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Commodity Area Analysis of Coffee in Kudus Regency

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Abstract: Coffee is one of the important plantation commodities cultivated in Kudus Regency and has the potential to be developed as a leading commodity to support regional economic growth. This study aims to identify coffee based production areas and analyze the characteristics of the spatial distribution of coffee commodities in Kudus Regency. The scope of the research focuses on robusta coffee production across districts in Kudus Regency. The study uses secondary time-series data covering the period from 2015 to 2024 obtained from official statistical sources. A descriptive quantitative approach was applied, employing Location Quotient (LQ) analysis, locality analysis, and specialization analysis to determine base areas, spatial concentration, and production specialization of coffee farming. The results show that based on coffee production indicators, there are two out of nine districts in Kudus Regency identified as coffee base areas, namely Gebog and Dawe Districts. However, coffee farming activities are not localized or concentrated in a single district but are instead spread across several districts. In addition, coffee farming in Kudus Regency does not indicate a high level of specialization compared to other plantation commodities. Despite this condition, coffee remains a strategic commodity that contributes to plantation development and regional development in Kudus Regency. These findings can serve as a reference for regional planning and policy formulation in developing coffee as a superior plantation commodity.

Keywords: Coffee Commodity, Location Quotient, Regional Potential Mapping, Plantation Development

1. Introduction

The plantation subsector is one of the strategic sectors in Indonesia's agricultural development because it plays an important role in increasing foreign exchange earnings, absorbing labor, improving farmers' incomes, and supporting regional development. The potential of this subsector is supported by various prospective commodities that are able to stimulate social and economic development in rural communities. Therefore, the development of the agricultural sector, particularly the plantation subsector, needs to be examined in depth to identify leading commodities that have high competitiveness and the potential to be developed sustainably (Helmi et al., 2021). One plantation commodity that has a strategic role in the Indonesian economy is coffee. Indonesia is the fourth largest coffee producer in the world after Brazil, Colombia, and Vietnam, and the majority of national coffee production is intended for the export market. In international trade, coffee is mainly traded in two types, namely robusta coffee and arabica coffee, each of which has a different export market share. The contribution of coffee to the national economy is reflected not only in its trade performance and value-added growth, but also in its role in providing employment opportunities and serving as a source of income for communities, especially in production center areas (Directorate General of Plantations, 2020; Indonesian Agency for Agricultural Research and Development, 2012 in Fithriyyah et al., 2020).

Central Java is one of the main coffee plantation centers in Indonesia. In addition to other plantation commodities such as coconut, sugarcane, tobacco, rubber, and tea, coffee is widely cultivated in this region, both arabica and robusta varieties. According to data from the Central Java Statistics Agency (2025), coffee production in Central Java in 2024 reached 26,492.13 tons with a plantation area of 37,702.50 hectares. One of the regions contributing to coffee production in Central Java is Kudus Regency.

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Kudus Regency is one of the coffee-producing regions in Central Java Province, with coffee production in 2024 amounting to 604.61 tons and a plantation area of 723.20 hectares (Statistics Indonesia of Kudus Regency, 2025). Coffee cultivation in Kudus Regency is predominantly managed by smallholder farmers, making this commodity important for labor absorption and a source of income for local communities. However, the development of the coffee sector in Kudus Regency faces various challenges, such as fluctuations in global coffee prices, the impacts of climate change on production quantity and quality, as well as dynamic changes in production levels and plantation areas. On the other hand, each sub-district in Kudus Regency still has the potential to be developed as a base area for coffee commodities. One important factor in agricultural commodity development is regional potential; therefore, proper planning in determining leading regions is essential. Each region has different characteristics and strategic values according to its resource potential, thus requiring a comprehensive assessment in planning agricultural commodity development (Kusmiati & Windiarti, 2011 in Bangun, 2020).

To identify base areas for coffee commodity development, one analytical method that can be used is Location Quotient (LQ) analysis. LQ analysis is applied to assess the economic condition of a region and to identify sectors or commodities that serve as the economic base. Through this analysis, it can be determined to what extent coffee commodities contribute to the regional economy compared to other regions. Although the LQ method is not yet able to provide final conclusions regarding the most strategic areas, as an initial step it is quite effective in describing the potential and comparative advantages of a region (Agustina & Utomo, 2014; Jumiyanti, 2018). Based on the above description, a study on mapping the regional potential of robusta coffee commodities in Kudus Regency is necessary. This research aims to identify sub-districts that serve as the production base for coffee and to analyze the characteristics of the spatial distribution pattern of robusta coffee commodities in Kudus Regency.

2. Literature Review

2.1 Development Theory and Economic Growth Theory

The concept of economic development has evolved in line with changes in policy orientation, which no longer focuses solely on increasing Gross Domestic Product (GDP) by five to seven percent or more per year (Ananda, 2018). According to Purba et al. (2021), economic development can be understood as a series of activities undertaken by a country to transform economic conditions that were initially relatively static over a certain period of time. Meanwhile, economic growth is associated with an increase in per capita output, which is obtained from the ratio between total output and the population size.

Furthermore, Mahi et al., (2017) explain that economic growth encompasses various activities occurring across all economic sectors. The measurement of economic growth is conducted by aggregating the production value of all sectors; therefore, sectoral activities play a very important role in economic development at both national and regional levels. Based on this perspective, the approach that explains regional economic growth is known as the sectoral approach. Thus, economic development and growth can be interpreted as a partnership pattern between local governments and the private sector in creating new employment opportunities and stimulating the development of economic activities within a region.

2.2 The Concept of Location Quotient (LQ)

Location Quotient (LQ) is a quantitative approach used to assess the level of specialization of an economic sector in a particular region compared to a broader reference region (Miller et al., 1991). Isard (1996) states that LQ is an effective analytical tool for identifying leading sectors in a regional economy. Furthermore, Stimson et al. (2019) explain that an LQ value greater than one indicates the presence of a comparative advantage, meaning that the sector has the potential to generate a surplus and be developed as an export-oriented commodity. Conversely, an LQ value of less than one indicates that the sector has not yet been able to meet the needs of its own region and remains dependent on supplies from other regions.

3. Methodology

This study uses secondary data sourced from publications of Statistics Indonesia (Badan Pusat Statistik/BPS) of Kudus Regency. The data analyzed consist of time series data over a ten-year period, namely from 2015 to 2024. The research variables include coffee production and various other plantation commodities cultivated by communities in each sub-district of Kudus Regency.

The analytical method applied in this study aims to identify base and non-base areas of coffee commodities in Kudus Regency. This analysis is conducted using the Location Quotient (LQ) method, as formulated by Bangun (2020) and Iswi and Santoso (2015).

$$\boldsymbol{LQ_i = \frac{y_{ij}/y_j}{Y_i/Y}}$$

Where:

LQ_i : Location Quotient

y_{ij} : Coffee production in sub-district i

y_j : Total commodity production in sub-district i
Y_i : Coffee production in Kudus Regency
Y : Total plantation commodity production in Kudus Regency

The decision-making criteria are as follows:
1. If the LQ value is greater than one (LQ > 1), the area is categorized as a base sub-district for coffee commodities, meaning that its production level is not only able to meet internal regional demand but also has a surplus that can be marketed outside the region.
2. Conversely, if the LQ value is less than one (LQ < 1), the area is classified as a non-base sub-district for coffee commodities, as its production is only sufficient to meet the needs of the sub-district itself.

The analytical methods used to identify the characteristics and distribution patterns of coffee commodities in Kudus Regency are localization analysis and specialization analysis. The localization coefficient is used to assess the degree of concentration of agricultural activities in a region, employing the formula proposed by Widyatami and Wiguna (2017) in Bangun (2020).

$$\alpha_i = [S_i/N_i] - \left[\sum S_i / \sum N_i\right]$$

Where:
α : Localization coefficient of coffee commodities
S_i : Coffee commodity production in sub-district i
N_i : Coffee commodity production in Kudus Regency
ΣS_i : Total plantation commodity production in sub-district i
ΣN_i : Total plantation commodity production in Kudus Regency

The decision-making criteria are as follows:
1. If $\alpha \geq 1$, coffee commodities are considered localized or concentrated in a particular sub-district.
2. Conversely, if $\alpha < 1$, it indicates that coffee commodities have a relatively even distribution pattern across several sub-districts in Kudus Regency.

The specialization coefficient is an indicator used to evaluate the extent to which a region has a specific focus or specialization in certain activities. The specialization coefficient is calculated using the formula proposed by Nurmalia et al. (2019) in Bangun R.H. (2020).

$$\beta_i = \left[S_i/\sum S_i\right] - \left[N_i/\sum N_i\right]$$

Where:
β_i : Specialization coefficient of coffee commodities
S_i : Coffee commodity production in sub-district i
N_i : Coffee commodity production in Kudus Regency
ΣS_i : Total plantation commodity production in sub-district i
ΣN_i : Total plantation commodity production in Kudus Regency

The decision-making criteria are as follows:
1. If $\beta \geq 1$, the sub-district is considered to have developed a specialization in coffee commodity production.
2. If $\beta < 1$, the sub-district has not yet demonstrated specialization in coffee commodity production.

4. Result

4.1 Development of Coffee Production

Robusta coffee production in Kudus Regency in 2024 increased by 3.33 percent compared to the average production in 2023 (Statistics Indonesia of Kudus Regency, 2025). This increase reflects the growing interest of local communities in developing coffee cultivation enterprises. This condition also indicates the strong potential of robusta coffee to continue to be developed and to strengthen its position as one of the leading commodities in Kudus Regency.

4.2 Base Areas of Coffee Commodities

The regionalization of leading commodities refers to the determination of commodities that become the focus of development in each sub-district. The identification of base and non-base areas was carried out based on the Location Quotient (LQ) values of coffee commodities in each sub-district. The results of the Location Quotient (LQ) calculation for coffee commodities based on production indicators in Kudus Regency during the period 2015–2024 are presented in Table 1.

Table 1. Results of Location Quotient (LQ) Calculation for Base Areas of Coffee Commodities Based on Production Indicators in Kudus Regency, 2015–2024

Sub-district	LQ Value										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Average
Kaliwingu	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Kota	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Jati	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Undaan	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Mejobo	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Jekulo	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Bae	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Gebog	2,012	1,498	1,764	1,259	1,110	1,552	1,913	1,953	2,319	2,443	1,782
Dawe	1,328	1,836	2,564	1,920	1,125	2,609	2,005	1,926	1,808	1,680	1,880

Source: Processed data, 2025

Table 1 shows that coffee is one of the plantation commodities cultivated by communities in sub-districts classified as base areas in Kudus Regency. Based on the Location Quotient (LQ) analysis, out of nine sub-districts, two were identified as base areas for coffee commodities, namely Gebog Sub-district and Dawe Sub-district. Both sub-districts recorded LQ values greater than one based on production indicators, indicating that coffee production levels in these areas are higher than the average coffee production in Kudus Regency. This condition demonstrates that Gebog and Dawe Sub-districts have considerable potential to be developed as leading coffee commodity areas in support of regional economic growth.

During the 2015–2024 period, LQ values of coffee commodities in the base sub-districts exhibited fluctuating dynamics, influenced by various factors such as unstable climatic conditions. Dawe Sub-district recorded the highest average LQ value of 1.880, indicating that coffee production in this area is not only sufficient to meet local demand but also generates surplus production to supply other regions. Meanwhile, other sub-districts Kaliwungu, Kota, Jati, Undaan, Mejobo, Jekulo, and Bae are categorized as non-base areas for coffee commodities, presumably due to less favorable topographic and climatic conditions. These findings emphasize that coffee commodities have high development potential in base areas, thus requiring well directed and sustainable regional development strategies to strengthen the role of coffee as a leading commodity in Kudus Regency.

4.3 Distribution of Coffee Commodities in Kudus Regency

The characteristics of coffee distribution in Kudus Regency can be analyzed through the results of localization and specialization analyses. Localization analysis is used to determine whether coffee commodities are concentrated in specific areas or dispersed across several sub-districts. Meanwhile, specialization analysis provides an overview of the tendency of each sub-district to focus its agricultural activities on coffee commodities.

Table 2. Results of Localization Analysis of Coffee Production in Kudus Regency

Sub-district	Localization (+)										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Average
Kaliwingu	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Kota	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Jati	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Undaan	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Mejobo	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Jekulo	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Bae	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Gebog	0,090	0,061	0,073	0,030	0,014	0,053	0,072	0,076	0,107	0,116	0,069
Dawe	0,079	0,144	0,203	0,170	0,040	0,217	0,175	0,166	0,139	0,123	0,146

Source: Processed data, 2025

Based on Table 2, the results of the localization analysis of coffee production in Kudus Regency during the 2015–2024 period indicate that most sub-districts do not exhibit positive localization values. Kaliwungu, Kota, Jati, Undaan, Mejobo, Jekulo, and Bae Sub-districts consistently recorded localization values of 0.000 throughout the

observation period. This condition indicates that coffee production in these areas is not concentrated and has not become a dominant activity compared to other sub-districts in Kudus Regency. Thus, coffee commodities in these sub-districts do not demonstrate spatial clustering patterns or relative advantages.

In contrast, Gebog and Dawe Sub-districts show positive localization values with fluctuations from year to year. Gebog Sub-district recorded an average localization value of 0.069, while Dawe Sub-district recorded a higher average value of 0.146. However, the localization coefficients for all sub-districts remain below one ($\alpha < 1$), indicating that coffee plantation activities in Kudus Regency are not concentrated in a single area but are instead dispersed across several sub-districts. These findings are consistent with Nurmalia and Suwandari (2019) and Sholihah et al., (2015), who argue that the spatial distribution of agricultural commodities across regions can provide advantages in maintaining availability and equitable fulfillment of commodity needs, as when one region experiences production constraints, other regions can act as buffers.

Table 3. Results of Specialization Analysis of Coffee Production in Kudus Regency

Sub-district	Spesialisasi (+)										
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**Mean**
Kaliwingu	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Kota	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Jati	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Undaan	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Mejobo	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Jekulo	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Bae	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Gebog	0,008	0,004	0,000	0,004	0,046	0,002	0,003	0,003	0,001	0,001	0,007
Dawe	0,003	0,006	0,001	0,005	0,053	0,005	0,003	0,003	0,001	0,001	0,008

Source: Processed data, 2025

Based on Table 3, the results of the specialization analysis of coffee production in Kudus Regency during the 2015–2024 period indicate that most sub-districts do not exhibit positive specialization values. Kaliwungu, Kota, Jati, Undaan, Mejobo, Jekulo, and Bae Sub-districts consistently recorded specialization values of 0.000 throughout the observation period. This condition indicates that these sub-districts do not consider coffee as a leading commodity or a primary focus in agricultural production activities, but instead cultivate various other commodities simultaneously as part of farm diversification strategies.

Meanwhile, Gebog and Dawe Sub-districts show positive specialization values, although relatively small and fluctuating from year to year, with average values of 0.007 and 0.008, respectively. However, all specialization index values remain below one ($\beta < 1$), indicating that no sub-district in Kudus Regency truly specializes in coffee production. This finding is consistent with Pasaribu and Soetriono (2009) in Bangun (2020), who state that the absence of regional specialization in a single commodity reflects the diversity of agricultural commodities cultivated by communities. Such diversity functions as a strategy to meet economic and food needs while simultaneously reducing farming risks arising from dependence on a single commodity.

5. Conclusion

Based on the results of the Location Quotient (LQ), localization, and specialization analyses of coffee production in Kudus Regency during the 2015–2024 period, it can be concluded that coffee is a leading commodity with its potential concentrated in Dawe Sub-district and Gebog Sub-district as base areas, as indicated by LQ values greater than one. However, the results of the localization and specialization analyses show that coffee production activities are not yet concentrated and have not become a specifically specialized commodity at the sub-district level, since all localization coefficients and specialization indices are below one. This condition indicates that coffee farming in Kudus Regency remains spatially dispersed and is carried out alongside other agricultural commodities. Therefore, the development of coffee commodities requires well-directed regional planning, support for improving farmers' capacity, and sustainable policies so that coffee can be strengthened as one of the region's leading commodities capable of driving economic growth and improving community welfare.

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Conflict of Interest

The authors declare no conflicts of interest.

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