

TABLE OF CONTENTS

	Page
Acknowledgements	iii
Abstract (in English)	iv
Abstract (in Thai)	vi
Table of Contents	viii
List of Tables	x
List of Figures	xii
CHAPTER 1 Introduction and Literature Review	1
1.1 Dry Dipterocarp Forest	1
1.2 Research Works on Dry Dipterocarp Forest	1
1.3 Effects of fire on Dry Dipterocarp Forest	2
1.4 Forest Biomass and Carbon Accumulation	3
1.5 Soils in Dry Dipterocarp Forest	4
1.6 Research Objectives	6
CHAPTER 2 Plant Species Diversity in Fire and Non-fire Dry Dipterocarp Forests	7
2.1 Introduction	7
2.2 Study Site	8
2.3 Materials and Methods	8
2.3.1 Vegetation Sampling	8
2.3.2 Physical Data of Sampling Plots	9
2.3.3 Calculation for Ecological Parameters	10
2.4 Results	12
2.4.1 Overall Species Diversity and Forest Conditions	12
2.4.2 Effect of Fire on Plant Diversity in DDF	31
2.4.3 Growth and Size Class Distribution	56
2.4.4 Natural Regeneration in DDF with and without Fire	69
2.5 Discussion	73
CHAPTER 3 Carbon and Nutrient Allocation in Tree Biomass of Fire and Non-fire Dry Dipterocarp Forest	74
3.1 Introduction	74
3.2 Materials and Methods	75
3.2.1 Vegetation Sampling	75
3.2.2 Calculation of Plant Biomass and Nutrient Accumulation	75
3.3 Results	76
3.3.1 Tree Biomass in Fire and Non-fire DDF	76
3.3.2 Stored Carbon-Nutrients in Fire and Non-fire DDF	76
3.4 Discussion	120
CHAPTER 4 Soil Properties, Stored Carbon and Nutrients, Nutrient Recycling, and Seasonal Changes of Some Physical Environmental Factors in Fire and Non-fire DDF	121
4.1 Introduction	121

TABLE OF CONTENTS (CONTINUED)

	Page
4.2 Materials and Methods	122
4.2.1 Soil Sampling	122
4.2.2 Soil Analysis	122
4.2.3 Nutrient Accumulations in Soils	123
4.2.4 Seasonal Changes of Some Physical Environmental Factors	123
4.2.5 Dry Matter and Nutrients in Litterfall	123
4.3 Results	124
4.3.1 Soil Properties in Fire and Non-fire DDF	124
4.3.2 Soil Carbon and Nutrient Storages in Fire and Non-fire DDF	128
4.3.3 Seasonal Change of Soil Moisture Contents in DDF	158
4.3.4 Seasonal Change of Air Temperature in DDF	159
4.3.5 Dry Matter and Nutrients in Litterfall	160
4.4 Discussion	163
CHAPTER 5 Conclusions and Recommendations	165
References	168
Curriculum vitae	174

LIST OF TABLES

Table		Page
2-1	Species list and growth forms of tree species in overall DDF	14
2-2	Quantitative characteristics of tree species in fifteen temporary plots of dry dipterocarp forests	16
2-3	Tree densities in fifteen temporary plots in the dry dipterocarp forest	19
2-4	Stem basal areas of tree species in fifteen temporary plots in DDF	22
2-5	Relative dominance of tree species in fifteen temporary plots in DDF	25
2-6	Species diversity index (SWI) of tree species in the dry dipterocarp forest based on fifteen sampling plots	29
2-7	Forest condition indexes of fifteen temporary plots in DDF	31
2-8	Species list and growth forms of tree species in permanent plots of DDF with fire	32
2-9	Species list and growth forms of tree species in permanent plots of DDF without fire	33
2-10	Quantitative characteristics of tree species in two plots of DDF with fire	41
2-11	Quantitative characteristics of tree species in two plots of DDF without fire	44
2-12	Quantitative characteristics of tree species in DDF with fire	47
2-13	Quantitative characteristics of tree species in DDF without fire	48
2-14	Shannon-Wiener Index (SWI) of tree species in two plots of DDF with annual fire	49
2-15	Shannon-Wiener Index (SWI) of tree species in two plots of DDF without fire	52
2-16	Forest condition index (FCI) in DDF with and without fire	55
2-17	Number of tree individuals of tree species with different height classes in DDF with fire	57
2-18	Number of tree individuals of tree species with different stem-girth classes in DDF with fire	60
2-19	Number of tree individuals of tree species with different height classes in DDF without fire	63
2-20	Number of tree individuals of tree species with different stem-girth classes in DDF without fire	66
2-21	Total number of seedling and ground-covered species in DDF with and without fire	70
2-22	Overall data of plant communities in DDF with and without fire	72
3-1	Biomass of tree species in DDF with annual fire	78
3-2	Biomass of tree species in DDF without fire	81
3-3	Biomass carbon amounts of tree species in DDF with annual fire	84
3-4	Biomass nitrogen amounts of tree species in DDF with annual fire	87
3-5	Biomass phosphorus amounts of tree species in DDF with annual fire	90
3-6	Biomass potassium amounts of tree species in DDF with annual fire	93
3-7	Biomass calcium amounts of tree species in DDF with annual fire	96
3-8	Biomass magnesium amounts of tree species in DDF with annual fire	99

LIST OF TABLES (CONTINUED)

Table	Page	
3-9	Biomass carbon amounts of tree species in DDF without fire	102
3-10	Biomass nitrogen amounts of tree species in DDF without fire	105
3-11	Biomass phosphorus amounts of tree species in DDF without fire	108
3-12	Biomass potassium amounts of tree species in DDF without fire	111
3-13	Biomass calcium amounts of tree species in DDF without fire	114
3-14	Biomass magnesium amounts of tree species in DDF without fire	117
3-15	Summarized data of nutrient amounts stored in biomass of tree species in DDF with and without fire	120
4-1	Some physical properties of soil profiles under fire and non-fire DDF	127
4-2	Effects of fire on some soil physical properties under DDF	128
4-3	Some chemical properties in soil profiles under fire and non-fire DDF	134
4-4	Effects of fire on chemical properties in soil profiles under DDF	135
4-5	Extractable bases and acidity, CEC and BS in soil profiles under fire and non-fire DDF	138
4-6	Fertility assessment along soil profiles under fire and non-fire DDF	139
4-7	Soil carbon and nutrient storages in fire and non-fire DDF	143
4-8	Topography and development of soil profile under fire and non-fire DDF	145
4-9	Seasonal changes of soil moisture contents DDF with and without fire	158
4-10	Seasonal changes of air temperature in DDF with and without fire	159
4-11	Annual amounts of litterfall in DDF with and without fire	160
4-12	Variations of litterfall throughout a year in DDF with annual fire	161
4-13	Variations of litterfall throughout a year in DDF without fire	162
4-14	Nutrient amounts in above-ground litterfall in DDF with and without fire	163

LIST OF FIGURES

Figure	Page
2-1 The location of study area at Intakin Silvicultural Research Station, Chiang Mai	9
2-2 Over view of DDF at Intakin Silvicultural Research Station	13
2-3 Plant species richness in DDF with and without fire	35
2-4 Over view of plant community in DDF with annual fire	36
2-5 Over view of plant community in DDF without fire	36
2-6 Densities of tree species in DDF with and without fire	38
2-7 Relative dominance of tree species in DDF with and without fire	39
2-8 Important value indexes of plant in DDF with and without fire	40
2-9 Relation between stem dbh and tree height in DDF with and without fire	56
2-10 Stem size class distribution of tree species in DDF with and without fire	56
3-1 Biomass of tree species in DDF with and without fire	76
3-2 Biomass carbon stocks in DDF with and without fire	77
4-1 Variations of bulk density (left) and gravel amounts (right) in soil profiles under DDF	130
4-2 Distribution of soil particles along soil profiles under DDF	130
4-3 Changes of some chemical properties along soil profiles under fire and non-fire DDF	136
4-4 C/N ratios, cation exchange capacity and base saturation in soil profiles under fire and non-fire DDF	137
4-5 Changes in amounts of organic matter and nutrients in soil profiles under fire and non-fire DDF	144
4-6 Study site and soil profile of pedon 1 (DDF with fire: Plot 1)	154
4-7 Study site and soil profile of pedon 2 (DDF with fire: Plot 2)	155
4-8 Study site and soil profile of pedon 3 (DDF without fire: Plot 1)	156
4-9 Study site and soil profile of pedon 4 (DDF without fire: Plot 2)	157
4-10 Seasonal changes of soil moisture contents at 0-5 cm depth in DDF with and without fire	159
4-11 Air temperature DDF with and without fire	160