

CONTENTS

	PAGE
ABSTRACT	I-II
ACKNOWLEDGEMENT	III
ABBREVIATIONS	IV-V
LIST OF CONTENTS	VI-X
LIST OF TABLES	XI
LIST OF FIGURES	XII
LIST OF APPENDIX TABLES	XII-XIV
DECLARATION	XV
SUPERVISOR'S CERTIFICATE	XVI
DEDICATION	XVII
CHAPTER 1	1-3
1.1 Introduction	1
1.2 Justification	2-3
1.3 Objectives of the research	3
CHAPTER 2 – LITERATURE REVIEW	4-32
2.1 Livestock management systems	4-5
2.1.1 Different livestock production systems	5-6
2.1.2 Role of livestock in farming systems	7
2.2. Soil characteristics of tropical farming environment	7-11
2.2.1. Animal manure and soil fertility	11-12
2.2.2 Grazing and the edaphic environment	12-17

2.2.3 Over grazing effect on rangeland soil properties	17
2.2.4 Impact of cattle and forage management on soil surface properties	17-18
2.3. Crop residues and nutrient cycling	18-20
2.4 Optimizing climate-soil-pasture-cattle interactions	21
2.5 Livestock rearing under coconut	21-23
2.5.1 Environmental factors in the pasture-cattle-coconut system	23-24
2.5.2 Disadvantages of livestock rearing under coconut	24-25
2.5.3 Economics of cattle under coconut	25
2.5.3.1 Coconut, cattle and small farm operations	26-27
2.5.4 Identified problems in the pasture-cattle- coconut system	27
2.5.5 Suitable pasture species	28-29
2.5.6 Understory weed management in coconut lands	29
2.5.6.1 Major weeds in mature plantations	29-31
2.5.6.2 Weed management in mature plantations	31
2.5.6.3 Grazing as a weed management method	32
2.6 Lessons from other integrated systems	32
 CHAPTER 3 – Materials and Methods	 33-44
3.1 Location and climatic conditions	33
3.1.1 Coconut-pasture-cattle system	33-34
3.1.2 Medium scale crop livestock integrated farm	34
3.1.3 Smallholder crop livestock integrated farm	34-35
3.1.4 Ungrazed coconut plantation	35
3.2 Experimental procedure of the survey	36

3.2.1 Collection of soil samples	36
3.2.2 Determination of soil physical properties	37
3.2.2.1 Determination of Bulk density	37
3.2.2.2 Determination of True density/ Specific gravity of soil	37-38
3.2.2.3 Determination of the Porosity	38
3.2.2.4 Determination of soil pH	38
3.2.2.5 Determination of Moisture Content	38-39
3.2.3 Determination of the Plant species Composition	39
3.3 Experimental procedure of the Designed Experiment	40
3.3.1 Experimental site	40
3.3.2 Experimental Design	40
3.3.3. Treatments	40
3.3.4 Methodology of the Research	41
3.3.4.1 Dry Weight Rank Method (DWRM)	41-42
3.3.4.1.1 Testing the adaptability of DWRM to tropical pastures	42
3.3.4.1.2 Determination of the plant species Composition by DWRM	42
3.3.4.2 Estimation of the Herbage Quality	43
3.3.4.2.1 Estimation of the Herbage Dry Matter Yield (DMY)- Qualitative	43
3.3.4.2.2 Dry matter content – Quantitative	43
3.3.4.2.3 Total ash content	43
3.3.4.2.4 Organic matter content	43
3.3.4.2.5 Crude protein content	44
3.3.4.3 Determination of the selected Soil Physical Properties	44

3.3.4.4 Statistical Analysis	44
3.3.4.4.1 Analysis of the Data of the Preliminary Survey	44
3.3.4.4.2 Analysis of the Data of the Designed Experiment	44
 CHAPTER 4 – RESULTS AND FINDINGS	 45-66
4.1 Preliminary Survey	45
4.1.1 General Features of the Farms	45
4.1.1.1 Coconut-pasture-cattle system	45
4.1.1.2 Medium scale crop-livestock integrated farm (Dissagawila)	46-48
4.1.1.3 Smallholder integrated farm	48
4.1.1.4 Ungrazed coconut plantation	49
4.1.2 Effect of integration on soil physical properties	49-51
4.1.3 Effect of crop-livestock integration on Plant species Composition	52
4.1.3.1 Effect of different experimental treatments with and without integration in a coconut plantation	52-53
4.1.4 Plant species composition and uses of plants	54
4.1.4.1 Medium scale integrated farm	54
4.1.4.2 Small scale integrated farm	55-56
4.2 Designed Experiment	57
4.2.1 Comparison of HS method and DWRM	57-58
4.2.2 Effect of different experimental treatments; with and without integration on the natural herbage	59
4.2.2.1 Plant species composition	59-60
4.2.2.2 Comparison of the botanical composition before and during the experiment	61
4.2.2.3 Dry Matter Yield	62-63

4.2.2.4. Organic Matter Yield	63-64
4.2.2.5. Correlation between Dry Matter Yield and Organic Matter Content (%)	64
4.2.2.6 Crude Protein Contents of herbage before and after grazing	65
4.2.3 Effect of different experimental treatments on soil physical properties	66
CHAPTER 5 – DISCUSSION	67-70
CONCLUSION	71
REFERENCES	72-80
APPENDIX	81-117

LIST OF TABLES

	PAGE
2.1 Relative resource availability in ruminant production systems of developing countries	6
2.2 Chemical analysis of soil under mature coconuts	16
4.1 Botanical composition of coconut-pasture-cattle system (with integration > 20 years)	52
4.2 Botanical composition of ungrazed coconut land (without integration)	53-54
4.3 Existing plant species and their uses of the medium scale integrated farm	54-55
4.4 Existing plant species and their uses of the small scale farm	55-56
4.5 Comparison of dry weight rank method (DWRM) with hand separation (HS) method	58
4.6 Plant species present at any time with different experimental treatments grazed, ungrazed and potentially ungrazed	59-60
4.7 Dry matter yields with different experimental treatments during February-July	62
4.8 Organic matter content of the natural herbage with different experimental treatments during February to July	63
4.9 Effect of different experimental treatments grazed vs. ungrazed / dry vs. wet on soil physical properties	66

LIST OF FIGURES

	PAGE
2.1 Inputs and outputs in a livestock production system within a whole-farm context	4
2.2 Simplified nutrient cycle for pasture ecosystems	15
2.3 Internal nitrogen cycle of crop/livestock farming systems	20
4.1 Nutrient recycling system of the medium scale integrated farming system	48
4.2 Effect of integration on soil pH in different farming systems	49
4.3 Effect of integration on Bulk density and True density of the soil under different farming systems	50
4.4 Effect of integration on moisture(%) and the porosity of the soil under different farming systems	51
4.5 Correlation between DWRM and HS method	57
4.6. Grasses, Legumes and other plant species presented before and during the experiment	61
4.7 Correlation between Dry Matter Yield and Organic Matter Content	64
4.8 Cured Protein contents of the grazed and ungrazed herbage	65

APPENDIX

	PAGE
A-1. Coconut-pasture-cattle system soil data (grazed)	81-82
A-2. Ungrazed coconut land soil data	82-84
A-3. Medium scale integrated farm soil data	84-86
A-4. Small-scale integrated farm soil data	86-87
A-5. Plants presented data in coconut-pasture-cattle system (grazed)	88-89
A-6. Plants presented data in ungrazed coconut land site	89-92
A-7. Questionnaire used to gather information from medium scale and small scale integrated farms	93-95
A-8 Botanical composition of plant species under different experimental Treatments	96-97
A-9. Plant species present in both seasons (Grazed Treatment)	97
A-10. Plant Species present in both seasons (Ungrazed Treatment)	98
A-11 Plant Species present in both seasons (Potentially Ungrazed Treatment)	98
A-12 Botanical composition in the coconut plantation before grazing (By DWRM)	100-101
A-13 Botanical composition in the coconut plantation Sampling 1 (ungrazed treatment)	102-103
A-14 Botanical composition in the coconut plantation Sampling 1 (grazed Treatment)	103-104
A-15 Botanical composition in the coconut plantation Sampling 1 (potentially ungrazed treatment)	104-105
A-16 Botanical composition in the coconut plantation Sampling 2 (ungrazed Treatment)	106
A-17 Botanical composition in the coconut plantation Sampling 2 (grazed Treatment)	107
A-18 Botanical composition in the coconut plantation Sampling 2 (potentially ungrazed treatment)	108

A-19 Botanical composition in the coconut plantation -Sampling 3 (ungrazed treatment)	109
A-20 Botanical composition in the coconut plantation -Sampling 3 (grazed Treatment)	110
A-21 Botanical composition in the coconut plantation -Sampling 3 (potentially ungrazed treatment)	111
A-22 Botanical composition in the coconut plantation -Sampling 4 (ungrazed treatment)	112
A-23 Botanical composition in the coconut plantation -Sampling 4 (grazed treatment)	113
A-24 Botanical composition in the coconut plantation -Sampling 4 (potentially ungrazed treatment)	114
A-25 Botanical composition in the coconut plantation -Sampling 5 (ungrazed treatment)	115
A-26 Botanical composition in the coconut plantation -Sampling 5 (grazed treatment)	116
A-27 Botanical composition in the coconut plantation -Sampling 5 (potentially ungrazed treatment)	117
A-28 Identification of natural herbage under coconut	118