

## CONTENTS

	<b>Page</b>
<b>ACKNOWLEDGEMENTS</b>	<b>iii</b>
<b>ABSTRACT (ENGLISH)</b>	<b>iv</b>
<b>ABSTRACT (THAI)</b>	<b>v</b>
<b>LIST OF TABLES</b>	<b>x</b>
<b>LIST OF FIGURES</b>	<b>xii</b>
<b>CHAPTER I INTRODUCTION</b>	<b>1</b>
1.1 Background Justification	1
1.2 Objectives	2
1.3 Scope of study	2
1.4 Conceptual framework	5
1.5 Expected Outcomes	5
<b>CHAPTER II LITERATURE REVIEWS</b>	<b>6</b>
2.1 Classifying sugarcane cultivation area using Remote Sensing	6
2.2 Classification sugarcane cultivation area using Normalized Difference Vegetation Index, Bare soil Index and Water Index	9
2.3 Classification cultivation sugarcane area by spectral reflectance analysis	11
2.4 LANDSAT 5	12
2.5 Global Positioning System: GPS	14
2.6 Field Spectroradiometer	15
2.7 Geographic Information System	16
2.8 Energy Plants	18
2.9 Study Area	28

## **CONTENTS (cont.)**

	<b>Page</b>
<b>CHAPTER III METHODOLOGY</b>	<b>32</b>
3.1 Materials and data	32
3.2 Research methodology	33
3.3 Step of study	36
3.3.1 Classification of sugarcane cultivation areas in Kanchanaburi Province using the spectral reflectance	36
3.3.2 Classification of sugarcane cultivation areas in Kanchanaburi Province using the satellite imagery	38
3.3.3 Evaluation of potential suitability area and land misutilization for sugarcane cultivation at Kanchanaburi Province	43
3.3.4 Evaluation on suitability of sugarcane cultivation at Kanchanaburi Province in term of food and energy	48
<b>CHAPTER IV RESULTS</b>	<b>50</b>
4.1 Classification of sugarcane cultivation areas in Kanchanaburi Province using Spectral Reflectance from field data	50
4.2 Classification of sugarcane cultivation areas in Kanchanaburi Province using satellite imageries	53
4.2.1 Classification of sugarcane cultivation areas in Kanchanaburi Province using Hybrid Interpretation	53
4.2.2 Classification of sugarcane cultivation areas in Kanchanaburi Province using spectral reflectance from satellite imagery	55

## **CONTENTS (cont.)**

	<b>Page</b>
4.2.3 Classification of sugarcane cultivation areas using several indices.	58
4.3 Assessment of potential suitability of sugarcane cultivation areas and land misutilization in Kanchanaburi Province	63
4.3.1 Identification of suitable sugarcane cultivation areas using Potential Surface Analysis (PSA)	63
4.3.2 Comparison of suitable sugarcane cultivation areas based on spatial potential	65
4.4 Evaluation of suitability of sugarcane cultivation in Kanchanaburi Province in terms of food and energy	66
4.4.1 Analysis of sugarcane productivity in term of food	66
4.4.2 Analysis of sugarcane productivity in term of energy	66
4.4.3 Comparison of sugar consumption in Kanchanaburi Province	67
4.4.4 Comparison of sugarcane productivity in sugarcane cultivation areas based on the spatial potential	67
<b>CHAPTER V CONCLUSIONS AND RECOMMENDATIONS</b>	<b>69</b>
5.1 Conclusion	69
5.2 Recommendation	70
<b>REFERENCES</b>	<b>72</b>
<b>APPENDICES</b>	<b>76</b>
<b>BIOGRAPHY</b>	<b>91</b>

## LIST OF TABLES

Table	Page
2.1 Particular characteristics in each Band of LANDSAT	13
2.2 Export quantities and value	19
2.3 Overseas Ethanol production with other plants	20
2.4 Thailand's sugarcane and sugar production	25
2.5 Quantity of sugar in Thailand	26
2.6 Comparison of ethanol quantity produced from various crops	27
2.7 Economically important plants of Kanchanaburi	31
2.8 Forecast report of sugarcane plantation areas and sugarcane production on 2010/2011 in the central region	31
3.1 Dataset for this study	33
3.2 Forecast report of sugarcane plantation areas and sugarcane production on 2010/2011 in the central region	36
3.3 TM Post-Calibration Dynamic Ranges for U.S. Processed Data ( $Mw \cdot cm^{-2} \cdot ster^{-1} \cdot \mu m^{-1}$ )	41
3.4 Distance from Earth to Sun (Astronomical Unit)	42
3.5 TM Solar Exoatmospheric Spectral Irradiances $ESUN_{\lambda}$	42
3.6 Rating factor of each factor used to evaluate suitable cultivation areas for sugarcane	45
3.7 Weighting Factors use for study to evaluate suitable area for sugarcane cultivation in Kanchanaburi province	46
4.1 Spectral reflectance of sugarcane in each age	50
4.2 Accuracy assessment of error matrix	55
4.3 Correlation and linear regression in each band	57
4.4 Normalized Difference Vegetation Index (NDVI), Bare Soil Index (BI), Water Index (WI)	58
4.5 Index of sugarcane in each age	60

## LIST OF TABLES (cont.)

<b>Table</b>	<b>Page</b>
4.6 Comparison of using indices in the construction of models by using the simple regression analysis	60
4.7 Scatter plot of sugarcane in each age	61
4.8 Accuracy assessment of error matrix	63
4.9 Suitable sugarcane plantation areas in Kanchanaburi Province as calculated by Potential Surface Analysis	64
4.10 Land misutilization in areas suitable for sugarcane plantation in Kanchanaburi province	66
4.11 Production from sugarcane plantation areas by using Potential Surface Analysis	68

## LIST OF FIGURES

Figure	Page
1.1 Kanchanaburi province	3
1.2 Frameworks	5
2.1 Electromagnetic radiation Wave Length values	11
2.2 Reflection in each Wave Length between plants, water and soil	12
2.3 ADS Field Spectrometer	15
3.1 Flow Diagram of Classify suitability sugarcane cultivation area using Geo-Informatics in Kanchanaburi Province	35
3.2 Processing of raw spectral data	37
4.1 Min and max spectral reflectance based on ages of sugarcane	51
4.2 Spectral reflectance of sugarcane in visible band	52
4.3 Spectral reflectance of sugarcane in near infrared band	52
4.4 Spectral reflectance of sugarcane in red band.	53
4.5 Sugarcane cultivation area in Kanchanaburi province based on Hybrid Interpretation.	54
4.6 Spectral reflectance of sugarcane in Kanchanaburi Province based on satellite imagery	56
4.7 The Normalized Difference Vegetation Index, Bare Soil Index and Water Index.	59
4.8 Sugarcane area using model of index	62
4.9 Suitable sugarcane cultivation areas in Kanchanaburi province by Potential Surface Analysis	65