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Determination of Leading Commodity for Food Security in the PEKANSIKAWAN Metropolitan Area

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Abstract: Food security is a critical aspect of regional development, particularly in metropolitan areas that function as centers of consumption, production, and distribution. This study aims to identify leading food commodities in the PEKANSIKAWAN Metropolitan Area of Riau Province, which includes Pekanbaru City, Kampar Regency, Siak Regency, and Pelalawan Regency, and to provide recommendations for strengthening regional food security. The research employed Location Quotient (LQ) and Shift Share Analysis (SSA) to examine comparative and competitive advantages across the four regions. The analysis identified four key commodities: poultry meat in Pekanbaru City, aquaculture fish in Kampar Regency, rice and onions in Siak Regency, and agroindustry-based rice and fish in Pelalawan Regency. These commodities form a complementary system that enhances interregional synergy and food supply resilience. The findings indicate that optimizing interregional linkages through collaborative investment, integrated supply chains, and food system clusters is essential to address both production disparities and consumption needs. The conclusion emphasizes that the metropolitan scale provides unique opportunities to combine local strengths into a coherent regional food system, which can better support the availability, accessibility, and stability of food. Policy implications highlight the need for strategic investment in irrigation, cold chain logistics, and digital market platforms, alongside institutional strengthening through farmer cooperatives, financial access, and capacity building. The study contributes scientifically by integrating territorial analysis with quantitative methods in a metropolitan context, offering both theoretical enrichment for food security literature and practical guidance for regional policymakers.

Keywords: Interregional Linkages; Location Quotient; Metropolitan Food Security; Policy Recommendation; Shift Share Analysis; Spatial Synergy.

1. Introduction

Food security is a strategic issue in both national and regional development as it is directly related to the welfare of society (Andrianti et al., 2024). Food security encompasses not only food availability but also supply stability, accessibility, nutritional quality, and the sustainability of production systems (Nguyen, 2018; Vågsholm et al., 2020). Global challenges such as population growth, climate change, agricultural land degradation, and international market dynamics further emphasize the need for adaptive and resilient food systems (Khalfaoui et al., 2024; Seppelt et al., 2022). Therefore, strengthening food security must be positioned as a key agenda in integrated regional development (Noer, 2016).

In the context of regional autonomy, local governments have strategic authority and roles in designing policies based on regional potential (Rustiadi et al., 2009). One effective approach is the identification of regional superior commodities (commodities with high economic value, strong competitiveness, and significant potential for sustainable development at the regional level) (Diniaty et al., 2024). Determining superior commodities allows local governments to allocate resources more efficiently, develop robust supply chains, and enhance the bargaining power of farmers and local entrepreneurs within the national food system (Cvijanović et al., 2020).

However, most previous studies have largely focused on food availability or sectoral production analysis. These studies have not fully integrated a regional approach that emphasizes spatial linkages and inter-regional synergies (Rahayu et al., 2021; Rosyadi et al., 2021). In fact, a territory-based strategy is crucial for addressing disparities in food production and distribution. This is particularly relevant to the Food Security Index (FSI) data from 2018–2022 in the PEKANSIKAWAN Metropolitan Area, which consists of Pekanbaru City, Kampar Regency, Siak Regency, and Pelalawan Regency. Pekanbaru City recorded a relatively high FSI score of 81,15 in 2018, increasing to 90,56 in 2021, and slightly decreasing to 86,56 in 2022. In contrast, Kampar Regency had a low score of 56.28 in 2022, categorized as Priority 3 (moderately food insecure), while Siak Regency and Pelalawan Regency were in better categories, Priority 6 (highly food secure) and Priority 5 (food secure), respectively (Badan Pangan Nasional, 2022). These data indicate inter-regional disparities in food security that require deeper analysis.

The PEKANSIKAWAN Metropolitan Area occupies a strategic position in Riau Province, supported by high economic potential in the agriculture, fisheries, and livestock sectors. Nevertheless, the development of food security still faces several challenges, such as fragmented policies, disparities in distribution infrastructure, and low-value-added local food products (Lu & Carter, 2023). Therefore, an empirical study is needed to identify superior food commodities in each region as a basis for formulating more targeted food development policies.

Based on this context, this study focuses on a single primary objective: identifying superior food commodities in the PEKANSIKAWAN Metropolitan Area using the Location Quotient (LQ) and Shift-Share Analysis (SSA) methods. This approach is expected to provide a comprehensive overview of commodities with comparative and competitive advantages in each area while revealing disparities in regional food potential.

The significance of this study lies in two main aspects. First, academically, the study offers novelty by applying a territorial development approach in determining superior food commodities. This enriches the literature, which has primarily emphasized sectoral aspects, by adding spatial and regional dimensions (Rustiadi et

al., 2009). Second, practically, the study can serve as a reference for local governments in designing collaborative, adaptive, and locally based food development policies. Thus, food development strategies can be oriented not only toward economic growth but also toward equity, social justice, and environmental sustainability (Maluf et al., 2022; Miles & Hoy, 2023).

Moreover, this study is crucial in the context of decentralization policies. Local governments in PEKANSIKAWAN are expected to utilize superior commodity potential to strengthen regional food production bases while reducing dependency on external supplies. The identification of superior commodities can also support inter-regional program synchronization, such as irrigation infrastructure development, food distribution networks, and agro-industrial development based on local commodities (Enirawan et al., 2015; Zerbian & de Luis Romero, 2023).

Therefore, this study is expected to make a tangible contribution to advancing knowledge and to regional development practices. Theoretically, it reinforces the importance of integrating a territorial approach into food security strategies. Practically, it can provide a foundation for policy formulation that is more responsive to local needs, adaptive to global challenges, and oriented toward sustainability.

This study provides dual benefits. From a theoretical perspective, it expands scientific understanding of the application of a territorial approach in food security by integrating spatial and regional dimensions that have been underexplored in previous studies. From a practical and policy-oriented perspective, the study offers a solid foundation for strategic decision-making by local governments and stakeholders, enabling the development of a food system that is efficient, sustainable, and equitable in the PEKANSIKAWAN Metropolitan Area.

2. Methods

The location of the study is shown in Figure 1, which shows the coverage of the PEKANSIKAWAN metropolitan area.

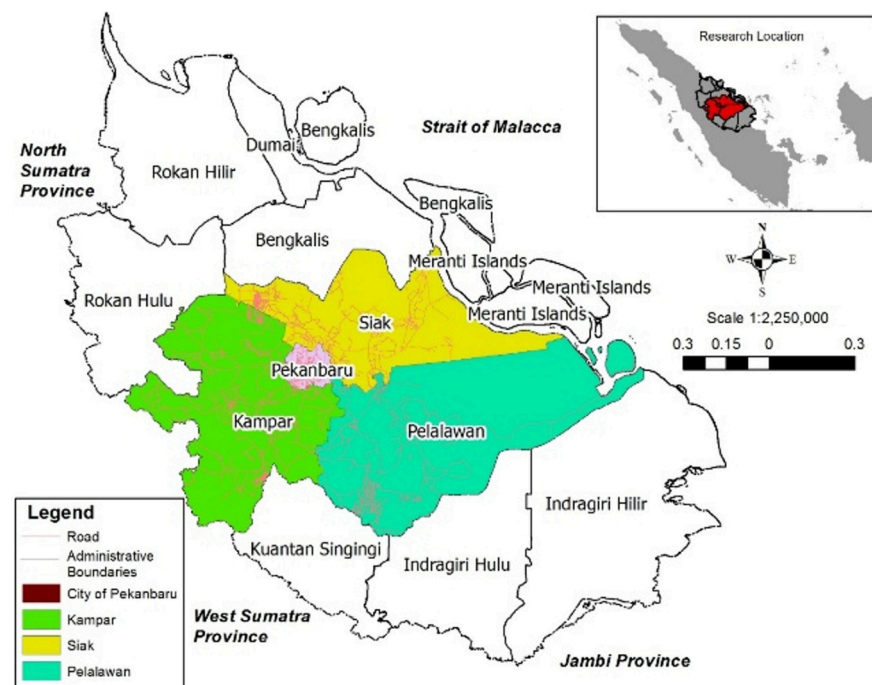


Figure 1. Research Location
(Metropolitan PEKANSIKAWAN Area)

This study utilizes secondary data sourced from the Central Statistics Agency of Riau Province, the Regional Development Planning Agencies, the Agriculture Offices, and the Food Security Services at both the provincial and regencies/city levels within the PEKANSIKAWAN metropolitan area. Based on the data available for the period 2018 to 2022, seven main food security commodities, namely rice, onions, chili, poultry meat, poultry eggs, livestock, and fish, were selected as the focus of the study in the four regencies/cities included in the area. These commodity data were compiled and analyzed to assess regional disparities in food production capacity and serve as an empirical basis for formulating strategic directions in regional food security planning.

Table 1. Production of 7 Food Commodities in the Metropolitan Area (Kg)

Commodities	Production Quantity (Kg)				
	2018	2019	2020	2021	2022
Rice	37.030.520	31.263.880	34.807.790	33.358.070	42.935.700
Onion	155.100	0	0	95.150	74.755
Chili	22.391.900	18.608.800	16.291.400	10.326.538	12.047.843
Poultry Meat	31.511.076	32.535.302	27.617.681	28.152.691	28.426.775,53
Poultry Eggs	9.226.262,845	5.260.262,371	3.479.584,585	2.860.818,596	3.090.762,456
Beef	7.757.347	7.912.865	7.758.748	4.932.298	7.237.231
Fish	78.779.820	80.570.000	74.108.000	80.276.000	89.487.000

Source: Central Statistics Agency of Riau Province data processing.

Table 1 shows the fluctuations in the production of seven main food commodities in the PEKANSIKAWAN metropolitan area during 2018–2022. For the seven main food commodities in the Riau Province area, see Table 2. Both tables illustrate the varying capacities of regions to contribute to regional food security, with some commodities experiencing significant year-to-year changes. This data serves as the basis for further analysis of spatial production disparities and the formulation of targeted development strategies.

Table 2. Production of 7 Food Commodities in the Riau Province (Kg)

Commodities	Production Quantity (Kg)				
	2018	2019	2020	2021	2022
Rice	152.086.610	131.816.960	139.851.830	124.800.580	130.475.020
Onion	186.500	0,00	0,00	329.490	195.305
Chili	30.015.000	25.633.000	25.362.100	20.534.029	20.534.029
Poultry Meat	63.217.054	64.481.392	48.913.185	49.891.444	107.910.471,78
Poultry Eggs	51.701.336	27.983.685	16.686.885	14.689.076	16.034.123,68
Beef	13.744.267	14.019.150	10.986.695	11.192.118	11.931.641
Fish	98.863.130	117.023.000	108.947.000	116.648.000	133.694.000

Source: Central Statistics Agency of Riau Province data processing.

Figure 2 illustrates the year-to-year proportional comparison of food commodity production based on normalized data. This radar chart illustrates the relative performance of seven major food commodities: rice, onion, chili, poultry meat, poultry eggs, beef, and fish, across five years from 2018 to 2022. The normalization process ensures that each commodity’s production value is presented on a comparable scale, allowing for a clearer interpretation of inter-annual variation. By comparing Riau Province and the PEKANSIKAWAN Area, this visualization highlights differences in food production dynamics between the two regions. Notably, certain commodities demonstrate consistent dominance in specific years, while others

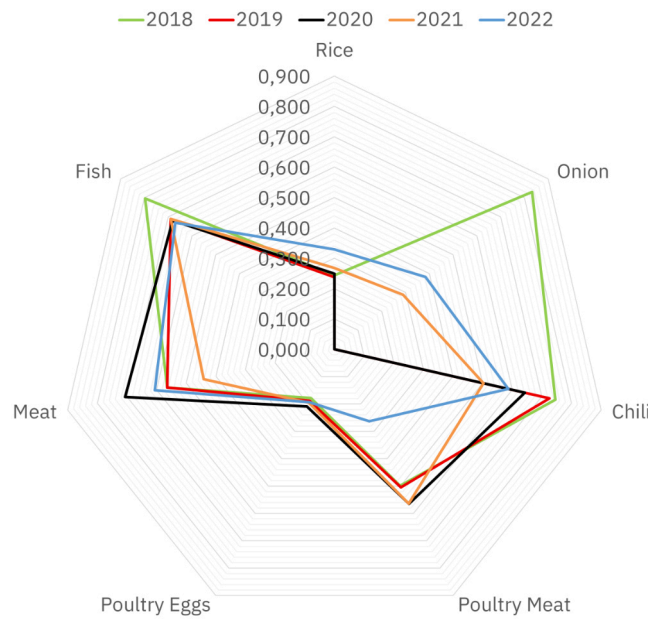


Figure 2. Radar Chart of Normalized Food Commodity Production in Riau Province and the PEKANSIKAWAN Area (2018–2022)

Source: Central Statistics Agency of Riau Province data processing.

fluctuate considerably. Overall, the chart serves as a useful tool for identifying trends and shifts in regional food security priorities over time.

The radar chart above presents a visualization of the normalized production of seven key food commodities in Riau Province and the PEKANSIKAWAN Area during the 2018–2022 period. The analyzed commodities include rice, onion, chili, poultry meat, poultry eggs, beef, and fish. This chart enables a fairer year-to-year proportional comparison as the data scale has been standardized through normalization. It is evident that in 2018 and 2022, onions and fish recorded relatively higher proportions compared to other years. In contrast, 2020 shows a noticeable decline across almost all commodities, likely due to disruptions in food production and distribution systems caused by the COVID-19 pandemic (Committee on World Food Security, 2021).

Compared with the overall average of Riau Province, food production in the PEKANSIKAWAN Area tends to be more dynamic, particularly for strategic commodities such as chili, fish, and poultry meat. This reflects the significant contribution of the regencies and cities within the area to the province's food security. Inter-regional connectivity in PEKANSIKAWAN, through logistics distribution, infrastructure support, and production synergy, is a key factor in maintaining the stability of the food supply. Therefore, this pattern of fluctuation can serve as a foundation for formulating integrated, region-based food security policies.

A quantitative approach was employed in this study by applying the Location Quotient (LQ) and Shift-Share Analysis (SSA) methods. These methods allow for the identification of the extent to which a commodity possesses comparative advantages and relative growth in each region, serving as a basis for determining leading commodities from an economic perspective (Diniaty et al., 2024; Hendriany et al., 2023; Maulana & Maulana, 2023; Siska et al., 2015). LQ focuses on comparing the concentration of a commodity in a specific region relative to other regions, while SSA analyzes the contribution of sectoral growth to regional economic growth, making the two methods complementary in quantitatively assessing commodity performance.

The selection of leading commodities in this study is based on the LQ and SSA methods, which identify the relative advantages of commodities using production data and sectoral growth. However, this approach has limitations in fully capturing the multidimensional aspects of food security. LQ and SSA emphasize quantitative aspects of production and economic growth without considering nutritional availability, public access to food, supply stability, and sustainable utilization. Consequently, the identification of leading commodities through these methods primarily reflects comparative and competitive economic advantages. However, it does not fully address multidimensional food security challenges, particularly in the PEKANSIKAWAN metropolitan area, which is complex and vulnerable to supply fluctuations and interregional distribution disparities.

The simultaneous use of LQ and SSA still provides a comprehensive approach to analyzing the leading commodities in the food sector. By understanding the comparative and competitive advantages of various commodities, policymakers can design more targeted development strategies to enhance food security while promoting regional economic growth. This approach is expected to serve as an empirical basis for formulating integrated, participatory, and responsive policies that address both production dynamics and food needs in the PEKANSIKAWAN metropolitan area.

In the context of the PEKANSIKAWAN metropolitan area in Riau Province, the LQ and SSA analysis was used to assess the role of 7 food security sectors, such as rice, onions, chili, meat, poultry, poultry eggs, livestock, and fish, in supporting the local economy compared to the provincial average. The formula for the Location Quotient (LQ) Method is as follows:

$$LQ = \frac{X_{ij}}{X_j} / \frac{Y_i}{Y} \quad (1)$$

where: LQ = Index or Location Quotient Coefficient, X_{ij} = Commodity production i at the regency level, X_j = Total production of food commodities at the regency level, Y_i = Commodity production i at the Provincial level, Y = Total production of food commodities at the regency level.

Results obtained from the analysis method Location Quotient (LQ) Was: $Q1 > 1$; show that the sector is a superior commodity because it can improve and develop the region/region because of its production output or is a base sector, $LQ = 1$; shows that the sector is not a base sector but has the potential to become a base/export sector on the other hand this sector is only able to meet the local needs of the region, $Q1 < 1$; shows that the sector is not a leading commodity/base, because this sector cannot meet local needs then there is a tendency to import from outside the region.

Shift-Share Analysis (SSA) is one method for analyzing regional growth. This analysis can identify the causes of growth and assess its future development potential. The Shift-Share analysis groups regional growth into three components, including: 1) share component, this component explains regional growth compared to what is displayed following national growth, thus regional growth is treated the same as national growth; 2) mix component, this component explains the relative speed of growth of sectors in regions that have higher growth than the same sector at the national level; 3). Competitive component: this component explains the relative competitive advantage of a sector in the region compared to the national level. Sectors with a competitive advantage have an environment conducive to their development.

The equation of the shift share analysis can be formulated as follows:

$$SSA = \left(\frac{Y'_i - Y_i}{Y_i} - \frac{Y'_{..} - Y_{..}}{Y_{..}} \right) Y_{ij} + \left(\frac{Y'_{ij} - Y_{ij}}{Y_{ij}} - \frac{Y'_i - Y_i}{Y_i} \right) Y_{ij} \quad (2)$$

where: SSA = Commodity net shift i in the region j , $Y_{..}$ = Total commodity production at the Provincial Level in the base year (2018), $Y'_{..}$ = Total production of commodities at the Provincial level at the end of the year (2022), Y_i = Commodity production i Provincial level in the base year (2018), Y'_i = Commodity production i Provincial level in the final year (2022), Y_{ij} = Commodity production i at the District Level j in the base year (2018), Y'_{ij} = Commodity production i regency level in the final year (2022).

3. Results and Discussion

The results of processing superior commodity data from seven food security sectors with LQ and SSA analysis using data on seven food commodities included in the main commodities of food security from 2018 to 2022 consist of rice, onions, chili, meat, poultry, eggs, poultry, livestock, and fish in the PEKANSIKAWAN metropolitan area show that there is an uneven distribution of superior commodities in each region.

For the results of data processing of superior commodities from seven food commodities in the Pekanbaru City area based on data processing using LQ and SSA analysis methods, see Table 3. Pekanbaru City, as the capital of Riau Province, serves as the core economic hub of the PEKANSIKAWAN metropolitan area, particularly in trade and services. Despite its strategic role, the city remains highly dependent on food imports, highlighting urban challenges in achieving food security. However, Pekanbaru City has strong potential as a food commodity producer. Based on LQ and Shift Share Analysis, poultry meat emerges as the city's sole leading commodity, with an LQ of 2.81 and a positive SSA of 1,648,789.79, indicating strong competitiveness and significant contribution to local economic growth.

Table 3. LQ and Results SSA Pekanbaru City

Commodities	LQ	SSA	Featured Commodities
Rice	0.093	3961845.61	-
Onion	0.391	10814.29	-
Chili	1.046	-7014931.27	-
Poultry Meat	2.807	1648789.79	Poultry Meat
Poultry Eggs	0.383	-1074156.97	-
Beef	3.287	-1539452.33	-
Fish	0.900	1579035.77	-

Source: Central Statistics Agency of Riau Province data processing.

Production data from 2018–2022 further support this, showing poultry meat as consistently the highest-produced commodity. In 2022, production reached 17.5 million kg, far exceeding fish (9.9 million kg) and livestock meat (3 million kg). This trend confirms that broiler farming is the most developed and promising sector in Pekanbaru. Given its production consistency, economic contribution, and high market demand, poultry meat rightfully stands as the city's primary commodity.

Kampar Regency has the opportunity to become a food base in Riau Province, supported by geographical conditions, a tropical climate with high annual rainfall (average 2.667 mm), and the flow of two main rivers, namely the Kampar Kiri River and the Kampar Kanan River. This characteristic provides abundant water resources for agricultural, livestock, and fishery purposes. The varied topography, from hills to lowlands, also supports a wide variety of agricultural activities. The fertility of the soil and natural forests that are still maintained adds to the ecological carrying capacity of this region. This combination makes Kampar Regency very promising for the

development of strategic food commodities, so that it can support regional food security and increase local economic competitiveness.

The results of data processing for superior commodities from seven food commodities in the Kampar Regency area, based on data processing using the LQ and SSA analysis methods, can be shown in Table 4.

Table 4. LQ and Results SSA Kampar Regency

Commodities	LQ	SSA	Featured Commodities
Rice	0.258	-1097016.19	-
Onion	1.468	-100048.091	-
Chili	0.971	-737974.865	-
Poultry Meat	0.327	743621.277	-
Poultry Eggs	0.224	-1514947.809	-
Beef	0.804	959699.902	-
Fish	2.464	3836974.363	Fish

Source: Central Statistics Agency of Riau Province data processing.

Based on the results of the Location Quotient (LQ) and Shift Share Analysis (SSA) in Table 4, the leading commodity in Kampar Regency is fish. The LQ value obtained is 2.464, which means that the fisheries sector has local advantages and specialties. In addition, the SSA value of fish commodities is also very high, which is 3,836,974.363, which shows that this sector is experiencing positive growth and makes a great contribution to the development of the regional economy.

Based on data on food and livestock commodity production in Kampar Regency from 2018 to 2022, the consistent amount of fish production dominates compared to other commodities every year. This figure far exceeds other commodities such as rice (7,096,290 kg), poultry meat (4,983,834.96 kg), and chili (5,426,400 kg). The most dominant contributor to fish production is aquaculture, which consistently accounts for more than 95% of total fish production. Kampar Regency has great potential to develop the aquaculture sector, which can contribute to food security and improve the community's economy. However, the main challenges in fisheries production in Indonesia are still low competitiveness, the issue of sustainability of fish resources, and the capacity of business actors, which are still the main focus in efforts to realize sustainable fisheries.

Siak Regency is known for its abundant natural resources, particularly petroleum and oil palm, making it one of Indonesia's major production centers. In addition to its mining and plantation sectors, Siak Regency also holds significant potential in food commodity development. Sabak Auh District, for instance, is notable for its extensive rice fields, offering a strategic opportunity to enhance both local and regional food security. The results of LQ and SSA analyses identifying leading food commodities in Siak Regency are presented in Table 5.

Table 5. LQ Results and SSA Siak Regency

Commodities	LQ	SSA	Featured Commodities
Rice	1.416	715422.769	Rice
Onion	1.294	4500.562	Onion
Chili	3.936	-3109534.591	-
Poultry Meat	0.578	-63325.289	-
Poultry Eggs	0.740	-1662283.332	-
Beef	0.929	-61341.293	-
Fish	0.195	1023987.596	-

Source: Central Statistics Agency of Riau Province data processing.

Based on Table 5, the results of the Location Quotient (LQ) and Shift Share Analysis (SSA) show that rice and onions are the leading food commodities in Siak Regency, with LQ values of 1,416 and 1,294, and positive SSA values of 715,422,769 (rice) and 4,500,562 (onions). These figures show comparative superiority and above-average growth, making them a powerful commodity for sustainable development.

Production data from 2018 to 2022 also support this. Rice consistently recorded the highest production, reaching 18 million kg in 2022, reflecting increased cultivation and support programs. Onion production, despite its lower volume, has shown a promising recovery, growing from zero in 2019–2020 to 46,750 kg in 2021 and 18,875 kg in 2022. This resurgence signifies new interest and potential, especially given the daily consumption of onions. Thus, both rice and onions are in a good position as the primary commodities for food security in Siak Regency.

Pelalawan Regency, which is the result of the expansion of Kampar Regency, has undergone a significant transformation in recent decades. This area is known to have a very wide area of forest use concessions, especially for the development of oil palm plantations. Pelalawan Regency has developed into one of the advanced industrialization areas in Riau Province, marked by the establishment of various large companies at both national and international levels. The development of this industry has a positive impact on economic growth and increases regional income. However, amidst this industrialization, Pelalawan Regency also has a great opportunity to strengthen the food security sector. The region's rich natural resources, including fertile farmland and adequate water availability, offer ample opportunities to enhance the productivity of various food commodities. In addition, the ever-evolving demographic structure presents both challenges and opportunities. Population growth requires sufficient and sustainable food availability. The results of data processing for superior food commodities in the Pelalawan Regency area, based on data analysis using the LQ and SSA methods, are presented in Table 6.

Table 6. LQ Results and SSA Pelalawan Regency

Commodities	LQ	SSA	Featured Commodities
Rice	1.099	1334526.599	Rice
Onion	0.004	0.000	-
Chili	0.197	-80499.694	-
Poultry Meat	1.043	-6256166.958	-
Poultry Eggs	0.595	-2130873.638	-
Beef	0.464	-86496.681	-
Fish	1.176	2160173.533	Fish

Source: Central Statistics Agency of Riau Province data processing.

The results of the Location Quotient (LQ) and Shift Share Analysis (SSA) show that rice and fish are leading food security commodities in the Pelalawan Regency area, with an LQ value greater than one and a positive SSA value, indicating comparative and competitive advantages. Rice has an LQ of 1,099 and an SSA value of 1,334,526.60, indicating strong internal sector growth and a higher-than-average contribution to the regional economy (Hendriany et al., 2023). Similarly, the fish has an LQ of 1,176 and an SSA of 2,160,173.53, reflecting local strengths in freshwater aquaculture, cultural traditions, and regional development initiatives. Other commodities, including onions, chilies, poultry, eggs, and beef, show LQ values below one and negative SSA values. This shows that these commodities currently have low competitiveness and a limited contribution to regional growth. Therefore, food

development strategies in the region should focus on commodities with clear structural and spatial advantages. Policy interventions need to prioritize increasing rice and fish productivity through the adoption of modern agricultural technologies, expanding irrigation and cold storage infrastructure, and increasing market access through integrated food logistics systems (Diniaty et al., 2024).

The identification of superior commodities through LQ and SSA analysis not only provides empirical evidence of comparative and competitive advantage but also the basis for designing strategies to strengthen food security throughout the PEKANSIKAWAN metropolitan area. Each district/city area has unique strengths that can be developed in complementary ways. The city of Pekanbaru specializes in poultry meat, making it a core hub for protein distribution and agricultural processing. At the same time, Kampar Regency has significant aquaculture potential, positioning it as a sustainable base for fish supply. Siak Regency, on the other hand, demonstrated strong performance in rice and onion production, which helped ensure the stability of staple foods. Pelalawan Regency showed competitiveness in both the rice and fish sectors, with promising opportunities for agro-industrial development. These findings highlight the importance of designing a regional strategy that emphasizes complementarity: poultry from Pekanbaru City can meet the protein demand in Siak and Pelalawan Regencies; rice from Siak Regency and Pelalawan Regency can supply the urban population of Pekanbaru; and fish from Kampar Regency can strengthen food diversification and nutritional security throughout the PEKANSIKAWAN metropolitan area.

These four commodities form the foundation for regional food independence strategies tailored to each region’s unique strengths. Kampar Regency has potential in the fields of horticulture and aquaculture, Siak Regency in peatland-based commodities, Pelalawan Regency in the agroindustry and logistics, and Pekanbaru City as a center of consumption and services. This diversity is a regional advantage when integrated through collaborative strategies, such as the development of food clusters and inter-regional supply chains (Susanti et al., 2017). The inter-regional linkage within the PEKANSIKAWAN Metropolitan Area in terms of food security based on superior commodities is evident in Table 7. Table 7 illustrates the inter-regional linkages of the leading commodities, and beyond the presentation of these data, also reveals several potential scenarios for synergies.

Table 7. The Interregional Linkages Within the PEKANSIKAWAN Metropolitan Area in Terms of Food Security Based on Superior Commodities

Region PEKANSIKAWAN	Superior Commodities	Interregional Linkages within the PEKANSIKAWAN Area	Strengthening Potential
Pekanbaru City	Poultry Meat	Rice, Fish, and horticultural needs are supplied from Kampar Regency and Pelalawan Regency	Poultry processing industry and distribution
Kampar Regency	Fish	Needs for rice, onions, and non-fish protein are supplied from Siak Regency, Pekanbaru City, and Pelalawan Regency	Fish farming and local feed production
Siak Regency	Rice and Onions	Protein needs are supplied from Kampar Regency and Pelalawan Regency	Irigation, superior seeds, and horticulture
Pelalawan Regency	Rice and Fish	Poultry protein and horticultural needs are supplied from Pekanbaru City and Siak Regency.	Agroindustry based on rice and fish

Source: Data processing.

By understanding these unique potentials, the government can design efficient collaborative strategies (Putra, 2014). One important mechanism is the balancing of supply and demand, where surplus areas, such as Kampar Regency with fish and Siak Regency with rice, can supply deficit areas such as Pekanbaru City with rice and Pelalawan Regency with poultry. Another possible scenario is the development of a cluster in which the city of Pekanbaru can function as a food and processing center, supported by the aquaculture cluster of Kampar Regency, the rice-horticulture

cluster in Siak Regency, and the rice-fish agroindustry cluster in Pelalawan Regency. In addition, joint programs can be developed through coordinated investments in irrigation (Siak Regency–Pelalawan Regency), cold chain logistics (delivery of fresh products) between Kampar Regency and Pekanbaru City, and digital markets throughout the Pekansikawan metropolitan area to improve the efficiency of the food system. This territorial approach is consistent with the concept of “food system clusters” (Lu & Carter, 2023; Susanti et al., 2017), which emphasizes spatial integration as a way to reduce costs, stabilize supply, and improve overall resilience.

Previous studies on food security have generally focused on sectoral production or availability (Rahayu et al., 2021; Rosyadi et al., 2021), without fully integrating territorial relations. This study enriched the literature by combining LQ and SSA with spatial metropolitan frameworks, thus offering insights into complementarity between regions. Similar findings on the importance of territorial integration have been highlighted by Rustiadi et al. (2009) in Indonesia and by Zerbian and de Luis Romero (2023) in European urban food systems. The novelty of this research lies in the application of the territorial approach specifically for the PEKANSIKAWAN Metropolitan Area, where the gap in the Food Security Index remains significant.

Beyond economic indicators, the development of superior commodities has direct socio-economic implications. For farmers and fishermen, strengthening the rice, fish, and poultry sectors can increase household incomes, create job opportunities, and reduce poverty. Challenges on the ground include land conversion for plantations and industry (Pelalawan Regency), low competitiveness of fish products (Kampar Regency), and inconsistent onion production (Siak Regency). Institutional support is essential, including farmer cooperatives, access to microfinance, crop insurance, and research and extension services to increase productivity and sustainability. Addressing this dimension ensures that food security strategies are not only growth-oriented, but also inclusive and socially just (Miles & Hoy, 2023).

In short, the integration of LQ and SSA results provides a clear direction to design complementary inter-regional food security strategies. By positioning Pekanbaru City as a hub, Kampar Regency as a fish production base, Siak Regency as a supplier of rice and horticulture, and Pelalawan Regency as a rice-fish agroindustry node, which further impacts the Pekansikawan metropolitan area, can develop into a resilient food system. This approach addresses production gaps, improves socio-economic welfare, and strengthens policy coherence in line with the principles of decentralization and sustainable regional development.

4. Conclusion

This study demonstrates that the PEKANSIKAWAN Metropolitan Area, comprising Pekanbaru City, Kampar Regency, Siak Regency, and Pelalawan Regency, plays a strategic role in strengthening food security in Riau Province. By applying the Location Quotient (LQ) and Shift-Share Analysis (SSA) methods, four leading commodities were identified, namely poultry meat, rice, fish, and onions. These commodities reflect the comparative and competitive advantages of each region. Pekanbaru City specializes in poultry production, while Kampar Regency has strong potential in aquaculture. Siak Regency excels in rice and onion cultivation, while Pelalawan Regency stands out in agroindustry, particularly in rice and fish production. Together, these commodities form a complementary regional food system that ensures supply stability and resilience.

The findings directly address the research objective, which was to identify leading food commodities to inform more targeted food security strategies. The spatial synthesis highlights that interregional linkages can be optimized through collaboration across districts and cities, supply chain integration, and the development of food system clusters. In practice, this means linking Pekanbaru City as the consumption and processing hub with Kampar's fish production base, Siak's staple food production, and Pelalawan's agroindustrial capacity.

Based on these results, several policy recommendations can be proposed. First, local governments should prioritize collaborative investment in irrigation, cold chain logistics, and digital markets to strengthen the food system's connectivity and efficiency. Second, institutional strengthening through farmer cooperatives, access to finance, and human resource capacity building is essential to improve productivity and competitiveness. Third, food development policies should encourage sustainable practices to balance economic growth with social equity and environmental resilience.

The scientific contribution of this study lies in integrating a territorial approach with quantitative methods, LQ, and SSA to identify leading commodities within a metropolitan context. Unlike previous studies that emphasized sectoral production, this research demonstrates the added value of a spatial framework that captures complementarities and disparities across regions. Therefore, this study not only enriches academic literature on food security and regional planning but also provides practical guidance for policymakers in designing metropolitan food systems that are adaptive, inclusive, and competitive.

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