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RESEARCH PAPER

Identifying Leading Aquaculture Commodities in West Java's Coastal Industry: A Multimethod Regional Analysis

Sri Kaidah[1,*], Tajuddin Bantacut[2], Muslich[3], Khaswar Syamsu[4]

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ABSTRACT
The initial stage in agro-industrial development planning involves identifying high-potential raw materials. Assessing commodity competitiveness requires a comprehensive analytical approach to ensure that decisions are both accurate and sustainable. The development potential of aquaculture-based agro-industries can strengthen linkages between upstream and downstream sectors, particularly between fishery production and processing industries. However, in four coastal regencies of West Java Province, aquaculture-based agro-industries have not yet been developed, despite aquaculture recording the highest export value at the provincial level. At present, the region remains dominated by manufacturing industries. This study aims to identify priority aquaculture commodities for coastal agro-industrial development. Commodity competitiveness was assessed using five analytical methods: Location Quotient (LQ), Dynamic Location Quotient (DLQ), Sectoral Contribution Index (SCI), Growth Ratio Model (GRM), and Shift Share Analysis (SSA). A multi-method approach was employed to generate complementary results and enhance the validity of the superior commodity designation. The findings reveal that shrimp is categorized as a highly competitive commodity across all four regencies. These results serve as a strategic foundation for regional agro-industrial development policies and can be replicated in other coastal areas.

KEYWORDS: *Coastal agro-industry; Superior commodity; Aquaculture; Analytical tools; Regional policy.*

1. Introduction

The agricultural sector, particularly the aquaculture sub-sector and processing industry, plays a strategic role in driving economic growth in the northern coastal regions of West Java, Indonesia. The linkage between aquaculture production and downstream commodity processing demonstrates a significant contribution to Gross Regional Domestic Product (GRDP) [1, 2], job creation, and improved welfare among coastal communities [3, 4]. Despite Indonesia's vast aquaculture potential, its utilization remains concentrated at the upstream level and has yet to be optimally integrated with agro-industrial systems [5]. Therefore, a local economic transformation strategy based on high-potential commodities through integrated agro-industrial development is essential to enhance value addition, strengthen food security, and accelerate sustainable poverty reduction [6].
The initial phase of aquaculture-based agro-industrial development relies heavily on the availability of high-quality and consistent raw materials. However, systematic scientific studies assessing the competitiveness of aquaculture commodities, particularly those sourced from coastal regions, remain limited. This is noteworthy given the substantial yet underutilized bioeconomic potential of coastal areas. In the context of regional economic development, identifying and strengthening local superior commodities is a key strategy for promoting inclusive and sustainable economic growth [7].
Superior commodities are expected not only to enhance food security and promote self-sufficiency in the fisheries sector [8-10]), but also to contribute to regional economic stability and the sustainable management of natural resources [11, 12]. Therefore, the identification of priority commodities must be grounded in a comprehensive and scientifically rigorous analytical approach to inform strategic policymaking and guide targeted agro-industrial development.
The Location Quotient (LQ) analysis is widely used to identify leading commodities [13, 14], but it is static and highly dependent on data accuracy [15]. To address these limitations, the Shift Share Analysis (SSA) method is often employed as a

* *Corresponding author: Sri Kaidah*
sri.kaidah@mercubuana.ac.id

1. *Industrial Engineering, Universitas Mercu Buana, Jakarta Barat, 11650, Indonesia*
2. *Agricultural Industrial Engineering, Institut PertanianBogor University, Bogor 16680, Indonesia*
3. *Agricultural Industrial Engineering, Institut PertanianBogor University, Bogor 16680, Indonesia*
4. *Agricultural Industrial Engineering, Institut PertanianBogor University, Bogor 16680, Indonesia*

complementary tool, although both approaches remain confined to the dimensions of economic role and structural shift [16]. This study integrates five analytical tools: Location Quotient (LQ), Shift Share Analysis (SSA), Dynamic Location Quotient (DLQ), Sectoral Contribution Index (SCI), and Growth Ratio Model (GRM) to produce a more comprehensive and accurate assessment in determining sectoral competitiveness for aquaculture-based agro-industrial development.
The four coastal regencies in West Java hold strategic potential for integrating the aquaculture sector with agro-industry to enhance supply chain efficiency and generate added value based on geographic proximity to raw material sources. This study offers a comprehensive approach by selecting priority commodities as the foundation for agro-industrial development, employing five sectoral competitiveness-based analytical tools. This approach is expected to strengthen the position of local commodities within the framework of regional competitiveness and promote sustainable coastal economic development [17]. Based on this background, the present study aims to identify superior aquaculture commodities in four regencies using a five-method analytical framework to support agro-industrial development in coastal regions.

2. Literature Review

2.1. Superior aquaculture commodities

Aquaculture is considered a priority sector for elevating local commodities to flagship status due to the strong potential of coastal areas [18]. A superior commodity is defined as one that meets several key criteria, including:
(a) high market competitiveness through product uniqueness and quality; (b) optimal use of local resources with development potential; (c) significant economic value-added for communities; (d) contributions to increased income and human resource quality; and (e) eligibility for financial support or development programs bantuan [19]. By meeting these criteria, superior commodities are positioned as vital instruments for sustainably enhancing regional economic contributions [12].

2.2. Agroindustry

Agro-industry refers to industries that utilize agricultural and fisheries-based raw materials to produce value-added products [20]. It encompasses activities related to food production, processing, distribution, preparation, and consumption [21]. This sector plays a vital role in regional economic growth and job creation [22], forms part of an integrated value chain system [23], and contributes to minimizing social and environmental impacts while optimizing resource utilization [24].

2.3. Regional competitiveness analysis tools

The Location Quotient (LQ), as defined by [25], is an analytical tool used to identify the concentration of a specific economic sector within a region in comparison to a reference area. LQ has been widely applied in regional and spatial studies and has evolved through the incorporation of graphical approaches, statistical metrics, and spatially-based mathematical models [26]. However, due to its static nature and limited ability to capture changes over time, LQ is often complemented by the Dynamic Location Quotient (DLQ), which enables the longitudinal assessment of sectoral competitiveness, particularly in agro-industrial contexts [27]. Shift Share Analysis (SSA), introduced by [28], evaluates sectoral growth through three components: national effect, industry effect, and competitive effect. SSA has been applied in various contexts, including regional economic structure analysis [16], identification of key commodities [29], and performance evaluation in the waste management sector [30].
In addition, the Sectoral Contribution Index (SCI) offers a simplified input-output approach to measure the relative contribution of each sub-sector to the regional economy and to identify functional linkages among sectors [31]. SCI also supports spatial analysis by revealing locational disparities, which serve as a foundational element in regional economics.

2.4. Previous studies

Most studies on superior commodity identification have been partial, focusing primarily on static changes in regional economic shifts, commonly employing Location Quotient (LQ) and Shift Share Analysis (SSA). A comprehensive comparison between this study and previous research is presented in Table 1.
As shown in Table 1, prior studies have frequently utilized LQ and SSA to assess sectoral shifts and contributions within regional economies. However, these approaches have rarely been applied to identify superior commodities, particularly in the context of aquaculture-based agro-industrial development. This study introduces a novel approach by integrating five analytical methods:

LQ, SSA, Dynamic Location Quotient (DLQ), Sectoral Contribution Index (SCI), and Growth Ratio Model (GRM) applied simultaneously. This integrated framework provides a more robust and comprehensive foundation for decision-making in identifying superior commodities and designing strategic agro-industrial development in coastal regions.

3. Methode

3.1. Research location and methodology

This study was conducted in four coastal regencies of West Java: Indramayu, Cirebon, Subang, and Karawang. A quantitative descriptive approach was employed, using primarily primary data. Primary data were collected through field observations and in-depth interviews conducted from June to November 2022, while secondary data were obtained from relevant institutions. A purposive sampling technique was used to select key informants, including policymakers, small and medium-sized industry actors, and experts in aquaculture and agro-industry. The collected information focused on identifying superior commodities as the basis for agro-industrial development in coastal areas. Details of the informants are presented in Table 2.

Secondary data were collected through a comprehensive literature review to identify potential superior commodities for small- and medium-scale agro-industrial development. The assessment covered various aspects, including production potential, regional characteristics, natural resources, socioeconomic conditions, and policy frameworks.

Tab.1. Positioning of this study about previous research

Research	Method
Mo [32] Analysis of import changes through shift-share, location quotient, and BCG techniques: Gwangyang Port in Asia	LQ-SSA
Azorin [33] A new proposal to model regional input–output structures using location quotients. An application to the Korean and Spanish regions	FLQ
Arruda [34] Location and specialization indicators of animal bioenergetic potential in Paraiba (Brazil)	LQ, and the indexes of Krugman (SI), Hoover (H), and Ellison-Glaeser (EG)
Murray [26] A location analytics perspective of regional science at a crossroad	LQ
Morrissey [35] A location quotient approach to producing regional production multipliers for the Irish economy	LQ
Ariyanti [36] Renewable energy potential of rice straw and paunch manure as bioethanol feedstocks in Central Java, Indonesia	LQ
Mazouz [37] Economic specialisation and complementarity dynamics in polycentric urban regions: A case study of the Rabat-Sale-Kenitra region, Morocco	LQ
Kim [38] Emerging industrial clusters of the disaster safety industry in Korea	LQ
Azorin [39] The vulnerability of regional agriculture regarding irrigation water from the Tagus-Segura transfer	FLQ, LQ, and SLQ
Hizbaron [40] Risk-Based interurban Makassar-Parepare railway development, Indonesia	LQ
Agovino [30] Environmental legislation and achieving circular economy in Italy's waste sector: A shift-and-share macro-area analysis	SSA
Oemmelen [41] Shared Power, Shared Benefits? Reviewing private sector collaborations with community actors in Sub-Saharan Africa's mini-grid sector Dembińska	SSA
Dembińska [42]The impact of space development structure on the level of ecological footprint-Shift share analysis for European Union countries	SSA
Sutikno [27] The Development of Manufacturing Industry Cluster as an Effort of Economic Improvement Expansion in East Java	DLQ, SLQ
Jabar [31] Economic sanctions and energy efficiency: Evidence from Iranian industrial sub-sectors	SCI (Sectoral Contribution Index) analysis
Diniaty [29] Determination of Superior Commodities for the Development of Small and Medium Industries in Kampar Regency	LQ, SSA
Kaidah et al (2025). Comprehensive Multimethod Analysis to Identify Superior Aquaculture Commodities in Agro-Industry Development	LQ, SSA, DLQ, SCI, and Growth Ratio Model (GRM)

Tab.2. In-depth interviews with experts/groups

Experts	Number interviewed
Department of marine affairs and fisheries (five regencies)	2 individuals
Provincial department of industry and trade, west java	2 individuals
Ministry of marine affairs and fisheries	2 individuals
Regional development planning, research, and development agency (Bappeda)	2 individuals
Academics	2 individuals
Practitioners in the agro-industry	2 individuals
Practitioners in aquaculture	2 individuals
Fish farmer/Fisher groups	2 groups

Data sources included statistical and fisheries agencies, official documents, and previous studies. The identification of superior commodities was conducted using a multi-method approach, comprising Location Quotient (LQ), Shift Share Analysis (SSA), Dynamic Location Quotient (DLQ), Sectoral Contribution Index (SCI), and Growth Ratio Model (GRM), which were synthesized through the calculation of a Composite Index. This study followed a systematic sequence of stages, ranging from potential mapping to the designation of base commodities for regional agro-industrial development, as outlined below:

3.2. Contribution of agriculture/fishery and processing industry sectors to GRDP

This stage aims to measure the contribution of the agriculture/fisheries sector and the processing industry at both the West Java provincial level and across the four regencies under study. The contribution magnitude is calculated using the following formula:

$$\text{Sector Contribution Value} = \frac{\text{GDP sector i}}{\text{GDP Total}} \quad (1)$$

3.3. Identification and determination of leading aquaculture commodities in coastal areas

3.3.1. Location quotient (LQ)

Based on the study conducted by [43], the LQ formula used in this research can be expressed as follows:

$$LQ = \frac{X_{ij}/X_j}{Y_i/Y} \quad (2)$$

Where: LQ= Location Quotient index/coefficient, X_{ij} = production volume of commodity i in regency j, X_j = total Production volume of all commodities in regency j, Y_i = production volume of commodity i at the provincial level.

Y= total production volume of all commodities at the provincial level.

Criteria: LQ >1: commodity i in regency j is classified as a superior commodity, LQ≤ 1: commodity i in regency j is not classified as a superior commodity.

In this study, a commodity is considered dominant in a particular regency if its average LQ value is greater than 1 [44].

3.3.2. Shift-share analysis (SSA)

This method can be used to determine the competitiveness of a sub-sector or a specific commodity [45].

$$PB_{ij} = \left(\frac{Y'_i - Y_i}{Y_i} - \frac{Y'_{..} - Y_{..}}{Y_{..}}\right) Y_{ij} + \left(\frac{Y'_{ij} - Y_{ij}}{Y_{ij}} - \frac{Y'_i - Y_i}{Y_i}\right) Y_{ij} \quad (3)$$

Where: PB_{ij}= net shift of commodity i in region j, Y..= total production at the provincial level in the initial year of analysis, Y'..= total production at the provincial level in the final year of analysis, Y_i = production of commodity i at the provincial level in the initial year of analysis, Y'_i = production of commodity i at the provincial level in the final year of analysis, Y_{ij}= production of commodity i in regency j in the initial year of analysis, Y'_{ij} = production of commodity i in regency j in the final year of analysis.

3.3.3. Dynamic location quotient (DLQ)

The Dynamic Location Quotient (DLQ) method is also one of the analytical tools used to assess superior commodities in a dynamic context. Based on the study by [27], the formula is as follows:

$$DLQ = \frac{(1+g_{ij})/(1+g_j)}{(1+G_i)/(1+G)} \quad (4)$$

Where: DLQ= Dynamic Location Quotient index, g_{ij}= average growth rate of commodity i at the regency level, g_j = average growth rate of all commodities at the regency level, G_i= average growth rate of commodity i at the provincial level, G= average growth rate of all commodities at the provincial level.

3.3.4. Sectoral contribution index (SCI)

The Sectoral Contribution Index (SCI) analysis provides information on the proportion of a

sector's or product's production value relative to other products or sectors within the same region. The formulation, as proposed by [2], is as follows:

$$SCI = \frac{X_i}{X_j} \quad (5)$$

Where: SCI= Sectoral Contribution Index, X_i= production volume of sector/commodity i in the study area, X_j= total production volume in the study area in year j.

3.3.5. Growth ratio model (GRM)

The Growth Ratio Model (GRM) is one of the analytical methods used to strengthen the assessment of a commodity's competitiveness based on its growth ratio. The formula is as follows:

$$GRM = \frac{\Delta X_j / X_{jt}}{\Delta X_n / X_{nt}} \quad (6)$$

Where: GRM= Growth Ratio Model, ΔX_j = change in production value of commodity x in regency j, X_{jt}= production value of commodity x in regency j at the beginning of the year, ΔX_n= change in production value of commodity x at the provincial level, X_{nt}= production value of commodity x at the provincial level at the beginning of the year.

3.3.6. Composite index (IC)

The composite index is used to rank various alternatives [46]. Before the composite index analysis, a scaling technique is applied to transform each analysis result into a range between 0 and 100 using the Min–Max scaling method, as expressed in the following formula:

$$f' = \frac{\left[f_{ij} - \min(f_{ij})\right]}{\left[\max(f_{ij}) - \min(f_{ij})\right]} \times 100 \quad (7)$$

Where: f'= scaling score, f_{ij}= average of the value of the method on commodity i in the district j, Min f_{ij}= mean of the lowest value on the method of commodities i in j district j, Max f_{ij}= averages of the highest value of method on the commodité i of the districts i to j.

The values obtained from the scaling process are then used to determine the Composite Index by applying a modified formula, as follows:

$$IC = \frac{X_1 + X_2 + X_3 + X_4 + X_5}{5} \quad (8)$$

Where: IC= Composite Index, X_1= Location Quotient (LQ), X_2= Dynamic Location Quotient (DLQ), X_3= Sectoral Contribution Index (SCI), X_4= Growth Ratio Model (GRM), X_5= Shift Share Analysis (SSA).

The classification of superior commodity values is determined based on score levels, ranging from very low to very high. The Composite Index scores are grouped into five categories using the following formula:

$$Range = \frac{(Higest - Lowest\ velue)}{5} \quad (9)$$

4. Results and Discussion

4.1. Contribution of the agriculture and processing industry sectors to the GDP of west java province

The results of the sectoral contribution analysis indicate that the processing industry sector provides the highest contribution to the Gross Regional Domestic Product (GDP), with an average share exceeding 41%, compared to 7–8% from the agriculture, fisheries, and forestry sectors (Table 3). This dominant position reflects the strategic role of the processing industry in generating value-added through manufacturing, construction, and raw material transformation activities [47], which significantly influence regional economic growth [48].

The development of processing agro-industries based on superior aquaculture commodities is one of the government's targets to enhance the economy of coastal regions.

4.2. Contribution of the agriculture and processing industry sectors to the GDP in Four coastal regencies of west java

The industrial development in the four study areas reveals a disparity between aquaculture potential and the contribution of its processing industry. Table 4 shows that the average contribution of the processing industry sector (based on non-agricultural/fisheries raw materials) is higher than that of the agriculture/fisheries sector. This misalignment indicates that the sector's development has not yet been optimally integrated into the processing industry system. Aquaculture plays a strategic role in promoting rural economic development [49], possesses comparative advantages, is renewable and sustainable, and has higher export potential compared to marine fisheries [50].

4.3. Identification and determination of leading aquaculture commodities in four regencies of west java

4.3.1. Location quotient (LQ)

The LQ analysis in thefour regencies indicates that milkfish and shrimp are classified as superior commodities (LQ >1), thereby serving as the

economic base at both local and regional levels [51]. Commodities with an LQ value greater than 1 are considered to have a relative advantage in driving regional economic growth [52] (Table 5). The strength of the LQ method lies in its ability to identify leading sectors based on five-year data and to optimally capture the dynamics of the local economicstructure [53].

However, this method cannot indicate whether a commodity's growth pattern is progressive or stagnant. Therefore, the limitation of LQ can be addressed by complementing it with DLQ analysis.

4.3.2. Shift share analysis (SSA)

The SSA results indicate that shrimp has an SSA value greater than 0, signifying progressive growth and competitive advantage compared to other commodities in the region [54]. The shift-share method is used to analyze changes in economic structure and the role of sectors in the study area.

Tab.3. Contribution of each sector to the Gross Regional Domestic Product (GDP) of West Java Province (%)

Category	Field of business	2016	2017	2018	2019	2020
A	Agriculture, Forestry, Fisheries	**7.84**	**7.51**	**7.65**	**7.74**	**8.07**
B	Mining and Quarrying	1.53	1.43	1.36	1.25	1.11
C	**Manufacturing**	**42.55**	**42.23**	**42.19**	**41.60**	**41.11**
D	Electricity and Gas Supply	0.72	0.61	0.56	0.52	0.48
E	Water Supply; Waste Management, Sewage, and Recycling	0.08	0.09	0.09	0.09	0.1
F	Construction |	8.11	8.25	8.45	8.54	8.21
G	Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	15.08	15.08	14.88	15.24	14.58
H	Transportation and Warehousing	5.74	5.79	5.68	5.52	5.24
I	Accommodation and Food Service Activities	2.60	2.71	2.79	2.88	2.92
J	Information and Communication	2.75	2.90	2.87	2.87	3.92
K	Financial and Insurance Activities	2.79	2.80	2.79	2.71	2.80
L	Real Estate Activities	1.02	1.04	1.06	1.08	1.13
M, N	Business Services	0.40	0.41	0.42	0.47	0.40
O	Public Administration, Defense, and Compulsory Social Security	2.37	2.42	2.32	2.31	2.21
P	Education Services	2.70	2.87	3.02	3.21	3.63
Q	Human Health and Social Work Activities	0.73	0.75	0.75	0.79	0.78
R, S, T.U	Other Services	1.95	2.06	2.09	2.15	2.16

Tab.4. Average contribution of each sector to the GDP of five districts (%)

Category	Field of business	Cirebon	Indramayu	Subang	Kerawang
A	Agriculture, forestry, fisheries	**14.11**	**15.01**	**26.83**	**3.09**
B	Mining and quarrying	1.33	12.82	9.48	2.30
C	Manufacturing	**20.59**	**44.42**	**11.91**	**71.23**
D	Electricity and gas supply	0.17	0.05	0.06	0.67
E	Water supply; waste management,	0.09	0.09	0.09	0.07
F	Sewage, and recycling construction |	12.00	5.26	8.34	4.06
G	Wholesale and Retail Trade; Repair	15.52	10.38	15.50	9.91
H	of Motor vehicles and motorcycles transportation and warehousing	7.66	2.57	3.88	1.84
I	Accommodation and food service	3.57	1.59	3.73	1.04
J	Activities information and communication	3.38	0.92	4.16	1.39
K	Financial and insurance activities	3.74	1.16	4.40	1.15
L	Real estate activities	2.41	0.52	1.08	0.26
M, N	Business Services	0.89	0.24	0.05	0.03
O	Public administration, defense, and compulsory social security	2.74	1.99	3.52	0.83
P	Education services	5.60	2.10	3.62	0.94
Q	Human health and social work	2.24	0.46	0.81	0.30
R, S, T, U	Activities other services	3.97	0.43	2.54	0.88

Tab.5. LQ results in cirebon, indramayu, subang, and karawang regencies

Komoditas	Nilai LQ per Kabupaten				
	Cirebon	Indramayu	Subang	Karawang	Bekasi
Milkfish	**3.0137**	**2.8290**	**2.6341**	**4.4535**	**3.3245**
Gourami	1.5506	0.8150	-	-	0.0787
Snapper	1.9227	-	18.4087	-	-
Shellfish	5.1584	-	-	-	3.4764
Crab	1.4322	-	-	-	0.8336
Catfish	1.2353	1.0650	-	0.0753	0.2449
Carp	0.0498	-	1.0447	0.4119	0.0392
Tilapia	2.4920	0.5445	0.7143	0.5310	0.1474
Pangasius	0.0875	-	-	0.3809	0.9639
Shrimp	**2.3693**	**2.6684**	**3.4244**	**3.5539**	**0.4405**
Seaweed	-	-	2.2363	0.3187	4.7162

This method measures regional changes relative to a reference region but does not identify differences in sectoral growth patterns [16]. Therefore, SSA analysis is complemented by the Sectoral Contribution Index to strengthen the identification of commodity advantages over a broader geographic scope. Overall, the shift-share assessment can be interpreted from the value of regional economic growth; a positive value indicates that the commodity has high competitiveness and regional advantage [32].

4.3.3. Dynamic location quotient (DLQ)

The analysis results show that shrimp and tilapia are prospective commodities with DLQ values greater than 1 (Table 6), indicating faster growth compared to other commodities. Conversely, commodities with DLQ values less than 1 exhibit slower development and are generally less promising for further development.

The DLQ analysis is crucial for determining the future repositioning of leading commodities in the four coastal regencies of West Java. With this analysis, it is possible to ascertain whether a commodity is prospective for future development or not, and whether commodities that were not previously considered leading have the potential to become leading commodities in the future.

4.3.4. Sectoral contribution index (SCI)

The Sectoral Contribution Index (SCI) measures the proportion of a commodity's production relative to other commodities within a region. SCI values range from 0 to 1; the higher the value, the more dominant the commodity's contribution, thereby reflecting a higher level of competitiveness [2]. The SCI analysis results show that shrimp and milkfish consistently record the highest values among aquaculture commodities (Figures 1–4). Together, they account for more than 25% of the total production volume at the provincial level, making them potential flagship commodities at the regency level. These findings are consistent with [55], who emphasize that the greater the contribution of a commodity at a broader regional scale, the higher its competitive value. SCI specifically measures the extent of a commodity's contribution to a wider geographical scope (province).

Tab.6. SSA results in cirebon, indramayu, subang, and karawang regencies

Commodity	SSA Value			
	Cirebon	Indramayu	Subang	Karawang
Milkfish	SSA< 0	SSA< 0	SSA< 0	SSA >0
Gourami	SSA< 0	SSA >0	-	-
Snapper	SSA< 0	-	SSA >0	-
Shellfish	SSA >0	-	-	-
Crab	SSA< 0	-	-	-
Catfish	SSA< 0	SSA >0	-	SSA >0
Carp	SSA< 0	-	SSA< 0	SSA >0
Tilapia	SSA< 0	SSA >0	SSA >0	SSA< 0
Pangasius	SSA<0	-	-	-
Shrimp	SSA>0	SSA>0	SSA>0	SSA>0
Seaweed	-	-	SSA>0	SSA>0

Tab.7. DLQ results in cirebon, indramayu, subang, and karawang regencies

Commodity	Nilai DLQ per Kabupaten			
	Cirebon	Indramayu	Subang	Karawang
Milkfish	DLQ< 1	DLQ< 1	DLQ >1	DLQ< 1
Gourami	DLQ< 1	DLQ< 1	-	-
Snapper	DLQ >1	-	DLQ >1	-
Shellfish	DLQ< 1	-	-	-
Crab	DLQ< 1	-	-	-
Catfish	DLQ< 1	DLQ >1	-	DLQ >1
Carp	DLQ< 1	-	DLQ< 1	DLQ >1
Tilapia	DLQ< 1	DLQ >1	DLQ >1	DLQ >1
Pangasius	DLQ< 1	-	-	DLQ< 1
Shrimp	DLQ >1	DLQ< 1	DLQ >1	DLQ >1
Seaweed	-	-	DLQ< 1	DLQ< 1

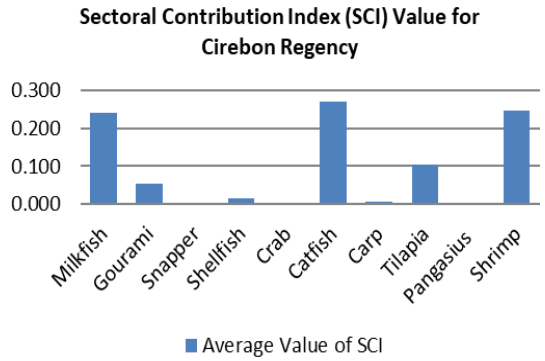

Fig.1. Cirebon Regency SCI value for aquaculture commodities

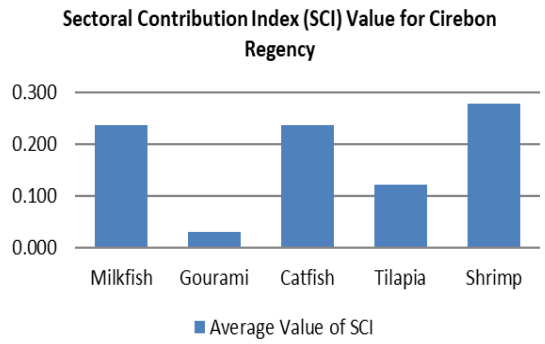

Fig.2. Indramayu Regency SCI value for aquaculture commoditie

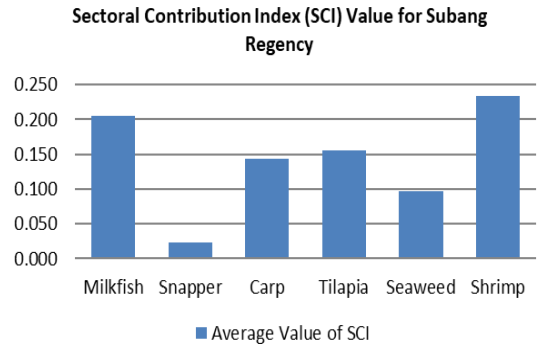

Fig.3. Subang Regency SCI value for aquaculture commodities

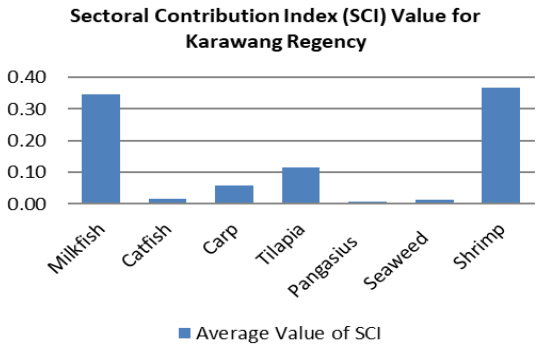

Fig.4. Karawang Regency SCI value for aquaculture commoditie

4.3.5. Growth ratio model (GRM)

The Growth Ratio Model (GRM) evaluates the quality of commodity production by comparing production volumes across periods, thereby reflecting the temporal potential of leading commodities. The analysis results indicate regional variation: Cirebon Regency recorded the highest positive scores for common carp and shrimp; Indramayu for tilapia; Subang for snapper; while Karawang showed positive growth for almost all commodities except common carp (Figures 5–8). A high GRM value indicates strong potential for increasing commodity productivity and contributing to regional economic growth, particularly at the regency level. This potential can be assessed using both LQ and GRM approaches, where GRM emphasizes productiongrowth over time, while LQ measures a commodity's capacity to meet both local and regional demand. Such an assessment is crucial, as the economic growth of coastal regions is influenced by resource utilization, industrial structure, logistics efficiency, production costs, and environmental regulations [56, 57].

The GRM measures the quality of commodity production based on changes in production volume

between periods, thereby representing temporal competitive potential.

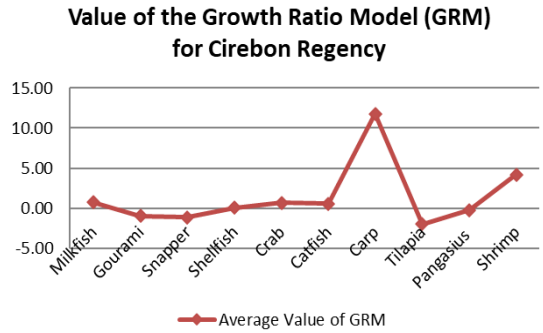

Fig.5. Cirebon Regency GRM value for aquaculture commodities

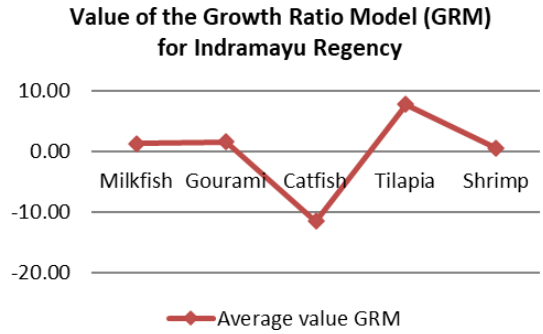

Fig.6. Indramayu Regency GRM value for aquaculture commodities

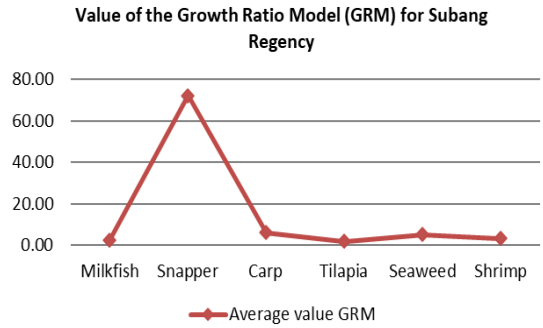

Fig.7. Subang Regency GRM value for aquaculture commodities

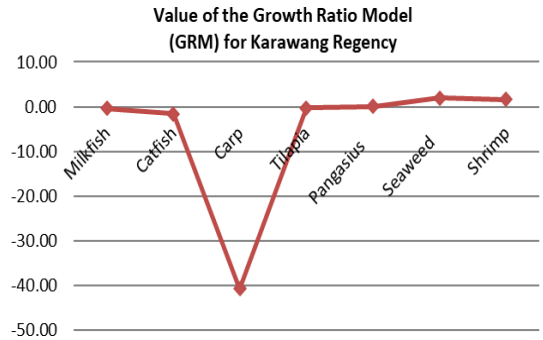

Fig.8. Karawang Regency GRM value for aquaculture commodities

Competitiveness is assessed by comparing production growth across commodities within the study area. A positive GRM value (+) indicates more prominent growth, whereas a negative value (−) reflects relatively lower growth compared to other commodities.

4.3.6. Composite Index (IC) in four districts

Each analytical method has its strengths and limitations; therefore, a combination of several approaches was employed to obtain more comprehensive results. The tested commodities were then classified based on their Composite Index (CI) values into five categories: Very High, High, Medium, Low, and Very Low. Commodities with a Very High CI indicate superior performance across all four regencies analyzed.

Based on Table 8, shrimp is identified as the leading commodity in Cirebon Regency with a Very High category, as indicated by a Composite Index score of 71.10. This commodity not only makes a significant contribution to production but also demonstrates positive growth in both regional and proportional growth components, as well as strong development prospects [58]. However, the sustainability of shrimp farming depends on effective pond management and environmental mitigation measures, given that the coastal area of Cirebon is vulnerable to tropical storms and high rainfall, which can affect pond area and productivity [59]. In Indramayu Regency, shrimp is classified as Very High based on a Composite Index score of 67.64 (Table 8), and is therefore recommended as a priority for development. An agro-industry based on this commodity has the potential to increase production, create jobs, raise community income, strengthen food security, and offset the decline in capture fisheries production [60, 61]. In Subang Regency, shrimp is also classified as Very High with a CI score of 62.09, while seaweed falls intothe Medium category (Table 8). Both commodities hold potential as high-value-added raw materials for agro-industrial processing. The development of these superior commodities requires appropriate policies to drive value addition, which is closely linked to improvements in quality, productivity, competitiveness, and industry sustainability [62].

In Karawang Regency, shrimp recorded the highest Composite Index score at 95.70 (Very High category), followed by milkfish with a score of 72.70 (High category) (Table 8). Both commodities are designated as development

priorities to serve as sustainable raw material sources for the agro-industry. Shrimp achieved the highest score among all regencies, reaffirming its status as a flagship commodity with both comparative and competitive advantages in Karawang.

The analysis of the four regencies shows that the potential of aquaculture commodities as superior raw materials for agro-industrial development is strengthened through five analytical approaches, serving as the foundation for initial competitiveness assessment. However, the success of agro-industrial development is not solely determined by the quality of raw materials but is also influenced by other factors, including technological capability. Enhancing technological capacity plays a crucial role in driving regional economic growth through innovation, industrial diversification, and the adaptation of strategies based on the stages of local technology development [63].

Coastal industrial development requires strategic considerations, particularly regarding the availability of raw materials. Optimizing local raw materials through the designation of superior commodities and further processing can enhance value addition. Stable availability also strengthens supply chain resilience, which is a critical issue in ensuring the sustainability and competitive advantage of industries [24]. Therefore, regional development should be framed within the context of regional knowledge capacity as a strategic foundation. This approach serves as an economic roadmap that guides the emergence of new products, industries, and technologies in the future [64].

5. Conclusion

This study demonstrates that shrimp is the leading commodity across all four regencies, as evidenced by the results of the LQ, DLQ, SSA, SCI, and GRM analyses.

Tab.8. Scale and Composite Index (IC) of four districts

Komoditas	LQ	Cirebon Regency			MRP	IC	Kategori
		SS	DLQ	IKS			
Milkfish	57.71	6.04	21.59	89.08	19.90	38.86	Medium
Gourami	28.85	18.07	10.11	20.10	7.34	16.89	Very Low
Snapper	36.19	32.00	0.00	0.00	6.45	34.93	Low
Shellfish	100.00	32.68	41.91	5.47	14.99	39.01	Medium
Crab	26.52	31.87	25.10	0.13	19.55	20.63	Very Low
Catfish	22.63	29.48	32.71	100.00	18.74	40.71	Medium
Carp	-0.74	31.11	15.35	2.28	100.00	29.60	Low
Tilapia	47.42	0.00	0.00	38.52	0.00	17.19	Very Low
Pangasius	0.00	32.18	26.30	0.39	14.99	14.77	Very Low
Shrimp	**45.00**	**100.00**	**74.09**	**91.60**	**44.79**	**71.10**	**Very High**
Indramayu Regency							
Milkfish	100.00	0.00	0.00	83.18	66.77	49.99	Medium
Gourami	11.84	40.01	31.63	0.00	67.89	30.28	Very Low
Catfish	22.79	72.61	100.00	82.88	0.00	55.66	High
Tilapia	0.00	100.00	60.09	36.64	100.00	59.35	High
Shrimp	**92.97**	**44.80**	**37.75**	**100.00**	**62.67**	**67.64**	**Very High**
Subang Regency							
Milkfish	10.85	0.00	41.01	86.39	0.81	27.81	Very Low
Snapper	100.00	67.76	32.99	0.00	100.00	60.15	Very High
Carp	1.87	52.72	0.00	57.03	5.82	23.49	Very Low
Tilapia	0.00	76.64	15.10	62.87	0.00	30.92	Very Low
Seaweed	90.57	92.70	1.64	34.84	4.52	44.85	Medium
Shrimp	**8.60**	**100.00**	**100.00**	**100.00**	**1.83**	**62.09**	**Very High**
Karawang Regency							
Milkfish	100.00	75.23	0.00	93.76	94.51	72.70	High
Catfish	0.00	15.88	95.95	2.32	91.62	41.15	Very Low
Carp	7.69	56.41	96.21	13.60	0.00	34.78	Very Low
Nila	10.41	0.00	95.89	29.68	94.66	46.13	Very Low
Tilapia	6.98	15.25	94.74	0.00	95.48	42.49	Very Low
Seaweed	29.75	28.13	94.72	0.99	100.00	50.72	Low
Shrimp	**79.45**	**100.00**	**100.00**	**100.00**	**99.06**	**95.70**	**Very High**

This superiority is reflected in its consistently highest performance in terms of commodity base, production contribution, growth, and development prospects. The multi-method approach provides a more comprehensive conclusion, as each analytical method complements the others. The utilization of superior raw materials serves as a strategic factor in agro-industrial development, and these findings can serve as a basis for regional policymaking as well as be replicated in other regions.

Implications

This study can serve as a reference for further research on coastal regional development based on superior commodities. In the future, the analytical framework can be strengthened by integrating additional methods to achieve a more comprehensive mapping of commodity potential. For both regency and provincial governments, the findings of this study provide policy direction for addressing development challenges, both general and strategic. Strategic issues such as the development of border areas, acceleration of development in underdeveloped regions, and optimization of underutilized superior commodities should be prioritized. Therefore, the planning and implementation of development programs in coastal regions must take into account the spatial and sectoral potential of commodities.

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