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Agricultural Land Carrying Capacity in West Sleman Regency 2014-2020

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ABSTRACT
The reduced area of agricultural land in West Sleman will affect the availability of food in the region. The decreasing availability of food will have an impact on the condition of the carrying capacity of the land, whether it will get better or worse. Based on these problems, a study was conducted to determine the condition of the class and the carrying capacity of rice farming land in West Sleman Regency in 2014-2020 and its effect on the indicators used. The data used in this study is secondary data from the Central Bureau of Statistics in 2015-2021 and analyzed quantitatively descriptively. The method used to calculate the carrying capacity of agricultural land using the formula Odum et al (1985) then analyzed by multiple linear regression. The results of the analysis of this study indicate that the carrying capacity of agricultural land in each sub-district in West Sleman is between 1.01-2.61. In addition, the trend of changes in the carrying capacity of agricultural land in West Sleman from 2014 to 2020 fluctuated. Changes in the pattern of carrying capacity of agricultural land are influenced by various factors of agricultural land area, number of harvests, population, and land productivity in each sub-district in West Sleman. The most influential indicators on the carrying capacity of the land are the area of harvested land and the average rice production. Changes in the decrease in the carrying capacity of agricultural land can cause food availability in every sub-district in West Sleman to also decrease.

Keywords: *agricultural land, capacity, West Sleman, 2014-2020.*

1. INTRODUCTION

One of the lands that have several problems is the land that is used for the agricultural sector. Agricultural land has problems in the form of decreased productivity, land conversion due to the development and expansion of cities in the area. In addition, social conditions also affect the population. The increase in population causes the need for land to be higher, which is used as a place to live and for other activities such as the construction of offices, shopping centers, and industries. This can affect rice production in an area, so it can affect rice productivity.

The condition of agricultural land can affect the carrying capacity of land in an area, where the available land can still support agriculture in the area or not. The carrying capacity of agricultural land is an effort of agricultural land to support the welfare of people's lives in an area, especially in meeting food needs [1]. Therefore, an analysis of the carrying capacity of agricultural land is very important to do, because it supports the sustainability of agriculture in the future. Analysis of the carrying capacity of agricultural land produces a link between the harvested area and agricultural productivity, in which these two factors can affect the increase in the carrying capacity of agricultural land [2].

Special Region of Yogyakarta is a province that has a rice field area of 762.73 〖km〗^2 in 2019 so that the agricultural sector is one of the factors influencing economic development in the province. The agricultural sector is the largest contribution in the formation of GRDP with number three after accommodation and availability of food and drink in 2017 [3]. One of the major agricultural contributions in the Province of the Special Region of Yogyakarta, which is dominated by rice commodities. The high value of the rice commodity can be seen from the intensity of the rice harvest which penetrates 1% [3]. However, the increase in population

in the Special Region of Yogyakarta causes the area of agricultural land to decrease.

The area of agricultural land that is always changing will affect the availability of food in an area. The decreasing availability of food will have an impact on the condition of the carrying capacity of the land, whether it will get better or worse. Therefore, research on the carrying capacity of agricultural land in West Sleman is important to be studied more deeply because it affects rice production in the area. In addition, research on the carrying capacity of agricultural land is also important to find out the increasing function of agricultural land, especially in the suburbs, and the need for land use to meet needs is also increasing. Based on the description that has been made, this study was conducted to determine the carrying capacity of rice farming land in West Sleman and the interrelationships between the indicators used.of style throughout a conference proceedings.

2. MATERIALS AND METHOD

The research will be conducted using secondary data, where this study uses quantitative descriptive methods, so that researchers can explain the secondary data in a time series, using data from 2014 to 2020. In addition, multiple linear regression methods are used to determine the effect of indicators on power. support rice farming land. The data that has been collected is then processed using SPSS software. The area coverage that will be the object of research and will be tested using a mathematical formula is four Kapanewon in West Sleman Regency, which consists of Kapanewon Minggir, Kapanewon Seyegan, Kapanewon Moyudan, and Kapanewon Godean which were analyzed descriptively quantitatively.

2.1. Location

Sleman Regency is a district that has the most extensive agricultural land in the Special Region of Yogyakarta [4]. However, in Sleman Regency there is a lot of land-use change because the southern part is directly adjacent to the city of Yogyakarta. In addition, another influencing factor is the existence of infrastructure facilities that encourage the occurrence of a massive activity or activity, such as the existence of universities in the city of Yogyakarta [4]. The West Sleman region which consists of four sub-districts namely Kapanewon Seyegan, Kapanewon Minggir, Kapanewon Godean, and Kapanewon Moyudan is the location of the research to be carried out. This location was chosen with various considerations, namely: (1) West Sleman is the most extensive agricultural area in Sleman Regency, so that agricultural land needs to be maintained to remain self-sufficient in food, (2) West Sleman is an area that has the characteristics of wetland agricultural.

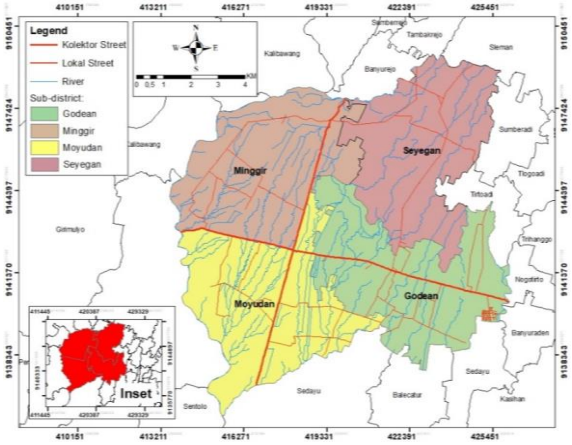

Figure 1 Administration Map of West Sleman Regency

2.2. Data Analysis

The data collection technique uses records and secondary data methods. The data used in this study are secondary data collected from the Central Statistics Agency and the Department of Agriculture and Fisheries of Sleman Regency. The data on the carrying capacity of agricultural land for rice commodities used in this study is data on the area of agricultural land in each sub-district, area of harvested land, average rice production, population, and minimum physical needs.

2.2.1. Carrying Capacity

The data processing method to determine the condition of the carrying capacity of agricultural land is to use a mathematical calculation formula. The calculation formula is used to determine the level of carrying capacity of agricultural land. The carrying capacity of agricultural land for rice commodities is obtained from the comparison of the area of rice harvested per capita with the area of harvested land. Therefore, the data needed to calculate the carrying capacity of the agricultural land is to use data on population, area of harvested land, average land production per hectare, and minimum physical needs. The mathematical calculations used to calculate the carrying capacity of agricultural land are using the following formulas from the concepts and theories of Odum, Christeiler, Ebenezer Howard, and Isard (1985) [5].

$$\partial = \frac{Lp/Pd}{KFM/Pr}$$

Description:

∂ = Carrying capacity of agricultural land

Lp = Harvested area (hectares)

Pd = Population (inhabitants)

KFM= Minimum Physical Needs (kg/capita/year)

Pr =Average land production per hectare (kg/hectares)

The calculation is carried out using only the necessary parameters, which are limited to 1) population, 2) harvested area, 3) Minimum Physical Needs (KFM), and 4) land productivity/ha. Parameters that are very influential on the carrying capacity of agricultural land are the condition of the area and its population. The Minimum Physical Needs (KFM) used to calculate the carrying capacity of agricultural land in this study is 265 kg/capita/year, and the Decent Living Needs (KHL) is 650 kg/capita/year. The amount of the KHL is equivalent to 2.46 x KFM. Therefore, the classification of the carrying capacity of agricultural land is divided into three classes, namely as follows.

1. Class I = $\partial > 2{,}46$, means that the area can be self-sufficient in food so that it can provide a decent life for the community.

2. Class II = $1 \leqslant \partial \leqslant 2{,}46$, means that the area can be self-sufficient in food but cannot yet provide a decent life for the community.

3. Class III = $\partial < 1$, means that the area has not been able to be self-sufficient in food for the community.

2.2.2. Relationship Between Agricultural Land Carrying Capacity Indicators

After analysing the carrying capacity of rice farming land in West Sleman, then an analysis of the relationship with the indicators used was carried out. The analytical method used to determine the relationship between the carrying capacity of agricultural land and its indicators is to use the multiple linear regression analysis methods. This method is used because the data to be tested has more than one indicator, and it is necessary to know the relationship between the indicators used.

The basis for decision making in the multiple linear regression test of agricultural land carrying capacity and food availability is using the t-test and F test. The level of confidence used for this multiple linear regression analysis is 95% or 0.05. The basis for making t-test decisions are as follows:

1. If the significance value is < 0.05, or t count > t table, then there is an influence between indicators

2. If the significance value is > 0.05, or t count < table, then there is no influence between indicators

The calculation of t table to test the carrying capacity of agricultural land is as follows:

t table = t(a/2 ; n-k-1)
= t(0.05/2 ; 7-3-1)
= t(0.025 ; 3)
= 3.182

The basis for making F test decisions are as follows:

1. If the significance value is < 0.05, or F arithmetic > F table, then there is a simultaneous influence between indicators on the carrying capacity of agricultural land

2. If the significance value is > 0.05, or F count < F table, then there is no effect between indicators simultaneously on the carrying capacity of agricultural land

The calculation of the F table to test the carrying capacity of agricultural land is as follows:

F table = F(k ; n-k)
= F(3 ; 7-3)
= F(3 ; 4)
= 6.59
Description: a = amount of data
k = number of variables

The withdrawal of the hypothesis in this multiple linear regression test is as follows:

a. H1 = There is an effect between indicators (population, area of harvested land, average rice production, and conversion of grain to rice) simultaneously on Agricultural Land Carrying Capacity and Food Availability

3. RESULT AND DISCUSSION

Food self-sufficiency, especially rice in an area, can be determined using indicators of the carrying capacity of agricultural land which can be seen from the availability of food ingredients, namely rice. The level of carrying capacity of agricultural land is divided into three classes, namely class I (high), class II (medium), and class III (low). The carrying capacity class of agricultural land is influenced by various indicators, namely the average rice production per kilogram per hectare, harvested area, and population. The increasing population growth in rural areas causes the need for land for settlement to increase as well. This can encourage changes in the use of agricultural land in settlements.

The data used to calculate the carrying capacity of rice farming land in West Sleman (Kapanewon Minggir, Kapanewon Seyegan, Kapanewon Moyudan, and Kapanewon Godean) uses five-year data, from 2014 to 2020. The theory is used as the basis for calculating the carrying capacity of this rice farming land namely using the theoretical concept of [5]. The value of the carrying capacity of rice farming land in West Sleman has different variations. Variations in these values are influenced by different indicator values. The indicators used are population, harvested area, KFM, and average rice production. The KFM (Minimum Physical Needs) value used is 265 kilograms/capita/year, which is equivalent to 1600 calories/person/day. This KFM value means that the population has a decent standard of living in an area.

3.1. Carrying Capacity of Agriculture Land in Kapanewon Minggir 2014-2020

The values of the carrying capacity of rice farming land indicators in Kapanewon Minggir are in table 1.

Table 1. Agricultural Land Carrying Capacity in Kapanewon Minggir 2014-2020.

Year	Population	Harvest Area (Ha)	KFM (Kg/ Capita/ Year)	Average Production (Kg/Ha)	Agriculture Land Carrying Capacity	Classification
2014	34.348	3177	265	5822	2,03	Class II
2015	34.340	3568	265	6446	2,53	Class I
2016	33.288	3813	265	6031	2,61	Class I
2017	32.463	3896	265	5420	2,45	Class II
2018	32.555	3515	265	5154	2,10	Class II
2019	32.585	3.541	265	5376	2,20	Class II
2020	32.110	3.545	265	5793	2,41	Class II

Source: Statistical Center Agency (processed), 2020

Based on table 1 it is known that the indicator values used to calculate the carrying capacity of rice farming land in Kapanewon Minggir from 2014 to 2020. One of the indicators that affect the carrying capacity of rice farming land is population. The number of residents in Kapanewon Minggir from 2014 to 2020 experienced fluctuating changes. Changes in the fluctuating population are balanced by the value of the carrying capacity of rice farming land which is also fluctuating. The largest population has the lowest carrying capacity value of rice farming land, while the least population has the highest carrying capacity value of rice farming land. For example, in 2014 it had the highest population while the carrying capacity of rice farming land was the lowest. The year 2016 has the lowest population, while the carrying capacity of rice farming land is the highest. This is because the population indicator greatly affects the size of the carrying capacity of agricultural land. Other indicators that affect the carrying capacity of rice farming land are harvested area in hectares, average rice production expressed in kilograms per hectare, and KFM value. The graph of the analysis of the carrying capacity of rice farming land in Kapanewon Minggir can be seen in figure 2.

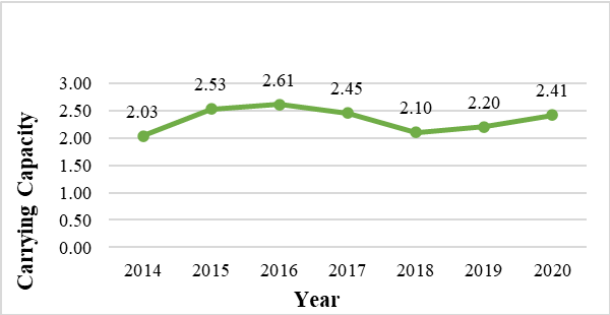

Figure 2. The graphic trend of carrying capacity of agricultural land in Kapanewon Minggir 2014-2020.

Based on figure 2 it is known that the carrying capacity of rice farming land in Kapanewon Minggir has a fluctuating trend, but tends to increase. This means that the carrying capacity of rice farming land has changed in the form of increasing and decreasing for seven years. The increase in the carrying capacity of rice farming land for the seven years occurred in 2015, 2016, 2019, and 2020. The increase in value from 2015 to 2016 was not large enough, but in both years it had the highest carrying capacity class for rice farming. tall.

The years 2015 and 2016 were included in the carrying capacity of class I rice farming land. This means that the Kapanewon Minggir area in that year was able to be self-sufficient in food and could also provide a decent life for its residents. From 2019 to 2020, there was a fairly large increase, but it was still only included in the carrying capacity of class II rice farming land. This is because the carrying capacity of agricultural land is only in the range of 1-2.46. In contrast to previous research, in the Cibaliung watershed, which has poor quality of land carrying capacity so that it has not been able to meet the welfare of its residents and has not been able to fulfill food self-sufficiency. The study also used the formula from Odum, Christeiler, Ebenezer Howard, and Isard [1].

The carrying capacity of rice farming land in 2015 was 2.53 which has increased from 2014 which was 0.50. The increase in the carrying capacity of rice farming land also occurred again in 2016 which was 0.8 to 2.61. After experiencing a significant decline in 2018, the carrying capacity of rice farming land increased again in 2019 from 2.10 to 2.20. Then in 2020 again experienced a fairly large increase, namely from 2.20 to 2.41. This increase occurred because the average yield of rice production and harvested area in 2014-2015 and 2019-2020 increased.

The increase in the average yield of rice production and harvested area affects the carrying capacity of the paddy farmland which also increases. Although in 2016 the average rice production decreased, the harvested area increased quite widely, and the population decreased. The population also affects the carrying capacity of rice farming land. If the population

continues to increase, it will cause the carrying capacity of the land to be lower. This is in line with previous research conducted by Mubarokah et al (2020) entitled "Analysis of the Carrying Capacity of Agricultural Land for Food Crops in the Cibaliung River Basin, Banten Province". The results of the study stated that the increasing population and decreasing quality of agricultural land for food crops were the cause of the low carrying capacity of agricultural land in the Cibaliung watershed.

The carrying capacity of agricultural land in 2017 decreased by 0.16, so from 2.61 to 2.45. This value decreased again in 2018 by 0.35, so that it became 2.10. This decrease has a large enough value, so the graph of the carrying capacity of rice farming land looks quite significant. The decrease in the carrying capacity of rice farming land was caused by the decrease in the average amount of rice production in 2017 and 2018. The population in that year did not have much effect on the decline in the carrying capacity of paddy fields. This is because the population in 2017 and 2018 has decreased, but there are other factors that affect the carrying capacity of rice farming land, namely KFM and the average rice production in that year. The KFM value will affect the area of land for food crops [6]. This is in line with the research conducted by Talumingan et al (2017) with the title "A Study of the Carrying Capacity of Agricultural Land in Supporting Food Self-Sufficiency in South Minahasa Regency". The results of the study stated that the ability of land to produce land crops and KFM affect the value of land area for food crops that always changes according to time and space.

3.1.1. The Influence of Indicators of Population, Harvest Area, and Average Rice Production on the Carrying Capacity of Rice Farming Land in Kapanewon Minggir 2014-2020.

Based on the test results, it is known that the population indicator has a significance value of 0.213. This means that the significant value of the population in Kapanewon Minggir is more than 0.05. The t count of the population is -1.576, which means that the t count is less than the t table which is 3.182. Therefore, the indicator of the population in Kapanewon Minggir has no effect on the carrying capacity of agricultural land.

Table 2. Results of Multiple Linear Regression Test Results for Rice Farming Land in Kapanewon Minggir 2014-2020.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1,889	0,383		**-4,936**	**0,016**
	Total Population	-2,196E-06	0,000	-0,143	**-1,576**	**0,213**
	Harvest Area	0,001	0,000	0,795	**10,892**	**0,002**
	Average Production	0,000	0,000	0,533	**5,881**	**0,010**

The area of rice harvested land in Kapanewon Minggir has a significance value of 0.002. This means that the significant value of the harvested area in Kapanewon Minggir is less than 0.05. The t count of rice harvested area is 10,892, which means that the t count is more than the t table which is 3,182. Therefore, the indicator of rice harvested area in Kapanewon Minggir has an influence on the carrying capacity of agricultural land. The average rice production in Kapanewon Minggir has a significance value of 0.010. This means that the significance value of the average production in Kapanewon Minggir is more than 0.05. The average t-count of rice production is 5.881, which means that the t-count is more than the t-table which is 3.182. Therefore, the average indicator of rice production in Kapanewon Minggir has an influence on the carrying capacity of agricultural land. The high rice production in Kapanewon Minggir is influenced by soil fertility because its location in the countryside has not been affected by intense human activities. This is similar to research conducted by Talumingan et al (2017), which states that soil fertility and pest/disease attacks, good conservation practices can affect high agricultural production.

3.2. Carrying Capacity of Agriculture Land in Kapanewon Moyudan 2014-2020

The values of the carrying capacity of rice farming land indicators in Kapanewon Moyudan are in table 3.

Table 3. Agricultural Land Carrying Capacity in Moyudan District 2014-2020.

Year	Population	Harvest Area (Ha)	KFM (Kg/Capita/ Year)	Average Production (Kg/Ha)	Agriculture Land Carrying Capacity	Classification
2014	33.303	3376	265	5770	2,21	Class II
2015	33.866	3483	265	6310	2,45	Class II
2016	33.288	3542	265	6205	2,49	Class I
2017	32.463	3664	265	5379	2,29	Class II
2018	33.613	3315	265	5039	1,88	Class II
2019	33.676	3.572	265	5444	2,18	Class II
2020	33.514	3.559	265	5745	2,30	Class II

Source: Statistical Center Agency (processed), 2020

Based on table 3, it is known that the indicators used to determine the level of carrying capacity of rice farming land in Kapanewon Moyudan from 2014 to

2020. The indicators used are population, harvested area, KFM, and average rice production. The population in Kapanewon Moyudan during the seven years experienced fluctuating changes but tends to increase. This affects the carrying capacity of rice farming land in Kapanewon Moyudan which also fluctuates. The lowest population in 2016 was 33,288 people. The low population has a high carrying capacity value of rice farming land, which is 2.49. The highest population was in 2015, which was 33,866 people. This high population does not have the lowest carrying capacity value of rice farming.

The carrying capacity of rice farming land in 2015 was quite high with the highest population. This can happen because the carrying capacity of agricultural land is also influenced by the values of other indicators. These indicators are in the form of rice harvested area and the average rice production which is also quite high. When compared with the previous research conducted by Ariani and Harini (2012), entitled "Population Pressure on Agricultural Land in Agricultural Areas (Case of Minggir and Moyudan Districts)" there are differences. The study stated that agricultural productivity would be high if it had low population pressure, but what happened in Kapanewon Moyudan was just the opposite [7]. The graph of the analysis of the carrying capacity of rice farming land in Kapanewon Moyudan can be seen in figure 3.

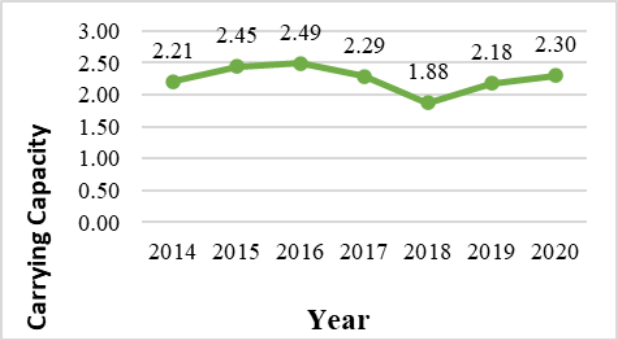

Figure 3. The graphic trend of carrying capacity of agricultural land in Kapanewon Moyudan 2014-2020.

Figure 3 shows that the carrying capacity of paddy fields in Kapanewon Moyudan has a fluctuating trend. Changes in the value of the carrying capacity of rice farming land in the form of increasing and decreasing for seven years. Changes in the increase in value occurred in 2015, 2016, 2019, and 2020. The increase in the carrying capacity of rice farming land in that year was quite small. Changes in value decline also occurred for two consecutive years, namely in 2017 and 2018. The decline in the carrying capacity of rice farming land in that year was quite large. This is caused by the imbalance between the average amount of rice production and the area of harvested land with the total population. The average number and area of rice harvested land in 2018 decreased and was the smallest compared to the other six years, but the population is increasing.

The carrying capacity of rice farming land in 2015 had an increased value from 2014. This value increased by 0.24, so from 2.21 to 2.45. This increase occurred because the area of rice harvested land and the average yield of rice production from 2014 to 2015 increased. 2016 experienced an increase again from 2015. This value increased by 0.4, so from 2.45 to 2.49. Changes from 2015 to 2016 are not significant, because the value of the increase is very small. This increase occurred because the area of rice harvested land from 2015 to 2016 has increased. Although the average yield of rice production did not increase, the population decreased quite a lot. This indicator also greatly affects the carrying capacity of rice farming land in Kapanewon Moyudan. In 2019, the value of the carrying capacity of rice farming lands experienced a large increase. The value increased by 0.30 from 1.88 to 2.18. In 2020 it increased again by 0.12 from 2.18 to 2.30.

The carrying capacity of rice farming land in 2017 decreased in value by 0.20, so from 2.49 to 2.29. This value decreased again quite significantly in 2018, so the graph changes look quite significant. The decrease in value was 0.41, so from 2.29 to 1.88. Although in 2017 the population decreased and the harvested area increased, the average yield of rice production decreased quite a lot. The average rice production decreased by 826 Kg/Ha, so from 6205 Kg/Ha it fell to 5379 Kg/Ha. In 2018 the carrying capacity of rice farming land in Kapanewon Moyudan decreased significantly because the population increased, the area of harvested land and the average rice production decreased. The population in 2018 increased by 1,150 people, so from 32,463 people to 33,613 people. The area of rice harvested land has decreased quite a lot, from 3664 Ha to 3315 Ha. The average yield of rice production also decreased quite a lot, from 5379 Ka/Ha to 5039 Kg/Ha. Based on the results of the calculation of the carrying capacity of the rice farming land, Kapanewon Moyudan is included in class II. The high carrying capacity of agricultural land in Kapanewon Moyudan can be caused by its geographical location in the lowlands. This is in line with previous research conducted in Madiun Regency by Kuncoro (2017). The research is entitled "Analysis of the Carrying Capacity and Needs of Agricultural Land in Madiun Regency in 2032" which states that the high carrying capacity of agricultural land in Madiun Regency is because most of the area has a flat topography and has a clay type of soil [8].

3.2.1. The Influence of Indicators of Population, Harvest Area, and Average Rice Production on the Carrying Capacity of Rice Farming Land in Kapanewon Moyudan 2014-2020.

Table 4. Results of Multiple Linear Regression Test Results for Rice Farming Land in Kapanewon Moyudan 2014-2020.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0,154	0,253		**0,607**	**0,587**
	Total Population	-6,543E-05	0,000	-0,148	**-10,443**	**0,002**
	Harvest Area	0,001	0,000	0,355	**25,533**	**0,000**
	Average Production	0,000	0,000	0,871	**70,212**	**0,000**

Based on the test results, it is known that the population indicator has a significance value of 0.002. This means that the significance value of the population in Kapanewon Moyudan is less than 0.05. The t count of the population is -10,443, which means that the t count is less than the t table of 3.182. Therefore, the population indicator in Kapanewon Moyudan does not affect the carrying capacity of agricultural land. The area of rice harvested land in Kapanewon Moyudan has a significant value of 0.000. This means that the significance value of the harvested area in Kapanewon Moyudan is less than 0.05. The t count of rice harvested area is 25,533, which means that the t count is more than the t table which is 3,182. Therefore, the indicator of rice harvested area in Kapanewon Minggir influences the carrying capacity of agricultural land.

The average rice production in Kapanewon Moyudan has a significance value of 0.000. This means that the significance value of the average production in Kapanewon Moyudan is less than 0.05. The average t-count of rice production is 70.212, which means that the t-count is more than the t-table which is 3.182. Therefore, the average indicator of rice production in Kapanewon Moyudan influences the carrying capacity of agricultural land. Based on the test results, it is known that the harvested area and the average rice production have more influence on the carrying capacity of the agricultural land. This can be caused by the availability of vast paddy fields and the small land conversion in Kapanewon Moyudan (Kuncoro, 2017). Therefore, the need for agricultural land in Kapanewon Moyudan is met, resulting in high rice production.

3.3. Carrying Capacity of Agriculture Land in Kapanewon Seyegan 2014-2020

The values of the carrying capacity of rice farming land indicators in Kapanewon Seyegan are in table 5.

Based on table 5, it is known that the population in Kapanewon Seyegan in 2014-2020 experienced fluctuating changes. This fluctuating population change is also followed by the value of the carrying capacity of rice farming land which changes every year. The high population is not matched by the low value of the carrying capacity of rice farming land. An example is the carrying capacity of rice farming land in 2015.

Table 5. Agricultural Land Carrying Capacity in Seyegan District 2014-2020.

Year	Population	Harvest Area (Ha)	KFM (Kg/Capita/Year)	Average Production (Kg/Ha)	Agriculture Land Carrying Capacity	Classification
2014	49.515	4252	265	5906	1,91	Class II
2015	50.869	3866	265	6521	1,87	Class II
2016	50.666	3317	265	6093	1,51	Class II
2017	49.845	3829	265	5517	1,60	Class II
2018	50.514	2953	265	5424	1,20	Class II
2019	50.965	2744	265	5749	1,17	Class II
2020	51.232	2587	265	6096	1,16	Class II

Source: Statistical Center Agency (processed), 2020

In 2015, Kapanewon Seyegan had the highest population of 50,869 people, but the value of carrying capacity of rice farming land was also quite high, namely 1.91. The low population in Kapanewon Seyegan has been offset by the high carrying capacity of rice farming land. For example, in 2014 Kapanewon Seyegan had the lowest population of 49,515 people. The population is balanced with the highest value of carrying capacity of agricultural land, which is 1.91. Based on these data, areas that have a high population do not necessarily have low productivity. This is because a small area of land can produce maximum rice with today's technology for processing agricultural land [7]. The graph of the analysis of the carrying capacity of rice farming land in Kapanewon Seyegan can be seen in figure 4.

Figure 4. The graphic trend of carrying capacity of agricultural land in Seyegan Sub-district 2014-2020.

Figure 4 shows that the carrying capacity of rice farming land in Kapanewon Seyegan from 2014 to 2020 has a fluctuating trend, but tends to decrease. Changes in the carrying capacity of rice farming land in Kapanewon Seyegan tended to decrease in 2015, 2016, 2018 to 2020. A fairly large decrease in value occurred in 2016 and 2018. Changes in the carrying capacity of rice farming land that increased only occurred in 2017. The carrying capacity of rice farming land in 2015 was 1.87, which has decreased from 2014 to 0.4. The decrease in the carrying capacity of rice farming land also occurred again in 2016 which was 0.36 to 1.51. The decline in value in 2016 was quite large. This can happen because the population in 2016 in Kapanewon Seyegan is quite large. This large population is followed by a small area of rice harvested land. A large decrease in the carrying capacity of rice farming land occurred again in 2018 which was 0.40. The value decreased from 1.60 only to 1.20. This is because the population in 2018 is quite high and the area of rice harvested land is very low. The declining rice harvested area in 2019 and 2020 also caused the carrying capacity of rice farming land to be lower. In 2019 it decreased from 1.20 to 1.17 and in 2020 it fell again to 1.16.

The value of the carrying capacity of rice farming land increased by 0.9 in 2017. This value increased from 1.51 to 1.60. The increase in the carrying capacity of agricultural land in that year could occur because it was influenced by several indicators. The indicators that influence it are the population that is not too large, namely 49,845 people, and the average value of rice production which is quite large, namely 5517 Kg/Ha. In addition, it is also influenced by the large area of rice harvested land, which is 3829 hectares, with a KFM value of 265 kilograms per capita per year. Based on the value of the carrying capacity of rice farming land in Kapanewon Seyegan, every year there is no significant change. This makes Kapanewon Seyegan included in the carrying capacity of class II rice farming land. Based on the trend of carrying capacity of agricultural land which tends to decrease, it can result in a decrease in the GRDP of the agricultural sector in Kapanewon Seyegan. Like the research conducted by Gede et al (2016) with the title "Analysis of Land Carrying Capacity Based on the Total Value of Agricultural Production in Gianyar Regency" which states that if the carrying capacity of land increases it will increase the GRDP of the agricultural sector [9]. The study used quantitative descriptive analysis by comparing land availability with land requirements.

3.3.1. The Influence of Indicators of Population, Harvest Area, and Average Rice Production on the Carrying Capacity of Rice Farming Land in Kapanewon Seyegan 2014-2020.

Table 6. Results of Multiple Linear Regression Test Results for Rice Farming Land in Kapanewon Seyegan 2014-2020.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1,774	1,891		**-0,938**	**0,417**
	Total Population	6,991E-06	0,000	0,013	**0,177**	**0,871**
	Harvest Area	0,000	0,000	0,926	**13,170**	**0,001**
	Average Production	0,000	0,000	0,261	**5,523**	**0,012**

Based on the test results, it is known that the population indicator has a significance value of 0.871. This means that the significance value of the population in Kapanewon Seyegan is more than 0.05. The t count of the population is 0.177, which means that the t count is less than the t table which is 3.182. Therefore, the population indicator in Kapanewon Seyegan does not affect the carrying capacity of agricultural land. The area of rice harvested land in Kapanewon Seyegan has a significance value of 0.001. This means that the significant value of the harvested area in Kapanewon Seyegan is less than 0.05. The t count of rice harvested area is 13,170, which means that the t count is more than the t table which is 3,182. Therefore, the indicator of rice harvested area in Kapanewon Seyegan influences the carrying capacity of agricultural land.

The average rice production in Kapanewon Seyegan has a significance value of 0.012. This means that the significance value of the average production in Kapanewon Seyegan is more than 0.05. The average t-count of rice production is 5.523, which means that the t-count is more than the t-table which is 3.182. Therefore, the average indicator of rice production in Kapanewon Seyegan influences the carrying capacity of agricultural land. Previous research analyzed the carrying capacity of agricultural land. The research was conducted by Rahayu et al (2014) entitled "Changes in the Carrying Capacity of Agricultural Land in Tasikmadu District, Karanganyar Regency in 2007-2013". This study states that the carrying capacity of agricultural land in Kapanewon Tasikmadu in 2007-2013 is not affected by changes in the area of rice fields [10]. When compared with this study, there are no similarities, because the area of harvested land affects the carrying capacity of agricultural land in Kapanewon Moyudan.

3.4. Carrying Capacity of Agriculture Land in Kapanewon Godean 2014-2020

The values of the carrying capacity of rice farming land indicators in Kapanewon Godean are in table 7.

Table 7. Agricultural Land Carrying Capacity in Godean District 2014-2020.

Year	Population	Harvest Area (Ha)	KFM (Kg/ Capita/ Year)	Average Production (Kg/Ha)	Agriculture Land Carrying Capacity	Classification
2014	69.530	3790	265	6082	1,25	Class II
2015	73.455	3423	265	6676	1,17	Class II
2016	70.117	3523	265	6121	1,16	Class II
2017	68.410	3368	265	5740	1,07	Class II
2018	69.203	3354	265	5524	1,01	Class II
2019	69.949	3193	265	5934	1,02	Class II
2020	72.255	3328	265	5872	1,02	Class II

Source: Statistical Center Agency (processed), 2020

Table 7 shows the indicators used to determine the carrying capacity of rice farming land in Kapanewon Godean from 2014 to 2020. The population in Kapanewon Godean from 2014 to 2020 experienced fluctuating changes but tends to increase. These changes indicate that the population for seven years has increased and decreased. The highest population was in 2015 of 73,455 people, but the carrying capacity of rice farming land owned was not the lowest during 2014 to 2018. This is because the area of rice harvested land and the average yield of rice production is not large enough, so it is not balanced with the large population. The larger population is because in Kapanewon Godean there is a higher conversion rate of rice fields compared to the other three Kapanewon (Kapanewon Minggir, Kapanewon Moyudan, and Kapanewon Seyegan) [11]. This is because the location of the eastern part of Kapanewon Godean is an urban area. The lowest population of 68,410 people also does not have the highest carrying capacity value of agricultural land from 2014 to 2018. This is because the area of rice harvested land and average rice production is also low, so it is not commensurate with the population. The graph of the analysis of the carrying capacity of rice farming land in Kapanewon Godean can be seen in figure 5.

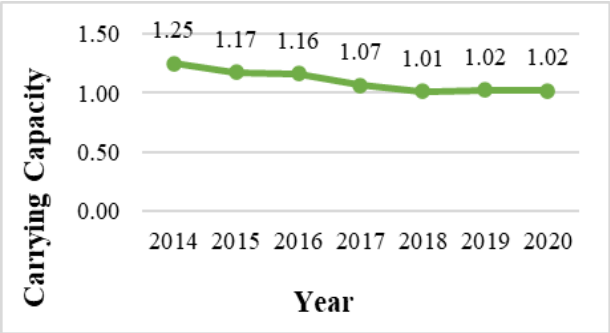

Figure 5. The graphic trend of carrying capacity of agricultural land in Kapanewon Godean 2014-2020.

Based on figure 5, it is known that the carrying capacity of rice farming land in Kapanewon Godean has a declining trend from 2014 to 2018. In 2019 the value increased but was very small, and the value in 2020 remained constant. 2015 experienced a significant decline. This can be seen clearly on the graph. The decrease was 0.8, so from 1.25 to 1.17. In 2016 it decreased again but only by 0.1, so from 1.17 to 1.16. In 2017, the carrying capacity of rice farming land in Kapanewon Godean has decreased again, which is quite visible in the graph. The decrease was 0.9, so from 1.16 to 1.07. In 2018 the value decreased again by 0.6, so from 1.07 to 1.01, 2019 saw a very small increase in value. The carrying capacity of the paddy field increased by 0.1 from 1.01 to 1.02. The declining carrying capacity of rice farming land in Kapanewon Godean from 2014 to 2019 is influenced by the indicator of the area of rice harvested land which has also decreased for seven years. The decreasing area of rice harvested land is caused by land conversion due to the location of Kapanewon Godean which is close to the economic growth area and is located on the edge of the highway. This is the same as the statement of Arini and Harini (2012) who said that areas that have a high carrying capacity of agricultural land are located far from highways and centers of economic growth. In addition, the high population and the low average yield of rice production in Kapanewon Godean also affect the carrying capacity of rice farming land in the region. This is because very dynamic population growth will have a major role in influencing the availability of agricultural land and the demand for agricultural production [12].

3.4.1. The Influence of Indicators of Population, Harvest Area, and Average Rice Production on the Carrying Capacity of Rice Farming Land in Kapanewon Seyegan 2014-2020.

Table 8. Results of Multiple Linear Regression Test Results for Rice Farming Land in Kapanewon Godean 2014-2020.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0,780	0,188		**-4,155**	**0,025**
	Total Population	-4,176 E-07	0,000	-0,139	**-1,251**	**0,300**
	Harvest Area	0,000	0,000	0,678	**5,945**	**0,010**
	Average Production	0,000	0,000	0,484	**4,985**	**0,016**

Based on the test results, it is known that the population indicator has a significance value of 0.300. This means that the significance value of the population in Kapanewon Godean is more than 0.05. The t count of the population is -1.252, which means that the t count is less than the t table which is 3.182. Therefore, the indicator of the population in Kapanewon Godean does not affect the carrying capacity of agricultural land. The area of rice harvested land in Kapanewon Godean has a significance value of 0.010. This means that the significant value of the harvested area in Kapanewon Godean is more than 0.05. The t count of rice harvested area is 5.945, which means that the t count is more than the t table which is 3.182. Therefore, the indicator of rice harvested area in Kapanewon Godean influences the carrying capacity of agricultural land. The average rice production in Kapanewon Godean has a significance value of 0.016. This means that the significance value of the average production in Kapanewon Godean is more than 0.05. The average t-count of rice production is 4.985, which means that the t-count is more than the t-table which is 3.182. Therefore, the average indicator of rice production in Kapanewon Godean influences the carrying capacity of agricultural land.

3.5. Carrying Capacity of Agriculture Land in Kapanewon Minggir 2014-2020

The classification of the spatial-temporal carrying capacity of agricultural land can be seen from the results of the analysis of the class division of the carrying capacity of agricultural land in each sub-district in West Sleman Regency in 2014-2020. Based on the class division, the West Sleman region in 2014 had a class II agricultural land carrying capacity. This shows that West Sleman in 2014 can be self-sufficient in food but cannot yet provide a decent living for its people. In 2015 all agricultural land was classified as class II, but there is one sub-district that has class I, namely Minggir District. This shows that Minggir District can be self-sufficient in food so that it can provide a decent life for the community. In 2016, the carrying capacity of class I agricultural land increased to two sub-districts, namely Minggir District and Moyudan District.

The increase was influenced by high agricultural production. High agricultural production is influenced by many factors, including soil fertility, the presence or absence of pests and diseases, good cultivation and maintenance techniques [6]. From 2017 to 2020, West Sleman has a declining land carrying capacity, which is class II. The declining carrying capacity of agricultural land can be resolved in various ways, including 1) Land conversion, or changing the type of land use to a more profitable business but adapted to the field; 2) Land intensification, namely using new land technology in agriculture; and 3) land conservation or prevention efforts [13]. Based on this analysis, the West Sleman region for seven years as a whole has a class II agricultural land carrying capacity.

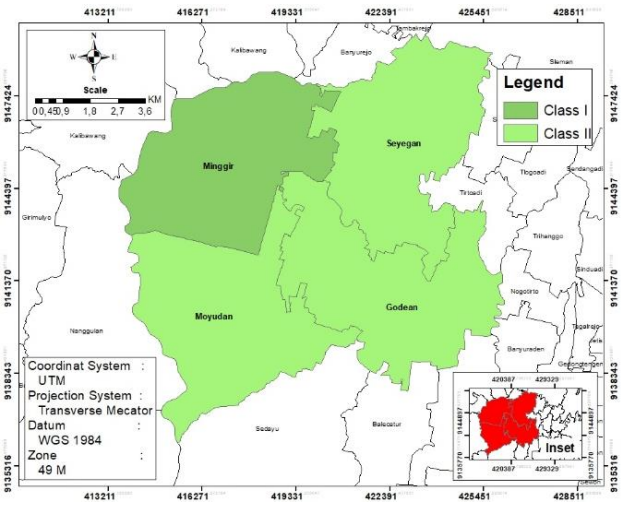

Figure 6. Map of Carrying Capacity of Agricultural Land in West Sleman Regency in 2015.

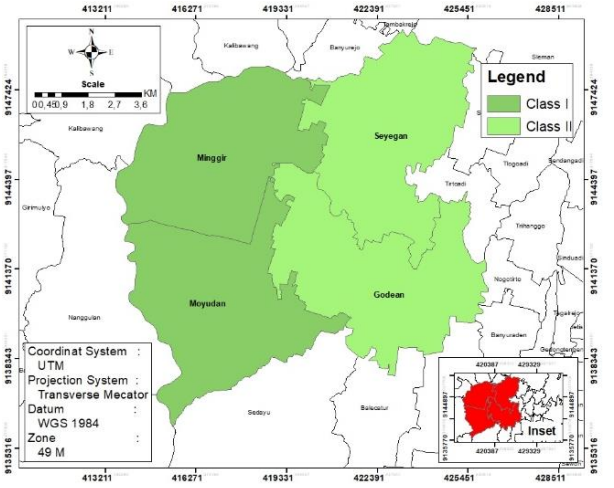

Figure 7. Map of Carrying Capacity of Agricultural Land in West Sleman Regency in 2016.

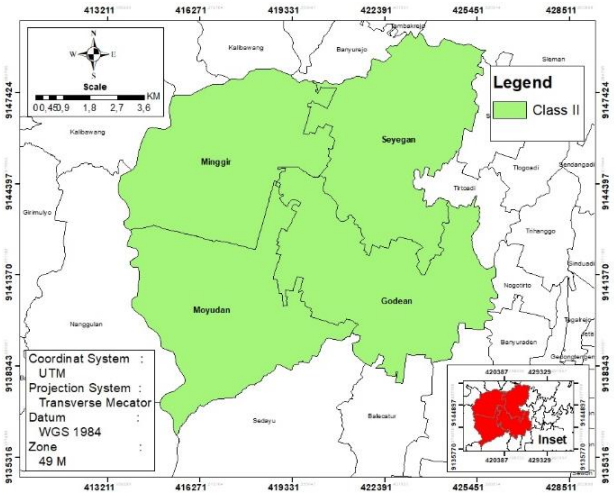

Figure 8. Map of Carrying Capacity of Agricultural Land in West Sleman Regency in 2020.

4. CONCLUSION

The carrying capacity of rice farming land in West Sleman during the last seven years has fluctuated changes, and the classification results tend to be in class II. This means that West Sleman has been able to be self-sufficient in food, but has not been able to provide a decent living for its citizens.

The most influential indicators on the carrying capacity of paddy fields in West Sleman are harvested area and average rice production.

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