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# Regionalization Analysis of Ruminant Livestock Commodities in Majalengka Regency Using the Location Quotient Method

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## ABSTRACT

The ruminant livestock sector constitutes a critical component in ensuring food security and strengthening regional economies, thereby necessitating spatial analyses to identify its development potential. This study employed secondary data from the Central Bureau of Statistics (BPS) of Majalengka Regency covering the period 2020–2024. The objective was to examine the spatial distribution and regionalization of ruminant livestock enterprises using the Location Quotient (LQ), Localization Index (LI), and Specialization Index (SI). The commodities analyzed comprised sheep, goats, cattle, and buffalo across sub-districts within the regency. The findings revealed that sheep represent the dominant commodity, characterized by consistently high LQ, LI, and SI values, thus establishing their role as the primary basis for regional livestock development. Goats demonstrated moderate index values, indicating potential as an alternative for expansion. Cattle exhibited relatively even distribution across sub-districts but were not identified as a leading commodity. Buffalo recorded the lowest index values, underscoring their role as a complementary species. These results underscore the importance of commodity-based planning, particularly emphasizing sheep development, to enhance the competitiveness and sustainability of the livestock sector in Majalengka Regency.

**Keywords**: Location Quotient (LQ), Localization Index (LI), Majalengka Regency, Ruminants, Specialization Index (SI)

## INTRODUCTION

Regional development is an integral component of efforts to achieve equitable welfare distribution and to strengthen the national economic structure. Development strategies aimed at enhancing local capacity necessitate approaches that capitalize on the potential of local resources (Putra et al., 2023). In this context, productive sectors with regional advantages must be correctly identified to ensure tangible contributions to both community income and regional revenue. Such identification should not only be limited to crop commodities but also encompass the livestock subsector, particularly ruminant livestock, which holds significant economic and social value.

Ruminant livestock, comprising cattle, buffalo, goats, and sheep, represents one of the most important subsectors in agricultural development (Muta'ali, 2019). This group of livestock plays a strategic role in providing animal-based food such as meat and milk, contributing to household income, and generating rural employment opportunities (Ginting & Ritonga, 2018).

Furthermore, ruminant farming activities are closely linked with other sectors, including trade, processing industries, transportation, and livestock equipment services (Lutfi et al., 2024). Accordingly, ruminant livestock development not only serves as a source of nutrition but also drives regional economic growth (Dewi, 2018).

Majalengka Regency, located in West Java, is an agrarian region with considerable potential in the ruminant livestock subsector. Data from the Food Security, Agriculture, and Fisheries Office indicate that the populations of cattle, buffalo, goats, and sheep in this region have exhibited significant dynamics over recent years. Among these species, sheep are the most dominant, with the largest population and making substantial contributions to meeting the demand for sheep in the Greater Jakarta area, particularly during religious events such as Eid al-Adha. Nevertheless, other ruminants, such as goats, beef cattle, and buffalo, also play vital roles both as sources of farmer income and as integral components of integrated farming systems.

Fluctuations in ruminant livestock populations from year to year reflect market dynamics, technical farming conditions, and policy factors that influence business sustainability. For instance, according to BPS data, sheep populations declined in 2022 but subsequently increased in 2023 and 2024. Similar patterns were observed for goats and beef cattle, suggesting that while this subsector remains vulnerable to external factors, it continues to exhibit long-term stability. This trend underscores the importance of ruminant livestock as a cornerstone of smallholder farming systems in Majalengka.

Despite its considerable potential, a key challenge lies in the absence of detailed mapping of ruminant livestock production bases at the sub-district level. To date, livestock population data have primarily been presented in aggregate form, without adequately highlighting comparative advantages across regions. Consequently, livestock development policies tend to remain general and fail to account for the specific characteristics of each area. In fact, information on ruminant livestock production centers is crucial for formulating development strategies that are targeted, efficient, and aligned with regional resource potential, particularly in differentiating between base and non-base sectors within a regency (Jumiyanti, 2018).

Within the framework of regional development, Majalengka Regency holds a strategic position as a ruminant-producing region, especially for sheep, which make a substantial contribution to livestock supply in West Java and at the national level. However, without data-based spatial mapping, livestock development efforts risk being misaligned with regional priorities. Therefore, quantitative analytical approaches such as the Location Quotient (LQ), Localization Index (LI), and Specialization Index (SI) are essential to identify base commodities and the spatial distribution of ruminant livestock across sub-districts.

Previous studies on ruminant livestock in Majalengka have primarily focused on technical farming practices and farm-level economics, while research on spatial distribution using index-based analyses remains limited. Such analyses, however, are fundamental for formulating more precise livestock development policies. Therefore, this study aims to identify ruminant livestock production bases in Majalengka Regency by applying LQ, LI, and SI. The findings are expected to provide a comprehensive understanding of regional commodity potentials and to support the development of an integrated, competitive, and sustainable livestock subsector.

## MATERIAL AND METHOD

Data collection in this study was based on secondary data obtained from official livestock statistics published in Majalengka Regency for the period 2020 to 2024. The data collected included the total population of ruminant livestock, with a particular focus on sheep, which served as the basis for calculating the Location Quotient (LQ), Localization Index (LI), and Specialization Index (SI). Livestock population data were sourced from the Central Bureau of

Statistics (BPS) of Majalengka Regency, which provides annual population developments by sub-district.

The Location Quotient (LQ) analysis was employed to measure the contribution of each ruminant livestock commodity, such as sheep, as a leading commodity in Majalengka Regency. The same calculation was repeated for other livestock commodities, including goats, cattle, and buffalo. This method was used to compare the proportion of sheep populations across sub-districts with the overall ruminant population in Majalengka Regency. The LQ value obtained was then used to determine the level of comparative advantage of each commodity in the study area.

The calculation of the Location Quotient (LQ) in this study applied the following equation:

$$LQij = \frac{Xij\ /Xi.}{X.j/X..}$$

Notes:
LQij = Location Quotient index for sheep commodity in Majalengka Regency
Xij = Sheep population in sub-district i (Animal Unit / AU)
Xi = Total ruminant population in sub-district i (AU)
X.j = Sheep population in Majalengka Regency AU)
X.. = Total ruminant population in Majalengka Regency (AU)

Interpretation of the Location Quotient (LQ) values was conducted using the following criteria: an LQ value greater than 1 indicates that sheep farming possesses a relative comparative advantage and can be categorized as a base commodity in Majalengka Regency. Conversely, an LQ value of less than 1 suggests that the commodity does not serve as a basis, and its contribution is relatively lower than the average level at the provincial scale.

b. Characterization of Distribution

The Localization Index (LI) and Specialization Index (SI) were applied to evaluate the spatial distribution pattern of sheep farming across subdistricts in Majalengka Regency. The LI was used to measure the degree of spatial concentration of sheep populations within a given subdistrict relative to the regency as a whole. Meanwhile, the SI was utilized to assess the level of specialization of sheep farming compared to other ruminant livestock commodities. Thus, the LI emphasizes the regional concentration aspect, whereas the SI focuses more on the structural specialization of the commodity.

The equation for calculating the Localization Index (LI) is expressed as follows:

$$LI = \frac{1}{2}\sum_{i=1}^{n}\left\{\left|\frac{X_{ij}}{X_{.j}} - \frac{X_{i.}}{X_{..}}\right|\right\}$$

Notes:
Xij = Sheep population in subdistrict i
X.j = Total sheep population in Majalengka Regency
Xi. = Total ruminant livestock population in subdistrict
X.. = Total ruminant livestock population in Majalengka Regency
n = number of subdistricts

The LI value ranges between 0 and 1, where values approaching 1 indicate a higher degree of spatial concentration (i.e., the distribution is more localized in specific subdistricts).

Specialization Index (SI)

The equation for calculating the Specialization Index (SI) is formulated as follows:

$$SI = \frac{1}{2}\sum_{j=1}^{P}\left\{\left|\frac{X_{ij}}{X_{i.}} - \frac{X_{.j}}{X_{..}}\right|\right\}$$

Notes:
Xij = sheep population in subdistrict i
Xi. = Total ruminant livestock population in subdistrict i
X.j = Total sheep population in Majalengka Regency
X.. = Total ruminant livestock population in Majalengka Regency
P = number of ruminant livestock types

The SI value ranges from 0 to 1. A value close to 1 indicates that livestock farming in a subdistrict is highly specialized in sheep production compared to other ruminant commodities. Conversely, a value approaching 0 suggests that livestock farming in the subdistrict is more diversified and evenly distributed among different ruminant types.

## RESULT AND DISCUSSION

### Location Quotient (LQ) Analysis of Ruminant Livestock

The Location Quotient (LQ) analysis was applied to examine the level of specialization and the basis of ruminant livestock commodities in Majalengka Regency. An LQ value greater than 1 (LQ>1) indicates that a subdistrict possesses a comparative advantage or belongs to the category of a basis sector. Conversely, an LQ value less than 1 (LQ<1) signifies that the subdistrict is classified as non-basis, implying that the contribution of the commodity is relatively small to the regional economy.

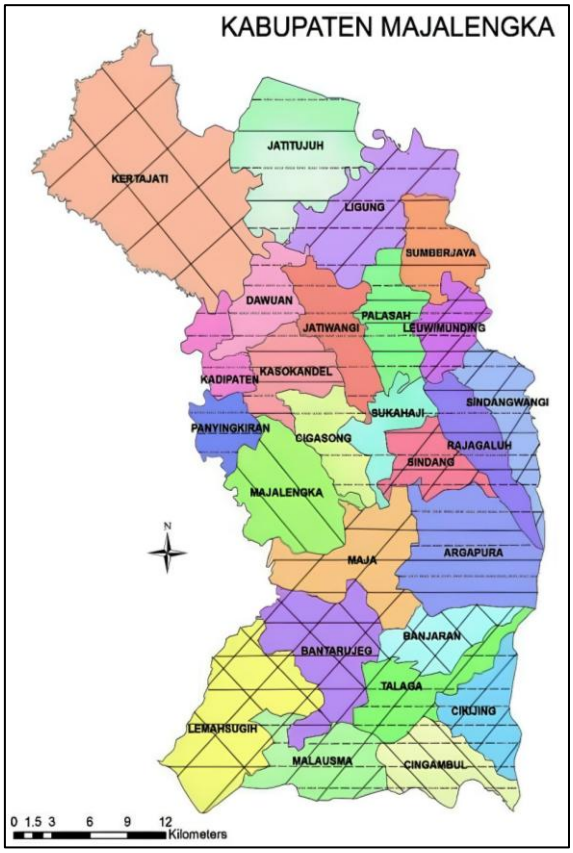


Figure 1. Distribution pattern of ruminant livestock commodities

Note:
= Sheep = Goat = Cattle = Buffalo

The results of the LQ calculation for the 2020–2024 period are presented in Table 1, which illustrates the distribution and relative role of the four main ruminant livestock commodities, namely sheep, goats, cattle, and buffalo, across the subdistricts of Majalengka Regency. These findings provide a clear overview of which commodities serve as the economic basis and which remain secondary in terms of contribution to the livestock sector (Table 1).

Table 1. Location Quotient Analysis of Ruminant Livestock in Majalengka Regency (2020–2024)

| Subdistrict | Sheep (LQ) | Conclusion | Goat (LQ) | Conclusion | Cattle (LQ) | Conclusion | Buffalo (LQ) | Conclusion |
|---|---|---|---|---|---|---|---|---|
| Lemahsugih | 0.83 | Non Basis | 1.49 | Basis | 3.13 | Basis | 1.14 | Basis |
| Bantarujeg | 0.97 | Non Basis | 1.65 | Basis | 1.22 | Basis | 2.61 | Basis |
| Malausma | 1.00 | Basis | 0.98 | Non Basis | 0.92 | Non Basis | 2.78 | Basis |
| Cikijing | 1.01 | Basis | 0.95 | Non Basis | 0.82 | Non Basis | 1.53 | Basis |
| Cingambul | 1.00 | Non Basis | 0.42 | Non Basis | 1.17 | Basis | 0.69 | Non Basis |
| Talaga | 1.00 | Non Basis | 1.05 | Basis | 0.99 | Non Basis | 1.59 | Basis |
| Banjaran | 0.98 | Non Basis | 0.34 | Non Basis | 1.38 | Basis | 1.67 | Basis |
| Argapura | 1.03 | Basis | 1.23 | Basis | 0.60 | Non Basis | 0.36 | Non Basis |
| Maja | 0.99 | Non Basis | 1.64 | Basis | 0.88 | Non Basis | 1.54 | Basis |
| Majalengka | 0.93 | Non Basis | 0.91 | Non Basis | 1.87 | Basis | 0.29 | Non Basis |
| Cigasong | 1.05 | Basis | 0.32 | Non Basis | 0.57 | Non Basis | 0.43 | Non Basis |
| Sukahaji | 1.03 | Basis | 0.90 | Non Basis | 0.67 | Non Basis | 0.85 | Non Basis |
| Sindang | 1.04 | Basis | 1.06 | Basis | 0.53 | Non Basis | 1.10 | Basis |
| Rajagaluh | 1.02 | Basis | 1.72 | Basis | 0.61 | Non Basis | 0.93 | Non Basis |
| Sindangwangi | 1.02 | Basis | 1.03 | Basis | 0.79 | Non Basis | 1.60 | Basis |
| Leuwimunding | 1.02 | Basis | 1.53 | Basis | 0.56 | Non Basis | 1.13 | Basis |
| Palasah | 1.00 | Basis | 1.24 | Basis | 0.93 | Non Basis | 0.40 | Non Basis |
| Jatiwangi | 1.04 | Basis | 0.42 | Non Basis | 0.62 | Non Basis | 0.07 | Non Basis |
| Dawuan | 1.03 | Basis | 0.89 | Non Basis | 0.59 | Non Basis | 0.90 | Non Basis |
| Kasokandel | 1.03 | Basis | 1.48 | Basis | 0.50 | Non Basis | 0.16 | Non Basis |
| Panyingkiran | 1.04 | Basis | 0.38 | Non Basis | 0.72 | Non Basis | 0.10 | Non Basis |
| Kadipaten | 1.04 | Basis | 0.58 | Non Basis | 0.65 | Non Basis | 0.41 | Non Basis |
| Kertajati | 0.91 | Non Basis | 0.62 | Non Basis | 2.18 | Basis | 1.40 | Basis |
| Jatitujuh | 1.04 | Basis | 1.30 | Basis | 0.51 | Non Basis | 0.07 | Non Basis |
| Ligung | 1.00 | Basis | 0.64 | Non Basis | 0.97 | Non Basis | 2.22 | Basis |
| Sumberjaya | 1.04 | Basis | 1.11 | Basis | 0.51 | Non Basis | 0.38 | Non Basis |

*Source: Processed secondary data (BPS Majalengka Regency, 2020–2024), compiled by the author, 2025.*

*Note: LQ > 1 → Indicates that the livestock commodity has a comparative advantage and is categorized as a basis sector in the respective subdistrict; LQ < 1 → Indicates that the commodity is non-basis, meaning its role is comparatively less important in the subdistrict's economy relative to the regency average.*

To clarify the results of the table analysis, a regional map is required. This map illustrates the distribution of ruminant livestock bases in each sub-district of Majalengka Regency based on the calculated index values. With the inclusion of the map (Figure 1), the spatial pattern of livestock commodity distribution is more clearly visible, making it easier to identify which areas serve as production centres. This spatial visualisation also helps better understand differences in potential between sub-districts, while providing a concrete overview of the development direction of ruminant livestock farming in the study area.

### *1) Sheep Commodity*

The results of the LQ analysis indicate that sheep are relatively evenly distributed across most sub-districts in Majalengka Regency. Several sub-districts recorded LQ values close to or slightly above 1, such as Cikijing (1.01), Argapura (1.03), and Panyingkiran (1.04). These values suggest that these areas are classified as basis regions, where sheep play an important role in the local economic structure. The relatively even distribution reflects the fact that sheep have long been integrated into community life, both as a source of household income and as part of cultural and religious practices such as aqiqah and qurban (Robiansyah & Karim, 2020).

Nevertheless, there are also several sub-districts categorized as non-basis, such as Majalengka (0.93) and Kertajati (0.91). This indicates that sheep populations in these areas are relatively smaller compared to the regency average, resulting in a less significant economic role. Contributing factors may include limited grazing land, land-use changes, or shifts in farmers' preferences toward other livestock such as cattle and buffalo.

In terms of potential, sheep-based sub-districts can be developed as specialized centers through productivity improvement, better feed management, and strengthened farmer institutions. Meanwhile, in non-basis areas, sheep can be maintained as a complementary activity to crop farming, ensuring sustainability without necessarily being a primary commodity.

Overall, sheep hold an important position as a leading livestock commodity in Majalengka Regency. The local government may consider sheep to be one of the pillars of community-based livestock development, particularly to meet both local demand and regional market demand.

### *2) Goat Commodity*

Goats exhibit a more varied distribution pattern compared to sheep. Some sub-districts recorded high LQ values, including Bantarujeg (1.65), Rajagaluh (1.72), and Maja (1.64). These values provide strong evidence that goats are a significant commodity in these areas, with considerable development potential. Such basis regions could serve as the foundation for establishing market-oriented goat production centers, targeting both meat supply and religious festivities.

Conversely, several sub-districts show very low LQ values, such as Banjaran (0.34), Panyingkiran (0.38), and Jatiwangi (0.42). This suggests that goats are not dominant in these regions. Contributing factors may include topographical conditions, community preferences for other livestock, or feed availability that is less suitable for goats (Purnama & Widianingrum, 2025).

The coexistence of basis and non-basis goat regions highlights the importance of a targeted development strategy. In contrast, non-basis regions may focus on integrating goats with crop farming, such as utilizing prioritized areas for large-scale production and the establishment of farmer cooperatives to strengthen competitiveness. In contrast, non-basis regions may focus on integrating goats with crop farming, such as utilising agricultural by-products for feed.

Thus, goats present significant potential in certain sub-districts, although their distribution across Majalengka is uneven. A location-specific development strategy would be more effective in elevating goats as a leading livestock commodity.

### *3) Cattle Commodity*

Cattle exhibit highly diverse LQ values across sub-districts. Some sub-districts recorded very high LQ values, such as Lemahsugih (3.13), Kertajati (2.18), and Majalengka (1.87). These figures reflect strong specialization, positioning cattle as a potential driver of local economic growth. Beyond their role as a source of animal protein, cattle also contribute to farming activities as draft power (though less so in recent years) and serve as a form of household savings (Tatipikalawan et al., 2022).

On the other hand, several sub-districts recorded LQ values below 1, such as Argapura (0.60), Cigasong (0.57), and Dawuan (0.59). These figures suggest that cattle are not yet a leading commodity in these areas, despite their presence. Possible contributing factors include limited forage availability, land-use competition, and farmers' limited financial capacity to sustain cattle farming.

Based on these findings, cattle development strategies should be directed toward the basis regions by increasing population numbers and improving production efficiency. According to Lubis et al. (2025), this may include artificial insemination programs, improved feed management, and enhanced market access. In non-basis regions, cattle development can serve as a supplementary activity to strengthen local food security without being the primary focus.

In conclusion, cattle have considerable potential, but their development is unevenly distributed across Majalengka. Basis regions provide strategic entry points for expanding cattle farming within the regency.

***4) Buffalo Commodity***

Buffalo still play a notable role in several sub-districts, although their population has generally declined compared to cattle and goats. The LQ results show that buffalo remain dominant in Malausma (2.78), Ligung (2.22), and Bantarujeg (2.61). These values illustrate that buffalo are still maintained in areas characterized by extensive rice fields or strong cultural traditions of buffalo rearing.

Conversely, some sub-districts recorded very low LQ values, nearly approaching zero, such as Jatiwangi (0.07), Jatitujuh (0.07), and Panyingkiran (0.10). These figures indicate that buffalo no longer hold significant economic importance in these areas. This decline can be attributed to shifts in agricultural practices, the mechanization of rice farming, and reduced farmer interest, with many preferring cattle over buffalo (Hilwawan et al., 2020).

Nevertheless, buffalo-basis regions still hold potential for development, particularly for buffalo meat, which continues to be in demand in traditional markets, and for conserving local genetic resources. Buffalo can also serve as a cultural livestock icon unique to Majalengka and could be promoted as part of agro-cultural tourism.

In summary, buffalo are no longer a broadly leading commodity, but they remain important in certain sub-districts. Development strategies should therefore focus on basis regions, combining conservation with productivity improvements, to ensure the long-term preservation of buffalo for future generations (Ulum et al., 2024).

**Analysis of the Localization Index (LI) of Ruminant Livestock**

The Localization Index (LI) is applied to measure the degree of concentration or spatial distribution of a commodity within a specific region. A higher LI value indicates that the commodity is more concentrated in one or several subdistricts. In contrast, a lower LI value suggests that the commodity is more evenly distributed across the entire region. Thus, the LI complements the results of the Location Quotient (LQ) analysis by providing further insight into whether a commodity is concentrated in certain areas or more widely dispersed.

The results of the LI calculation for ruminant livestock in Majalengka Regency during the period 2020–2024 are presented in the following table. The results of the Localization Index analysis for ruminant livestock are shown in Table 2.

***1) Sheep Commodity***

The results of the LI calculation indicate that sheep have very small values across almost all sub-districts, ranging from 0.0001 to 0.0042. The lowest values are observed in Ligung (0.0001) and Talaga (0.0001), while the highest is in Lemahsugih (0.0042). These low values suggest that the sheep population is evenly distributed and not concentrated in a particular area. This aligns with the fact that sheep are predominantly raised under traditional smallholder

systems, either in household yards or open fields, which contributes to their widespread presence across most sub-districts.

The even distribution pattern also demonstrates that sheep possess a high level of adaptability to diverse geographical conditions (Ibrahim et al., 2025). Both highland areas, such as Argapura, and lowland areas, such as Jatitujuh, maintain sheep populations, albeit in varying numbers. This illustrates the flexibility of sheep farming, which is not highly dependent on specific environmental conditions.

From a livestock development perspective, Surachman et al. (2022) highlight that the equal distribution of sheep is advantageous for economic development, as sheep adapt well, are preferred by communities, and benefit from sufficient forage availability, including agricultural by-products. Consequently, local governments are not required to focus solely on certain basis areas; instead, they can promote sheep development simultaneously across nearly all sub-districts. This potential also strengthens the role of sheep as a reliable source of meat for local markets and religious practices such as aqiqah and qurban.

Thus, it can be concluded that sheep exhibit the most evenly distributed pattern compared to other commodities. This makes sheep a strategic commodity, important not only from an economic standpoint but also for promoting equitable livestock development across Majalengka Regency.

Table 2. Analysis of the Localization Index of Ruminant Livestock

| Subdistrict | Sheep | Goat | Cattle | Buffalo | Conclusion |
|---|---|---|---|---|---|
| Lemahsugih | 0.0042 | 0.0117 | 0.0509 | 0.0101 | uniformly distributed |
| Bantarujeg | 0.0005 | 0.0118 | 0.0039 | 0.0305 | uniformly distributed |
| Malausma | 0.0002 | 0.0006 | 0.0019 | 0.0313 | uniformly distributed |
| Cikijing | 0.0003 | 0.0010 | 0.0034 | 0.0113 | uniformly distributed |
| Cingambul | 0.0001 | 0.0095 | 0.0028 | 0.0102 | uniformly distributed |
| Talaga | 0.0001 | 0.0009 | 0.0027 | 0.0113 | uniformly distributed |
| Banjaran | 0.0004 | 0.0134 | 0.0076 | 0.0129 | uniformly distributed |
| Argapura | 0.0006 | 0.0045 | 0.0079 | 0.0165 | uniformly distributed |
| Maja | 0.0002 | 0.0126 | 0.0030 | 0.0135 | uniformly distributed |
| Majalengka | 0.0016 | 0.0026 | 0.0207 | 0.0170 | uniformly distributed |
| Cigasong | 0.0008 | 0.0123 | 0.0077 | 0.0104 | uniformly distributed |
| Sukahaji | 0.0004 | 0.0015 | 0.0049 | 0.0037 | uniformly distributed |
| Sindang | 0.0005 | 0.0009 | 0.0070 | 0.0024 | uniformly distributed |
| Rajagaluh | 0.0004 | 0.0139 | 0.0075 | 0.0058 | uniformly distributed |
| Sindangwangi | 0.0005 | 0.0026 | 0.0055 | 0.0098 | uniformly distributed |
| Leuwimunding | 0.0005 | 0.0102 | 0.0084 | 0.0061 | uniformly distributed |
| Palasah | 0.0001 | 0.0042 | 0.0015 | 0.0106 | uniformly distributed |
| Jatiwangi | 0.0008 | 0.0115 | 0.0075 | 0.0181 | uniformly distributed |
| Dawuan | 0.0007 | 0.0021 | 0.0079 | 0.0080 | uniformly distributed |
| Kasokandel | 0.0007 | 0.0096 | 0.0099 | 0.0170 | uniformly distributed |
| Panyingkiran | 0.0007 | 0.0122 | 0.0055 | 0.0177 | uniformly distributed |
| Kadipaten | 0.0006 | 0.0072 | 0.0059 | 0.0100 | uniformly distributed |
| Kertajati | 0.0021 | 0.0089 | 0.0278 | 0.0082 | uniformly distributed |
| Jatitujuh | 0.0008 | 0.0068 | 0.0110 | 0.0225 | uniformly distributed |
| Ligung | 0.0001 | 0.0074 | 0.0005 | 0.0302 | uniformly distributed |
| Sumberjaya | 0.0007 | 0.0021 | 0.0092 | 0.0106 | uniformly distributed |

*Source: Processed secondary data (BPS Majalengka Regency, 2020–2024), compiled by the author, 2025*

***2) Goat Commodity***

In contrast to sheep, goats show slightly higher LI values, ranging from 0.0006 to 0.0139. The highest values are recorded in Rajagaluh (0.0139), followed by Banjaran (0.0134) and Maja (0.0126). These relatively higher figures indicate a concentration of goat populations in specific sub-districts, which is consistent with the previous LQ results, which identified goats as a key commodity in several areas.

Nevertheless, most other sub-districts exhibit low LI values, such as Talaga (0.0009) and Malausma (0.0006). This confirms that although specific clusters of concentration exist, the overall distribution of goats remains relatively widespread. The broad distribution can be attributed to the fact that goats are relatively easy to raise, have low capital requirements, are resilient to various environmental conditions, and are supported by strong market demand.

The centers of goat concentration identified by LI values can be directed toward development hubs. For instance, Rajagaluh and Banjaran may be targeted as primary areas for goat production, both for meat supply and religious ceremonies. The concentration of goat farming in these areas also makes it more feasible to establish farmer cooperatives or associations, thereby enhancing competitiveness.

Meanwhile, sub-districts with lower LI values still play a crucial role, particularly in ensuring equitable distribution and meeting local needs. Integrating goats with crop farming, such as utilizing corn or peanut residues as feed, could be a suitable strategy to sustain goat populations (Jiyanto et al., 2022). Therefore, goats exhibit a generally widespread distribution with some localized concentrations, requiring location-specific development strategies.

***3) Cattle Commodity***

Cattle show a wider variation in LI values, ranging from 0.0005 to 0.0509. Lemahsugih records the highest value (0.0509), followed by Kertajati (0.0278) and Majalengka (0.0207). These values highlight a high concentration of cattle in specific sub-districts. In contrast, Ligung (0.0005) and Palasah (0.0015) present very low LI values, indicating relatively small and non-concentrated cattle populations.

The availability of forage resources, market access, and infrastructure support likely influences the concentration of cattle in Lemahsugih, Kertajati, and Majalengka. This aligns with Hasan et al. (2018), who emphasize the need for integrated crop-livestock farming systems to support national food security. As a large ruminant, cattle require extensive land and higher maintenance costs, making only certain areas suitable for large-scale cattle farming.

This uneven distribution pattern requires different policy approaches for sheep and goats. Cattle development should be concentrated in high-LI areas using intensive strategies, such as population expansion, artificial insemination, and improved market access. In non-concentrated areas, cattle can be maintained at a smaller scale as a supplementary household enterprise.

Thus, cattle exhibit a more concentrated distribution pattern than sheep and goats. Their development should therefore be focused on the basis areas to maximize their contribution to livestock-based economic growth in Majalengka Regency.

4) Buffalo Commodity

Buffalo exhibits relatively high variations in LI values, ranging from 0.0024 to 0.0313. The highest values are found in Malausma (0.0313), Bantarujeg (0.0305), and Ligung (0.0302), which represent the most substantial buffalo concentrations. Conversely, sub-districts such as Sindang (0.0024) and Sukahaji (0.0037) record low values. This pattern suggests that buffalo are concentrated only in certain sub-districts, particularly areas with extensive paddy fields and strong buffalo-rearing traditions.

Cultural factors play an important role in buffalo concentration. In several sub-districts, buffalo are still used for ploughing rice fields and are regarded as symbols of social status.

Furthermore, demand for buffalo meat remains present in traditional markets, prompting farmers in basis areas to maintain their buffalo herds.

However, in sub-districts with low LI values, the role of buffalo has declined, replaced by agricultural mechanization and shifting farmer preferences toward cattle or goats. This finding is consistent with Nurhayati et al. (2023), who noted that buffalo populations in urban areas are significantly smaller than those in rural areas and have declined substantially, reflecting a lower societal dependence on buffalo. Consequently, buffalo development strategies cannot be generalized. In basis areas such as Malausma or Ligung, programs focusing on conservation and productivity enhancement are more appropriate, while in other areas, small-scale maintenance or genetic resource preservation may suffice.

Thus, buffalo demonstrate a highly location-specific distribution. Their development should be based on sub-districts and supported by policies that combine conservation with productivity to ensure the sustainability of buffalo populations in the future.

**Specialization Index (SI) of Ruminant Livestock**

The Specialisation Index (SI) is calculated to assess a region's specialisation in a specific commodity. A higher SI value indicates that the commodity is relatively more concentrated in a particular subdistrict compared to other areas. It can thus be considered a leading or dominant commodity. Conversely, a lower SI value suggests that the commodity is not concentrated in a single area but is more evenly distributed across all subdistricts. The results of the Specialization Index (SI) analysis for ruminant livestock are presented in Table 3.

***1) Sheep Commodity***

The SI results indicate that sheep exhibit a relatively wide range of specialisation across subdistricts. The highest value was recorded in Kertajati (0.0406), followed by Majalengka (0.0314), Cigasong (0.0202), and Jatiwangi (0.0190). These figures suggest that these areas have a relatively higher sheep concentration than other subdistricts. Lemahsugih also showed a significant value (0.0799), although its population is more concentrated in rural areas. Meanwhile, subdistricts such as Palasah (0.0017) and Ligung (0.0016) had very low values, indicating that sheep are not the primary leading commodity in those areas. Overall, it can be concluded that sheep production centers tend to be concentrated in the northern and central parts of Majalengka, particularly Kertajati, which also supports the potential for commercial livestock development.

***2) Goat Commodity***

Goats display a somewhat different pattern compared to sheep. The highest SI values were recorded in Rajagaluh (0.0050), Cigasong (0.0048), Banjaran (0.0047), and Maja (0.0045). These values are lower than those for sheep, indicating that goats are not intensely concentrated in a single area but are instead more evenly distributed. Nonetheless, there is a tendency for central areas such as Rajagaluh and Cigasong to focus more on goat farming. Subdistricts such as Malausma (0.0003), Cikijing (0.0003), and Talaga (0.0003) recorded very low values, suggesting that goats are not a specialized commodity in those areas. Thus, goat development in Majalengka is more dispersed and functions primarily as a supplementary livelihood rather than as a subdistrict-specific flagship commodity.

***3) Cattle Commodity***

Cattle showed relatively high SI values in several subdistricts, indicating strong development bases. The highest values were recorded in Kertajati (0.0398), Majalengka (0.0320), and Lemahsugih (0.0775), which were particularly prominent. Subdistricts such as Cigasong (0.0149), Argapura (0.0134), and Banjaran (0.0130) also showed significant values, indicating that cattle are fairly well distributed across the central region. On the other hand,

subdistricts such as Ligung (0.0008) and Palasah (0.0024) recorded low values, suggesting that cattle are not a primary specialization in these areas. This demonstrates that cattle have substantial potential as a strategic commodity for Majalengka Regency, with major concentrations in large subdistricts and areas with broader market access, such as Majalengka and Kertajati.

Table 3. Specialization Index (SI) of Ruminant Livestock

| Subdistrict | Sheep | Goat | Cattle | Buffalo |
|---|---|---|---|---|
| Lemahsugih | 0.0799 | 0.0034 | 0.0775 | 0.0008 |
| Bantarujeg | 0.0143 | 0.0046 | 0.0068 | 0.0027 |
| Malausma | 0.0051 | 0.0003 | 0.0047 | 0.0031 |
| Cikijing | 0.0055 | 0.0003 | 0.0066 | 0.0010 |
| Cingambul | 0.0020 | 0.0041 | 0.0059 | 0.0010 |
| Talaga | 0.0036 | 0.0003 | 0.0044 | 0.0013 |
| Banjaran | 0.0099 | 0.0047 | 0.0130 | 0.0012 |
| Argapura | 0.0123 | 0.0016 | 0.0134 | 0.0010 |
| Maja | 0.0043 | 0.0045 | 0.0045 | 0.0016 |
| Majalengka | 0.0314 | 0.0008 | 0.0320 | 0.0013 |
| Cigasong | 0.0202 | 0.0048 | 0.0149 | 0.0010 |
| Sukahaji | 0.0123 | 0.0007 | 0.0119 | 0.0004 |
| Sindang | 0.0161 | 0.0004 | 0.0169 | 0.0003 |
| Rajagaluh | 0.0081 | 0.0050 | 0.0132 | 0.0005 |
| Sindangwangi | 0.0138 | 0.0012 | 0.0120 | 0.0009 |
| Leuwimunding | 0.0107 | 0.0037 | 0.0151 | 0.0005 |
| Palasah | 0.0017 | 0.0017 | 0.0024 | 0.0010 |
| Jatiwangi | 0.0190 | 0.0041 | 0.0136 | 0.0017 |
| Dawuan | 0.0150 | 0.0008 | 0.0142 | 0.0010 |
| Kasokandel | 0.0153 | 0.0034 | 0.0176 | 0.0015 |
| Panyingkiran | 0.0158 | 0.0044 | 0.0111 | 0.0017 |
| Kadipaten | 0.0162 | 0.0030 | 0.0125 | 0.0011 |
| Kertajati | 0.0406 | 0.0027 | 0.0398 | 0.0007 |
| Jatitujuh | 0.0159 | 0.0021 | 0.0168 | 0.0017 |
| Ligung | 0.0016 | 0.0025 | 0.0008 | 0.0018 |
| Sumberjaya | 0.0176 | 0.0008 | 0.0176 | 0.0012 |

Source: Processed secondary data (BPS Majalengka Regency, 2020–2024), compiled by the author, 2025.

### *4) Buffalo Commodity*

Unlike sheep, goats, and cattle, buffalo recorded generally low SI values across all subdistricts. The highest value was observed in Malausma (0.0031), followed by Jatitujuh (0.0017), Panyingkiran (0.0017), and Ligung (0.0018). Although these values remain relatively small, they indicate that buffalo are not a primary focus in Majalengka. Even in major subdistricts such as Majalengka and Kertajati, SI values were very low (only 0.0013 and 0.0007, respectively). These findings confirm that buffalo remain a traditional commodity, maintained on a small scale by rural communities rather than as a regional leading commodity.

### Integration of LQ, LI, and SI Analysis of Ruminant Livestock

The analysis of the Location Quotient (LQ), Localization Index (LI), and Specialization Index (SI) provides a comprehensive overview of the potential and role of ruminant livestock

commodities in Majalengka Regency. These three analytical tools complement each other in identifying the extent to which a commodity has comparative advantage, its concentration level, and its regional specialisation. The results derived from the tables above show interesting variations among ruminant commodities, sheep, goats, cattle, and buffalo, each contributing differently to the local economy and the sustainability of community-based livestock farming.

The LQ results indicate that sheep are a base commodity with LQ values > 1 in almost all subdistricts. This condition confirms that Majalengka Regency has a comparative advantage in sheep farming compared to other regions. Relatively high and consistent population data further reinforce the dominance of sheep as a base commodity over the past five years. Meanwhile, goats showed LQ values approaching 1 in most subdistricts, meaning that goats serve as supportive commodities but have not yet become a dominant base. Cattle showed more varied LQ values, with concentrations in areas with agricultural land and feed availability. In contrast, buffalo showed low LQ values (<1), indicating that this commodity is not a leading sector but rather functions as a complementary component of the local livestock system.

From the perspective of the Localization Index (LI), it can be observed whether ruminant livestock populations are concentrated in specific subdistricts or more evenly distributed. Sheep recorded higher LI values, suggesting that populations are concentrated in certain subdistricts that serve as production centres. This aligns with the longstanding tradition of sheep farming in Majalengka, serving both economic and religious needs. Goats showed moderate LI values, indicating relatively even distribution with some dominant subdistricts. Cattle tended to have lower LI values, reflecting a broader distribution across nearly all subdistricts without strong concentrations. In contrast, buffalo had very low LI values, indicating small populations thinly spread across the region, without any clear dominance.

The SI analysis, on the other hand, demonstrates the relative specialisation of each subdistrict compared to regional averages. Sheep recorded high SI values, reaffirming that several subdistricts in Majalengka rely heavily on this commodity as a primary economic activity. This finding is consistent with both the LQ and LI results. Goats showed moderate SI values, indicating a complementary role with strong development potential. Cattle had lower SI values, reflecting their wide distribution but less prominent contribution compared to sheep. Buffalo recorded the lowest SI values, confirming that this commodity is not a specialization in any subdistrict.

Taken together, the three analyses highlight that sheep are the primary (base) commodity in Majalengka Regency, with clear concentration and high specialisation across several subdistricts. Goats occupy a secondary position, with relatively even potential that can be further developed through intensification programs and integration with crop farming systems. Cattle serve as an additional commodity with widespread distribution, but their economic contribution remains less significant than that of sheep. Meanwhile, buffalo, although still present in traditional livestock systems, offer few advantages and serve primarily as a complementary commodity.

Overall, these findings provide a strong basis for planning the development of ruminant livestock in Majalengka Regency. The local government may prioritise sheep as the flagship commodity, focusing on population growth, market development, and the creation of value-added products. Goats and cattle should also be supported due to the availability of resources. Buffalo, meanwhile, can be maintained as a traditional commodity, preserved mainly for cultural and biodiversity reasons rather than as a primary focus. Thus, the combined use of LQ, LI, and SI provides a comprehensive framework for region-based ruminant livestock policy in Majalengka Regency.

## CONCLUSION

The analysis indicates that sheep are the leading livestock commodity in Majalengka Regency. This is evidenced by the high values of LQ, LI, and SI, showing that sheep possess a comparative advantage over other commodities. Goats occupy a medium position, meaning they have potential for development but are not as dominant as sheep. Cattle are relatively well distributed across several areas, although they do not stand out as a leading commodity. Meanwhile, buffalo play a relatively small role, serving more as a complementary component in community livestock farming. Therefore, livestock development in Majalengka Regency should prioritise sheep, while supporting the development of goats and cattle and maintaining buffalo to maintain the diversity of local livestock.

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