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MORALITY BEFORE KNOWLEDGE

Study of the potential suitability of chrysanthemum plant areas with the suitability matrix overlay method

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ABSTRACT

Background: Chrysanthemums are ornamental and floricultural plants that have an important role in Indonesia because they are used for religious ceremonies, decorations, and even health therapy. Today, chrysanthemums are considered a trendsetter in the cut flower industry in Indonesia because of their advantages: rich in color, size, and shape, durable, and have a pleasant aroma. However, the increase in production has not been accompanied by a significant increase in productivity. The expansion of chrysanthemum cultivation in Bandung Regency shows a downward trend, although there has been a slight increase lately. The potential of chrysanthemums depends on the suitability of the growing area. Based on this, it is necessary to carry out management and analysis related to the suitability of chrysanthemum cultivation land in Bandung Regency, West Java. The purpose of this study is to identify and evaluate land that is suitable for chrysanthemum cultivation in Bandung Regency. **Methods:** This research study was carried out using Geographic Information System (GIS) analysis with a weighted overlay method using ArcGIS Pro. **Findings:** Based on the results of the analysis, it was found that the area suitable for chrysanthemum cultivation is at an altitude of 0-1500 meters above sea level (masl) with a slope of 0-16%, in the soil types of Andosol and Gleisol, and with a soil surface temperature between 17-30ºC. The land suitable for chrysanthemum cultivation in Bandung Regency is approximately 40,192.23 hectares or around 23.03% of the area of Bandung Regency. less than the area that is classified as "moderately appropriate" and "non-appropriate". **Conclusion:** The study concludes that Bandung Regency has only a small area suitable for chrysanthemum cultivation, highlighting the need for further refinement of the suitability model. **Novelty/Originality of this article:** Thus, the suitability of the chrysanthemum cultivation area in Bandung Regency is reflected in the suitability matrix with a percentage of 23.03%.

KEYWORDS: chrysanthemum; geographic information system (GIS); production; regional suitability.

1. Introduction

Indonesia is known as the largest archipelagic country in the world that is rich in biodiversity known as megadiversity (Ardhita, 2013; Widyatmoko, 2018), in fact Indonesia is the second country in the world after Brazil, which has abundant biodiversity (Parikesit et al., 2012). The agricultural sector plays a significant role in the life of the Indonesian

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nation, one of the promising agricultural potentials in Indonesia is the floriculture commodity because it is supported by the appropriate climate and agroecosystem, available resources, and its ever-increasing population growth (Chrisdiyanti & Yuliawati, 2019). Chrysanthemums are a type of floriculture commodity. Currently, chrysanthemums are among the trendsetter cut flowers in Indonesia because they have advantages: rich in color, size and shape, durable, and have a fragrant smell (Purwanto & Martini, 2013). Chrysanthemums (*seruni*) are ornamental plants that have high economic value and are very popular among the public. According to Setyanti (2016), increasing public knowledge about the uses and benefits of cut flowers can also increase the demand for cut flowers. The uses of chrysanthemum cut flowers are usually used as religious ceremonies, decorations and decorations and are even used for health therapy (Pandey et al., 2023). Apart from being an ornamental plant, this chrysanthemum plant has several benefits in health (Gupta et al., 2021; Sharma et al., 2023). Almost all parts of chrysanthemums can be used for medicinal ingredients. Chrysanthemum plants can be used to treat various diseases such as flu, improving the visual system, cough, fever, abdominal pain, shortness of breath and headaches (Spaargaren & van Geest, 2018). In addition, as an herbal plant, chrysanthemums are often used as a tea and anti-inflammatory in traditional Chinese medicine (Yang et al., 2017).

Chrysanthemums have the potential to be developed because they are in great demand by the community in terms of beautiful shapes and colors (Purwono et al., 2014). The chrysanthemum plant is very popular and in great demand by the public due to its diversity of colors, shapes and types and The main attraction of chrysanthemums lies in the beauty of their flowers (Gupta et al., 2021). The projected demand for chrysanthemums in 2014-2019 is estimated to continue to increase until 2019 to reach 70,676 tons, with an average increase in demand of 12.40% per year (Ekanantari, 2014). Based on statistical data on the production of floricultural plants in Indonesia, chrysanthemums are the type of ornamental plant that has the highest production with the number of harvests per stalk of 466,056,093, 459,188,329 and 378,910,135 respectively from 2018 to 2020 (BPS, 2020). In addition, this ornamental plant has high economic value with high domestic and foreign market demand. Seeing the large demand for cut flower commodities will have an impact on opening up market opportunities for cut flower business actors. The cut flower that has the highest market interest is chrysanthemum. Chrysanthemum (*Chrysanthemum sp.*) is a floricultural plant that has high economic value and has great potential to be developed (Choliq et al., 2020). However, the increase in production was not significantly followed by an increase in productivity. The development of the chrysanthemum harvest area in Bandung Regency shows a trend that had been declining even though it is now slightly increasing. This is evidenced by a decrease in the production of chrysanthemums by around 596,949 in 2019 and began to increase by around 137,209 in 2020 in Bandung Regency (BPS, 2020). The decrease in chrysanthemum productivity in Bandung Regency is caused by, among other things, the cultivation system that has not met the requirements such as not being planted in the appropriate land suitability class (Genesiska et al., 2021). This is due to uncertain climatic conditions that make it less favorable for the productivity produced per unit area of land. Therefore, it is necessary to analyze the suitability of chrysanthemum plant areas using the Geographic Information System (GIS).

Geographic Information System (GIS) is a tool to collect, store, display, and connect spatial data from (partial) earth's surface phenomena to be analyzed and the results communicated to information users, especially for decision-making (Supriatna, 2018). The role of the Geographic Information System (GIS) in terms of land suitability can be in the form of land suitability modeling and land mapping. With this mapping, it is hoped that it can determine land zoning that is in accordance with the characteristics of plant growth conditions. So, it can increase crop production. By using GIS, data to analyze and implement spatial databases can be made available to decision-makers (Prahasta, 2014).

This research was conducted in Bandung Regency, where the production commodity of floriculture plants in Bandung Regency is quite high and has the potential to be

developed. This is supported by the condition of the Bandung Regency area having various types of soil, ranging from volcanic soil to fertile alluvial soil. In addition, Bandung Regency also has a variety of climates, ranging from tropical to subtropical climates that support the growth of various types of plants, including chrysanthemum plants, as well as the use of land which still has many undeveloped areas, and is located in the middle to hilly parts and has cool and cold temperatures that are suitable for the cultivation of floricultural plants, namely chrysanthemums. Therefore, Bandung Regency is one of the areas chosen to evaluate the suitability of chrysanthemum plant areas, in order to increase the production and quality of chrysanthemums in the area, because mapping areas that have the potential to be a place for chrysanthemum cultivation by utilizing spatial data and Geographic Information Systems is an effective strategy to prevent land conversion that is still productive.

This study aims to find out and evaluate the suitable land suitability area for the development of chrysanthemum crop production in Bandung Regency, and to analyze the correlation of physical condition characteristics for the suitability of chrysanthemum plant areas, so that actions can be taken for the improvement and utilization of land in the area. It is hoped that the map produced in this study can help in decision-making related to the area to be planted chrysanthemums in order to increase optimal chrysanthemum productivity and can avoid land conversion that has the potential for chrysanthemum cultivation.

1.1 Land concept and regional suitability

Land suitability is the suitability of specific land uses in a certain type of land (Habibie et al., 2021; Nedd et al., 2021). The level of land suitability can vary depending on the potential and limiting factors that exist in land resources to be used for specific purposes. This depends on the requirements required by user. According to Wahyunto et al. (2016), land suitability classes can be distinguished into subclasses based on the quality and characteristics of land which are the biggest limiting factors. Land suitability reflects the suitability level of an area of land for special use. Good land use planning must consider the level of capability and suitability of land resources (Dong et al., 2021; Huang et al., 2023; Luan et al., 2021). Suitability of land use is the main requirement to achieve optimal land management and utilization. Meanwhile, according to Ritung et al. (2007), Land suitability is a description of the level of suitability of a plot of land for a certain use. Assessing land suitability there are several ways, among others, by multiplying parameters, summation, or using the minimum law, namely matching the quality and characteristics of the land as parameters with the criteria of land suitability class that have been prepared based on the requirements of use or the requirements for growing plants or other commodities that are evaluated. Evaluation of land suitability is indispensable for productive and sustainable land use planning. The suitability of the land can be assessed in the present and future state after repair. Land evaluation is a process of assessing the potential of a land for certain uses (Hardjowigeno & Widiatmaka, 2007). The use of computer-based technology to support such planning is increasingly needed to analyze, manipulate and present information in the form of tables and spaces.

The classification of land suitability for commodities was evaluated using the criteria. Land suitability classification is by combining or matching the criteria/conditions of plant growth that are evaluated with the quality of the land in each SLH research area so that the actual land suitability class is obtained. In determining the classification of land suitability, indicators in the form of characteristics of a land are used. The characteristics/quality of the land observed are temperature, area height, rainfall, soil type, and others. Differences in soil quality and terrain shape are often the main causes of differences in land map units in an area. The definition of land suitability is different from land capability. The capacity of the land emphasizes more on the capacity of various land uses in general that can be cultivated in an area. The more types of plants that can be developed, the higher the ability of the land

(Wahyunto et al., 2016). Land suitability information is expected to provide input and information to carry out appropriate management for sustainable development and community welfare. Based on this, it is necessary to conduct research in an effort to evaluate the level of land suitability for chrysanthemum plant commodities.

1.2 Chrysanthemum chrysanthemum plant

Chrysanthemum sp. is one of the most popular ornamental plants and is in great demand by the public because of its rich colors, shapes, and types of flowers. In addition to having high economic value with high domestic and foreign market demand (Hayati et al., 2021), chrysanthemums also attract attention because of the charming beauty of their flowers. Another factor that affects the high consumer demand for ornamental plants is the diversity of plant phenotypes, which is a motivation for plant lovers (Hayati et al., 2021). Chrysanthemum (*Chrysanthemum morifolium Ramat.*) is also a cut flower that is included in the important commodity in the ornamental plant business. In addition, chrysanthemums have potential as medicinal ingredients in traditional Chinese medicine, especially as a tea and anti-inflammatory (Yang et al., 2017). The natural compounds in chrysanthemums, such as flavonoids, triterpenoids, and caffeoylquinic acid derivatives, have a wide range of pharmacological effects, including as inhibitors of the activity of the HIV-1 integrase enzyme and aldose reductase, as well as having antioxidant, anti-inflammatory, anti-mutagenic and anti-allergic activity properties (Yang et al., 2017). In addition, chrysanthemums also have potential as herbal cosmetics due to their ability to inhibit tyrosinase activity, which is associated with antioxidant effects, skin whitening, and maintaining skin moisture (Yang et al., 2017). In addition to being used as ornamental plants and medicinal materials, chrysanthemums also have potential in the culinary industry. Chrysanthemum leaves and flowers contain potential substances that can be processed into snacks such as candy, chips, and instant drinks. In fact, chrysanthemum leaves, flowers, and stems can be used as natural dyes in silk fabrics (Listyani & Widiawati, 2013).

In the scientific classification, chrysanthemum plants belong to the division Spermatophyta, subdivision Angiosperms, class Dicotyledoneae, family Asteraceae, genus Chrysanthemum, and species Chrysanthemum morifolium Ramat, C. indicum, C. daisy, and others. Chrysanthemums, also known as golden flowers, are native to East Asia, such as Korea, Japan, and Northern China, but are currently more widely grown in Europe and America. In Japan, chrysanthemums are considered a symbol of empire and are the national flower of the cherry blossom country. Chrysanthemums are perennials that flower continuously, but are cultivated as annuals. Chrysanthemums were introduced to Europe and France in 1795 after spreading from China and Japan. In Indonesia, chrysanthemums began to be developed commercially by flower farmers since 1940. Then there are more than 50 varieties of chrysanthemums, such as Fiji, Marimar, Azzura, Pasopati, Solida, Bakardi, and Puspita Nusantara, which are the superior varieties in Indonesia. These variants are characterized by diverse flower colors, large size, and uniform plant growth. Production risks in chrysanthemum cultivation can arise due to the use of improper inputs, such as seeds, fertilizers, pesticides, and labor, as well as inappropriate environmental conditions. Overall, chrysanthemums are a popular ornamental plant and have high economic value. This is because the beauty of flowers and their potential use in various industries make them in demand both as ornamental plants, medicinal materials, and raw materials for culinary and textile products. With the development of superior varieties and a good understanding of proper cultivation, chrysanthemums have great potential in improving the living standards of farmers and meeting the increasing market needs (Khan et al., 2021; Wasito & Marwoto, 2004).

1.3 Growing requirements for chrysanthemums

Factors that affect the diversity of chrysanthemum plants are topography and geography, namely with the criteria of having a height that is in accordance with the conditions for growing chrysanthemums, climate and good care can produce maximum results. Chrysanthemums are generally cultivated at an ideal altitude of 800 meters above sea level (above sea level). Meanwhile, according to the Agency for the Assessment of Agricultural Technology, chrysanthemums can grow well in medium to highland areas with an altitude range of 700-1200 meters above sea level. According to the International Chrysanthemum Society, chrysanthemum plants grow well in sandy clay-textured soils, water content of 50% – 70% with a type density of 0.2 – 0.8 g/cm^3 and a pH range of 5.5 – 6.5. The air temperature is good for chrysanthemums to grow, especially in tropical areas such as Indonesia, between 17°C - 30°C. Chrysanthemum plants require high air humidity, which is 90-95%, at the beginning of growth for the beginning of seed root formation by the shoot cuttings method (Cahyono et al., 2021). Meanwhile, in adult plants, the air humidity needed is around 70-85%. In its natural habitat, chrysanthemums are shrubbing plants and can grow up to 30-200 cm in height. Chrysanthemum plants are plants that are not resistant to inundation and avoid direct rainwater splashes (Dinika et al., 2021). Heavy rain or high rainfall conditions that directly hit chrysanthemum plants can cause plants to collapse easily, damage and poor flower quality. Therefore, chrysanthemum cultivation should be done in a plastic house building or greenhouse. The ideal planting medium for chrysanthemums is soil that has a sandy clay texture, is fertile, loose and has good drainage (Shintiavira et al., 2021; Singh et al., 2022). In the study of the suitability of chrysanthemum plant areas, evaluation parameters were used using the classification of the suitability of chrysanthemum plant land.

1.4 Methods for territorial conformity

According to Supriatna (2018), GIS is a tool that can be used to obtain, store, display and correlate spatial data derived from spatial phenomena on the earth whose results can be analyzed and communicated to users of certain information to make a decision. Geographic Information System is a set of equipment to collect, store, output as needed, move, and display data spatially derived from the actual situation. With GIS, spatial analysis of the suitability of the area or land can be carried out using parameters that are processed and weighted according to the magnitude of the influence on the productivity of chrysanthemum plant growth. This ability distinguishes GIS from other information systems that make it useful for various circles to explain events, plan strategies, and predict what happens.

2. Methods

2.1 Research areas

This research was conducted in Bandung Regency. Bandung Regency is one of the districts located in West Java Province, which administratively is located between the city of Bandung, West Bandung Regency, Cianjur Regency, Sumedang Regency and Garut Regency. The geographical condition of the Bandung Regency area is located at the coordinates of 107° 31' 41.07" East Longitude and 7° 1' 18.97" South Latitude, and is located in a highland area. Bandung Regency has an area of 176,796 hectares or 1,767.96 km^2, most of which the Bandung area is located between the hills and mountains that surround Bandung Regency and consists of 31 sub-districts, 10 sub-districts, and 270 villages. The boundaries of Bandung Regency are as follows, to the north there are West Bandung Regency, Bandung City, Cimahi City, Subang Regency and Sumedang Regency; to the east

there are Garut Regency and Sumedang Regency; to the south there are Garut Regency and Cianjur Regency; to the west there are West Bandung Regency and Cianjur Regency.

The Bandung Regency area has a topography characterized by a large plateau in the central part surrounded by mountains to the west, south, north and east. The morphology of Bandung Regency is in the form of a highland or mountainous area with an average slope slope between 0-8%, 8-15% to above 45%. Bandung Regency has a tropical climate that is influenced by a monsoon climate with an average rainfall of between 1,500 mm to 4,000 mm per year. The air temperature ranges from 12 °C to 24 °C with humidity between 78 % in the rainy season and 70 % in the dry season. Meanwhile, based on its topography it is divided into 2 parts, namely to the north lies Bukit Tunggul with a height of 2,200 m, Mount Tangkuban Parahu with a height of 2,076 m which borders West Bandung Regency and Purwakarta Regency and to the south there is Mount Patuha with a height of 2,334 m, Mount Malabar with a height of 2,321 m, and Mount Papandayan with a height of 2,262 m and Mount Guntur with a height of 2,249 m. both are on the border with Garut Regency.

2.2 Research variables

In this study, four variables are used to determine the suitability of the area for chrysanthemum cultivation. These variables include altitude, slope, soil type, and soil surface temperature. Each variable is assessed based on the specific characteristics required for optimal chrysanthemum growth.

Table 1. Data used in the study

Data Type	Year	Source
Soil Type	2019	Agricultural Research and Development Center (BBSDLP)
Altitude of the Region	2019	DEMNAS (BIG)
Slope	2019	DEMNAS (BIG)
Soil Surface Temperature	2019	LST Landsat Imagery 8

2.3 Data collection

In determining the area of suitability for chrysanthemum plants in Bandung Regency, the weighted overlay method is used. The data collection used in this study is secondary data. Secondary data is data obtained indirectly by data collectors (Sugiyono, 2019). Secondary data in this study is in the form of data or information obtained from literature study sources and the data needed is obtained from various sources related agencies. The data obtained and the data sources in this study are as follows.

Table 2. Data used in the study

Data Type	Year	Source
Soil Type	2019	Agricultural Research and Development Center (BBSDLP)
Altitude of the Region	2019	DEMNAS (BIG)
Slope	2019	DEMNAS (BIG)
Soil Surface Temperature	2019	LST Landsat Imagery 8

2.4 Data processing

Data processing in this study was carried out after obtaining secondary data. According to Wardani (2013), Data Processing is a system that provides report information in the form of value reports and related information based on the web, thus helping speed and quality in the delivery of information. The data processing in this study uses a spatial analysis model in the Geographic Information System (GIS). Land suitability maps for turmeric plants are generated through several stages of map overlays using a formula consisting of several parameters such as rainfall, slope and elevation. This overlay stage is carried out by utilizing facilities in the ArcGIS software.

In determining the area of suitability for chrysanthemum plants, there are several areas that are not suitable for chrysanthemum planting land. The type of soil for the area of suitability for chrysanthemums is a type of soil that has sandy clay soil conditions, rich in organic matter, and a pH that is not too acidic, which is between 5.5 - 6.5 which is suitable for planting chrysanthemum plants. The soil that is suitable for chrysanthemum plants is andosol and Gelisol soil (Table 3).

Table 3. Scoring soil type parameters

Soil Type	Drainage	Conformity Class	Score	Weight
Andosol	Excellent	Appropriate	3	40
Gleisol	Good	Appropriate	3	
Sambisol, Latosol	Pretty Good	Quite appropriate	2	
Arenosol, Mediterranean Land	Less	Inappropriate	1	

(Kadriansari, 2017)

The height of the region is the difference between the height and low of the earth's surface or the vertical position of an object to a certain point. The height of the place can affect the growth of chrysanthemums. According to Ningrum (2022), the height of the place is an environmental factor that affects plant growth and development. The height of a place can cause differences in environmental factors in that place and affect the size and color of flowers. Chrysanthemum plants can grow optimally at an altitude of 600 - 1500 meters above sea level. Meanwhile, at an altitude of more than 2000 meters above sea level, chrysanthemums will produce low quality and easily die or wither.

Table 4. Altitude parameter scoring

Altitude (masl)	Conformity class	Score	Weight
> 2000	Inappropriate	1	30
1500 - 2000	Quite Appropriate	2	
1200 - 1500	Appropriate	3	
≤ 1200	Appropriate	3	

A slope refers to the shape of the earth's surface that forms a specific angle of inclination relative to the horizontal plane. The steepness of a slope influences water drainage, soil stability, and plant growth. Chrysanthemum plants can grow optimally on slopes ranging from 0% to 16%, which are categorized as flat to gently sloping areas.

Table 5. Scoring slope parameters

Slope %	Information	Conformity class	Score	Weight
> 30	Steep	Inappropriate	1	20
16 - 30	A bit steep	Quite Appropriate	2	
8 - 16	Ramps	Appropriate	3	
0 - 8	Flat	Appropriate	3	

Chrysanthemums originate from subtropical regions, so excessively high temperatures can limit their growth and negatively affect their quality. The ideal temperature range for chrysanthemum cultivation is between 20ºC and 26ºC. However, these plants can still grow in areas with temperatures ranging from 17ºC to 30ºC.

Table 6. Scoring of soil temperature parameters

Surface Temperature °C	Conformity class	Score	Weight
> 35	Inappropriate	1	10
30 - 35	Quite Appropriate	2	
25 - 35	Appropriate	3	
< 25	Appropriate	3	

This study uses several data processing, namely Landsat 8 image data processing using Google Earth Engine, DEM SRTM image data processing and Shapefile using Arcgis Pro (Amin et al., 2023; Ridwan et al., 2023). All data that has spatial information can be visualized in the form of maps with ArcGIS PRO software. In processing each variable, the analysis used is the Weighted Overlay analysis. The analysis uses raster baseline data. Raster data is used to search, display, and store spatial information using grid-shaped pixels, where the grid itself represents specific data or uses matrix structures. Next is model validation. Model validation using the model builder.

2.5 Data analysis

In this study, the overlay analysis used to obtain the area of conformity was the overlay raster with the weighted overlay method. This overlay analysis is built from several variables, namely slope, height, soil surface temperature and soil type. The variable that has the least suitability class is land use with suitable and non-suitable classes. The determination of the weight of each variable based on the size of its influence on the suitability of the area based on the growing conditions of chrysanthemums. The output produced is in the form of a raster that has a new value on each pixel that depicts the appropriate and inappropriate regions.

The research was conducted in determining the suitability area of chrysanthemum plants in West Java Province using the weighted overlay method. The data needed in this study is in the form of secondary data, namely data or information obtained from literature study sources and agencies related to the data needed. The following is a matrix of the suitability of chrysanthemum planting land.

3. Results and Discussion

3.1 Altitude conformity region

Based on Figure 1, most areas of Bandung Regency have suitable classes for chrysanthemum plants. Areas with appropriate regional heights are in the northern, eastern, and western parts of Bandung Regency, a little in the south and central, precisely in Banjaran District, and Arjasari District. Meanwhile, areas that are slightly suitable and not suitable for chrysanthemum plants are scattered randomly in the southeast and southwest parts following the shape of the hills in Bandung Regency.

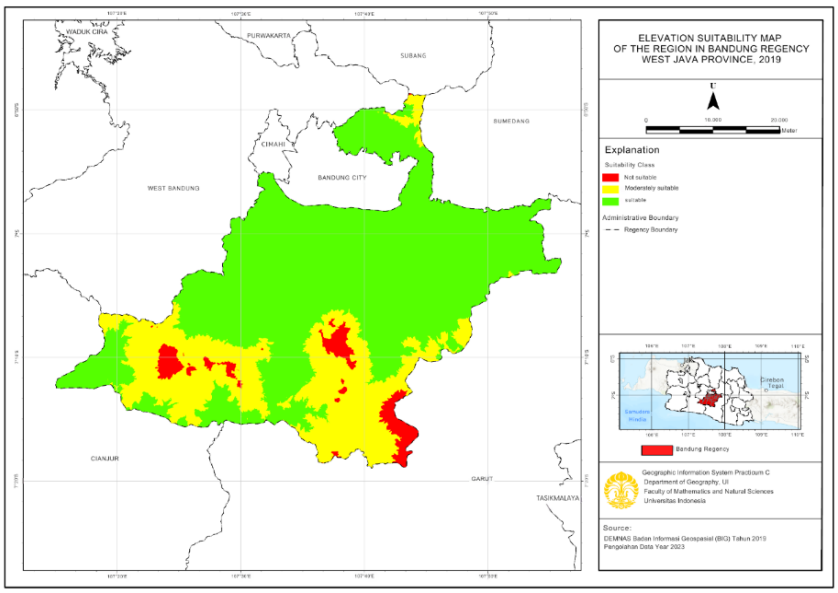

Fig. 1. Map of regional elevation conformity in Bandung Regency in 2019

3.2 Slope suitability region

Based on Figure 2, the areas with most of the conditions are spread across the central, northwest to northern part of Bandung Regency because it has flat to sloping terrain. A small part of this area is quite suitable in the southwest region and a little in the southeastern part of Bandung Regency. However, part of Bandung Regency consists of slope areas that are not suitable because the northern, eastern, western and southern parts of Bandung Regency consist of hills that have a slope of more than 30% with steep to very steep reliefs.

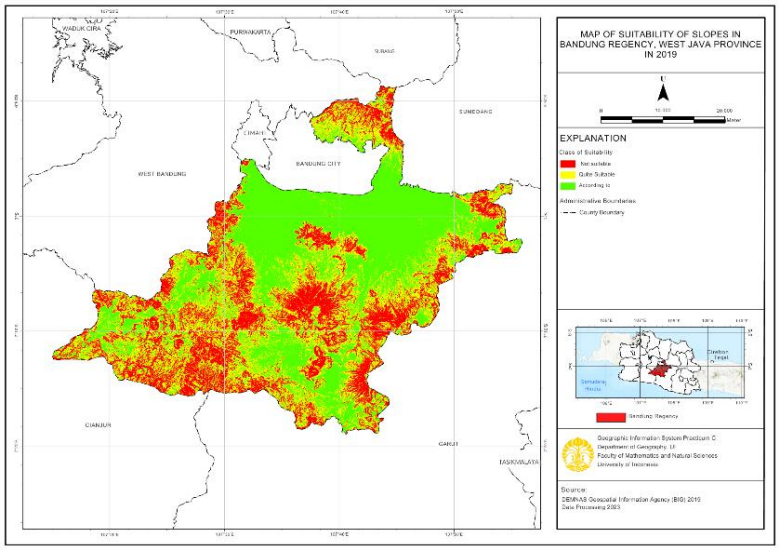

Fig. 2. Map of slope suitability in Bandung regency in 2019

3.3 Land type suitability region

Based on Figure 3, the area with suitable conditions is mostly spread in the southeastern part of Bandung Regency slightly to the center and northwest to the north because it has a type of andosol soil in the southeast and gleisol in the northwest part. Some areas are quite suitable in the northeast, central and southwestern regions of Bandung Regency. However, there are a few areas in the Regency that consist of slope areas that are not suitable in the middle because they have a type of sandstone soil.

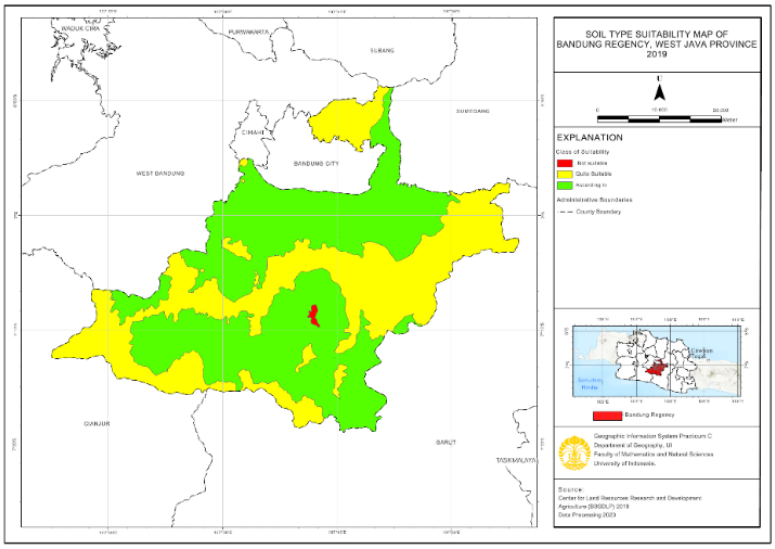

Fig. 3. Map of land type suitability in Bandung Regency in 2019

3.4 Soil surface temperature conformity region

Based on Figure 4, the Bandung Regency area mostly has a soil surface temperature that is suitable for the growth of chrysanthemum plants. However, there are several areas that also have quite suitable and inappropriate soil surface temperature conditions, which are found in the eastern part of Bandung Regency.

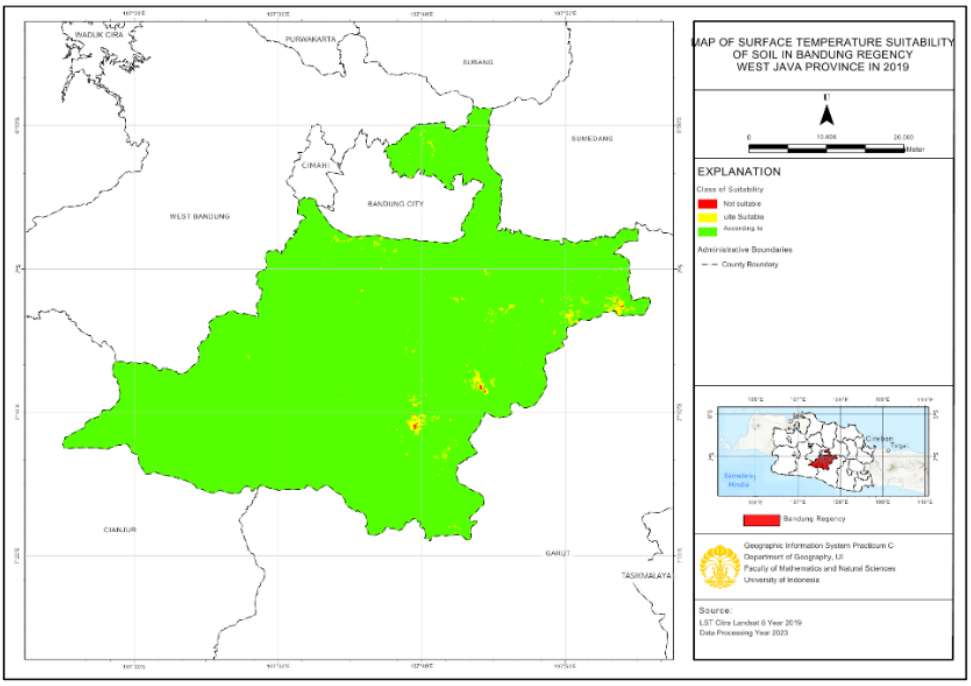

Fig. 4. Map of soil surface temperature conformity In Bandung Regency in 2019

3.5 Region fit overlay analysis

Based on the results of weighted overlay processing, the areas suitable for chrysanthemum plants are spread across the northern part of Bandung Regency. The results obtained were three regional conformity classes, namely suitable, moderately suitable, and non-suitable. The appropriate class is in areas with an altitude of 0 to 1500 meters above sea level, and a slope range of 0% to 16% with andosol and gleisol soil types, and has surface temperature conditions ranging from 17º-30ºC. The type of class that is quite suitable is in areas with an altitude of 1500-2000 meters above sea level, with a slope of about 16-30% or a slightly steep relief, with the types of ambisol and latosol soils. Then for areas with inappropriate class types, they are at an altitude of more than 2000 meters above sea level (>2000 meters above sea level) with a slope of more than 30% or steep to very steep relief. In addition, it has arenosol soil types and Mediterranean soils, as well as temperatures greater than 35ºC.

The appropriate areas are mostly in the West, namely Ketapang District, Margahayu District, Margaasih District, Kutawaringin District, Soreang District, Cangkuang District and a small part, in the south in Pangalengan District, and most in the north in Bojongsoang District, Dayeuhkolot District, Cileunyi District, Rancaekek District, Solokan Jeruk District and a small part in Baleendah District. In the northeast to the southwest, it is an area that is quite suitable and not suitable for growing chrysanthemum plants. The weighted overlay process produces polygons with appropriate regional categories, quite suitable, and not suitable for growing chrysanthemums. Polygon areas can be identified by calculating the geometric method for each region suitability class (Iwahashi & Yamazaki, 2022; Kim et al., 2024; Liu et al., 2024). The area of each class is determined in hectares (Ha).

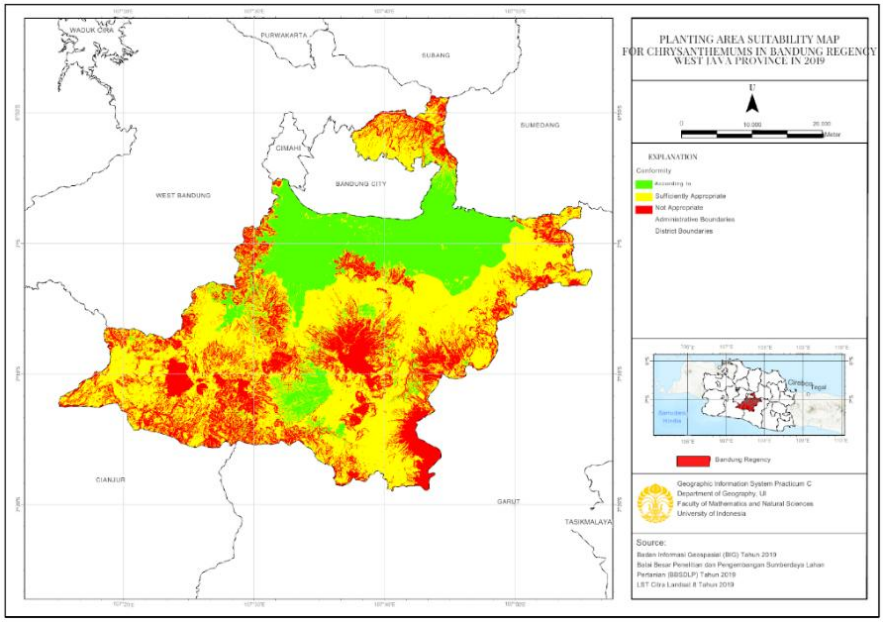

Fig. 5. Map of chrysanthemum crop area suitability in Bandung Regency

From the category of fairly appropriate classes, there is the highest area, which is 83509.80 hectares or 47.84% of the total area of Bandung Regency. As for the category of non-suitable classes, an area of 50790.31 hectares or around 29.13% of the total area of Bandung Regency was obtained. Then for the appropriate category, an area of 40192.23 hectares or around 23.03% was obtained. The results of the study show that the are suitable for growing chrysanthemums has a small area in Bandung Regency.

Table 7. Percentage of regional conformity

Class	Total Area (ha)	Percentage
Appropriate	40192,23	23,03%
Quite Appropriate	83509,80	47,84%
Inappropriate	50790,31	29,13%

4. Conclusion

Bandung Regency is one of the districts that has ornamental plants, namely chrysanthemums. The variables used in the process of determining the area of suitability for chrysanthemums are slope, height, soil type, and soil surface temperature. The area suitable for growing chrysanthemums is around 23.03% of the total area of Bandung Regency, less than the area that is quite suitable and not suitable. The most suitable chrysanthemum growing areas are in the western and northern parts of Bandung Regency. The results of the study show that the area suitable for growing chrysanthemums has a small area in Bandung Regency. This suitable area is located at an altitude of 0-1500 meters above sea level with a slope of 0-16% in andosol and gleisol soil types, and has a surface temperature between 17-30ºC. This study was carried out due to limited data to validate the results of the suitability of the spatial model of chrysanthemum plant areas. However, the resulting model can still be developed by adding variables or other parameters to determine the appropriate area for chrysanthemum plants in Bandung Regency.

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