also reported a positive and significant relationship between labor and GRDP.

However, the coefficient is relatively small (0.0024), which may indicate that simply increasing the number of workers is not sufficient. Improvements in productivity and human capital quality are also needed an issue highlighted in the background of this study as a key challenge in the agricultural sector.

6. Conclusions

This study aimed to evaluate the impact of Foreign Direct Investment (FDI) and labor on the Gross Regional Domestic Product (GRDP) of the agricultural sub-sector in Indonesia. Using panel data from 34 provinces during the 2019–2022 period, the findings reveal that FDI has a positive and statistically significant effect on agricultural GRDP. Specifically, every IDR 1 billion increase in FDI is estimated to raise agricultural GRDP by approximately IDR 4.95 billion. This confirms the important role of foreign investment in enhancing production capacity and technology in the agricultural sector.

Labor also shows a positive and significant relationship with agricultural GRDP, though the coefficient is relatively small (0.0024). This suggests that while increasing the number of workers contributes to output growth, it must be complemented by improvements in human capital quality to achieve optimal results. Therefore, worker productivity and technical capacity remain key factors in boosting sustainable agricultural performance.

Based on these findings, several policy recommendations can be proposed. First, the government should strengthen investment-friendly policies in the agricultural sector

through fiscal incentives, simplified licensing procedures, and improved investment security. Second, efforts must be made to enhance labor quality by promoting training programs focused on agricultural technology and management skills. Third, future researchers are encouraged to explore the role of labor quality such as education and skill levels in influencing productivity. Additionally, expanding the scope of research to include other economic sectors can offer a more comprehensive understanding of how FDI and labor contribute to national development. Finally, strong collaboration between the government and private sector including both domestic and foreign investors is essential for facilitating technology transfer, infrastructure development, and workforce capacity building.

Despite its contributions, this study has certain limitations. It relies solely on secondary data and focuses only on the quantity of labor, without examining aspects of quality or productivity. Moreover, the analysis is limited to the agricultural sub-sector, which may not fully capture the dynamics present in other sectors. Therefore, future research should consider incorporating qualitative dimensions of labor, including education, skills, and training, as well as expanding the analysis to cover a broader range of economic sectors. Such efforts would provide a more holistic view of the role of FDI and labor in promoting inclusive and sustainable economic growth.

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