DETERMINATION OF CHANGES IN FIELD AREA WITH FOOD-SUPPORTING CAPACITY USING REMOTE SENSING IN AGAM

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ABSTRACT: West Sumatra Province is one of the provinces in Indonesia which is the best rice producer in Indonesia, but a large number of conversions to paddy fields has resulted in food threats for the local population, data from the Ministry of Agriculture states that the decline in paddy fields in West Sumatra in 2008 was 228,176 ha. , in 2009 amounted to 229,693 ha, then in 2010 amounted to 231,463 ha, and in 2011 amounted to 229,368 ha, then decreased in 2012 amounted to 224,182 ha and in the area of West Sumatra Cities that experienced land conversion, namely Agam Regency, conversion of agricultural land to non-use Agriculture is a threat to national food security.

Keywords: Remote Sensing, Rice Fields, Food Carrying Capacity

1. INTRODUCTION

Indonesia is a country that has a fertile region because its area is located in the tropics and is crossed by various volcanoes. The fertile soil in Indonesia's territory makes the agricultural sector quite capable, thus making the agricultural sector very important for the development of the country's economy. Indonesia. The Ministry of Agriculture (2005) states that the agricultural sector is a sector that drives the economy in Indonesia, because the agricultural sector is a driver for increasing gross domestic product, employment, as a foreign exchange earner, and has an indirect role in environmental preservation.

The great potential in the agricultural sector has made the territory of the State of Indonesia an agricultural country, where the agricultural country is a country where the majority of the population has livelihoods. mainly as farmers and depend on the agricultural sector to fulfill their necessities of life, the dominant agricultural product developed in Indonesia is rice fields, because the majority of the Indonesian population eats rice, which is processed rice as daily food. As an agricultural country, most of the population still depends on the agricultural sector, this encourages research related to the balance of agricultural land and food carrying capacity with a population that continues to increase, food carrying capacity is an area's ability to meet the food needs of the local population to be able to live prosperously (Muta'ali, 2012) West Sumatra Province is one of the provinces in Indonesia which is the best rice producer in Indonesia, but the many conversions of paddy fields have resulted in a threat to food for the local population, data from the Ministry of Agriculture shows a decrease in the area of rice fields awah in West Sumatra in 2008 amounted to 228,176 ha, in 2009 amounted to 229,693 ha, then in 2010 amounted to 231,463 ha, and 2011 amounted to 229,368 ha, then decreased in 2012 by 224,182 ha and in the area of West Sumatra the city that has experienced land conversion, namely Agam Regency, the conversion of agricultural land to non-agricultural use is a threat to national food security.

Geographically, Agam Regency is located at 000 01' 34" - 000 28' 43" South Latitude and 990 46' 39" – 1000 32' 50" East, Agam Regency is located in a very strategic area, where it is traversed by the Sumatra Central Route and the Sumatra West Cross Route and is traversed by roads that connect the West Cross, Central Cross and East Sumatra Cross, so it is important to make the best of geographical advantages.

Agam Regency is a hilly/mountainous coastal area that is dominated by protected areas with an agricultural economic basis.increases from year to year, resulting in the use of land to be used continues to increase every year, the conversion of agricultural land continues to occur in this Regency area, resulting in the total area of agricultural land in this region continuing to decrease which will have an impact on the carrying capacity of food in Agam Regency. The area of rice fields in several sub-districts in Agam Regency, West Sumatra is decreasing every year, seen from the last year from 2019-2021 there has been a reduction in the area of rice fields due to rice fields being converted to building various types of development including building shops, industry and housing, which reduced from 3,523.51 ha to 2,893.29 ha, all of these things will have an impact on the carrying capacity of food because the rice fields are getting narrower from year to year (BPS Province of SUMBAR , 2020).

The availability of food carrying capacity in an area is closely related to the availability of agricultural land and enough rice fields, from both sides this is very interdependent, so if the area of paddy fields in an area decreases, the availability of food in that area will also decrease, so this problem will have an impact on the food carrying capacity of the people in that area , In Law No. 32/2009 it is about the protection and management of the environment, namely the ability of the environment to support human life, other creatures, and the balance between the two. The existence of population pressure that continues to increase will have an impact on land use and excessive food-carrying capacity it will threaten the sustainability of the environment in an area.

Very fast population growth will encourage changes in land use, including various purposes such as housing and development facilities, this is due to the area of the land surface of the earth being relatively fixed while the needs of humans on this earth will continue to increase along with the increase in population from year to year (Iswandi, 2017).

Changes in land use change can be seen and known without having to come to the field. This is done with remote sensing technology where we can obtain an object, or area using remote sensing technology data, namely by using imagery, using imagery we can analyze and get information about objects in an area without going directly to the object or area to be studied (Lillesand and Kiefer, 1979). Remote sensing technology is a technology that is used to identify an area with data in the form of an image, from the image data earlier you can get geographic information in that area by analyzing and observing the image data using elements of image interpretation. Changes in the use of paddy fields can be seen using remote sensing image data with the image interpretation element method, data This remote sensing image is very efficient and also affordable because with this image data it can cover a large area, in a short time and at a relatively low cost.

This study using Landsat imagery with a comparison of 3 years, namely 2000, 2010 and 2020 where Landsat imagery is an image generated by the Landsat satellite where Landsat satellite imagery consists of 8 Landsat images which have two sensors, namely a Multi-spectral scanner and a Thematic mapper, which has a resolution of up to 30 x 30 meters has a range of 185 km and 185 km and a radiometric resolution of 8 bits.

2. LITERATURE REVIEW

Remote sensing is a science that is used to analyze data obtained from a device without direct contact with the object to be analyzed, the data referred to here is data that is generated from remote sensing technology. namely in the form of objects on the surface of the earth, or in space, where the data is usually called an image, with an image the user can analyze an area, or an object in an efficient way, the tool used to capture a surface object is a tool that uses sensor, where this sensor is installed on a vehicle in the form of an airplane, satellite or another vehicle, the object data is obtained from a long distance so that this science is called remote sensing (Daeonodoro, 2011).

Landsat imagery is an image produced by the Landsat satellite, where Landsat satellite is the oldest satellite among other satellites launched by the United States of America, Landsat satellite imagery began in 1972 with the launch of the first generation Landsat satellite. 1, launched on July 23, 1972, the function of image classification is to retrieve object information.

exist on the surface of the earth without touching the object, or it can be a reference for its users. By using the imagery of the land, we can identify objects of paddy field cover in the Agam district by using elements of interpretation so that we can see changes in paddy fields from 2000 to 2020.

3. THE METHOD

This research uses descriptive quantitative research with a spatial approach where to explain changes in the paddy field area, quantitative descriptive research is research that aims to describe, record, analyze and interpret and classify the conditions that occur.

The method used in this study is a supervised classification method, and the ratio formula for per capita harvested area of food crops to the area of land for food self-sufficiency and by using the CA (cellular automata) method for predicting food carrying capacity for 2030 in Agam District.

4. RESULTS AND DISCUSSION

4.1 Paddy field area with food carrying capacity in 2000.

In 2000 9 sub-districts were capable of self-sufficiency in food in the Agam district, namely Tanjung Mutiara, Lubuk Basung, Palebayan, Matur, Malalak, Ampek Angkek, Palupuah, Kamang Magek, and Ampek Nagari, while Tanjung Raya sub-district, IV Koto, Banuhampu, Sungai Pua, Canduang, Baso and Tilatang Kamang are still sub-districts that are included in class II where Class II is an area that is capable of self-sufficiency in food but has not been able to provide a decent life for its inhabitants.

Figure 1 . Map of the distribution of paddy fields Supervised image classification results in Landsat 5 in the Year 2000

4.2. Paddy field area with food carrying capacity in 2010.

In 2010 11 sub-districts were capable of self-sufficiency in food in the Agam district, namely Tanjung Mutiara, LubukBasung, Palebayan, Matur, Malalak, Ampek Nagari, Palupuah, IV Koto, Sungai Pua, Tilatang Kamang, Baso, while the sub-districts Ampek Angkek, Tanjung Raya, Banuhampu, Canduang and Kamang Magek are still sub-districts that are included in class II where Class II is an area that is capable of self-sufficiency in food but has not been able to provide a decent life for its inhabitants.
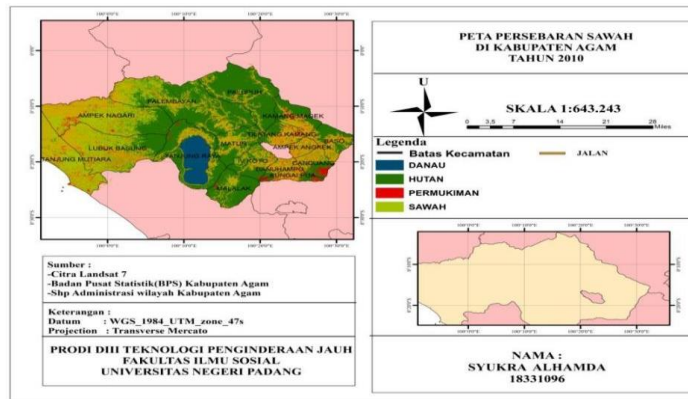
Figure 2 . Paddy field distribution map results of Supervised Landsat imagery classification 7 of 2010

4.3. Paddy field area with food carrying capacity in 2020.

In 2020 9 sub-districts are capable of self-sufficiency in food in the Agam district, namely Tanjung Mutiara, LubukBasung, Palebayan, Matur, Malalak, Ampek Nagari, Palupuah, IV Koto and Kamang Magek, while the Ampek Angkek sub-district, Tanjung Raya, Banuhampu, Canduang, Kamang Magek, Sungai Pua, and Baso are still sub-districts that are included in class II where Class II is an area that is capable of self-sufficiency in food but has not been able to provide a decent life for its inhabitants.
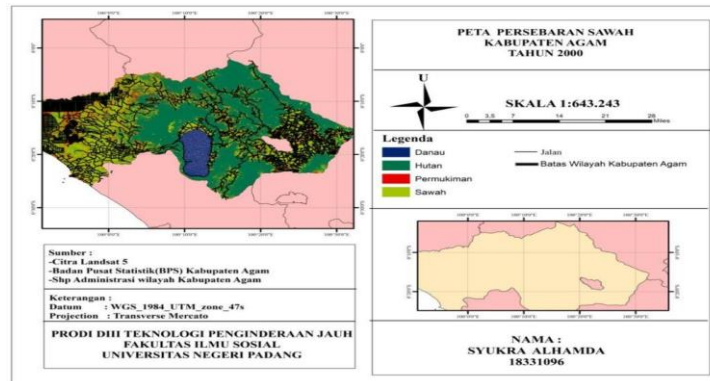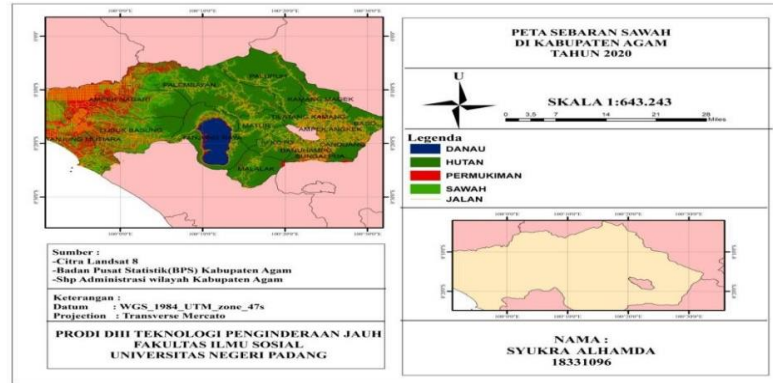
Figure 3 . Map of the distribution of paddy fields. The results of the classification of Supervised Landsat imagery 8, 2020
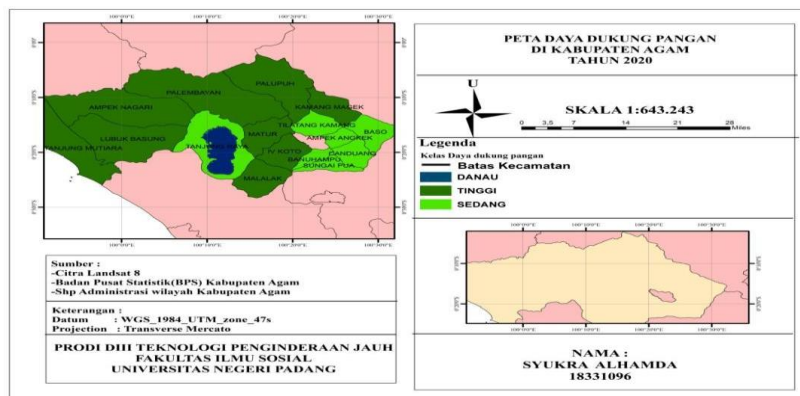
Figure 4 . Map of the 2020 Food Carrying Capacity in Agam Regency

Paddy fields' distribution area and food carrying capacity of food in 2030 are carried out by the Cellular Automata (CA) method. Prediction of paddy field distribution area and food carrying capacity in In 2030 the Cellular Automata (CA) method was carried out using Raster Data from the Paddy Field Distribution Map for 2010 and 2020 as a reference and driving vector data such as rivers and roads, this data is processed at Educliance distance for use in Softwerw Qgis, then in Qgis processed using the Molusce tool, resulting in a prediction of rice field distribution maps in 2030, then to determine the food carrying capacity in 2030, a population calculation is carried out based on the population growth rate formula using the population in 2010 and 2020, so that from the data This resulted in a Class Map of the existing food carrying capacity in 2030.

Figure 5 . Prediction Map of Rice Field Distribution in 2030 in Agam Regency

Figure 6 . Prediction map of Food Carrying Capacity in Agam Regency 2030

5. CONCLUSIONS AND SUGGESTIONS

5.1. Conclusion

The results of this study resulted in conclusions based on the formulation of the problems that have been described previously. The conclusion that can be drawn is the change in paddy field area in Agam Regency uses Landsat imagery from 2000, 2010 and 2020 there is a change in the area of paddy fields where in 2000 the area of paddy fields was 102,233 Ha, in 2010 the area of paddy fields was 92,962 Ha, and in 2020 the area of paddy fields continued to decrease to 68,054 Ha.

Then for the form of the food carrying capacity of Agam Regency In 2020 the food carrying capacity in Agam Regency 9 sub-districts are in class I, then 7 other sub-districts are in class II, where Class I $\sigma > 2.46$ Regions that are capable of self-sufficiency food and able to provide a decent life for its inhabitants and Class II $1 \leq \sigma \leq 2.46$ Regions capable of self-sufficiency in food but not yet able to provide a decent life for its inhabitants.

then the prediction of the food carrying capacity in Agam Regency. was in class II. And 4 Districts that are in Class III.

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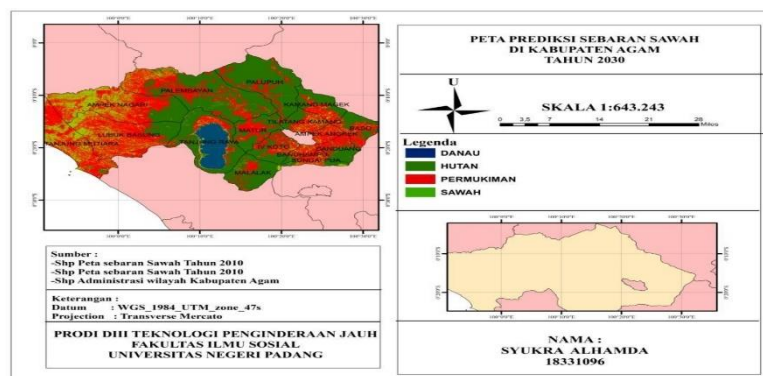[2] Ardiansyah. 2014" Pengolaan Citra Penginderaan Jauh Menggunakan Envi 5.1 dan Envi Lidar" Bogor. PT Labsig Inderaja Islim.

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