NDVI OF OIL PALM TREES BY LANDSAT-5 Imagery

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ABSTRACT: Oil Palm plantations in Malaysia are managed to allow the optimum yield rate. Most plantations have a series of techniques for managing the palms. Good management provides sound recommendations and reliable management decisions of the oil palm trees. One of the techniques is the application of remote sensing which is used as a tool to determine decisions about the oil palm plantations. It is important that decisions to manage these palms are made based on fair and reliable information. Landsat-5 has capability to determine some of these information and facts. NDVI derived from the Landsat-5 can be used to determine the greenness of these palm plantations. Oil palm trees greenness can be obtained. This information can be used in determining the fertilizer application that contributes to the yield of oil palm plantations.

INTRODUCTION

From the perspective of increasing the supply–demand chain for oil palm products, there is the need for the relevant knowledge to increase the average palm oil yield per hectare. Malaysia is currently the second world highest producer and exporter of palm oil [1]. Oil palm trees in Malaysia are managed in many approaches to allow the optimum yield rate. One of the approaches is to allow the application of remote sensing as a tool. Multispectral images obtained over area of interest can provide overall and detailed information of the palm footings. Different bands of a multispectral image may be combined to accentuate the vegetated areas. One such combination is the Normalized Difference Vegetation Index (NDVI). NDVI has allowed wide application in vegetative studies as used to estimate crop yields [2]. Generally, healthy vegetation will absorb most of the visible light that falls on it and reflect a large portion of the near-infrared [3].

METHOD AND EQUATION

The study area (*Fig. 1*) covered 671.5hactares in the southern part of Perak, Malaysia. The dominant over-storey was oil palm trees. Satellite imagery that covers the study area was acquired on 14th August 2011 by the Landsat-5 (TM sensor).

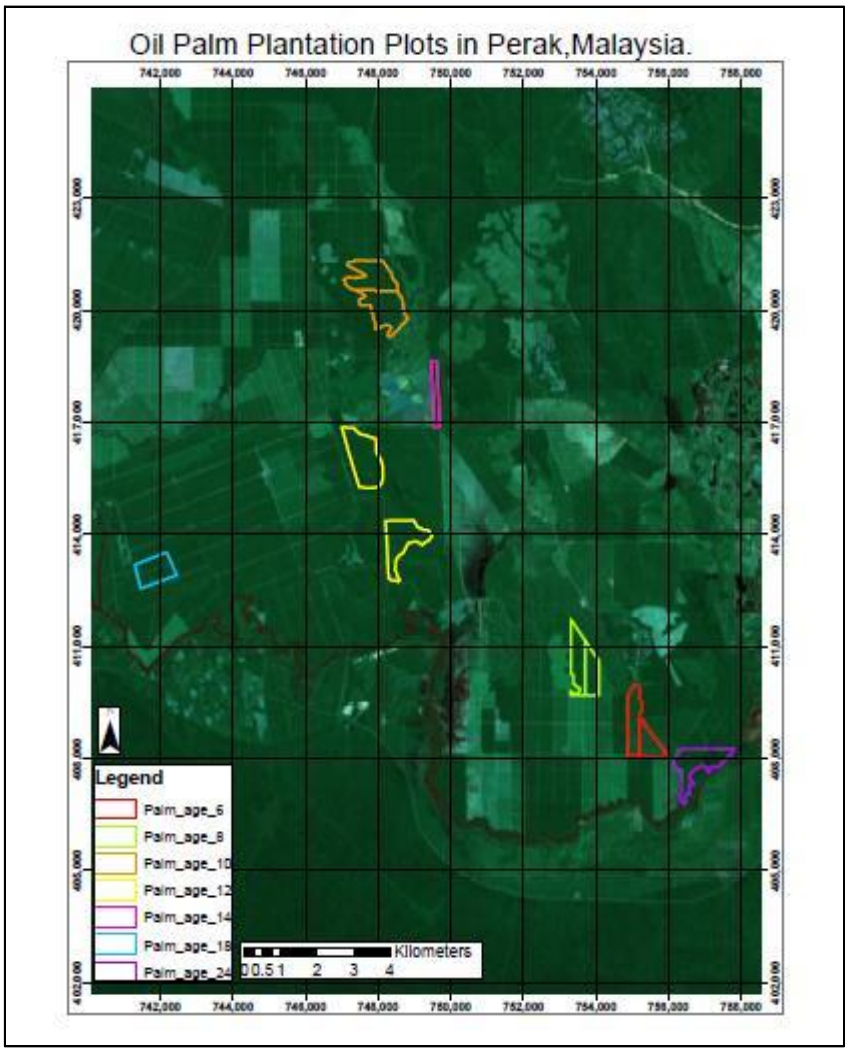

Figure 1: Landsat-5(TM Sensor) of oil palm plots in Perak, Malaysia.

The cloud free image of 30m resolution was orthorectified with the ENVI 4.8 image processing environment. Preparation of Landsat-5 imagery involved cropping and obtaining NDVI of the study area. This was be done by selecting seven different age group plots of oil palm plantation. Ground survey was carried out in the study area and measurements of the palm oil trees were recorded. The area of interest was then calculated to obtain the Normalized Difference Vegetation Index (NDVI) to allow the status of oil palm stand interpretation (1).

$$NDVI = (NIR - RED) / (NIR + RED) \quad \ldots. (1)$$

RESULTS AND DISCUSSION

Using the distinct spectral signature of plants with low reflectance in the visible (0.4-0.7 um) and very high reflectance in the near infrared region (0.7-1.2 um) of the solar spectrum, the spectral contrast can be used for identifying the presence of green vegetation and evaluating some characteristics through vegetation indices. From Fig.2 it is shown that the NDVI of the plots are higher than 0.65. This shows that the plots are healthy vegetation that has low red-light reflectance and high near-infrared reflectance, and hence, high NDVI values.

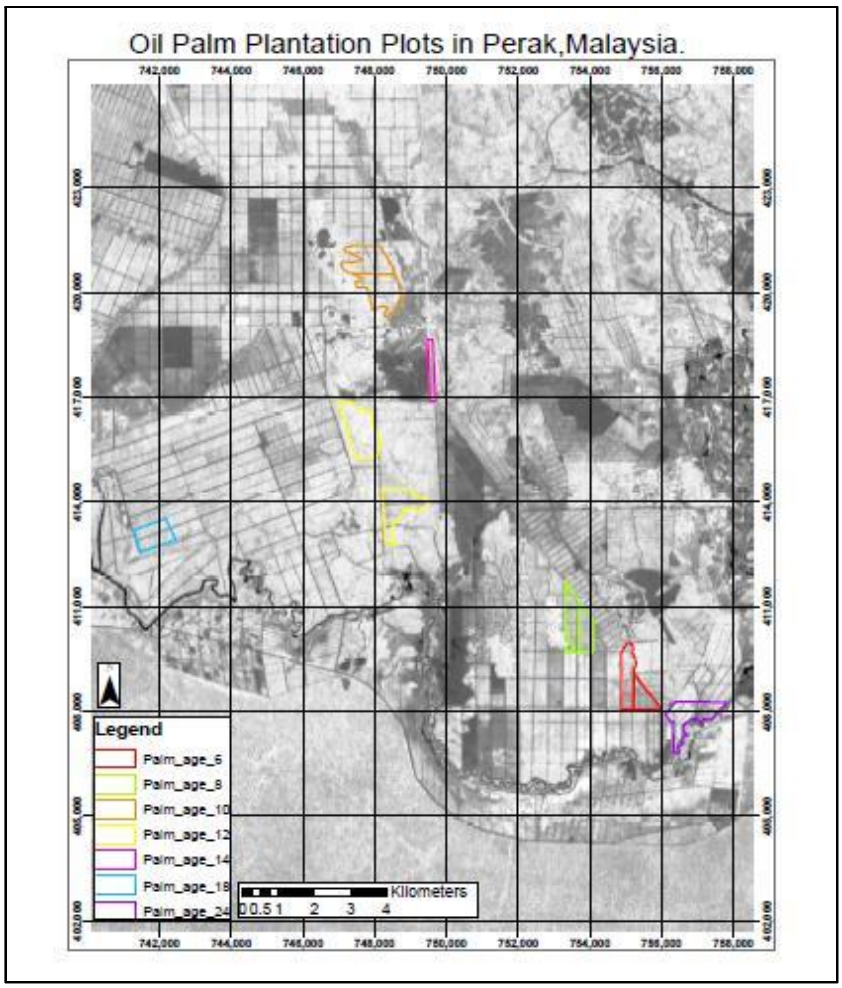

Figure 2: NDVI image of oil palm plots in Perak, Malaysia.

Table 1: NDVI values of the oil palm plot by palm age

Age	NDVI
6	0.673
8	0.682
10	0.717
12	0.722
14	0.656
18	0.702
24	0.684

Green leaves commonly show better reflection in the near-infrared wavelength range than in visible wavelength ranges. When leaves are water stressed, diseased, or dead, they become more yellow and reflect significantly less in the near-infrared range [4].However, in this study, the palm aged 24 also indicated high NDVI values of 0.684. This shows the tree stand is healthy. NDVI is often used worldwide to monitor drought and predict agricultural production. In this case, the oil palm plots are shown to be healthy and the optimum age of the palm trees shows two highest NDVI values. NDVI is preferred for global vegetation monitoring because it helps to compensate for changing illumination conditions, surface slope, aspect, and other extraneous factors [5].

CONCLUSIONS AND RECOMMENDATIONS

The oil palm trees in the study are has shown a good NDVI values ranging from 0.656 to 0.722. This allows us to interpret that the covered vegetation is healthy and can help us to predict that it is productive palm. It is important to know the NDVI of the oil palm stand to enable the plantation manager to gauge the level of effectiveness in the management of the palms. It is recommended to allow the NDVI analysis on wider age stand intervals.

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