

CONTENTS

	PAGE
CONTENTS	i
LIST OF TABLES	iv
LIST OF FIGURES	v
LIST OF APPENDICES	vi
DECLARATION	vii
ACKNOWLEDGEMENT	viii
ABSTRACT	ix
1. INTRODUCTION	01
2. REVIEW OF LITERATURE	07
2.1 Salinity and Salt-affected Soils.	07
2.2 Governing Factors on Saline Soil Formations	09
2.3 Electrical Conductivity (EC) as a Measure of Soil Salinity	12
2.4 Types of Saline Soil and Their Characteristics	14
2.5 The Grouping of Salt-affected Soils	16
2.6 Extent of Salt-affected Lands of the World	17
2.7 Salt-affected Lands in Sri Lanka	19
2.8 Soil Salinity and Plant Growth	21
2.9 Salt Tolerant Crops	23
2.10 Reclamation and Management of Saline Soils	25

2.10.1 Salt leaching	25
2.10.2 Drainage	27
2.11 Utilization of Salt-affected Lands	29
2.12 Use of GIS and Remote Sensing for Saline Soil Identification and Mapping	29
2.12.1 Use of GIS for soil salinity mapping	29
2.12.2 Point interpolation methods	30
2.12.3 Use of Remote Sensing for salinity mapping	32
2.12.3.1 Thematic image classifications	34
2.12.3.2 Vegetation Index for salinity mapping	36
2.12.3.3 Saline indicators for mapping of salinity	37
3. MATERIALS AND METHODS	39
3.1 General Description of Hambantota District	39
3.2 Study Area	42
3.3 Data Collection and Analysis	43
3.3.1 Soil sampling and analytical procedure	43
3.3.2 Land cover points with GPS	44
3.3.3 Topographic and digital maps	45
3.3.4 Contour map creation	45
3.3.5 EC variation in D.S. Divisions	45
3.3.6 Salinity maps (generation)	45
3.3.7 Analysis of the satellite data	46
3.3.7.1 Saline indicators	47
3.3.7.2 Application of vegetation indicators	47
3.3.7.3 Image classification	48

4.	RESULTS AND DISCUSSION	49
	4.1 Data Analysis and Locational Maps	49
	4.2 Correlation Analysis	50
	4.3 EC Variation in D.S. Divisions	50
	4.4 Salinity Maps	52
	4.5 Elevation Data Analysis	58
	4.6 Application of Remote Sensing Indicators for Identification of Salinity	59
	4.6.1 Salinity indices	59
	4.6.2 Vegetation index	61
	4.6.3 Identification of saline soils in Hambantota district using Supervised Classification	62
5.	CONCLUSION	66
	APPENDICES	67
	BIBLIOGRAPHY	73

LIST OF TABLES

Table 2.1	Salinity in Saturated Soil Extract Based on Scale of Electrical Conductivity	14
Table 2.2	Classification of salt-affected soils.	14
Table 2.3	Estimate of salt-affected soils in the world (area in 1000 ha)	18
Table 2.4	Distribution of main groups of salt-affected soils.	20
Table 2.5	Salinity tolerance of crops	22
Table 2.6	Soil salinity classes and crop growth	23
Table 4.1	Summary of pH and EC values	49
Table 4.2	pH and EC correlation	50
Table 4.3	Salinity classes and labels	53
Table 4.4	Salinity distribution	57
Table 4.5	Extent of <i>Acacia leucophloea</i>	63
Table 4.6	Extent of <i>Acacia leucophloea</i> in saline and none saline areas.	64

LIST OF FIGURES

Figure 2.1	Saline soil formation	12
Figure 2.2	Global distributions of salt-affected soils	18
Figure 2.3	A schematic relationship between the depth of groundwater and relative evaporation rate from soil surface.....	28
Figure 3.1	Annual average rainfall map of Sri Lanka	40
Figure 3.2	Mean annual temperature map of Sri Lanka.....	41
Figure 3.3	Study area of Hambantta District of Sri Lanka.....	42
Figure 3.4	Distribution of the sample points over the study area.....	43
Figure 3.5	Landsat image of the study area.....	46
Figure 4.1	Variation of pH and EC in each D.S. Division	51
Figure 4.2	Salinity map of 0-10cm soil depth.....	54
Figure 4.3	Salinity map of 10-20cm soil depth	54
Figure 4.4	Salinity map of 20-30cm soil depth.....	55
Figure 4.5	Salinity map of 30-40cm soil depth.....	55
Figure 4.6	Salinity map of 40-50cm soil depth.....	56
Figure 4.7	Average salinity map for 0 – 50 cm depth.....	57
Figure 4.8	Contour map with D.S.D. boundaries and main streams.....	58
Figure 4.9	Salinity Index map of the study area.....	59
Figure 4.10	Normalized Difference Salinity Index map of the study area.....	60
Figure 4.11	Normalized Differential Vegetation Index map of the study area.....	62
Figure 4.12	Classified image of Hambantota area	63
Figure 4.13	Acacia distribution map	63
Figure 4.14	Overlay of saline areas with the acacia distribution map	64

LIST OF APPENDICES

Appendix A	Locational data.....	67
Appendix B	pH and EC values of each location.....	70