

TABLE OF CONTENTS

	Page
Acknowledgments	i
Abstract	ix
English	ix
Thai	xi
List of Tables	xvi
List of Figures	xx
Nomenclature	xxi
I. INTRODUCTION	1
1.1 Statement of Problem	1
1.2 Objectives	13
1.3 Review of Literature	14
1.3.1 The Tea Plant (<i>Camellia sinensis</i>)	14
1.3.2 The Forest-Tea as a Highland Agroforestry System	16
1.3.3 Economic History of <i>Miang</i>	17
1.4 Research Methodology	22
1.4.1 Data Collection	22
1.4.2 Data Analysis	26
1.4.3 A Brief Methodological Note	28
1.5 Village Profile of <i>Kui Tuai</i>	30
1.5.1 Physical Characteristics	30
1.5.1.1 Topography	30
1.5.1.2 Soil	35
1.5.1.3 Climate	35
1.5.1.3.1 Rainfall	35
1.5.1.3.2 Temperature	37
1.5.1.3.3 Relative Humidity	37
1.5.1.3.4 Wind Velocity	37
1.5.1.3.5 Evaporation	37

1.5.1.4	Vegetative Cover	37
1.5.2	Social-Demographic-Economic Profile	38
1.5.2.1	History	38
1.5.2.2	Population	40
1.5.2.3	Social Structure and Religion	40
1.5.2.4	Household Structure and Labor	42
1.5.2.5	Land Ownership and Tenure	44
1.5.2.6	Farming System	51
1.5.2.6.1	Cropping Pattern	51
1.5.2.6.2	Animal Raising	55
1.5.2.6.3	Collection of Forest and Non- forest Products	57
1.5.2.7	Income	57
1.5.2.8	Credit	59
1.5.2.9	Education	59
1.5.2.10	Public Health	60
1.5.2.11	Infrastructure	60
1.5.2.12	Market	61
1.5.2.13	Off-farm Employment	61
1.5.3	Ban Kui Tuai under the UN/Thai SMHDP and the USFPP	62
1.6	Organization of the Study	68
II.	ANALYSIS OF THE FOREST-TEA PRODUCTION SYSTEM	69
2.1	Miang Production as the Main Focus of the Forest-Tea Production System	69
2.2	The Major Actors in the Forest-Tea Production System	70
2.3	Description of <i>Miang</i> or Fermented Tea	76
2.4	Miang Production	77
2.4.1	Stages (In Sequence)	77
2.4.1.1	Firewood Gathering	79
2.4.1.2	Picking of Tea Leaves	79
2.4.1.3	Production of <i>Kam</i>	81
2.4.1.4	The Processing of <i>Miang</i>	87
2.4.1.5	Packing	88
2.4.1.6	Transporting	90
2.4.1.7	Marketing	90
2.4.2	Other Aspects of <i>Miang</i> Production	92

2.4.2.1	Cultivation	92
2.4.2.2	Consumption of Miang	92
2.5	Major Components and their Interrelationships	
	Existing in the Forest-Tea Production System	96
2.5.1	Income	96
2.5.2	Land Tenure and Labor	102
2.5.3	Role of Livestock in the Traditional Forest-Tea Agroforestry System	104
2.6	The Villagers' Tree Cutting Practice	107
2.6.1	Firewood Acquisition	107
2.6.1.1	Who Acquires the Firewood?	108
2.6.1.2	Sources of Firewood	109
2.6.1.3	Species of Trees Preferred	111
2.6.1.3	Time of Collecting Firewood	113
2.6.2	Firewood Usage	114
2.6.2.1	For Boiling Miang	114
2.6.2.2	For Cooking	115
2.6.2.3	Other Usages of Firewood	117
2.6.3	Decision-making in Collecting Firewood	119
2.6.4	Attitude of the Villagers Towards Tree Cutting	121
2.6.5	Roles of Current Development Projects in Ban Kui Tuai	123
2.7	The Role of Fast-Growing Species as Alternate Sources of Firewood	125
2.7.1	The Villagers' Perception Towards Fast-Growing Species	125
2.7.2	Introduction of <i>Eucalyptus</i> <i>camaldulensis</i> and <i>Melia azedarach</i> as Sources of Firewood in Ban Kui Tuai	125
2.7.2.1	Characteristics	127
2.7.2.1.1	<i>Eucalyptus</i> <i>camaldulensis</i>	127
2.7.2.1.2	<i>Melia azedarach</i>	127
2.7.2.2	<i>Eucalyptus camaldulensis</i> and <i>Melia azedarach</i> as	

Two of the Fast-Growing Species Promoted in the 6th National Economic & Social Development Plan (1986-1991)	128
2.8 Production Function Estimation of <i>Eucalyptus</i> <i>camaldulensis</i> and <i>Melia azedarach</i>	129
2.9 Estimation on the Supply of Firewood in Meeting its Future Demand in Ban Kui Tuai	135
2.9.1 Present and Future Demand of Firewood	135
2.9.2 Present and Future Supply of Firewood	137
2.9.3 Estimation on the Areas Needed for Planting <i>Eucalyptus camaldulensis</i> and <i>Melia azedarach</i>	137
III. CONCLUSION	162
IV. POLICY IMPLICATIONS AND FURTHER RESEARCH	165
References	168
Appendices	178
Curriculum Vitae	209

LIST OF TABLES

Table	Page
1. Population of Doi Sam Mun	6
2. Percentage of agricultural and other products sold and consumed by hilltribes, and seasonal labor required	8
3. Miang consumption by adults in Chiang Mai Province (sample survey 1970 - 1971)	9
4. Summarized climatic data of Tung Jaw Forest Watershed Development Unit as recorded during June 1980 to May 1983	36
5. Number of households migrating within each 10-year range and their reasons, 1950 - 1958	39
6. List of districts of Chiang Mai Province where migrants came from (descending order)	39
7. Population and size of households	41
8. Kui Tuai villages by sex and age, 1990	41
9. Projected population of the northern region of Thailand	43
10. A. Land tenure and ownership in Ban Kui Tuai	48
B. Summary of landholdings in Ban Kui Tuai	49
11. Means of acquiring land	50
12. Land-use in Ban Kui Tuai	52
13. Fruits and vegetables grown in the village	52
14. Animals raised in the village	56
15. List of non-animal forest products collected from the forests around Ban Kui Tuai	58
16. A. Distribution of resources of large tea farmers in Ban Kui Tuai	71
B. Distribution of resources of small tea	

	Page
farmers in Ban Kui Tuai	72
C. Distribution of resources of landless tea farmers in Ban Kui Tuai	73
D. Total number and percentage of resources in Ban Kui Tuai	74
17. Two types of miang preferred by the villagers	74
18. Summary on the distribution of amount of tea leaves harvested in Ban Kui Tuai	83
19. A. Distribution of amount of tea leaves harvested for large tea garden owners (1989)	85
B. Distribution of amount of tea leaves harvested from small tea garden owners and non-tea garden owners (1989)	85
C. Distribution of amount of tea leaves harvested from the landless who lease miang gardens (1989)	86
20. Market price, total volume and sales of miang for the last five years (1985 - 1989)	91
21. Results of the survey from all 99 villagers on the consumption of miang in Ban Kui Tuai	93
22. Survey results from 26 households on the present trend on the demand for miang	93
23. Survey results from 26 households on the supply of tea leaves	95
24. Survey results from 26 households on the prospect of miang market	95
25. A. Annual family income of large tea farmers from each resource in Ban Kui Tuai	97
B. Annual family income of small tea farmers from each resource in Ban Kui Tuai	97
C. Annual family income of landless tea farmers from each resource in Ban Kui Tuai	98

Table	Page
D. Summary of annual family income from each resource in Ban Kui Tuai	99
26. Livestock ownership	106
27. Tree species used for firewood and bamboo species used as raw materials	112
28. Number of trees cut, number of pieces and volume of firewood used per year for miang processing by 18 households	116
29. Amount of firewood used for cooking per year by 26 households	118
30. Villagers' awareness on the impacts of tree cutting	122
31. Response of the villagers on the idea of solving the problem of tree cutting	122
32. Villagers' attitude towards fast-growing species	126
33. Growth data of <i>Eucalyptus camaldulensis</i> Dehnh and <i>Melia azedarach</i> Linn.	130
34. Results of estimating the production models for <i>Eucalyptus</i> and <i>Melia</i> using ordinary least squares	131
35. Total volume of firewood used per household per year in Ban Kui Tuai (1989)	138
36. Yearly projection of firewood consumption in Ban Kui Tuai (1990-2049) using 2% growth rate	140
37. Five-year projection of land areas needed for planting (1990-2019) and cutting (1995-2024) <i>E. camldulensis</i> and <i>M. azedarach</i> in Ban Kui Tuai	145
38. Total accumulated planted land areas calculated from the five-year production period for planting (1990-2003) and cutting (1995-2008) <i>E. camaldulensis</i> and <i>M. azedarach</i> in Ban Kui Tuai	146
39. 15-year projection of planted areas needed for (1990-2032) and cutting (2005-2047) <i>E. camaldulensis</i> and <i>M. azedarach</i> in Ban Kui Tuai	147

40. Total accumulated land areas and number of trees calculated from the 5- and 15-year production period for planting and cutting of *E. camaldulensis* and *M. azedarach* in Ban Kui Tuai 149
41. Grand total accumulated land areas and number of trees calculated from the 5- and 15-year production period for planting and cutting of *E. camaldulensis* and *M. azedarach* in Ban Kui Tuai 152
42. Yearly projection of firewood consumption in Ban Kui Tuai (1990-2049) using 1.6% growth rate 142
43. Five-year projection of land areas needed for planting (1990-2019) and cutting (1995-2024) *E. camaldulensis* and *M. azedarach* in Ban Kui Tuai 154
44. Total accumulated planted land areas calculated from the five-year production period for planting (1990-2003) and cutting (1995-2008) *E. camaldulensis* and *M. azedarach* in Ban Kui Tuai 155
45. 15-year projection of planted areas needed for (1990-2032) and cutting (2005-2047) *E. camaldulensis* and *M. azedarach* in Ban Kui Tuai 156
46. Total accumulated land areas and number of trees calculated from the 5- and 15-year production period for planting and cutting of *E. camaldulensis* and *M. azedarach* in Ban Kui Tuai 158
47. Grand total accumulated land areas and number of trees calculated from the 5- and 15-year production period for planting and cutting of *E. camaldulensis* and *M. azedarach* in Ban Kui Tuai 160

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

Copyright© by Chiang Mai University

All rights reserved

LIST OF FIGURES

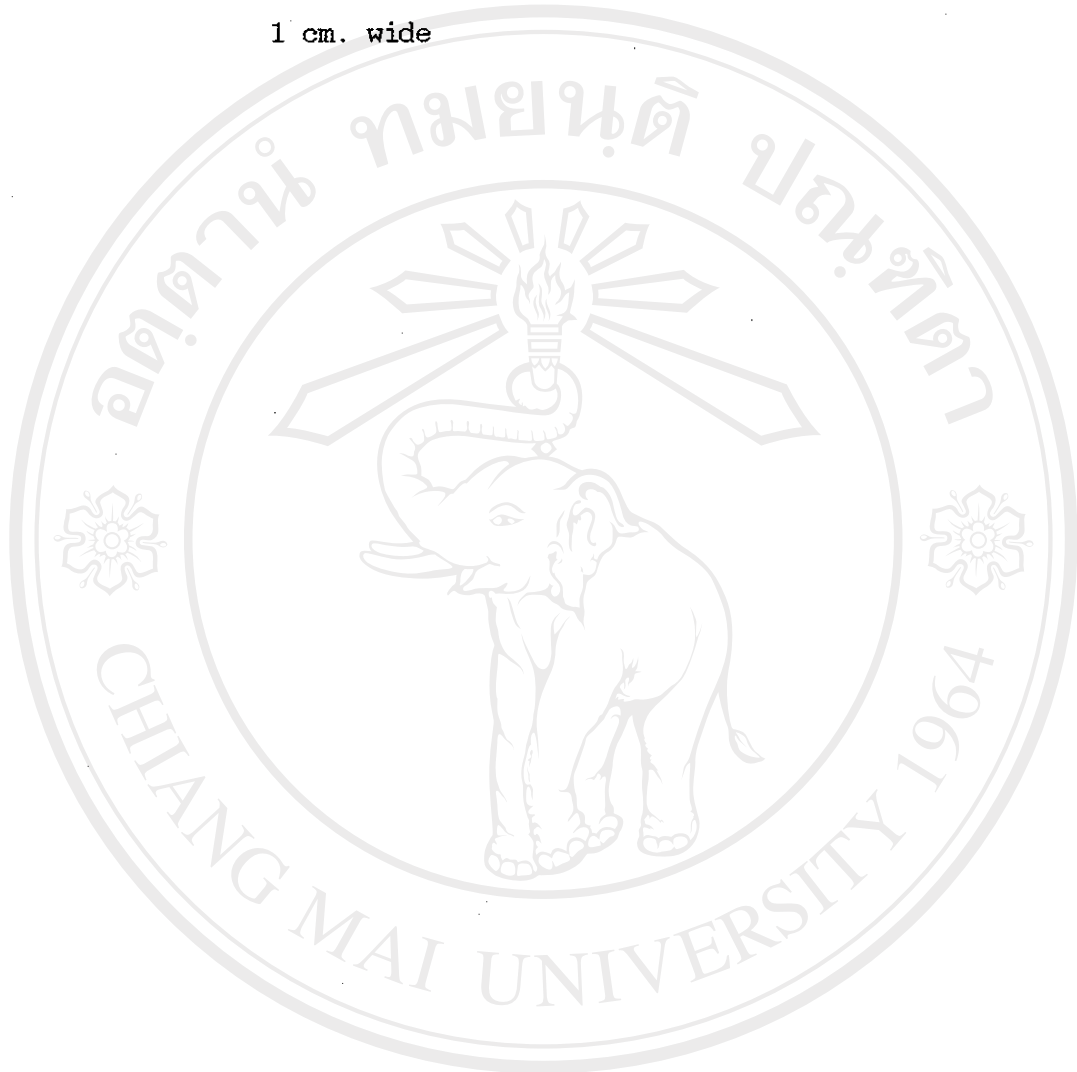
Figure	Page
1. Map showing main tea growing areas	2
2. Land forms, land-use systems, and vegetation in Northern Thailand	4
3. Village map of Kui Tuai	31
4. Road map from Chiang Mai to Ban Kui Tuai	32
5. Sketch map of Mae Loei Basin	33
6. Hierarchical setting of Ban Kui Tuai	34
7. Land-use map of Ban Kui Tuai	53
8. Highland cropping schedule of Ban Kui Tuai	54
9. Location and setting of UN-Thai SMHDP area	63
10. Map of project area - villages and roads	64
11. Map of project area - watershed classification boundaries and provincial boundary	65
12. Map of project area - unit boundaries and watershed development units	66
13. Seasonal activities of the forest-tea production system in Ban Kui Tuai	78
14. Average amount of tea leaves harvested per season	84
15. Percentage of annual family income in Ban Kui Tuai	100
16. Actual & predicted volumes of <i>Eucalyptus</i> <i>camaldulensis</i>	133
17. Actual & predicted volumes of <i>Melia azedarach</i>	134

Nomenclature

Some Thai Vocabulary

amphoe	=	district, second subdivision of Thailand
baht	=	Thai currency (\$1 = 24.48 Baht, as of 16 Aug. 90)
ban	=	village
changwat	=	province, first subdivision of Thailand
doi	=	mountain
gaeng	=	middle
hai	=	consists of a fine pit about 2 meters or more in length by a half a meter wide and deep.
huapi	=	beginning
kam	=	a small, fist-sized bundles of miang leaves
Khon muang	=	northern Thai people
laeo	=	a base of bamboo mesh
mai	=	end/last
mathayom	=	high school
miang	=	fermented tea
miang daeng	=	red fermented tea
miang kao	=	white fermented tea
prathom	=	elementary school
rai	=	unit of field measurement equivalent to 0.16 hectare
silo	=	four-wheel taxi
soi	=	near the end
suan miang	=	miang garden
Tambon	=	Subdistrict, third subdivision of Thailand

tang = a large bamboo basket used for keeping miang
tok = a small bundle of bamboo laths which is about
1 cm. wide



ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright© by Chiang Mai University
All rights reserved