

ABSTRACT

In Indonesia, the expansion of agriculture has become one of the drivers of deforestation, particularly with regard to farmland adjacent. Conservation areas such as national parks, nature reserve, and wildlife reserves are examples of forested areas that are most vulnerable to the threat of deforestation. Data on change in land use and in particular the existence of cropping within the protected forest areas is required as the initial attempt in understanding and preventing deforestation, followed by further actions such as law enforcement and collaboration with various organizations.

By adopting a remotely sensed approach using satellite images, this research aims to map the change of agriculture expansion and cropping segmentation throughout the national park boundary in Kerinci mountain, Indonesia. This area studied is located at Kerinci regency, Jambi province, on the island of Sumatra, Indonesia., The mountain is part of Kerinci Seblat National Park (KSNP) which is also known as the home for a range of currently critically endangered species such as Sumatran tiger, orangutan, elephant, and rhinoceros, as listed by UNESCO World Heritage Committee and International Union for Conservation of Nature (IUCN).

The images data used in the analysis were acquired on three dates (1998, 2008 and 2018) and consisted of Landsat 5 Thematic Mapper (TM) and Landsat 7 Enhanced Thematic Mapper Plus (ETM+) with the 30-meter spatial resolution provided by United States Geological Survey (USGS). Additionally, two dates of SPOT-6 images (2013 and 2018) with 1.5-metre (panchromatic) and 6 meters (multispectral) spatial resolution were obtained from LAPAN (National Institute of Aeronautics and Space-Indonesia). These Such images were used to map the segmentation of cropping within the park's boundary.

In the Landsat imagery processing, a supervised classification approach applied to distinguish between forest and the fragmented area around the boundary of the park. On the other hand, the Object-Oriented Image Analysis (OBIA) with machine learning utilises SPOT-6 imagery to classify the segmentation of crops

throughout the northern section of the Kerinci Seblat National Park. Change in land use/land cover was determined from the multiple dates. By using a series Landsat imagery and classification accuracy around 89 - 90%, the study found that in the last twenty years, forest loss in the park increases significantly from 3379.3 hectares in 1998 to 5685.83 hectares in 2018 (60%). The classification of SPOT 2013 explained that almost 80% of forest loss within the national park was occupied actively by illegal farmers. It was indicated by the segmentation existence of plastic shade, agriculture, and fallow. Other class/ segmentation such as shrubs and pasture only accounts for 20% or around 749 hectares. The overall classification accuracy in such image achieved 85.29%. The classification of SPOT 2018 enlightened that around 55% of forest loss area within the park was caused by agricultural activities that were signified by the segmentation presence of agriculture, plastic shade and fallow. The class of shrubs contributed around 44% of total deforestation in 2018. The overall classification accuracy in such image attained 85.71% — however, around 50% of the image covered by the cloud. Therefore, the investigation of such activities was not calculated thoroughly.

In conclusion, a series of Landsat imagery can be used to distinguish the trend of forest change due to the availability of images collection throughout the year. On the other hand, OBIA and machine learning are suitable for detecting and mapping small area intensive crops.