Spatial distribution of agriculture commodity in Cilacap Regency

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Abstract. The agricultural commodities in Cilacap Regency has potential to meet the local needs. This research is intended to describe the type, quantity and location of commodity in Cilacap Regency. The analysis models used in this research are GIS, LQ, and study literature. The study showed that Cilacap Regency has excellent potential in food crops, horticulture, plantation, and animal husbandry commodities. Food crops commodities include rice, corn and soybeans. Horticultural commodities include orange, mangosteen, papaya, banana, and chili. Plantation commodities include rubber, coconut, nutmeg, cloves, and coffee. Animal husbandry commodities include cow, goat, duck, broiler, and chicken. Agropolitan commodities are spread in several sub-districts in Cilacap Regency with a variety of biodiversity in adequate land area. The distribution of locations are Dayeuhluhur, Cimanggu, Majenang, Wanareja, Karangpucung, Gandrumangu and Cipari Districts.

1. Introduction

Based on the Central Statistics Agency of Cilacap Regency data, the contribution of agricultural, forestry and fisheries businesses continues to increase [1]. In 2014 to 2016, the successive distribution of PDRB values are 7,785, 8,716, and 9,306 billion IDR respectively. Field survey shows that Cilacap Regency has variety of superior commodities, such as food crops, horticulture and animal husbandry subsectors. The Cilacap Regency has abundant natural resources and contributes greatly to the communities welfare. The production of agricultural commodities in Cilacap Regency has potential to satisfy both local and regional needs as well. Cilacap Regency has superior potential in food crop commodities such as paddy, corn and soybeans. Main commodities of horticultural crops are chili for vegetables and banana for the fruit. In addition there are other sub-sectors of plants that have the potential as leading commodities for example coconut, nutmeg, and cloves. Main animal husbandry commodities are beef cattle, goats, broilers, ducks and quails.

Agricultural Research and Development Agency [2] defines Superior commodities as mainstay commodities that have a strategic position to be developed in an area. Superior commodities are determined by various considerations like technical (soil and climate conditions), socio-economical, and institutional aspects (technological mastery, resource capability, human, infrastructure and local socio-
cultural conditions). The development concept of leading commodities is approached by agribusiness based on the potential of local resources and numbers of commodities which have comparative and competitive advantages (competitiveness). Therefore, the development of leading commodities starts from primary production with main consideration is the agroecosystem [2].

The agroecosystem is the development of an agricultural area, considering the quality and availability of land resources through commodity zoning. Commodity zoning takes land suitability and agroclimate into account in order to obtain optimal agricultural outputs and productivity. The characteristic of tropical agroecosystems is the high diversity of biological resources, but the high diversity of species is not entirely business potential.

The research aims to describe the type of commodity, quantity and location of commodity in Cilacap Regency. Agropolitan strategic areas in Cilacap Regency are Dayeuhluhur, Wanareja, Majenang, Cimanggu, and Karangpucung District [3] [4]. Whereas the development plan areas for the agropolitan strategic area in Cilacap Regency are Cipari and Gandrumanggu Districts [5].

2. Method

The research method are divided into data collection and data analysis. The data collection was carried out by direct observations and in-depth interviews with the community, businesses, and local governments as primary data. This research also uses secondary data such as instantalional data and the result of the similar researches before. the Spatial Planning Document of Cilacap Regency (RTRW) for 2011 - 2031 and Regional Medium-Term Development Plan of Cilacap Regency (RPJMD) for 2017 – 2022 are regional policy document to support secondary data in analysis method. All datas were analysed qualitatively using descriptive-analytic and quantitatively using Locational Quotient.

Spatial analysis powered by Geographic Information System was also used to know the distribution of potential commodity location in Cilacap Regency. Data for GIS are obtained from Peta Rupa Bumi Indonesia of Central Java Province Scale 1:25.000, Digital Contour Map of Cilacap Regency Scale 1:25.000 and Google Terrain of Cilacap Regency. This GIS method produces maps [6].

The Location Quotient (LQ) method that is used to identify superior commodities is accommodated from Miller & Wright (1991), Isserman (1997), and Ron Hood (1998) [7] [8] [9]. According to Hood (1998) Location Quotient is a simple economic development tool with all its advantages and limitations [7]. This following is LQ Formula for superior commodity analysis [10].

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LQ = \frac{(Xic / X)}{(Xi / X...)}
\]

LQ is commodity location queuing i index, Xic is number of commodity i production, Xi is total production of all commodities, Xij is total commodity i production in Central Java Province, Xi .. is total production of all commodities in Central Java Province. This method is used as a first step to understand the activity sectors that are driving growth. This discussion focuses on aspects of labor and income. LQ technique is very relevant to be used as a method in determining leading commodities, especially in terms of supply (production or population). For land-based commodities such as food crops, horticulture and plantations, the calculation is based on agricultural land (planting or harvested area), production or productivity.
3. Study Area
This study was conducted in Cilacap Regency, Central Java Province. This study is located between 108° 4’30” - 109° 30” East Longitude and 7° 30’ - 7° 45”20” South Latitude. It has 24 districts, namely Cimanggu, Majenang, Wanareja, Dayeuhluhur, Sampang Sidareja, Kedungreja, Gandrungmangu, Cilacap Utara, Cilacap Tengah, Cilacap Selatan, Cipari, Bantarsari, Karangpucung, Patimuan, Nusawungu, Maos, Kroya, Kusuh, Kawantung, Kampung Laut, Jeruk Legi, Binangun, and Adipala [1]. Cilacap Regency is bordered by several other regions. The north is bordered by Banyumas Regency and Brebes Regency. East side is bordered by Kebumen Regency and west side is bordered by Ciamis Regency and Pangandaran City, West Java Province [5]. For the agropolitan area, this research was conducted at Dayeuhluhur, Cimanggu, Majenang, Wanareja, Karangpucung, Gandrungmangu, and Cipari districts.

![Figure 1. Administrative Map of Cilacap Regency](image)

4. Result and Discussion
In regional economic development theory, several regions have more potential and abundance of local resources that can lead to comparative and competitive advantages in spurring equitable regional economic growth. The economic growth is assessed from the development of the sector which is the foundation for the distribution of public welfare. To determine the comparative and competitive indicators, the base sectors are needed as a superior. The base sectors are the economic sector that has a specialization or dominance in the Cilacap Regency region compared to the other area of Central Java Province and has a comparative advantage economy in Cilacap Regency. In other words, the base sector is an economic sector that is able to meet all the needs of its own region and to export to other regions as well.

The potential sector is an economic sector whose growth rate is dominant but in terms of contribution to the PDRB is still relatively small. Meanwhile, leading sector is defined as superior economic sector both in terms of growth and in terms of PDRB contribution. To meet the requirements of the leading sector development model, it is necessary to know the distribution of the existing conditions of agropolitan leading commodity producing areas in Cilacap Regency.
The result of field observation survey, food crops commodities include paddy, corn and soybeans. Horticultural commodities are orange, mangosteen, papaya, banana, and chili. Plantation commodities include rubber, coconut, nutmeg, cloves, and coffee. Animal husbandry commodities include cow, goat, duck, broiler, and chicken. The existing commodities are spread in several districts in Cilacap Regency, namely Dayeuhluhur, Cimanggu, Majenang, Wanareja, Karangpucung, Gandrumangu, and Cipari. Food Crops, horticulture, plantation, and animal husbandry Commodity Distribution Map can be seen at Figure 2, 3 and 4.
Figure 4. Plantation Commodity Distribution Map in the Area and Location Plans of Agropolitan

Figure 5. Animal Husbandry Commodity Distribution Map in the Area and Location Plans of Agropolitan
Paddy dominates the area of production land in the agropolitan area. Gandrumang District has the highest area of production land. Gandrumang, Majenang, and Wanareja Districts have area of 10,120 Hectares, 9,545 Hectares, and 9,018 Hectares production land respectively. The area of production land for corn is 524 hectares in Gandrumang District, 490 Hectares in Cimanggu District and 365 Hectares in Karangpucung District. The highest area of production land for soybeans is Gandrumang district which also the highest in Cilacap Regency, which is 410 hectares. The data of production land can be seen at Table 1.

Based on the results of data collection, the area of land production for horticultural commodities uses the number of trees as units for oranges, mangosteen, and papaya. As for the chili, the production uses hectares as units. Papaya is a commodity that dominates the horticulture sector. While the banana commodity is the most commodity in the horticulture sector, which is 516,198 trees. The number of papaya trees in each district is 37,101 trees in Gandrumang District, 21,239 trees in Wanareja District, 12,393 trees in Dayeuhluhur District, 7,000 trees in Cipari District, 6,000 trees in Karangpucung District, 5,000 trees in Cimanggu District and 3,500 trees in Majenang District. The total area of production land for chili in the horticultural sector is 131 hectares spread across Dayeuhluhur, Cimanggu, Majenang, Wanareja, Karangpucung, Gandrumang, and Cipari Districts. The data of production land can be seen at Table 2.

Table 1. The area of production land agropolitan at food crops and horticulture sector

| Districts   | Paddy Rice (Hectares) | Corn (Hectares) | Soybean (Hectares) | Orange (Trees) | Mangosteen (Trees) | Papaya (Trees) | Banana (Hectares) | Chili (Hectares) |
|-------------|------------------------|-----------------|--------------------|----------------|--------------------|----------------|-------------------|-----------------|
| Dayeuhluhur | 6.619                  | 2               | 16                 | 481            | 60.200             | 12.393         |                   | 55              |
| Cimanggu    | 7.568                  | 490             | 234                | 100            | -                  | 5.000          |                   | 1               |
| Majenang    | 9.545                  | 20              | 29                 | -              | 5.075             | 3.500          |                   | 31              |
| Wanareja    | 9.018                  | 65              | -                  | -              | 2.512             | 21.239         | 516.198           | 22              |
| Karangpucung| 4.503                  | 365             | 156                | 55.400         | -                  | 6.000          |                   | 3               |
| Gandrumang  | 10.120                 | 524             | 410                | 11.988         | 29                 | 37.101         |                   | 17              |
| Cipari      | 4.422                  | 80              | -                  | -              | -                  | 7.000          |                   | 2               |

Source: Data Compilation from Departement of Agricultural and Statistic Centre of Cilacap Regency, 2019

Table 2. The area of production land agropolitan at plantation sector

| Districts   | Rubber (Hectares) | Coconut (Hectares) | Nutmeg (Hectares) | Clove (Hectares) | Coffee (Hectares) |
|-------------|-------------------|--------------------|-------------------|------------------|-------------------|
| Dayeuhluhur | 1.086             | 1.140              | 301               | 161              | 198               |
| Cimanggu    | 33                | 1.189              | 249               | 14               | 23                |
| Majenang    | 285               | 1.870              | 83                | 46               | 46                |
| Wanareja    | 796               | 190                | 8                 | 33               | 22                |
| Karangpucung| 261               | 1.390              | 36                | 4                | 10                |
| Gandrumang  | 180               | 1.463              | -                 | -                | -                 |
| Cipari      | 280               | 1.299              | -                 | 2                | 10                |

Source: Data Compilation from Departement of Agricultural and Statistic Centre of Cilacap Regency, 2019.
In the plantation sector, the existing commodities are rubber, coconut, nutmeg, cloves and coffee. The area of production land is in hectares units. Coconut dominates and it is the most commodity in the plantation sector, namely 8,541 hectares of production land. Dayeuhluhur District has 1,086 Hectares of rubber, 1,140 Hectares of coconut, 301 Hectares of nutmeg, 161 Hectares of Cloves, and 198 Hectares of Coffee. Gandrumangu District has 180 Hectares of rubber and 1,463 Hectares of Coconut. Cipari District has 280 Hectares of rubber, 1,299 Hectares of coconut, 2 Hectares of cloves, and 10 Hectares of coffee.

One of the targets to be achieved in the success of the agropolitan strategic area is to increase the quantity of production, product quality and the sustainability of the production of commodities produced. Table 3, 4, and 5 describe the amount of existing production in agropolitan commodities. The data was obtained from the Department of Agriculture and the Central Statistics Agency of Cilacap Regency [1].

Development agricultural areas has a clear production orientation which is to meet both local food needs and market demand. The Agriculture area becomes the main supplier of food needs community because it has several sectors commodity like food crops (paddy, corn, soybeans), animal husbandry (boiler and poultry), and plantation commodities.

The development of agriculture area are able to produce competitive products through increasing production quantity and productivity. The various instruments are using to increase production such as area expansion, use of superior seeds / seeds, application of cultivation technology, irrigation and other activities that focus on the upstream aspect (superior seeds / seeds) and aspects of cultivation (quantity of production).

Agricultural areas as a secondary and tertiary product, develops high value commodities and market demand. Those area are directed to be suppliers of the local and international market demand. Market demand-oriented activity area is directed to be able to improve product competitiveness through increasing production and product quality, continuity of product availability, post-harvest processing and other activities with an emphasis on aspects of cultivation and post-harvest. Post-harvest aspects include processing, storage and quality improvement. Cilacap Regency has all of those to create agropolitan commodities. Total Production of Agropolitan Commodities in Cilacap Regency can be seen at Table 3 and 4.

### Table 3. Total Production of Agropolitan Commodities at Food Crop and Horticulture Sector.

| District      | Paddy (ton) | Corn (ton) | Soybean (ton) | Orange (ton) | Mangosteen (ton) | Papaya (ton) | Banana (ton) | Chili (ton) |
|---------------|-------------|------------|---------------|--------------|------------------|--------------|--------------|------------|
| Dayeuhluhur   | 42.033      | 16         | 17            | 800          | 45.150           | 16.774       | 343.182      | 3.807      |
| Cimanggu      | 48.192      | 532        | 242           | 25           |                  | -            | 3.271        | 17         |
| Majenang      | 61.085      | 164        | 30            | -            | 1.015            | 1.890        |              | 908        |
| Wanareja      | 57.707      | 4.011      | -             | -            | 1.004            | 58.944       |              | 978        |
| Karangpucung  | 28.838      | 2.976      | 161           | 27.700       |                  | -            | 5.966        | 491        |
| Gandrumangu   | 62.846      | 4.331      | 424           | 9.150        | 14               | 62.259       |              | 2.488      |
| Cipari        | 27.856      | 655        | -             | -            | -                | 5.653        |              | 72         |

Source: Data Compilation from Departement of Agricultural and Statistic Centre of Cilacap Regency, 2019.

### Table 4. Total Production of Agropolitan Commodities at Plantation Sector

| District      | Rubber (ton) | Coconut (ton) | Nutmeg (ton) | Clove (ton) | Coffee (ton) |
|---------------|--------------|---------------|--------------|-------------|--------------|
| Dayeuhluhur   | 661.169      | 712           | 2            | 8           | 44           |
| Cimanggu      | 2.040        | 766.800       | 2            | 20          | 7            |
| Majenang      | 8.017        | 1.329.366     | 2            | 41          | 15           |
### Table 5. Total Production of Agropolitan Commodities at Animal Husbandry Sector

| District       | Rubber | Coconut | Nugmed | Clove | Coffee |
|----------------|--------|---------|--------|-------|--------|
| Wanareja       | 554.266| 494     | -      | 30    | 6      |
| Karangpucung   | 41.067 | 660.000 | 1      | 2     | 1      |
| Gandrumangu    | -      | 725.112 | -      | -     | -      |
| Cipari         | 152.676| 483.446 | -      | 1     | 2      |

Source: Data Compilation from Departement of Agricultural and Statistic Centre of Cilacap Regency, 2019.

The LQ calculation results are categorized into three (3) criteria, namely: 1) LQ > 1, means the commodity is the base or becomes a source of growth; 2) LQ = 1 means, the commodity is classified as non-base, has no comparative advantage; and 3) LQ < 1 means, the commodity is a non-base. From LQ analysis, 3 leading commodities will be selected and adjusted to the results of previous studies on agribusiness and policies from the central and regional governments [11].

The centers of horticulture production in Cilacap Regency are located in Dayeuluhur, Wanareja, Gandrumangu Districts. The dominant types of plants are cili, orange, and papaya. But among other fruit plants, there are only two commodities whose processing industry is developing, namely banana and mangosteen hence these two commodities are the leading commodities in fruit plants in Cilacap because it will be able to absorb a lot of labor [11].

![Figure 6. LQ Analysis Result for Horticulture in Cilacap Regency](image-url)

Food crops provider food for humans and feed ingredients of animal husbandry [12], including paddy, corn and soybeans. The highest production for food crops is paddy. Species diversity in food crops shows that Cilacap has considerable potential in absorbing labor as well as driving the micro-level economy [12]. To find the types of food crops that have large enough production, then LQ analysis is used which is presented in Figure 7.
Cilacap Regency has a varied topographic that suitable for plantation crops to grow. Some of areas that suitable for plantations are Majenang and Dayeuluhur [12]. LQ analysis result for plantations is presented in Figure 8. Based on LQ analysis result, the value of other commodities that have more than one LQ Value are rubber, coconut and nutmeg. So they are the base commodities.

For the animal husbandry sector, only Goat has a less than one LQ value. Therefore, it is considered as non-base commodities. Commodities that are spread over to all districts are cows, goats, ducks and chickens. Figure 5.5 shows the results of LQ analysis of animal husbandry. The commodity serves to satisfy the local needs and able to supply region outside the Cilacap Regency. Some areas that become centers of animal husbandry population include Wanareja and other districts [12].

5. Conclusion
Main commodities of Cilacap Regency in accordance to the direction of national superior commodities food crops, horticulture, plantations and animal husbandry. The commodities are distributed in Dayeuluhur, Cimanggu, Majenang, Wanareja, Karangpucung, Gandrumangu and Cipari Districts. Food crops such as paddy and corn, disperse in 7 Districts namely Dayeuluhur, Cimanggu, Majenang, Wanareja, Karangpucung, Gandrumangu, and Cipari Districts, while soybean, spread over 6 Subdistricts namely Dayeuluhur, Cimanggu, Wanareja, Karangpucung, Gandrumangu, and Cipari Districts. Paddy dominates in the agropolitan area, totally 51,795 hectares are of production land. Horticulture sector such as Orange and Mangosteen, disperse in 4 Districts while Papaya, banana and chili, spread in 7 Districts, namely Dayeuluhur, Cimanggu, Majenang, Wanareja, Karangpucung, Gandrumangu, and Cipari Districts. Plantation sector such as Rubber and Coconut, spread in 7 Districts. Coconut is the most commodity in the plantation sector, namely 8,541 hectares area of production land. Cloves and
coffee are spread in 6 Districts, while Nutmeg, spread in 5 Districts, namely Dayeuhluhur, Cimanggu, Majenang, Wanareja, and Karangpucung. Animal Husbandry Sector is scattered in 7 districts namely Dayeuhluhur, Cimanggu, Majenang, Wanareja, Karangpucung, Gandrumangu, and Cipari Districts while Broiler spread in one District, Karangpucung District. Total of the chickens are 733.952 in all area and the highest is Majenang District namely 213.435 chickens.

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