

**Project title:** A computerized digital imaging technique to estimate palm oil content and quality based on fruit color

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#### Abstract

Typically, crude palm oil (CPO) quality is determined destructively using wet chemical analysis, which can be costly and time consuming. Deterioration of Bleachability Index (DOBI) is a key indicator of crude palm oil (CPO) quality. An alternative evaluation procedure that combines consistency and reporting accuracy is desirable. One such method is the use of fruit color as an indicator of CPO quality. A recent study showed that fruit color was significantly correlated with palm oil content (Balasundram et al., 2006a). An extension of that work further showed that fruit color was also significantly correlated with DOBI (Balasundram et al., 2006b).

Both these studies employed a digital imaging approach to quantify fruit color. Oil palm fruit images were captured using a high resolution digital camera. After imaging, the fruits were manually squeezed for oil and analyzed for total oil content and DOBI using standard laboratory procedures. The images were processed using ILWIS 3.2 (Academic) to generate percentage of color based on clustering and unsupervised classification. Each classified image was re-colored to its original color separation, which comprised black, red, orange and yellow components. Correlation and stepwise regression techniques were used to determine the relationship between oil content/DOBI and fruit color components.

In this work, we present an automated technique of quantifying fruit color components based on digital images captured in Joint Photographic Experts Group (JPEG) format. This technique is based on a simple computer program written in Visual Basics and interfaced with ILWIS 3.2. Using the empirical relationship between oil content/DOBI and fruit color, an additional step of estimating % total oil content and/or DOBI values is also made possible. Essentially, the digital fruit image (in JPEG format) serves as the input data to churn out two levels of output sets, i.e., the percentage of color components (black, red, orange and yellow) and the predicted oil content and/or DOBI value. A comparative analysis between the manual estimation procedure and the automated estimation procedure is given.

The automated technique can enable oil yield and/or oil quality mapping to facilitate precision oil palm management. Currently, there is no practical method of mapping oil palm yields/quality due to logistical and instrumentation limitations.

#### References cited

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