

## TABLE OF CONTENTS

	<b>Page</b>
ACKNOWLEDGEMENTS	i
ABSTRACT	iii
THAI ABSTRACT	v
TABLE OF CONTENTS	vii
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF APPENDIX TABLES	xii
<b>CHAPTER 1 INTRODUCTION</b>	<b>1</b>
1.1 Statement of Problem	1
1.2 Rationale	2
1.3 Literature Review	3
1.4 Objectives	6
1.5 Usefulness of the Study	6
<b>CHAPTER 2 BACKGROUND OF NORTHERN REGION</b>	<b>7</b>
2.1 General Information and Characteristics of the Zones	7
2.1.1 General Information of Northern Region in Thailand	7
2.1.2 Characteristics of the Zones in Northern Region	10
2.2 Economic Structure and Composition of Agricultural Production	12
2.3 The Government Policy	15
2.4 Characteristics of Agricultural Resources	17
2.4.1 Land	17
2.4.2 Labor	17
2.4.3 Machinery	20
2.4.4 Infrastructure	20
2.5 Fertilizer Use and Technology Adoption	22

	<b>Page</b>
<b>CHAPTER 3 METHODOLOGY</b>	25
3.1 Conceptual Framework	25
3.1.1 Pattern of Production Growth	25
3.1.2 Technical Efficiency Relative to a Frontier Production Function	27
3.2 Empirical Framework	29
3.2.1 Effect of Input Growth, Technological and Efficiency Change	29
3.2.2 Specification of the Stochastic Frontier Production Function and Functional Forms	30
3.3 Scope and Data	34
<b>CHAPTER 4 ESTIMATION OF PRODUCTION FUNCTION</b>	37
4.1 Specification of Variables	37
4.2 Preliminary Consideration	38
4.2.1 The Empirical Model	38
4.2.2 Test for the Government's Role	39
4.3 Estimation Result	40
4.4 Production Elasticity for Different Factors	42
4.5 Production Efficiency	45
4.6 Statistical Characteristics and Limitations of the Study	48
<b>CHAPTER 5 IMPACTS OF INPUT USE, TECHNOLOGICAL AND EFFICIENCY CHANGE ON AGRICULTURAL PRODUCTION AND POLICY IMPLICATION</b>	50
5.1 Introduction	50
5.2 Detailed Results of the Analysis by Region and Zone	51
5.3 The Determinants of Zone Performance	55
5.3.1 The Effect of Total Input Growth	55
5.3.2 Total Productivity Growth	57
5.4 The Policy Implications	58
5.4.1 Increased Input Use	58
5.4.2 Technological Change	63
5.4.3 Efficiency Improvement	64
<b>CHAPTER 6 CONCLUSION</b>	65

	<b>Page</b>
REFERENCES	68
APPENDICES	72
A1. Test results for structural change (dummy variable) by OLS method	72
A2. Test results for structural change (dummy variable) by ML method	74
CURRICULUM VITAE	89

## LIST OF TABLES

		<b>Page</b>
Table 1.1	Per capita income by region at current price (baht), 1960 - 1979	2
Table 2.1	Regional economic structure, 1981 and 1991	13
Table 2.2	Gross agricultural products in 1981, 1991 (at 1988 prices)	14
Table 2.3	Agricultural production composition of northern region (%)	14
Table 2.4	Harvested area in northern region	18
Table 2.5	Agricultural labor in northern region	19
Table 2.6	Agricultural machinery in northern region, 1975 and 1991	20
Table 2.7	Accumulated irrigation area in northern region	22
Table 4.1	Estimates of production functions	41
Table 4.2	Production elasticity for different inputs, 1975 - 1991	43
Table 4.3	Production elasticity for inputs in Thailand agriculture (1950 - 76)	44
Table 4.4	Level and variability in technical efficiency of four zones, 1975 - 1991	46
Table 5.1	Accounting for growth of total agricultural production in terms of annual growth rate, 1975 - 1991	53
Table 5.2	Crop farm cash expense per farm in northern region, selected crop years	60
Table 5.3	Area and cost of large and medium scale irrigation projects in northern region of Thailand (at 1986 constant prices)	62

## LIST OF FIGURES

	<b>Page</b>
Figure 1.1 Comparison of per capita GRP in northern region with per capita GDP at national level, 1981 - 1991	2
Figure 2.1 Map showing northern Thailand	8
Figure 2.2 Rivers and tributaries in northern Thailand	9
Figure 2.3 Agroeconomic zones in northern region	11
Figure 2.4 Harvested Area in Northern Region	18
Figure 2.5 Agricultural labor in northern Thailand	19
Figure 2.6 Network of major roads in northern Thailand	21
Figure 3.1 Effects on production growth of input increase, technological change and efficiency improvement	30
Figure 4.1 Technical efficiency in northern Thailand, 1975 - 1991	47
Figure 5.1 Sources of total production growth (in terms of annual growth rate) in northern region of Thailand, 1975 - 1991	54

## LIST OF APPENDIX TABLES

	<b>Page</b>	
A—Table 1	Gross provincial products in agriculture at constant 1988 prices	75
A—Table 2	Agricultural Labor	76
A—Table 3	Harvested area of agricultural crops	77
A—Table 4	Planted area of rice	78
A—Table 5	Accumulated Irrigation area	79
A—Table 6	Agricultural tractors	80
A—Table 7	Output / labor ratio	81
A—Table 8	Output / harvested area ratio	82
A—Table 9	Harvested area / labor ratio	83
A—Table 10	Output / labor ratio, output / land ratio, and land / labor ratio by zone and plan period	84
A—Table 11	Output / tractor ratio	85
A—Table 12	Harvested area / tractor ratio	86
A—Table 13	Labor / tractor ratio	87
A—Table 14	Accumulated Irrigation area / Harvested area ratio	88