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LOCATION QUOTIENT ANALYSIS IN DETERMINING CATTLE BASE IN ACEH, INDONESIA

Analisis Location Quotient dalam Menentukan Basis Sapi di Aceh, Indonesia

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ABSTRACT

Aceh province is an area that has prospects for the development of cattle. The potential of the Province of Aceh has considerable prospects for improving its economy in the future. This study uses a quantitative descriptive approach using a survey method based on secondary data. The data was taken from related government agencies, such as the Aceh Provincial Animal Husbandry Service, and the Aceh Statistics Centre. This study aims to identify the livestock base in various districts/cities in Aceh Province. The secondary data obtained was used as the basis for the survey method used in this study. This study used a quantitative descriptive research design and conducted a Location Quotient (LQ) analysis to identify the location of cattle centres in Aceh Province. The livestock population in Aceh Province in 2012-2021 is used as data in this study. The results of the study found 13 livestock base areas in Aceh Province namely Aceh Tamiang, Aceh Singkil, Nagan Raya, East Aceh, Pidie Jaya, Bireuen, Aceh Besar, Simeulue, Southeast Aceh, Banda Aceh City, Aceh Jaya, Pidie, and Gayo Luwes.

Keyword: Aceh, cattle, livestock, location quotient

ABSTRAK

Provinsi Aceh merupakan daerah yang memiliki prospek pengembangan ternak sapi. Potensi Provinsi Aceh memiliki prospek yang cukup besar untuk peningkatan perekonomiannya di masa mendatang. Penelitian ini menggunakan pendekatan deskriptif kuantitatif dengan menggunakan metode survei berdasarkan data sekunder.

Data diambil dari instansi pemerintah terkait, seperti Dinas Peternakan Provinsi Aceh, dan Badan Pusat Statistik Aceh. Penelitian ini bertujuan untuk mengidentifikasi basis peternakan di berbagai kabupaten/kota di Provinsi Aceh. Data sekunder yang diperoleh digunakan sebagai dasar metode survei yang digunakan dalam penelitian ini. Penelitian ini menggunakan desain penelitian deskriptif kuantitatif dan melakukan analisis Location Quotient (LQ) untuk mengidentifikasi lokasi sentra sapi di Provinsi Aceh. Populasi ternak di Provinsi Aceh tahun 2012-2021 digunakan sebagai data dalam penelitian ini. Hasil penelitian ditemukan 13 daerah basis peternakan di Provinsi Aceh yaitu Aceh Tamiang, Aceh Singkil, Nagan Raya, Aceh Timur, Pidie Jaya, Bireuen, Aceh Besar, Simeulue, Aceh Tenggara, Kota Banda Aceh, Aceh Jaya, Pidie, dan Gayo Luwes.

Kata Kunci: Aceh, sapi, ternak, location quotient

INTRODUCTION

Beef cattle farming in Indonesia has become an important sector for the country's economy (Rustinsyah, 2019), as it contributes significantly to the country's agricultural GDP. Beef consumption in Indonesia is high, and considered an important part of the diet of most Indonesians (Agus & Widi, 2018). According to Wahyono & Utami (2017), beef demand in Indonesia has continued to increase in recent years. In 2021, Indonesia's beef production is expected to reach 540,000 tons, up from 529,000 tons in 2020. Meanwhile, consumption is expected to reach 2.45 million tons in 2021, up from 2.35 milliontons in 2020 (Fauzie & Siallagan, 2023). This indicates a significssant gap between supply and demand, which presents an opportunity for domestic and international producers to fill the gap. The Indonesian government has recognized the importance of the beef cattle industry and has implemented policies to support its growth (Basyar, 2021). In addition to government support, the beef cattle industry in Indonesia is also driven by foreign investment. International companies have invested in large-scale cattle farms in Indonesia, which has improved the efficiency and productivity of the industry. Another factor contributing to the bright prospects of beef cattle farming in Indonesia is the increasing demand for high-quality beef from Indonesia's growing middle class (Agus & Widi, 2018). This has led to an increase in beef consumption, which is expected to continue in the future. One of the Indonesian provinces that have bright prospects in cattle farming is Aceh Province.

Great opportunity for Aceh Province to improve its economy in the future can be found through the livestock agribusiness sector (Sofyan et al., 2021). The potential to become a promising livestock exporter exists in Aceh Province, both in domestic and international markets (Yahya et al., 2015). However, this sector is currently not being managed seriously (Ikramuddin et al., 2015), which has little impact on improving the welfare of the community, as animal husbandry is still considered a side business with relatively small economic benefits.

Despite the high demand for livestock products in Aceh, especially during Meugang and Islamic holidays (Mizan et al., 2021), the price of animal feed has also increased. Although feed prices are relatively high in Aceh, the increase in livestock selling prices is higher, indicating that farmers can still make significant profits. To meet beef demand, the government needs to increase the cattle population by improving reproductive efficiency and addressing reproductive problems in the current population (Cooke et al., 2020).

Aceh Province, there are fluctuations in the cattle population that need to be addressed by identifying appropriate locations to increase the cattle population in certain areas (Sutarno & Setyawan, 2015). It is provided that this research, which has not yet been done in Aceh Province, would promote environmental harmony and allow for the best possible arrangement of livestock patterns to provide an ordered and effective livestock base area, particularly in Aceh Province. As part of initiatives to raise the economic well-being of nearby people, it is anticipated that this research will help local government policies on the development of cattle in Aceh Province. Using the LQ technique, which may assist pinpoint the districts and cities in Aceh Province where the base and non-base cattle populations are located, is one way to pinpoint the location of the cow base. By doing so, the government can know which areas in Aceh Province need to be developed for these cattle populations. Aceh cattle, a local cattle breed that has been a part of rural farming communities for many years, is the most popular cattle breed in Aceh Province (Sofyan et al., 2020). However, the Aceh cattle population may decline if it is not protected from the sale and slaughter of productive females, so it must be conserved to prevent extinction (Sofyan et al., 2021).

LQ (Location Quotient) study, which measures a region's capacity in a certain industry sector but does not reach a definitive result, gives a general picture of that region's capacity in that area (Suresti et al., 2021). A region's comparative advantage in a certain sector is indicated if it has a high LQ for that sector. In order to determine the relative ratio of a sector's added value contribution to that of the sector in question, one method that may be employed in economic models based on economic foundation theory is the LQ methodology. Calculating the ratio of sector production in the district to sector production in the province in the province/country (Gaffar & Khusaini, 2018). LQ strengthening of the cattle breeding sector in Aceh Province has certain advantages. This could include developing infrastructure, training the workforce, increasing access to resources, and providing other support to promote the growth of a thriving agricultural sector.

RESEARCH METHOD

This study was carried out in Aceh Province on purpose since Aceh Province has a substantial potential for the growth of the cattle population. This study employs a quantitative descriptive methodology, which requires the researcher to provide a thorough explanation of the order and steps of the study in a logical and methodical fashion. The researcher must also be able to systematically and logically describe the connections between each step of the investigation (Ekowati et al., 2018). Secondary data were employed for collecting the data for this investigation. The information was gathered from pertinent government organizations, including the Aceh Central Bureau of Statistics and the Aceh Provincial Livestock Service Office, among others. The expertise and information needed for this study came from a variety of sources, including publications pertinent to the subject under investigation as well as journals, articles, research reports, and papers. The data was gathered using the time series approach during a period of ten years, from 2012 to 2021 (Yang & Laven, 2021). In this study, an analysis method known as Location Quotient (LQ) was used. Location Quotient (LQ) analysis is a comparison between the role of a specific economic sector in a region its role nationally, or a comparison with a larger administrative area (Setiawan et al., 2022).

The names of the companies, the specifications of the items and equipment utilized in the study, as well as the location of the city and nation, should all be stated explicitly by the authors. Although the biological process should be stressed, appropriate statistical methodologies should be applied. It is necessary to choose the statistical model, classes, blocks, and experimental unit. It is advised to consult a statistician before using any flawed or insufficient statistical techniques.

$$LQ = \frac{vi/vt}{Vi/Vt}$$

Description:

LQ : Location Quotient index of cattle in districts/municipalities of Aceh province.
vi : Number of cattle at district level in Aceh province
vt : Number of livestock at district level in Aceh province
Vi : Total value of cattle at Aceh province level
Vt : Total value of livestock at Aceh province level

Determine superior products or products that are not superior by using the Location Quotient value (Darmanto et al., 2020).

1. If the LQ of a sector exceeds one (>1), it indicates that the sector has a more important role in the region than nationally, and is referred to as a base sector. The potential of livestock in the area can not only be used to meet local needs, but can also meet the needs of surrounding areas.
2. If the LQ of a sector is equal to one (= 1), it means that the sector has the same role at both local and national levels, and is categorized as a non-base sector. The potential of the sector is only enough to fulfill the needs in its own region, without being able to fulfill the needs in the surrounding areas.
3. If the LQ of a sector is less than one (< 1), it indicates that the role of the sector is smaller in the region than at the national level, so the sector can be categorized as a non-base sector. From this it can be concluded that the region is not a potential place for the development of the livestock sector.

RESULT AND DISCUSSION

According to the findings of the study, Table 1. presents the number of cattle in each district and city in Aceh Province. The province of Aceh raises a variety of animals, including cows, buffaloes, goats, sheep, free-range chickens, broilers, and ducks (Table 2).

Location Quotient Analysis of Cattle Population in Aceh Province 2012-2021.

Using the Location Quotient (LQ) Analysis based on 18 districts and 5 cities, the average yield of the livestock base sector in Aceh Province from 2012 to 2021 has been computed (Table 1). Aceh Tamiang, Aceh Singkil, Nagan Raya, East Aceh, Pidie Jaya, Bireuen, Aceh Besar, Simeulue, Southeast Aceh, Banda Aceh, Aceh Jaya, Pidie, and Gayo Luwes are the 13 districts where the cattle industry is concentrated. The province of Aceh has a variety of animals, including cows, buffaloes, goats, native chickens, broiler chickens, and ducks (Table 2). According to the graph diagram shown, the 5 districts with the greatest cattle base Location Quotient (LQ) values are shown in Figure 1. Aceh Tamiang district ranks first with an LQ of 7.05, followed by Aceh Singkil district with an LQ of 3.21, Nagan Raya district with an LQ of 2.35, East Aceh district with an LQ of 2.29, and Pidie Jaya district with an LQ of 2.01.

Based on information from 18 districts and 5 cities in the Aceh Province and calculated using location quotient (LQ) methodology. According to the statistics, South Aceh District, Langsa City, Bener Meriah District, West Aceh District, Subulussalam City, and North Aceh District are the six areas with the highest average (Figure 1). LQ was used to determine cattle base and non-base

locations in Aceh Province. 13 Districts in Aceh were identified as cattle base locations, meaning that the proportion of labor in the cattle sector in these areas is higher than the proportion of labor in the cattle sector at the national level. One of the factors influencing a region's prominence in the cattle sector is its ability to withstand various threats and challenges (Darmawan et al., 2023), including pandemic cycles and livestock disease attacks. In this case, the 13 cattle base districts in Aceh are considered able to withstand all pandemic cycles that have occurred in the last five years, including the Covid-19 pandemic and FMD and LSD virus attacks on cattle (Clemmons et al., 2021).

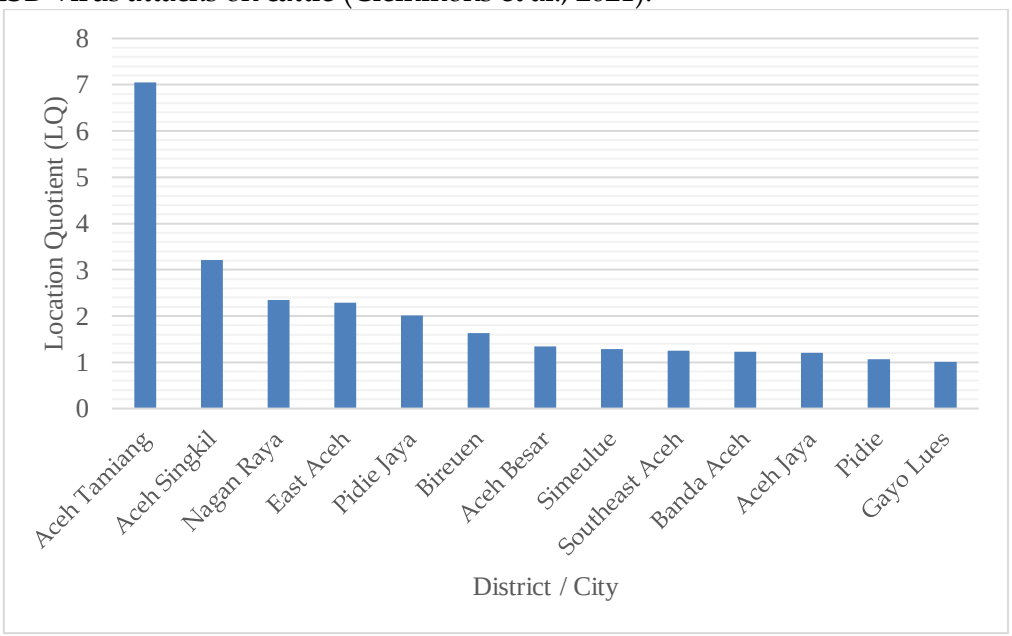

Figure 1.
Location Quotient (LQ) Value of Cattle Base in Aceh Province
The average results of the Non-base cattle sector for the period 2012-2021 were.

Other factors also influenced several districts in Aceh to become livestock base locations apart from their success in dealing with threats and challenges. One of these is the government's breakthrough in developing twin-breed cattle technology, as practiced by Pidie District Sofyan et al., (2020). In addition, Gayo Lues District also develops dairy cattle to meet the high demand for whole milk, and runs an artificial insemination program to produce a superior cattle population (Yusriani & Rahmah, 2020). Through the use of LQ and factor analysis, districts in Aceh can be identified as potential cattle bases. Local governments can use this information to develop programs and policies that support the development of the cattle sector in these areas, such as technology development and support programs for local communities.

Local governments can also use the information obtained from LQ analysis to better map the potential of the region and develop targeted development

programs. By knowing which regions have advantages in the cattle sector, local governments can direct appropriate investments and resources to strengthen and enhance these advantages (Suresti et al., 2021). In addition, the identification of cattle base districts in Aceh can also have a positive impact on the regional and national economy (Republic of Indonesia, 2020). If cattle production in these areas is increased, it will increase the supply of beef in the market, thereby reducing the price of beef in the market and meeting national food needs (Greenwood, 2021).

The expansion of the cattle industry in the area has the potential to boost employment opportunities and local economies (Azmi et al., 2022). This might be done by providing technical and financial assistance for the expansion of cattle farming in the region, as well as by establishing training and coaching programs to help farmers enhance their abilities. Long-term growth of the indigenous cattle industry can also increase the nation's food security and lessen reliance on foreign beef imports (Smith et al., 2018). Thus, the advantages of Aceh's cattle base districts not only benefit the region, but also the country as a whole.

Judging from the graphic (Figure 2) diagram provided, there are six districts that have a Location Quotient (LQ) result below one for Non-cattle basis. South Aceh District has an LQ of 0.17, Langsa City has an LQ of 0.22, Bener Meriah District has an LQ of 0.38, West Aceh District has an LQ of 0.39, Subulussalam City has an LQ of 0.44, and the District of North Aceh has an LQ of 0.93.

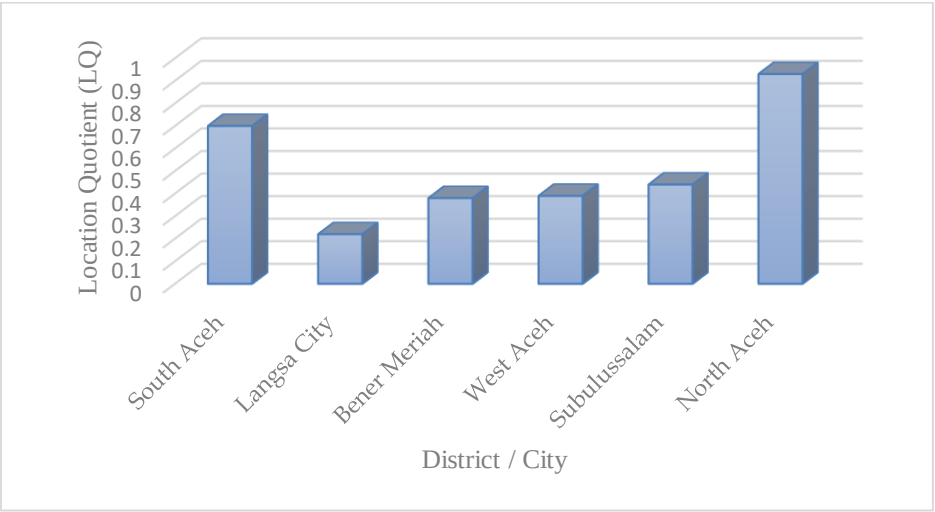

Figure 2.
Non-cattle-based Location Quotient (LQ) Value in Aceh Province

Compare the results of the determination of cattle base and non-base locations in Aceh Province using LQ, it can be done by referring to previous studies that have been conducted in other regions in Indonesia. Some studies

that are relevant to this topic include: Research by Rasminati et al., (2022) in Gunungkidul District, Yogyakarta that used LQ to determine the location of cattle bases and non-bases. The study showed that there were 6 sub-districts in the cattle base category and 11 sub-districts in the non-cattle base category. Sub-districts in the cattle base category have a larger and higher quality cattle population than sub-districts in the non-cattle base category.

Research by Reski el al., (2022) in Bulukumba District, South Sulawesi used LQ to determine the location of cattle base and non-base. The results showed that there were 5 sub-districts in the cattle base category and 8 sub-districts in the non-cattle base category. Sub-districts in the cattle base category have higher and more stable cattle production levels than sub-districts in the non-cattle base category. Research by Sandiah et al., (2021) in Southeast Sulawesi used LQ to determine the location of cattle base and non-base. This study showed that there were 4 sub-districts in the cattle base category and 13 sub-districts in the non-cattle base category.

Table 1. Number of Cattle in Districts/Municipalities in Aceh Province from 2012 to 2021.

Kabupaten /Kota	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Simeulue	1,881	1,039	2,038	2,764	3,331	3,564	882	719	3,127	3,130
Aceh Singkil	3,907	3,709	3,790	4,308	4,094	4,381	3,078	3,540	4,102	3,669
South Aceh	1,982	1,944	1,858	2,293	2,086	2,232	1,647	1,696	1,939	2,680
Southeast Aceh	5,859	3,682	4,705	4,755	4,691	5,019	3,058	4,825	4,638	5,696
East Aceh	70,874	48,444	51,428	69,616	71,588	72,101	41,254	38,663	40,445	40,132
Central Aceh	7,044	5,480	6,886	8,089	7,805	8,351	4,647	4,451	5,376	8,846
West Aceh	4,195	4,695	5,323	5,968	4,499	4,814	6,614	7,467	7,602	7,089
Aceh Besar	72,874	60,221	89,421	108,084	109,001	111,060	50,570	77,192	79,743	81,276
Pidie	55,513	46,252	61,408	66,869	67,654	72,390	39,540	44,344	45,164	46,332
Bireuen	58,366	49,074	56,422	47,980	63,309	67,741	41,951	44,895	53,816	65,056
North Aceh	90,388	65,307	92,365	105,214	104,889	107,119	55,873	53,072	54,664	54,750
Southwest Aceh	2,010	1,167	1,967	2,169	2,378	2,544	2,520	2,830	2,815	3,808
Gayo Lues	5,524	5,078	5,126	5,954	6,061	6,485	4,116	4,430	7,930	8,542
Aceh Tamiang	54,672	47,984	62,836	68,169	71,948	76,984	41,179	42,930	46,250	44,315
Nagan Raya	9,032	9,398	9,587	11,021	10,463	11,195	7,918	10,830	11,805	12,816
Aceh Jaya	17,355	13,084	15,370	19,276	19,019	20,350	11,027	19,229	22,435	22,803
Bener Meriah	968	903	1,677	3,035	3,622	3,876	756	779	802	822
Pidie Jaya	19,625	17,229	18,967	21,393	20,168	21,580	21,364	21,613	21,810	21,902
Banda Aceh City	1,915	2,194	1,947	2,196	2,487	2,661	1,875	1,714	1,819	1,703
Sabang City	2,336	2,052	2,678	3,076	2,989	3,198	1,766	2,092	1,968	1,836
Langsa City	7,094	5,487	6,572	7,328	6,960	7,447	4,690	5,952	7,177	7,715
Lhokseumawe City	9,548	7,858	7,044	8,028	9,011	9,642	6,755	7,192	7,414	7,439
Subulussalam City	2,209	1,940	1,947	2,702	2,706	2,895	1,661	2,576	2,535	2,820
Total	505,171	404,221	511,362	580,287	600,759	627,629	354,741	403,031	435,76	455,177

Table 2. Types of Livestock in Aceh Province in 2012 – 2021

Cattle	Year -					
	2012	2013	2014	2015	2016	2017
Cow	505,171	404,221	511,362	580,287	600,759	555,239
Buffalo	164,294	111,95	111,975	171,747	173,804	185,97
Goat	581,676	643,637	581,597	594,065	634,11	670,334
Sheep	163,544	157,111	111,03	107,163	124,35	133,055
Free-Range Chicken	6,065,665	6,054,553	5,938,919	5,184,254	5,358,341	5,733,425
Broiler chicken	2,959,212	3,041,218	3,324,447	4,591,820	4,833,893	5,475,266
Ducks	2,328,054	2,271,247	2,369,449	1,763,178	2,533,606	2,997,708

Cattle	Year -				Average	Amount
	2018	2019	2020	2021		
Cow	354,741	403,031	435,376	455,177	477,799.2	4,805,364
Buffalo	85,431	86,717	131,43	112,402	130,158.4	1,335,720
Goat	617,543	613,869	634,073	649,511	626,526.6	6,220,415
Sheep	93,288	95,659	102	100,76	113,824	1,187,960
Free-Range Chicken	5,487,312	4,553,244	4,977,749	4,275,940	5,284,860	53,629,402
Broiler chicken	7,072,130	33,328,202	31,232,588	34,047,386	14,105,217	129,906,162
Ducks	2,199,960	1,995,346	1,721,992	1,714,738	2,174,136	21,895,278
		Total			22,912,521	218,980,301

In the cattle base category had a larger and higher quality cattle population than sub-districts in the non-cattle base category. In the case of cattle production, an LQ greater than one in a particular region indicates that the cattle industry is an important contributor to the local economy. This information can be used to guide policy decisions, such as the allocation of resources for research and development, or the implementation of programs to support the industry. LQ analysis can also be used to identify potential areas for growth and development in the cattle industry. Areas with low LQ may represent untapped markets for cattle production, or areas where the industry has the potential to expand Spiegal et al., (2020). By identifying these areas, policy makers and industry stakeholders can target their efforts and resources to support industry growth in these areas. The Aceh Province's West Aceh, North Aceh, Langsa City, and South Aceh Districts were noted as non-cattle base areas. Because people prefer to eat chicken meat, which has a more consistent price than beef, which varies, West Aceh District is one of the non-cattle base places. However, if this issue can be resolved,

West Aceh District may eventually turn into a cattle base site if people start eating more beef in the future. The Covid-19 pandemic and the FMD (Foot and Mouth Disease) virus epidemic have made the North Aceh District a non-cattle base area.

Study conducted by Susanti et al., (2014) showed that the total cattle population in Indonesia decreased by 0.38 percent compared to 2018, and Aceh was one of four provinces in Indonesia that experienced a significant decrease in cattle population. A study conducted by Bawono et al., (2020) showed that factors such as cage management, feed, and animal health affect cattle productivity in Indonesia. The study also showed that there are still many farmers in Indonesia who have not implemented modern agricultural technology and good management systems. In a study by Sofyan et al., (2020) in Aceh, factors affecting cattle productivity included cattle age, feed type, and the use of veterinary medicines. The study also showed that access to resources such as water and sufficient feed are important factors in improving cattle productivity. Location Quotient (LQ) results showed that the utilization of modern agricultural technology and good management systems are important factors in increasing cattle productivity and availability in non-cattle base areas Cheng et al., (2022). In general, existing research shows that cattle availability is still a problem in Indonesia, especially in non-cattle-base areas. Factors such as management of cages, feed, and animal health, access to resources, and utilization of modern agricultural technology and good management systems are important factors in increasing cattle productivity (Džermeikaitė et al., 2023).

Another study related to the determination of cattle base and non-base locations in Indonesia is a study conducted by Suryani (2019). This study used Location Quotient (LQ) and Shift Share analysis methods to determine the location of beef cattle base and non-base in Central Java Province. The results of this study show that there are five districts that are beef cattle bases in Central Java Province, namely Brebes, Cilacap, Demak, Grobogan and Rembang. Meanwhile, there are 18 districts that are not beef cattle bases in Central Java Province considering factors such as land availability, feed availability, and the number and quality of livestock in the area. Although this study is different from the beef cattle base and non-base location determination study in Aceh Province, both studies have similarities in using the Location Quotient (LQ) analysis method to determine beef cattle base and non-base locations. In addition, both studies also provided recommendations to increase the cattle population in non-cattle base areas, such as increasing the supply of animal feed, improving the quality of livestock, and educating farmers about the benefits and economic potential of cattle farming.

CONCLUSION AND SUGGESTION

Conclusion

There are 13 cattle base regions in Aceh Province, identified by the Location Quotient study, including Aceh Tamiang, Aceh Singkil, Nagan Raya, East Aceh, Pidie Jaya, Bireuen, Aceh Besar, Simeulue, Southeast Aceh, Banda Aceh City, Aceh Jaya, Pidie, and Gayo Luwes.

Suggestion

As a result of this study, it is anticipated that district and city governments in Aceh Province will concentrate on promoting cattle farming in areas that have been identified as cattle bases. This will increase farmers' income by offering advice and training on how to raise quality cattle, allowing them to produce superior local cattle that can be exported to other regions and used to meet regional needs.

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