

**Universiti Teknologi MARA**

**SITE-SPECIFIC MANAGEMENT OF  
IMMATURE OIL PALM ON PEAT:  
GPS, GIS AND GEOSTATISTICAL  
APPROACH**

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## TABLE OF CONTENTS

	Pages
<b>ACKNOWLEDGEMENTS</b>	ii
<b>LISTS OF TABLES</b>	vi
<b>LISTS OF FIGURES</b>	vii
<b>LISTS OF PLATES</b>	ix
<b>LISTS OF DIAGRAMS</b>	x
<b>ABSTRACT</b>	xi
<b>CHAPTER</b>	
<b>1 INTRODUCTION</b>	1
1.1 An Overview	1
1.2 Hypothesis	4
1.3 Objective of the Study	4
<b>2 LITERATURE REVIEW</b>	5
2.1 An Overview of Peat Formation	5
2.2 Classification of Peat	6
2.2.1 Topographical Factor	7
2.2.2 Vegetation Factor	8
2.2.3 Chemical Factor	9
2.3 Characteristics of Peat	10
2.3.1 Physical Properties	12
a. Soil Moisture	12
b. Bulk Density	14
c. Porosity	15
d. Texture and Loss on Ignition	15
e. Irreversible Drying	15
2.3.2 Chemical Properties	16
a. Acidity and Soil Salinity	16
b. Cation Exchange Capacity	17

c. Organic Carbon	17
d. Nitrogen	18
e. Phosphorus	19
f. Potassium	19
g. Trace Elements	20
2.3.3 Biological Properties	22
2.3.4 Significant of Peat to Human Activity	22
2.4 Site Specific Management	24
2.5 Global Positioning System	25
2.5.1 Global Positioning System Segments	26
a. Space Segment	26
b. Control Segment	27
c. User Segments	27
2.5.2 Details on Global Positioning System Satellite Signals	28
2.6 Geographical Information System	28
2.6.1 Significance of Geographical Information System	29
2.7 Geostatistical Analyses for Windows	30
<b>3 MATERIALS AND METHODS</b>	<b>31</b>
3.1 Site Characteristics and Experimental Setup	31
3.2 Field Observation	35
3.3 Systematic Field Sampling.	35
3.4 Soil and Leaf Samplings	38
3.5 Sample Handling and Preparation	39
3.6 Laboratory Analysis	40
3.6.1 Determination of Total Nitrogen	40
3.6.2 Determination of Total Organic Carbon	41
3.6.3 Determination of Soil pH	42
3.6.4 Determination of Exchangeable Bases - $K^+$ , $Ca^+$ and $Mg^{2+}$	43
3.6.5 Determination of Cation Exchange Capacity (CEC)	45
3.6.6 Digestion Method for Soil and Plant Tissue	46

## ABSTRACT

Peat is considered as a problem soil in tropical countries due to the very acidic nature, low bulk density, low bearing capacity, high loss of ignition and poor structure. Comprehensive and sustainable peat management could increase productivity and economic return. Over the past 2-4 years, recent achievements by site-specific management approach significantly foster, spur and sustain price of commodity crops in global market. As a matter of fact, modern technology and good agronomic practices if worked in parallel, can benefit the agriculture industry. In line with current demand for food and environmental constraints, this is the right time to treat crops with precise nutrients and specific treatments. In this study, approximately 310 soil samples were taken at the depth of 0-15 cm and 153 plant tissues were collected from the oil palm trees. A geostatistical sampling was conducted along the palms rows (within and in between the palm nucleus). Based on the data analysis, it showed that the coefficient of variations (CV's) for certain parameters indicated an extreme variability within the field i.e. exchangeable potassium, exchangeable magnesium and exchangeable calcium compared to other parameters. Positive correlation coefficients were obtained from the analysis particularly in total nitrogen with organic carbon content, phosphorus with exchangeable potassium, soil pH with exchangeable potassium, soil pH with exchangeable magnesium, soil pH with exchangeable calcium, exchangeable potassium with exchangeable magnesium, exchangeable potassium with exchangeable calcium and exchangeable magnesium with exchangeable calcium. Obviously, the spatial variability for each parameter under study was classified according to the nutrient level in soils and plant tissues. In addition, the best fit model was developed to predict the spatial variability of data. It is understood that, a high variability would result in a considerable amount of nutrients required for oil palm growth whereas low variability would results in lesser amount of nutrient available for the palms. In order to get a precise estimation on field management zone, the spatial maps were digitized from raster to vector image. At the end of the study, this intelligent system (GPS, GIS and Geostatistical) would help modern planters and oil palm growers to apply the input at right amount, time, place and way in the field. Hence, it could help to prevent input wastage particularly fertilizers and minimize the environmental risk.

# CHAPTER 1

## INTRODUCTION

### 1.1. An Overview

As we move to the new millennium, there are many things people have to learn about new technology. Obviously, humans have to enhance their knowledge in science and information technology. The manipulation of technology helps people to solve critical problems and maximizing productivity. Scientists and researchers believe that technology is like a wizard, which can improve the quality of human life and bring forward new ideas. Over the past century, great civilizations like Egypt, Mesopotamia, Minoans, Babylon, Aztec, Ganges, Ming Dynasty etc were well populated and flourished on fertile soils, which gradually helped these civilizations rise to greater heights. Historically, assimilation between east and west civilizations brought new ideas, wealth, new technology and approaches especially in agricultural practices. In 18th century, the industrial revolution had brought forward new ideas and innovations to the farmers and benefited the local industries. As a result, more attentions were given in soil and plant relationship study.

As we know, Malaysia is a top producer of palm oil and has had most advanced technologies and prestigious human resources in oil palm industry. Further more, our agricultural industry has moved towards agro-technology system. The global trends of supply and demand for palm oil, soybean oil, rapeseed oil, sunflower oil, other oils and fats show a potential growth. In the Asian regions, every year the demand for foods i.e products of palm oil has shown a positive incremental figure towards the growth of human population. Thus limited land resources have resulted some in agricultural activities to be extended into marginal areas like peat land. At present, several private sectors in Malaysia have invested heavily on agricultural projects involving peat land.