UNIVERSITI PUTRA MALAYSIA

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By

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Chairman : **Associate Professor Siti Zauyah Darus, PhD**

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Seven most common soils on different parent materials from oil palm estates in Tawau-Semporna area, Sabah were selected for this study. The study was carried out due to the lack of detailed information for proper classification and management of the soils. The objectives are therefore to determine their physical, chemical, mineralogical and micromorphological properties; to classify them according to the FAO/UNESCO Legend, the Sabah Classification System, the World Reference Base (WRB) and the Soil Taxonomy and to compare the usefulness of these different systems; and to evaluate their fertility status and suitability for oil palm.

All the soils have deep solum (>100 cm) and oxic or argillic horizons. Soil color and texture vary depending on the parent materials. Bulk density of andesitic soils is lower than the rest of the soils.

Soil pH of the soils are acidic (<5.0) and have a net negative charge. Except for the andesitic basalt soil, the studied soils have mainly low amount of bases and capacity exchange cation (CEC). Soil N, P and K are also mostly low. Soil Mg is high on the andesitic basalt and tuffaceous sedimentary rocks soils. For oil palm cultivation, the soils are of low to very low fertility.

Most of the studied soils are highly weathered due to the dominance of kaolinite, quartz, goethite, hematite and gibbsite. Andesitic basalt and tuffaceous sedimentary rock soils are however less weathered as indicated by the presence of 2:1 clay minerals, illite and feldspars. The most interesting mineralogical and micromorphological anomaly is the presence of cristobalite in the soils over sedimentary rocks indicating the volcanic influence on the soils through the addition of volcanic ash and by the presence of tuffaceous materials.

The studied soils are classified into different soil types according to the various classification systems indicating each soil have specific properties. The classification of soils according to the WRB systems appears to give more detailed information and better interpretation on soil properties and management than the FAO/UNESCO legend and Soil Taxonomy.

Based on the Fertility Capability Classification, the studied soils are classified into different fertility groups with major problems of low CEC, Al toxicity and K deficiency. No major constraint is encountered on the andesitic basalt soil due to its

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PENCIRIAN, PENGELASAN DAN KESESUAIAN UNTUK KELAPA SAWIT BEBERAPA JENIS TANAH DI TAWAU-SEMPORNA, SABAH

Oleh

ARIF SUGANDI

April 2005

Pengerusi : **Profesor Madya Siti Zauyah Darus, PhD**

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Tujuh jenis tanah daripada bahan induk yang berbeza dari kawasan kelapa sawit di Tawau-Semporna, Sabah dipilih untuk kajian ini. Kajian ini dilakukan kerana maklumat yang terhad bagi kegunaan pengelasan dan pengurusan tanah-tanah ini. Objektif daripada kajian ini iaitu untuk menentukan sifat-sifat fizik, kimia, mineralogi dan mikromorfologi; pengelasan tanah-tanah tersebut mengikut Sistem FAO/UNESCO, Sistem Pengelasan Sabah, World Reference Base (WRB) dan Sistem Taksonomi Tanah dan membandingkan penggunaan diantara sistem-sistem ini; dan menilai tahap kesuburan dan kesesuaian tanah untuk penanaman kelapa sawit.

Kesemua tanah mempunyai solum yang dalam (>100 cm) dan horizon oksik atau argilik. Warna dan tekstur tanah berbeza bergantung kepada bahan induk tanah tersebut. Ketumpatan pukal tanah yang terbentuk daripada andesitik adalah rendah.

Kesemua pH tanah adalah asid (<5.0) dan mempunyai cas negatif. Kesemua tanah mempunyai kandungan bes dan keupayan pertukaran kation (KPK) yang rendah kecuali bagi tanah basalt andesitik. Kandungan N, P and K tanah-tanah ini adalah juga rendah. Kandungan Mg adalah tinggi pada tanah basalt andesitik. Untuk kelapa sawit, tanah-tanah ini mempunyai kadar kesuburan yang rendah.

Tanah-tanah ini mempunyai kadar luluhawa yang tinggi kerana mengandungi mineral kaolinit, kuarsa, goetit, hematite dan gibsit. Tanah basalt andesitik dan tanah endapan bertuff mempunyai kadar luluhawa yang kurang tinggi ditunjukkan oleh kehadiran lempung jenis 2:1, mika dan feldspar. Ciri-ciri mineralogi dan mikromorfologi yang menarik adalah kehadiran kristobalit pada tanah endapan menunjukkan pengaruh bahan volkanik dalam tanah tersebut.

Tanah-tanah pada kajian ini mempunyai pengelasan yang berbeza mengikut pelbagai sistem pengelasan tanah yang ada. Ianya menunjukkan bahawa tanah-tanah ini mempunyai sifat dan ciri yang berbeza. Pengelasan tanah-tanah tersebut berdasarkan Sistem WRB memberikan maklumat yang lebih terperinci mengenai ciri-ciri tanah dan intrepretasi yang lebih baik berbanding Sistem FAO/UNESCO dan Taksonomi Tanah.

Kajian pengelasan menurut *Fertillity Capability Classification* (FCC) menunjukkan bahawa tanah-tanah tersebut mempunyai pengelasan yang berbeza. Masalah kesuburan yang paling utama ialah nilai KPK yang rendah, ketoksikan Al dan

kekurangan K. Tiada masalah pada tanah basalt andesitik kerana tahap kesuburannya yang lebih tinggi. Kajian analisa cluster menunjukkan tanah-tanah pada kajian ini berkumpulan sesuai dengan jenis bahan induk.

Tanah-tanah pada kajian ini adalah sesuai kepada sederhana-sesuai untuk tanaman kelapa sawit kecuali profil SDM-4. Profil SDM-4 digredkan sebagai marginal kepada sederhana-sesuai disebabkan oleh masalah tekstur, struktur dan kandungan nutrien yang rendah bagi tanaman kelapa sawit. Mengikut kajian ini, kebanyakan tanah-tanah tersebut mempunyai masalah perhubungan dengan kesuburan tanah. Masalah tanah lain adalah kecerunan, tanah berlaterit, tanah-tanah oksik, horizon yang berpasir.

Kajian ini menunjukkan bahwa pedologi, pengelasan dan kesesuaian tanah adalah sangat penting untuk mengetahui sifat-sifat dan kesesuaian tanah sebenar untuk tanaman. Kajian serupa adalah sangat berguna dan harus dilakukan untuk jenis tanah yang lain di Malaysia.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES