Palm Oil Plantation Growth in Sumatra, Indonesia

Abstract
Palm oil trees are rapidly spreading across the landscape in Sumatra, Indonesia. The province of Bengkulu is a prime example of this. Finding an accurate way to monitor plantation growth remotely would be of great benefit as scientists and others attempt to monitor how Indonesia’s palm oil boom is effecting climate change. This research details a methodology for utilizing satellite imagery to accurately differentiate palm trees from other forms of vegetation on a plantation scale. The research applied an unsupervised classification process found in ArcMap to a series of LANDSAT’s 4-5, 7, and 8 satellite imagery for palm tree detection. The results of this study show that the rate of palm oil expansion was still growing as of 2018. However, the study was inconclusive as to whether or not the Indonesian government is in compliance with the New York Declaration on Forests, signed in 2014, where they pledged to not deforest any new land.

Methodology:
This remote sensing project utilized LANDSAT imagery from LANDSAT’s 4-5, 7, and 8 recorded during the months March-May. This time of the year was selected as it typically has the least amount of cloud obstruction. It was important to use the same timeframe from year to year, so the cycle of plantation growth is the same. The land classification was run in the ArcGIS software ArcMap and was the only software used throughout this project.

After obtaining the imagery from the United States Geological Survey (USGS), ArcMap was used to clip and mosaic specific bands from the LANDSAT image for the Bengkulu province. An unsupervised classification was originally tried at the province scale, but was unsuccessful. It appears that the classes were not specific enough, for example it was classifying all the vegetation together rather than just the palm oil. The area was clipped again around the boundary of two palm oil plantations and one rubber plantation. This boundary was hand drawn by ground truthing with Google Earth Pro. Google Earth Pro is a great tool and resource for a project like this where historical imagery is needed. Next, an unsupervised classification was conducted to measure the growth for two palm oil plantations (PT Bio Nusantara Teknologi and PT Sandabri Indah Lestari).

The classification was deemed overall successful after further ground truthing with Google Earth Pro. A binary was established of what is palm oil and what is not. This ground truthing was done by finding multiple points of reference (significant bends in a river, coast line marker, etc.) and checking several points before confirming a class identity.

Country: Indonesia
Island: Sumatra
Study Area: Bengkulu Province

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Sources: