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DETECTION OF MATURE AND IMMATURE OIL PALM FROM IMAGE SENTINEL-2 USING GOOGLE EARTH ENGINE (GEE)

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ABSTRACT

Oil palm is crucial to ecology, the environment, and the economy. If improperly managed and monitored, unrestrained oil palm activities could contribute to deforestation, which can seriously affect the environment. Remote sensing provides a means to effectively detect and map oil palms from space. Recent developments in big data and cloud computing enable quick mapping on a wide scale. However, the use of cloud computing remains limited and challenging in Malaysia. Thus, this study used image Sentinel 2 processed in Google Earth Engine (GEE) to classify mature and immature oil palms' land cover in TDM Plantation, Terengganu. Four (4) machine learning algorithms are used in classification, such as Random Forest (RF), smile Classification and Regression Tree (smileCART), Gradient Tree Boost (GTB), and Minimum Distance (MD). Overall accuracy (OA) and kappa produced by Random RF, GTB, smileCART and MD were OA = 85.14%, kappa = 0.80, OA = 84.00%, kappa = 0.78 , OA = 83.42%, kappa = 0.77 and OA = 78.29%, kappa = 0.71 respectively, for 6 classes (water body, built up, mature, immature, bare land and forest). Therefore, image Sentinel-2 efficiently detected mature and immature oil palms' land cover using the RF algorithm implemented in GEE.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

Oil Palm is one of the most important agricultural commodities for our country. It belongs to the genus Elaeis and contributes to about one-fifth of the world's oil and fat production. The genus Elaeis contains two important species: E. guineensis (African oil palm) and E. oleifera (American oil palm). African oil palm is a high-yielding species that are commercially cultivated. Although the American oil palm is a low-yielding species, the oil quality and composition are superior to those of the African species (Arunachalam, 2012). The oil palm species commonly planted in Malaysia is Tenera, a hybrid between dura and pisifera species. Tenera was chosen because it gives a good ratio of palm oil and palm kernel oil yields. Palm oil has assisted Malaysia in becoming is the world's second-largest oil palm exporter. Oil palm has also been one of the main sources of income for FELDA settlers. This is because oil palm is one of the major agricultural products produced by FELDA, FGV and is being cultivated by settlers (Faizi et al., 2016).

However, finding a sustainable balance between economic development and environmental protection is a major challenge for palm oil-producing countries (Nilsson, 2013). As forests throughout the world are increasingly exploited and converted for oil palm plantations, it is critical to have a classification system capable of detecting oil palm land cover across the tropics in near-real-time (Lee et al., 2016). The geographical distribution for environmental and monitoring tasks requires extensive coverage of land cover or land use (LCLU). The accurate crop maps can be used to more correctly estimate agriculture data and forecast crop yields. (Shelestov et al., 2017). Modelling land use and land cover change (LULCC) is a powerful method for evaluating the present human footprint on the earth. However, it was used to create them, as were the classification systems that were used to generate the various land-use partitions (Sidhu et al., 2018).