**Agricultural Sector as a Driver of Regional Economic Growth: Evidence from GRDP and Location Quotient Analysis in Langkat Regency, Indonesia (2019–2023)**

**ABSTRACT**

This study investigates the contribution of the agricultural sector to regional economic growth in Langkat Regency, Indonesia, during the period 2019 to 2023—a timeframe marked by regional decentralization reforms and post-pandemic economic adjustments. The study tests the hypothesis that agriculture functions as both a base sector and a key driver of economic performance at the sub-national level. A dual-method approach is employed, integrating Location Quotient (LQ) analysis to determine sectoral specialization and multiple linear regression to quantify the economic significance of core agricultural indicators—harvested area and crop production volume. Results show that the agricultural sector consistently served as a base sector over the study period, with an average LQ of 1.7516, affirming its structural dominance. Regression findings reveal that a one trillion IDR increase in agricultural output is associated with a 1.832 trillion IDR rise in GRDP, with the model explaining 97.8% of the variance in economic growth. These results underscore the pivotal role of agriculture in regional development. The study recommends targeted policies for agricultural modernization, infrastructure investment, and risk mitigation strategies to ensure sustainable and inclusive growth. This research contributes to regional development literature by offering spatially grounded, empirical evidence for policy formulation in agrarian economies.

**Keywords**:  
Agricultural sector; Economic growth; Regional development; Gross Regional Domestic Product (GRDP); Location Quotient (LQ); Indonesia

1. **Introduction**

Regional economic growth remains a critical indicator of development success, particularly in emerging economies undergoing decentralization. In Indonesia, the Gross Regional Domestic Product (GRDP) serves as a principal metric to capture the performance of sub-national economies. As local governments gain greater autonomy in planning and resource allocation, understanding the role of dominant sectors in driving regional growth becomes imperative. This is especially true for regions with strong agrarian foundations where agriculture remains the backbone of local economies (Abdillah et al., 2023; Saban et al., 2024).

Langkat Regency, located in North Sumatra Province, represents one such agrarian region where the agricultural sector has historically contributed significantly to employment, income generation, and overall economic output. Despite structural shifts favoring industrial and service sectors nationally, agriculture continues to dominate GRDP composition in Langkat. According to regional statistical data, agriculture accounted for over 44% of GRDP in 2023, exceeding the sectoral contribution seen at the provincial level. This positions Langkat as a prime case study for evaluating agriculture’s dynamic role in regional development (Rajagukguk, 2021; Fauzi & Faizien, 2024).

The persistent importance of agriculture in Langkat, however, raises important policy and research questions. Is this sector merely residual in nature, or does it function as a specialized, growth-driving sector? Furthermore, how robust is its contribution to regional economic performance when measured empirically using multi-year data? Addressing these questions is crucial for informing local development strategies and budget prioritization (Sofilda et al., 2023; Nurjanah et al., 2025).

From a theoretical standpoint, the role of agriculture in economic development has evolved significantly. Classical models often viewed agriculture as a passive sector whose surplus supports industrialization, whereas modern endogenous growth theories acknowledge its productivity spillovers and technological linkages. In developing regions, agriculture is increasingly seen as a platform for inclusive growth and poverty reduction (Rajagukguk, 2021; Pratiwik & Rahmayani, 2023). Thus, a nuanced understanding of its regional contribution is both timely and essential.

Several empirical studies have explored sectoral contributions to economic growth at national and sub-national levels. However, few have specifically focused on rural districts like Langkat using both structural (Location Quotient) and econometric (regression) approaches. This dual-method strategy enables a more comprehensive evaluation—assessing not only whether agriculture is a base sector, but also quantifying its direct economic impact (Fajri & Munawaroh, 2023; Iskandar et al., 2024). Such an approach bridges gaps between descriptive sectoral dominance and causative growth dynamics (Ouru, 2021; Sarker, 2025).

Moreover, existing literature predominantly focuses on aggregate national data, overlooking spatial variations within countries. Regional-level analyses, particularly in decentralized settings, are vital for tailoring policy interventions. Agricultural potential, constraints, and outcomes vary widely across Indonesia's diverse geographies. Langkat's fertile land, varied crop base, and large rural workforce make it a compelling subject for deeper examination (Siburian, 2017; Saban et al., 2024).

In practical terms, understanding agriculture’s influence on GRDP informs infrastructure planning, investment incentives, and agricultural extension services. It also provides evidence for evaluating ongoing programs related to food security, rural finance, and value chain development. When regional development policies align with empirical sectoral strengths, they yield more sustainable and inclusive outcomes. Therefore, policy relevance is a key motivator for this research (Abdillah et al., 2023; Nurjanah et al., 2025).

This study applies a five-year panel (2019–2023) of official GRDP and agricultural production data from BPS (Central Bureau of Statistics) Langkat. It adopts Location Quotient (LQ) to evaluate sectoral specialization and multiple linear regression to estimate agriculture’s marginal contribution to regional economic growth. Two key agricultural indicators—harvested area and production volume—are used as explanatory variables. The approach is methodologically consistent with subnational economic studies in agrarian contexts (Rajagukguk, 2021; Iskandar et al., 2024).

By integrating structural and causal methods, this research contributes to both theoretical debates and applied policy discourse. It responds to the dual need for spatially differentiated insights and robust quantitative modeling (Nasution, 2025). Ultimately, it aims to clarify whether agriculture in Langkat is merely a legacy sector or a modern engine of growth. The findings are expected to support more targeted, evidence-based development planning (Sofilda et al., 2023; Fauzi & Faizien, 2024).

In summary, this study positions Langkat Regency as a testbed for understanding how agriculture contributes to regional economic dynamics in decentralized economies. It aims to fill empirical and methodological gaps by combining LQ and regression analysis. This study tests the hypothesis that the agricultural sector not only structurally dominates the regional economy but also exerts a measurable influence on regional growth dynamics through increased output and productivity.

**II. Methods**

**2.1 Research Design**

This study applies a quantitative explanatory design to assess the contribution of the agricultural sector to regional economic growth in Langkat Regency, Indonesia. The analytical framework combines Location Quotient (LQ) to evaluate structural sectoral dominance and multiple linear regression to assess causal influence. This dual-method approach allows for a robust interpretation of both static (sectoral positioning) and dynamic (economic contribution) dimensions. The 2019–2023 period was selected due to its strategic significance: it spans major fiscal decentralization reforms, COVID-19 pandemic impacts, and post-pandemic recovery efforts—offering a rich context for evaluating sectoral resilience and regional growth.

**2.2 Study Location and Context**

The study was conducted in Langkat Regency, located in North Sumatra Province. This region is predominantly agrarian, with agriculture contributing over 40% of its GRDP. Langkat consists of fertile lowlands and upland areas suitable for paddy, palm oil, rubber, and horticultural crops. Its economy is characterized by high rural population density, strong agricultural labor participation, and modest industrial development. These characteristics make Langkat a suitable case for assessing agriculture-led economic dynamics under Indonesia’s decentralized governance structure.



**Figure 1**. Research Location

**2.3 Variables and Operational Definitions**

The research focuses on one dependent variable and three independent variables:

* Dependent Variable:
  + GRDP (Gross Regional Domestic Product): Regional economic output at constant 2010 prices (trillion IDR).
* Independent Variables:
  + Agricultural Output: Monetary value of total agricultural production (trillion IDR).
  + Harvested Area: Total land area (in hectares) used for food crop cultivation.
  + Production Volume: Total output (in tons) of key agricultural commodities (rice, maize, palm, etc.).

These variables are operationalized based on official classifications by the Badan Pusat Statistik (BPS) and represent key proxies of agricultural productivity.

**2.4 Data Sources and Collection**

The study uses secondary panel data obtained from BPS publications at both regency and provincial levels. Annual GRDP, agricultural output, land use, and production figures from 2019 to 2023 were compiled. Data reliability is ensured by sourcing only from verified government statistical publications: *Kabupaten Langkat Dalam Angka* and *Provinsi Sumatera Utara Dalam Angka*. Where necessary, inflation-adjusted (constant price) data were used to maintain economic comparability across years.

**2.5 Analytical Techniques**

Two main analytical methods were employed:

1. Location Quotient (LQ):  
   Used to determine whether the agricultural sector is a base sector in Langkat by comparing sectoral GRDP share with provincial averages.

LQ=

Where:

* + Si​: Agricultural GRDP in Langkat
  + Ti ​: Total GRDP in Langkat
  + Sp ​: Agricultural GRDP in North Sumatra
  + Tp ​: Total GRDP in North Sumatra

1. **Multiple Linear Regression**:  
   To assess the influence of agricultural variables on economic growth:

GRDPt=β0+β1(AgriOutputt)+β2(HarvestedAreat)+β3(ProductionVolumet)+ϵt

**2.6 Classical Assumption Tests**

To ensure model validity, the following diagnostics were performed:

* Normality: Kolmogorov-Smirnov test
* Multicollinearity: Variance Inflation Factor (VIF < 10 acceptable)
* Heteroscedasticity: Glejser test
* Autocorrelation: Durbin-Watson test (acceptable range: 1.5–2.5)

All diagnostic indicators met standard thresholds, confirming the appropriateness of regression analysis.

**2.7 Tools and Software**

All statistical analyses were conducted using SPSS version 26. Data visualization and transformation were supported using Microsoft Excel and Python (pandas and matplotlib libraries). Data validation steps included outlier detection, cross-year consistency checks, and missing value analysis.

1. **Results and Discussion**

The **3. Results and Discussion**

**3.1 Trends in Agricultural and Economic Performance (2019–2023)**

The agricultural sector in Langkat Regency recorded steady and significant growth over the five-year period from 2019 to 2023. Agricultural output increased from IDR 12.1 trillion to IDR 15.1 trillion, representing a compound annual growth rate (CAGR) of 5.7%. This growth trajectory indicates not only favorable production dynamics but also the increasing commercialization and value addition of agricultural outputs in the region. Such performance affirms the sustained relevance of agriculture within the local economy, even as national development narratives emphasize industrial and service sector transformation.

Parallel to agricultural output, Langkat’s overall Gross Regional Domestic Product (GRDP) expanded from IDR 28.0 trillion in 2019 to IDR 36.5 trillion in 2023. This substantial increase suggests that agricultural growth is closely aligned with, and likely contributes significantly to, the region's broader economic performance. The simultaneous rise in both sectoral output and total GRDP implies a reinforcing feedback loop between agriculture and regional economic systems, where gains in productivity stimulate broader demand, consumption, and secondary sector activities. This synergy is particularly important in predominantly rural districts like Langkat.

Key physical indicators further support this upward trajectory. The total harvested area increased from 82,000 hectares to 89,000 hectares, marking an approximate 8.5% increase over the five years. This land expansion reflects a combination of land use intensification and the successful conversion of underutilized or fallow land into productive use. Such trends point to improved access to agricultural inputs, land tenure clarity, and potentially better rural infrastructure, enabling farmers to cultivate more land efficiently and consistently.

In addition to land expansion, production volume across key agricultural commodities grew from 240,000 tons in 2019 to 288,000 tons in 2023—a 20% increase. This rise in yield could be attributed to the adoption of improved farming practices, greater use of technology, and possibly favorable weather conditions across the observed years. While increases in harvested area contribute to higher total output, rising yields per hectare suggest gains in efficiency and productivity. The combined effect strengthens the case for agriculture as a viable driver of economic acceleration underpinned by innovation.

The upward trend in both nominal and real output underscores agriculture’s capacity to remain a resilient sector even amidst national economic shifts. In many regions, agriculture is often portrayed as a subsistence activity with declining relevance; however, in Langkat’s context, it has functioned as a growth-oriented, investment-responsive sector. This is especially notable given broader macroeconomic disruptions over the period, including the COVID-19 pandemic, which strained multiple sectors. Agriculture’s growth despite these external shocks highlights its adaptive capacity and its embeddedness in local livelihoods and economic structures.

These performance indicators collectively affirm agriculture’s central role in Langkat’s development trajectory. The rising trends in output, harvested area, and production volume—alongside regional economic expansion—support the hypothesis that agriculture is not just structurally dominant, but dynamically productive. These findings justify deeper inquiry into the sector’s structural and causal roles in economic development, which are explored in the subsequent sections using Location Quotient analysis and econometric modeling.

**Table 1.** Annual Performance of Agricultural Sector and Its Contribution to GRDP in Langkat Regency (2019–2023)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **Agricultural Output (trillion IDR)** | **Harvested Area (ha)** | **Production Volume (tons)** | **GRDP (trillion IDR)** | **Location Quotient (LQ)** |
| 2019 | 12.1 | 82,000 | 240,000 | 28.0 | 1.70 |
| 2020 | 12.5 | 83,500 | 250,000 | 29.4 | 1.72 |
| 2021 | 13.2 | 85,000 | 265,000 | 31.2 | 1.75 |
| 2022 | 14.0 | 87,000 | 275,000 | 33.1 | 1.76 |
| 2023 | 15.1 | 89,000 | 288,000 | 36.5 | 1.78 |

**3.2 Structural Dominance of Agriculture: LQ Analysis**

The Location Quotient (LQ) is a comparative statistical measure used to assess the relative specialization of an economic sector within a specific region, compared to a broader benchmark, typically the province or nation. In this study, LQ was applied to determine whether the agricultural sector in Langkat Regency holds a structurally dominant position relative to North Sumatra Province. The results are compelling: LQ values for agriculture consistently exceeded 1.70 over the 2019–2023 period, with a gradual increase from 1.70 in 2019 to 1.78 in 2023. These figures unequivocally designate agriculture as a **base sector**, implying that Langkat has a greater reliance on agriculture than the provincial average.

The steady increase in LQ values over time indicates not only sustained sectoral dominance but also an intensifying specialization in agriculture. In other words, Langkat's economic identity is becoming more concentrated around agricultural activities, a pattern that aligns with localized development theories emphasizing endogenous growth through sectoral strengths. This concentration also reflects spatial economic differentiation within North Sumatra, where some regions may be pivoting toward manufacturing or services, while Langkat remains anchored in agriculture—potentially leveraging comparative advantages such as land availability, labor intensity, and agro-climatic suitability.

These findings reinforce classical economic base theory, which asserts that base sectors are essential for generating external income and sustaining local economic activity. In this context, agriculture functions as both an income-generating and employment-intensive sector. Its role is not residual, but proactive—acting as a foundational platform upon which the rest of the local economy is built. From a policy standpoint, this justifies a focus on agricultural upgrading and value-chain development, since enhancing a base sector tends to have strong multiplier effects on ancillary services and industries.

Moreover, the LQ results have implications for the spatial planning and fiscal prioritization strategies of the regional government. A high and rising LQ calls for alignment between public investment and sectoral strengths. This includes channeling resources into agricultural infrastructure, such as irrigation networks, rural roads, and cold storage systems. It also warrants investment in research and extension services to sustain the sector's competitive edge. Langkat’s specialization, if strategically supported, could evolve into a more diversified agri-industrial cluster that generates higher value-added and employment.

Beyond economic implications, the structural importance of agriculture in Langkat may also influence social and environmental policy directions. Regions with dominant agricultural sectors often face unique challenges, including land pressure, labor intensity, and ecological sustainability. Policymakers must therefore consider integrated approaches that balance growth with conservation, and economic efficiency with social inclusion. This could involve zoning regulations, incentives for sustainable farming, and community-based resource management systems.

In conclusion, the LQ analysis confirms that agriculture is not only quantitatively significant but also structurally embedded in Langkat’s economic framework. Its designation as a base sector reinforces its policy centrality and strategic value. Importantly, the rising LQ values suggest that this dominance is not static but evolving, likely driven by market linkages, technological uptake, and demographic alignment. These structural insights provide a foundation for the regression analysis in the next section, which quantifies the sector’s causal contribution to GRDP.

**3.3 Quantitative Contribution to GRDP: Regression Evidence**

Multiple linear regression analysis revealed a very strong statistical relationship between agricultural variables and GRDP, with an R² value of 0.978. This indicates that nearly 98% of the variation in Langkat’s GRDP is explained by agricultural output, harvested area, and crop production volume. The elasticity of agricultural output was highest (β = 1.832), suggesting that each additional trillion rupiah in output boosts GRDP by 1.832 trillion IDR. Harvested area and production volume also showed statistically significant contributions, confirming that both land utilization and yield gains are critical drivers of economic performance. No issues of multicollinearity or heteroscedasticity were found, affirming the model's reliability and predictive validity.

These findings highlight agriculture’s dual role as both a structural foundation and an active catalyst for regional growth. The results align with prior studies such as Rajagukguk (2021), who found agriculture pivotal in regional GRDP models, and Sofilda et al. (2023), who emphasized the growing importance of localized sectoral strength in the decentralization era. Furthermore, the evidence reflects strong forward and backward linkages between agriculture and other sectors, including transportation, agribusiness, and rural trade.

**3.4 Strategic Implications: Toward Sustainable and Inclusive Growth**

Despite agriculture’s robust contribution, over-reliance on the sector poses risks, especially in the face of climate variability, market shocks, and demographic shifts. This underscores the importance of diversification strategies within agriculture (e.g., high-value crops, agroforestry) and development of risk-resilient systems (e.g., crop insurance, irrigation, and weather-indexed advisories). Moreover, equity considerations remain central: policies must ensure that smallholder farmers, women, and marginalized rural groups benefit proportionally from agricultural expansion.

Langkat is also well-positioned to foster agro-industrialization, moving up the value chain through food processing, logistics, and agritech hubs. The high LQ and rising output volumes justify the development of agricultural clusters supported by local universities, extension services, and cooperatives. From a planning perspective, the empirical results support stronger integration of agriculture into spatial and infrastructure policy. Roads, storage, and irrigation investments should be prioritized to maximize economic multipliers. Lastly, future research should embed sustainability and inclusivity metrics—such as poverty rates, environmental degradation, and income distribution—to better capture agriculture’s multidimensional impact on development.

1. **Conclusion and Recommendations**

This study confirms the critical role of the agricultural sector in driving regional economic growth in Langkat Regency between 2019 and 2023. Through structural analysis using Location Quotient (LQ), agriculture was consistently identified as a base sector with increasing specialization over time. Complementary regression analysis demonstrated a strong and statistically significant relationship between agricultural variables—output, harvested area, and production volume—and the Gross Regional Domestic Product (GRDP). The sector’s economic multiplier effect, indicated by a coefficient of 1.832, affirms its dynamic contribution to regional development. These results reinforce the theoretical premise that in decentralized, agrarian regions, agriculture remains a central pillar of inclusive and sustainable economic advancement.

In light of these findings, it is recommended that regional development strategies prioritize the modernization and diversification of agriculture. This includes improving rural infrastructure, enhancing access to credit and technology, and fostering agro-industrial linkages to increase value-added retention. To address climate variability and market shocks, policy instruments such as weather-indexed crop insurance, community-based early warning systems, and expanded rural irrigation schemes are recommended. Inclusion of smallholder farmers and marginalized groups can be enhanced through farmer cooperatives, targeted subsidy programs, and capacity-building initiatives for women and youth in agribusiness

Policymakers should also integrate risk mitigation strategies to address climate variability and price shocks. Furthermore, the inclusion of smallholder farmers and marginalized rural populations must be emphasized to ensure equitable benefit distribution. Finally, future research should explore environmental and social metrics alongside GRDP to create a multidimensional framework for sustainable agricultural development in similar sub-national contexts.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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