Analysis of Agropolitan Area Planning Based on Natural Disaster Mitigation in West Muna Regency, Southeast Sulawesi, Indonesia

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Abstract

Natural disasters that occur have an impact on the agricultural sector. The impact of the disaster on the agricultural community in the form of failed harvests and damage to farming facilities, in addition to causing considerable losses to the community it is also detrimental to the government because in the end it can have an impact on food shortages. The agricultural sector has an important role in West Muna Regency, a sustainable planning is needed and in accordance with the conditions in the region. Therefore, this study aims to analyze agropolitan area planning in the agricultural sector in West Muna Regency based on natural disaster mitigation. The data used in this research is agricultural sector data, especially food crops in West Muna Regency. The Location Quotient method is used to analyze efficient food crop base commodities. Based on the results of the study, it was found that an efficient food plant base commodity was obtained with geographic conditions as an Agropolitan Area. In addition, commodities that are suitable for the disaster that occurred in West Muna Regency were also obtained. Thus the availability of food raw materials is still available and maintained, and can increase competitiveness in the agricultural sector.

Keywords:
Natural Disaster, Agropolitan, Agriculture, food crop commodities, Location Quotient Method.

1. Introduction

Natural disasters that occur have an impact on the agricultural sector. The disasters caused by climate change have a very detrimental impact on the agricultural sector (Sukono et al., 2021). Therefore, the formulation of agricultural policies needs to be done in an effort to minimize the impact of disasters (Kalfin et al., 2020a; Kalfin et al., 2020b; Kalfin et al., 2021). Anticipation efforts need to be carried out so that the impact of the disaster can be minimized and allows the agricultural sector to continue running (Sivakumar et al., 2005). Protection for farmers against the impacts that may be caused by a disaster needs to be done, by implementing disaster impact management activities in order to ease the burden on the farming community and maintain the continuity of agricultural production processes and Agropolitan development in an area. In addition, natural disasters that occur affect the standard of living of rural communities affected by natural disasters (Van, 2006; Davies et al., 2009).

Agropolitan is an agricultural-based economic area characterized by superior commodities, with limitations of economies of scale / business scale without being limited by administrative areas (Surya et al., 2021). The target in developing this agropolitan area is to create an agroplitan area and the development of a local economy based on regional superior products that are effective, efficient, transparent and sustainable (Saleh et al., 2017). Cultivated agricultural commodities are agricultural commodities (food crops, horticulture, plantations, animal husbandry, fisheries) that are cultivated by the majority of the community, their availability is guaranteed continuously. In addition, the concept of development and development of agropolitan areas can change the standard of living of rural communities (Ahmad and Saleh, 2019).

West Muna Regency, where the majority of the people are farming, still use traditional farming systems that depend on the environment and natural resources. The majority of the people of West Muna, in farming, rely on the rain tada system. Where the local people farm during the rainy season and in the dry season prepare land for planting when the rainy season arrives. However, global warming has an impact on climate change, so that the weather is uncertain, causing the agricultural production of the West Muna community to not be optimal. So that the development of Agropolitan development that has been announced does not run optimally.

Based on the problems described above, this study is interested in analyzing efficient food crops with geographic conditions and disasters that occur due to climate change as an effort to develop an agropolitan area in West Muna Regency. With the aim that the government in West Muna Regency can design an agropolitan area plan in the agricultural sector. So that the economic growth of the local community can increase.

2. Material and Method

In this study, the Materials and Methods used are given as follows:

Material

The location of the research carried out is in West Muna Regency, Southeast Sulawesi Province. The data used in the analysis of agropolitan area planning based on natural disaster mitigation, namely data obtained from 11 Districts in West Muna Regency, namely Tiworo Islands, Maginti, North Tiworo, South Tiworo, Central Tiworo, Lawa, Sawerigadi, Barangka, Wadaga, Kusambi and Napano Kusambi. . Data obtained from the Department of Agriculture and Animal Husbandry of West Muna Regency is in the form of agricultural products in each sub-district in West Muna for the last three years (2016-2018).

Method

Insert data

Insert data series is done by arranging the research data subsector based on rows and columns. The subsector is compiled by filling in the indicators used in the research in the form of area names and agricultural commodities.

Calculating the mean value of a random variable

If X is a discrete random variable with a probability distribution $f\ (x)$, then the expected value or mean of X is stated (Cover, 1973):

$$\mu = E(X) = \sum_x xf(x). \quad (1)$$

Meanwhile, if X is a continuous random variable with a probability distribution $f\ (x)$, then the expected value or average of X is declared:

$$\mu = E(X) = \int_{-\infty}^{\infty} xf(x). \quad (2)$$

Whereas $u\ (X)$ is a function in X, the expectation or average of the random variable $u\ (X)$ based on equations (1) and (2) can be stated:

- For discrete X,

$$\mu_{u(x)} = E[u(X)] = \sum_x u(x)f(x). \tag{3}$$

- For continuous X,

$$\mu_{u(x)} = E[u(X)] = \int_{-\infty}^{\infty} u(x)f(x)dx. \tag{4}$$

Calculation of the average value is used to determine the area of the harvest according to each commodity from all sub-sectors.

Location Quotient (LQ) Analysis

The location quotient (LQ) analysis is an analysis used to determine the degree of specialization of economic sectors in an area that take advantage of the basic sector or leading sectors. The location quotient calculates the ratio of the output share of sector i in a city or district and the share out of sector i in the province. The leading sector here means that the business sector will not run out if it is exploited by the regional government (Jumiyanti, 2018; Panagiotopoulos and Kaliampakos, 2021).

Mathematically, Location Quotient Analysis is formulated as follows (Lamonica et al, 2020):

$$\mathbf{LQ} = \frac{\boldsymbol{pi/pt}}{\boldsymbol{Pi/Pt}} \tag{5}$$

Where pi is the average harvested area based on each commodity from all subsectors, PT is the number of subsector harvested areas, Pi is the total production value of agricultural products in each region and Pt is the sum of the harvested / production area of all commodities for each sub-sector from all regions.

Interpretation of Location Quotient (LQ) values

The LQ value obtained will be in the range less than or equal to one to greater than 1, or 1> LQ> 1. The value of LQ indicates the degree of specialization or concentration of the commodity in the region concerned relative to the reference area. This means that the greater the LQ value in an area, the greater the degree of concentration in that area (Lee, 2020).

3. Results and Discussion

The climatic conditions in West Muna Regency show that the average temperature of the area ranges from 25 0C - 27 0C, the annual rainfall is 1,564 mm with an average monthly rainfall of 130.29 mm. The Dry Month period occurs from August to October. With global warming which has an impact on climate change, agricultural production is not optimal in West Muna Regency. The production of agricultural products that is not optimal is influenced by the average agricultural system of the West Muna community using the rain tada system. For example, in planting corn and peanuts in local communities, the majority of resources used in farming expect from rainwater. So that with changes in the rainy season and the erratic dry season causes crop failure and reduced agricultural production.

The results of the analysis of land use in the agricultural sector, especially the food crops cultivated by the people of West Muna Regency, namely maize, peanuts and rice. Corn is a commodity with the most cultivation in West Muna district because it is scattered in each district. Based on production data from the Department of Agriculture and Animal Husbandry of West Muna Regency in 2018, the amount of maize production was 22,600 tons. The sub-district with the highest amount of production is in the Sawerigadi sub-district, which is 3,825 tons. The use of paddy fields is spread across five sub-districts, namely Sawerigadi, Central Tiworo, Tikep, South Tiworo and Maginti districts. The rice fields of Tiworo Selatan and Maginti sub-districts, for now, many people visit to just take pictures with the rice fields as the object. Based on data from the agriculture department, the amount of rice production in West Muna Regency is 3,183 tons with the highest production in Sawerigadi District 1,320 tons in 2018.

Commodity Base for Food Plants

Determination of the basis for food plants using the Location Quotient (LQ) using equation (1). This LQ calculation uses harvested area data and production of each commodity in West Muna Regency 2016-2018. The results of the analysis are given in the following histogram image:

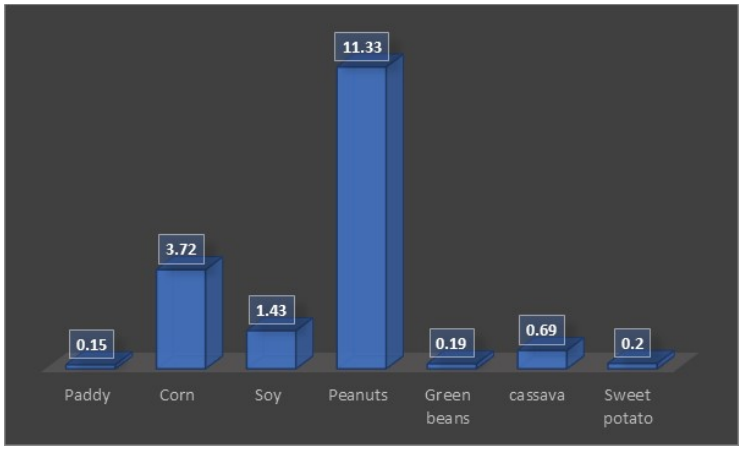

Figure 1. Histogram of LQ value of food crop commodities based on the harvested area

Based on Figure 1, the food crop commodity in West Muna Regency with an LQ value of> 1 is corn at 3.72, soybean at 1.43 and peanuts at 11.33. Furthermore, from the three plants with LQ> 1, namely corn, soybeans and peanuts, the LQ analysis was carried out again. The LQ analysis was carried out based on the harvested area data for the sub-districts in West Muna Regency in 2018. Based on the results of the analysis, data on the harvest area and production of food crops in West Muna Regency in 2018 per district is given in the following histogram image:

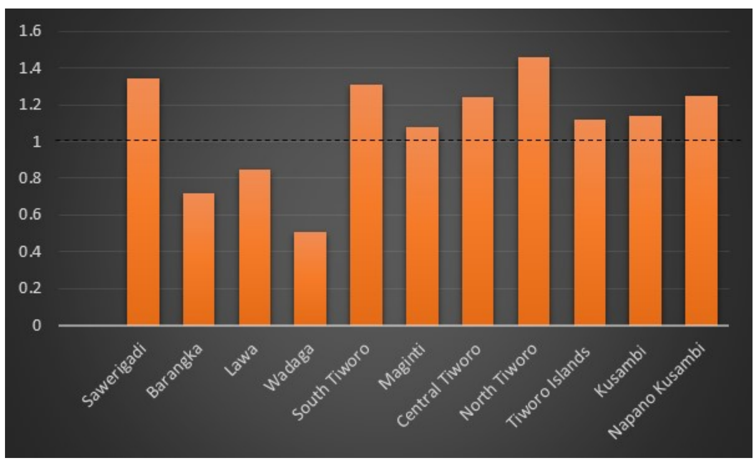

Figure 2. Histogram of LQ Value of Corn Plants Based on Harvested Area per District in West Muna Regency

Based on Figure 2, the highest LQ value is in the North Tiworo District, namely 1.46. While the lowest LQ value was in Wadaga District, namely 0.51. In Figure 2, the distribution of the corn plant base is almost evenly distributed in all sub-districts in West Muna Regency.

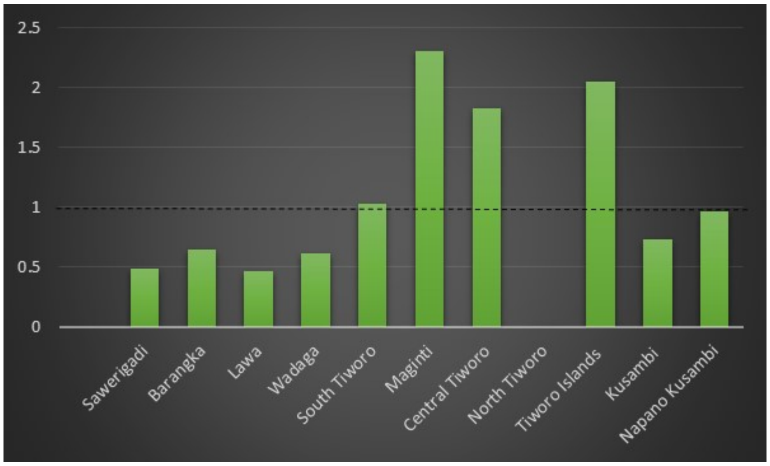

Figure 3. Histogram of Soybean LQ Value Based on Harvested Area per District in West Muna Regency

Based on Figure 3, soybean plants with an LQ value> 1 are scattered in four districts. The four sub-districts are South Tiworo, Central Tiworo, Tiworo Islands and Maginti. The district with the highest LQ value was in Maginti District, namely 2.30, while the lowest LQ value was in Lawa District, namely 0.45. Meanwhile, North Tiworo District does not produce soybeans.

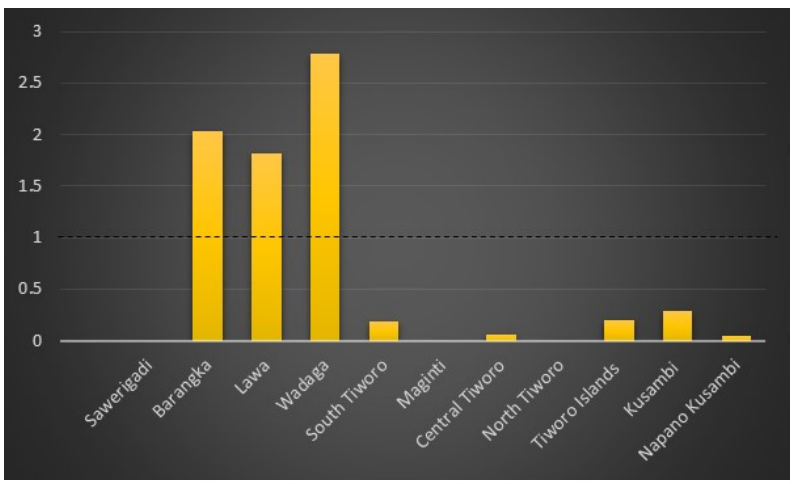

Figure 4. Histogram of LQ Value of Peanut Plants Based on Harvested Area Per District in West Muna Regency

Based on Figure 4, referring to the value of LQ> 1, peanut plants are scattered in the Districts of Barangka, Lawa, and Wadaga. The results of the estimated value of LQ for each district are Barangka of 2.04, Lawa of 2.79 and Wadaga of 1.82. The results of the highest LQ estimation value are in Wadaga District. In the sub-districts of Sawerigadi, Maginti and Tiworo Uatara do not produce peanut plants.

Based on the results of the calculation of the LQ value of food plants based on production data in Southeast Sulawesi using equation 5. The results of the calculation of plant commodities with an LQ value of> 1 for West Muna Regency, namely corn commodities of 5.22, soybeans 2.52, peanuts 16.75, amounted to 1.1 and sweet potatoes by 1.85. Furthermore, from commodities with LQ value> 1, the LQ value analysis is based on the districts in West Muna. The results of the LQ analysis of the 2018 sub-district production data are given as follows:

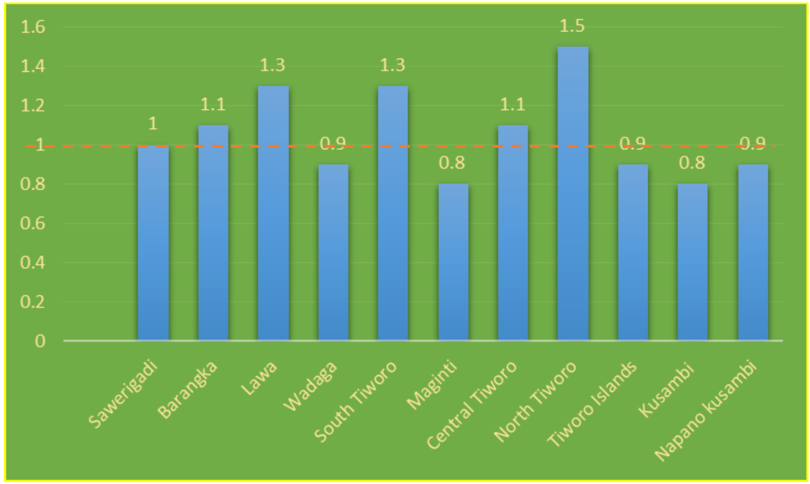

Figure 5. Histogram of LQ Value of Maize Food Crop Production of West Muna Regency per District in 2018

Based on Figure 5, LQ value> 1 for Maize Food Crop Production of West Muna Regency, namely Barangka, Lawa, South Tiworo, Central Tiworo and North Tiworo subdistricts. As for other districts, the LQ value is below one.

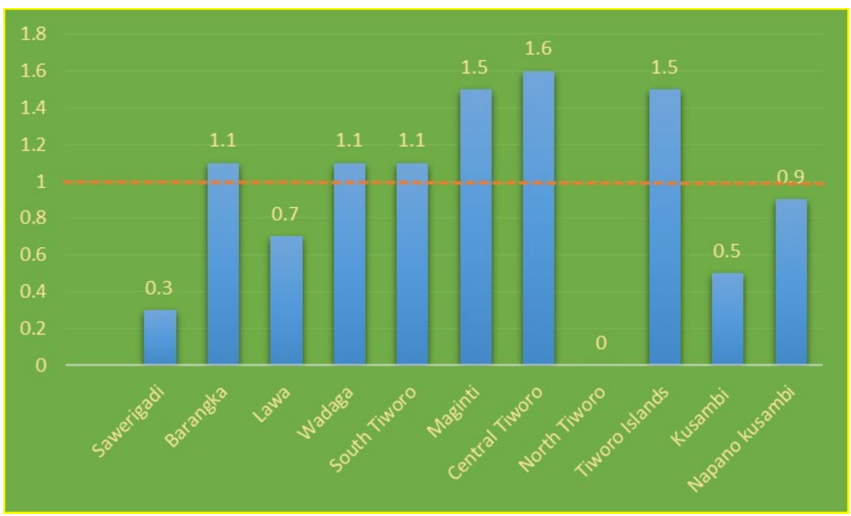

Figure 6. Histogram of LQ Value of Soybean Food Crop Production of West Muna Regency per District in 2018

Based on Figure 6, LQ value> 1 for Soybean Food Crop Production of West Muna Regency, namely Barangka, Wadaga, South Tiworo, Maginti, Central Tiworo and Tiworo Islands subdistricts. As for other districts, the LQ value is below one.

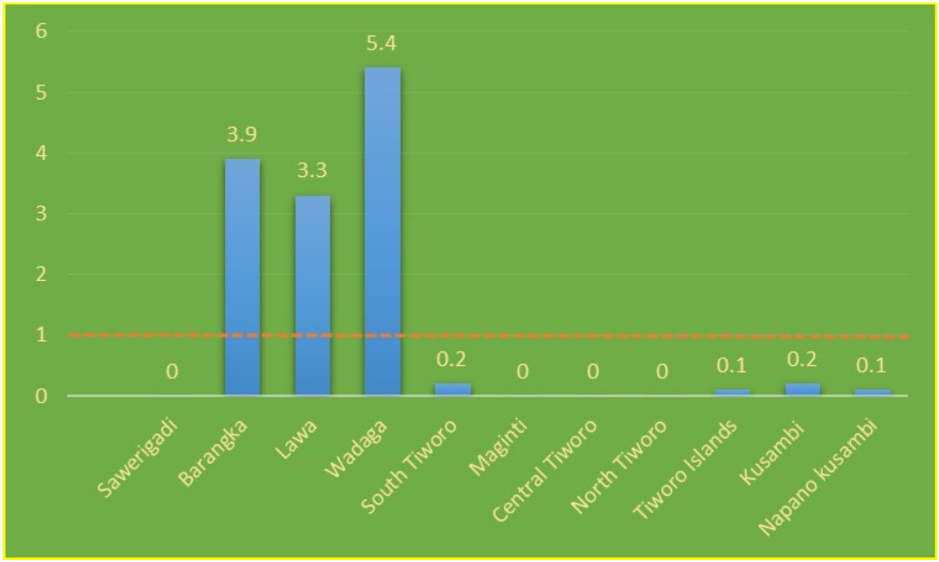

Figure 7. Histogram of LQ Value of Peanut Food Crop Production in West Muna Regency by District in 2018

Based on Figure 7, the value of LQ> 1 for the Production of Peanut Food Crops in West Muna Regency, namely Barangka, Lawa and Wadaga Districts. Meanwhile, for other districts, the LQ value is below one.

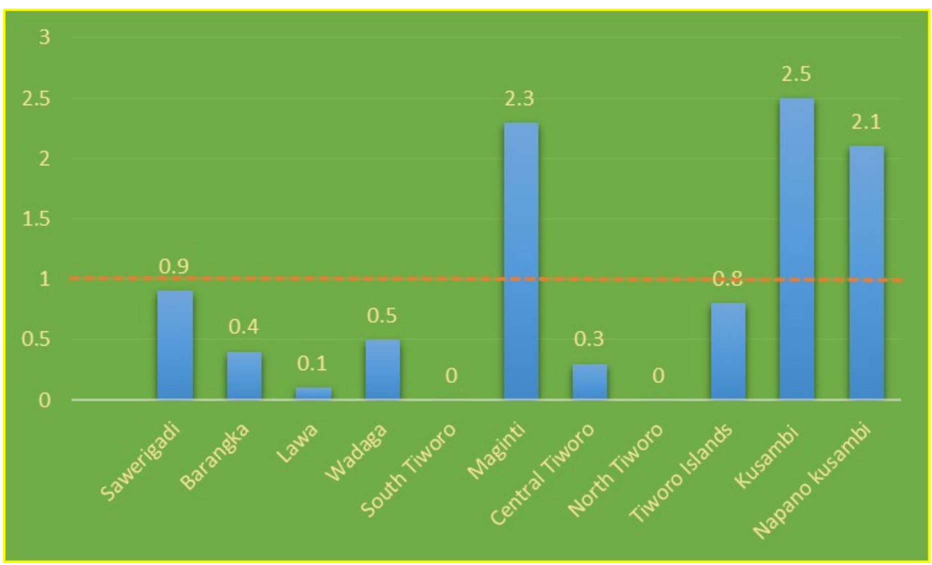

Figure 8. Histogram of LQ Value of Cassava Food Crop Production in West Muna Regency per District in 2018

Based on Figure 8, the value of LQ> 1 for the production of cassava food crops in West Muna Regency, namely Maginti, Kusambi and Napano Kusambi. Meanwhile, for other districts, the LQ value is below one.

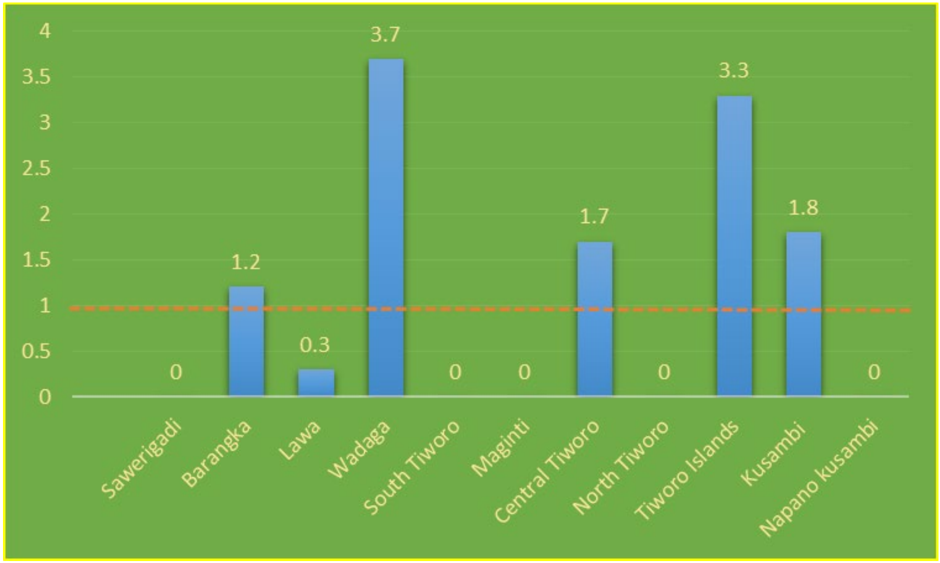

Figure 9. Histogram of LQ Value of Sweet Potato Food Crop Production in West Muna Regency per District in 2018

Based on Figure 9, the value of LQ> 1 for the production of sweet potato crops in West Muna Regency, namely the districts of Barangka, Wadaga, Central Tiworo, Tiworo Islands and Kusambi. Meanwhile, for other districts, the LQ value is below one.

Based on data on production of basic commodities in West Muna Regency, including peanuts, corn, soybeans, cassava, and sweet potatoes. For regional peanut commodities that have an LQ value of more than 1 are in Wadaga District with the highest LQ value of 5.4, then Barangka District with an LQ 3.9 value and the three Lawa Districts with an LQ 3.3 value. Corn commodities that have an LQ value of more than 1 are in Barangka and Tiworo Tengah Districts, namely 1.1, Lawa and Tiworo Selatan Districts, 1.3, and Tiworo Utara Districts 1.5. Soybean commodities with an LQ value of more than 1 are in Barangka, Wadaga and South Tiworo Districts, namely 1.1, Maginti and Toworo Islands Districts 1.5 and Central Tiworo 1.6. The cassava commodity production quantities with an LQ value of more than one are in Maginti, Kusambi and napano Kusambi districts with 2.3, 2.5 and 2.1 respectively. Furthermore, sweet potato commodities with an LQ value of more than one are in Barangka District, namely 1.2, Wadaga 3.7, Tiworo Tengah 1.7, Tiworo Islands 3.3 and Kusambi 1.8 Districts.

The results of the analysis based on harvested area and production data show that peanut is the most basic commodity because it has the highest LQ value compared to other commodities scattered in Lawa, Wadaga and Barangka Districts. This means that the peanuts produced by Wadaga District, Barangka District, and Lawa District are able to meet the needs of their regions and have the potential to meet the needs in other areas or in other sub-districts in West Muna Regency and even export peanuts outside West Muna Regency. The sub-districts of Tiworo Selatan, Tiworo Kepulauan, Kusambi and Napano Kusambi, the LQ value is still very small so that it cannot be developed yet because it is not enough to fill the sub-districts. Sawerigadi, North Tiworo and Tiworo Tengah Districts do not produce peanuts.

4. Conclusion

Based on the existing conditions of the agropolitan area of West Muna Regency, the agricultural commodities of food crops that are widely cultivated in West Muna Regency are corn, peanuts and rice. The development of an agropolitan area based on the results of LQ analysis shows that the basic sector of food crops in West Muna Regency is based on data on the harvested area, namely maize in North Tiworo of 1.5, soybeans in Central Tiworo sub-district of 1.6, peanuts in Wadaga sub-district of 5.4, cassava in Kusambi sub-district of 2.5 and sweet potatoes in Wadaga sub-district of 3.7.

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