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Analysis of Leading Sectors Supporting Agriculture through the LQ and Shift Share Approaches in Sumatera

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ABSTRACT

This study analyzes the economic impact of agriculture on Sumatra's regional growth from 2018 to 2022, employing quantitative descriptive methods and data from the Provincial Central Statistics Agency (BPS). By utilizing Location Quotient (LQ), Dynamic Location Quotient (DLQ), and Shift Share (SS) analyses, the research identifies key agricultural sectors contributing to economic development. Results reveal that plantation crops, forestry, fisheries, and agricultural services are significant contributors, with Riau Province showing the highest relative contribution. Cluster analysis categorizes sectors into four groups, with plantation crops and agricultural services in the second cluster. Sumatera Utara and Riau demonstrate stable economic growth. The study suggests enhancing productivity, expanding export markets, and improving infrastructure and innovation for less significant sectors. Future research should explore non-basis sectors and successful case studies to provide deeper insights into sectoral performance and economic impact.

Keywords
Agricultural Sector, Economic Growth, Location Quotient (LQ), Dynamic Location Quotient (DLQ), Shift Share (SS)

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INTRODUCTION

Indonesia's agrarian status underscores its economy's and development's reliance on the agricultural sector, facilitated by its geographical positioning. The agricultural sector encompasses diverse subsectors including food crops, fisheries, agriculture, horticulture, hunting and agrarian activities, forestry, plantations, and livestock (Emalia, 2018). This sector plays a crucial role in Indonesia's economy by ensuring food security, creating business opportunities, generating employment, and providing income for both individuals and the nation. Given the dependency of almost the entire Indonesian population on agriculture, this sector remains integral to economic growth and development (Rosmika, 2020). Economic growth is defined as the sustained increase in per capita income within a nation, alongside enhanced

regulatory and organizational structures. Economic development involves advancing a country's or region's GDP above the population growth rate and evolving institutions to elevate per capita income (Wijaya & Marseto, 2022).

Economic progress is assessed through absolute economic growth and overall growth by considering the regional GDP (Gross Domestic Product) as a measure of sectoral growth rates. If sectors grow slowly, they may hinder overall economic growth, while sectors with significant growth can boost economic performance. Evaluating contributions to GDP helps indicate a region's productive capacity (Emalia, 2018). Regional economic development entails creating new institutions, expanding additional sectors, enhancing existing workforce skills, discovering new markets, and increasing knowledge. Government involvement is crucial for mitigating adverse market mechanisms and promoting balanced growth across sectors, addressing socio-economic disparities across regions (Rosyidah, 2022).

Economic growth refers to advancements in production and overall prosperity through increased individual productivity and industrial sector expansion, which propels national economic development (Wijaya & Marseto, 2022). Growth is typically measured as the change in GDP at constant prices over time. GDP serves as a key instrument for evaluating regional economic progress, with growth measured in both current and constant prices (Sukirno, 2016). Three primary factors influencing economic development are capital accumulation, population growth, and technological progress.

Economic development assessments often focus on growth rates, particularly in developing countries like Indonesia. Achieving consistent high-level economic development poses significant challenges, especially when no single macroeconomic factor can address all issues effectively (Manaraja et al., 2023). GDP is crucial for identifying sectoral growth rates and assessing which sectors impact overall economic growth. Statistics on GDP, using both current and constant prices, are essential for evaluating a region's economic state (Afriani & Irfan, 2023). GDP reflects the total market value of all final goods and services produced within a specific area. The magnitude of GDP depends on a region's ability to manage its resources (Damanik & Sidauruk, 2020).

Economic and developmental progress must begin at the grassroots level in each region. Local governments should identify regional products that can compete effectively in local, national, and international markets. The economic structure theory divides sectors into basic and non-basic, where basic sectors focus on exports, while non-basic sectors cater to local needs. Prominent industries meet market demands locally and internationally (Sulistyowati et al., 2022).

Agriculture plays a pivotal role in Indonesia's economy due to its abundant natural resources and the significant proportion of the population engaged in farming (Asyafina & Muljaningsih, 2022). The sector is a key driver of economic growth. Regional economic development requires strategies aligned with each region's unique characteristics and resource potentials (Afriani & Irfan, 2023).

Despite the pandemic's adverse effects, agriculture remains a critical sector for job creation and economic contribution in Sumatra. Data shows that from 2018 to 2022, the agricultural sector's GDP contribution in Sumatra has generally increased. Analyzing sectoral performance through tools like LQ (Location Quotient) and Shift Share helps in identifying key sectors supporting agriculture and devising strategies for enhancing economic growth in Sumatra (Yulianta et al., 2023). This research aims to analyze the changes in economic structure and PDRB percentages in Sumatra from 2018 to 2022, identify superior supporting sectors for agriculture using LQ, DLQ, and Shift Share approaches, and evaluate their relative contributions to regional economic growth. It seeks to understand how structural transformation patterns and economic strategies reflect in sectoral contribution shifts and classify these supporting sectors based on Shift Share growth rates, relative contributions, and cluster typologies. The significance of this study lies in its provision of practical insights for researchers on the impact of agriculture on Sumatra's economic status and its contribution to academic literature, offering valuable data and perspectives for future research.

Economic Growth

Adam Smith, in "An Inquiry into the Nature and Causes of the Wealth of Nations," defines economic growth as an increase in population, which subsequently enhances economic development and expansion. He posits that economic advancement occurs when rising population numbers broaden the market and drive specialization. Sukirno (2016) extends this definition, suggesting that economic growth reflects increased economic activity leading to more commodities and services, thereby improving societal welfare. Economic growth, viewed as a macroeconomic issue over time, involves measuring GDP or regional GDP (PDRB) growth rates to assess development progress (Sholihah et al., 2017; Amir, 2013). Key factors influencing growth include land and resource utilization, labor quality, capital and technology, social programs, and market scale (Sukirno, 2016). Accurate measurement of economic progress is essential for evaluating development and designing growth strategies (Arsyad, 2016).

Gross Regional Domestic Product

Sukirni (2016) defines Gross Regional Domestic Product (PDRB) as the total value added from various economic activities within a region, regardless of ownership. It reflects regional economic growth and development success (Sukirni, 2016). PDRB encompasses the market value of all final goods and services produced in a region, with variations based on resource management (Damanik & Sidauruk, 2020). Calculations include nominal and real PDRB, with real PDRB adjusting for price changes (Widodo & Ratna, 2019). Structural transformation involves fundamental economic shifts toward modernization and technological adaptation, aimed at optimizing sectoral contributions to economic growth (Arsyad, 2016). Contribution margin measures each sector's economic impact, aiding in strategic planning (Arsyad, 2016).

LQ Theory

Location Quotient (LQ) is a technique used to identify base sectors in a region by comparing the concentration of sectoral employment within the region to a larger reference area. It assesses which sectors are more prevalent or underrepresented relative to a broader economic context, assuming similar labor productivity and product types across regions (Arsyad, 2016). The LQ formula is:

$$LQ = \frac{(Vik/Vk)}{(Vip/Vp)}$$

Dynamic Location Quotient (DLQ) extends LQ by incorporating temporal changes in sectoral production. DLQ reflects the growth of specific sectors over time and their future economic potential, offering insights into sectors that could underpin future economic development. The DLQ formula according to (Pribadi & Nurbiyanto, 2021) is:

$$DLQ = \frac{(1 + gij)/(1 + gj)}{(1 + gip)/(1 + gp)}$$

Where gij and gip represent growth rates for the sector and reference region, respectively (Pribadi & Nurbiyanto, 2021).

Shift Share Theory

Shift share analysis is a method used to assess regional economic performance by examining changes in economic indicators over time. It evaluates sectoral performance relative to national or regional economies, identifying key sectors and structural changes. Three key indicators are: absolute shift (Dij), differential shift (Cij), and proportional shift (Mij), which reflect sectoral growth, competitive ability, and rapid expansion, respectively (Ambya et al., 2022; Pribadi & Nurbiyanto, 2021).

Economic Sector Theory

The economic sector theory posits that increasing basic economic activities in a region enhances income by boosting demand for goods and services, fostering non-basic economic activities through a multiplier effect. Conversely, a decrease in basic activities reduces regional income and demand for non-basic goods (Banowati & Sriyanto, 2014). Identifying key sectors, or "sectors of excellence," is crucial for regional economic planning and is typically done using methods such as Location Quotient (LQ) and Shift Share (SS) (Widodo, 2017; Nadziroh, 2020).

Base Theory

Economic base theory posits that a region's economic development is largely driven by the growth of its export activities. Basic sectors, which provide goods and services for both local and external markets, are crucial for stimulating regional economic growth. In contrast, non-basic sectors primarily serve the local market. According to this theory, regions should focus on developing basic sectors to enhance economic growth (Tarigan, 2018). The theory highlights that regional economic expansion relies on external demand for products and services, with basic sectors acting as primary drivers of economic progress, while non-basic sectors benefit indirectly from the growth of basic sectors.

Agricultural Sector in the Economy

Kuznets (2014) identifies agriculture as a pivotal sector for national economic growth, particularly in developing countries, contributing through foreign exchange, production factors, markets, and products. Agriculture, both narrowly (crops) and broadly (including livestock and aquaculture), significantly impacts national economies by supporting GDP, job creation, and food security. It is a fundamental sector that underpins productive activities in other sectors (Banowati & Sriyanto, 2014; Banowati & Sriyanto, 2019; Isbah & Iyan, 2016; Nadziroh, 2020).

RESEARCH METHODE

Type of Research

This study employs a quantitative descriptive method, involving the use of numerical data processed through statistical analysis to derive conclusions (Hardani et al., 2020). Descriptive research details data through charts, graphs, and tables, describing findings to produce insights or conclusions about phenomena or events at the research site.

Research Object

The object of a study refers to the entity, event, or specific matter being examined by the subject. This research focuses on the reports concerning the agricultural sector and annual economic growth across all provinces on the island of Sumatra, including Kepulauan Riau, North Sumatra, West Sumatra, South Sumatra, Jambi, Aceh, Bengkulu, Riau, Lampung, and Bangka Belitung, as published and processed by the BPS Provinces.

Data and Data Sources

The data utilized in this research encompasses all provinces on the island of Sumatra, accessed through the Provincial Central Statistics Agency (BPS). This data is available for download from the official BPS website. Specifically, the study employs data on the Agricultural Sector and Economic Growth (GDP and GDP per capita) for Sumatra from 2018 to 2022.

Data Analysis Techniques

The research employs several analytical techniques to assess economic sectors in Sumatra, with a focus on agriculture and economic performance. The Location Quotient (LQ) method is used to identify key sectors by comparing the economic output of a sector in a specific region with that of a broader reference region. This technique helps pinpoint sectors with export potential; an LQ value greater than 1 indicates that a sector is a basis or key sector, suggesting potential for economic expansion and export growth. Conversely, an LQ value less than 1 signifies that the sector is non-basis, meaning it does not significantly contribute to regional economic output (Arsyad, 2016).

Additionally, the Dynamic Location Quotient (DLQ) is utilized to evaluate future sectoral performance by integrating growth rate data. This method combines the LQ with growth rates to forecast potential sectoral growth. A DLQ value greater than 1 suggests that the sector is likely to experience future growth, while a value less than 1 implies limited growth prospects (Pribadi & Nurbiyanto, 2021). The Shift Share (SS) analysis complements these methods by examining regional economic performance and sectoral transformation. It breaks down economic growth into three components: Regional Share (RS), Proporsional Shift (PS), and Differential Shift (DS). RS measures the impact of external factors on regional growth, PS evaluates sector-specific growth relative to the overall regional economy, and DS identifies competitive advantages or disadvantages within the region (Badan Pusat Statistik, 2017). By analyzing these components, Shift Share provides a comprehensive view of local economic performance relative to broader trends and highlights potential for sectoral development.

RESULT AND DISCUSSION

Changes in Economic Structure in Sumatra Island 2018-2022

From 2018 to 2022, Sumatra exhibited varied economic trends across its provinces, as revealed through shift-share analysis. The analysis showed that national policies had a consistent regional share value (RSij) of 0.8 across all provinces, indicating that national economic growth positively impacted sectors like agriculture, forestry, and fisheries. However, the growth rates and competitive abilities of specific sectors varied significantly. In Aceh and North Sumatra, hunting, livestock, agriculture, and forestry experienced slow growth with negative proportional shift values (PSij), while the fisheries sector grew rapidly. West Sumatra mirrored this trend, with positive PSij for fisheries and competitive strengths in agriculture and fisheries, although forestry lagged.

Riau and Jambi also had a regional share value of 0.8, with rapid growth in the fisheries sector (PSij of 0.05) and slower growth in agriculture and forestry. Differential shift values (DSij) revealed competitive strengths in hunting, livestock, agriculture, and timber in Riau, while Jambi's agriculture and forestry sectors showed competitive capabilities, despite challenges in fisheries. In Lampung, Bangka Belitung, and the Riau Archipelago, the regional share value of 0.8 reflected positive national impacts, with the fisheries sector generally experiencing rapid growth. Agriculture and fisheries maintained competitive abilities, though forestry faced competitiveness challenges. Overall, the analysis from 2018 to 2022 highlights diverse growth patterns and sectoral competitiveness across Sumatra. Agriculture and fisheries showed significant growth, while forestry struggled, with the COVID-19 pandemic contributing to annual growth rate fluctuations.

Leading Sectors Supporting the Agricultural Sector in Sumatra Island 2018-2022

From 2018 to 2022, Sumatra's provinces display varied economic sector strengths. Aceh shows high Location Quotient (LQ) values for agriculture and related services, but not for forestry or fisheries. Dynamic Location Quotient (DLQ) analysis indicates strong growth across all sectors. In North Sumatra, agriculture is core, with rapid growth observed in all sectors. West Sumatra highlights agriculture and forestry as core sectors, with promising DLQ values. Riau's forestry stands out with high LQ, and fisheries show growth potential.

The Riau Archipelago emphasizes fisheries as core, while Jambi, Bengkulu, South Sumatra, and Lampung exhibit strong growth in agriculture and fisheries, with variable forestry contributions..

International Journal of Education, Social Studies, And Management (IJESSM)
Volume 4, Issue 3, October 2024
Page 932-949

Table 1.
Growth of the Agricultural Support Sector of Sumatra Island
Based on Shift-Share

No	Field of Business	Average Growth Rate of the Agricultural Sector in Provinces in Sumatra Island 2018-2022										
1	Agriculture, Forestry, & Fisheries	**Aceh**	**Bngkl**	**Jmbi**	**Babel**	**Kep. Riau**	**Lpg**	**Riau**	**Sumbar**	**Smsel**	**Sumut**	**Average Economic Growth of Sumatra Island**
	Agriculture, Livestock, Hunting & Services	0,1	0,11	0,15	0,12	0,08	0,06	0,18	0,09	0,13	0,2	0,122
	Agriculture	-0,18	0,04	-0,23	0,19	-0,43	0,03	-0,08	-0,06	0,02	0,03	-0,067
	a. Food Crops	0,27	0,11	0,12	0,1	0,16	-0,09	0,13	0,23	0,25	0,1	0,138
	b. Horticultural Crops	0,19	0,18	0,2	0,12	-0,06	0,04	0,2	0,12	0,15	0,28	0,142
	c. Plantation Crops	0,15	0,15	0,12	0,14	0,33	0,22	0,14	0,26	0,16	0,1	0,177
	d. Livestock	0,13	0,13	0,17	0,15	-0,19	0,09	0,14	0,1	-0,05	0,13	0,08
2	e. Agricultural Services and	-0,21	-0,06	0,01	-0,18	-0,18	-0,81	0,14	-0,12	0,11	0,01	-0,129
3	Hunting	0,19	0,15	0,11	0,17	-0,11	0	0,04	0,22	0,12	-0,08	0,081

Leading Sectors Supporting the Agricultural Sector in Sumatra Island Based on LQ

Based on Location Quotient (LQ) analysis from 2018 to 2022, Sumatra's agricultural sector shows varying strengths across its provinces. In Aceh and North Sumatra, agriculture is a core sector with an LQ of 1.02 and 1.15, respectively, indicating strong specialization. However, forestry and fisheries in these provinces are not core sectors. In West Sumatra, agriculture and forestry are significant, though fisheries are not. Riau and Jambi also have agriculture and forestry as core sectors, while fisheries show mixed results. In Lampung and the Riau Archipelago, fisheries are a core sector, supporting agriculture. Bengkulu's agriculture is not core, but fisheries are. Overall, agriculture's average LQ of 0.96 suggests it is not a core sector in Sumatra. Despite this, agriculture remains crucial for regional economies, impacting food security, employment, and economic development (Himran & Buhang, 2023; Dewi et al., 2022). Dynamic Location Quotient (DLQ) analysis reveals that all agricultural sub-sectors show potential for growth across Sumatra, with DLQ values

consistently above 1, indicating promising development in agriculture, forestry, and fisheries.

Table 2.
Leading Sectors Supporting the Agricultural Sector on Sumatra Island Based on LQ

Field of Business	Average LQ of the Agricultural Sector of Provinces in Sumatra Island 2018-2022										Average LQ of Sum Island.	Note
Agriculture, Forestry,	Aceh	Bngkl	Jambi	Babel	Kep. Riau	Lampung	Riau	Sumbar	Sumsel	Sumut		
& Fisheries	1,02	0,96	1,16	0,83	0,51	1,02	0,99	1,02	0,94	1,15	0,960	NON BASIS
Agriculture, Livestock,	0,7	1,16	0,27	0,12	0,01	1,35	0,12	1,05	0,67	0,57	0,602	NON BASIS
Hunting & Agricultural Services	1,25	1,12	0,97	0,86	0,4	0,48	0,18	1,36	0,58	0,81	0,801	NON BASIS
a. Food Crops	1,06	0,6	2,38	1,61	0,72	0,82	2,42	1,05	1,37	2,05	1,408	BASIS
b. Horticultural	1,18	1,18	0,36	0,45	1,1	1,28	0,21	0,56	0,77	0,65	0,774	NON BASIS
Crops	2,56	1,48	0,61	0,78	0,47	1,49	0,56	1,41	1,15	0,47	1,098	BASIS
c. Plantation Crops	0,97	0,44	1	0,35	0,08	0,16	3,29	1,16	2,32	0,71	1,048	BASIS
d. Livestock	0,92	1,3	0,4	1,87	3,33	1,11	0,5	0,86	0,94	0,42	1,165	BASIS

Potential Supporting Sectors of the Agricultural Sector in Sumatra Island Based on DLQ

The focus of regional development in Sumatra aims for significant economic growth to enhance community welfare sustainably. The Dynamic Location Quotient (DLQ) analysis indicates that sectors like agriculture, forestry, and fisheries, despite varying core status across provinces, hold substantial potential for economic advancement. All sectors, including non-core ones, show promising growth. Research by Renatha (2022) confirms that these sectors significantly impact Gross Regional Domestic Product (GRDP) formation. Effective national planning, including strategic investment allocation and consideration of regional needs, is crucial for maximizing their contributions to the national economy (Himran & Buhang, 2023).

International Journal of Education, Social Studies, And Management (IJESSM)
Volume 4, Issue 3, October 2024
Page 932-949

Table 3.
Potential of Supporting Sectors of the Agricultural Sector on Sumatra Island Based on DLQ

No	Field of Business	Average DLQ of the Agricultural Sector of Provinces in Sumatra Island 2018-2022										Average DLQ of Sumatra Island	Information
	Agriculture, Forestry, &	Aceh	Bengkulu	Jambi	Babel	Kep.Riau	Lampung	Riau	Sumbar	Sumsel	Sumut		
1	Fisheries	1	1,001	1,001	1,005	1,003	1,001	1	1	1,001	1	1,001	POTENTIAL
	Agriculture, Livestock,	1,007	1,001	1,012	1,034	1,035	1,003	1,007	1,004	1	1,002	1,0105	POTENTIAL
	Hunting & Agricultural Services	1,003	1,002	1,002	1,016	1,009	1,013	1,002	1,002	1,001	1,005	1,0055	POTENTIAL
	a. Food Crops	1	1,003	1,003	1,005	1,006	1,003	1,001	1,005	1,005	1,002	1,0033	POTENTIAL
	b. Horticultural Crops	1	1,002	1,002	1,004	1,002	1	1,001	1,001	1	1	1,0012	POTENTIAL
	c. Plantation Crops	1,001	1	1,001	1,004	1,005	1,001	1,001	1,001	1,005	1	1,0019	POTENTIAL
2	d. Livestock	1,007	1,004	1,003	1,009	1,052	1,215	1,002	1,005	1	1,003	1,03	POTENTIAL
3	e. Agricultural Services and	1,01	1,001	1,002	1,006	1,015	1,002	1,003	1,005	1	1,007	1,0051	POTENTIAL

Total Shift Share, DLQ, LQ of Supporting Sectors of Agriculture in Sumatra

The table summarizing the Shift Share, LQ, and DLQ analyses identifies key sectors supporting agriculture across Sumatra. Aceh excels in agricultural services and hunting, while Bengkulu and Lampung also show strengths in this area. Jambi and Sumatera Utara lead in plantation crops, with Riau dominating forestry and logging. Kepulauan Bangka Belitung and Kepulauan Riau stand out in fisheries, with Riau showing greater dominance. Sumatera Barat leads in horticulture, and Sumatera Selatan in forestry. The overall table highlights diverse regional specializations and contributions to agriculture, aiding in strategic economic development planning.

Table 4.
Total Shift Share, DLQ, LQ of Agricultural Support Sectors in Sumatra

No	Field of Business	Aceh	Bengkulu	Jambi	Babel	Kep.Riau	Lampung	Riau	Sumbar	Sumsel	Sumut
1	Agriculture, Livestock, Hunting & Agricultural Services	2,120	2,071	2,311	1,955	1,593	2,081	2,170	2,110	2,071	2,350
	a. Food Crops	1,527	2,201	1,052	1,344	0,615	2,383	1,047	1,994	1,690	1,602
	b. Horticultural Crops	2,523	2,232	2,092	1,976	1,569	1,403	1,312	**2,592**	1,831	1,915
	c. Plantation Crops	2,250	1,783	**3,583**	2,735	1,666	1,863	3,621	2,175	2,525	**3,332**
	d. Livestock	2,330	2,332	1,482	1,594	2,432	2,500	1,351	1,821	1,930	1,750
	e. Agricultural Services and hunting	**3,691**	**2,610**	1,781	1,934	1,285	**2,581**	1,701	2,511	2,105	1,600
2	Forestry & Logging wood	1,767	1,384	2,013	1,179	0,952	0,565	**4,432**	2,045	**3,430**	1,723
3	Fisheries	2,120	2,451	1,512	**3,046**	**4,235**	1,882	1,543	2,085	2,060	1,347

Relative Contribution of Supporting Sectors of Agriculture in Sumatra Province

Sumatra's agricultural sector is vital to the region's economy, with significant contributions from various supporting sectors. High relative contributions are seen in Riau and Lampung for agriculture, livestock, and agricultural services, highlighting their economic importance. Conversely, Kepulauan Riau and Bangka Belitung show lower contributions, indicating these sectors are less central to their economies. Riau and Lampung excel in crops and livestock, while Sumatera Barat leads in horticulture and plantations. The forestry and fishing sectors exhibit varied contributions, with Riau and Lampung showing dominance.

Table 5.
Relative Contribution of Agricultural Support Sectors (%)

Relative Contribution of Agricultural Support Sectors (%)											
Sector	**Province**										**AVG**
	Aceh	Bengkulu	Jambi	Babel	Kep.Riau	Lampung	Riau	Sumbar	Sumsel	Sumut	
Agriculture, Livestock, Hunting & Agricultural Services	5,47%	1,78%	6609,21%	1,24%	0,40%	10001,73%	19164,15%	5618,44%	7,23%	22,80%	**4143,25%**
a. Food Crops	3,73%	2,15%	1562,63%	0,18%	0,01%	13207,14%	2344,43%	5757,43%	5,18%	11,23%	**2289,41%**
b. Horticultural Crops	6,74%	2,08%	5512,74%	1,27%	0,32%	4715,96%	3532,85%	7453,49%	4,47%	16,07%	**2124,60%**
c. Plantation Crops	5,66%	1,12%	13556,94%	2,40%	0,57%	8004,95%	46871,88%	5757,73%	10,58%	40,53%	**7425,24%**
d. Livestock	6,33%	2,19%	2032,93%	0,66%	0,87%	12500,44%	4125,17%	3084,49%	5,95%	12,78%	**2177,18%**
e. Agricultural Services and Hunting	13,74%	2,76%	3464,07%	1,17%	0,38%	14587,42%	10795,47%	7754,42%	8,81%	9,23%	**3663,75%**
	5,18%	0,81%	5704,45%	0,52%	0,06%	1603,46%	63811,37%	6384,94%	17,86%	14,05%	**7754,27%**
Forestry & Logging	4,94%	2,42%	2295,89%	2,78%	2,64%	10808,87%	9567,86%	4735,75%	7,23%	8,16%	**2743,66%**
Timber	**51,80%**	**15,32%**	**40738,87%**	**10,21%**	**5,25%**	**75429,97%**	**160213,18%**	**46546,70%**	**67,32%**	**134,85%**	**32321,35%**

Typology of Supporting Sector Clusters of Agriculture in Sumatra

The Typology Klassen analysis categorizes Sumatra's agricultural support sectors into four clusters based on growth and relative contribution. Using this method, sectors are classified as follows: Klaster K2 (Advanced and Growing Rapidly) includes plantation crops, agricultural services, and fisheries. Klaster K3 (Potential) includes horticulture and livestock, indicating potential for

further development. Klaster K4 (Relatively Backward) comprises food crops and forestry. No sector falls into Klaster K1 (Advanced but Stagnant). This classification helps identify strategic development needs, with advanced sectors showing high growth, potential sectors demonstrating strong development capacity, and lagging sectors needing targeted support.

Table 6.
Typology of Sumatra Agricultural Support Sector Clusters

Sector	Growth Rate Based on Shift Share (Gi)	Relative Contribution (Si)	Average Growth Rate Based on Shift Share (G)	Average Contribution (S)	Category Class Typology
Food Crops	-0,067	22,8941	0,0603	40,2544	K4: Relatively Underdeveloped Sector
Horticultural Crops	0,138	21,246	0,0603	40,2544	K3: Potential Sector
Plantation Crops	0,142	74,2524	0,0603	40,2544	K2: Advanced and Rapidly Growing Sector
Livestock	0,177	21,7718	0,0603	40,2544	K3: Potential Sector
Agricultural and Hunting Services	0,080	36,6375	0,0603	40,2544	K2: Advanced and Rapidly Growing Sector
Forestry and Logging	-0,129	77,5427	0,0603	40,2544	K4: Relatively Underdeveloped Sector
Fisheries	0,081	27,4366	0,0603	40,2544	K2: Advanced and Rapidly Growing Sector

Relative Contribution Ranking Matrix of Supporting Sectors of Agriculture Based on Province

The matrix of relative contribution rankings for agricultural support sectors in Sumatra reveals significant variations across provinces. Riau ranks highest with a total contribution of 160,213.18%, dominated by forestry and logging with a score of 4.432. Lampung follows with 75,429.97%, with agricultural services and hunting leading at 2.581. West Sumatra, in third place with 46,546.70%, excels in horticulture with a score of 2.592. Jambi ranks fourth at 40,738.87%, with plantation crops scoring 3.583. North Sumatra, with a contribution of 134.85%, and South Sumatra at 67.32% are categorized as medium contributors, with plantation crops and forestry as key sectors respectively. Aceh (51.80%) is also medium-ranked, excelling in agricultural services. Bengkulu and Bangka Belitung, with contributions of 15.32% and 10.21%, show lower contributions, with key sectors being agricultural services

and fisheries. Kepulauan Riau, at the lowest rank with 5.25%, excels in fisheries. This matrix aids in identifying regional development strategies and sectoral focus areas.

Table 7.
Relative Contribution Ranking Matrix of Agricultural Support Sectors Based on Province

Rank	Province	Total Relative Contribution (%) All Sectors Agricultural Support	Leading Sectors Based on SS, LQ, DLQ	
1	Riau	**160213,18%**	Forestry & Logging	4,432
2	Lampung	**75429,97%**	Agricultural & Hunting Services	2,581
3	Sumbar	**46546,70%**	Horticultural Crops	2,592
4	Jambi	**40738,87%**	Plantation Crops	3,583
5	Sumut	**134,85%**	Plantation Crops	3,332
6	Sumsel	**67,32%**	Forestry & Logging	4,432
7	Aceh	**51,80%**	Agricultural & Hunting Services	3,691
8	Bengkulu	**15,32%**	Agricultural & Hunting Services	2,610
9	Babel	**10,21%**	Fisheries	3,046
10	Kep.Riau	**5,25%**	Fisheries	4,235

Basic Sector Matrix in Sumatra: Evaluation Based on LQ, Shift-Share, and DLQ

The matrix evaluates key agricultural support sectors in Sumatra based on their average Shift-Share, LQ, and DLQ values. Plantation Crops leads with an average total of 11,463, LQ of 1.408, Shift-Share of 0.142, and DLQ of 10.055, marking it as a basis potential sector, dominant in Riau. Forestry and Logging ranks second with an average total of 11,348, LQ of 1.048, Shift-Share of 0.129, and DLQ of 10.300, also a basis potential sector in Riau. Fisheries is third with an average total of 11,216, LQ of 1.165, Shift-Share of 0.081, and DLQ of 10.051, prominent in Kepulauan Riau. Agricultural Services and Hunting holds fourth with an average total of 11,117, LQ of 1.098, Shift-Share of 0.080, and DLQ of 10.019, primarily in Aceh. Food Crops, Horticulture, and Livestock are non-basis potential sectors with varying contributions, needing strategic enhancements to boost their economic impact.

Table 8.
Leading Sector Ranking Matrix Based on Average Shift-Share, LQ, and DLQ

Rank	Leading Sectors of Sumatra Plantation Crops Forestry and Logging	Shift-Share Avg	LQ Avg	DLQ Avg	Total Avg	Notes	Leading Sector Province	
		Sumatera	Sumatera	Sumatera	SS, LQ, DLQ Sumatera		Berdasar SS, LQ DLQ	
1	Plantation Crops	0.142	1.408	10.055	**11463**	BASIS	Riau	3,621
2	Forestry and	0.129	1.048	10.300	**11348**	POTEN	Riau	4,432

	Logging					TIAL		
3	Fisheries	0.081	1.165	10.051	**11216**	BASIS	Kep. Riau	4,235
4	Agricultural Services and Hunting	0.080	1.098	10.019	**11117**	POTEN TIAL	Aceh	3,691
5	Food Crops	0.067	0.602	10.105	**10105**	BASIS	Lampu ng	2,383
6	Horticultural Crops	0.138	0.801	10.055	**10055**	POTEN TIAL	Sumba r	2,592
7	Livestock	0.177	0.774	10.012	**10012**	BASIS	Lampu ng	2,500

Strategy to Support Structural Transformation of Leading Sectors in Sumatra

Structural transformation in Sumatra aims to shift the economy from traditional, low-value sectors to those with higher productivity and sustainability. For the plantation sector, strategies include modernizing technology, such as smart irrigation systems and automation, and diversifying products to enhance value. The forestry and logging sector will focus on sustainable forest management and diversifying non-timber products. The fisheries sector will transition to sustainable aquaculture and advanced processing technologies. For agricultural and hunting services, modernizing services and resource management are key. The food crops sector will benefit from innovations in crop varieties and infrastructure improvements. In horticulture, modern cultivation techniques like hydroponics and innovative marketing will be introduced. The livestock sector will use modern technology, animal health practices, and product diversification. These strategies aim to boost efficiency, sustainability, and economic competitiveness in Sumatra.

CONCLUSION

The analysis highlights key findings. Notably, plantation crops, forestry and timber harvesting, fisheries, and agricultural services are identified as major contributors to agriculture in Sumatra. In contrast, food crops, horticulture, and livestock are considered less significant. Riau Province leads with the highest relative contribution of 160,213.18%, indicating its strong agricultural role. Within Riau, forestry and timber harvesting are the most dominant sectors. Cluster analysis shows that no sectors fall into the category of advanced but pressured. Instead, plantation crops, agricultural services, and fisheries are in the second cluster, horticulture and livestock in the third, and food crops and forestry in the fourth. Sumatera Utara has stable economic growth with an average PDRB growth rate of 4.028% and a total growth of 16.114%, followed by Riau with 3.820% and 15.282%, respectively. Plantation

crops in Sumatra, especially in Riau, show a strong competitive advantage with high LQ and DLQ values, indicating their significant impact on the regional economy. Enhancing productivity and expanding export markets could further boost this sector's economic contribution. For the government, it is essential to strengthen leading sectors by focusing on technology, product diversification, and sustainability. Support for less significant sectors should include improving innovation, infrastructure, and policies. Expanding training for farmers and investing in research and policy evaluation is also recommended. Future research should explore non-basis sectors to identify challenges and opportunities and conduct case studies on successful provinces and long-term sector performance.

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