

Research Article

Analysis of the Potential of Leading Sectors and Mapping of Food Crops in Magetan Regency

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Abstract: This study discusses the potential of leading sectors in agriculture, particularly in the food crop subsector, in Magetan Regency. The study aims to identify leading food crop commodities in Magetan Regency and map the production areas of leading food crop commodities. The type of research used is a descriptive quantitative approach. The data sources used in this study are secondary data obtained from official publications of the Central Statistics Agency (BPS) and data from the National Food Agency. The data analysis techniques used are the Sectoral Contribution Index (SCI), Growth Ratio Model (GRM), Dynamic Location Quotient (DLQ), Supply-Demand Ratio (SD), and Composite Index. Meanwhile, the mapping of production areas for key commodities was conducted using GIS at the sub-district level. The results show that corn, sweet potatoes, and rice are the leading food crop commodities in Magetan Regency. Spatial analysis further identifies that priority production areas for these crops vary according to their bio-physical characteristics, with corn being the top priority commodity for development due to its production surplus and competitive advantage.

Keywords: leading commodities, food crops, spatial analysis, Magetan Regency

INTRODUCTION

The agricultural sector remains the backbone of Indonesia's economy, particularly in rural areas characterized by agrarian economic structures. According to data from (Badan Pusat Statistik, 2023), agriculture contributes significantly to the Gross Regional Domestic Product (GRDP) in various regions and absorbs a large portion of the labor force. In East Java Province, agricultural commodities are among the largest contributors to national agricultural production, making the sector a key pillar of the provincial economy and a supporter of national food security. Agricultural commodities contribute 11.04% to East Java's total GRDP composition, making it the third-largest economic driver after the manufacturing and trade sectors.

One region in East Java that exemplifies this dominance is Magetan Regency, located in the western part of the province and part of the Madiun Residency area. Magetan has strong agricultural potential, both in terms of production and land area. A study by (Nadzirah, 2020) revealed that the agricultural sector is the dominant contributor to Magetan's GRDP, with nearly 70% of the population directly employed in agriculture. Additionally, 28,269 hectares out of the total 68,885 hectares of Magetan's

area are rice fields. This not only reflects the community's economic dependence on agriculture but also demonstrates the sector's capacity to absorb labor and improve welfare through the sustainable use of fertile natural resources.

In terms of topography, which consists of plains and hilly areas, combined with a relatively stable climate, Magetan is recognized as a fertile and productive agricultural region. According to the Sensus Pertanian 2023 published by (Badan Pusat Statistik, 2024) the majority of household enterprises in Magetan are still engaged in the agricultural sector, reaffirming the region's agrarian character. Furthermore, the agricultural sector continues to contribute significantly to Magetan Regency's GRDP, highlighting its vital role in the local economic structure. Therefore, the development of the agricultural sector in this region carries strategic significance not only for food security but also for promoting inclusive and sustainable regional economic growth.

Although the potential for food crops in Magetan Regency is quite substantial, it has not been fully optimized. The mismatch between regional potential and commodity development has resulted in low productivity and limited contributions to local economic growth. According to (Wicaksono, 2011) three key factors influence agricultural sector growth: the potential of leading commodities, comparative and competitive advantages, and regional specialization. Moreover, the absence of comprehensive spatial mapping of food crop production areas has led to uneven distribution in regional agricultural development. As emphasized by (Isdianto & Syathori, 2022) spatial mapping efforts can estimate the development potential of leading commodities in each specific area.

According to a study conducted by (Haris et al., 2016) the development of leading commodities in the agricultural sector particularly within the food crop subsector holds a highly important and strategic role due to the increasing demand for food and the need for a continuous and reliable supply. Given the issue that the food crop potential in Magetan Regency has not yet been fully optimized, it is necessary to acquire comprehensive knowledge and conduct mapping of the leading commodities in the region. This will ensure that development strategies are well-targeted and based on the identification of key commodities.

Through this approach, agricultural development planning in Magetan Regency can be directed toward areas with clear comparative and competitive advantages. As a result, policy interventions such as improvements in agricultural infrastructure, market access, and technological innovation can be implemented more effectively. Ultimately, efforts to optimize the utilization of food crop potential in Magetan Regency will not only enhance regional food security but also foster sustainable and inclusive rural economic transformation.

LITERATURE REVIEW

Leading Sectors

Leading sectors are sectors that can be further developed and aim to boost economic growth in a region. Leading sectors are formed from the development of production based on the potential of the region. These leading sectors are not only capable of meeting demand within the region but also capable of meeting demand from outside the region (Kesuma & Utama, 2015). According to (Tarigan, 2014), a key sector is a field that holds a competitive advantage capable of contributing to and making regional development more efficient, as well as accelerating economic growth based on the sector's capacity to contribute to the regional GDP.

According to (Kesuma & Utama, 2015), key sectors can serve as one of the drivers in accelerating economic growth in each region. The economic growth of a region is based on the development of various sectors in that region. Therefore, an analysis of the strategic leading sectors that significantly contribute to regional economic growth is required. These leading sectors can be prioritized in regional economic development planning. Thus, development planning strategies are based on the sectoral potential of the region (Muljanto, 2021).

Commodity Mapping

Mapping leading commodities in a region is a must. Mapping can be a methodology for exploring the economic components of food (Sweeney et al., 2016). This commodity mapping is needed to see the distribution of food commodity development. Thus, it can be the basis for developing food commodity production and distribution that is more evenly distributed in the region. Local governments need to identify sectors and key commodities that are projected to grow rapidly in the region. These commodities have the potential to be marketed outside the region or exported in the future and can be developed to their fullest potential. These sectors need to be stimulated, developed, and synergized with other sectors to achieve maximum results. According to (Tarigan, 2005) sectors are said to be synergistic if the growth of one sector drives the growth of another. Conversely, this creates a significant multiplier effect, ultimately accelerating the economic growth of the region. By considering the potential of a region, the initial step that can be taken is through commodity mapping.

Food Crops

Food crops are a type of plant that can produce carbohydrates and proteins that are very useful for the body. According to (Moeljopawiro & Manwan, 1992), food crops are divided into three groups, namely:

1. Cereals, which are staple crops such as rice, wheat, or sorghum that have a high carbohydrate content.
2. Grains, which include corn, legumes, and soybeans.
3. Root crops such as sweet potatoes, taro, cassava, and others.

According to (Kemenhan RI, 2020), three food commodities rice, corn, and cassava are priority commodities in achieving national food security. These three commodities are considered strategic because:

1. They can be easily developed locally,
2. They are resilient to various climatic conditions, and
3. They provide added value for the feed and food industries.

Food is an important commodity because it is a primary component of human life. Therefore, food as a primary need in terms of consumption must be ensured in terms of supply, access, and distribution (Istifadah & Tjaraka, 2020). Food crops also play an important and strategic role in development. As stated in (Kemenhan RI, 2020), the Deputy Minister of Defense emphasized that food security is a strategic strength no less important than weapons, as in crisis situations such as pandemics or conflicts, food security becomes the primary reliance. Reliance on food imports without national reserves makes the country vulnerable to external and socio-political disruptions.

METHOD

The research approach applied in this study is a descriptive qualitative approach. This approach aims to explore data and information in depth and analyze statistical data to determine the food commodities that are leading commodities in Magetan Regency through the collection of various data from a number of agencies, which are then analyzed spatially to visualize the data in the form of thematic maps. Data collection techniques were carried out using secondary data sources, consisting of statistical data from publications by the Central Statistics Agency and the National Food Agency for the years 2021–2023, as well as spatial data obtained from the National Geospatial Information Agency (BIG).

The steps in statistical data analysis in this study to determine flagship food crops used the Sectoral Contribution Index (SCI), Growth Ratio Model (GRM), Dynamic Location Quotient (DLQ), Production-Need Ratio/Supply-Demand Ratio (SD), and Composite Index (CI). Each of these analyses has its own strengths and weaknesses, so the use of multiple analytical methods is expected to yield optimal results.

Analysis of Leading Sectors and Leading Commodities

Sectoral Contribution Index (SCI) analysis is an analysis that provides information on the proportion or magnitude of production of a sector/product compared to other products/sectors in a region (Jauhari, 2020). The SCI value itself ranges from 0 - 1, with values closer to 1 indicating that the commodity is superior in terms of higher production than other commodities. With the following formulation:

$$SCI = \frac{X_{si}}{X}$$

Description:

SCI = Sectoral Contribution Index

X_{si} = Production value of sector/commodity i

X = Total production value

The Growth Ratio Model (GRM) analyzes the quality of a commodity's production based on the production volume of two time periods (Jauhari, 2020). The GRM value provides a picture of the temporal production potential of a commodity based on the growth of commodity production in the district compared to the production of the same commodity in the province. The formula is as follows:

$$GRM = \frac{\frac{\Delta X_j}{X_{jt}}}{\frac{\Delta X_n}{X_{nt}}}$$

Description:

GRM = Growth Ratio Model

ΔX_j = Change in the value of production of sector/commodity X in the district

X_{jt} = Production value of sector/commodity X in the district in the initial year

ΔX_n = Change in production value of sector/commodity X in the province

X_{nt} = Production value of sector/commodity X in the province in the initial year

Location Quotient analysis is used to determine the potential of a commodity sector in a region relative to the same commodity sector in a larger area. Determining whether a sector is dominant or not aims to identify a method for determining its dominant sector in terms of regional comparative advantage using the Location Quotient analysis tool (Negara & Putri, 2020). The formula is as follows:

$$LQ = \frac{\frac{X_{ij}}{X_j}}{\frac{Y_i}{Y}}$$

Description:

LQ = Location Quotient Index

X_{ij} = Production value of commodity i at the district level

X_j = Total production value of food crops at the district level

Y_i = Production value of commodity i at the provincial level

Y = Total production value of food crops at the provincial level

Meanwhile, Dynamic Location Quotient is an advancement of Location Quotient that can overcome static weaknesses (only describing conditions at one point in time). DLQ analysis uses production data from two points in time, thereby providing information about comparisons or changes in commodity performance over time (Jauhari, 2020). The formulation is as follows:

$$DLQ = \frac{\frac{(1 + g_{ij})}{(1 + g_j)}}{\frac{(1 + G_i)}{(1 + G)}}$$

Description:

DLQ = Dynamic Location Quotient Index

g_{ij} = Average growth rate of commodity i at the district level

g_j = Average growth rate of commodities at the district level

G_i = Average growth rate of commodity i at the provincial level

G = Average growth rate of commodities at the provincial level

Commodity demand analysis (supply-demand) is a comparison between production and demand for a commodity (Sitorus & Mulya, 2014). This analysis compares the volume of commodity production in a region with the volume of consumption demand, which is calculated by multiplying the population by the average consumption of a commodity published by the National Food Agency. The formula is as follows:

$$SD = \frac{Pr}{Kk}$$

Where is:

$$Kk = \frac{(Kp \times Pdd)}{1000}$$

Description:

SD = Supply-Demand Index

Pr = Commodity Production (tons/ha)

Kk = Commodity Demand (tons/year)

Kp = Average Food Consumption (kg/capita/year)

Pdd = Number of Population (souls)

The results of each analysis will be scaled, then added together and averaged. This scaling technique will convert the values of each analysis result into a range of values between 0 (lowest) and 100 (highest). The interpretation of the Composite Index processing results is that the higher the average composite index value of a commodity, the more superior that commodity is compared to other commodities, and vice versa. The general formula for the Composite Index method is as follows (Muta'Ali, 2015):

$$CI = \frac{x_1 + x_2 + \dots + x_n}{n}$$

Keterangan :

CI = Composite Index

x_1, x_2, x_n = Variables used (in this study, the results of SCI, GRM, DLQ, and SD analyses)

n = Number of variables

Spatial Analysis based on Geographic Information Systems

Spatial analysis uses Geographic Information Systems (GIS), which are computer systems built to capture, store, manipulate, analyze, manage, and display various types of spatial or geographic data. The “geographic” part of the GIS acronym refers to information about positions on the Earth's surface, also known as spatial data, as it can be located in space and has geographic references (Kayla M. Gordon, 2017). Thus, GIS's ability to analyze spatial data can serve as a foundation for decision-making, supported by its comprehensive analytical capabilities.

The use of GIS for decision-making is supported by its comprehensive analytical capabilities. GIS technology has specific features for modeling, optimization, and simulation that are needed to generate, evaluate, and test data processing results (Nyerges & Jankowski, 2010). As an example of GIS application, it has been used in studies to determine priority commodity areas in the food crop sector, as conducted by (Jauhari, 2020) and (Achsa et al., 2022), who utilized GIS analysis for food commodity mapping.

GIS applications in this study serve to process spatial and statistical data as the basis for decision-making in determining food crop commodity areas. The results of this analysis can serve as input and evaluation for policies planned by local governments to develop agropolitan areas and supporting infrastructure.

RESULTS

Determination of Leading Commodities in the Food Crop Subsector

Table 1. Food Crop Production in Magetan Regency and Jawa Timur Province in 2021 and 2023 (Tons)

Komoditas	Magetan		Jawa Timur	
	2021	2023	2021	2023
Rice	383753,3	403571,8	9526515,67	9710661,33
Corn	118765	139795	7419580	5991810
Cassave	65974	60500	1677384	1520633
Sweet Potato	39641	55586	346941	324161
Soyben	1042	935	70759	103798
Peanut	8073	5391	119092	121130
Mung Bean	692	357	35997	50138
Total	617940,3	666135,8	19196268,67	17822331,33

Source : Badan Pusat Statistik

Table 2. Food Consumption of Magetan Regency Residents in 2021 and 2023

Commodity	Food Consumption (kg/cap/year)	
	2021	2023
Rice	86,35	84,1
Corn	0,86	0,6
Cassave	18,09	13,8
Sweet Potato	4,99	4,1
Soyben	10,44	9
Peanut	0,49	0,2
Mung Bean	0,24	0,3

Source : Badan Pangan Nasional

Based on the food crop data presented in Tables 1 and 2, several analyses were conducted to assess the performance of each commodity, namely the Sectoral Contribution Index (SCI), Dynamic Location Quotient (DLQ), Growth Ratio Model (GRM), and the Supply-

Demand Ratio (SD). The results of these four analyses were then further processed to generate a Composite Index. The outcomes of these analyses are presented in Table 3.

Table 3. Results of SCI, DLQ, GRM, and SD Analyses of Food Crop Commodities in

Commodity	Magetan Regency			
	SCI	GRM	DLQ	SD
Rice	0.60	1.06	0.86	6.88
Corn	0.21	1.38	1.34	280.13
Cassave	0.09	1.19	1.22	6.01
Sweet Potato	0.08	1.41	1.52	10.64
Soyben	0.00	0.64	0.47	0.17
Peanut	0.01	0.66	0.45	28.96
Mung Bean	0.00	0.55	0.26	2.64

Source : Processed Data

Based on the analysis of leading commodities in Table 2, it can be observed that **rice** generally has the highest average score in the Sectoral Contribution Index (SCI), with a value of 0.60. This score was derived from processed data on food crop production in 2021 and 2023. Meanwhile, in the Growth Ratio Model (GRM) column, **corn** stands out with the highest score of 1.41, making it the most prominent among all food crop commodities analyzed.

The analysis of commodity specialization using the Dynamic Location Quotient (DLQ) method indicates that sweet potatoes, corn, and cassava in Magetan Regency generally show strong potential as base commodities for future development. This conclusion is based on the fact that all three commodities have DLQ values greater than one (>1). Finally, the comparison of production and consumption levels through the Supply-Demand Ratio reveals that corn has the highest average ratio, reaching 280.13, indicating a substantial surplus in production relative to local demand.

Table 4. Scaled Scores and Composite Index Assessment of Food Crop Commodities in Magetan Regency

Commodity	SCI	GRM	DLQ	SD	CI
Rice	100	54.98	47.39	2.4	51.19
Corn	35.3	96.33	85.8	100	79.36
Cassave	14.42	72.04	75.97	2.09	41.13
Sweet Potato	13.3	100	100	3.74	54.26
Soyben	0.16	0	16.68	0	4.21
Peanut	1.46	2.75	15.15	10.29	7.41
Mung Bean	0	-11.8	0	0.88	-2.73

Source : Processed Data

Subsequently, the results of the SCI, GRM, DLQ, and SD analyses presented in Table 4 were further processed using a scaling method to standardize the values. These scaled values were then combined to form a Composite Index used to determine the leading food crop commodities in Magetan Regency. The results show that corn has the highest Composite Index score, reaching 79.36. Based on previous analyses, it can be concluded

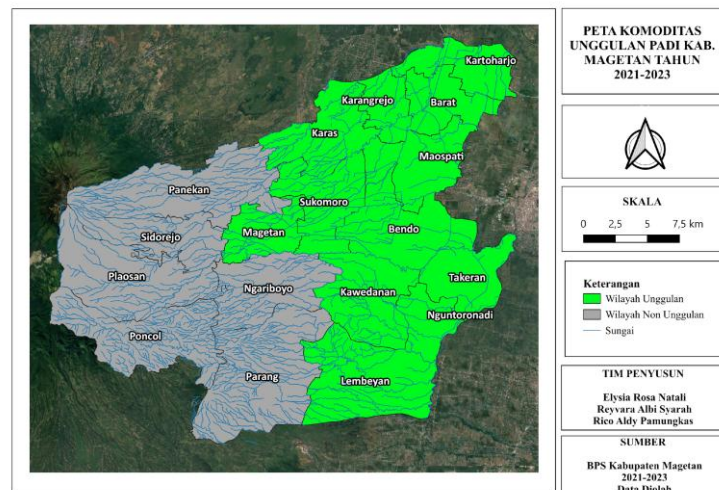
that corn generally possesses strong potential as a base commodity with promising prospects for future development, in addition to having a high production to consumption (supply-demand) ratio.

Spatial Analysis for Determining Production Areas of Leading Food Crop Commodities

Rice Commodity

Rice is identified as one of the base commodities in Magetan Regency during the period of 2021–2023. Based on the results of the Location Quotient (LQ) analysis, twelve sub-districts have been identified as base areas for rice production. These sub-districts include Kartoharjo, Barat, Maospati, Karangrejo, Sukomoro, Bendo, Takeran, Nguntoronadi, Lembeyan, Kawedanan, Magetan, and Karas. The spatial mapping of rice as a base commodity is presented in Figure 1.

Figure 1. Map of Rice Base Commodity Areas in Magetan Regency.

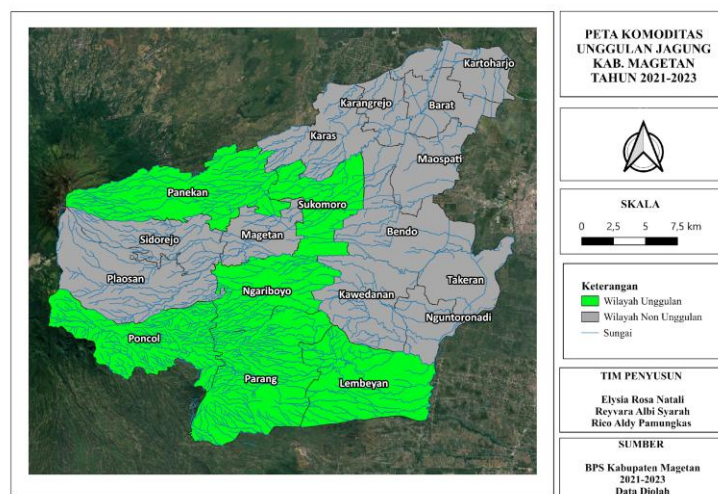


Source : Processed Data

Corn Commodity

Corn is identified as one of the base commodities in Magetan Regency during the period of 2021–2023. Based on the Location Quotient (LQ) analysis, six sub-districts have been identified as base areas for corn production. These sub-districts include Panekan, Sukomoro, Ngariboyo, Poncol, Parang, and Lembeyan. The spatial mapping of corn as a base commodity is presented in Figure 2.

Figure 2. Map of Corn Base Commodity Areas in Magetan Regency.

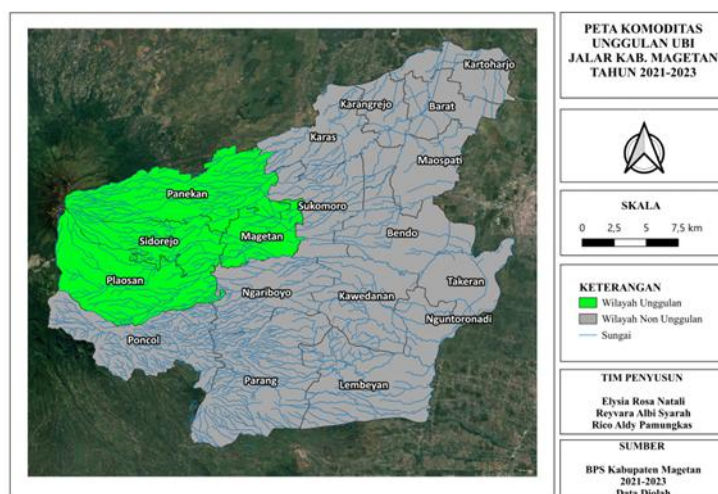


Source: Processed Data

Sweet Potato Commodity

Sweet potato is identified as one of the base commodities in Magetan Regency during the period of 2021–2023. Based on the results of the Location Quotient (LQ) analysis, four sub-districts were identified as base areas for sweet potato production. These sub-districts include Panekan, Sidorejo, Magetan, and Plaosan. The spatial mapping of sweet potato as a base commodity is presented in Figure 3.

Figure 3. Map of Sweet Potato Base Commodity Areas in Magetan Regency.



Source: Processed Data

DISCUSSION

Determination of Leading Food Crop Commodities

The agricultural sector, particularly the food crop subsector, plays a crucial and strategic role in supporting food security and the sustainability of the local economy. This is due to the growing demand for food, driven by population growth and changing

consumption patterns. In Magetan Regency, the primary food crop commodities include rice, corn, soybeans, cassava, sweet potatoes, peanuts, and mung beans. The selection of these commodities is based on the completeness and availability of reliable data, enabling a more accurate and comprehensive analysis of their development potential.

In the broader context of the former Madiun Residency area, the productivity of food crop commodities in Magetan Regency demonstrated significant dynamics between 2021 and 2023. As shown in Table 1, rice remains the main and leading commodity in the region, with production increasing from 383,753.3 tons in 2021 to 403,571.8 tons in 2023. This reflects the continued reliance of Magetan Regency on rice production as the backbone of both food security and the local economy. In addition to rice, corn also experienced significant growth, increasing from 118,765 tons to 139,795 tons, indicating adaptation to the predominantly dry land characteristics of the region. Sweet potatoes also showed an increase in production, while cassava experienced a decline. The production of soybeans, peanuts, and mung beans remained relatively low, suggesting that these commodities still play a limited role in the agricultural sector of Magetan.

Meanwhile, Table 2, which presents food consumption data in Magetan Regency for 2021 and 2023, indicates that rice remains the main staple food, despite a decline in consumption from 86.35 kg/capita/year to 84.1 kg/capita/year. Other commodities such as cassava, sweet potatoes, and soybeans also saw a decrease in consumption. This decline reflects shifting consumer preferences, increased consumption of processed foods, and greater access to practical instant foods. Additional factors such as inflation and rising prices of basic necessities have also reduced purchasing power, leading to decreased consumption even as production continues to increase.

Based on the food crop data, the analysis presented in Table 3 shows that rice holds the highest average Sectoral Contribution Index (SCI) score of 0.60, contributing more than half of the total food crop production in Magetan. This contribution far exceeds that of corn (0.21) and cassava (0.09). However, the Growth Ratio Model (GRM) analysis reveals that corn has the highest score of 1.41, indicating a significant increase in production from 118,765 tons in 2021 to 139,795 tons in 2023. Notably, this increase occurred while provincial corn production declined by 1,023,058 tons, making Magetan's corn growth rate the highest, as local production rose amid a provincial downturn.

The specialization analysis using the Dynamic Location Quotient (DLQ) method shows that sweet potatoes, corn, and cassava have values greater than one (>1), classifying them as prospective base commodities for future development. In contrast, rice, soybeans, peanuts, and mung beans have DLQ values below one (<1), indicating a lack of comparative advantage. In the final analysis related to the production-to-consumption ratio (supply-demand), corn shows the highest surplus, with a ratio of 280.13. In 2023, corn production reached 139,795 tons, far exceeding local consumption needs of only 415.5 tons for a population of 692,553. This data reinforces corn's position as the most promising commodity for future development.

Subsequently, as shown in Table 4, the analysis results were scaled and aggregated into a Composite Index to determine the leading food crop commodities in Magetan Regency. The results indicate that corn has the highest Composite Index score

of 79.36. This confirms that corn stands out due to its high production-consumption ratio, significant contribution to overall food crop output, and potential as a base commodity. Following corn, sweet potatoes ranked second with a Composite Index score of 54.26, and rice ranked third with a score of 51.19.

This study concludes that corn is the leading food crop commodity in Magetan Regency due to its substantial contribution to the potential development of the agricultural sector, both in terms of productivity and economic value. In addition to corn, sweet potatoes and rice are also identified as leading commodities based on the analysis. Therefore, corn production should be further enhanced to support regional self-sufficiency in staple food provision, especially in dryland areas suited to its cultivation. Based on the analysis, the leading food crop commodities in Magetan Regency can be prioritized as follows: Priority 1 – Corn, Priority 2 – Sweet Potatoes, and Priority 3 – Rice.

Spatial Analysis for Determining Production Areas of Leading Food Crop Commodities

Based on the map of leading commodities in Magetan Regency from 2021 to 2023, spatial analysis was conducted to identify the distribution of production areas for the main food crop commodities, namely rice, corn, and sweet potatoes. The spatial analysis results, as illustrated in the rice commodity map, show that the leading rice production areas in Magetan Regency are predominantly located in the eastern, central, and southeastern sub-districts, such as Kartoharjo, Karangrejo, and Barat. These areas are characterized by relatively flat biophysical features and adequate river networks, which support sustainable irrigation systems for paddy fields. These favorable conditions enable intensive and continuous rice cultivation, establishing these regions as leading rice-producing zones.

In contrast, sub-districts located in the western and southwestern parts, such as Poncol, Parang, and Sidorejo, are categorized as non-leading areas for rice production. Geographically, these areas are situated at the foothills of Mount Lawu and feature steeper slopes with dense river networks, indicating higher land gradients and erosion risks. These conditions are generally unsuitable for rice farming, which requires flat land and stable water availability. Consequently, these regions are more suitable for the development of plantation crops, forestry, and horticulture.

The spatial analysis of corn commodity maps indicates that leading corn production areas are concentrated in the western, southwestern, and southern regions of Magetan. Sub-districts such as Poncol, Sukomoro, Parang, Ngariboyo, Lembeyan, and Panekan are identified as primary production zones. These areas generally have varied topography often elevated or hilly and are equipped with simple irrigation systems suitable for corn cultivation.

Meanwhile, the spatial analysis of sweet potato commodity maps reveals that the main production centers are located in the western parts of the regency, including the sub-districts of Plaosan, Sidorejo, Panekan, and Magetan. This distribution reflects geographic and climatic conditions that are favorable for sweet potato cultivation, such

as fertile volcanic soils and elevations that support optimal growth. In contrast, the eastern and southern areas are not considered leading zones for sweet potato production due to unsuitable soil types and differing farmer orientations. This indicates that sweet potato cultivation in Magetan Regency remains localized and specific to certain areas.

CONCLUSION

Based on the results of the SCI, GRM, DLQ, and SD analyses compiled into a Composite Index, this study concludes that corn is the leading food crop commodity in Magetan Regency, with the highest composite score of 79.36, followed by sweet potatoes and rice. The superiority of corn is supported by its significant production growth, its comparative advantage as a base commodity, and a substantial surplus of production relative to local consumption needs. Although rice has the largest overall production contribution, its low DLQ score indicates that it is less prospective as a base commodity in the future. The spatial analysis further reinforces these findings by identifying key sub-districts with production advantages aligned with the region's biophysical characteristics. Therefore, this study recommends focusing agricultural development on improving productivity and efficiency in corn production areas as the first priority, followed by sweet potatoes and rice as the second and third priorities respectively, as a strategy to support food security and local economic self-sufficiency based on regional potential.

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