

**SOIL ORGANIC CARBON MAPPING USING REMOTE SENSING
TECHNIQUE AND MULTIVARIATE REGRESSION MODEL**

MUHAMMAD RADHI BIN ABDUL RAHMAN
2014192543



**Thesis submitted to the Universiti Teknologi MARA Malaysia
in partial fulfillment of award of the degree of
Bachelor of Surveying Science and Geomatics (Honours)**


JULY 2018

AUTHOR'S DECLARATION

I declare that the work in this thesis/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

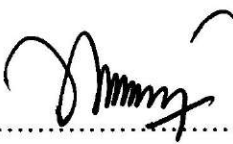
I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student : Muhammad Radhi bin Abdul Rahman
Student I.D. No. : 2014192543
Programme : Bachelor of Surveying Science and Geomatics (Hons)
Faculty : Faculty of Architecture , Planning and Surveying
Thesis : Soil Organic Carbon Mapping Using Remote Sensing
Technique and Multivariate Regression Model

Signature of Student : 
Date : July 2018

Approved by:

Name of Supervisor : Madam Siti Aminah binti Anshah

Signature and Date :  12/7/2018

ABSTRACT

Organic were the terms use to represent the materials that combined with or derived from living organisms. The quantity of organic matter in soil is frequently used as an indicator of the possible sustainability in a soil system. Soil organic matter was significant part in nutrient cycle and fixing soil structure. Organic carbon in soil was important to build up good health in soil environment and vital in supplying the needs of the ecosystem. This project aims to identify the Soil Organic Carbon distribution based on multivariate regression model. This project was used satellite imagery, SPOT 5 to estimate SOC distribution using remote sensing technique and soil sampling in the Ladang Harumanis, UiTM Arau, Perlis. There were nine soil samplings were picked randomly collected using a handheld Global Positioning System (GPS) unit to location the position of the sampling points. The satellite data derived spectral indices, NDVI and BSI were used to assess spatial distribution of SOC in the study area by testing in the multivariate regression model. The result of regression analysis between the observed and predicted SOC using $R^2 = 0.10$ value was showed only 10% accurate because of the lack of number of soil samples and same land use type which no really soil variations that reflected this result. This information of this study can gave advanced understanding by using the remote sensing approach which had many advantages regarding conventional approach before would be important technique thus increase the effectivity of the soil management method.

TABLE OF CONTENT

	Page
CONFIRMATION BY PANEL OF EXAMINERS	i
AUTHOR'S DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENT	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF SYMBOLS	x
LIST OF ABBREVIATIONS	xi
CHAPTER ONE INTRODUCTION	1
1.1 RESEARCH BACKGROUND	1
1.2 MOTIVATION	2
1.3 PROBLEM STATEMENT	2
1.4 AIM	3
1.5 OBJECTIVES	3
1.6 SIGNIFICANCE OF STUDY	3
CHAPTER TWO LITERATURE REVIEW	4
2.1 INTRODUCTION	4
2.2 SOIL ORGANIC CARBON (SOC)	4
2.3 BARE SOIL INDEX (BSI)	9
2.4 NORMALIZED DIFFERENCE VEGETATION INDEX (NDVI)	10
2.5 REMOTE SENSING TECHNIQUE IN SOIL MAPPING	12
2.6 SATELLITE IMAGERY	13
2.6.1 SPOT 5	14
2.7 STATISTICAL ANALYSIS	15
2.7.1 Regression Analysis	16
2.7.2 Correlation Analysis	17

2.8	SOFTWARE	17
2.8.1	ERDAS Imagine 2014	18
2.8.2	ArcGIS 10.4	18
2.8.3	Microsoft Excel 2016	18
2.9	SUMMARY	19
 CHAPTER THREE RESEARCH METHODOLOGY		20
3.1	INTRODUCTION	20
3.2	METHODOLOGY	20
3.2.1	Satellite Data	22
3.2.2	Ground Observation	23
3.3	STUDY AREA	24
3.4	IMAGE PROCESSING	25
3.4.1	Pansharpening	25
3.4.2	Subset	26
3.4.3	Image enhancement	26
3.4.4	Vegetation Index Process	26
3.4.5	Bare Soil Index Process	26
3.4.6	Exported to ArcGIS	27
3.5	DATA ANALYSIS	27
 CHAPTER FOUR RESULTS AND ANALYSIS		28
4.1	INTRODUCTION	28
4.2	DESCRIPTIVE STATISTICS OF THE SOC, NDVI AND BSI	28
4.3	NORMALIZED DIFFERENCE VEGETATION INDEX MAP YEAR 2014	31
4.4	BARE SOIL INDEX MAP YEAR 2014	32
4.5	DIGITAL SOIL ORGANIC CARBON MAP YEAR 2014	33
4.6	RELATION NDVI AND SOC	34
4.7	RELATION BSI AND SOC	35
4.8	PREDICTION OF SOC	36
4.9	VALIDATION OF MODEL	37