Analysis of land resources balance in Nusa Tenggara Timur Province

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Abstract. Land is an abiotic component that plays a role in providing space for human activity. Land utilization and land use will always be related to population development. If the population continues to grow, the need for land will continue to increase which means the population pressure on the land will also increase, while the land has limited properties. Nusa Tenggara Timur province is a province that has a population of about 4.3 million people with a total area of approximately 4.9 million hectares of which 1.7 million hectares are forests. This research is conducted with the aim of knowing and analyzing land-based resource balance of land resources in the province of East Nusa Tenggara so that it can be concluded about the supporting power of land in East Nusa Tenggara province. The balance of land resources in 2007-2012 and 2013-2017 showed that there was a reduction in an agricultural land area of 11,162 Ha, while non-agricultural land increased by 9,962 Ha. Agricultural land is reduced in the form of plantation land, while the increase in the field of rice fields, moor, and fields. The support of East Nusa Tenggara province has decreased by 0.01 annually due to increasing population. Urban areas such as Kupang City have a lower value for land capacity (DDL) than rural areas.

Keywords: land support, land resource balance, agriculture, Non-agriculture

1. Introduction

Productive land, especially agriculture, plays an important role in supporting human life and even supporting the regional economy [1]. Land has become one of the main elements in order to support human life continuity since the first time human-occupied the earth [2]. Human life is very dependent on the existence of land where the land is as the provider of space for human activities. Diversity of land characteristics cause not every land can be utilized for human activities, while human really need land to carry out their lives. This is the reason why the balance of land resources is so important to be researched.

Population dependence on the land, in general, will affect land availability itself. According to [3], land use will always be related to human development. If the population continues to experience growth, the needs of land will continue to have increasing that means population pressure to land will be increasing too, since land is limited. Kustiawan, as cited in [4], said that as long as the population continues to increase, the population pressure on land will also increase and the conversion of...
agricultural land to non-agricultural land will be very difficult to avoid. Population pressure indicates overpopulation in an area that is able to be used to assess the carrying capacity of the environment which is affected by its needs which always increase with population growth while resources have limits on availability. [5].

Human activities such as deforestation, cutting slopes for roads and buildings, and mining can cause land damage or land degradation and even landslides, this shows that the land has a limited carrying capacity [6]. The carrying capacity of the land itself is defined as land ability in an area to support human life sustainability in the form of land use aimed to meet human needs, especially food. Changing the use of agricultural land into non-agricultural land cannot be avoided, each region needs to estimate the carrying capacity of land through the calculation of land balance [7]. Environmental carrying capacity based on the land balance will be called balanced if the area of agricultural land in an area can meet the minimum physical needs of its population.

East Nusa Tenggara Province is one of the provinces in Indonesia which is located in the Nusa Tenggara archipelago. The province has a population of around 4.3 million people within an area of about 4.9 million hectares of which 1.7 million hectares of it is forest [8]. The Nusa Tenggara region itself has a dry climate with less than 2000 mm/year rainfall and around 72% of the area is hilly and mountainous with shallow and rocky soil [9]. These characteristics cause the carrying capacity of the land to become lower so that certain policies need an upgrade in regard to support the population’s need, especially food. This research is conducted with the aim of studying and analyzing the land balance based land carrying capacity so that conclusions of the land carrying capacity in East Nusa Tenggara Province can be drawn.

2. Methodology

This study uses secondary data from related institutions relating to land use data of the Nusa Tenggara Timur Province. Determination of land use trends using data from 2007 to 2017 by classifying land between agricultural and non-agricultural land. Agricultural land consists of dry fields, fields, plantations, and rice fields.

![Figure 1. Flowchart of land resources analysis](image)

2.1 Data analysis technique

The analytical method used in this research is quantitative descriptive analysis, spatial analysis, resource allocation analysis and land carrying capacity analysis. This analysis is based on published data and calculations previously carried out. This analysis is carried out based on the required numerical data with certain variables that are in accordance with the requirements and carrying capacity characteristics of the land in East Nusa Tenggara Province.
2.2 Spatial Analysis
Spatial analysis in this study was using a Geographic Information System in the form of ArcGIS. The dimensions to be achieved in this study are quite complex with spatial dimensions, so it needs to be done with spatial analysis [10]. So, it can be seen the characteristics of spatial land use in the province of East Nusa Tenggara. The unit of analysis used in this study is the district.

2.3 Land Resource Analysis
Land resource balance is one of the instruments in evaluating land use utilization in an area. Utilization of natural resources must pay attention to the carrying capacity of the region, so it is important to use reference standards for the compilation of land resource accounts to allocate natural resources and environmental spatial planning [11]. The preparation is carried out with the principle of balancing the potential of the initial land resources (assets) and the final use (liabilities) of land resources and their balance within a period of 10 years, from 2007 to 2017.

Analysis of land resources in NTT Province was carried out by comparing the condition of agricultural and non-agricultural land with a difference of 5 years, namely 2007-2012 and 2013-2017 so that changes in land use were known at this time. This land resource balance takes into account the degradation of land resources due to land use which is calculated into land use (liabilities). The balance of land resources in a total area does not change but only changes in the area of land functions and values.

2.4 Land Carrying Capacity Analysis
Land carrying capacity analysis is performed by calculating the Land Carrying Capacity of the population using the following formula:

\[ A = \frac{L}{P} \]

Where: 
- \( A \) = Carrying capacity of the land 
- \( L \) = Land Area (ha) 
- \( P \) = Population (people)

If the carrying capacity of land (A) is more than 1 (one), so it is categorized as sufficient, A is equal to 1 (one) in balanced category, and A is less than 1 (One) categorized as less. Data analysis was performed descriptively quantitative by explaining the data that has been processed and analyzed spatially using maps.

3. Result and Analysis
3.1 Land Use Trend
Increasing demand for land availability has led to changes in land use, specifically changes in agricultural land to non-agricultural land. As a result, an increase in population pressure on agricultural land increased. Based on Figure 2 shows that from 2007 to 2017 the population in the East Nusa Tenggara Province continued to increase, with an average growth rate of 1.7.

Data on the area of agricultural and non-agricultural land in East Nusa Tenggara in the 2007-2017 period, from Figure 3 shows that in 2007 agricultural land area still dominated, namely by 53% of the total land area in NTT, then in 2011 there was a decline in an agricultural land area which is quite significant to 42% of the total land area. The area of agricultural land continues to decline each year until in 2017 agricultural land remains only 39% of the total land area in NTT Province. Land use changes and population dynamics have an impact on the condition of food availability that causing food security problems [12].
Based on Figure 3, it can be seen that the percentage of agricultural land in East Nusa Tenggara Province continues to decline from year to year. The percentage of agricultural land in East Nusa Tenggara Province in 2007 was 57%, then decreased to 44% in 2011, and in 2017 decreased to 29%. One of the significant decreases in agricultural land is influenced by population growth that is high enough to increase population pressure on land, primarily a agricultural land. As a result, many agricultural lands have been converted into non-agricultural lands.

In terms of spatial distribution, land use in East Nusa Tenggara Province in 2007 was still dominated by lands with vegetation cover and not developed land, especially in the Districts of West Manggarai, East Manggarai, Ende, and South Central Timor. Whereas on the island of Sumba dominated by land use in the form of grasslands. Thus, in Sumba Island, many farms are developed, especially buffalo and horses. The dominance of vegetation land cover in 2007 because at that time the population of East Nusa Tenggara has not experienced significant growth, so the population pressure on the land tends to be low.
In 2017 NTT Province experienced an increase in changes in agricultural land to non-agricultural land. Based on data from BPS, it is known that the area of non-agricultural land in 2007 was 3,375,437 hectares, then in 2017, it increased to 3,385,399 hectares. The proportion of pasture land use on Sumba Island in 2017 has seen an increase, while on Timor Island land use has increased, namely forest and plantation land use.

3.2 Land Resources Balance
Land resource balance shows the land changes and the potential that exists in an area to be utilized by its inhabitants. Table 1 shows that in 2007-2012 agricultural land area increased by 100468 ha, while
non-agricultural land area decreased by 100468 ha. Agricultural land area increased because of an intensification program of rice and plantations in all districts in East Nusa Tenggara Province which was held since 2010.

The increase of rice fields is due to the development of inpari rice varieties that are able to grow and produce well both on dry and wet land. The increase aims to meet rice shortages due to the high population growth rate in 2020 of 2.1%. Meanwhile, the total population in East Nusa Tenggara Province in 2010 was 4.777.582 people, so that number of 541.019 tons were needed but the production was only 326.662 tons. The land use change into non-agricultural land that has not been too massive is due to the technology development that is not so massive and there are still many people who rely their lives on the primary sector and there was increased productivity in the primary sector [13].

| Initial Condition | Assets For 2007 | Final Conditions | Liability For 2012 |
|-------------------|----------------|-----------------|-------------------|
|                   | Wide (Ha) | Percent (%)  | Wide (Ha) | Percent (%)  | Conversion |
| Agriculture       | 1359553   | 100.00        | Agriculture | 1460021     | 100468     |
| Moor              | 522775    | 11.04         | Moor      | 574015      | 12.12      | 51240     |
| Field             | 333004    | 7.03          | Field     | 326087      | 6.89       | -6917     |
| Plantation        | 332449    | 7.05          | Plantation | 372340      | 7.86       | 39891     |
| Rice Fields       | 171325    | 3.62          | Rice Fields | 187579      | 3.96       | 16254     |
| Non Agriculture   | 3375437   | 71.27         | Non       | 3274969     | 69.17      | -100468   |
| Total             | 4734990   |               | Agriculture | 4734990     |            |

(Source: Statistic Data Processing, 2020)

Table 2 shows that there was a reduction in agricultural land by 61067 ha while non-agricultural land experienced an increase of 61067 ha in 2013-2017, this means that changes in agricultural land entirely turned into non-agricultural land. The higher population growth lead the need for settlements become higher, many of the productive age population are not working in the primary sector, the low-income derived from the primary sector and a large amount of construction of various facilities and infrastructure for community services is the reasons of the large number changes of land functions.

The dominant land use change is plantations by 126435 ha. The average annual air temperature in East Nusa Tenggara has increased by 0.2 degrees celsius and will continue to increase every year, causing a dry climate and low productivity of plantations. That bad condition is compounded by the population condition with a low education level dominated by elementary school graduates and not graduating from school, there is no skill in cultivating land, so they choose to transfer the land functions as shops, kiosks, motor vehicle repair shop, and furniture workshop which are considered to be more productive to increase income.

The increase in rice fields in the 2013-2017 period is not as big as the increase in the previous period. This is because the programs run by the government have been ineffective because of the lack of good cooperation between the government and the community. In addition, limited water availability is a barrier factor in the opening of the new rice fields. The addition of moorland and fields is a success of the government’s efforts to improve dry land productivity. Increased productivity of dry land to become moor and fields due to the success of the technology used as well as an appropriate agricultural targets and system including in the selection of commodities that are in line with the climatic conditions in East Nusa Tenggara such as corn and wheat.
Table 2. Land Resource Balance of East Nusa Tenggara Province in 2013-2017

| Initial Condition | Assets For 2013 | Liability For 2017 |
|-------------------|-----------------|-------------------|
|                   | Wide (Ha)       | Percent (%)       | Wide (ha) | Percent (%) | Conversion |
| Agriculture       | 1410658         |                  | Agriculture | 1349591 | -61067 |
| Moor              | 508745          | 10.74            | Moor       | 534313    | 11.28    | 25568 |
| Field             | 312514          | 6.60             | Field      | 346004    | 7.31     | 33490 |
| Plantation        | 379913          | 8.02             | Plantation | 253478    | 5.35     | -126435 |
| Rice Fields       | 209486          | 4.42             | Rice Fields | 215796    | 4.56     | 6310 |
| Non Agriculture   | 3324332         | 70.21            | Non        | 3385399   | 71.50    | 61067 |
| Total Agriculture | 4734990         |                  | Total      | 4734990   |          |        |

(Source: Statistic Data Processing, 2020)

Figure 5 shows how big are the changes in agricultural land use as a result of the land balance calculation of land resources by districts/cities in the Province of East Nusa Tenggara in the period of 2007-2012 and 2013-2017. The types of land use that are included in agricultural land are appropriate to those listed in Table 1. There is a significant variation on agricultural land-use changes between districts/cities as well as between different time periods. Some of the significant changes were also influenced by the regency that experienced regional expansion. The changes of agricultural land use area tend to be balanced between addition and reduction that are scattered in several districts. Manggarai regency experienced the largest reduction of agricultural land use area in 2007-2012 which reached 89740 ha. While in the period of 2013-2017, Manggarai regency experienced the pattern change of agricultural land use area to be increased, although in a relatively low number of hectares.

The agricultural land use area in Manggarai regency is in line with the decline of population interest in farming as well as the population growth which causes high demand for built-up land. There are several factors that cause the decline of population interest in farming, some of them are the mushrooming of government and private projects on Flores Island in several sectors that cause many farmers to switch professions then cause the land to become a vacant land, inheritance land distribution tradition in the Manggarai family cause young people to lack ownership of the land, and unstable selling prices for agricultural products accompanied by the absence of farmer associations.

The highest agricultural land use area increase in the 2007-2012 period was in North Central Timor Regency. While in the next period, 2013-2017, North Central Timor experienced a significant agricultural land use area decrease. The change was accompanied by a number of other districts on Timor Island, where many of it was dominated by moor, field, and plantation addition.

The changes of agricultural land use area in 2013-2017 in each district/city tend to have a lower value compared to the previous period with a fairly distribution both in the form of addition and reduction. The largest area change occurred in Belu Regency where there was a reduction up to 38858 ha. Agricultural land use reduction is accompanied by the non-agricultural land use reduction up to 80805 ha. This happened because of the expansion of Belu Regency into Malaka Regency as the 22nd district in East Nusa Tenggara Province in accordance with Law Number 3 of 2013.

Kupang City as the capital of East Nusa Tenggara Province always experiences agricultural land use area reduction both in the 2007-2012 and 2013-2017 period, although it does not show a significant number of hectares. According to, the dominant land use in Kupang City is in the form of settlements where most of it was converted from fields/moor/shrubland. Kupang City as a seaside city is also experiencing rapid growth in its coastal area where most of the service and trade activities in East Nusa Tenggara Province are concentrated. That is in accordance with the Regional Regulation No. 11 of 2011 on Regional Spatial Planning in Kupang City which stipulates that part of the coastal area is designated for tourism.
3.3 Land Carrying Capacity

Land Carrying Capacity can be used to measure the appropriateness of land use in an area where if the land carrying capacity value is exceeded, it can be said that land use in the area is excessive. Figure 6 shows the land carrying capacity value of East Nusa Tenggara Province in 2007-2017. Based on this picture, it is known that the land carrying capacity value of East Nusa Tenggara Province has a downward trend every year. The average decrease in land carrying capacity is around 0.01 in each year. The decline in the value of and carrying capacity was caused by the increasing population of East Nusa Tenggara Province each year. This is supported by [14] which states that the area of land that is stable but has a high population growth causes a decrease in the carrying capacity of land, especially agricultural land which causes population pressure on land.

The land carrying capacity of East Nusa Tenggara Province in 2007-2010 is included in the sufficient category because it has a land carrying capacity value >1. The next year, in 2011-2017 is included in the category of lacking (insufficient) because it has a land carrying capacity value <1. This shows that in 2007-2010, land in East Nusa Tenggara Province was able or sufficient to meet the needs of the population, while in 2011-2017 it could not meet the needs of its residents because it had exceeded the carrying capacity of the land. Therefore, to overcome the decrease in the carrying capacity of the land, several efforts can be made including the conversion of land use towards a more profitable business but adapted to the area, land intensification, and land conservation.
Figure 6. Chart of Land Carrying Capacity of East Nusa Tenggara Province in 2007-2017
(Source: Statistic Data Processing, 2020)

Figure 7 shows a comparison of the land carrying capacity values for each district in East Nusa Tenggara Province in 2007 and 2012. Based on the picture it is known that in general, each district in East Nusa Tenggara Province has decreased in the land carrying capacity in 2012. The decrease in the carrying capacity of the land is due to the increase in population and the narrowing of the land area due to the formation of new districts as happened in the Manggarai Regency and Kupang Regency. The area of Manggarai Regency narrowed due to the division of East Manggarai Regency in mid-2007 which also caused the East Manggarai Regency's land carrying capacity data in 2007 not yet available. Another case occurred in the Kupang Regency which had to divide its territory for the expansion of Sabu Raijua Regency since 2008 so that the land area became narrower which then caused land carrying capacity values to decrease. Malacca Regency in the figure below has no value because in that year Malacca Regency was not yet formed.

The highest land carrying capacity is in the districts of East Sumba and Central Sumba in both 2007 and 2012, which is around 2-3 and it is included in the enough class because >1. This value shows that the land in the districts of East Sumba and Central Sumba is very adequate for its population needs. The lowest land carrying capacity is in Kupang City, which is <1. This value shows that the land in Kupang City is not adequate for its population needs because Kupang City has a high population, but has a land area that is not so large.

Figure 7. Chart of Land Carrying Capacity of East Nusa Tenggara Province in 2007 and 2012
(Source: Statistic Data Processing, 2020)
Figure 8. Map of Land Carrying Capacity of East Nusa Tenggara Province in 2007 (Top) and 2012 (Bottom). (Source: Data Processing, 2020)

Figure 9. Chart of Land Carrying Capacity of East Nusa Tenggara Province in 2013 and 2017. (Source: Data Processing, 2020)
Figure 10. Map of Land Carrying Capacity of East Nusa Tenggara Province in 2013 (Top) and 2017 (Bottom). (Source: Data Processing, 2020)

Figure 8 shows the spatial distribution of land carrying capacity values, in 2007 there were 10 districts included in the sufficient class: West Manggarai, Ngada, Nagekeo, Lembata, Alor, Central Sumba, East Sumba, Central Timor North, Kupang, and Rote Ndao. The districts included in the insufficient class: Manggarai, Ende, Sikka, East Flores, Southwest Sumba, West Sumba, South Central Timor, and Belu. In 2012 there were 10 regencies included insufficient classes, including West Manggarai Regencies, Ngada, Nagekeo, Lembata, Alor, Central Sumba, East Sumba, North Central Timor, Kupang, and Rote Ndao, while districts included in the class were lacking namely Manggarai Regency, Ende, Sikka, East Flores, Southwest Sumba, West Sumba, South Central Timor, Sabu Raijua, East Manggarai, and Belu. Based on these data, it is known that there were no class changes in each district in East Nusa Tenggara from 2007 to 2012.

The carrying capacity of each district in East Nusa Tenggara Province in 2013 and 2017 (Figure 9) has decreased compared to the previous year (Figure 7). In general, each district in the province of East Nusa Tenggara experienced a decline in the value of Land Carrying Capacity in 2017. There was a decrease in the number of districts that had a Land Carrying Capacity value more than 1 because of the increasing number of the population each year and the division and narrowing of land again: Malacca Regency in 2013 which was a division of Belu Regency.
Figure 10 shows the spatial distribution of land carrying capacity values, in 2013 there were 8 districts included in the sufficient class: West Manggarai, Ngada, Nagekeo, Alor, Central Sumba, East Sumba, Central Timor North, and Kupang. The districts included in the insufficient class: Manggarai, East Manggarai, Ende, Sikka, East Flores, Lembata, Southwest Sumba, West Sumba, South Central Timor, Rote Ndao, Sabu Raijua, and Belu. In 2017 there were 7 districts included in the sufficient class: West Manggarai, Ngada, Alor, Central Sumba, East Sumba, Central Timor North, and Kupang. The districts included in the insufficient class: Manggarai, East Manggarai, Nagekeo, Ende, Sikka, East Flores, Lembata, Southwest Sumba, West Sumba, South Central Timor, Rote Ndao, Sabu Raijua, and Belu. The district that experienced a class decline is the Nagekeo District, which shows that the land in Nagekeo in 2017 is unable to meet the needs of its population.

4. Conclusion
Population in East Nusa Tenggara Province from 2007-2017 continues to increase. The increase in population reduced the amount of agricultural land by 50%, from 2,721,506 Ha in 2007 to 1,349,591 Ha in 2017. Based on an analysis of agricultural resources that increased investment in agricultural land by -126,435 Ha. Spatially there are significant variations in the use of agricultural land between districts / cities based on different time periods. In the period 2007-2012 Manggarai Regency increased the largest use of agricultural land area of 89740 ha, while in the period 2013-2017 the biggest change occurred in Belu District where an increase in agricultural land use reached 38858 ha.

Land carrying capacity of East Nusa Tenggara Province has a downward trend every year. This number increases with the increase in the population with an area that needs to be improved. In 2007-2010, they were included in sufficient classes and in 2011-2017 they were classified as less. The city of Kupang is the region with the lowest land carrying capacity value in the province of East Nusa Tenggara because of its sloping to flat morphology and includes an economic, political, educational, and cultural center so that it has a larger population than just increasing land. While East Sumba and Central Sumba have high land carrying capacity values because of their large area with a small amount due to increased morphology due to hilly.

References
[1] Rahmah C N, Purnomo A D, Amalia R D, and Putri R F 2020 Agriculture development of Lampung Province based on agropolitan zonation IOP Conf. Series: Earth and Environmental Science 451 doi:10.1088/1755-1315/451/1/012035
[2] Afni N 2016 Daya Dukung Lingkungan Kecamatan Pattallassang Kabupaten Takalar Jurnal Perencanaan Wilayah dan Kota Volume 5 No.1
[3] Pratama N A, Widiatmono B R, and Wirosoedarmo R 2015 Evaluasi Daya Dukung Lingkungan Berbasis Kemampuan Lahan di Kota Batu Jurnal Sumberdaya Alam dan Lingkungan Vol. 2 No. 1
[4] Risky K M 2017 Analisis Perubahan Pemanfaatan Lahan Pertanian Menjadi Kawasan Terbangun Terhadap Kondisi Ekonomi Masyarakat Petani di Kecamatan Pallangga Kabupaten Gowa. Thesis. Fakultas Sains dan Teknologi UIN Alauddin Makassar
[5] Dewi R P, Khofianida A, Agista D E, Arrasyid F P, Kurniawati, Damayanti S I, and Putri R F 2020 Landuse change in Jakarta Province: trend, types, and sociodemographic factors IOP Conf. Series: Earth and Environmental Science 451 doi:10.1088/1755-1315/451/1/012055
[6] Aditya B, Amri I, and Putri R F 2020 Farmer’s perception and knowledge on landslide occurrences in Beruk Village, Karanganyar Regency, Central Java IOP Conf. Series: Earth and Environmental Science 451 doi:10.1088/1755-1315/451/1/012050
[7] Herdiansyah A R, Hastari N R F, Ramdani H P, and Putri R F 2020 Land use change and its impact on rice productivity in Sleman Regency 2007-2017 IOP Conf. Series: Earth and Environmental Science 451 doi:10.1088/1755-1315/451/1/012054

[8] Kementerian Lingkungan Hidup dan Kehutanan RI 2015 Nusa Tenggara Timur Available in: http://incas.menlhk.go.id/id/data/east-nusa-tenggara (accessed on 16th March 2020)

[9] Mulyani A, Nursyamsi D, and Las I 2014 Percepatan Pengembangan Pertanian Lahan Kering Iklim Kering di Nusa Tenggara Jurnal Pengembangan Inovasi Pertanian Vol. 7 No. 4th December 2014: 187-198

[10] Putra A U, Putro H R V, Budiman L S, Adlina L, and Putri R F 2020 Relation between gross domestic product (GDP) and poverty population in East Kalimantan Province from 2013 - 2017 IOP Conf. Series: Earth and Environmental Science 451 doi:10.1088/1755-1315/451/1/012108

[11] Kafafa U, Nadia H, Fadilah G O, Abadi A W, and Putri R F 2020 Carrying capacity trend and projection analysis for Sumatra Selatan agricultural land in 2030 IOP Conf. Series: Earth and Environmental Science 451 doi:10.1088/1755-1315/451/1/012046

[12] Fauziyanti N U, Alfana M A F, and Putri R F 2020 A projection production and consumption of food crops in Bali Province towards 2021-2025 IOP Conf. Series: Earth and Environmental Science 451 doi:10.1088/1755-1315/451/1/012037

[13] Priyanto D and Dwiyanto K 2014 Pengembangan Pertanian Wilayah Perbatasan Nusa Tenggara Timur dan Republik Demokrasi Timor Leste Pengembangan Inovasi Pertanian Vol 7 No 4 hal 207-220

[14] Putri R F, Aji A, and Sulisty A R 2020 Land priority area for agribusiness development based on human and economic resources in Central Java IOP Conf. Series: Earth and Environmental Science 451 doi:10.1088/1755-1315/451/1/012020