Jurnal Ilmu Produksi dan Teknologi Hasil Peternakan
ISSN 2303-2227 eISSN 2615-594X
Accredited by National Journal Accreditation No. 105/E/KPT/2022

Vol. 12 No. 2 Juni 2024, Hlm: 105-111
DOI: https://doi.org/10.29244/jipthp.12.2.105-111
Available online at https://journal.ipb.ac.id/index.php/ipthp/index

Regional Analysis of Sheep Business in Banjarnegara Regency

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(Received 12-04-2024; Revised 27-05-2024; Accepted 28-06-2024)

ABSTRACT

Banjarnegara Regency is home to the local Batur sheep, known for their significant body weight. The community has been raising Batur sheep for generations, aiming to develop them into a regional economic driver. This study aims to analyze potential areas for sheep livestock development in Banjarnegara Regency. The data used came from the farm statistics of the Directorate-General for Farm and Animal Health in 2021. The location quotient (LQ), localization index (LI), and specialization index (SI) method were used to perform regional analysis of sheep business. The results of the survey showed that the base area of sheep farming in Banjarnegara district is distributed in the districts of Karangkobar, Pejawaran, Batur, and Wanayasa. The localization and specialization index showed that sheep farming is spread evenly throughout the district of Banjaregara, not concentrated in a particular region.

Keywords: Banjarnegara district, base area, location quotient, sheep

ABSTRAK

Kabupaten Banjarnegara memiliki domba lokal yaitu domba batur yang memiliki keunggulan bisa mencapai berat badan besar. Masyarakat secara turun temurun memelihara domba batur, sehingga bisa dikembangkan menjadi penggerak ekonomi daerah. Penelitian ini bertujuan mengalisis wilayah potensial untuk pengembangan ternak domba di Kabupaten Banjarnegara. Data yang digunakan berasal dari statistik peternakan Direktorat Jenderal Peternakan dan Kesehatan Hewan tahun 2021. Metode location quotient (LQ) digunakan untuk menganalisis, localization index (LI), dan specialization index (SI) digunakan untuk menganalisis wilayah sentra bisnis domba di kabupaten Banjarnegara. Hasil penelitan menunjukkan bahwa wilayah basis usaha ternak domba di kabupaten Banjarnegara terdistribusi di Kecamatan Karangkobar, Pejawaran, Batur, dan Wanayasa. Indeks lokalisasi dan spesialisasi menunjukan bahwa usaha ternak domba tersebar merata diseluruh wilayah Kabupaten Banjarnegara, tidak terkonsentrasi pada satu wilayah tertentu.

Kata kunci : kabupaten Banjarnegara, location quotient, ternak domba, wilayah basis

INTRODUCTION

Regional development is essentially the operationalization of national development within a specific region, tailored to the region's physical, social, and economic capacities based on applicable laws and regulations (Tahrir 2023). This process has gained importance with the issuance of Law No. 23/2014, which delegates significant responsibilities for managing and implementing development to regional governments. This decentralization is based on the assumption that regional governments possess the capability to plan and manage development independently, given their familiarity with their regions unique potentials and advantages. Sheep breeding is one of the most popular livestock businesses that developed in Banjarnegara due to the animal genetic resource of Batur sheep. Batur sheep has been one of the development sector priorities of Banjarnegara regency since 1974 and was designated as one of the Indonesian local sheep breeds through the Decree of the Ministry of Agriculture of the Republic of Indonesia No. 2916/Kpts/OT.140/6/2011.

In planning regional development, regional governments must consider the concept of comparative advantage, which refers to the superiority of a product compared to other products that could be produced, given the region's specific resources (Jumiyanti 2018). These specific resources include land, climate, biological, and cultural assets, all of which are closely related to commodity production from natural resources such as agriculture, fisheries, forestry, mining, and other primary sectors.

Banjarnegara Regency in Central Java is one such region where development planning is crucial to improving its economic growth, which lags behind other regions in the province. The economic growth in Banjarnegara is relatively low, and the poverty rate is relatively high. Data from the Central Java Central Statistics Agency (BPS) in 2020 shows that the per capita income in Banjarnegara Regency is only Rp 3,773,323, significantly lower than the Central Java provincial average of Rp 6,706,874. Furthermore, the poverty rate in Banjarnegara Regency is 15.20%, higher than the national poverty rate of 9.57%. The majority of Banjarnegara Regency is rural, yet the contribution of the agriculture, forestry, livestock, and fisheries sectors to the Gross Regional Domestic Product (GRDP) has been declining, from 31.59% in 2016 to 30.58% in 2020. This is concerning, given that most of the population relies on agriculture for their livelihood. One potential solution is to develop the region's leading agricultural commodities.

One such leading commodity in Banjarnegara is the Batur sheep, with a population of 9,867 head of sheep (Distankankp 2022). The Batur sheep are well adapted to high-altitude areas and have a relatively large body weight. Besides that, Batur sheep farming requires relatively low investment, is easy to maintain, environmentally friendly, and provides a significant source of income for farmers, contributing to regional development (Tawaf *et al*. 2005). On a national level, developing the Batur sheep farming industry can increase livestock population and production. Furthermore, promoting Batur sheep farming could be an effective poverty reduction strategy that would subsequently boost the district's GRDP.

The development of sheep farming in Banjarnegara Regency necessitates identifying which subdistricts have comparative advantages, highlighting potential development areas. Therefore, a regional study is needed to align the potential for Batur sheep farming with strategic planning in Banjarnegara Regency. Research on the comparative advantages of livestock commodities in Indonesia, particularly for sheep, is still limited. Surachman *et al.* (2022) utilized the location quotient (LQ) method to regionalize sheep farming in West Java Province, identifying several subdistricts as sheep farming bases, although sheep farming was not concentrated in one area. There remains a need for an analysis of the comparative advantages of sheep farming in Central Java, considering its potential as a sheep farming center alongside West Java and East Java.

This research focuses on Banjarnegara Regency, which has the largest potential Batur sheep population in Indonesia. The study aims to identify the subdistricts that serve as the base for sheep farming and analyze the characteristics of sheep farming distribution within Banjarnegara Regency.

MATERIAL AND METHODS

Material

The data utilized in this research comprises livestock statistics published by the Directorate General of Animal Husbandry and Animal Health from 2021 to 2023. This dataset included the number of ruminant livestock sheep, goats, cows, and buffalo distributed across various subdistricts within Banjarnegara Regency.

Methods

Data from the 2022 Banjarnegara Agriculture and Fisheries Service Survey by the Central Java Province Central Statistics Agency (BPS) was used to describe the characteristics of farmers. Meanwhile, the total ruminant livestock population data, used to calculate the location quotient (LQ), localization index (LI), and specialization index (SI), was sourced from livestock statistics published by the Directorate General of Animal Husbandry and Animal Health (Ditjen PKH) and the Food Security and Animal Husbandry (DKPP) of Central Java Province.

Base Region Analysis

Location quotient (LQ) analysis was used to assess the contribution of sheep as a leading commodity in the region. The equation for location quotient (LQ) analysis was as follows:

$$LQ = \frac{\left(\frac{X_{ij}}{X_{.j}}\right)}{\left(\frac{X_{i.}}{X_{..}}\right)}$$

LQ = Location Quotient
X_{ij} = Number of sheep in subdistrict j (animal unit/AU)
$X_{.j}$ = Number of ruminant in subdistrict j (AU)

$X_{i.}$ = Number of Sheep in Banjarnegara Regency (AU)
X.. = Number of ruminant in Banjarnegara Regency (AU)

If LQ < 1, it indicated that subdistrict i has a relatively smaller share of Sheep compared to ruminant livestock found in Banjarnegara Regency. On the other hand, if LQ > 1 shows the centralization of Sheep in the i subdistrict relative to the total region. LQ > 1 indicates that the role of Sheep is quite dominant in the i subdistrict and is often a sign that the i subdistrict has excess, and will send that commodity to another region. Therefore, LQ > 1 indirectly indicates that the subdistrict has a comparative advantage for the commodity in question. If LQ = 1, it means that the role of Sheep in the i subdistrict is relatively similar to the role of Sheep in the region of Banjarnegara Regency (Rustiadi *et al*. 2017).

Analysis of Distribution Characteristics

The localization index (LI) and specialization index (SI) analyses assessed the concentration and specialization of sheep farming businesses in Banjarnegara Regency. The equations for these analyses were as follows:

$$LI = \frac{1}{2}\sum_{j=1}^{22}\left\{\left|\frac{X_{ij}}{X_{.j}} - \frac{X_{i.}}{X_{..}}\right|\right\}$$

Information:
LI = Localization Index
Xij = Number of Sheep in subdistrict j (AU)
X.j = Number of ruminant in subdistrict j (AU)
Xi. =Number of Sheep in Banjarnegara Regency (AU)
X.. =Number of ruminant in Banjarnegara Regency (AU)

If the localization index (LI) value is close to 0, it indicated that the distribution of sheep farm is relatively balanced throughout the district or city. Conversely, if the LI is close to 1, it means that the distribution of sheep farming businesses is relatively unbalanced and concentrated in one specific district or city (Muta'ali 2015). Specialization index (SI) equation:

$$SI = \frac{1}{2}\sum_{j=1}^{22}\left\{\left|\frac{X_{ij}}{X_{.i}} - \frac{X_{.j}}{X_{..}}\right|\right\}$$

Information :
SI = Specialization Index
Xij = Number of sheep in subdistrict j (AU)
X.j = Number of ruminant in subdistrict j (AU)
Xi. = Number of Sheep in Banjarnegara Regency (AU)
X.. = Number of ruminant in Banjarnegara Regency (AU)

If the specialization index (SI) value is close to 0, it indicated that the district or city area has a diversity of activities and is not specialized in sheep farming (Muta'ali 2015). Conversely, if the SI value is close to 1, it suggested that the district or city area tends to have unique activities predominantly focused on the sheep farming business.

RESULTS AND DISCUSSION

Characteristics of Sheep Farmers in Banjarnegara Regency

The characteristics of farmers play an important role in the development of the livestock subsector. These characteristics describe the farmers conditions about their involvement in managing livestock businesses. Sheep farmers in Banjarnegara Regency show unique and varied traits, influenced by geographic factors, climate, and local livestock practices.

Overall, the farmers are in productive age, ranging from 15 to 64 years old. The dominant age group among farmers is 38-46 years, comprising 47.37% of the total. The detailed characteristics of sheep farmers in Banjarnegara Regency are presented in Table 1. Sheep farmers in Banjarnegara Regency have varied experiences. According to Parengkuan (2019) the age factor is usually closer to work productivity. If someone is still of productive age. their productivity level is high. This has an impact on physical condition and thinking ability. The younger the farmers the more likely they are to be physically strong and dynamic in managing their business. so they can work stronger than older farmers. There were no farmers aged <29 years based on farmers age characteristics (Table 1).

Table 1. Characteristics of Sheep Farmers in Banjarnegara Regency

Variable	Category	Percentage (%)
Age of Farmer (years)	29-37	10.53
	38-46	47.37
	47-55	31.58
	56-64	10.53
Education Level	Did not have formal education	10.53
	Elementary school/equivalent	73.68
	Secondary school/equivalent	5.26
	High school	10.53
Experience (years)	<9	36.84
	Sep-21	31.58
	22-34	15.79
	35-45	15.79

Source: BPS Central Java 2021 Processed

Breeding experience can influence the farmer's abilities and skills in raising sheep. The more experience a farmer has. the easier it will be to raise sheep. Generally, farmers learned the procedures for raising livestock from their parents and pay attention to other farmers independently. 36.84% of sheep farming experience in Banjarnegara Regency Province has less than 9 years. 31.58% has 9-21 years of experience. 15.79% has 22-34 years of experience and 15.79% has 35-45 years of experience. Most farmers do not keep sheep permanently or continuously due to side bussines reason. The main bussinees activity of farmers was holticulture program. Most of the flocks of sheep cultivated

by farmers in Banjarnegara Regency are Batur sheep. Batur sheep are the result of a cross between merino sheep and thin-tailed sheep with an original geographical distribution in Batur subdistrict and its surroundings (Ministry of Agriculture Decree 2011). This sheep is a dual purpose type because it can produce both meat and wool. This typical sheep can weigh twice as much as local sheep, that is between 60 - 80 kg, with a maximum weight of 140 kg at the age of more than 12 months, and has thick and smooth hair (Ministry of Agriculture 2011).

On an animal unit (AU) scale, the number of sheep owned by farmers ranges from 0.07 AU to 10.262 AU with an average livestock ownership of 513 AU. Livestock ownership greatly influences the value of the production produced. The more sheep you have the greater the production value generated. The number of livestock has a very real influence on sheep production. especially the number of ewes owned by farmers (Cyrilla *et al*. 2010). The aim of raising goats and sheep on a small scale is to obtain additional income or savings which can become a source of emergency cash when the need is urgent (Rusdian and Praharai 2015).

Sheep Farming Business Base Area in Banjarnegara Regency

The results of the LQ analysis of sheep livestock in Banjarnegara Regency indicate that out of the 20 subdistricts designated for sheep population development. Four districts (22.22%) are identified as base area, while 20 subdistricts (88.88%) are not designated as non-base areas (Table 2). Economic base analysis or regional comparative analysis. conducted through LQ analysis. is essential for identifying base or non-base areas for livestock development (Jumianti 2018). LQ analysis is also frequently employed to estimate sectors or commodities. as well as specific activities that can contribute substantial monetary units to society by exporting goods and services (Fironika *et al*. 2024).

The four subdistricts were identified as base areas for sheep farming, with LQ values exceeding 1 were Karangkobar, Pejawaran, Batur, and Wanayasa. Among these, the Pejawaran subdistrict has the highest average LQ value (4.988). while the Pandanarum subdistrict shows the lowest average LQ value of 0.000. Pejawaran and Batur are the primary focus areas for the development of sheep farming in Banjarnegara Regency. This action plan includes establishing a breeding center for crossbreed sheep in Pejawaran and for Batur sheep in the Batur sub-district. Both Pejawaran and Batur subdistricts serve as the base areas for the production of seed and meat from local sheep in Banjarnegara. The significant LQ coefficient in the Pejawaran and Batur subdistrict indicates that the presence of a sheep population effectively balances the population of other ruminants. Conversely, the low LQ coefficient in Pandanarum subdistrict is due to the absence of a sheep population, leading to livestock development focusing on cattle and goats. Additionally, the Pandanarum area is relatively small and a new expansion area of the Kalibening subdistrict, further contributes to this observation.

Sheep farming serves as a primary source of income for communities in base areas, where farmers have a strong cultural inclination towards developing sheep farming. Conversely, in nonbase areas, sheep farming does

Table 2. Results of Location Quotient (LQ) Analysis of Sheep in Banjarnegara Regency

Subdistrict	Location Quotient (LQ) Value			Mean	Basis/Non Basis
	2021	2022	2023		
Susukan	0.061	0.07	0.135	0.089	Non Basis
Purworejo Klampok	0.029	0.039	0.038	0.035	Non Basis
Mandiraja	0.227	0.233	0.241	0.234	Non Basis
Purwonegoro	0.038	0.04	0.041	0.04	Non Basis
Bawang	0.250	0.281	0.154	0.228	Non Basis
Banjarnegara	0.282	0.300	0.224	0.269	Non Basis
Pagedongan	0.414	0.445	0.341	0.400	Non Basis
Sigaluh	0.320	0.323	0.501	0.381	Non Basis
Madukara	0.814	0.853	1.237	0.968	Non Basis
Banjarmangu	0.199	0.196	0.717	0.371	Non Basis
Wanadadi	0.174	0.198	0.134	0.169	Non Basis
Rakit	0.773	0.818	0.639	0.744	Non Basis
Punggelan	0.194	0.201	0.305	0.234	Non Basis
Karangkobar	1.508	1.487	1.705	1.567	Basis
Pagentan	0.715	0.711	0.672	0.7	Non Basis
Pejawaran	3.853	3.726	7.385	4.988	Basis
Batur	4.383	4.327	4.903	4.538	Basis
Wanayasa	1.796	1.789	1.654	1.746	Basis
Kalibening	0.654	0.664	0.437	0.585	Non Basis
Pandanarum	0	0	0	0	Non Basis

not significantly contribute to the subdistrict economic growth compared to the overall economy of Banjarnegara Regency. The LQ analysis underscores this point, depicting more nonbase areas for sheep compared to base areas in Banjarnegara Regency (Figure 1). This suggests that raising sheep in nonbase areas in Banjarnegara Regency is suboptimal in productivity, resulting in relatively small added value.

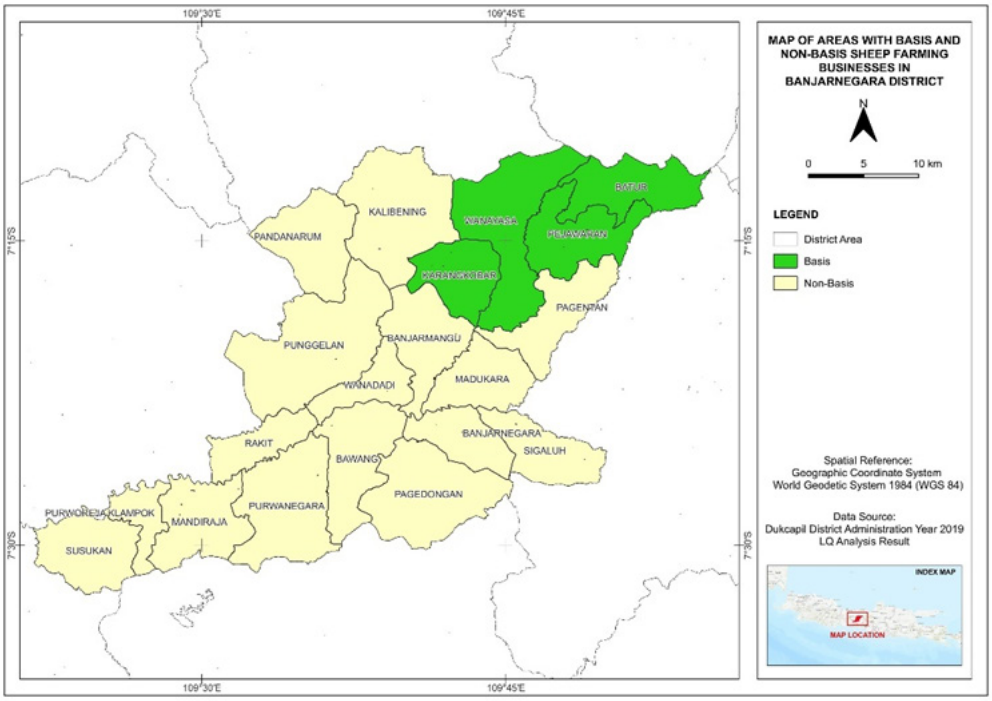

Figure 1. Map of Base and Nonbase Areas for Sheep Farming in Banjarnegara Regency

The sheep farming business in Banjarnegara Regency is mainly integrated with other agricultural companies such as food crops, horticulture, and plantations, which causes sheep livestock productivity to be very low. Climatic factors play an essential role in supporting integration between livestock and agriculture, such as in terms of the availability of animal feed. Banjarnegara Regency has quite promising potential for forage land. The significant potential sources of feed availability, such as agricultural waste and the extent of land-producing forage, can support sheep development (Mastuti *et al*. 2019). Sheep farming is not the main focus of agribusiness, but livestock are kept as savings and sold according to the needs of farmers. Livestock are kept with simple management. The number of livestock is usually 2-3 heads, technology is used as much as possible, and the middleman determines and estimates the selling price. Also, livestock development has yet to be integrated into potential locations. There are difficulties in getting support for facilities, infrastructure, human resources, institutions, and other technical elements that can increase productivity because the sheep farming business develops on a small scale and has many locations (Surachman *et al.* 2021).

Characteristics of the Distribution of Sheep Farming Businesses in Banjarnegara Regency

The results of the localization analysis of sheep farming businesses show that the localization index for sheep farming businesses in subdistricts in the Banjarnegara area are Pejawaran and Batur (Table 3). This value means that from 2021 to 2023, the sheep farming business in Banjarnegara Regency will not be localized to a particular subdistrict area. Sheep farming businesses are spread throughout the subdistrict due to the characteristics of sheep farming, which can adapt to the natural conditions in the Banjarnegara Regency area. Sheep are relatively easy to maintain with diverse land topographic conditions, and sources of forages can always be available even if they come from agricultural waste (Najmuddin *et al.* 2019). Most of Banjarnegara Regency is located in the highlands or mountains with soil types Alluvial, Andosol, and Organosol (Tresia *et al.* 2021). Residents use the carrying capacity of dry land in Banjarnegara Regency to cultivate the horticultural sub-sector as their main livelihood. These plant commodities can produce relatively large biomass potential as a local feed source for livestock development in Banjarnegara Regency.

Sheep Farming Business Specialization in Banjarnegara Regency

The analysis of the specialization of sheep farming businesses reveals that the Specialization Index (SI) value of sheep farming businesses in subdistricts in Banjarnegara Regency is less than one. This indicates that each subdistrict in Banjarnegara Regency does not specialize in sheep farming businesses within its area. The government of Banjarnegara, in collaboration with the Ministry of Agriculture, has designated a special focus area

Table 3. Results of Localization Index (LI) analysis of sheep in Banjarnegara Regency

Subdistrict	Localization Index Value (LI)			Mean
	2021	2022	2023	
Susukan	0.132	0.138	0.005	0.092
Purworejo Klampok	0.136	0.142	0.005	0.094
Mandiraja	0.109	0.114	0.006	0.076
Purwonegoro	0.135	0.142	0.005	0.094
Bawang	0.105	0.106	0.005	0.072
Banjarnegara	0.101	0.104	0.006	0.07
Pagedongan	0.082	0.082	0.006	0.057
Sigaluh	0.096	0.100	0.007	0.068
Madukara	0.026	0.022	0.001	0.016
Banjarmangu	0.112	0.119	0.008	0.08
Wanadadi	0.116	0.119	0.005	0.08
Rakit	0.032	0.027	0.008	0.022
Punggelan	0.113	0.118	0.006	0.079
Karangkobar	0.071	0.072	0.013	0.052
Pagentan	0.040	0.043	0.008	0.030
Pejawaran	0.399	0.404	0.030	0.277
Batur	0.473	0.493	0.018	0.328
Wanayasa	0.111	0.117	0.003	0.077
Kalibening	0.049	0.050	0.007	0.035
Pandanarum	0.140	0.148	0.005	0.098

Table 4. Results of Specialization Index (SI) analysis of sheep farming businesses in Banjarnegara Regency

Regency	Specialization Index Value (SI)			Mean
	2021	2022	2023	
Susukan	0.715	0.688	0.069	0.491
Purworejo Klampok	0.280	0.299	0.034	0.204
Mandiraja	0.249	0.262	0.028	0.180
Purwonegoro	0.305	0.312	0.024	0.214
Bawang	0.692	0.709	0.054	0.485
Banjarnegara	0.298	0.289	0.031	0.206
Pagedongan	0.278	0.256	0.018	0.184
Sigaluh	0.505	0.496	0.043	0.348
Madukara	0.266	0.309	0.030	0.202
Banjarmangu	0.928	0.894	0.595	0.806
Wanadadi	0.479	0.433	0.192	0.368
Rakit	0.251	0.237	0.031	0.173
Punggelan	0.550	0.539	0.101	0.397
Karangkobar	0.143	0.144	0.019	0.102
Pagentan	0.087	0.100	0.035	0.074
Pejawaran	0.791	0.807	0.063	0.554
Batur	0.940	0.985	0.053	0.659
Wanayasa	0.305	0.317	0.020	0.214
Kalibening	0.440	0.441	0.026	0.302
Pandanarum	0.435	0.443	0.042	0.306

for preserving Batur sheep through the UPLAND Project for 2022-2024. This project aims to conserve Batur sheep in the Batur region by establishing a breeding center. The purpose of this breeding center is to select superior Batur sheep and to continue crossbreeding efforts to produce superior and pure Batur sheep. Most individuals engaged in sheep farming do not prioritize it as their primary source of income. It's important to note that having an LQ value more excellent than one does not necessarily imply specialization in that commodity in a particular area (Syahrial *et al.* 2019).

Generally, sheep farmers primarily engage in farming as their main livelihood, with sheep farming considered a supplementary activity or a means of saving. While some farmers may prioritize livestock as their primary source of income, sheep farming is typically not the sole focus, as farmers often raise other types of livestock, such as goats and beef cattle.

It is worth noting that research conducted in the West Java area by Firman *et al*. (2018) identified 10 districts as base areas for sheep livestock commodities, in contrast to the four districts identified in this study. This disparity can be attributed to differences in data sources and the timing of the research. In this study, the initial process of determining the primary commodity focused on sheep due to their significant population in Banjarnegara Regency.

Several other studies have explored various types of essential or superior commodities within a sector. aligning to identify superior commodity types at the provincial or district/city level (Syahrial and Herman 2019; Mulyono 2020; Naya and Wijayanto 2017). However, this research focuses on sheep farming to identify base areas for sheep livestock commodities and characterize their distribution using the principles of regional analysis, considering LQ, LI, and SI values. The development of sheep farming business areas in Banjarnegara Regency can benefit from this method, complemented by assessing the potential carrying capacity of sheep farming (Surachman *et al*. 2021).

CONCLUSION

The base areas for sheep farming in Banjarnegara Regency from 2021 to 2023 were Karangkobar, Pejawaran, Batur, and Wanayasa. However, sheep farming businesses in Banjarnegara Regency were not concentrated in a particular subdistrict area; instead, they were spatially dispersed. Additionally, no subdistricts in Banjarnegara Regency specialize in sheep farming. The information derived from the results of this research can be utilized to formulate policies aimed at developing sheep farming areas to enhance the productivity of sheep farming in Banjarnegara Regency.

ACKNOWLEDGEMENT

This research was supported by Matching Fund (MF) – Kedai Reka 2023 under the title “Introduction to Breeding Healthy Sheep to Produce Premium Meat as Added Value to Improve the Upstream and Downstream Industry-Based

Economy in People's Livestock." with Contract No. 18977/IT3.L1/HK.07.00/P/T/2023.

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