TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENT	iii
ACKNOWLEDGEMENT ABSTRACT	iv
THAI ABSTRACT	vi
TABLE OF CONTENTS	viii
LIST OF TABLES	xi
LIST OF FIGURES	xiv
LIST OF APPENDIX FIGURES	xvi
LIST OF APPENDIX TABLES	xvii
CHAPTER 1 INTRODUCTION	1
1.1 Background	1
1.2 Rationale	3
1.3 Literature Review	5 5
1.3.1 Risk and Uncertainty	5
1.3.2 Cropping Simulation Model	6
1.3.3 Stochastic Dominance Analysis	10
1.4 Objective of the Study	12
1.5 Scope of the Study	13
CHAPTER 2 RESEARCH METHODOLOGY	15
2.1 Framework of the Study	15
2.1.1 Crop Model	16
2.1.2 Concept of Stochastic Dominance Analysis	20
2.2 Data Collection	26
2.2.1 Primary data	26
2.2.2 Secondary data	27
2.3 Data Analysis	28
2.3.1 Descriptive Analysis	28
2.3.2 Quantitative Analysis	28
CHAPTER 3 BIOPHYSICAL CONDITIONS AND AGRICULTURE	
PRODUCTION OF THE STUDY AREAS	32
3.1 Physical Condition of Chiang Mai Province	32
3.1.1 Location and Topography	32
△ 3.1.2 Climate	34
3.1.3 Soil	37
3.1.4 Sources of Water Supply	39
3.2 Agriculture Production	42
3.2.1 Agriculture Production of Chiang Mai Province	42 44
3.2.2 Agriculture Production of San Sai District	44

	Page
CHAPTER 4 RICE PRODUCTION SYSTEM IN SAN SAI DISTRICT	45
4.1 Biophysical and Socio-economic Conditions of Rice Production	45
4.1.1 Rice Growing Area	45
4.1.2 Rice Farm Household	46
4.1.3 Farm Size	47
4.1.4 Cropping Pattern with Rice Base Cropping System	48
4.1.5 Rice Varieties	49
4.2 Rice Cultivation and Practices	50
4.2.1 Land Preparation	50
4.2.2 Planting	52
4.2.3 Fertilizer Applications	52
4.2.4 Weeding	53
4.2.5 Water Management	54
4.2.6 Pesticide Application	54
4.2.7 Harvesting	54
4.3 Rice Yield	56
4.4 Marketing of Rice	56
4.5 Cost and Margin of Rice Production	57
4.5.1 Cost of Inputs	57
4.5.2 Price of Rice	59
4.5.3 Margin Analysis	59
1.5.5 Ividigin'i Many sis	
CHAPTER 5 CROP SIMULATION	61
5.1 Input Data	61
5.1.1 Weather Condition	61
5.1.2 Genetic Coefficient	63
5.1.3 Soil Data	65
5.1.4 Farm Management	67
5.1.5 Prices of Output	69
5.1.6 Cost of Inputs	69
5.2 Simulated Yield	70
5.2.1 Rice Yield in Rainy Season	70
5.2.2 Rice Yield in Dry Season	73
5.3 Simulated Net Margin	74
5.3.1 Net Margin of Rice Production in Rainy Season	74
5.3.2 Net Margin of Rice Production in Dry Season	76
5.5.2 Net Warght of Mee I founction in Bry Souson	•
CHAPTER 6 RISK ANALYSIS	79
6.1 Stochastic Dominance Analysis of Yield	79
	91
6.2 Stochastic Dominance Analysis of Net Margin	97
6.3 Summary of the Findings and Discussion	71
CHAPTER 7 CONCLUSION AND RECOMMENDATION	101
	101
7.1 Conclusion 7.2 Recommendations	107
('

	1 agc
DEFEDENCES	109
REFERENCES APPENDIX A Input Data File Use in the Simulation	112
APPENDIX B Variables and Values descriptions of Input Data File	120
CUDICUI IIM VITAE	124



ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่ Copyright[©] by Chiang Mai University All rights reserved

LIST OF TABLES

Table		Page
1.1	Fertilizer management level of photo period-sensitive variety	
2.1	(KDML105, NSPT, RD6) and photo period-insensitive variety (SPT1)	13
3.1	General process diagram for IBSNAT / CERES Model The group of major sail true in Okione Major	20
3.2	The areas of major soil type in Chiang Mai province	38
3.3	The areas of major soil type in San Sai district	39
	The planted area of major crops in Chiang Mai province, crop year 2001/2002	42
4.1	Number and percentage of rice farm households in the study area classified by number of household member, San Sai district, Chiang	
	Mai province, 2001/2002	46
4.2	Number and percentage of rice farm households classified by number of full-time labor on farm, San Sai district, Chiang Mai province, 2001/2002	3080
4.3		46
4.5	Number and percentage of rice farm households classified by	
	membership of institutions, San Sai district, Chiang Mai province, 2001/02	
4.4		47
4.4	Number and percentage of rice farm household classified by farm	10
4.5	size, San Sai district, Chiang Mai province, 2001/02	48
4.5	Number and percentage of rice farm households classified by land	40
4.6	ownership, San Sai district, Chiang Mai province, 2001/2002	48
	Cropping pattern on rice base cropping system in San Sai district, crop year 2001/2002	49
4.7	Number and percentage of rice farm households classified by rice varieties that they grown in rainy season, San Sai district, Chiang Mai province, 2001/02	49
4.8	Number and percentage of farm households classified by rice that	"1 7
	they grown in dry season, San Sai district, Chiang Mai province,	
	2001/02	50
4.9	Dosage of seed used classified by rice variety (Kg./rai) of farmers in	50
	San Sai district, Chiang Mai province, 2001/02	51
4.10	Number and percentage of rice farm households classified by sources	- 51
	of seed for rice cultivation of farmers in San Sai district, chiang Mai	
	province, 2001/02	51
4.11	Number and percentage of farm household classified by types of	
	fertilizer used and rice variety, San Sai district, Chiang Mai province	
	2001/02	52
4.12	Dose of Chemical fertilizer application that farmers used classified by	34
	rice variety, San Sai district, Chiang Mai province, 2001/02	53
4.13	Number and percentage of farm households classified by methods of	23
	weeding and rice variety, San Sai district, Chiang Mai province,	
	2001/02	53

Table		Page
4.14	Number and percentage of farm households classified by pesticide application and rice variety, San Sai district, Chiang Mai province, 2001/02	
4.15	Number and percentage of farm households classified by methods of	54
4.16	harvesting, San Sai district, Chiang Mai province, 2001/02 Number and percentage of household classified by methods of threshing and rice variety, San Sai district, Chiang Mai province,	55
4.17	2001/02	55
	Mai province, 2001/02	56
4.18	Number and percentage of farm household classified by selling	
4.19	channels, San Sai district, Chiang Mai province, 2001,02 Cost of material inputs in rice production classified by items and rice	56
4.20	variety, San Sai district, Chiang Mai province, 2001/02 Labor utilization classified by rice production activities, San Sai	57
4.21	district, Chiang Mai province, 2001/02	58
4.21	Labor inputs classified by rice variety and sources of labor, San Sai district, Chiang Mai province, 2001/02	59
4.22	Average price of rice received by rice farmers classified by rice	
4.23	variety, San Sai district, Chiang Mai province, 2001/02 Summary of gross margin analysis classified by rice variety, San Sai	59
	district, Chiang Mai province, 2001/02	60
5.1 5.2	Genetic coefficient of rice varieties in the study	65
٧,٧	Data on soil characteristic of Hang Dong, San Sai and San Pa Thong soil series used in study	Y 66
5.3	Farm management strategies in the study	66 68
5.4	The average price of rice yield in year 1998-2002	69
5.5	Total cost in each farm management strategies, San Sai district,	
5.6	Chiang Mai province, 2001/02 Mean and standard deviation (S.D.) of simulated rice yield classified	70
	by farm management strategy and condition in rainy season, San Sai district, Chiang Mai province, 2001/02	71
5.7	Mean and standard deviation (S.D.) of simulated rice yield classified	?
	by biophysical conditions and rice farm management in dry season, San Sai district, Chiang Mai province, 2001/02	74
5.8	Mean and standard deviation (S.D.) of simulated net margin classified	
	by farm management strategy and condition in dry season, San Sai district, Chiang Mai province, 2001/02	versity .
5.9	Mean and standard deviation (S.D.) of simulated net margin classified	
	by farm management strategy and condition in dry season, San Sai district, Chiang Mai province, 2001/02	77
	The comparison of FMS2 and FMS8 by using the first degree of	77
	stochastic dominance analysis (FSD)	81

Table		Page
6.2	The comparison of FMS8 and FMS5 by using the second degree of stochastic dominance analysis	84
6.3	Performance in terms of yield of selected management options for San	
	Pa Thong Soil series in rainy season	87
6.4	The risk-efficient farm management strategies derived from stochastic dominance analysis for self-sufficiency farm classified by biophysical	99
6.5	The risk-efficient farm management strategies derived from stochastic dominance analysis for farm targeted at optimize income classified by	
	biophysical conditions	99



LIST OF FIGURES

Figure		Page
1.1 2.1	Yield of rice production of Chiang Mai province in year 1992-2001 The framework for the evaluation of proper farm management	1
	strategies	16
2.2	Schematic of the main component of DSSAT v3.5	18
2.3	The first degree of stochastic dominance analysis	24
2.4	The second degree of stochastic dominance analysis	26
2.5	The treatment of farm management for simulation in rice production	27
3.1	Map of Chiang Mai province	33
3.2	Distribution of monthly average temperature in Chiang Mai province	35
3.3	Distribution of monthly average rainfall in Chiang Mai province	35
3.4	Distribution of temperature by using 30 years (year 1972 – 2001) of	
	weather data in San Sai district, Chiang Mai province	36
3.5	Distribution of precipitation by using 30 years (year 1972 – 2001) of	
	weather data in San Sai district, Chiang Mai province	37
3.6	Irrigated area of large projects in Chiang Mai province	41
3.7	Rice planted area in Chiang Mai province	43
3.8	The planted area of different crops in San Sai district, crop year	
	2001/2002	44
4.1	Rice planted area in San Sai district, Chiang Mai province	45
5.1	Example weather data file of the study (file name = cmmj0101.wth)	62
6.1	The cumulative probability distribution of rice yield for different farm	
	management strategies at Hang Dong soil series in rainy season	80
6.2	The comparison of risk-efficient management strategies between	
	FMS2 and FMS8 of yield for Hang Dong soil series in rainy season	
	resulted from SSD analysis	82
6.3	Comparison of risk-efficient management strategies of yield for Hang	
	Dong soil series in rainy season resulted from SSD analysis	83
6.4	Comparison of risk-efficient management strategies of yield for San	
	Sai soil series in rainy season resulted from SSD analysis	85
6.5	Comparison of risk-efficient management strategies of yield for San	
	Pa Thong soil series in rainy season resulted from SSD analysis	86
6.6	Comparison of risk-efficient management strategies of yield for Hang	•
	Dong soil series in dry season resulted from SSD analysis	88
6.7	Cumulative probability of farm management strategies for San Sai	
	soil series in dry season	89
6.8	Comparison of risk-efficient management strategies of yield for San	W
	Pa Thong soil series in dry season resulted from SSD analysis	90
6.9	Comparison of risk-efficient management strategies of net margin for	
	Hang Dong soil series in rainy season resulted from SSD analysis	92

Figure		Page
6.10	Comparison of risk-efficient management strategies of net margin for	
	San Sai soil series in rainy season resulted from SSD analysis	93
6.11	Comparison of risk-efficient management strategies of net margin for	
	San Pa Thong soil series in rainy season resulted from SSD analysis	94
6.12	Comparison of risk-efficient management strategies of net margin for	
	Hang Dong soil series in dry season resulted from SSD analysis	95
6.13	The cumulative probability of farm management strategies for San Sai	
	soil series in dry season	96
6.14	Comparison of risk-efficient management strategies of net margin for	
	San Pa Thong soil series in dry season resulted from SSD analysis	97



LIST OF APPENDIX FIGURES

Figure		Page
1	The sample of Weather data file in the study	112
2	Genetic coefficients in the study in RICER980.CUL	113
3.1	Soil characteristic of Hang Dong soil series in the study (SOIL.SOL	
	file)	114
3.2	Soil characteristic of San Sai soil series in the study (SOIL.SOL file)	115
3.3	Soil characteristic of San Pa Thong soil series in the study (SOIL.SOL	
	file)	116
4.1	Format of input data file described different farm management	
	strategies used in the study (Part 1)	117
4.2	Format of input data file described different farm management	
	strategies used in the study (Part 2)	118
4.3	Format of input data file described different farm management	
	strategies used in the study (Part 3)	119

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่ Copyright[©] by Chiang Mai University All rights reserved

LIST OF APPENDIX TABLES

Table		Page
1	Variables and values descriptions of input data file	
2	(CMMJ0101.SNX) as shown in Appendix Figure 4.1	120
_	Variables and values descriptions of input data file (CMMJ0101.SNX) as shown in Appendix Figure 4.2	101
3.1	Variables and values descriptions of input data file	121
3.2	(CMMJ0101.SNX) as shown in Appendix Figure 4.3 (Part1) Variables and values descriptions of input data file	122
	(CMMJ0101.SNX) as shown in Appendix Figure 4.3 (Part2)	123
	Transfer in (runtz)	123

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่ Copyright[©] by Chiang Mai University All rights reserved