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UTILIZATION OF REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS FOR SHRIMP POND IDENTIFICATION USING OBIA METHOD IN BATANG ANAI DISTRICT

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ABSTRACT: This study aims to identify shrimp pond objects using Sentinel images in 2017 and 2022 and determine the area of ponds from 2017 to 2022 in Batang Anai District to monitor shrimp pond cultivation, where the amount of production each year always increases. The method used in this study is OBIA *(Object Based Image Analysis*). Based on the results of image interpretation of the Obia Citra Sentinel-2 method in 2017, it shows that the area of shrimp ponds in Batang Anai District, especially Nagari Katapiang, is only 1.82 ha. Meanwhile, the results of the interpretation of the Obia method image in 2022 show that the area of shrimp ponds in Batang Anai District is 102.75 ha. The *Object Base Image Analysis* (Obia) method used in Sentinel-2 images in 2017 and 2022 produces segmentation that shapes existing objects into a class that has the same characteristics. Shrimp ponds are segmented with a grayish dark hue, regular shape, boxed pattern, have a smooth texture, water site and associate with rivers. and located on the beach bordering the sea. The identification of obia method ponds in 2017 and 2022 has changed quite drastically in the last 5 years, namely the addition of pond areas of around 100.91 ha. Identification of ponds using the obia method produces segmentation which makes objects look the same into one object.

Keywords: Remote Sensing, Pond Object, Sentinel-2, OBIA.

1. INTRODUCTION

Indonesia has the second longest coastline in the world with a variety of coastal aquatic ecosystems and a variety of existing biota is one of the enormous potentials for the development of aquaculture (freshwater, coastal and marine aquaculture). One of the country's foreign exchange contributors in the field of fisheries is shrimp. No wonder coastal and marine resources will become alternative resources, as well as the main focus for the sustainability of the nation through various utilization activities that can be carried out. Shrimp is one of the superior fishery food commodities in the global and domestic markets. Market demand for high shrimp production is offset by the availability of existing production suppliers. In 2013 it was recorded that the gap between production and demand in the world was around 1,102,631 tons (OCEDFAO, 2014). Activities for the utilization of existing coastal resources, one of which can be done is pond cultivation.

GIS can provide and display a lot of information in the form of images that are more preferred and easy to understand by *users.* GIS has the ability to create models in order to compile land suitability maps that are displayed quickly and precisely for different activities, besides that remote sensing has the ability to identify and monitor changes in natural resources and the environment in a certain time quickly, accurately and continuously and the data produced is always *up to date* (Hendiarti et al., 2006).

The distribution of ponds in Padang Pariaman Regency is generally found in coastal areas, one of which is in Batang Anai District. Which area is an area directly adjacent to the sea. The area of the tabak from year to year must always be changing. This is caused by several factors such as land clearing, abrasion, high sea water during high tide, conversion of pond land and other factors caused by humans and nature. For this reason, it is very important to know the identification of pond objects that are useful in monitoring shrimp pond aquaculture production from year to year.

The application of remote sensing and GIS, especially the Obia method in identifying ponds, is much more effective because it has high reliability, saves costs, and can reduce tersertrial work. In addition, data generated from remote sensing can also be displayed spatially in the form of maps so that they can evaluate and monitor pond distribution patterns and possible changes. This study aims to identify productive shrimp pond objects and calculate changes in area in Batang Anai District using Sentinel 2A images for 201, 7 and 2022

2. RESEARCH METHODS

This study used quantitative methods. Quantitative research is a type of research that obtains findings that can be accessed using calculation or measurement procedures (V. Wiratna Sujarweni, 2014). This study uses a descriptive approach with the aim of explaining a situation that will be studied with the support of literature studies so as to further strengthen the researcher's analysis when making a conclusion. Where the results of the study are obtained from the calculation of the indicator variables, the research is then presented in writing by the author. The research flow chart is shown in Figure 1.

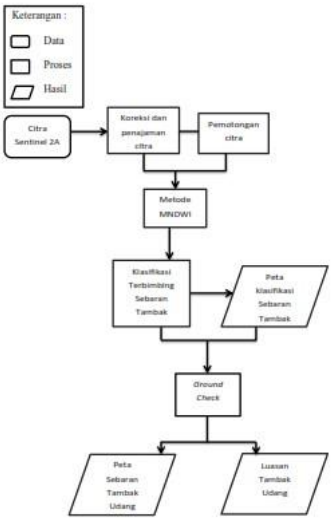

Figure 1. Research flow chart

2.1 Identification of shrimp pond objects using the Object Base Image Analysis (OBIA) classification method

Before entering the data processing process, first carry out the data pre-processing process such as inputting data, the data used in this study is in the form of Sentinel image data. The image is inputted into the software and then cropping is done to limit the research area so that it is not too wide. Image sharpening is done to clarify the appearance of the image so that information from an object is more informative. Segmentation is carried out for objects in the image then calcification. Image classification is a technique used in analyzing the appearance of the image so that useful information is obtained for the identification of pond objects and producing a map of the distribution of shrimp ponds

2.2 Calculating shrimp farm area in 2017 and 2022

The method of calculating the area using the calculate geometry menu in the software by utilizing Table attribute data on images that have been classified and have been converted to Shapefile (Shp) format, the unit of area results used is hectare (ha).

3. RESULTS AND DISCUSSION

3.1 Research Results

3.1.1 Area of ponds spread across Batang Anai District in 2017 and 2022

Based on the results of image interpretation of the Obia Citra Sentinel-2 method in 2017, it shows that the area of shrimp ponds in Batang Anai District, especially Nagari Katapiang, is only 1.82 ha. Meanwhile, the results of the interpretation of the Obia method image in 2022 show that the area of shrimp ponds in Batang Anai District is 102.75 ha. This is one indication that there has been a drastic increase in the area of shrimp ponds, which is 100.91 ha as can be seen in Table 1 below.

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Table 1. Pond area in 2017 and 2022

No	Object	Area (ha)
	2017	
1	Pond	1.83
2	Non Farm	13332.3
	2022	
1	Pond	102.75
2	Non Farm	13231.83

Source : Image analysis results, 2017 and 2022

3.1.2 Identification of pond objects using the obia method in 2017 and 2022

Figure 2. Pond segmentation results in 2017 and 2022

Object Base Image Analysis (Obia) used in Sentinel-2 images in 2017 and 2022 produces segmentation that shapes existing objects into a class that has the same characteristics. The shrimp pond is segmented with a dark grayish hue and color and is located on the edge of the beach bordering the sea, for other significant differences can be shown in figure 3.

Objek	Kunci interpretasi								
	Rona/warna	Bentuk	Ukuran	Pola	Tinggi	Bayangan	Tekstur	Situs	Asosiasi
Tambak	Gelap keabu-abuan	berkotak	kecil	teratur	Tidak ada	Tidak ada	halus	air	jalan
Permukiman	Pink kecoklatan	Tidak beraturan	kecil	Tidak teratur	Tidak ada	Tidak ada	halus	atap	jalan
Sawah	Gelap kecoklatan	Tidak beraturan	Lumayan besar	Tidak teratur	Tidak ada	Tidak ada	halus	tanah	irigasi
Hutan Campuran	Hijau kegelapan	Tidak teratur	besar	Tidak teratur	Tidak ada	Tidak ada	halus	pohon	perbukitan
Vegetasi	Hijau cerah	Tidak teratur	Lumayan besar	Tidak teratur	Tidak ada	Tidak ada	halus	semak	permukiman
Bandara	cerah	memanjang	kecil	memanjang	Tidak ada	Tidak ada	halus	Aspal	jalan

Figure 2. Key tables of interpretation

The segmentation process is then analyzed with train maximum likelihood classification using ArcGis software in the Segmentation and Classification tool.

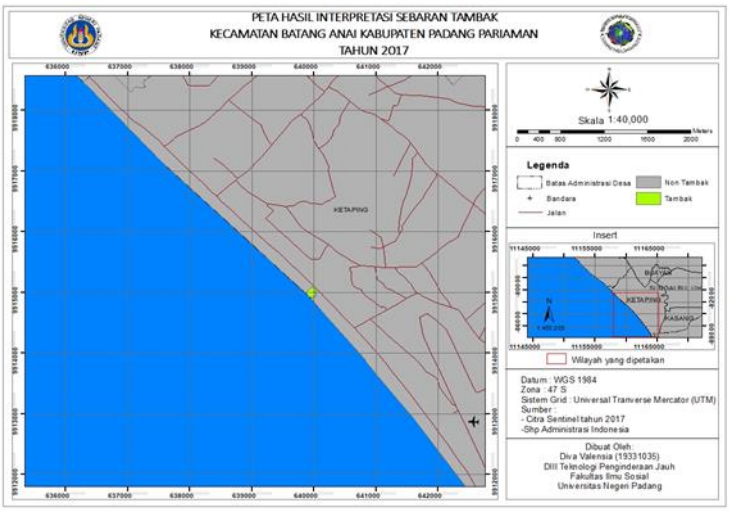

Figure 3. Map identi pond fication in 2017

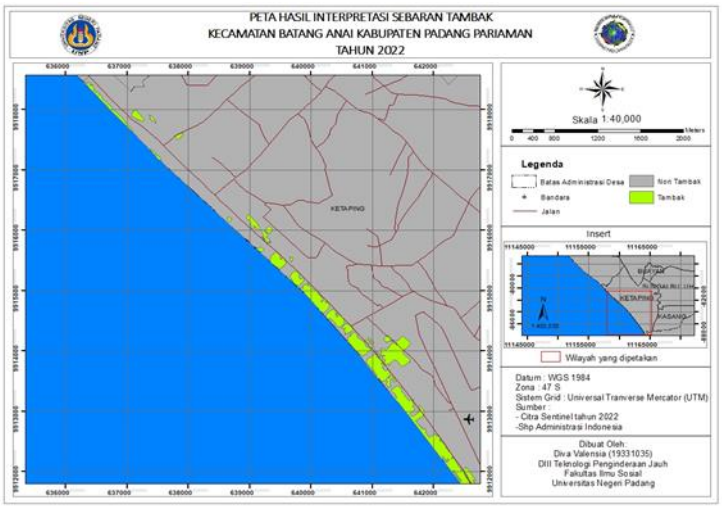

Figure 4. Farm identification map in 2022

3.1.3 Accuracy Test

From the ground check results that have been carried out above with a total of 22 location points, the correct value of 21 points and 1 point is wrong. To determine how accurate the level of image accuracy from the ground check results can be calculated as follows:

$$\text{Correctness of interpretation} = \frac{\text{Number of correct points}}{\text{Number of survey points}} \times 100\%$$

$$= \frac{21}{22} \times 100\% = 95.83\%$$

The count shows that the accuracy rate is 95.83%. This value has exceeded the minimum value set in Geospatial Information Agency Regulation No.15 of 2014 where the minimum accuracy value is 85%. Thus, it can be ascertained that the image classification result of 95.83 is qualified. Based on the ground check results on 22 sample points scattered from the classification results, there are object points that are the same as the conditions in the field and some are different. This error occurs because the types of objects that have been classified have hues and colors that are almost similar to pond objects. The following is a table of field accuracy test results.

Table 2. Field accuracy test results

	Field Data
Class	Sum
Pond	21
Non Farm	1
Total	22

Source : Sample and data analysis, Year 2022

3.2 Research Discussion

Based on the results of the obia method digital image processing with maximum likelihood classification, processed with ArcGis 10.3.1 using Sentinel images with a resolution of 20 meters at a scale of 1: 40,000 with an area of 1 pixel, the image reaches 0.01 hectares, identification of pond objects in Batang Anai District in 2017 and 2022 was obtained. The results of processing carried out in the early stages of the image are composit bands true color, namely bands 4, 3, and 2, then image cutting is carried out according to the administrative area of the research location and then obia identification can be carried out by segmenting the image. So that the results of segmentation are then classified into several class objects.

The segmentation results of the object of study are segmented ponds with a grayish dark hue, regular shape, boxed pattern, have a smooth texture, water sites and associate with rivers. The object-based classification method is able to provide land cover information quite well because it is done by dividing segments in the form of groups of pixels that are similar to each other in terms of color, size and shape. (Hafa, Sri, Naf'an, 2022). According to Tunjung and Suharyadi (2012) the OBIA method is considered superior to pixel-based classification because it takes into account spatial and spectral aspects. OBIA with specifications whose analysis process is based on spectral and spatial displays is considered suitable for identifying pond bjek on medium spatial resolution images.

The classification results obtained several other objects besides ponds, namely ponds, built-up land, vegetation, built-up land and secondary forests for the 2022 image and pond objects, rice fields, built-up land, vegetation and secondary forests for the 2017 image.

The results of image classification in the form of raster data are converted to vector form The objects other than the classified ponds are put together using the dissolve tool in ArcGis and made into non-pond classes and then the area calculation is carried out for ponds and non-ponds in 2017 and 2022. After calculating the existing pond area using calculate geometry in the Table attribute, it was obtained that the pond area was 1.83 ha and non-pond area was 13,332.3 ha in 2017 and the pond area was 102.75 ha and non-pond area was 13231.38 in 2022. From these results, it can be seen that the addition of pond areas is quite drastic within 5 years, from 2017 to 2022.

4. CONCLUSION

a. The identification of obia method ponds in 2017 and 2022 has undergone drastic changes in area in the last 5 years, namely an increase in pond area of around 100.91 ha from only 1.83 ha in 2017 to 102.75 ha in 2022.
b. Identification of ponds using the obia method produces segmentation which makes objects look the same into one object, Ponds are segmented with a dark grayish hue, regular shape, boxed pattern, have a smooth texture, water sites and associate with rivers.

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