

PN-ABK-159

\*\*\*\*\*

NORTHEAST AGRI-BUSINESS  
HANDBOOK

A condensation and bibliography of data collected  
in connection with an economic survey by a team  
of American business executives under auspices  
of the Agri-business Council Inc of New York City,  
and supported by U S A.I D May-June 1968

Compiled By Hope Sullivan  
For  
Private Enterprise Division  
U S Operations Mission to Thailand  
(Contract No TH 1528/68)

\*\*\*\*\*

A

## TABLE OF CONTENTS

I	INTRODUCTION	1
II.	SUMMARY	12
III	PRESENT AND POTENTIAL SOURCES OF INCOME	16
	A General	16
	B Prime Potential Areas for Development	20
	C Crops	25
	D Agribusiness	51
	E Livestock	52
IV	MARKETING	58
V	RESOURCES	64
	A. Land and Soil	64
	B Electric Power	68
	C Transportation	75
	D Water - Irrigation	82
	E Manpower - Labor	107
VI	AGRICULTURAL INPUTS	114
	A. Fertilizers	114
	B. Seeds	120
	C Equipment	124
	D Credit	127
	E Extension and Educational Services	139
VII	GOVERNMENT PROMOTIONAL AGENCIES	145

CONVERSION TABLE

1 Square Kilometer-----	100 Hectares -----	247 1056 Acres
1 Hectare -----	2 471058 Acres -----	6 25 Rai
1 Acres -----	0 404685 Hectares -----	4840 Square Yards
1 Square Mile -----	640 Acres -----	258 99836 Hectares
1 Rai -----	1600 Square M -----	0 16 Hectares 0 39536928 Acres

## I INTRODUCTION

Northeast Thailand's stability is weakened by its relatively low productivity  
AID's goal is to increase the economic well - being of the Thai farmer  
All available information regarding the organizational, operational and  
capital structure of existing agribusiness, technical and commercial  
ventures in Northeast Thailand has been compiled in the following summary  
It covers all infrastructure components and agricultural input practices  
It attempts to cover the full range of governmental programs and activities  
and pertinent factors which are needed to stimulate potential private invest-  
ment in the NE

It covers the findings as well as information and reports made available  
to the Northeast Agribusiness Team which spent one month in Thailand  
to determine the feasibility of establishing a Farm Marketing Service  
Center in Northeast Thailand This team was composed of 14 representa-  
tives from 9 U.S business firms They spent four weeks in briefing and  
meetings given by personnel from the U.S. Embassy, USOM/Thailand,  
RTG Ministries and Agencies, private companies, and commercial banks  
They also made a one week inspection tour of the Northeast

This summary expands and supplements the findings of the Team by pre-  
senting a complete list of references on various topics related to the agri-  
business development of the Northeast

---

It was taken from all available sources within USOM, and further supported by RTG Ministry reports and reports by various persons affiliated with the RTG, USOM, and private companies in Thailand. Each section has a reference list where readers may find additional detailed information.

The basic information and reports used in compiling this summary are collected and filed in the Private Enterprise Division of USOM. A list follows.

Further information may be found at Applied Scientific Research Corporation, Advanced Research Projects Agency (ARPA), and the various departments under ARPA, RTG Ministries, US Trade Center, Technical Library USOM, and Agriculture and Private Enterprise Divisions of USOM. Personnel of FAO, ILO, Rockefeller Institute, Board of Investment are also available for consultation.

This summary does not attempt to form conclusions or to promote specific areas for agribusiness investment or development. The information presented does not necessarily reflect the views of USOM but is simply a condensation of data and material collected on the Northeast region of Thailand which may be pertinent to a potential investor.

LISTING OF  
INFORMATION AND REPORTS GIVEN TO  
NE AGRIBUSINESS TEAM

Livestock

- 1 Livestock Statistics from "Thailand Agricultural Statistics" published by first Asian International Trade Fair
- 2 Beef Cattle--Regulations Livestock in Thailand--Ministry of Agriculture
- 3 Poultry Production in Thailand--PE Division
4. Some Advantages of Improved Pastoral Farming to the Upland Areas of NE Thailand, and a Progress Report on Pasture Investigations at Khon Kaen University, March 1968

Crops

5. Comparative Values of Four Feed Stuffs T. D. N. Basis--Chart
- 6 The Existing Farm Economic Condition in Demonstration Area--1966
- 7 Time Series Record of Crop Trials on Experimental Farm--1965/1968  
Kalasin Thailand FAO--Chart
- 8 Preliminary Crop Cost and Return Studies for Crops at Pa Mong Study Area--Report and Study
- 9 Vegetable Production and Marketing in Changwad Nakorn Panom--Report
10. Legume Responses to Lime and Inoculum--Khon Kaen--Smith and Phoorat
- 11 Rice Exported from Thailand During the Month of January 1968--Chart
- 12 Produce Exported from Thailand During the Month of January 1968--Char
- 13 Yield Paddy in Various Experiments--1966-1967--Chart
14. Meeting Between Thai Jute Assoc. and Overseas Consumers on Quality of Thai Kenaf--Checchi
- 15 Comprehensive Kenaf Fiber Production and Industrialization Program
- 16 Kenaf--Estimated Production Costs Per Rai
- 17 Overall Development Plan for Thai Kenaf Industry--Checchi
- 18 Improved Kenaf Retting Facilities on Northeast Thailand--Checchi
- 19 Kilograms of Corn Required to Pay for 100 Kilograms of Fertilizer--  
Chart
- 20 Corn--Average Production Costs and Returns per rai
- 21 Conversion Tables--Prices of Corn
- 22 Marketing Program for Peanuts and Corn in the Amphur Farmer Group in Dan Sai--Changwad Loei--Checchi
- 23 Proposed Peanut Experimentation and Demonstration Program in Dan Sai--Changwad Loei--Checchi
- 24 Development of Peanut Growing and Processing in NE Thailand--Checchi
- 25 Notes on Grain Sorghum Production in Thailand--Checchi

- 26 Some Observations of 80 Strains of Sorghum in NE Agricultural Center  
Tha Phra, Khon Kaen, Rainy Season 1967--Chart
27. Proposed Silk Project
- 28 Farm Mechanization--Report and Chart
- 29 Accelerated Rural Development--Task in Thailand--Bangkok Post
- 30 Farmers' Organizations in Thailand--Yang
31. Amphur Farmer Groups--The First Year--ARD--Alton Gamble-1968
- 32 Summary of Irrigation Development, Northeast Thailand
- 33 Statistics Northeast Thailand
- 34 Schedule of Rates--Cargo and Vehicle Drive Away Service
35. Thailand Economic Fact Sheet
36. ARD Roi-Et Tractor Plan
- 37 Appendix of Research Findings and Present Projects Titles for Thai  
Agricultural Economics Research Agencies--Listing
38. Agricultural Goals of Thailand--M.R. Chakratong--Under Secretary  
Ministry of Agriculture
39. Marketing Margins and Marketing Channels of Major Agriculture  
Commodities and Livestock in the NE Thailand
40. Credit for Farm Production and ARD Agricultural Development  
Subactivity--1966
- 41 Agricultural Credit and Marketing in Northeast Thailand--Peters
- 42 Organizational Chart Ministry of Agriculture--Chart
43. Organizational Chart--Government Organizations--Ministry of  
Agriculture--Chart

### Industry

- 44 Organizational Chart--Ministry of Industry
- 45 Thailand Management Development and Productivity Centre--Activity
- 46 Thailand Management and Development Productivity Centre--Report
47. Industrial Development Policy--Ministry of Industry
48. Agriculture and Industrialization--FAO
- 49 Promotion of Industrial Investment Act 1962
- 50 Economic Indicators of Thailand
- 51 Private Enterprise Investment Opportunities in Thailand
- 52 Outline of Thailand's Taxation 1966
- 53 Preparing your Promotion Application
- 54 Application for Promotion
- 55 List of Industries currently eligible for Promotion
- 56 Investment in Thailand--Bangkok World Supplement
- 57 Asian Industry Magazine--May 1968
- 58 What is TMCP
59. Department of Science--Ministry of Industry
- 60 Industrial Development and Investment in Thailand--1966
- 61 Electric Power in Thailand--Price-PE Division

- 62 Electric Power for Thailand Industrial Development--Dec 1966  
Land Development
- 63 Large Scale Land Clearing Program
- 64. Castle and Cooke, Ind --Policy Statement
- 65. Castle and Cooke, Inc. Letter of Expressed Interest in Regional  
Economic Development Plan for NE Thailand
- 66. Announcing the Establishment of the Overseas Agriculture Development  
Company Limited
- 67. Agribusiness Council Inc. Organizational Charts

### Maps

- 68 Caltex Road Map
- 69. Calabrian Thailand Co., Ltd Transportation Map
- 70. Map of Thailand, Water Resources Development Project--RID
- 71 Northeast Thailand Rice Agriculture and Livestock Offices--TAAVS
- 72. Changwad Khon Kaen
- 73. Chart, Average Maximum Mean and Minimum Temperature 1953-1962
- 74 Rain Fall 1953-1962 by Regions--TAAVS
- 75 Power Projects and Transmission System in Thailand--CP Division-  
TAAVS
- 76 Marketing Map of Thailand--PE Division-TAAVS
- 77. Pamong Project Findings--BUREC

LISTING OF REPORTS ON FILE  
RE NORTHEAST AGRIBUSINESS POTENTIAL  
(Number is file identification number)

1. Amphoe - Tambon Statistical Directory of 14 ARD Changwads, NSO
2. Foreign Trade of Thailand Department of Customs
3. Changwad - Amphoe Statistical Directory, NSO
4. Crop Statistics -- Tables
5. Statistics Northeast Thailand
6. Household Expenditure Survey, NSO
7. Report on the 1964 Industrial Census, NSO
8. National Income of Thailand 1966, NEDB
9. Thailand's Facts and Figures
10. Statistical Yearbook Thailand 1965
11. Agricultural Statistics 1964
12. Agricultural Statistics 1965

Agriculture

13. Economic and Social Conditions among Farmers in Changwad Khon Kaen  
Long, Kasetsart University
14. Agricultural Goals Thailand
15. Organizational Chart, Ministry of Agriculture
16. Northeast Thailand Economic Profile
17. Agricultural Development in the NE Thailand, Patterson-USOM
18. System for Changwad Development Planning under NEED
19. Research for Planning Thai Agricultural Development Kasetsart  
University
20. Saraphi Janlekha Geographical Publications Limited
21. Economic Development of Agriculture, Iowa State University Center
22. Getting Agriculture Moving, Mosher
23. Agricultural Development of Thailand, Scoville, Thieme, USOM

Crops

24. Corn Development in Thailand 1964
25. Improved Kenaf Retting Facilities for Northeast Thailand, Checchi
26. Overall Development, Plan for the Thai Kenaf Industry
27. Soluble Coffee an Investment Opportunity in Thailand, BOI
28. Rice Production Manual Rice Institute
29. Thai Rice
30. Yield of Paddy in Various Experiments - Table
31. Rice Exported in January 1968
32. Report on Experiments on the Rearing Methods of Silkworms in  
Earlier Stages in Thailand, Hashida

33. Proposed Silk Project
34. Development of Peanut Growing and Processing in Northeast Thailand 1968, Checchi
35. Proposed Peanut Experimentation and Demonstration Project
36. Marketing Program for Peanuts and Corn in Amphur Farmer Group in Dan Sai, Changwad Loei, Checchi
37. Development of Vegetable Production and Marketing in Changwad Nakorn Panom
38. Soil Science Studies Legumes
39. Crop Cost and Return Studies
40. Scheme to Aid Farmer
41. Existing Farm Economic Conditions Demonstration Area 1966
42. Time Series Record of Crop Trials Kalasin
43. Grain Sorghum Introductions
44. Notes on Grain Sorghum Production-Thailand
45. Sorghum Strains Grown in Northeast Agricultural Station
46. Sorghum Research Significance
47. Growing 100 Bushels of Corn with irrigation
48. Suggested Program for Developing Specifications of Vapor Process Family Size Vegetable Seed Envelope for Distribution of Seed in Tropical Countries
49. Cotton Research Methodology in Thailand
50. Report on Status of Cotton Research in Thailand
51. Meeting between the Thai Jute Association and Overseas Consumer on the quality problems of Thai Kenaf
52. Comprehensive Kenaf Fiber Production and Industrialization Program for Northeast Thailand
53. The Thai Jute Industry
54. Statistical Description of the Forests of Thailand MRDC

#### Livestock

55. Livestock Statistics
56. Beef Cattle Regulations Export Program
57. Broiler Production
58. Livestock Statistics
59. Some Advantages of Improved Pastoral Farming to Upland Areas NE
60. Importation Hazards and Premunition, for anaplasmosis, Prioplasmosis
61. A Survey of Buffalo in Thailand
62. Notes on Market Prices of Meat-Bangkok
63. Marketing Margins and Marketing Channels of Major Agricultural Commodities and Livestock in the Northeast Region of Thailand, 1964
64. Animal Feeds Industry in Thailand
65. Farm Mechanization

## ARD

66. Negative Research ARD, Research Division
67. ARD Special Projects Section
68. Accelerated Rural Development
69. Amphur Farmer Groups -- The First Year -- Gamble
70. Evaluation Report ARD, Volume 1 and 2
71. Agricultural Progress Through Institutional Development
72. Thailand Agricultural Cooperatives An Evaluation with Recommendations for Improvement, Larson, International Cooperative Training Center
73. Farmers Organizations Thailand
- 74.

## Farm Planning-Land

75. Farm Planning Projects in Pra Buddha Bart Self Help Land Project
76. Farm Management Manual
77. Methods and Problems of Farm Management Research -- Sitton
78. How Can Farm Management Contribute to Economic Development
79. Land Utilization of Thailand
80. Large Land Clearing Program
81. Land Clearing Cost Study on Khon Kaen Thailand, University Farm

## Industry

82. Thailand Investment Potential Compared with other Far East Countries
83. Investment in Thailand
84. List of Industries Currently Eligible for Promotion
85. Application for Promotion
86. Outline of Thailand Taxation
87. Organizational Charts - Ministry of Industry
88. Industrial Development Policy - Ministry of Industry
89. Thailand Management Development and Productivity Center
90. Report on Industrial Development in Thailand
91. Economic Indicators of Thailand
92. Rural Industrial Technical Assistance Projects
93. Brief Analysis of Selected Industries
94. Report on Possibilities of Manufacturing Petrochemical Products in Thailand
95. Potential for Private Agri-Business Investment in Northeast Thailand
96. Plastics Machinery Industry of Thailand
97. Asian Industry Magazine - Special Issue on Thailand

- 98 Mining Resources and Mining Investment Potential in Thailand
- 99 Status of Mineral Industry in Thailand
- 100. Department of Science in Ministry of Industry
- 101. What is TMDPC
- 102 Thailand Private Enterprise Investment Opportunities
- 103 Thailand Business Legal Handbook
- 104 Extended Risk Guaranties of Loans for Private Projects
- 105 Preparing your Promotion Application
- 106 Promotion of Industrial Investment Act 1962
- 107 Agriculture and Industrialization
- 108 Investment in Southeast Asia
- 109 Industrial Development and Investment in Thailand 1966
- 110 Registered Factories in Bangkok, Thonburi and the Whole Kingdom  
including Northeast by region, 1947 - 1966
- 111 Industrial Development Thailand 1967, Siat Report
- 112 Memo -- LOSID 1968
- 113

Manpower -- Education

- 114 Cultural Factors in Worker Client Relationship
- 115 Policy Paper on Rural Manpower Utilization
- 116 Preliminary Assessment of Education and Human Resources in  
Thailand
- 117 Establishing an Agricultural Research Center in Northeast Thailand
- 118 Northeastern Thai and Education
- 119 Education/Training Program for ARD in Northeast Thailand
- 120

Transportation

- 121 Sattahip Civil Development Program
- 122 Port Facilities Studies
- 123 Cost Benefit Studies of Roads in North and Northeast Thailand
- 124

Fertilizer

- 125 Report on Pest Control in Thailand
- 126 A Report on the Thailand Fertilizer Situation and Potential
- 127 Cost Comparison of Ocean Shipment of Anhydrous Ammonia and Solid  
Urea Versus Shipment of Urea Ammonia Solution
- 128

### Electric Power

- 129 Amphoe and Tambol Electrification in Northeast Thailand
- 130 Electric Power for Thailand Industrial Development
- 131 Electric Power Study
- 132 Electric Power for Thailand
- 133

### Credit

- 134 Financing of Rural Households in Thailand - Rozenthal
- 135. Commercial Banking in Thailand - Rozenthal
- 136 Agricultural Credit in Thailand - Kasetsart
- 137 Savings and Loan Feasibility Study Thailand
- 138 Financial Markets and Development Planning, A Conceptual Framework - Rozenthal
- 139 Mobilization of Domestic Savings and the Structure of Capital Markets and Underdevelopment - Rozenthal
- 140 Northeast Thailand, Its Problems and Potentialities - Han Plutenius
- 141 Agricultural Credit and Marketing in Northeast Thailand - Peters
- 142 Credit for Farm Production an ARD Agricultural Development Sub Activity
- 143 Agricultural Credit Thailand, 1964
- 144

### Northeast Research Division Reports

#### Village Security Problems, Village Research Projects

### Irrigation-Water

- 145 Pa Mong Study - 5 volumes
- 146 Ground Water Resources Development Northeast Thailand - 2 volumes
- 147. Annual Report 1966-1967 of Watershed Development Project
- 148 Summary of Irrigation Development - Table
- 149 Growing 100 Bushels of Corn with Irrigation
- 150 Research Proposal Farmers Adoption of Irrigation
- 151

### Miscellaneous

- 152 Maps -- extra copies
- 153 American Firms Subsidiaries and Affiliates in Thailand 1967
- 154 Overseas Agricultural Company
- 155 Preinvestment Survey Northeast Farm Market Service Center

- 156 Thailand Economic Sheet
157. Technical Library Listings
158. Published Research Findings and Present Project from the Division of Agricultural Economics, Ministry of Agriculture
- 159 Applied Scientific Research Corporation of Thailand, List of Technical Reports completed or in draft as of 31, May 1968
160. Listing of Commercial Library -- U.S. Trade Center

Reports in USOM Technical Library (used as reference)

- 161 Relationship between Marketing and Farm Management - Sitton
- 162 Economic Affairs - Economic Trends
- 163 Manpower and Employment - Second Economic Development Plan
164. How Rice Export Premium affects the Farmer Problem traced back to World War Two
- 165 Soil Trip Reports - Bordsen, Khon Kaen
- 166 Gunny Bag Industry Recommended Policies
167. Highest Wind Velocity in Thailand
168. Monthly and Annual Normals of Rainfall and of Rainy Days 1931-1960

## II. SUMMARY

The Northeast Farmer simply has not found replacing traditional techniques with new agricultural methods -- the use of fertilizers, insecticides, irrigation and other input factors -- profitable or feasible. The lowest per capita ratio of arable land in Thailand is in the Northeast. If production and soil conditions remain constant, and with the living standards remaining at the same level, 1.5 million rai of new land will have to be cultivated during the next 10 years to meet the increased demands of the normal population increase. The agricultural development in the past 10 years has been principally the result of additional cultivation of new acreage, about a 30% increase, and the introduction of new crops such as kenaf and maize, rather than by increased volume or by diversification of crops.

There are estimated to be approximately 10,000,000 buffalo and cattle in the Northeast and this is about 50% of the total livestock population in Thailand. Because of the under-developed pasture land, the small number of cattle and buffalo owned by individual farmers, strict government controls, the lack of developed and local markets, the livestock industry is not found to be a profitable, productive or well organized industry at this time.

Thailand is the lowest user of fertilizers, at this time, in Southeast Asia. Only 3.9% of the Northeast farmers use chemical fertilizers, although some farmers use farmyard manures. The cost of the chemical fertilizers

may require reduction before the farmer will feel he can afford to substantially expand use. He also lacks education as to the proper methods of utilization of these inputs.

The NE farmer depends on his second crop or upland crop for his needed cash income. He only produces enough to cover his financial needs. There is an established market pattern for rice and maize, but it is not considered efficient. The existing market system is unprofitable for buying or selling using modern efficient volume type marketing techniques. A major factor hindering development of modern high volume marketing is that the farmer varies his crops from year to year depending on the current prices paid for the crops, with the result that there is no assurance of substantial volumes of commodities available at a central point for purchase by a volume marketer.

The seed program is not highly developed either in production or in distribution.

In 1966 estimates indicate that only 10% of the cultivated areas were mechanized. Small farming units depended mainly on buffalo and human power. There has been an increase in farm mechanization since 1963 when only 2% of the farm holdings were mechanized, while in 1966 the rate had increased to about 10%. The land holdings are too small, averaging 21.64 ra<sup>1</sup>, to make mechanization profitable for an individual farmer unless he uses custom plowing.

There is a developing transportation system with emphasis on highway development. The transportation costs have been reduced with the development of roads, but the schedules of the trucking firms are very flexible.

Non-bank credit is available to 90% of the Northeast farmers who need credit, however, interest rates are very high. The money is mainly borrowed from unorganized sources. Bank sources are being developed.

The government has organized educational and extension services, but only a limited number of the farmers are receiving the benefits from them. The government has only a few trained workers compared with the large number of farmers who need extension services.

The soils are generally poor in the Northeast and are in need of soil conditioners.

The total land area of the NE is the same size as the whole of South Vietnam, or 106,391,250 rai, of which 26,419,099 rai or 25% are farm holdings according to the agricultural census of 1963. Most agricultural expansion has been achieved through clearing of new land for cultivation, rather than increased yields and double cropping of existing farm land.

The power supply and demands are steadily growing in the Northeast. All demands are being met at this time. The government is developing increased sources of power supply.

The agricultural labor force in the Northeast is under-employed and/or unemployed except during short periods when seasonal agricultural production labor requirements are heavy. Farm management practices are neither modern nor efficient. 85% of the population is engaged in or dependent on agriculture. The importance of development of agriculture is further emphasized by the fact that 90% of Thailand's exports are agricultural commodities and provide the major source of foreign exchange.

The government is developing irrigation in the Northeast with about 91,545 hectares or 572,156 rai now irrigated. This is being done at no cost to the farmer, except by the use of the income from the rice premium. The farmer is unaware in most cases of the value of irrigation, or the methods of its proper usage.

### III PRESENT AND POTENTIAL SOURCES OF INCOME

#### A - General

##### 1 - Per Capita Income

The National Economic Development Board statistics indicate per capita gross domestic product in the Northeast to have approximated US\$ 72 in 1966. This was about half the national average and the lowest for any region in Thailand as shown in the following table

#### 1966 Regional Per Capita G. D. P.

<u>Region</u>	<u>Baht<sup>a/</sup></u>	<u>Equiv US\$<sup>b/</sup></u>
Northeast	1440	72
Central Plains	4620	231
North	2090	105
South	3113	156
Kingdom	2783	139

Notes a) Source Regional Gross Domestic Product 1961-1966,

National Income Accounts Division, N. E. D. B

b) Converted to \$ @ ฿ 20. - = US\$ 1. -

G. D P. - Gross Domestic Product

The Household Expenditure Survey in 1962, the latest available, found that per capita income (roughly equivalent to per capita G. D. P ) in the Northeast included about \$18 - income in kind as well as survey income. Since income in kind is considered to remain relatively constant in the Northeast, average money income in 1966 can be estimated at about \$54. The Household Expenditure Survey also indicated that per capita income in villages in the Northeast closely approximated the regional average and that in towns was about 3 times the regional average.

Per capita income in the Northeast is heavily dependent on agricultural production, in particular that of rice and kenaf. As shown in the following table, regional income growth has closely approximated the population growth rate except for 1966 when there were bumper rice and kenaf crops.

Trend in Northeast Per Capita G D P

	<u>Baht</u>	<u>US \$ Equivalent</u>
1961	1261	63
1962	1250	63
1963	1259	63
1964	1240	62
1965	1251	63
1966	1440	72

Note Baht 20 - = US\$ 1 -

Source Regional Gross Domestic Product, Nat'l Income Accounts Div , NEDB

Nearly everyone is adequately housed and fed by Southeast Asian standards and conditions

Savings are very low, and studies indicate that few farmers put money in the bank or have money to put into banks. The average family spends about 8 baht per month in excess of his declared earnings

The NE farmer is interested in producing a crop from which he will realize at least a 15 dollar per rai profit or \$37.50 per acre

## 2 - Northeast Profile

- 1 15 provinces
- 2 1/3 of the geographical area of Thailand, 1/4 the size of the State of Texas, same land area as South Vietnam
  - a. 106,391,250 rai of land area
  - b. area in farm holdings -- 26.4 million rai
  - c. forest and grazing -- 42.5 million rai
  - d. swamp and lakes -- 0.4 million rai
  - e. unclassified -- 37.1 million rai
- 3 1/3 of the population of Thailand lives in the NE, 1960 Census, 10,000,000 persons, average increase about 3.3% per year --  
Est 1966, 11,296,500
- 4 85% of the population depend on agriculture -- employment in 1966 was 11.63 million -- agriculture was 50% of the total output in 1966 -- per capita gross domestic product Baht 1440

- 5 Farm holdings average about 21 64 rai per farm -- 90% farmer owned.
- 6 There is a developed transportation system, roads, railroads, airports
- 7 Irrigation projects are being developed
- 8 Education level is about 70% literacy
- 9 Area has potential for growing second crops
  - a rice, the main food crop
  - b kenaf - major cash crop
  - c maize
  - d sorghum
  - e cotton
  - f soybeans
  - g peanuts
  - h vegetables
  - i tree crops--fruit
  - j pasture improvement

#### Some Disadvantages

- 1 Isolated from commodity inputs sources
- 2 Great distances from direct market outlets--Khon Kaen to Bangkok 452 km
3. Technical assistance for proper agricultural techniques and materials--too small in extent to have large impact

4. Isolated from Government and private organization headquarters--  
physically & culturally
- 5 Soils generally less productive than the rest of Thailand
  - a Needs fertilizers
  - b Needs water--irrigation
  - c Soil is sandy, soil conditioners, lime, etc , needed
  - d Surveys needed on soil fertility

## B - Prime Potential Areas for Development

### 1 - Khon Kaen

- a Khon Kaen is the hub of the NE and is experiencing a commercial boom
- b. It has good railway system, airport, hotels, restaurants
- c It has adequate land available -- 4,693,636 rai for development.
- d Irrigation developed -- extensive RID projects, 28% of the cultivated land is irrigated or 649,177.2 rai, 50 to 80% good quality water from wells
- e It has a good road system
- f It has good distribution -- center from Bangkok for spare parts and inputs
- g It has extension and research schools, also vocational schools
- h It has fair soil as compared to the Central Plains

- i. It has a population of 844,075 persons, 85% engaged in agricultural work
- j It has 109,082 farm holdings average of 21 5 rai each
- k Land area -- 3,312,128 4 acres or 8,280,321 rai, 28% is cultivated or 2,318,489 8 rai
- l Industries developed in Khon Kaen
  - 1 rice and milling
  - 2 livestock industry -- growing
  - 3 ceramic industry
  - 4 source of spare parts -- dealers
  - 5 textile -- cotton weaving and ginning
  - 6 wood treating plant for parquet flooring manufacturing
- m Forest lands -- 1,712,755 rai

2 - Kalasin

- a has a good road system
- b is near railway system
- c water -- irrigation system, Lam Pao Dam -- 21% of the cultivated land is irrigated or 183,988 2 rai -- 50-80% good quality from wells
- d Land available -- 2,235,790 rai for development
- e good soil -- with inputs, i e., fertilizer, water
- f FAO experimental farm

- g. near to Khon Kaen, the hub of the NE fast becoming the commercial center of NE, for inputs and transportation
- h land area -- 1,890,600.35 acres or 4,781,875 rai 19% of which is cultivated or 908,556.25 rai
- i has a population of 426,795 persons, 93% of whom are engaged in agriculture
- j there are 60,685 agriculture holdings averaging 20.4 rai each
- k industry
- l forest lands -- 1,142,676 rai
- m industry
  - 1. rice milling
  - 2 animal raising
  - 3 textile
  - 4 handicraft

3 - Roi-Et

- a land available -- 2,125,074 rai for development
- b good soil
- c water -- 24% of the cultivated land is irrigated or 523,995.3 rai  
50-80% good quality water from wells
- d good roads available
- e population 668,193, 93% engaged in agriculture
- f there are 95,488 agriculture holdings averaging 23.1 rai each

- g. land area -- 1,940,723.4 acres or 4,851,808 5 rai 45% of which  
is cultivated or 2,183,313 8 rai
- h. industry
  - 1. silk weaving
  - 2. cotton ginning and weaving
  - 3. handicraft
  - 4. commercial area expansion
  - 5. rice milling
  - 6. sugar milling
- i. forest lands -- 582,963 rai
- j. commercial development

4 - Loei

- a. best soil in the NE
- b. land available -- 1,356,456 rai for development
- c. good road system -- long distance from markets
- d. no railway system -- long distance from markets in Bangkok
- e. airport
- f. plenty of water -- no developed irrigation system -- but 32% of  
cropland is irrigated or 86,496 8 rai
- g. population 210,535 persons, 90% of whom are engaged in agriculture
- h. land area -- 2,703,026 9 acres or 6,757,567.2 rai of which 4%  
is in agriculture or 270,302.6 rai

1. **industry**

1 silk

2. weaving

3 cotton ginning

j forest lands -- 5,002,839 rai

5 - Ubon

a good railway system

b good road system in area and connecting to Roi-Et and Khon Kaen  
but only indirect route to Bangkok

c good air service

d. good water for irrigation -- 16% of the cultivated land is irrigated  
or 607,338 rai -- 80% better quality water from wells Surface  
water is plentiful. River draining N. E. pass through Ubon to  
the Mekong River.

e. good forest land -- 5,324,369 rai

f. good soil

g. new hydro-electric dam under construction

h 400 miles from Bangkok -- is market center for south east corne  
of NE Thailand and southern Laos

i provincial population -- 1,130,712 persons of whom 88% are  
engaged in agriculture. Ubon -- Warin metropolitan area --  
50-60,000

- j. land area -- 5,623,501.8 acres or 14,058,754.5 rai of which 27% is in agriculture cultivated land
- k. there are 158,567 farm holdings, averaging 23.6 rai each
- l. land available for development -- 4,516,052 rai
- m. industry
  - 1. timber
  - 2. poultry and livestock
  - 3. commercial development
  - 4. rice milling
  - 5. sugar mills
  - 6. stick lac
  - 7. kenaf baling
  - 8. ice plants
  - 9. soft drink bottling
  - 10. liquor plant
  - 11. handicrafts
- n. large US Air Force Wing stationed at a Royal Thai Air Force base

### C - Crops

The Northeast produces rice, the traditional food crop, as its first crop, but only 11% of its production is sold. General cropping, or second and upland crops which give the farmer a cash income are listed in order of their importance

- a tobacco, corn, sorghum, cotton, kenaf
- b edible and inedible oil crops soy beans, mung beans, sesame, castor beans, peanuts
- c fruit crops papaya, mango, banana
- d tree crops kapok, bettlenut
- e grasses

The farmer rebasedly expects one crop failure every five years due to the drought or flooding, 1 good crop and 3 marginal crops in every five years

The government standards and quality control are set for the export market

#### 1 - Rice

70 to 90% of the calories consumed by the Thai individual is in the form of rice The average intake per year is about 300 pounds Of the total crop produced in the northeast only 11% is sold after the family needs are satisfied The rice produced in the Northeast is the long maturing glutinous type which the farmer prefers

With the use of improved inputs, irrigation, etc , the rice yields could be increased to 1 metric ton (600 to 1000) per hectare of paddy Also with the use of irrigation two crops per year could be produced in some areas

## 2 - Tobacco

Production of tobacco is controlled by the Tobacco Monopoly, and all tobacco is sold to them. Both local, Burley and Oriental types, and Virginia tobaccos are grown.

In 1966, Thai tobacco production totalled 80,620 metric tons on an area of 418,406 rai according to the Ministry of Agriculture. The Northeast region ranked second in output (after the north) in output with 15,422 metric tons on an area of 94,061 rai.

The leaf is either sun dried or "kiln" or "barn" dried, and requires a constant heat of 170 degrees for 100 hours heat to produce the best quality. The low quality of the Thai tobacco is because of the lack of good drying practices.

## 3 - Kenaf

The production of kenaf is concentrated in the Northeast. It is a good dry season upland crop which grows in poor soils. It provides a needed cash income to the farmer. The quality of kenaf in Thailand is very low due to the primitive retting process used by the farmer. An adequate water supply is essential for good retting procedures. Only 3% of the farmers use fertilizers for kenaf production.

In 1965 Thailand was producing 350,000 tons per year, most of which was exported. In 10 years (1975) with improved methods, Thailand could produce 400 to 500 thousand tons for a world market. Only 20 to 30% of the produced fiber is now being used locally.

There are 10 mills with a capacity of 942 looms, with an expected increase to 3000 looms by 1975 which could handle 250,000 tons of kenaf for the production of gunny bags. This will produce about 80 million gunny bags.

It costs the farmer Baht 150 per rai to achieve a return of Baht 300 per rai or a profit of Baht 150 per rai. If the farmer were to use family labor completely, he could clear Baht 266 per rai.

Production averages 200 kg per rai. Kenaf farm areas average about 8 rai each and there were 21,062 hectares planted in kenaf in 1963.

#### 4 - Cotton

In the Northeast, cotton is mainly produced in Changwad Loei also a small quantity in Changwads Mahasarakram, Kalasin, Nakorn Rajasima, and Chaiyaphum. The farmer consider cotton expensive to produce since it needs special handling, i. e., fertilizers and insecticides. There are 121.9 thousand rai of cotton planted in these areas.

If no sprays and fertilizers are used the yields are from 75 to 100 kg. per rai, but by using the sprays and fertilizers yields increase to 300 to 350 kg.

per rai. The best earnings without sprays average about 350 baht per rai, and the net with spray use is 875 baht. The average price paid to the farmer is reported to be about 2.80 baht per kg.

96% of the cotton produced is sold on the market, and with the textile mills expanding the number of spindles there is a potential market for all the crop produced. The other 4% is used in home industry and hand weaving.

With improved cotton quality the textile mills will buy Thai cotton instead of importing cotton, which now averages (both yard goods and yarn included) about 15 to 19% of Thailand's total imports. Thailand hopes to become self sufficient in cotton by 1970. The present production is 15,483 tons, and a total of 51,000 metric tons are needed for total consumption requirements. At this time only about 1/3 of the crop is of sufficient quality to be used by the mills.

In many cases the farmers are extended credit by the local ginning mills and the farmer then sells his production directly to this mill.

#### 5 - Maize

In its export value, maize is third to rice and rubber, accounting for about 21% of foreign exchange earnings. It is a relatively new crop to Thailand. The Northeast produces about 1/3 of the total production in Thailand.

The area planted in the Northeast in 1964 was 253,000 rai with the production total of 63,400 tons. About 20% of the production is used locally for feed or oil. Average yields are low, but in the last 15 years the number of rai planted has increased 800% and yields have increased from 150 kg per rai to 300 kg per rai.

### Pasture land

Pasture lands in the Northeast are in very poor condition or are non-existent. There is a lack of any attempt to provide good pasture lands for livestock, even though the northeast produces 50% of the total of Thailand's livestock. Cattle now graze in right of ways, and on paddy lands after the harvest. The crude protein content level of native grasses is very low, and of short duration due to the rapid maturity each season.

By adding legumes, which capture the nitrogen from the air, and transfer it into the soil, the pasture lands could be improved greatly. Khon Kaen University in testing various legumes finds that a variety of Townsville lucerne would be very adaptable to the conditions in the Northeast.

This legume grows successfully in dry areas, and will spread naturally in areas receiving only 25 inches (600 mm.) of annual rainfall. The production rate in sandy soil and under very acid conditions is very high. The protein content is very high, and it can be reserved for the dry season as a good supplement for cattle feeding along with rice and grass straw. This

legume is low in cost to grow and needs only moderate fertilization to produce high yields

Khon Kaen University is investigating 38 species of tropical grass, 16 varieties, 21 species, 7 varieties of tropical legumes. Results from tests so far indicate that Napier Grass seems to be the best grass for northeast conditions.

#### References

- 1 Status of Cotton Research Thailand -- Breitenback
2. Review Cotton Research Methodology in Thailand -- Breitenback
3. Industrial Development and Investment in Thailand 1966
4. Selected Industries in Thailand -- PE Division
- 5 Thai Jute Industry -- Summary of Scandinavian Engineering Corp.  
Final report 1966
6. Pa Mong Study
7. Land Utilization of Thailand 1965, Ministry of Agriculture
8. Agricultural Statistics of Thailand 1965
9. Corn Development in Thailand
- 10 Grain Sorghum Production
11. Overall Development Plan for Thai Kenaf Industry
12. Improved Kenaf Retting Facilities for Northeast Thailand

13. Study -- Norman Mangnall, Khon Kaen University, Some Pastoral Farming to the Upland areas of Northeast Thailand
14. Gunny Bag Industry, Technical Library USOM, 338.4 PRI
15. Developments of Agriculture, Technical Library 630, DEV.

Crop Production in order of  
Importance -- NE

1. Rice -- traditional food crop
2. General Cropping
  - a. corn, tobacco, kenaf, cotton, sorghum, cassava
3. Oil Crops
  - a. peanuts, soy beans, sesame, ground nut, castor bean,  
mung bean
4. Fruit Crops
  - a. papaya, mango, bananas
5. Tree Crops
  - a. kapok, bettle nut
6. Grasses

80 crops produced in varying amounts but only 38 have a commercial value.

Labor costs for all crops excepting cotton average about baht 150 per rai. If hired labor costs are figured without the cost of the added inputs the average is 20 to 40 baht per rai.

Production Forecasts -- Selected Crops

<u>Crop</u>	<u>Planted Area</u> 1000 rai		<u>Production</u> 1000 Metric Ton		<u>Average Yield</u> kg per rai	
	<u>1963</u>	<u>1971</u>	<u>1963</u>	<u>1971</u>	<u>1963</u>	<u>1971</u>
Rice	41,277	45,000	10,168	12,000	246	267
Maize	2,612	3,900	858	1,500	328	385
Peanuts	520	820	113	186	217	227
Kapok	334	390	284	330	851	846
Soybean	210	300	33	49	157	163
Sesame	122	164	16	23	131	139

Source

Pa Mong Study

THAILAND PRODUCTION COMMODITIES

Production	Unit	Actual Production 1965	Production Target 1971
<b>Agriculture</b>			
Rice	Ton	11,070,000	13,700,000
Maize	Ton	1,000,000	1,500,000
Rubber	Ton	215,000	250,000
Kenaf	Ton	370,000	500,000
Cassava	Ton	2,340,000	2,500,000
Soy Bean	Ton	33,000	50,000
Mung Bean	Ton	120,000	200,000
Ground Nut	Ton	121,000	185,000
Cotton	Ton	13,000	45,000
Castor Bean	Ton	32,000	55,000
Tobacco	Ton	62,000	88,000
<b>Industry</b>			
Cement	Ton	1,300,000	2,800,000
Gunny Bags	Unit	42,400,000	65,000,000
Paper	Ton	22,300	65,000
Chemical Fertilizer	Ton	-----	250,000
Car Assembly	Unit	8,692	
Tires	Unit	140,000	300,000
Steel	Ton	100,000	400,000
Oil Refinery	Million barrels.	13	18

Source NEDB

ANNUAL GROSS RECEIPTS

<u>Crop</u>	<u>Yield</u> kg/rai	<u>Price/unit</u> baht	<u>Total</u> baht
Rice (wet season)	750	91	682 50
(dry season)	675	91	614 25
Corn (shelled)	750	92	690 00
Kenaf (retted)	450	1 76	792 00
Cotton (seed with lint)	500	2 37	1185 00
Peanuts (with shells)	450	1 91	859 50
Tobacco (fresh weight)	650	1 20	780 00
Sugar cane (fresh)	12000	11	1320 00

AVERAGE CASH SALES PER FARM

PER YEAR

Rice	Baht 200 to 400
Kenaf	Baht 600 to 1500
Vegetables	Baht 200
1 hog	
few chickens	
1 cow or buffalo	

Average Wholesale Prices of Paddy and Rice  
(1US\$ = 20 75 Baht)      Dollars/Metric Ton

Period	PADDY			RICE						
	No 1	No 2	No 3	100%	5%	10%	15%	20%	25%	A <sup>1</sup> broken (super)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1960	43 28	40 72	38 94	79 08	71 61	64 53	61 68	57 15	53 20	46 07
1961	47 47	43 61	41 88	83 42	78 70	75 13	75 13	69.87	67 32	59 61
1962	56 48	52 82	51 13	96 00	91 23	88 09	88 09	-	79 03	69 44
1963	49 69	45 98	44 87	86 70	81 06	78 12	74 69	-	68 72	63 80
1964	42 12	36 72	35 52	80 96	74 41	70 84	67 61	65 01	58 84	48 57
1965	43 95	40.19	39 18	79 47	74 02	71 42	68 96	67 27	63 27	51 46
1966	61 78	57 69	55 95	105 49	100 53	97 68	94 31	90 69	89 10	79 42
Jan	48 77	44 67	43 47	85 49	81 54	78 31	76 48	74 93	73 10	64 77
Feb	47 61	43 04	41 88	84 87	80 19	76 86	74 50	72 91	71 27	64 86
Mar	49 35	45 11	44 10	90 17	85 83	82 31	79 42	77.06	75.18	69 46
Apr	58 84	54 27	52 63	104 05	98 17	94 55	91 66	89 10	87 51	78 84
May	59 42	55 13	53 83	101 16	96 48	93 59	91 51	89 73	89 15	79 75
June	62 75	58 65	57 69	106 17	101 49	97 83	95 95	94 36	93 44	81 68
July	65.59	65 64	64 67	113 20	108 14	104 48	102 79	101 20	100 14	86 02
Aug	65 49	60 92	59 81	110 51	105 64	103 90	100 38	98 07	96 48	81 10
Sept	69 35	65 25	64 19	115 42	110 55	108 96	105 20	102 36	100.72	85 92
Oct	73 59	69 54	67 66	124 00	118 94	116 48	112 86	107 51	103 58	88 19
Nov	76 14	72 10	64 72 <sup>1/</sup>	129 40	123 42	120 91	108 33 <sup>1/</sup>	-	-	86 84
<sup>1/</sup> Dec	60 67	58 02	57.01	101 59	95 75	94 16	92 57	-	-	85 63
1967	64 72	59 52	57 98	122 02	115 56	111 95	105 68	102 16	100 28	79.51
Jan	55 42	51 90	50 60	100 19	94 51	91 71	88 67	86 89	86.45	84 33
Feb	60 87	56 82	55 61	111 52	105 64	102 69	97 63	95 42	93 54	86 69
Mar	63 76	59 33	57 73	118 36	112 92	110 26	102 31	100 19	98 60	85 49
Apr	61 69	56 92	55 61	115 47	109 40	106 98	98 69	97 10	95 46	78 12
May	63 86	59 28	58 07	117 93	111 56	109 68	103 27	101 59	99 95	77 83
June	64 14	60 14	58 70	121 64	114 89	112 14	105 44	103 85	102 21	74 79
July	65 88	61 11	59 47	127 76	120 29	116 77	108 91	105 73	104 33	73 49
Aug	69 83	63 94	62 12	135 23	128 58	124 48	117 54	110.26	106.89	81 30
Sept	75 52	68 29	66 36	144 19	137 59	131 22	123 56	114 55	112 24	84 48
Oct	72 53	64 72	62 55	138 02	129 93	124 52	120 00	112 91	110 31	76 24
Nov	64 67	57 73	56 05	126 51	118 31	114 16	105 73	103 22	100 91	74 16
<sup>1/</sup> Dec	58 51	54 27	52 53	107 52	103 23	98 55	96 48	94 07	92 28	77 01
1968										
Jan	64 14	59 37	57 78	110 65	104 96	102 55	99 22	97 15	94 98	78 07

Note      <sup>1/</sup> New Crop

Source      Department of Internal Trade

Average Wholesale Prices of Maize (CORN)

(1US\$ = 20 75 Baht)

<u>Year</u>	<u>Baht/Metric Ton</u>	<u>US\$/Metric Ton</u>
1958	n a	n a.
1959	1,002 33	48 31
1960	1,009 50	48 65
1961	1,108 00	53 40
1962	988 83	47 65
1963	1,026 83	49 49
1964	1,041 67	50 20
1965	1,202 91	57 97
1966	1,125.33	54 23
Jan	1,206 47	58 14
Feb.	1,183 08	57 02
March	1,132 50	54 58
April	1 106 25	53 31
May	1,153 83	55 61
June	1,050 33	50 62
July	1,059 00	51 04
August	1,050 83	50 64
Sept.	1,116 67	53 82
October	1,086 83	52 38
Nov	1,118 17	53 89
Dec	1,241 67	59 84
1967		
Jan	1,174 00	56 58
Feb	1,121 67	58 64
March	1,141 83	55 03
April	1,259 50	60 70
May	1,343 17	64 73
June	1,292 00	62 27
July	1,288.17	62 08
August	1,144 64	55 16
Sept	1,048 33	50 52
October	1,050 83	50 64
Nov	1,056 00	50 89
Dec	1,056 17	50 90
1968		
Jan	982 50	47 35

Source Yip In Tsou Co Ltd , Department of Commercial Intelligence

KILOGRAMS OF CORN REQUIRED TO PAY FOR 100 KILOGRAMS OF FERTILIZER

PRICE RECEIVED BY THE FARMER FOR SHELLED CORN \$ M/T OR ₱ 100 KG

FERTILIZER COST PER METRIC TON  
TO THE FARMER INCLUDING CREDIT  
\$1 00 = ₱20 57

		<u>\$29 17</u>	<u>\$31 60</u>	<u>\$34 03</u>	<u>\$36 46</u>	<u>\$38 89</u>	<u>\$41 32</u>	<u>\$43 75</u>	<u>\$46 18</u>	<u>\$48 61</u>	<u>\$51 04</u>	<u>\$53 47</u>
		<u>₱60 00</u>	<u>₱65 00</u>	<u>₱70 00</u>	<u>₱75 00</u>	<u>₱80 00</u>	<u>₱85 00</u>	<u>₱90 00</u>	<u>₱95 00</u>	<u>₱100 00</u>	<u>₱105 00</u>	<u>₱110 00</u>
<u>\$</u>	<u>₱</u>											
50 00	1028 50	171	158	147	137	129	121	114	108	103	98	94
55 00	1131 35	189	174	162	151	141	133	126	119	113	108	103
60 00	1234 20	206	190	176	165	154	145	137	130	123	118	112
65 00	1337 05	223	206	191	178	167	157	149	141	134	127	122
70 00	1439 90	240	222	206	192	180	169	160	152	144	137	131
75 00	1542 75	257	237	220	206	193	182	171	162	154	147	140
80 00	1645 60	274	253	235	219	206	194	183	173	165	157	150
85 00	1748 45	291	269	250	233	219	206	194	184	175	167	159
90 00	1851 30	309	285	264	247	231	218	206	195	185	176	168
95 00	1954 15	326	301	279	261	244	230	217	206	195	186	178
100 00	2057 00	343	316	294	274	257	242	229	217	206	196	187
105 00	2159 85	360	332	309	288	270	254	240	227	216	206	196
110 00	2262 70	377	348	323	302	283	266	251	238	226	215	206
115 00	2365 55	394	364	338	315	296	278	263	249	237	225	215
120 00	2468 40	411	380	353	329	309	291	274	260	247	235	224
125 00	2571 25	429	396	367	343	321	303	286	271	257	245	234
130 00	2674 10	446	411	382	357	334	315	297	281	267	255	243
135 00	2776 95	463	427	397	370	347	327	309	292	278	264	252
140 00	2879 80	480	443	411	384	360	339	320	303	288	274	262
145 00	2982 65	497	459	426	398	373	351	331	314	298	284	271
150 00	3085 50	514	475	441	411	386	363	343	325	309	294	281
155 00	3188 35	531	490	455	425	399	375	354	336	319	304	290
160 00	3291 20	549	506	470	439	411	387	366	346	329	313	299
165 00	3394 05	566	522	485	453	424	399	377	357	339	323	309

List of Recommended Rice Varieties  
Rice Department Ministry of Agriculture\*

THAILAND

No	Variety Name	Har Date	Type	Yield <sup>1/</sup> Kg /ha	Kernel Size(mm)*			Blast <sup>2/</sup> React	Year of Release	Remark
					T	W	L			
<b>I NORTHERN REGION</b>										
1	Daw Hawn 26	Nov 20	G	2906 25	1 89	2 64	7 42	4,5	1964	221
2	Daw Leuang 88	28	G	3406 25	1 72	2 30	7 44	1,2	1964	261
3	Muey Nawng 62 M	20	G	3300 00	2 00	2 90	6 60	5,6	1961	576
4	Niaw San-pah-tawng	26	G	3300 00	1 80	2 30	7 20	1	1961	1,088
5	Gan Pai 15	30	G	3556 25	2 00	2 80	7 20	1	1961	782
6	Dawk Mali 3	25	NG	3306 25	1 75	2 30	7 85	2,3	1964	125
7	Leuang Yai 34	25	NG	3262 50	1 80	2 40	7 50	1	1955	300
<b>II NORTHEASTERN REGION</b>										
1	Daw Hawn 26	Nov 21	G	1775 00	1 88	2 53	7 42	5	1964	2,300
2	Khi-ton Yai 98	18	G	1756 25	2 00	2 80	7 40	4,5	1961	6,041
3	Niaw San-pah-tawng	26	G	1887 50	1 80	2 20	7 30	1	1961	7,000
4	Gan Pai 41	30	G	2012 50	1 90	2 60	7 30	1	1961	3,807
5	B K 293	22	NG	1931 25	1 79	2 16	7 65	4	1964	1,080
6	Leuang Tawng 82	25	NG	1981 25	1 70	2 13	7 74	4	1964	379
7	Khao Pakk Maw 17	28	NG	2025 00	1 80	2 34	7 67	3,4	1964	1,655
8	Khao Dawk Mali 105	20	NG	1737 50	1 50	2 40	7 60	3,4	1958	4,000
9	Jao' Leuang 11	26	NG	1893 75	1 70	2 20	7 40	5	1961	3,400
<b>III CENTRAL REGION</b>										
1	B K 293	Nov 23	NG	2475 00	1 87	2 20	7 58	4	1964	872
2	Leuang Tawng 101	30	NG	2556 25	1 65	2 17	7 07	4	1964	629
3	Khao Pakk Maw 148	Dec 3	NG	2525 00	1 89	2 30	7 59	3,4	1964	2 030
4	Bai Lod 104	13	NG	2506 25	1 81	2 23	7 17	4	1964	1,285
5	Leuang Pra-tew 123	19	NG	2837 50	1 80	2 26	7 40	4,5	1964	4,035

List of Recommended Rice Varieties

No	Variety Name	Har Date	Type	Yield <sup>1/</sup> Kg /ha	Kernel Size (mm)*			Blast <sup>2/</sup> React	Year of Release	Remarks
					T	W	L			
III	<u>CENTRAL REGION</u> (Cont)									
6	Nahng Mon S-4	Nov 26	NG	2400 00	1 80	2 40	7 70	3	1955	1,4
7	Gow Ruang 88	15	NG	2256 25	1 70	2 20	7 30	4,5	1961	2,17
8	Jao' Leuang 11	23	NG	2137 50	1 70	2 10	7 30	1	1961	1,8
9	Puang Nahk 16	Dec 25	NG	2100 00	1 80	2 20	7 50	7	1966	1,4
	<u>FLOATING RICE VAR</u>									
1	Khao Nahng Nuey 11	Dec 28	NG	3831 25	1 80	2 31	7 28	3	1964	12
2	Khao Puang 32	31	NG	3962 50	1 79	2 31	7 24	2,3	1964	3
3	Ta-paw Gaew 161	9	NG	2706 25	1 70	2 50	7 20	4,5	1958	8
4	Jek Chuey 159	9	NG	2475 00	1 80	2 40	7 20	5	1958	6
5	Leb Mue Nahng 111	19	NG	3587 50	1 70	2 30	7 00	3	1958	2,0
6	Pin Gaew 56	29	NG	3725 00	1 70	2 20	7 40	3,4	1958	2,4
7	Nahng Cha-lawng	Nov 30	G	2462 50	1 90	2 90	7 30	3	1958	6
IV	<u>SOUTHERN REGION</u>									
1	N T 3986	Jan 18	NG	1887 50	1 76	2 23	7 30	5	1964	3
2	Leuang 152	27	NG	1968 75	1 70	2 20	7 00	6	1961	1
3	Nahng Phya 132	Feb 16	NG	2093 75	1 70	2 20	7 80	5,6	1961	2,7
V	<u>NON-SENSITIVE VAR</u>									
1	Leuang Tawng	135 days	NG	2137 50	1 70	2 28	7 19	3,(4)	1964	

Type \* G = Glutinous or waxy starch  
NG = Nonglutinous or nonwaxy starch

Kernel Size (mm)\*  
T = Thickness  
W - Width  
L = Length

<sup>1/</sup> Average from Regional Yield Trials conducted in 1962, 1963 and 1964

<sup>2/</sup> Average Blast reaction based on natural infection at Stations with the respective region

PLANT POPULATION PER RAI

(จำนวนต้นพืชไร่)

Distance between Plants (cm)	← ระยะห่างระหว่างต้น - Distance between Rows (cm) - ระยะห่างระหว่างแถว -														
	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120
10	32,000	29,092	26,663	24,616	22,856	21,332	20,000	18,824	17,776	16,844	16,000	15,240	14,544	13,912	13,332
12	26,666	24,243	22,223	20,513	19,046	17,777	16,666	15,686	14,814	14,036	13,333	12,699	12,119	11,593	11,110
14	22,856	20,779	19,018	17,582	16,325	15,237	14,285	13,445	12,696	12,031	11,428	10,885	10,388	9,937	9,523
16	20,000	18,182	16,667	15,385	14,285	13,333	12,500	11,765	11,110	10,527	10,000	9,525	9,090	8,695	8,333
18	17,777	16,162	14,815	13,675	12,697	11,850	11,111	10,457	9,875	9,357	8,888	8,466	8,079	7,728	7,406
20	16,000	14,546	13,334	12,308	11,428	10,666	10,000	9,412	8,888	8,422	8,000	7,620	7,272	6,956	6,666
22	14,545	13,223	12,121	11,189	10,389	9,696	9,091	8,556	8,080	7,756	7,472	7,227	6,927	6,610	6,323
24	13,333	12,121	11,111	10,256	9,523	8,888	8,333	7,843	7,406	7,018	6,666	6,350	6,060	5,796	5,555
26	12,068	10,971	10,057	9,283	8,619	8,044	7,542	7,099	6,703	6,352	6,034	5,747	5,484	5,246	5,027
28	11,428	10,390	9,524	8,791	8,163	7,618	7,143	6,722	6,348	6,015	5,714	5,442	5,194	4,968	4,761
30	10,666	9,697	8,809	8,205	7,618	7,110	6,666	6,274	5,925	5,614	5,333	5,079	4,847	4,637	4,444
32	10,000	9,091	8,333	7,692	7,142	6,666	6,250	5,882	5,550	5,263	5,000	4,762	4,545	4,347	4,166
34	9,412	8,556	7,843	7,240	6,722	6,274	5,882	5,536	5,228	4,954	4,706	4,482	4,277	4,091	3,921
36	8,888	8,081	7,407	6,837	6,340	5,925	5,555	5,228	4,937	4,678	4,444	4,233	4,039	3,864	3,703
38	8,420	7,655	7,017	6,477	6,014	5,613	5,263	4,953	4,677	4,432	4,210	4,010	3,827	3,660	3,508
40	8,000	7,273	6,667	6,154	5,714	5,333	5,000	4,706	4,444	4,211	4,000	3,810	3,636	3,478	3,333
42	7,620	6,927	6,350	5,861	5,442	5,079	4,762	4,482	4,232	4,010	3,810	3,629	3,463	3,312	3,174
44	7,272	6,611	6,060	5,594	5,194	4,848	4,545	4,278	4,040	3,828	3,636	3,463	3,305	3,161	3,030
46	6,956	6,324	5,797	5,351	4,968	4,637	4,348	4,092	3,864	3,661	3,478	3,313	3,161	3,024	2,898
48	6,666	6,060	5,555	5,128	4,761	4,443	4,166	3,921	3,703	3,509	3,333	3,174	3,029	2,898	2,777
50	6,400	5,818	5,333	4,923	4,571	4,266	4,000	3,764	3,555	3,368	3,200	3,048	2,908	2,782	2,666

STOCKS OF MAIZE IN BANGKOK AND NEARBY PROVINCES

	Quantity Metric Ton									
	1964		1965		1966		1967		1968	
	Date	Quantity	Date	Quantity	Date	Quantity	Date	Quantity	Date	Quantity
January	-	-	Dec 28, 65	195,007 4	Jan 4, 66	303,244 0	Jan 3, 67	256,723 4	Jan 2, 68	210,982 3
February	-	-	Jan 30, 65	112,173 5	Jan 28, 66	290,659 0	Feb 3, 67	240,721 5	Feb 3, 68	222,824 3
March	-	-	Mar 1, 65	19,901 6	Mar 1, 66	314,390 5	Mar 1, 67	178,013 0	Mar 1, 68	210,614 1
April	-	-	Apr 1, 65	11,426 5	Apr 1, 66	142,763 7	Apr 3, 67	138,915 5	Apr 1, 68	181,895 9
May	May 4, 64	171,150 7	Apr 30, 65	5,573 7	May 3, 66	84,434 8	May 2, 67	102,091 9	May 2, 68	178,464 6
June	June 1, 64	81,190 1	June 1, 65	786 5	June 1, 66	40,418 5	June 1, 67	56,048 4	June 3, 68	101,235 1
July	July 1, 64	88,818 7	July 1, 65	1,409 5	July 1, 66	28,429 6	July 3, 67	18,022 3	July 1, 68	39,841 5
August	Aug 6, 64	17,797 1	Aug 2, 65	7,420 6	Aug 3, 66	27,363 1	Aug 1, 67	5,213 6	Aug 1, 68	15,507 5
September	Sept 1, 64	40,520 7	Sept 1, 65	17,332 1	Sept 1, 66	54,562 6	Sept 1, 67	27,193 2	Sept 2, 68	41,151 7
October	Oct 1, 64	102,788 6	Oct 1, 65	54,527 3	Oct 3, 66	76,962 8	Oct 2, 67	43,975 9		
November	Nov 3, 64	74,907 4	Nov 1, 65	92,934 8	Nov 1, 66	151,997 9	Nov 1, 67	82,349 4		
December	Nov 30, 64	145,007 2	Dec 1, 65	156,628 2	Dec 1, 66	211,906 4	Dec 1, 67	105,839 9		

SOURCE • STANDARDS DIVISION

CONVERSION TABLES (฿ 20 57 = \$ 1 00)  
 PRICES OF CORN (\$ 0486145 = ฿ 1 00)

Baht Per 60 479 Kgs 133 1/3 Lbs Picul	Dollars Per 100 Pounds	Dollars Per 56 Pounds Bushel	Dollars Per Metric Ton	Baht Per Metric Ton
9 00	328	184	7 23	148 82
9 50	346	194	7 64	157 08
10 00	365	204	8 04	165 35
10 50	383	214	8 44	173 62
11 00	401	225	8 84	181 89
11 50	419	235	9 24	190 15
12 00	438	245	9 65	198 42
12 50	456	255	10 05	206 69
13 00	474	265	10 45	214 96
13 50	492	276	10 85	223 22
14 00	510	286	11 25	231 49
14 50	529	296	11 66	239 76
15 00	547	306	12 06	248 03
15 50	565	316	12 46	256 29
16 00	583	327	12 86	264 56
16 50	602	337	13 26	272 83
17 00	620	347	13 67	281 10
17 50	638	357	14 07	289 36
18 00	656	368	14 47	297 63
18 50	675	378	14 87	305 90
19 00	693	388	15 27	314 17
19 50	711	398	15 67	322 43
20 00	729	408	16 08	330 70
20 50	747	419	16 48	338 97
21 00	766	429	16 88	347 24
21 50	784	439	17 28	355 50
22 00	802	449	17 68	363 77
22 50	820	459	18 09	372 04
23 00	839	470	18 49	380 31
23 50	857	480	18 89	388 57
24 00	875	490	19 29	396 84
24 50	896	500	19 69	405 11
25 00	912	510	20 10	413 38
25 50	930	521	20 50	421 64
26 00	948	531	20 90	429 91

Baht Per 60 479 Kgs 133 1/3 Lbs Picul	Dollars Per 100 Pounds	Dollars Per 56 Pounds Bushel	Dollars Per Metric Ton	Baht Per Metric Ton
26 50	966	541	21 30	438.18
27 00	984	551	21 70	446 45
27 50	1.003	561	22 11	454 71
28 00	1 021	.572	22.51	462 98
28 50	1 039	.582	22.91	471 25
29.00	1 057	592	23 31	479 52
29 50	1,076	602	23 71	487 78
30 00	1 094	613	14 12	496 05
30 50	1 112	623	24 52	504 32
31 00	1 130	633	24 92	512 59
31 50	1 149	643	25 32	520 85
32 00	1.167	653	25.72	529 12
32 50	1 185	664	26 12	537 39
33 00	1 203	674	26 53	545 66
33.50	1 221	684	26 93	553 92
34 00	1 240	.694	27 33	562 19
34 50	1 258	704	27 73	570 46
35.00	1 276	715	28 13	578 73
35 50	1.294	725	28 54	586 99
36.00	1 313	735	28 94	595.26
36 50	1,331	745	29 34	603 53
37 00	1,349	755	29 74	611 80
37 50	1,367	766	30 14	620 06
38 00	1 386	776	30.55	628 33
38 50	1 404	786	30.95	636 60
39 00	1 422	796	31 35	644 87
39.50	1 440	807	31 75	653 14
40.00	1.458	817	32 15	661 40
40 50	1 477	827	32 56	669 67
41.00	1 495	837	32.96	677 94
41 50	1 513	.847	33 36	686.21
42 00	1 531	858	33 76	694 47
42.50	1.550	868	34.16	702 74
43.00	1 568	878	34 57	711 01
43 50	1 586	.888	34 97	719 28
44.00	1 604	898	35 37	727.54
44 50	1 623	909	35 77	735 81
45 00	1 641	919	36 17	744.08
45 50	1.659	929	36 57	752 35
46 00	1 677	.939	36 98	760 61
46 50	1.695	.949	37 38	768 88

Baht Per 60.479 Kgs. 133 1/3 Lbs. Picul	Dollars Per 100 Pounds	Dollars Per 56 Pounds Bushel	Dollars Per Metric Ton	Baht Per Metric Ton
47 00	1.714	959	37 78	777 15
47 50	1 732	970	38 18	785 42
48 00	1 750	.980	38 58	793 68
48 50	1 768	990	38 99	801 95
49 00	1 787	1 000	39 39	810 22
49 50	1 805	1 011	39 79	818 49
50 00	1 823	1 021	40 19	826 75
50 50	1 841	1 031	40 59	835 02
51 00	1 860	1.041	41.00	843 29
51 50	1 878	1 052	41 40	851 56
52 00	1 896	1 062	41 80	859 82
52 50	1 914	1 075	42 20	868 09
53 00	1 932	1 082	42 60	876 36
53 50	1 951	1 092	43 01	884 63
54 00	1 969	1 103	43 41	892 89
54 50	1 987	1 113	43 81	901 16
55 00	2 005	1 123	44 21	909 43
55 50	2 024	1 133	44 61	917 70
56 00	2 042	1 143	45 02	925.96
56 50	2 060	1 154	45 42	934 23
57 00	2 078	1 164	45 82	942 50
57 50	2.096	1 174	46.22	950 77
58 00	2 115	1 184	46 62	959 03
58 50	2 133	1 194	47.02	967 30
59 00	2 151	1 105	47 43	975 57
59 50	2 169	1 215	47.83	983 84
60 00	2 188	1 225	48 23	992 10
60 50	2 206	1 235	48 63	1000 37
61 00	2 224	1 246	49 03	1008 64
61 50	2 242	1 256	49 44	1016 91
62.00	2 261	1 266	49 84	1025 17
62 50	2 279	1 276	50 24	1033 44
63 00	2 297	1 286	50 64	1041 71
63.50	2 315	1.297	51 04	1049 98
64.00	2 333	1 307	51 45	1058 24
64 50	2 352	1 317	51 85	1066 51
65 00	2 370	1 327	52 25	1083 05
66 00	2 406	1 348	53 05	1094 31
66 50	2 425	1 358	53 46	1099 58
67 00	2 443	1 368	53 86	1109 85

Baht Per 60.47 Kgs. 1.3 1/3 Lbs. Picul	Dollars Per 100 Pounds	Dollars Per 56 Pounds Bushel	Dollars Per Metric Ton	Baht Per Metric Ton
67 50	2 461	1 378	54 26	1116 12
68 00	2 479	1 388	54 66	1124 38
68 50	2 498	1 399	55 06	1132 65
69 00	2 516	1 409	55 47	1140 92
69 50	2 534	1 419	55 87	1149 19
70 00	2 552	1 429	56 27	1157 45
70 50	2 570	1 439	56 67	1165 72
71 00	2 580	1 450	57 07	1173 99
71 50	2 607	1 460	57 47	1182 26
72 00	2 625	1 470	57 88	1190 52
72 50	2 643	1 480	58 28	1198 79
73 00	2 662	1 490	58 68	1207 06
73 50	2 680	1 500	59 08	1215 33
74 00	2 698	1 510	59 48	1223 59
74 50	2 716	1 521	59 89	1231 86
75 00	2 735	1 531	60 29	1240 13
75 50	2 753	1 542	60 69	1248 40
76 00	2 771	1 552	61 09	1256 66
76 50	2 789	1 562	61 49	1264 93
77 00	2 807	1 572	61 90	1273 20
77 50	2 826	1 582	62 30	1281 47
78 00	2 844	1 593	62 70	1289 73
78 50	2 862	1 603	63 10	1298 00
79 00	2 880	1 613	63 50	1306 27
79 50	2 899	1 623	63 91	1314 54
80 00	2 917	1 633	64 31	1322 81
80.50	2 935	1 644	64 71	1331 07
81.00	2 953	1 654	65 11	1339 34
81 50	2 972	1 664	65 51	1347 61
82 00	2 990	1 674	65 92	1355 88
82 50	3 008	1 684	66 32	1364 14
83 00	3 026	1 695	66 72	1372 41
83 50	3 044	1 705	67 12	1380 68
84 00	3 063	1 715	67 52	1388 95
84 50	3 081	1 725	67 92	1397 21
85 00	3 099	1 736	68 33	1405 48
85 50	3 117	1 746	68 73	1413 75
86 00	3 136	1 756	69 13	1422 02
86 50	3 154	1 766	69 53	1430 28
87 00	3 172	1 776	69 93	1438 55
87 50	3 190	1 787	70 34	1446 82
88 00	3 209	1 797	70 74	1455 09

Baht Per 60.479 Kgs. 133 1/3 Lbs. Picul	Dollars Per 100 Pounds	Dollars Per 56 Pounds Bushel	Dollars Per Metric Ton	Baht Per Metric Ton
88 50	3 227	1 807	71 14	1463 35
89 00	3 245	1 817	71.54	1471.62
89 50	3 263	1 827	71 94	1479 89
90 00	3 281	1 838	72 35	1488 16
90 50	3 300	1 848	72 75	1496 42
91 00	3 318	1 858	73 15	1504 69
91 50	3 336	1 868	73 55	1512.96
92 00	3 354	1 878	73 95	1521.23
92 50	3 373	1 889	74 36	1529 49
93 00	3 391	1 899	74 76	1537 76
93 50	3 409	1 909	75 16	1546 03
94 00	3 427	1 919	75 56	1554 30
94 50	3 446	1 930	75 96	1562 56
95 00	3 464	1 940	76 37	1570 83
95 50	3 482	1 950	76 77	1579 10
96 00	3 500	1 960	77 17	1587.37
96.50	3 518	1 970	77 57	1595 63
97 00.	3 537	1 981	77 97	1603.90
97.50	3 555	3.991	78 37	1612.17
98 00	3 573	2 001	78 78	1620 44
98 50	3 591	2 011	79 18	1628.70
99.00	3.610	2 021	79 58	1636 97
99.50	3 628	2 032	79 98	1645 24
100 00	3 646	2 042	80 38	1653 51

	Total Day Matter Percent	Dig Protein Percent	Total Dig Nutrients Percent	AVERAGE TOTAL COMPOSITION				
				Protein	Fat	Fiber	N-Free Extract	Mineral Matter
Corn Flint	88.5	7 5	83 4	9 8	4 3	1 9	71 0	1 5
Corn Dent U S Grade 2	85 0	6 6	80 1	8 6	3.9	2 0	69 3	1 2
Comparison Flint - Dent	+3 5	+ 9	+3 3	+1 2	+ 4	- 1	+1 7	+ 3

Source

Feeds and Feeding  
Frawk B Morrison

#### D - Agribusiness

The real rate of growth of the economy has been estimated at 7.2 per cent per year since 1961. With population growing at 3.2 per cent per year, this means an impressive per capita growth of the economy at 4.0%. The share of agriculture of total gross national product has fallen from 38 to 32% between 1961 and 1966. Manufacturing has increased its share from 11.1 per cent to 12.8 per cent. The major emphasis of current industrial policy is "import substitution". Much of the growth of the domestic manufacturing sector has been in this direction.

The Northeast has some small agriculturally related industries

- 1 - Gunny Bags -- seven gunny bag factories in the NE of the total of 10 factories in Thailand. All but one of these are government owned, and all use locally grown kenaf and jute fibers. Gunny bags are now an export item.
- 2 - Cotton Ginning -- mainly located in the NE. They are small locally owned mills. They sell to the textile mills which are concentrated in the Bangkok area, but only about 1/3 of their production is of high enough quality for use in the textile industry.
- 3 - Oil -- small locally owned plants which produce oil for local consumption and for feed cake. They utilize, peanuts, rice, maize, and oil beans.

4 - Handicraft and cottage industry -- silk weaving, cotton weaving, ceramics, wood carvings, all these items are home industry type operations. Production is insufficient to satisfy large demand of foreign markets. The small production does satisfy the market for the tourist and foreigners who use them as gifts and souvenirs.

5 - Livestock and leather -- not highly developed, and all are small cottage industry type operations in the Northeast.

#### E - Livestock

##### 1 - Present

50 per cent of the total livestock production in Thailand is in the NE, an estimated 10,000,000 cattle and buffalo. The livestock are now used mainly for draft purposes. There is a government law which states that as long as an animal is good for draft purposes it cannot be slaughtered. Most of the farms in the NE have an average of 3 buffalos and some cattle and swine.

There are no commercial slaughter houses in the NE, due to the government monopoly and the tight controls and laws regulating the industry. In 1965, 521,784 cattle and buffalo were slaughtered in Thailand with the average price paid of 1200 baht per head. In this same year, 7,195 buffalo, and 67,570 cattle were slaughtered in the NE by individual farmers and by local shops. With government regulations prohibiting the transport of slaughtered meat over changwat lines, this indicates these slaughtered animals were consumed in the NE. Farmers keep animals 2 to 4 years before selling.

The main outlet for animals in the NE is the Central Plains 75 to 85% of the NE cattle are now shipped, or herded live to the Central Plains on a regular route The animals are inspected by government stations and are vaccinated before going into the Central Plains area

At this time, animals graze on the right of ways, forests, and harvested areas There are no improved pastures in the NE The pasture lands could be improved by the introduction of some hybrid grasses, i e Hybrid Napier and Coastal Bermuda Animal feeds now mainly consist of rice bran and broken rice, native grasses and rice stubble

By the use of feed grains the livestock production could be doubled within 12 months The feed grains are being exported at this time, and it would be more economical to use these grains as feed and ship the livestock The demand for animal feeds in 1965 was 25 thousand metric tons, and the estimated demand for prepared feeds by 1971 would be at least 1.9 times greater

Unless there is an increase in the livestock production by 1970 projected statistics indicate a deficit in livestock consumption supply

There are ten experimental animal husbandry stations in Thailand, six are located in the Northeast These stations help enforce the regulations which govern the export market, they govern the weight, immunization, health inspection of the livestock When animals are shipped from one changwat to another, or for export in the foreign market these regulations apply

## 2 - Potential

Demands for meat expect to multiply by 1 89 per cent per year by 1971

Per capita consumption for the NE population in the year 1967 was 315 0 grams of meat and 103 58 grams of poultry for each seven day period

Essential factors which are needed to expand the livestock programs to meet these demands

- a Increase the prices paid to the farmers
- b Availability of assured market outlets
- c A slaughterhouse established in the NE -- a possibility at Khon Kaen, since this is a rapidly developing area, centrally located, is also on the established direct flow pattern of the routes now used by the NE farmer for the shipment of their cattle and buffalos to the Central Plains market outlet The Central Plains depends on the NE as their source of draft animals
- d System of quality grade standards
- e Sale and purchase of live animals based on the animals weight and carcass grade
- f Sale of meats also based on the types of cuts and quality of carcass
- g Improved grazing lands
- h Education to the farmer in livestock production
- i Improved vaccination programs

An integrated program to include the growth of related industries, such as animal feed programs, food processing, slaughterhouse facilities, hides, will be stimulated by the improved livestock production programs

### 3 - Problems

- 1 Livestock controls -- government, these must be updated and improved
- 2 Lack of farmer incentive
- 3 Lack of education on the value and the expected income to be derived from livestock production
- 4 Lack of a slaughterhouse in the NE
- 5 Lack of good pasture
- 6 Lack of veterinarians and training in veterinary science -- it is not highly developed
- 7 Need of improvement in the experimental and also in the vaccination programs

### 4 - References

- 1 Library -- background of the livestock programs in Thailand
- 2 Animal Feed Report, Selected Industry Report -- PE Division
- 3 Livestock regulations -- #2 Alternate File NE Agribusiness Team
- 4 Report #10 1962, Livestock Trade in Thailand, Arb Nakajud, Kasetsart University.
- 5 Livestock prices -- #1 Alternate File, NE Agribusiness Team
- 6 Agricultural Statistics of Thailand 1965, Ministry of Agriculture
- 7 Survey of Buffalo in Thailand -- Kasetsart University.
- 8 Agricultural Development in Thailand -- Dr Patterson, Agriculture Division, USOM

**NOTES ON MARKET PRICES OF MEAT IN  
BANGKOK**  
Collected by Mario Laure - Agri-Business Advisor  
Checchi & Company Cont.  
May 1968

Locally produced pork, buffalo, beef and chicken meat is currently consumed by the Thai population in Bangkok. Pork meat is preferred by Thai people as well as lard is preferred to other vegetable oils.

Wholesale and Retail Prices in Bangkok

Kind of Meat	Wholesale Prices Baht/kg.	Retail Prices Baht/kg
<b>Pork</b>		
Fatty		13 00
Half fatty	10 20-11.00	15 00
No fat		20 00
<b>Buffalo</b>		
1st quality		12.00
2nd quality		14 00-16 00
<b>Beef</b>		
1st quality		14 00
2nd quality		18 00-20.00
<b>Chicken</b>		
Broilers	15.00	17 00
Capon	16.00-20 00	28 00
<b>Lard</b>	9 85	11 00-12 00
<p>Source Wholesale prices from the Daily Trade News - May 15-17, 1968 Retail Prices from direct interviews - May 21, 1968</p>		

Value of Imported Meat and Dairy Products

	Total CIF Value - 1,000 Baht			
	1963	1964	1965	1966
Animals alive for food	1,192	641	950	3,477
Meat fresh, chilled or frozen	5	24	26	1,520
Meat dried or salted	30	46	26	86
Meat canned	4,869	4,373	4,901	6,400
Milk and cream fresh	20,138	23,034	23,034	-
Milk and cream evaporated condensed or dried	447,929	461,456	442,456	435,704
Butter	6,143	9,714	22,508	49,642

Source Department of Custom

Frozen or chilled beef meat is imported in small quantity from the USA, Australia, New-Zealand and Switzerland for use mostly by foreigners. It is important to compare the value of meat imported with the value of dairy products imported. CIF average prices in 1966 for imported meat (best cuts) were

Imports from USA	฿ 73 40 per kg
" from Switzerland	฿ 67 70 " "
" from New Zealand	฿ 50 26 " "
" from Australia	฿ 48 98 " "

Retail prices in Bangkok for imported meat are between 80 to 120 Baht per kg

Bangkok May 23, 1968

#### IV MARKETING

Northeast Thailand does not have a stable and effective agricultural market system. It is a low volume/high cost/small unit situation.

The local market is an important factor in agricultural production, the farmers are now only producing enough to cover their financial needs. Market sales provide enough to satisfy the farmer, he is interested in growing a crop if he receives \$15 per rai. Market demands provide the incentive to produce the cash crop, he varies his crop from year to year according to the market situation, to insure himself of the required cash income to cover his subsistence level needs.

The home consumption market is satisfied for the NE farmer, he only sells 11% of his rice production which is the main crop produced in the Northeast. The outside--the farm--market is not satisfied at this time. There is no concentration of a particular crop in one specific area which will provide the production needed to support an industry or to promote a developed marketing system. The lack of high volume also increases costs on the transportation and storage handling. The majority of the farmers have small area holdings and are not achieving a high volume yield.

Market prices are based on Bangkok quotations. Local prices are determined by secondary dealers and are then made available to the local buyers. About

44% of the buyers are from the immediate vicinity of the farm, 56% are from the Changwad or Amphoe. The key person in the existing market system is the merchant or buyer in the local village.

The dealers who handle farm products in the NE are not independent and detached, but are closely attached to secondary dealers and to the dealers in Bangkok.

The development of the highway system in the NE has improved the market situation somewhat. Farmers will use busses, trucks and bikes to reach the market outlet. Many busses only charge 1 baht fares, and will allow the farmer to carry loads on the bus with him free of charge. The farmer will travel up to 120 km to a market. Sometimes dealers will purchase the crops on the farm and transport them to the village. Transportation costs influence the market prices received by the farmer.

Market outlets should provide for the farmer/producer,

- a Handling and distribution, the crops now sold by the farmer are surplus to the family needs. The rice sets the basic pattern of production and the other crops follow the same pattern.
- b Storage facilities, the storage facilities in the NE are limited, however, the low volume production does not merit more storage area at this time.
- c Grading, government controls of grading are not developed excepting for export crops.

- d Buyer, 13% of the NE farmers are generally obligated to sell their crops to the dealer who has extended the farmer his credit "Market prices" are left to be determined by the dealer at the time of the delivery The remainder of the farmers sell to buyers who come to them with offers
- e Timing of sale, the farmer cannot afford to hold crops for a higher price due to his pressing need for the cash income In addition he has no storage facilities available
- f Place of sale, the farmer is limited by the distances to the markets The poor road conditions, the high cost of the transportation all influence his profits

### Problems

- a Concentration of crops -- one area does not produce enough to guarantee a supply for an industry or a market under the present situation
- b Farmers vary crops yearly depending on the market demands and/or price paid for a crop.
- c Prices fluctuate so the farmer cannot plan on a definite price for his crop
- d There is no dependable source of market information available to the farmer
- e Farms are isolated from the market area or outlets

- f Lack of credit sources makes the farmer dependent upon the dealer who supplies most of the credit to the farmer The farmer is usually obligated to sell his crop to the dealer at prices which the dealer sets
- g. Lack of price differentiation for good quality discourages a market for production of top quality output
- h Increased production is not only dependent on the market but also other inputs
- i Cooperatives appear uneconomical and non-competitive with services offered by the dealers -- there is need for a cooperative which would offer a developed market system as an alternate market opportunity for the farmer
- j Farmer would like to have a 30 to 40% increase in income before he will adapt new methods for increased production

### Reference

- 1 NE Social and Economic Survey -- Department of Community Development
- 2 Agriculture Workers Survey -- Ministry of Agriculture
- 3 A study on Conditions and Trends of Agriculture Labor -- Kasetsart University
- 4 Labor Migration in Thailand -- ILO
- 5 Social and Economic Survey of Various Localities in the NE -- Department of Community Development

6. Department of Land Survey
7. Manpower Planning Division NEDB -- Translation 1968.
8. Memo -- Bailhe to Parsons May 1967 -- Thailand investment potential compared with other countries in the Far East
9. Agricultural Development in Thailand -- Thieme and Scoville 1964.
10. Maize Trends in Thailand -- Amnuay Viravan Team Leader -- Chulalongkorn University -- In Thai
11. Pa Mong Study
12. Economic Development of Agriculture -- Iowa State University Center
13. Getting Agriculture Moving -- Mosher

SOURCES OF MARKET INFORMATION  
TO NE FARMER

<u>Major Source</u>	<u>Frequency</u>
Radio	14%
Neighbors and Relatives	66%
Merchants	4%
Government Officials	14%
Newspapers	22%

## V. RESOURCES

### A - Land and Soil

The land area in the Northeast totals 106,391,250 rai, with farm holdings totaling 26,419,099 rai in 1963. This area was divided into 1,220,786 individual holdings averaging 21.64 rai each. Only 50% of the arable land is cultivated. Between 80 and 90% of the population is dependent on agriculture. The soils are generally unproductive, of a sandy texture, in need of fertilizers and soil conditioners.

98% of the farms are largely occupier - owner worked. This is a higher ratio than in any other area in the Kingdom of Thailand. The crop acreage has increased in the last 10 years -- rice has declined with the substitution of higher valued crops. The government is tolerant of the shifting cultivation. The diversified agricultural sector has had a growth rate of 4.5% per year.

The farmers will expand their holdings if acreage is available, and if the farmer has the incentive and the need. He will cash lease his land holdings for a maximum price of \$30 per acre depending on certain locations and the type of the land, on a short term lease, but is normally unwilling to sell his acreage.

Land development, and agricultural expansion have been encouraged by the development of the highway system. The agricultural development mainly

is a result from an increased acreage and expansion of the irrigation system. Land use is 10% in grass and right of way, 35% in predominantly cultivated area, 10% in partially cultivated area, 45% in forest lands. 50% of the arable land is cultivated, and of this area 85% is planted in rice, 15% in diversified crops. 20% of the cultivated land is irrigated.

The Northeast soils are generally unproductive

- a are sandy
- b are unproductive
- c are extremely hard due to constant rice growing
- d. are in need of fertilizers -- mainly potassium and nitrogen
- e are in need of lime
- f do not retain moisture to a very high degree
- g contain high percentage of quartz sand and salt
- h. large portion of the uplands too poor to produce crops
- i management problems, i.e. flood control, low water holding capacity, laterite pan formations, salinization through severe evaporation, severe erosion if natural vegetation is removed prior to rainy season

The BUREC team is doing research on the soils and land utilization of the area in the Pa Mong Study in connection with the irrigation project. This covers five million acres in Thailand, and Laos, with 4,600,000 acres within Thailand. This is a semi-detailed study, with sub-reconnaissance studies

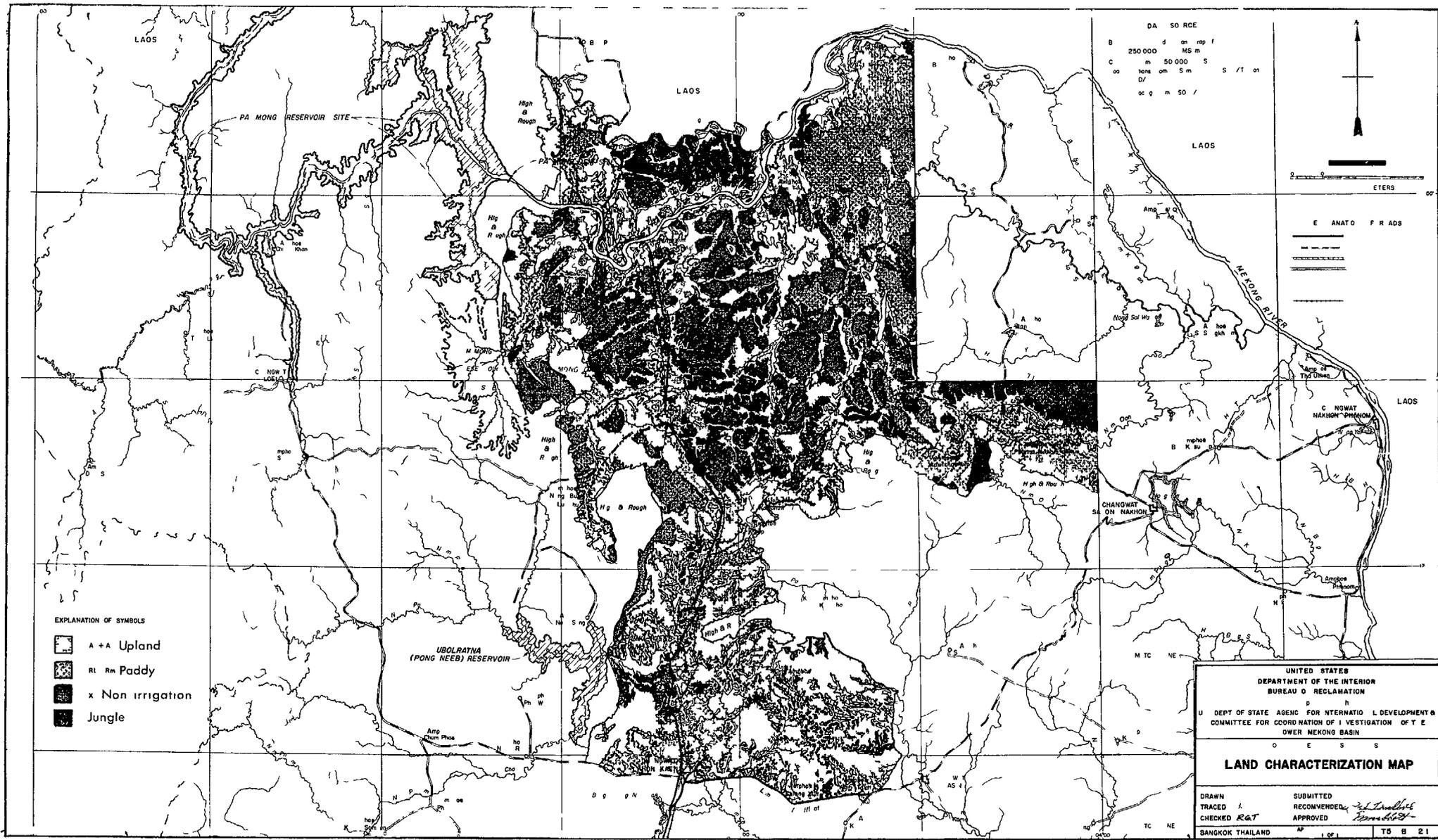
covering 75,000 acres in Phase I study. Sub-reconnaissance studies are the least detailed type of study, marking the areas potentially irrigable, paddy lands, cultivated lands, erosion, etc., but include classification of few soil samples.

### Potential

Soil fertility and soil structure could be improved. By improving the pasture areas by planting legumes, which replace the nitrogen in the soil, and also improve the structure of the land so moisture is retained, higher yields could be expected. Kasetsart University has done studies on this problem, and have reached results which indicate Townsville lucerne, a low cost, high protein legume would adapt well to the northeast area.

### Problems

1. Little is known about the soil and soil fertility in the NE, much more research on the soils is needed, and this in turn should be given to the farmers.
2. Soil moisture is not being utilized at this time, and farmers need more education about this factor.
3. Farmers will clear new land for use when production falls instead of improving the soils.
4. General lack of management, and little education available to the farmer.



EXPLANATION OF SYMBOLS

- A + A Upland
- Rl Rm Paddy
- x Non irrigation
- Jungle

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION

U S DEPT OF STATE AGENC FOR INTERNATIONAL DEVELOPMENT'S  
COMMITTEE FOR COORDINATION OF INVESTIGATION OF THE  
LOWER MEKONG BASIN

**LAND CHARACTERIZATION MAP**

DRAWN *[Signature]* SUBMITTED *[Signature]*  
TRACED *[Signature]* RECOMMENDED *[Signature]*  
CHECKED *[Signature]* APPROVED *[Signature]*

BANGKOK THAILAND 1 of 1 T5 B 2 I

66a

## Reference

- 1 Land Utilization of Thailand 1965, Ministry of Agriculture
- 2 Agricultural Statistics of Thailand, 1965, Ministry of Agriculture
- 3 Soil Studies, Dr F R Moorman, FAO Soil Scientist, Ministry of National Development, Study to be found in the USOM Technical Library
- 4 Pa Mong Study
- 5 Agriculture Development of Thailand, Scoville and Thieme USOM
- 6 Soil Studies and Trip Reports, Bordsen, Schott, Soil Advisors USOM Technical Library
- 7 Land Clearing Cost Study of Khon Kaen University Farm, Kasetsart University, Professor Lapp, 1967
- 8 Some Advantages of Improved Pastoral Farming to the Upland Areas of Northeast Thailand, and a Progress Report on Pasture Investigations at Khon Kaen University, Norman Mangnall, March 1968

## B - Electric Power

The Northeast is served by two hydroelectric generating plants, and many small individual diesel generating plants. Generating sources are currently operating at capacity. So far the power supply is keeping pace with the demands, but projections indicate a possible deficiency in the near future. Currently projected power demands/supply plans indicate that all future power requirements will be satisfied. The rates are slightly higher than the U.S. 1 1/2 cents per KW versus 1 cent per KW in the U.S.

Electric power has increased 20% per year over the past five years. As transmission lines are brought into the NE from Yan Hee Dam and from other developed sources, the existing small diesel plants will be used as standby systems for the rural areas. In 1965, there were 60 MW small diesel plant capacity, and PEA is not expanding these plants.

Nam Pong, located near Khon Kaen, hydroelectric plant has 25 MW capacity in 1966. Nam Pung located between Khon Kaen and Sakon Nakorn, has a 6 MW capacity. These are administered by NEEA. There were 129 communities in the NE supplied by 127 diesel plants. These plants contained 227 separate units -- 175 (77%) were 75 KW or less.

The total power generating facilities in Thailand amounts to slightly over 500 MW.

Power stations in the NE are administered by

PEA -- Provincial Electric Authority -- which distributes power and handles the generating and distribution from isolated diesel power plants, outside the Bangkok Metropolitan area

NEA -- National Energy Authority -- regulates functions, planning and development of energy sources, such as the Nam Pong and Nam Pong Hydroelectric plants

NEEA -- Northeast Electric Authority -- established for construction and operation of the Nam Pong and Nam Pong Dams and hydroelectric plants, and irrigation projects generating and transmission facilities

Privately owned diesel engine generating and distribution systems which operate under franchises granted by the Department of Public and Municipal Works

Rates in Thailand are slightly higher than in the U.S. with PEA rates in the Northeast slightly higher than the Metropolitan area of Bangkok. These rates are influenced by loan factors and other conditions. New average rates for MEA (Metropolitan Electric Authority) vary from a high of Baht 0 50 (2 5¢) to a low of Baht 0 281 (1 4¢). There is a charge of Baht 0 19 (0 95 ¢) for large consumption. See tables attached.

If an industrial company wishes to have a line run into a plant site, he must

pay for this line. Most areas in the NE would need a standby system at this time

### Potentials

In 1969 a 115 KV transmission line of 200 kilometers from Yan Hee Dam will expand the service in the NE. A gas turbine generating plant is to begin operation in 1968 in Korat.

The estimated electrical requirements for Central - North - Northeast areas in 1970 will be 3750 million Kwh. In 1965 this was 1166 million Kwh. This is an increase of about 25% over the years.

Pa Mong will provide from 3 to 5 million KW capacity in 1971 - 1976. This also -- via a transmission line and one substation -- will service Bangkok

### Problems

- 1 Power lack is caused by the lack of generating sources
- 2 Development plans in the Northeast are in the planning stage
- 3 Rates are still high, act as disincentive to big industrial users
- 4 Available service only reaches a limited amount of the population

### References

- 1 Thailand Electric Power Study, December 1966
2. Pa Mong Project Study

- 3 Plastics Machinery Industry of Thailand, December 1967
- 4 Industrial Development and Investment in Thailand, Ministry of Industry
5. MEA and PEA rate schedules

<u>Electric Rates</u>				
	<u>Monthly Bill</u>	<u>Per KWH</u>		
		<u>Amt</u>	<u>Index</u>	
<u>Commercial</u>				
6 KW - 750 KWH	485	BAHT 0 65	90	
12 KW - 1500 KWH	913	0 61	85	
30 KW - 6000 KWH	3240	0 54	75	
40 KW - 10,000 KWH	4940	0 49	68	
<u>Industrial</u>				
150 KW - 30,000 KWH	15900	0 53	74	
300 KW - 60,000 KWH	31250	0 52	72	
1000 KW - 200,000 KWH	96000	0 48	67	

PROVINCIAL ELECTRICITY AUTHORITY  
Residential Electric Rates

Schedule	Rates per month	Cost per Unit (Baht)		
		A Areas supplied with power Gen by YEA	B Areas supplied with power Gen LA & NEEA	C Areas supplied with power Gen by PEA
Residential Service	First 2 kwh or less (minimum charge)	4 00	4 00	4 00
	Next 3 - 50 kwh - per kwh	1 30	1 30	1 60
	51 - 100 kwh - per kwh	1 20	1 20	1 50
	101 - 200 kwh - per kwh	1 10	1.10	1 40
	201 - 300 kwh - per kwh	1 00	1 00	1 30
	401 and above per kwh	90	90	1 10
	Minimum bill	4 00	4 00	4 00

These rates are correct as of 8 21 69 They will be reduced 10 1 68 by reducing the 2nd block (3 - 50 kwh) from baht 1 3 to baht 1 2 All rates will be reduced a small amount.

PROVINCIAL ELECTRICITY AUTHORITY  
ELECTRIC RATES

Schedule	Rates per Month	Unit	Cost per Unit (Baht)		
			A Area supplied with power Gen. by YEA	B Area supplied with power Gen LA & NEEA	C Area supplied with power Gen. by PEA
1. A.B.C. Areas Business and Small Industry	First 100 kwh or less (Minimum charge)		90 00	90 00	120 00
	Next 101 - 1000 kwh	kwh	80	80	1 00
	Next 1001 - 5000 kwh	kwh	.70	70	90
	Next 5001 and over	kwh	65	65	80
	Next 3001 - 5000 kwh	kwh			80
	Next 5001 and over	kwh			70
	Minimum Bill		90.00	90.00	120 00
2. A.B.C. Areas Business and Industry consum- ing over 10,000 kwh monthly	1 - 10,000 kwh	kwh	65	65	
	1 - 20,000 kwh	kwh			70
	10,001 - 20,000 kwh	kwh	55	55	
	20,001 - 50,000 kwh	kwh			65
	20,001 and over	kwh	50	50	
	50,001 and over	kwh			60
3. A.B. areas Business and Industry	For power demands of 30 kw or more through a single meter of demand and energy at a delivery voltage of 3.5 kv and above				

Schedule	Rates per Month	Unit	A.	B	C
3. Continued	<u>Demand Charge</u>				
	First 50 kw	kw	45 00	45.00	
	Next 150 kw	kw	40 00	40 00	
	Over 200 kw	kw	35 00	35 00	
	- plus -				
	<u>Energy Charge</u>				
	First 50 kwh per kw	kwh	43	45	
	Next 150 kwh per kw	kwh	40	42	
Next 200 kwh per kw	kwh	32	34		
Over 400 kwh per kw	kwh	24	25		
4. C. Areas Business and Industry con- suming over 100,000 kwh monthly	A fixed rate of ₱ 0 50 per kwh is applied. If any monthly power consumption is lower than 100,000 kwh, the applied rate will be the following				0 50
	1 - 20,000 kwh	kwh			0 70
	20,001 - 35,000 kwh	kwh			0 65
	35,001 - 50,001 kwh	kwh			0 60
	50,001 and over	kwh			0 50
	If monthly power con- sumption is lower than 10,000 kwh, the rate schedule #2 (C) must be applied				

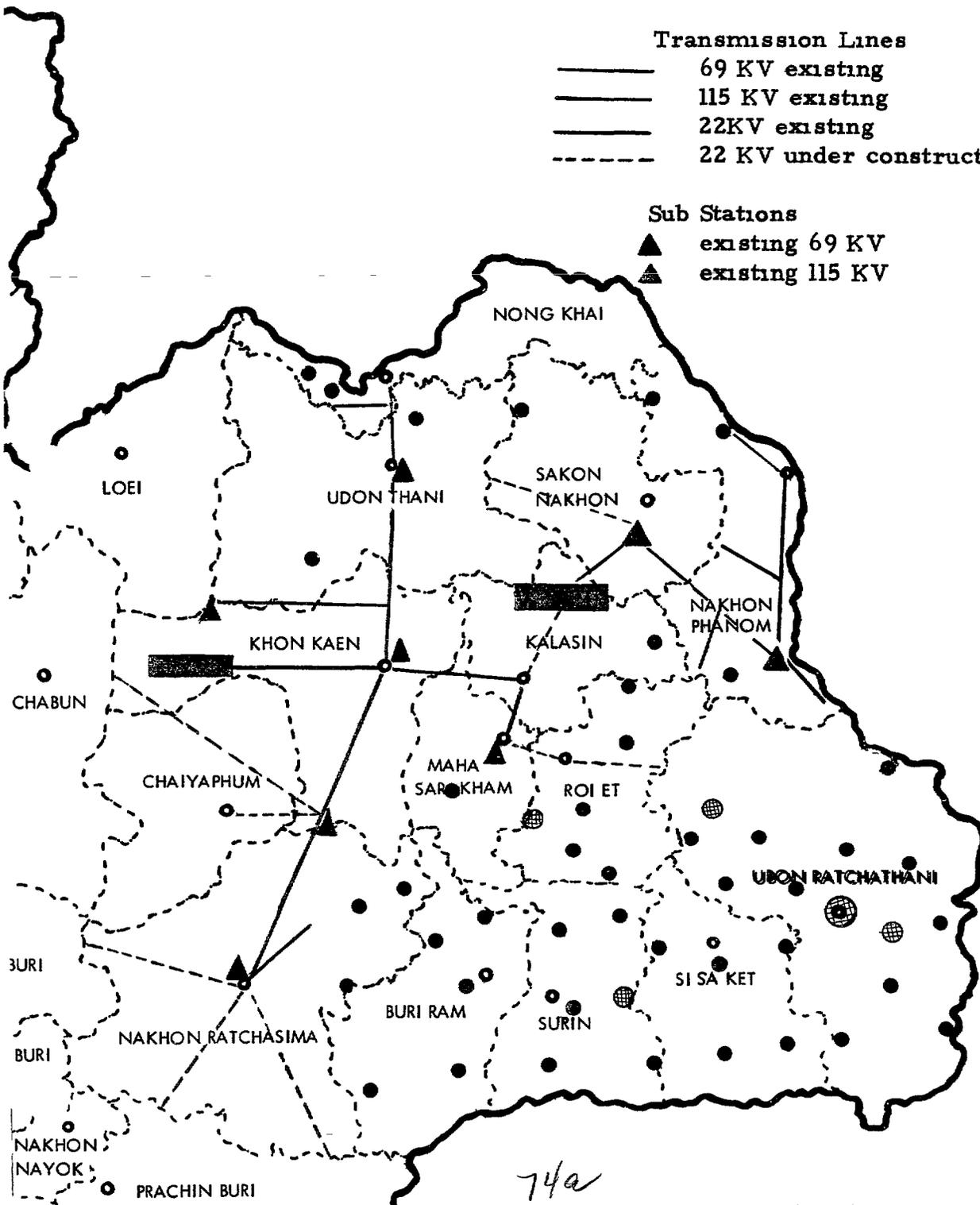
These rates will be lowered a slight amount on October 1, 1968.

MAP SHOWING NAM PONG AND NAMPUNG HYDROELECTRIC PLANT AND TRANSMISSION SYSTEMS - ALSO LOCATIONS OF DIESEL POW PLANTS OPERATED BY PEA. - August 1967

- Hydroelectric stations (N. E. E. A.)
- Diesel Electric Stations (P. E. A.)
- 100KW Generating capacity
- ⊙ 101-250 KW
- 250-1000 KW
- ⊙ over 1000 KW

- Transmission Lines
- 69 KV existing
  - 115 KV existing
  - 22KV existing
  - - - 22 KV under construction

- Sub Stations
- ▲ existing 69 KV
  - ▲ existing 115 KV



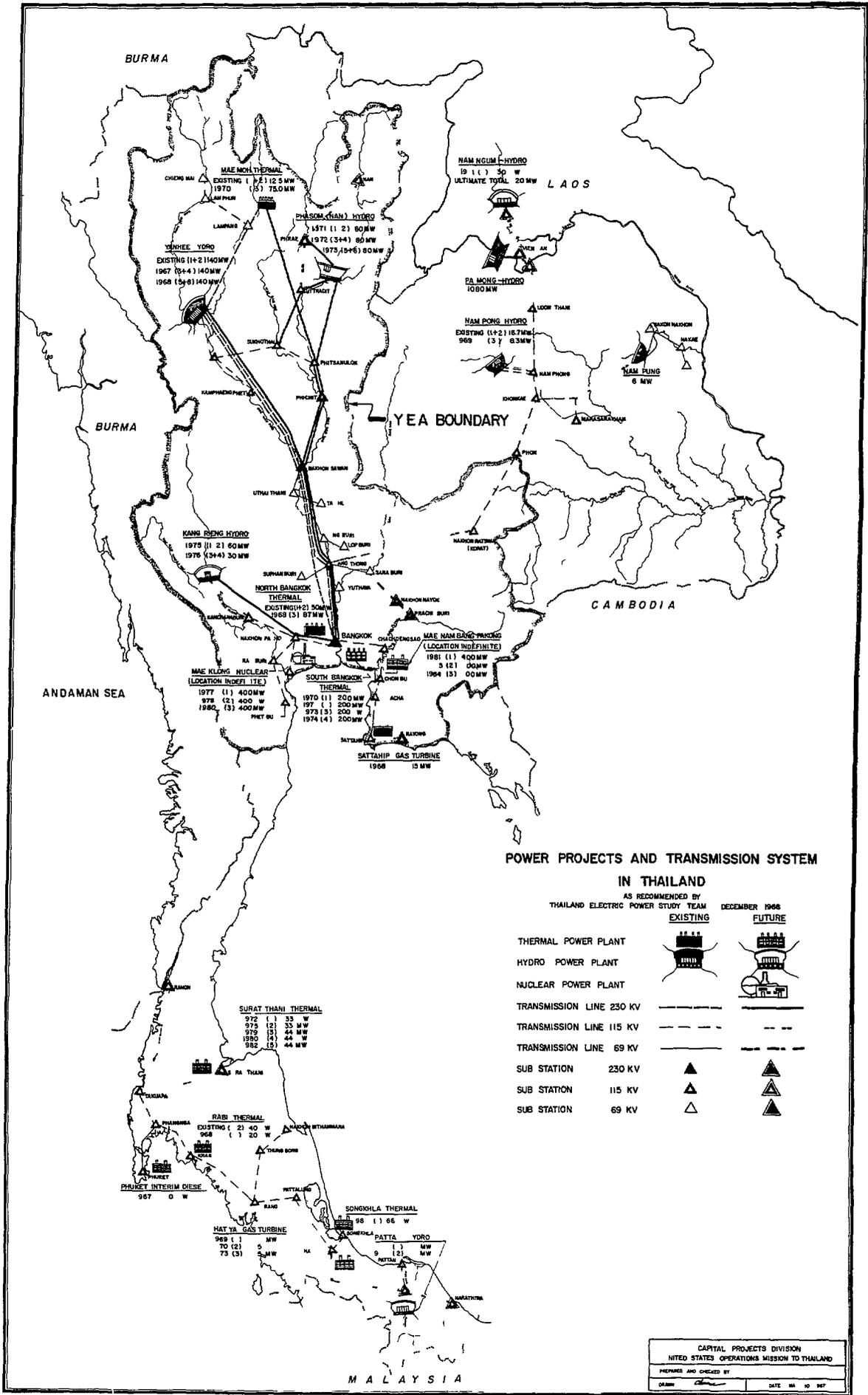
74a

## **C - Transportation**

The transportation system of Thailand is basically an adequate system. It consists of railroads -- 3491 kms, canals -- 3000 kms, concentrated mainly in the Central Plains area, highways -- 10,000 kmw, with an additional 1/3 of that amount planned in the next five years, air -- at least 20 cities receiving service by the Government owned Thai Airways within the borders of Thailand.

ARD/USOM has invested \$25,000,000 in the roads program in the past five years, mainly in the form of equipment. The Government has been concentrating on expanding the highway system in the past five years, and now the majority of the villages in the NE are connected directly or are at least accessible to the town/market outlet, with passable roads the major part of the year. At a construction rate of 1500 kms per year, all farm to market roads should be completed within the next five years.

Trucking facilities are available to all parts of the country and currently this is the best and the preferable means of transportation, especially in the NE regions. Costs are slightly higher than the US (attached table) but are now 75% less than before the development of the roads system. This has contributed about a 50% increase in the farm income in the NE and in many parts of Thailand. There are private trucking companies whose rates vary depending on the customer and the size of the load. Costs average about 2.0 cents per ton/mile. A 12 ton load would average about 800 to 1000



75a

CAPITAL PROJECTS DIVISION  
 UNITED STATES OPERATIONS MISSION TO THAILAND  
 PREPARED AND CHECKED BY  
 DATE 08 30 1967

1  
baht, but if only 1/2 the capacity of the truck were used, the net costs to the farmer or user would then increase about 50%

The government owned ETO has fixed prices and they are slightly higher than the private companies. All the port facilities are handled by the ETO, and it is required that cargo be handled by them at the ports.

There are two main ports in Thailand, Bangkok--Klong Toey, and a military port at Sattahib. There are two or three other smaller ports in the South. Costs at Sattahib are about \$2 per ton less than the ETO rates.

The rail system extends from Bangkok South to the Malaysian Border, North to the Burmese Border, Northeast to the Laos Border. Train service continues across the borders except at the Burmese border. Rail costs are slightly higher than in the US, namely, 1.7 cents per ton/mile up to 300 miles, 1.3 cents per ton/mile up to 1000 miles. The rail system is the second best service of transportation in Thailand.

The barges used on the canals in the Central Plains are an average of 1 meter draft, push type, individual or small group owned. Cost per ton/mile is not available. These are ideal for bulk loads--if the town or village is serviced by the canal. The delivery time is very uncertain. The Applied Science Corporation in cooperation with the University of Michigan is making a detailed study of the economics of Water Transportation in the Central Plains.

## Problems

- 1 The trucking system is not dependable daily delivery service, and is sometimes very slow making deadline deliveries.
2. Cost are higher than the US, but within reason due to Thailand conditions
- 3 ETO monopoly of port facilities increase the costs of handling.
4. Railway system will have to be expanded with further development reaching more areas.
5. Private trucking companies costs vary dependent upon the load and the customer.
6. Bad road and vehicle maintenance.
7. With improved operations the ports could double handling capacities.

## Reference

1. A Report on the Thailand Fertilizer Situation and Potential 1966, TVA Report.
2. Plastics Machinery Industry in Thailand, PE Division.
3. Cost - Benefit Study of Roads in the North and Northeast Thailand -- Yatsushiro
- 4 Statistical Yearbook 1965, NSO.

**FERTILIZER TRANSPORTATION COSTS  
BANGKOK TO NORTHEAST**

Area-Location	Distance Miles	Freight Rate Baht/ton		Freight Rate Baht/ton/mile	
		Rail ----	Truck	Rail ----	Truck
<b>Korat</b>	130	65	60	.500	461
<b>Khon Kaen</b>	310	108	125	348	.403
<b>Ubol</b>	429	121	183	282	426

**SCHEDULE OF RATES**

**TRANSPORT OF GENERAL CARGO**

<u>If Transport Distance is</u>		<u>Rate Per</u>	<u>Minimum Charge</u>
<u>Not Less Than</u>	<u>Or More Than</u>	<u>R/T per Km</u>	<u>per R/T</u>
0 01 km	3.00 km	₱ 5.00	₱ 10.00
3 01	6.00	3.00	15.00
6 01	20.00	1.50	18.00
20.01	50.00	1 10	30 00
50.01	150.00	.70	55 00
150.01	300.00	.50	105.00
300.01	500.00	40	150.00
500 01	1,500.00	.30	200.00

+

**VEHICLE DRIVE AWAY SERVICE**

	<u>Per Vehicle Per Km</u>	<u>Minimum</u>
a. Government furnished fuel and lubricants	₱ 2.00	₱ 60 00
b. Contractor furnished fuel and lubricants	2.00	60.00
1. vehicles - up to 8,000 lbs	2.00	60.00
2. vehicles - 8,000 to 24,000 lbs	3.00	90 00
3. vehicles - 24,000 to 40,000 lbs	5 00	150.00
4. vehicles - 40,000 to 60,000 lbs	7.00	210.00

**TRANSPORTATION**  
**Percentage of Costs to Farmer**

COMMODITY	POINT OF DELIVERY TO BUYER	
	On Farm	Off Farm
Rice	41.5	58.5
Fruits and Vegetables	17.8	82.2
Other Crops	48.1	51.9
Livestock	77.2	22.8

**MEANS USED BY FARMER IN DELIVERY**

Type of Transport	Amount
Truck	25 %
Bus	21 %
Car	12 %
Foot	10 %
Boat	2 %
Cart (oxen or buffalo drawn)	22 %
Bicycle and Misc.	3 %

95 % farmer paid for the transportation costs.

## TRANSPORTATION

	Unit	1966	Target 1971
<b>Highways</b>			
National highways	k. m	9,611	11,294
Provincial highways	k m	6,903	9,027
<b>Railways</b>			
Freight cars <sup>1/</sup>	number	8,200	8,396
Passenger cars <sup>1/</sup>	number	820	857
Diesel trains	set	10	48
Locomotives (diesel)	number	165	243
Passengers	1000 passen- ger-k m	2,932,000	3,399,000
Freight	1000 ton-k m	1,518,000	1,676,000

<sup>1/</sup> 1967-1971, not included 339 and 173 depreciated and replaced freight cars and passenger cars respectively.

Source NEDB

---

**D - Water - Irrigation**

Irrigation in the Northeast will double the amount of lands presently under cultivation and will also increase and encourage double cropping. There are 154 small tank projects in the Northeast with 37 used for irrigation. With the various irrigation projects there is a potential of 1 to 5 million acres from the Pa Mong project area, and about 200,000 acres from other projects in existence now, or under construction.

Rainfall in Thailand averages between 1000 to 1500 cm yearly, with the NE average 1300 cm. 80% of this rainfall is between the period of May to November.

The NE has two main rivers, the Mun and the Chee, which form the Maenam Mun and this river flows into the Mekong River at the southeastern corner of NE Thailand.

Thailand does not sell water, but the farmer pays a rice premium which contributes to the National Income. Construction and Maintenance costs for irrigation projects are paid for out of the National Budget.

Nong Wai Diversion Dam will be completed in 1968 - east canal, and 1971 - west canal. This will service 122,000 acres of land.

Lam Pao project will be completed in 1969, servicing 40,000 acres. There will be enough water to completely handle the requirements during the wet

season, but only 40% of the requirements during the dry season

Lam Pra Pierng Project will be completed in 1969, and will service 24,000 acres

Pa Mong Project will provide irrigation for 1 to 5 million acres but will not be finished until the late 1970's

Nam Pong is now complete and services 47,000 hectares or 116,090 acres

Nam Pung irrigates 8,000 hectares, or 19,760 acres, with water pumped from the Mekong River, and a gravity canal during the dry season irrigates 16,000 hectares or 39,520 acres This is now in use

Tank projects -- tanks irrigate about 55,000 hectares or 135,850 acres of land in the Northeast. These are small projects each from 50 to 3000 hectares, 123 5 to 7410 acres of land serviced with irrigation

The irrigation system project program in the NE is administered by the RID and the Ministry of National Development It is divided into three categories

- a - State projects which are federal financed and constructed and controlled.
- b - Peoples projects which are locally financed and constructed, but controlled by the government.

- c - Tank projects which are federally financed, but the operation and maintenance is locally controlled. These vary in size from 40 to 3000 hectares of land.

The tank projects program hope to ultimately have 1000 tanks in the NE, with a growth rate of 5 to 10 per year.

#### References

- 1 - Table of the total Water Resources in the NE Pa Mong Study, Volume 4, table A - IV 44
- 2 - Pa Mong Study
- 3 - Electric Power Study of Thailand
- 4 - ARD reports.

WATER RESOURCES DEVELOPMENT  
NE THAILAND

<u>Kind</u>	<u>No. of Projects</u>	<u>Total Storage Capacity CuMeter (acre-feet)</u>	<u>Hectares</u>	
			Now-----	Potential
Tank Projects	140	357,117,304 (289,515)	50,745	61,721
State Irrigation Projects	9	diversion		106,230
People's Irrig Projects	6	diversion		2,800
Storage Dams Developed under State Irrigation Project Law	3	840,000,000 (680,000)	40,800	60,240
TOTAL NE	160	1,830,117,305	91,545	285,911

Of this total, 107 projects are supplying varying amounts of water for irrigation.

A total of 160 projects have been completed or are under construction. A combined reservoir capacity of 1,500 million acres--feet 91,545 hectares now irrigated, potential of about 286,000 hectares with full development

Summary of Irrigation Development, Northeast Thailand  
by type, basin, province, and total for region

Basin & Project	Province	Type	Pur- poses served	Capacity in Million Meters <sup>3</sup>	Irrigation Area		Construction Year		Canal System Under Con- struction (1968)
					Wet Season Ha	Dry Season Ha	Started	Completed or Comple- tion ex- pected	
<u>Mekong River Basin</u>									
Mekong Valley	Nong Khai	State Irri- gation project	F,C	-	10,240	-	1939	1955	-
Nam Man	Loei	"	I	-	880	-	1939	1954	-
Huai Luang	Udon Thani	"	I	-	6,400	-	1939	1956	-
Huai Pla Hang	Sakon Nakon	"	I	-	6,400	-	1950	1961	-
Nam Oon	" "	"	C,I,F	520	27,200	10,080	1967	(1971)	27,200
Basin Sub-total:				520	51,120	10,080			27,200
<u>Chi River Basin:</u>									
Bantum - Bantui	Mahasara- Kham	"	F,C	-	4,640	-	1939	1955	-
Thung-Saeng- badan	Roi Et	"	F,C	-	28,800	-	1939	1955	-
Lam Pao, 1st stage	Kalasin	"	C,I,F	1,260	16,000	40,640	(1963	(1968)	16,000
Lam Pao, 2nd stage	Kalasin	"	I	-	38,080	-	(1968	(1971)	38,080
Nam Pong(Nong Wai), 1st stage:	Khon Kaen	"	C,I,F	-	35,200	-	1965	(1971)	35,200
<u>Mun River Basin:</u>									
Lam Takong	Nakhon Ratchasima	"	C,I,F	310	33,600 <sup>1/</sup>	24,000	1964	1969	-
Lam Phra Ploeng	" "	"	C,I,F	152	10,640	5,280	1963	(1968)	5,840
Huai Saneng	Surin	"	I	-	7,390	-	1939	1959	-
Basin Sub-total:				462	51,630	29,280			5,840
Sub-total for Northeast Region				2,242	225,470	80,000			122,320

Summary of Irrigation Development, Northeast Thailand ... (Continued)

Basin & Project	Province	Type	Pur- poses served	Capacity in Million Meters <sup>3</sup>	Irrigation Area		Construction Year		Canal System Under Con- struction (1968) ex- pected
					Wet Season Ha.	Dry Season Ha.	Started	Completed or comple- tion ex- pected	
<u>Chi River Basin:</u>									
Rong Kut Oh	Kalasin	Peoples Irriga- tion Projects	C	-	400	-	1949	1949	-
Huai Sangkeap Thung Phung Phut	" Khon Kaen	" "	C C	- -	400 480	- -	1950 1952	1952 1952	- -
Basin Sub-total				-	1,280	-			-
<u>Mun River Basin:</u>									
Huai Ari	Surin	Peoples Projects	C	-	320	-	1950	1950	-
Installation of 10 pipes Reg. Sung Noen	Nakhon Ratcha- sima "	" "	C I	- -	- 960	- -	1950 1953	1950 1960	- -
Lam Takut	"	"	I	-	240	-	1949	1950	-
Basin Sub-total				-	1,520	-			-
Sub-total for Northeast Region				-	2,800	-			-
<u>Tanks Completed: to the end of 1967</u>									
Nong Kok	Nakhon Ratchasima	Tank	I	2,083	142	-	1951	1953	

Summary of Irrigation Development, Northeast Thailand ... (Continued)

Basin & Project	Province	Type	Pur- poses served	Capacity in Million Meters <sup>3</sup>	Irrigation Area		Construction Year		Canal System Under Con- struction (1968)
					Wet Season Ha.	Dry Season Ha.	Started	Com- pleted or comple- tion ex- pected	
Bung Ta Lua	Nakhon Ratchasima	Tank	M	1.402	For Domes -tic Use	-	1951	1951	-
Huai Yang	"	"	I	5.540	544	-	1951	1956	-
Bung Kraton	"	"	I	7.656	464	-	1952	1952	-
Bung Thanonhak	"	"	I	0.656	65	-	1952	1952	-
Nong Nae	"	"	M	0.809	For Domes -tic Use	-	1953	1954	-
Nong Bua	"	"	M	0.234	" "	-	1953	1953	-
Huai Nam Khem	"	"	I	0.584	128	-	1953	1953	-
Huai Sakat	"	"	I	3.579	480	-	1953	1956	-
Nong Pru	"	"	M	0.062	For Domes -tic Use	-	1954	1954	-
Bung Nong Khu	"	"	M	0.355	" "	-	1955	1955	-
Huai Ban Yang	"	"	I	6.520	816	-	1957	1958	-
Bung Bua Yai	"	"	M	0.500	For Domes -tic Use	-	1957	1957	-
Huai Sap Wai	"	"	M	0.080	" "	-	1960	1960	-
Than Asok	"	"	I	3.602	480	-	1960	1960	-
Thakoengphon	"	"	M	1.175	For Domes -tic Use	-	1961	1961	-
Lam Chamuak	"	"	I	23.445	1,600	-	1962	1963	-
Nong ThaloK	Buri Ram	"	I	2.766	336	-	1951	1952	-
Nong Ta Mu	"	"	I	0.226	15	-	1952	1952	-
Huai Noi	"	"	I	1.201	130	-	1952	1953	-
Huai Talat	"	"	I	19.178	2,240	-	1953	1956	-
Huai Yai	"	"	I	1.315	168	-	1952	1957	-
Thung Laem	"	"	M	0.172	For Domes -tic Use	-	1958	1958	-
Huai Khinu	"	"	I	1.599	101	-	1961	1961	-
Huai Charakhe Mak	"	"	I	21.226	2,000	-	1962	1962	-
Nong Pla Thao	Chaiyaphum	"	I	0.355	20	-	1951	1951	-
Huai Thong Lang	"	"	I	0.288	23	-	1951	1951	-
Basan	"	"	I	0.354	40	-	1952	1956	-
Hin Lap Mit	"	"	I	0.482	28	-	1953	1953	-
Nong Phak Pang	"	"	M	0.147	For Domes -tic Use	-	1959	1959	-
Huai Sam Poi	"	"	I	7.647	800	-	1952	1961	-
Nong Bua Khok	"	"	M	0.117	For Domes -tic Use	-	1961	1961	-

## Summary of Irrigation Development, Northeast Thailand ... (Continued)

Basin & Project	Province	Type	Pur- poses served	Capacity in Million Meters <sup>3</sup>	Irrigation Area		Construction Year		Canal System Under Con- struct (1968)
					Wet Season Ha.	Dry Season Ha.	Started	Com- pleted or comple- tion ex- pected	
Huai Nam Thiang	Udon Thani	Tank	I	0.190	51	-	1951	1951	-
Sok Nam Khao	"	"	I	0.467	237	-	1951	1951	-
Nong Bo	"	"	I	0.593	240	-	1952	1952	-
Nong Ta Kai	"	"	I	0.788	235	-	1952	1952	-
Nong Sam Rong	"	"	I	2.802	352	-	1952	1952	-
Nong Pa Kho	"	"	I	3.077	800	-	1953	1953	-
Nong Prachak	"	"	M	0.998	For Domes- tic Use	-	1953	1953	-
Nong Khon Kwang	"	"	M	0.643	"	-	1953	1953	-
Nong On	"	"	I	0.308	160	-	1953	1956	-
Nong Hua Taek	"	"	M	0.101	For Domes- tic Use	-	1953	1953	-
Lam Pla Khao	"	"	I	0.393	48	-	1953	1957	-
Sok Rang	"	"	I	0.430	38	-	1953	1957	-
Kud Ling Ngor	"	"	I	5.440	1,216	-	1956	1961	-
Huai Sai Sawang	Sakon Nakhon	"	I	1.283	496	-	1952	1955	-
Phu Phek	"	"	I	2.708	640	-	1952	1956	-
Huai Pong	"	"	I	1.630	128	-	1952	1953	-
Huai Sai Khamin	"	"	I	2.402	768	-	1953	1956	-
Nong Bua	"	"	I	0.198	20	-	1953	1953	-
Huai Nam Bo	"	"	I	2.200	576	-	1964	1964	-
Nong Song Hong	Nong Khai	"	I	0.380	67	-	1951	1952	-
Huai Pleow Nguak	"	"	I	2.752	1,328	-	1953	1956	-
Huai Bang Phuan	"	"	I	10.071	960	-	1956	1962	-
Phu Kratae	Nakhon Phanom	"	I	0.203	43	-	1951	1951	-
Rong Krabao	"	"	I	0.348	191	-	1952	1953	-
Nong Yat	"	"	I	6.797	792	-	1953	1953	-
Huai Chiang Yun	"	"	I	0.344	224	-	1953	1953	-
Huai Som Hong	"	"	I	2.424	1,600	-	1956	1958	-
Bung Mo	"	"	M	0.343	F.D.U.	-	1957	1958	-
Huai Si Khun	"	"	I	1.806	1,056	-	1956	1959	-
Huai Khilek	"	"	I	26.986	2,400	-	1964	1965	-
Nong Bua	Mahasara- kham	"	I	2.549	712	-	1951	1956	-
Nong Bo	"	"	I	0.967	352	-	1951	1951	-
Kaeng Loeng Chan	"	"	I	6.063	1,008	-	1951	1953	-
Eksatt Sunthon	"	"	I	1.174	320	-	1952	1952	-
Nong Hai	"	"	I	2.022	160	-	1952	1956	-
Nong Kae Dam	"	"	I	1.276	240	-	1953	1953	-
Nong Khu Khat	"	"	I	0.368	72	-	1953	1953	-

## Summary of Irrigation Development, Northeast Thailand ... (Continued)

Basin & Project	Province	Type	Pur- poses served	Capacity in Million Meters <sup>3</sup>	Irrigation Area		Construction Year		Canal System Under Con- struction (1968)
					Wet Season Ha.	Dry Season Ha.	Started	Com- pleted or comple- tion ex- pected	
Nong Waeng Noi	Mahasarakham	Tank	M	0.385	For Domes- tic Use	-	1953	1953	-
Rong Hua Chang	"	"	I	1.291	512	-	1953	1954	-
Nong ChokKhwang	"	"	I	1.284	1,744	-	1953	1956	-
Huai ChiangKham	"	"	I	5.067	512	-	1953	1956	-
Huai Kha Khang	"	"	I	4.126	1,280	-	1956	1957	-
Huai Pra Du	"	"	I	2.804	320	-	1957	1959	-
Nong Kra Thum	"	"	I	2.528	400	-	1958	1959	-
Nong Thewarat	"	"	I	1.457	.64	-	1964	1964	-
Nong Mun Than	Roi Et	"	M	0.041	For Domes- tic Use	-	1951	1951	-
Nong Ya Ma	"	"	I	2.117	512	-	1951	1952	-
Nong Phu	"	"	I	4.178	192	-	1952	1952	-
Thawatchai	"	"	I	3.013	752	-	1952	1952	-
Nong Waeng	"	"	I	0.458	144	-	1953	1956	-
Huai Kut Daeng	"	"	I	2.806	784	-	1953	1953	-
Nong Tha Chok	"	"	I	0.809	480	-	1953	1956	-
Huai Kut Khaen	"	"	I	1.996	560	-	1953	1953	-
Huai Laeng	"	"	I	5.075	522	-	1958	1959	-
Huai Aeng	"	"	I	21.890	3,040	-	1963	1964	-
Huai Chan Tai	"	"	I	4.959	640	-	1965	1965	-
Nong Ma Chok	Kalasin	"	I	1.070	192	-	1951	1951	-
Huai Pho	"	"	I	2.465	458	-	1952	1953	-
Bung Aram	"	"	I	2.517	384	-	1952	1952	-
Nong Ya Ma	"	"	I	2.559	608	-	1953	1956	-
Nong Ban Sa	"	"	I	0.555	80	-	1953	1953	-
Rong Kaset	"	"	I	0.231	26	-	1953	1953	-
Huai Si Thon	"	"	I	5.890	1,760	-	1957	1959	-
Huai Phung	"	"	I	4.150	880	-	1965	1966	-
Huai Fa	"	"	I	6.422	1,280	-	1965	1966	-
Huai Kaeng	"	"	I	27.448	2,400	-	1966	1966	-
Huai Wang Daeng	Ubon Rat- chathani	"	I	0.496	304	-	1951	1952	-
Nong Lao Hin	"	"	I	1.673	160	-	1951	1951	-
Rong Nam Sap	"	"	I	0.423	207	-	1952	1956	-
Huai Pho	"	"	I	5.392	1,093	-	1952	1956	-
Setseni	"	"	M	0.183	For Domes- tic Use	-	1953	1953	-
Nong Chang Yai	"	"	I	7.680	1,200	-	1953	1954	-
Nong Bua	"	"	M	0.127	For Domes- tic Use	-	1953	1954	-
Sra Saming	"	"	I	1.011	347	-	1953	1954	-

Summary of Irrigation Development, Northeast Thailand ... (Continued)

Basin & Project	Province	Type	Pur- poses served	Capacity: in Million Meters <sup>3</sup>	Irrigation Area		Construction Year		Canal System Under Con- struction (1968)
					Wet Season Ha.	Dry Season Ha.	Started	Com- pleted or comple- tion ex- pected	
Huai Muang	Ubon Rat- chathani	Tank	M	0.602	For Domes- tic Use	-	1953	1954	-
Huai Wang Nong	"	"	I	1.260	48	-	1959	1959	-
Phuttha Uthayan	"	"	I	15 339	2,560	-	1957	1963	-
Suwanapha	Surin	"	I	1.073	376	-	1951	1951	-
Am Pun	"	"	I	3.728	1,072	-	1952	1956	-
Lung Pung	"	"	I	0.780	102	-	1953	1956	-
Nong Ka	"	"	I	1.053	91	-	1953	1956	-
Huai Rahan	"	"	I	1.103	64	-	1956	1956	-
Nong Sala	"	"	M	0.060	For Domes- tic Use	-	1953	1953	-
Nong Kra Thum	"	"	M	0.540	" "	-	1957	1957	-
Ban Sakon	"	"	M	0.044	" "	-	1959	1959	-
Lam Phok	"	"	I	13.267	1,280	-	1953	1961	-
Lum Phuk	"	"	I	0.364	27	-	1959	1962	-
Huai Kaeo	"	"	I	13.328	1,152	-	1965	1965	-
Huai Nam Kham	Si Sa Ket	"	I	1.010	95	-	1951	1951	-
Nong Sa-ang	"	"	I	0.876	19	-	1952	1953	-
Huai San	"	"	I	2.706	512	-	1952	1954	-
Huai Nam Khem	"	"	M	1.069	For Domes- tic Use	-	1953	1954	-
Huai Pun	"	"	M	0.152	" "	-	1953	1954	-
Huai Khla	"	"	I	3.784	752	-	1956	1958	-
Huai Sieo	Khon Kaen	"	I	1.167	544	-	1951	1951	-
Huai Yang	"	"	I	1.098	187	-	1951	1951	-
Sok Ruak	"	"	I	0.777	368	-	1951	1953	-
Tha Phra	"	"	M	1.579	For Domes- tic Use	-	1955	1955	-
Huai Yai	"	"	I	0.481	224	-	1952	1953	-
Nong Na Wua	"	"	I	1.391	58	-	1952	1954	-
Kok Muang	"	"	I	0.488	256	-	1953	1954	-
Nong Hua Chang	"	"	M	0.209	For Domes- tic Use	-	1953	1953	-
Sok Sam-ang	"	"	I	0.071	11	-	1953	1953	-
Nong Waeng Noi	"	"	M	0.208	For Domes- tic Use	-	1953	1953	-
Nong Chong Maeo	"	"	M	0.120	" "	-	1954	1956	-
La Loeng Wai	"	"	I	2.800	560	-	1958	1958	-
Huai Sai	"	"	I	2.355	176	-	1963	1964	-
Huai E-Loet	Loei	"	I	1.431	352	-	1951	1953	-
Huai Nam Wak	"	"	I	0.664	159	-	1951	1951	-
Huai Noi	"	"	I	0.426	112	-	1951	1951	-
Huai Nam Phao	"	"	I	1.364	781	-	1952	1956	-
Huai Yang	"	"	I	3.500	208	-	1966	1966	-
Grand Total				427.809	2/64,203	(22,400)			

Summary of Irrigation Development, Northeast Thailand ... (Continued)

Basin & Project	Province	Type	Pur- poses: served	Capacity: in Million Meters <sup>3</sup>	Irrigable Area		Construction Year		Canal System Under Con- struction (1968)
					Wet Season Ha.	Dry Season Ha.	Started	Completed or comple- tion ex- pected	
<u>Tank project under construc- tion</u>									
Lam Sam Lai	Nakhon Ra- tchasi	Tank	I	39.804	1,600	-	1966	1968	-
Huai Kan Luang	Nakhon Phanom	"	I	5.908	960	-	1967	1968	-
Huai Khaen	"	"	I	11.095	560	-	1968	1968	-
Huai Kan Luang	Sakon Nakon	"	I	8.095	1,280	-	1967	1968	-
Huai Suang	"	"	I	6.054	1,120	-	1968	1968	-
Huai Sa Thot	Kalasin	"	I	10.000	1,280	-	1967	1968	-
Huai Sai Na Wiang	"	"	I	0.750	44	-	1968	1968	-
Huai Kho	Mahasara kham	"	I	27.000	4,000	-	1968	1969	-
Huai Toei	Khon Kaen	"	I	2.705	400	-	1968	1968	-
Huai Haeo	Loei	"	I	2.573	240	-	1968	1968	-
Lam Choraka	Chaiyaphum	"	I	10.532	960	-	1968	1969	-
Huai Sam	Nong Khai	"	I	1.500	128	-	1968	1969	-
Sub-total gravity				<u>126.567</u>	<u>12,570</u>	-			-
Total all/projects completed or under construc- tion N.E. Region:				2,796.376	305,043	102,400	-	-	-
<u>Pump Irrigation for Rice Irriga- -tion outside irrigated areas in 1967</u>									
	Nakhon	-	I		526	-			
	Ratchasima				636	-			
	Khon Kaen				471	-			
	Udon Thani				26,383	-			
	Nong Khai				1,146	-			
	Kalasin				736	-			
	Roi Et								



Summary of Irrigation Development, Northeast Thailand

Completed to the end of 1967 and under construction in 1968

Project	Capacity	Irrigable	Area
	(Mill. M <sup>3</sup> )	Wet (Ha.)	Dry (Ha.)
Total State Irrigation (12 Projects)	2,242,000	225,470	80,000
Total Peoples Irrigation ( 6 Projects)	-	2,800	-
Total Tanks in N.E. Completed to the end of 1967 (144 Tanks)	427.809	64,203	22,400
Total Tank Projects under construction (12 Tanks)	126.567	12,570	-
Total Pump Irrigation	-	30,632	-
Total	<u>2,796 376</u>	<u>335,675</u>	<u>102,400</u>

HIGHEST WIND VELOCITY IN THAILAND

PERIOD 1937 - 1965

Station	Knots	Kms/h	Miles/h	Dir.	Month	Date	Time	Year	Observation for
Pai	20	37.1	23.0	NW	Feb.	12, 13	-	1959	1958-1963 only
Khunyuam	32	59.3	36.9	N	May	15	-	1960	1959-1963 only
				S	Aug	14	-	1961	
				S	Jul.	15	-	1962	
				S	Sep.	19	-	1962	
Chiang Rai	63	116.8	72.5	NW	May	18	1915-2015	1959	
Chiang Mai	63	116.6	72.5	SE	Apr	22	-	1964	
Mae Hong Son	60	111.2	69.1	W	May	26	-	1957	
Mae Sariang	60	111.2	69.1	W	May	7	-	1960	
Nan	63	116.8	72.5	W	May	13	-	1952	
Lampang	70	130.0	80.6	WNW	Mar	28	1925	1958	
Phrae	68	126.0	78.3	S	Apr.	16	-	1958	1952-1965
Uttaradit	36	66.7	41.5	NE	Jan	9	-	1955	
Mae Sot	40	74.1	46.1	W	Feb.	26	-	1965	
				E	Apr.	26	-	1961	
Phetchabun	45	83.4	51.8	S,W	May	17	-	1963	
Phitsanulok	50	92.7	57.6	W	Apr	25	1550-1700	1956	

Station	Knots	Kms/h	Miles/h	Dir	Month	Date	Time	Year	Observation for
Nakhon Sawan	70	129.7	81.1	S	May	3	-	1952	
Lop Buri	52	96.4	59.9	NE	Feb	13	-	1962	
Tak	55	101.9	63.3	NW	May	1	-	1955	1954-1965
Bhumibol Dam	27	50.0	31.1	SW W	Mar. May	14 8	- -	1960 1960	1959-1965
Kanchanaburi	55	101.9	63.3	SW	Jul.	16	-	1964	
Suphan Buri	45	83.4	51.8	E	Apr.	13	-	1952	
Don Muang	65	120.5	74.9	SE	Apr.	17	1605	1960	
Bang Khen	50	92.7	57.6	ENE	Apr	13	-	1952	
Phra Nakhon	56	103.0	64.5	E	Apr	13	-	1952	
Aranyaprathet	41	76.0	47.2	W	Jul	11	-	1962	
Prachin Buri	55	101.9	63.3	ESE NW	Mar. Jun	12 20	- -	1963 1963	
Pom Phrachun	44	81.5	50.7	NW	May	20		1963	1958-1965
Chon Buri	64	118.6	73.7	SW	Jun	18	-	1944	
Koh Sichang	40	74.1	46.1	W	Jun.	10	-	1963	1958-1965
Sattahip	73	136.0	84.1	NNW	Nov.	14	0008	1956	
Chanthaburi	65	120.5	74.9	S	Mar.	31	1250	1959	
Khlong Yai	55	101.9	63.3	NW	Jun	28	1035	1949	

Station	Knots	Kms/h	Miles/h	Dir.	Month	Date	Time	Year	Observation for
Loei	47	87.1	54.1	W	Apr.	22	-	1963	1954-1965
Udon Thani	63	116.8	72.5	NE	May	11	2230	1945	
Sakon Nakhon	50	92.7	57.6	W	Apr	12	1720	1955	
Surin	50	92.7	57.6	WNW	Aug	18	-	1962	
Nakhon Ratchasima	54	100.0	62.2	SE	Oct	14	-	1962	1956-1965
Sutmuang	33	61.2	38.0	E	May	1	-	1961	
Ubon Ratchathani	68	126.0	78.3	S	Aug	27	-	1957	
Roi Et	36	66.7	41.5	N S NE	Apr May Aug	28 18 8	- - 1415	1957 1960 1958	
Chaiyaphum	39	72.3	44.9	S,NW N,SW E	Apr Mar Mar	11,14,27 15,23 28	- - -	1960 1962 1963	1956-1965
Khon Kaen	55	101.9	63.3	W	Jul	14	-	1961	
Mukdahan	80	149.0	92.1	WSW	Apr	4	1912-1920	1965	
Nakhon Phanom	50	92.7	57.6	W	Feb	28	1600	1954	
Hua Hin	50	92.7	57.6	ESE W	Apr. Jul.	9 30	- -	1949 1951	
Prachuap Kiri Khan	45	83.4	51.8	E,SE	Mar.	22	-	1952	
Chumphon	47	87.1	54.1	E W	Oct May	26 27	- -	1962 1959	

Station	Knots	Kms/h	Miles/h	Dir.	Month	Date	Time	Year	Observation for
Ranong	60	111.2	69.1	W	Oct.	4	-	1960	
Bandon	75	139.0	86.4	W	Jul	26	1345	1950	
Nakhon Si Thammarat	55	101.9	63.3	WSW	Aug	26	-	1959	
Trang	50	92.7	57.6	E	Apr.	19	-	1962	1958-1965
				W	May	30	-	1963	
Phuket	45	83.4	51.8	SW	Jul.	9	-	1959	
Phuket Airport	56	103.8	64.5	WSW	Oct.	26	-	1962	1952-1965
Songkhla	70	127.0	79.5	E	Nov.	28	-	1965	
				WSW	Jun.	5	1650	1965	
Narathiwat	60	111.2	69.1	NE	Nov.	5	-	1962	

Division of Climatology,  
 Meteorological Department,  
 Office of the Prime Minister,  
 Bangkok, March 4, 1967

Compiled by V. Jayawardena

Monthly And Annual Normals of Rainfall And of Rainy Days

Period 2474 - 2503 (1931 - 1960)

----- \*\* -----

<u>Station</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Annual</u>
<u>NORTHERN PART</u>													
1 Chiangrai	11 6 1 2	11 8 1 5	23 1 1.5	75 3 7 1	211 8 13 8	228 5 16 6	309 3 19 8	397 6 21 5	310 4 16 3	120 5 8 4	35 5 3 7	9 5 1 6	1744 9 113 0
2 Mae Hongson	11 9 1 0	5 6 0 6	10 9 1 0	34 6 2 9	137 2 7 8	190 6 13 8	277 4 17 5	276 7 15 5	231 1 13 9	105 7 7 6	21 4 3 2	9 4 1 0	1312 5 85 8
3 Chiangmai	6 6 1 0	10 9 1 2	14 9 1 6	50 8 5 0	139 0 12 3	154 2 15 5	187 5 18 3	220 0 21 1	292 3 17 7	124 4 9 8	38 2 3 7	9 7 1 3	1245 8 108 5
4 Nan	7 4 0 9	11 8 1 4	22 3 2 6	84 7 5 6	143 6 10 6	123 8 11 2	205 1 13 8	268 9 16 8	216 7 14 0	55 5 6 0	15 5 1 5	4 8 0 6	1160 1 85 0
5 Lamphun	4 0 0 3	6 6 0 3	8 4 0 5	56 9 2 1	103 2 5 8	123 5 7 0	159 4 6 8	177 4 7 4	257 1 9 4	128 8 4 8	13 1 0 7	10 5 0 6	1045 9 45 7
6 Lampang	6 9 0 9	9 0 0 9	22 5 2 3	71 5 4 9	136 1 11 5	128 2 11 9	128 7 14 1	190 1 16 9	203 1 15 9	123 3 11 0	23 6 2 7	4 6 1 4	1047 6 94 0
7 Mae Sariang	6 8 0 6	4 8 0 4	8 2 0 5	47 6 3 5	145 4 14 9	228 3 22 1	213 1 23 9	273 7 25 3	221 7 20 1	94 6 10 6	28 2 2 9	16 1 1 2	1288 5 126 0
8 Phrae	8 6 0 5	13 8 0 8	28 9 1 8	76 4 3 7	160 1 9 4	120 0 9 6	170 0 12 6	213 7 13 9	227 2 12 2	80 1 5 8	17 0 1 9	6 2 0 3	1122 0 72 5
9 Uttaradit	7 5 0 9	17 0 1 6	21 2 2 4	85 4 5 1	191 0 12 8	196 0 16 6	235 2 17 7	254 2 19 7	333 3 17 3	124 2 8 8	29 2 2 8	3 1 0 7	1497 3 160 4
10 Sukhothai	5 7 0 5	12 1 1 2	34 5 2 0	72 7 3 8	174 7 9 6	183 6 11 0	148 7 9 1	189 9 10 8	303 4 13 1	145 7 7 1	39 1 2 0	0 7 0 2	1310 8 70 4

<u>Station</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Annual</u>
11 Tak	1 2 0 3	6 4 0 4	9 1 0 8	53 7 3 3	142 6 8 2	112 4 8 8	104 4 8 4	103 7 9 0	215 9 10 7	166 8 7 1	33 9 1 9	1 0 0 3	951 1 59 2
12 Phitsanulok	6 7 1 0	24 5 3 4	38 8 5 1	74 8 5 1	158 5 11 6	178 2 15 0	203 7 16 3	227 0 18 1	272 4 17 5	131 5 10 3	36 9 3 3	1 4 0 4	1354 4 104 4
13 Mae Sot	3 9 0 8	4 6 0 7	6 0 0 9	38 7 3 2	144 3 15 0	222 9 24 2	346 6 26 6	407 6 26 2	198 9 21 0	103 4 11 9	18 7 2 6	2 5 0 7	1498 1 133 8
14 Kamphaeng Phet	0 0 0 0	16 9 0 4	13 5 1 0	48 4 1 9	107 4 5 6	162 3 8 1	108 4 5 8	132 5 7 3	207 4 8 0	150 8 4 6	36 3 1 9	3 8 0 3	987 7 44 9
15 Phichit	1 3 0 1	28 2 1 3	16 1 0 8	86 7 2 7	138 2 6 6	179 8 8 8	208 9 10 7	238 6 11 2	289 8 12 3	128 7 8 1	23 2 1 1	2 5 0 2	1342 0 63 9
16 Phetchabun	9 3 1 0	25 6 1 9	46 5 3 1	74 6 4 4	160 3 8 6	181 9 10 9	197 9 12 5	198 6 11 6	277 9 11 9	95 0 5 9	19 1 1 5	0 0 0 0	1286 7 73 3

NORTHEASTERN PART

1 Nong Khai	5 3 0 3	20 0 1 1	24 9 1 8	73 0 3 5	206 3 8 4	226 8 9 0	227 9 9 3	315 6 12 5	302 2 10 7	70 2 2 8	11 0 0 6	1 8 0 1	1485 0 60 1
2 Loei	6 3 0 7	19 3 1 9	35 8 3 4	90 5 5 4	175 1 9 4	173 2 9 8	127 9 9 4	211 3 12 3	223 9 12 5	109 2 6 5	19 6 1 7	2 0 0 2	1194 1 73 2
3 Nakhon Phanom	5 2 0 4	14 5 1 3	23 3 2 0	79 4 4 0	216 0 9 9	384 2 14 3	474 2 15 7	534 1 17 2	358 1 12 1	64 3 4 3	6 8 0 5	3 2 0 1	2163 3 81 8
4 Udon Thani	7 9 1 0	19 6 3 0	37 8 4 7	95 7 7 2	223 1 15 4	218 3 16 0	197 9 17 1	246 0 18 3	264 1 17 2	87 9 6 6	15 0 1 7	4 3 0 4	1418 5 108 6
5 Sakhon Nakhon	6 9 0 6	18 9 1 7	54 5 3 2	88 8 5 8	235 5 12 3	233 9 11 9	259 4 14 2	270 9 17 4	255 7 13 3	54 7 5 0	12 6 1 2	1 2 0 3	1493 0 86 9

<u>Station</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Annual</u>
6 Mukdahan	2 9 0 4	8 7 1 4	43 4 2 4	66 7 6 3	217 1 14 8	217 7 15 1	246 2 18 1	269 2 18 8	290 6 18 1	54 5 4 9	5 7 1 0	23 2 0 1	1445 9 101 4
7 Kalasin	1 7 0 2	24 6 1 2	27 9 2 1	63 0 3 3	176 8 7 7	192 5 7 5	235 1 9 3	226 9 9 8	323 2 11 3	98 3 3 3	9 6 0 5	1 0 0 1	1380 6 56 3
8 Khon Kaen	6 0 0 8	20 0 2 0	29 0 3 2	72 5 5 7	184 9 11 9	176 2 10 9	168 3 13 6	175 6 14 0	273 7 15 5	91 1 7 5	8 6 1 4	2 6 0 4	1208 5 86 9
9 Mahasarakham	1 2 0 1	10 9 1 0	26 2 1 4	70 8 3 4	171 4 6 5	165 7 6 3	137 1 6 7	191 3 7 8	249 2 10 2	66 8 3 5	13 4 0 5	3 9 0 1	1107 9 47 5
10 Roi-et	2 0 0 6	23 1 2 1	35 0 3 5	91 0 5 7	197 3 12 1	190 5 11 4	212 4 13 3	249 3 14 5	324 1 16 4	73 7 6 4	13 0 1 3	2 8 0 3	1414 2 87 6
11 Chaiyaphum	2 2 0 3	14 8 1 4	46 0 2 4	75 4 3 4	149 6 7 6	140 3 7 5	129 2 8 2	172 6 8 4	255 4 10 1	89 0 5 5	13 7 0 9	0 9 0 1	1089 1 55 8
12 Ubon Ratchathani	0 9 0 2	1 0 1 0	39 9 2 7	71 7 5 9	172 1 12 3	204 8 14 2	260 6 16 4	313 0 17 1	310 0 17 3	132 1 8 5	22 4 2 3	1 9 0 5	1530 4 98 4
13 Sisaket	0 4 0 1	13 1 0 6	18 3 1 3	56 1 2 5	109 4 6 1	170 6 7 0	200 0 9 2	254 3 10 5	293 5 11 6	127 7 5 4	26 4 1 3	2 2 0 1	1272 0 55 7
14 Buriram	2 9 0 1	8 2 0 6	30 6 1 6	65 4 3 6	144 5 7 5	149 5 8 0	155 5 8 8	210 9 9 9	279 2 11 4	146 7 6 5	22 3 2 0	2 4 0 2	1218 1 60 2
15 Surin	2 2 0 4	11 9 1 6	43 2 3 3	71 3 6 0	173 4 11 1	168 2 13 4	191 8 15 0	223 6 15 9	268 8 17 2	156 6 8 7	24 2 2 8	0 6 0 2	1340 8 95 6
16 Nakhon Ratchasima	6 6 0 8	32 3 3 1	47 6 5 3	77 9 7 7	166 5 14 5	114 1 12 6	128 1 14 0	140 3 14 9	235 4 17 6	167 9 11 5	35 7 3 2	2 8 0 8	1155 2 106 0

<u>Station</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Annual</u>
<u>CENTRAL PART</u>													
1 Nakhon Phanom	3 9 0 5	32 6 1 8	26 0 2 3	65 4 4 3	137 1 9 6	141 1 11 6	147 7 12 7	178 7 13 9	272 2 15 1	148 0 9 3	25 8 2 1	3 3 0 3	1181 8 83 6
2 Nakhon Phanom	1 8 0 1	14 8 0 7	25 6 1 2	79 5 2 7	125 5 6 1	136 2 7 6	137 0 8	151 9 9 2	271 2 11 0	153 7 6 7	37 8 1 8	3 6 0 1	1138 6 55 9
3 Chant	5 4 0 0	19 5 0 0	37 2 1 5	95 0 3 5	134 9 5 1	133 5 7 2	139 4 8 1	1 5 9 9	297 4 11 4	170 0 5 5	33 4 2 1	3 5 0 1	1225 9 55 7
4 Singburi	3 5 0 1	24 5 0 8	34 8 1 7	72 2 3 1	117 8 5 1	127 7 1 0	1 5 0 7	183 1 9 7	264 8 11 3	149 5 6 8	33 8 1 7	4 9 0 2	1171 7 56 0
5 Lopburi	3 8 0 6	20 5 1 9	48 7 3 4	84 5 5 0	142 8 10 3	147 4 12 3	1 0 4 13 3	179 4 14 3	259 5 16 6	175 9 8 9	32 4 2 9	2 3 0 4	1238 7 90 9
6 Ang Thong	4 9 0 4	22 7 0 9	26 5 1 9	80 9 3 9	145 4 8 1	158 4 9 1	150 8 10 5	183 3 11 0	262 2 13 3	139 0 8 2	34 3 2 1	4 2 0 3	1220 7 69 7
7 Saraburi	3 9 0 3	19 5 1 2	48 7 2 8	84 5 4 3	157 1 8 8	234 3 10 2	229 4 10 5	247 9 12 0	280 1 12 5	99 8 7 3	41 8 2 3	3 4 0 2	1450 4 72 5
8 Suphanburi	4 5 0 5	18 3 1 5	41 6 2 7	90 2 5 1	150 7 9 6	107 1 9 7	127 5 11 7	175 6 12 7	274 9 15 5	220 6 11 3	51 5 3 7	4 4 0 7	1276 9 84 8
9 Ayuthaya	5 3 0 4	22 7 0 0	33 4 2 0	87 1 4 2	159 2 9 0	186 6 10 8	177 2 11 8	175 5 12 8	277 6 14 3	165 9 9 8	45 8 3 0	5 5 0 4	1342 7 78 4
10 Nakhon Nayok	15 7 0 5	20 1 1 0	49 4 2 5	106 7 5 0	205 9 11 1	348 8 14 4	393 2 15 2	394 5 16 5	470 0 10 7	195 9 9 1	39 9 3 3	5 5 0 5	2245 5 95 0
11 Prachinburi	7 2 0 5	27 3 1 7	55 1 3 2	124 2 6 4	241 3 12 9	325 3 15 9	378 5 17 1	346 4 15 9	388 1 16 8	188 2 9 6	30 2 2,4	2 1 0 3	2113 9 102 7

<u>Station</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Annual</u>
12 Kanchanaburi	1 3 0 6	13 6 1 4	34 5 2 4	68 9 5 0	141 8 9 1	82 7 8 4	121 3 10 5	86 2 10 2	192 2 12 3	188 2 10 3	57 4 4 0	4 0 0 7	992 1 74 9
13 Prathum Thani	6 4 0 4	27 7 1 3	27 1 1 7	97 9 4 4	153 2 8 8	147 9 9 1	191 2 11 2	181 3 10 5	302 1 13 0	201 1 9 2	50 9 2 9	5 9 0 5	1392 7 73 0
14 Don Muang	5 6 1 1	26 8 3 0	42 2 4 3	107 5 7 5	171 8 15 6	172 0 17 0	181 2 18 8	215 6 20 7	296 9 21 7	266 5 17 0	48 3 6 2	8 1 1 5	1542 5 134 4
15 Nonthaburi	3 9 0 6	11 4 0 9	16 1 1 4	55 7 2 9	131 5 7 9	156 6 8 2	167 7 10 1	165 5 10 4	304 9 14 0	227 3 10 4	46 7 3 3	5 9 0 5	1293 2 70 6
16 Nakhon Prathom	4 9 0 4	15 0 0 9	35 5 1 7	61 2 3 4	150 7 9 6	156 0 10 8	148 6 11 7	136 0 10 4	256 6 14 3	240 4 1	74 2 4 2	10 3 0 9	1289 4 78 9
17 Aranyaprathet	7 1 1 1	31 0 2 5	69 3 6 0	113 0 10 1	176 5 17 2	184 1 19 4	218 9 19 6	190 3 19 7	269 3 20 8	-9 0 14 8	57 0 6 2	11 7 1 3	1522 2 138 7
18 Chachoengsao	9 7 0 5	17 1 1 0	44 9 2 5	79 7 4 2	148 2 9 4	137 3 8 3	207 4 10 5	179 7 10 2	279 6 13 1	176 8 8 5	85 9 2 8	6 5 0 3	1372 8 71 4
19 Bangkok	8 9 1 6	25 2 2 8	34 4 3 3	89 0 6 4	166 3 14 1	168 1 15 8	179 4 18 0	176 8 18 4	304 7 21 2	253 1 16 0	56 9 6 2	7 1 1 1	1469 9 124 9
20 Bang Khunthian (Thonburi)	5 2 0 3	14 3 0 7	13 1 1 0	63 0 2 7	137 8 7 7	160 2 8 0	149 0 8 4	182 9 9 2	283 6 12 0	218 7 8 7	58 0 2 9	4 5 0 4	1290 3 62 0
21 Samutprakan	9 1 0 3	31 3 1 5	33 8 1 8	91 8 3 3	227 4 8 7	152 5 9 3	212 1 10 4	202 1 10 8	310 1 13 6	258 9 10 2	58 2 3 5	4 9 0 4	1592 2 73 8
22 Samutsakhon	6 1 0 7	27 7 1 3	28 2 2 0	81 6 3 8	151 3 8 1	130 5 9 3	157 0 10 4	169 5 11 1	275 3 14 0	274 1 11 7	61 9 5 0	11 3 0 9	1374 5 78 3
23 Ratburi	4 1 0 3	12 0 0 8	21 2 1 0	50 5 3 4	155 2 8 2	112 8 8 8	132 0 10 2	132 5 10 2	213 2 12 3	201 7 9 9	71 3 4 3	16 4 0 8	1122 9 70 2

<u>Station</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Annual</u>
24 Samutsongkhram	6 4 0 2	9 6 0 4	20 4 0 8	57 2 2 1	114 8 6 5	99 1 7 4	109 2 7 4	131 7 7 8	235 9 0 5	253 4 9 2	103 3 4 3	16 8 0 4	1157 8 57 0
<u>GULF OF THAILAND --</u>													
<u>EAST COAST</u>													
1 Chonburi	11 3 1 2	21 2 2 4	43 8 3 1	77 6 6 1	153 4 10 2	138 1 10 5	184 3 12 0	151 8 12 4	292 7 15 0	209 0 11 1	55 9 4 9	1 5 0 5	1335 6 89 4
2 Sattahip	24 1 2 1	48 9 4 5	65 0 5 7	109 5 9 0	160 9 14 0	79 8 11 2	95 1 12 7	107 4 15 0	225 1 16 3	280 5 18 7	98 5 9 6	17 4 2 2	1312 2 121 7
3 Rayong	10 8 0 4	50 9 1 8	48 6 1 9	87 4 2 9	182 3 5 6	149 6 4 9	157 6 5 3	142 2 5 6	220 6 8 9	216 3 7 1	68 2 2 9	8 6 0 4	1343 1 47 7
4 Chanthaburi	20 7 2 0	37 6 3 8	65 6 6 8	143 1 9 5	352 2 19 3	494 3 28 8	533 8 24,3	491 8 22 9	526 7 23 2	271 3 16 0	78 5 7 3	9 6 1 3	3025 2 160 2
5 Trat	37 1 1 3	36 4 2 1	91 9 4 4	163 9 6 9	324 4 11 3	534 8 15 4	611 0 15 2	568 2 14 4	585 6 15 5	327 8 9 9	91 6 4 1	14 3 0 7	3387 0 101 2
6 Khlong Yai	21 2 2 4	77 1 6 1	161 4 9 7	156 2 14 5	416 9 21 7	778 2 23 3	792 5 26 1	840 9 27 1	751 4 25 6	352 4 19 6	105 9 9 9	2 8 2 0	4456 9 188 0
<u>GULF OF THAILAND --</u>													
<u>WEST COAST</u>													
1 Phetburi	2 4 0 3	9 8 0 6	25 9 1 0	50 1 2 6	112 0 7 3	103 6 8 5	130 2 10 3	120 3 10 0	197 3 12 4	297 0 11 2	116 8 4 9	17 3 0 8	1190 7 69 9
2 Hua Hin	14 0 1 2	19 7 2 6	19 5 2 5	63 9 5 0	108 2 12 4	79 1 14 8	79 1 15 5	89 0 17 0	136 9 18 1	267 4 16 6	131 8 8 4	9 8 2 2	1018 4 116 3

<u>Station</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Annual</u>
3 Prachuap Khirikhan	31 5 2 2	45 8 3 1	46 0 3 5	79 3 5 6	112 8 10 1	94 0 13 7	93 5 14 8	91 6 14 9	115 0 13 9	253 9 14 4	164 9 8 6	32 6 2 3	1160 9 107 1
4 Chumphon	67 7 5 2	70 0 4 5	78 3 5 0	122 2 8 8	160 8 13 6	161 1 16 6	191 6 18 1	175 9 17 9	171 5 17 0	251 5 17 8	326 6 13 4	185 3 6 6	1962 5 144 5
5 Bandon	62 7 6 9	27 9 3,8	30 4 4 1	95 4 10 4	203 7 16 2	144 9 16 4	130 9 15 5	143 9 16 6	196 6 19 4	269 4 20 0	312 2 18 2	240 0 13 4	1858 0 160 9
6 Nakhon Si Thammarat	201 0 11 4	94 1 4 8	87 2 4 8	159 0 8,5	209 0 11 6	83,9 7,5	97 4 8 1	136 0 10 9	147 9 11 6	345 6 15 9	533 5 16 4	473 9 15 6	2568 5 127 1
7 Songkhla	159.5 14 4	58 0 7 4	57.3 7 1	90 7 9 8	118 5 13 9	100 3 12 1	92 1 12 1	91 0 12 6	102 9 8 9	325 2 21 7	579 5 23 1	456 3 19 8	2231.3 162 9
8 Phatthalung	134 7 4 7	50 7 2 3	55 6 2 6	67 6 3 8	80 3 5 0	74 3 4 5	90 4 4 6	78 8 4 9	101 7 5 5	334 6 10 8	449 8 12 3	402 4 9 9	1920 9 70 9
9 Pattani	83 8 2 8	18 4 1 0	27 7 1 2	42 4 1 5	91 5 4 2	90 5 4 1	91 1 4 3	104 4 4 8	88 5 5 0	242 3 8 0	452 2 10 1	330 8 8 0	1663 6 55 0
10 Yala	158 8 5 3	66 7 2 6	62 3 2 8	93 5 3 6	132 2 5 2	92 9 4 4	135 3 4 4	148 6 5 9	141 7 6 1	259 0 7 7	333 0 8 6	253 5 6 7	1877 5 63 3
11 Narathiwat	221 2 12 8	89 2 6 2	111 2 6 4	85 3 6 8	176 3 10 9	141 8 9 4	108 6 9 6	165 5 11 0	181 2 12 2	362 2 16 1	591 5 16 8	491 6 17 0	2689 6 135 2
<u>SOUTHERN PART</u>													
<u>WEST COAST</u>													
1 Ranong	24 6 3 3	25 2 3 2	58 9 5 1	228 9 11 6	548 6 18 8	839 0 21 9	832 2 22 1	845 5 23 1	955 3 22 9	456 1 19 8	209 9 13 3	82 1 5 4	5106 3 170 5
2 Phang Nga	34 5 3 0	77 5 3 6	127.7 6 4	248 4 11 1	321 4 13 6	470 9 15 5	393 2 14 6	429 2 16 8	443 0 17 7	344 4 14 9	191 4 9 0	86 6 3 8	3168 2 130 0

<u>Station</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Annual</u>
3 Krabi	22 0 1 7	25 8 1 9	56 0 3 0	139 0 5 8	170 1 7 9	255 3 10 4	214 7 9 2	228 5 10 4	323 2 12 7	219 9 10 4	181 1 7 5	59 8 2 7	1895 4 83 6
4 Phuket	36 7 4 3	29 9 3 0	67 2 5 7	150 9 13 1	278 7 17 5	299 2 17 6	282 4 17 0	276 2 17 3	327 3 19 0	363 5 19 2	206 8 14 1	69 7 7 9	2388 5 155 7
5 Trang	38 6 3 4	25 5 1 4	64 2 3 6	176 9 8 8	214 2 10 9	216 8 10 7	238 8 9 9	254 9 11 6	282 2 12 9	304 3 14 1	255 1 10 9	106 2 5 3	2177 7 103 5
6 Satun	38 0 2 0	37 8 1 7	85 1 3 8	193 8 8 0	278 6 9 3	207 7 6 6	230 2 9 6	268 3 9 8	316 8 9 7	356 4 10 9	291 8 9 8	91 0 3 2	2415 5 84 4

\*\*\*\*\*

REMARK

UPPER FIGURES are amounts of rainfall in m m

LOWER FIGURES are average rainy days

Division of Climatological,  
 Meteorological Department,  
 Office of the Prime Minister,  
 February 4, B E 2508 (1965)

## E - Manpower - Labor

82 3% of the Thai population is engaged in agriculture and allied industry, i.e., forestry, hunting, fishing, etc., with 85% of this number located in the rural areas of Thailand. Only 3 4% of the population is engaged in manufacture. The agricultural population tends to be under - employed and unemployed due to the seasonal work patterns. There is an adequate supply of unskilled labor available in Thailand, but the skilled labor force is in very short supply. Industry reports indicate that Thai laborers are alert, intelligent, industrious and easily trained. Firestone reports that it requires about 2/3 the training time for Thai workers as compared to training U.S. workers.

The agriculture workers engaged in agriculture only work an estimated 87 to 100 days per year. Small groups in the NE migrate temporarily to other provinces, dependent upon the harvest and the weather. They are also influenced by opportunities offered in the other areas, their savings, and the family demands. 72% of the heads of households are willing to take on any job if the pay is baht 10 per day, during the off season when they are free from their agricultural work. They also must be free to return to the farm during the agricultural season. 75% of these family heads are willing to have other members of their families seek off season work.

Labor legislation is administered by the Department of Labor. Organization of Labor Unions is not permitted and strikes are rare.

Rates paid are lower than in Malaysia and are the lowest in the Far East

Unskilled ----- 10 baht per day

Semi - skilled ----- 20 to 40 baht per day

Skilled ----- 60 to 100 baht per day

In the Northeast the rates are slightly lower. Example an unskilled farm worker received 6 to 8 baht per day during the 1967 season Labor costs for most crops in the Northeast average about 20 to 40 baht per rai The farmers do not figure the family labor into their costs, but do hire additional workers when the family cannot supply the needed labor

In the nation the population breakdown into age category 52% -- under 20 years of age, 17% -- 20 to 29 years of age, 11% -- 30 to 39 years of age

For the manpower breakdown into labor categories, see the attached table

### Potential

The government is aware of the manpower - labor patterns, and are in the process of training workers, and offering training programs to various categories of personnel Educational institutions have been established or are being expanded with respect to projected labor demands Boys Vocational schools are offering mechanical trades, auto mechanics, welding, building construction, woodworking, leathercrafts Girls Vocational Schools are offering dressmaking, handicrafts, Technical Colleges are offering advanced training in many fields, short course schools are offering typing,

shorthand, accountancy, University levels are offering agricultural, engineering, and medicine courses, Ministries are offering many training programs in various fields of extension works, and amnagement The Government feels it will need from 10 to 15 years to develop the skills needed for an established skilled labor force

By the development of production patterns supplying locally placed industries, the off season period could be made productive for the farm workers, but some allied industries in some areas will have to be developed The industries now in the NE gunny bags, rice milling, sugar milling, cotton ginning, feed and oil industries, handicrafts and woodworking The second National Economic and Social Development Plan has a target for the promotion of general rural development and employment -- through the off season period -- by development and enlargement of the irrigation projects and home industry

The Manpower Planning Board anticipates by 1980 that 74% of the labor force will be engaged in agriculture This is a reduction from the 82 3% now engaged in the agricultural field

### Problems

- 1 - Productivity remains low due to the under-employment of the agricultural sector
- 2 - Farmer production is limited to 100 days per year, the time engaged

in agriculture

- 3 - With 80 to 85% of the labor force engaged in agriculture production, how the main force of Thailand is utilized daily, what crops will be planted, how capital is utilized, remains in the hands and the decision of the agricultural labor force
- 4 - Need for the development of a skilled labor force

#### Reference

- 1 - Preliminary Assessment of Education and Human Resources in Thailand  
Tha1-USOM Human Resources Task Force -- 1963.
- 2 - Labor Bureau -- Department of Public Welfare -- NSO -- Labor Force  
Survey
- 3 - Current and Projected Secondary Education Programs for Thailand --  
1966, Educational Planning Office, Ministry of Education
- 4 - Chapter VI Manpower and Employment, Second Five Year Plan
- 5 - Industrial Development and Investment -- 1966 -- Ministry of Industry
- 6 - Statistical Yearbook -- Thailand -- 1965

ESTIMATED TOTAL EMPLOYMENT IN THAILAND  
1 9 8 0

Type of Activity	Estimated Total Employment		Actual Total
	Agricultural 70%	Agricultural 74%	Employment 1960
Total Economically Active Population	<u>24,944,000</u>	<u>24,944,000</u>	<u>13,722,104</u>
Agricultural Workers (Farmer Fishermen, Hunters, Loggers Related Workers)	17,460,800	18,485,600	11,332,489
Non-Agricultural Workers	<u>7,483,200</u>	<u>6,485,400</u>	<u>2,439,615</u>
<u>a/</u> Professional, Technical, Related Workers	598,600	518,800	173,960
<u>b/</u> Administrative, Executive, Managerial Workers	89,800	77,300	26,191
<u>c/</u> Clerical Workers	538,800	466,500	154,303
Sales Workers	2,140,200	1,855,800	735,303
Miners, Quarrymen Related Workers	89,800	77,300	26,255
Workers in Transport and Communication	449,000	389,100	144,610
Craftsmen, Production Process Workers, Laborers	2,529,300	2,192,600	806,205
Service, Sports Recreation Workers	823,200	713,400	273,375
<u>d/</u> Other Workers Not Classifiable	244,500	194,600	99,259

a/ Including captains and military officers of higher rank working in professional occupations

b/ Including captains and military officers of higher rank, excepting above

c/ Including all other military personnel, except privates, occupations not classified in other groups

d/ Including privates

Manpower Planning Unit of Office of the National Economic Development Board

EMPLOYMENT  
(millions of persons)

Economic Sector	1966	Forecast 1971	Increase 66-71
Agriculture	11 62	12 69	1 06
Manufacturing and Mining	0 73	1 03	0 30
Construction	0 11	0 16	0 05
Electricity and Water Supply	0 03	0 06	0 03
Transport and Communication	0 23	0 32	0 09
Trade and Commerce	1 03	1 37	0 34
Services	0 80	1 14	0 34
<b>TOTAL</b>	<b>14 55</b>	<b>16 76</b>	<b>2 21</b>

Source NEDB

Range of Labor Rates in Thailand

<u>Job Categories</u>	<u>Hourly Rate Range</u>	
	<u>Baht per Hour</u>	<u>US¢ per Hour</u>
General Labor	2 5 to 4 0	12 5 to 20 0
Assembly and Other Light Tasks	2 0 to 3 4	10 0 to 16 8
Service (Warehousemen, Fork truck, Operators, Janitors)	3 0 to 5 0	15 0 to 25 0
Welders	4 5 to 6 6	22 5 to 33 0
Machine Tool Operators	4 0 to 8 3	20 0 to 40 0
Pipefitters	4 8 to 8 0	24 0 to 40 0
Carpenters, Electricians	4 0 to 8 3	20 0 to 41 5

Note Rates above apply mainly to the Bangkok area, rates in the NE slightly lower

## VI AGRICULTURAL INPUTS

### A - Fertilizers

In 1967 the Customs Department statistics show that there were 196,254 tons of fertilizers imported into Thailand up to November. The yearly increase averages 17 to 20% over the past five years. This is an expenditure of 10 million dollars per year -- about \$75 per ton. By 1970 fertilizers consumption is expected to increase to between 230,000 to 280,000 tons per year. 50% of the NE farmers use some form of fertilizers now, but only about 39% use chemical fertilizers. Thailand is still one of the lowest users of fertilizers in the world.

The fertilizers are imported in 45 to 50 kilo jute-polyethylene bags, which are stenciled with the type and grade content. These are shipped to the individual dealers where sometimes they may break the bag into smaller units of 1 to 2 kilos for use by the small rai farmer. The farmer prefers these jute bags as they are reusable.

Of the total import in 1967 only 15,000 tons were used in the Northeast. 4000 tons were used in the ARD program which reached 11,000 farmers. Only 8% of the imported fertilizers are used in the Northeast, the concentration of sales are within a 250 km radius of Bangkok. Indications of increased use of fertilizers are shown in the increased sales of the individual dealers. These dealer sales are operated on a margin of 24.5% on credit.

sales Many times dealers extend credit to the farmers either in cash or inputs The cost of fertilizers in the NE is 3000 baht per ton when purchased on credit, and 2500 to 2600 baht per ton when purchased for cash Most of the fertilizers sold in the NE are N - P - K mixtures

There is one company producing fertilizers in Thailand, The Chemical Fertilizer Company located at Mae Moh in Northern Thailand In 1966, it produced 60,000 tons of Ammonium Sulphate, and 30,000 tons of Urea In 1968, it started to mix and sell N - P mixtures This mixture is bagged in gunny - polyethylene lined bags which are locally produced

There is no import tax on fertilizers excepting Urea of over 45% N content (a 27 1/2% tax) and ammonium sulphate

25 to 40 companies import fertilizers, the number varies from year to year The leading importers are Bara Windsor Co , Ltd (Chinese and German owned), Yip In Tsoi Co , Ltd (Chinese owned), U S. Summit Co (American owned), International Minerals Co (American owned), Esso Chemicals Easter (American owned) Japan sells 43% of the total imports, West Germany 25 3%, Netherlands 14%, United States, France and Italy 16% Within Thailand, the dealers handle the direct sales to the farmer in the villages, the RTG through the ARD, Ministry of Agriculture, Rice Department, and Cooperatives all are sources of supply to the farmer The dealers charge about 5 to 10% above the cost of transport, handling costs, and the product

## Potential

The potential for increased fertilizer use in the Northeast is not very promising unless some unfavorable factors are changed, namely low income to the farmers, poor credit situation, lack of education and extension services on the use and the value of fertilizers, and the high cost of fertilizers. The farmer needs the incentive of a more stable and increased market before he will feel it justified to pay the cost of the fertilizers.

Some education is done by the dealers, some by RTG agencies, but the need for expansion of education and extension services on the use of fertilizers is unlimited.

The use of fertilizers by the NE farmers could increase to a potential of 550,000 tons per year if fertilizers were priced more reasonably. The emphasis should be on using more fertilizers on upland cash crops.

## Problems

- 1 - The cost of the fertilizers discourage the farmer from using them.
- 2 - The lack of knowledge of the value of fertilizers, and also the lack of education in the proper use and/or extension programs.
- 3 - A sound credit structure must be established before the farmer has a source of credit with reasonable interest rates to fund the fertilizers. 90% of the Northeast Farmers require credit.

- 4 - Increased and guaranteed income to the farmer for his crops
- 5 - Controls needed on the bagging and the mixing and marking specifications

#### References

- 1 - Import Statistics
- 2 - TVA Fertilizer Report -- Report on the Fertilizer Situation and Potential
- 3 - Pa Mong Report
- 4 - Crop increase yields -- page 127, TVA Report
- 5 - Fertilizer cost per ra1 -- Pa Mong Study
- 6 - Cost Comparison of Ocean Shipment of Anhydrous Ammonia and Solid Urea versus Shipment of Urea -- Ammonia Solution -- Frank Achorn, Harold Walkup

FER TILIZER MATERIAL EXPENSE

<u>Crop</u>	<u>Type</u>	<u>Number of Application</u>	<u>Amount Applied</u>	<u>Price per Kg <u>1/</u></u>	<u>Cost</u>
Rice (wet) <u>1/</u>	16-20-0	2	25 00	2 00	50 00
Rice (dry) <u>1/</u>	16-20-0	2	30 00	2 00	60 00
Field Corn	12-12-0	2	48 00	3 00	96 00
Kenaf	12-8-12	2	10 00	3 00	30 00
Cotton	5-10-10	2	50 00	2 00	100 00
Peanuts	3-9-9	2	50 00	2 00	100 00
Tobacco	6-24-16	1	60 00	2 00	120 00
Sugar Cane	24-12-15	2	50 00	3 00	150 00

1/ If potassium deficiency symptoms appear it may be necessary to add this element Presently, on the better soils there is little response to applying potassium

It is assumed that if the farmer purchases fairly large quantities of fertilizer the price per kilogram will be around these levels Presently the RTG subsidizes the fertilizer used on rice at Baht 2 per kg

FERTILIZER TRANSPORTATION COSTS  
BANGKOK TO NORTHEAST

Area-Location	Distance Miles	Freight Rate baht/ton		Freight Rate baht/ton/mile	
		Rail-----	Truck	Rail-----	Truck
Korat	130	65	60	500	461
Khon Kaen	310	108	125	348	403
Ubol	429	121	183	282	426

## B - Seeds

The seed program is not highly developed either in seed production or in the distribution of improved seeds. The government restricts seeds for commercial uses, but does allow seeds imported for experimental purposes. Local seeds are still not of high quality. There are nine experimental multiplication stations in the Northeast.

The Ministry of Agriculture has a farm demonstration program -- 665 farms of 2 to 3 rai each, involving 2 to 3 farmers, who are producing seeds. They are supervised by extension workers, and supplied seeds free of charge until they reach a good supply level. The fertilizers are subsidized at 2 baht a kilo, and when the farmers pay for the seeds they are also subsidized at 1 baht kilo.

The Rice Department has 93 stations, one for each sensitive amphur, all farmer owner and worked, totalling 400 rai. The farmer is given the seed and other inputs or are charged a very low price. These farmers are also supervised by extension workers. The farmer receives the income from the crop yields. In 1967 the Rice Department sold 14,830 tons of seeds in the Northeast, partly supplied from these stations.

The Ministry of Agriculture is working on rice, maize, sorghum, peanuts, tobacco, cotton, soy and mung beans, 3 or 4 fruits and vegetables.

Kasetsart University is doing extensive work on rice and maize, pasture grasses and legumes

The dealers handle the main percentage of the seed distribution, however the farmers sometimes pay up to five times more than he should from this source.

The ARD program also distributes seeds, subsidizing the seeds at 1 baht per kilo The farmer also produces much of his own seeds, especially for his rice crops

### Potential

There is a potential for private development if testing were done for the whole of Thailand and not directed specifically toward the Northeast area

The large farm demonstration programs which are only 3 years old, through the Ministry of Agriculture, have had success in their approach toward improving the seeds and the crop yields, by further support and development higher yields would probably result

### Problems

- 1 - Need improved quality seeds
- 2 - Need more farmer education
- 3 - Need more extension workers for supervision of programs
- 4 - Need change in import restrictions on seeds

- 5 - Better storage and/or packaging of seeds which would improve the quality of the existing level of seeds
- 6 - Price of seeds from the dealers should be controlled
- 7 - Better distribution system

#### References

- 1 - Corn development of Thailand
- 2 - Development of Agriculture - Technical Library 630 DEV
- 3 - Some Pastoral Farming to the Upland areas of NE Thailand, Khon Kaen University
- 4 - Pa Mong Study

## SEEDING RATES AND COSTS

<u>Crop</u>	<u>Rate</u> Kg/Rai	<u>Value/Kg</u>	<u>Total</u>
Rice	5 00	97	4 85
Corn	2 50	96	1 85
Kenaf	3 50	2 00	7 00
Cotton	2 50	2 50	6 25
Peanuts	12 50	2 29	27 48
Tobacco	3 00	1 50	4 50
Sugar cane (3000 cuttings) (1/3) <u>2/</u>		03	30 00

1 Source Department of Agriculture and Rice

2/ Productive life of sugar cane is expected to be three years

## C - Equipment

Surveys indicate that Thai farmers are starting to mechanize their farms and have purchased an estimated 20,000 to 25,000 tractors in recent years. In 1961 there was 1 tractor for every 600 farms, estimates in 1963 indicate only 2% of the farms were mechanized or 1 tractor for every 300 farms. In 1966 estimates indicate 10% of the cultivated areas were mechanized. Distribution of the ownership is 10 to 15% in the Northeast, 50 to 60% in the Central Plains, and 5 to 10% in the North, 15% in the South. Many are purchased on a joint-ownership basis.

In 1966-67 there were approximately 4000 tractors imported into Thailand, 2/3 of these were 45 to 65 horsepower. Most tractors are 4 wheeled, about 2000 are 2 wheeled, including John Deere, Ford, Massey - Ferguson, International Harvester brands.

The tractor costs from 70,000 to 100,000 baht each, and with bank credit require 30 to 50% cash down payment, with 12 to 15% interest per year on the balance.

The farmers owning tractors generally own at least 30 rai of land. Most of these farmers also do custom tilling at rates ranging from 15 to 100 baht per rai, depending on the type and condition of the land, to offset the cost of a tractor. Contract farming work is done on average for five to six months per year, with estimated annual tractor use to average from

900 - 1000 hours Under optimum conditions one tractor can till 60 rai of land, either paddy or upland, per 20 hour day. With buffalo power the maximum load is 10 rai per 8 hour day. A buffalo cannot be worked more than 8 hours per day and frequently the maximum is 5-7 hours in hot weather

In several land clearing programs, it was found that tractors operated at a higher efficiency rate with fewer breakdowns during the rainy season

Traditional equipment, much of it hand and home made, is now used by the majority of the farmers These include, buffalo, which frequently are able to work only 5 hours per day, oxen used for transportation and some upland work, shovels, spades, hoes, hand ploughs, harrows, rollers, yokes, weeding knife, sickles, ox carts, threshing sticks, pitchforks, storing baskets, seed containers (coconut shells), bamboo poles for drying and for harvesting crops

Costs of using the tractor per rai Paddy land, 15-35 baht per rai for plowing 15-20 baht per rai for harrowing Upland crops, 20-45 baht per rai for plowing cleaned land and up to 100 baht for virgin land Labor costs for hand equipment laborers receive average of 6 to 8 baht per day for female workers, 6 to 10 baht per day for male workers

### Potential

The growth rate in tractor sales indicate that the farmer is becoming more

aware of the value of mechanization With increased mechanization and the use of other modern inputs the farmers production and income should increase. The tractor can work 200 to 3000 times the work of the buffalo

### Problems

- 1 - Lack of education available to the farmer in the use and advantages of mechanization.
- 2 - Small farmers lack the income and/or credit source to purchase tractors.
- 3 - Many farmers hold to the traditional facilities -- many dealers do not have the needed spare parts, or the trained mechanics needed for repair work
- 5 - Experimental stations or dealers should train tractor operators in the proper use and maintenance of tractors and equipment
- 6 - Many farm holdings are too small to justify mechanization
- 7 - Many holdings have trees and stumps in their fields -- some of these trees are left for shade which is needed, to put nutrients back into the poor soil, or remain due to the farmers inability to remove them

### References

- 1 - Farm Mechanization -- PE Division.
- 2 - Agricultural Development -- 1964 Scoville
- 3 - Saraphi -- Kamol Janlekha
- 4 - Farm Management Manual, FAO.

- 5 - Land Clearing
- 6 - Demand for Farm Tractors -- Dr. M Wagner
- 7 - Pa Mong Study
- 8 - Development of Agriculture -- Chapter 6 Technical Library 630

DEV

#### D - Credit

Credit is available to farmers and dealers, if they are willing to pay the high interest rates asked by the lenders. Organized credit in Thailand is just beginning to be effectively developed. The Bangkok Bank and the bank of Agriculture and Agricultural Co-operatives started agricultural credit divisions in 1963 and 1966 respectively. They are both rapidly expanding, but so far only reach the category three farmer -- the farmer who has larger holdings and cash savings and/or collateral for a loan. They require a 50% cash down payment for a long term loan, i. e. for land improvements or machinery. They expect to be able to reach only 11% of the farm holdings by 1971.

The banks have good repayment records on their loans and interest, about 96%, but in 1967 only 5.5% of the total agricultural money loaned was from bank sources.

Credit cooperatives also make agricultural credit loans, but only cover

---

about 8% of the farm households. The coops have a return of 89% repayment. Their loans are usually made on a co-signer or group basis.

Most of the loans in the agricultural field are made by unorganized markets, the lenders, the dealers of farm inputs. Many farmers could not borrow the needed funds except from these sources.

Peak debt in the Northeast in 1965 was 850 million baht. 90% of the farmers in the NE need credit. These farmers for the most part, are reported to be high credit risks as they have little or no collateral in the form of savings, and while most own their own land the parcels are small and title often difficult to establish. Many are reported to manage to repay only part of the loan, or sometimes only the interest on the loan, hence each year go deeper into debt. For example, in 1967, there was a carry over at the end of the season of about 250 million baht not repayed from the money loaned from all sources during that season.

The lenders sometimes require a land collateral guarantee on a loan, but seldom foreclose for failure to repay, due to the complicated and cumbersome laws and procedures governing foreclosure. The lenders are also satisfied with the collection of the interest on the loan. The dealers charge high rates of interest up to 130% per year in extreme cases, but averaging about 30 to 69% for a short six month term loan.

Each dealer handles his own interest rates and terms. There are no govern-

ment laws governing him. He in turn receives his financing from distributors of inputs and operates on a margin of 20 to 30%. Deficiencies in loan repayments are the greatest in the dealer/lender loans. Occasionally the farmer with good credit standing, who would be able to receive organized credit will borrow from these dealer/lenders. These loans are granted in as little time as a few hours, as compared to the long involved investigations required by the banks, this will discourage the farmer from seeking funds from this source.

Some of the bank investigations and appraisals take as long as 2 to 3 months. Bangkok Bank has a good record of granting loans in as little as 15 days in some cases. Most banks handle their own loan investigations and subsequent supervision of the loans.

In 1967 approximately 11,000 farmers received credit via AFG. This group aids the farmers in receiving bank credit for their seeds, fertilizers, insecticides. USOM/ARD guarantees the banks against a 50% natural disaster loss, and this feature will be assumed by the banks in another three years time.

The average loan to the farmer is about 2500 baht, however, many farmers only borrow as little as 300 to 400 baht.

### Trends

60% of lenders are relatives, neighbors loan about 8%, institutional loans

about 12%, and this is mostly for crops, 30% are from commercial sources, as the dealers, lenders. Most loans, 70% are for less than one year periods

The need for credit is increasing yearly

### Sources available

#### Organized credit

Bank for Agriculture and Agricultural Cooperatives

Bangkok Bank

Krung Thai Bank

Thai Farmers Bank

Sri Ayudhya Bank

Amphur Farmer Groups

Cooperatives

#### Unorganized credit

Private Money Lenders

Dealers

Relatives

Landlords

Neighbors

### Potential

In the NE the majority of the farmers need credit, until the banks can adequately take over the full responsibilities for all agricultural credit,

much of the credit available now is going to have to continue to be supplied by the lender/dealers. There are short term sources of money available at this time from these dealers although at the high interest rates which they charge. If the interest rates were fixed at a legal rate of 15% much of the commercial credit now being supplied by these lender/dealers would disappear.

Short term loans increase the administration costs for the bank, hence they should make larger loans for longer periods to fewer farmers. If the banks would raise the rates on agricultural loans to 15 to 20% they could attract some private entrepreneurs to make more funds available.

The banks should encourage savings, and encourage the farmer to use his credit for productive not consumptive uses. There is a need for promoted savings, national savings, in the form of cash, banked or hoarded, irrigation or farm improvement, resources, farm investment, taxes on agricultural products.

Some credit can be given to the farmer in the form of government programs land, clearing, irrigation, new crops, extension.

### Problems

#### 1 - Organized credit

- a - Through organized channels with the banks doing their own loan investigations and supervision, the costs involved require higher

interest rates and hence less money is available to loan

- b - Appraisal time is lengthy from organized credit sources, sometimes is not granted until it is too late for it to be used for the original purpose intended, hence it becomes a consumptive rather than productive type of credit
- c - Is not developed enough to reach the majority of the farmers needing credit 90% of the NE farmers need credit either in kind or in cash The Bank for Agriculture and Agricultural Cooperatives only expect to reach 11% of the farm households by 1971
- d - Does not have enough trained loan personnel to investigate and handle the loans
- e - Needs more loan funds to lower the interest rates for the farmer, but initially they should be raised to attract more private loan capital
- f - Loans should be longer than one year

## 2 - Unorganized credit

- a - Has very high interest rates -- short term loans, frequently no collateral required.
- b - Accumulated profits are not fed back into productive agricultural enterprise -- they are either consumed or taken out of the NE
- c - Farmer must have good bank credit source before elimination of this source

## Coop. Failures

- a - They are government sponsored not farmer initiated
- b - Lack interest of the administrators
- c - Distrust of coops by the farmer since it is a government organization
- d - Many are too small and too understaffed to permit efficient management
- e - Interest rates bear no relationship to the market -- hence a loss of funds which could be available for credit
- f - Cumbersome methods involved in loan administration

## References

- 1 - Financing of Rural Households in Thailand -- A Rozenthal
- 2 - Commercial Banking in Thailand -- A Rozenthal
- 3 - Financial Markets and Development Planning, A conceptual framework -- A Rozenthal
- 4 - Agricultural Credit in Thailand 1964
- 5 - Savings and Loan Feasibility Study Thailand 1965 -- Dagnino
- 6 - Agricultural Credit and Marketing in Northeast Thailand - Peters
- 7 - Agricultural Credit and Thailand -- Kasetsart University/Univ of Hawaii
- 8 - Agricultural Cooperatives An evaluation and recommendation for Improvement, ICTC 1968

- 9 - Hans Platuenius Report to Thailand, Northeast Thailand, Potentials and Problems
- 10 - Bank of Agriculture and Agricultural Cooperatives -- Chamnien
- 11 - Bangkok Bank reports
- 12 - Pa Mong Survey, BUREC

Attachment to the Credit Section

General Information about Bank for Agriculture and Agricultural Cooperatives

- 1 - Prefer to work through the cooperative groups
- 2 - If there is no organized group, it will make individual loans to farmers
- 3 - From December 1966 to July 1967, 15 provincial banks branches were set up
- 4 - April to May 1968, 10 more branches were set up
- 5 - Bank Functions
  - a - Credit supervision
  - b - Commodity loans -- bank does own credit investigation and selection, and follow-up supervision
  - c - Technical guidance provided to the farmer
  - d - Credit education
  - e - Mobile units to serve areas without established branches
- 6 - Services in 1967
  - a - 15 branches serving 95 district -- 60 offices and mobile units

- b - 40,000 short term loan-
  - 1 - Baht 60,000,000 made for rice production, corn tapioca, cotton, and upland crops
  - 2 - Baht 61,000,000 for buffalo, water pumps, land clearing improvements
- c - 97% repayment through 1968 March
- d - Maximum loan per customer 60 to 70,000 baht
- 7 - Short term loans -- 12 months (12%)
  - a - 1 year, seasonal expenses, fertilizers, insecticides, labor, etc
  - b - Security group liability -- 5000 baht limit
- 8 - Medium Term Loan -- 3 year repayment period (12% per annum)
  - a - Capital items, draft animals, water pumps, land clearing, land improvements, and land mortgage
  - b - Loans up to 5000 baht require 2 signers
  - c - Loans over 5000 baht require a land mortgage
- 9 - Long Term Loan -- large farm areas extended credit at 9% per annum
  - a - Facility loan warehouse, tractor loans, require 50% cash down payment, for 50% credit
  - b - No chattel mortgage law in Thailand, but bank sometimes require a land mortgage
  - c - 3 to 4 persons usually purchase together
  - d - A cooperative is allowed up to 50,000 baht for equipment
  - e - Extension service controls the wear and tear on the equipment

both before and after delivery

f - Finance up to 100% of custom farm service (plowing, etc ) the bank controls the number of rai to be cultivated, requires an itemized household and harvesting cost list, present savings declaration, and charge 1% per month (12% per annum) for this type of loan

### LOSID (Loan Office for Small Industry Development)

LOSID is a Department of the Ministry of Industry which makes low-interest credit available to industries. They make technical assessment of each application and make recommendation for the loan to agrobusiness industries. Krung Thai Bank contributes 3 baht for every 1 baht which the Ministry allocates. In 1968 up to August 31, LOSID had granted a cumulative total of 313 loans amounting to Baht 75.3 million (from March 1964 when LOSID was created). Of this total 104 loans amounting to Baht 24.7 million were granted in 1968. The budget for next year from the Ministry of Industry is Baht 6 million, with the added funds from the Krung Thai Bank, Baht 18 million, and the 6 million baht loan repayments, about 30 million Baht will be available next year for loans.

The loan limit at this time is Baht 500,000. However, efforts are being made to include the Bangkok Bank as a third partner in LOSID. If this occurs the loan limit will be raised to Baht 1 million.

LOSID activities in the Northeast are increasing. A total of 55 loans amounting to Baht 13.5 million have been made in the NE. This is in line with the government emphasis on expanding credit to agrobusiness ventures in the NE.

Sources of Credit by Percentage of Value

Farmers needing credit -----	90%
Relatives -----	40 to 60%
Neighbors -----	20%
Institutional Lenders -----	10% (most are coops - government)
Miscellaneous Sources -----	20%

70% of the loans made are made in cash, 30% are made in kind

Average size ----- Baht 1,620 (\$78)

70% are for less than one year duration 30% over one year

Repayments are made mostly in cash on both the interest and principal

**The Average monthly interest rates by type of lenders**

Relatives -----	1 8 %
Neighbors -----	3.3
Commercial lenders -----	4 3
Local Store -----	6.2
Crop Buyer -----	3.9
Landlord -----	1.8
Moneylender -----	7 3
Others -----	7 0
Institutional Lenders -----	0 8
Government Credit Cooperatives -----	0 8
Other Government Agencies -----	0.8
Average Rate -----	2 7

Money lenders have more than 1/3 failure of repayment

70% of the lenders must borrow to have adequate funds available prior to the new crop season

Purposes of Credit -- NE

Family living -----	47.84 %
Production Expenses -----	41 77 %
Farm Improvement -----	7 93 %
Miscellaneous -----	2 46 %

## E - Extension & Educational Services

In the NE school is compulsory through the 4th grade, and in some areas through the 7th grade. Most persons under the age of 30 can read and write, the literacy rate is about 70%. Only 90% of the school - age children attend school, with 75% attending general education schools, 15% attending vocational schools, 5% attending teacher training schools, 5% attending higher education schools. The farmer does not see the necessity of formal education in relationship to his agricultural work. There is a high drop out rate, especially during the seasonal agricultural periods. There are 53 agriculture extension stations in the Northeast and a total of 144 in Thailand. They are reaching a limited number of farmers with the improved methods which result from their individual experiments.

There are two teacher training schools and 40 vocational schools in the NE with attendance of 12,000 students per year, and 2 higher level education schools.

Extension education primarily functions in the rural areas through organized extension clubs -- new agricultural practices are introduced via these channels. Extension work is done under the sponsorship of the Ministries of Agriculture, Interior, National Development, and Finance. The National Extension Office under the Under Secretary of State, Ministry of Agriculture, was set up to coordinate this work. However, most of the private and government work is done independently, and each department under the Ministry of

Agriculture also functions independently

Facilities available.

The Ministry of Agriculture is responsible for research including

- a - Cultivation of food and fiber crops
- b - Animal husbandry.
- c - Fishing
- d - Forestry

Research is divided among five departments and nine divisions in the Ministry of Agriculture. Research and experimentation provide information and advice, establish demonstrations, operate programs, distribute improved seeds, combat agriculture diseases, conserve and develop specific natural resources, regulate agricultural production and sales

Research also is done by RID, Ministry of National Development, Tobacco Monopoly, Ministry of Finance, Welfare Department, Ministry of Interior, Kasetsart University; Rockefeller, FAO, Agricultural Research Institute, of the Applied Scientific Corporation of Thailand, Bangpra Testing Station, NE Agricultural Vocational Schools in Kalasin, Khon Kaen, Surin, Nan, and Pitsanuloke, and NRD in the Office of the Prime Minister.

All of the small programs have adequate equipment to contribute to their small programs. The Seed Multiplication stations are doing good work in

experimentation and for the limited areas covered in the distribution system of seeds, the program is effective

The Regional Extension Center at Khon Kaen coordinates area extension and research activities and serves as a training center. Classes up to 100 persons are held in production workshops for extension information services

Extension workers now receive special training before doing field work. All workers have received a six month pre-service training course and most of the keymen have had training abroad

#### Potential

Current plans are for the training of 100 persons per year for new Amphoe Officers, hoping to attain the ratio of 1 man per each 2000 farms -- 1967. The present ratio is 1 for each 6000 farms. Extension education with aid from private industry could reduce the period of time needed to upgrade agricultural production. The Education programs should be related to and coordinated with the research programs.

The Community Development and ARD programs do reach a percentage of the farmers, but could be expanded greatly for more effective results

#### Problems

1 - High cost of reaching a large number of small farm families. NE has

15,000 villages and about 1 million individual farms

- 2 - The education and experiment results are not reaching many farmers
- 3 - Road conditions are bad during the wet and growing seasons, when the extension workers are needed the most.
- 4 - Ideal would be 1 worker for each 10 villages or 1000 to 1200 additional extension workers, this would cost an estimated 2 5 million dollars
- 5 - Lack of experienced leadership at the field level.
- 6 - Consolidation of many extension services -- which many times overlap or duplicate.
- 7 - Excess of paper work now required by extension workers, which cuts his time in the field where he is needed.
- 8 - Research is needed for
  - a - water management in relation to soil types,
  - b - crop response to fertilization,
  - c - the best management practices,
  - d - cropping patterns,
  - e - integrated livestock programs,
  - f - irrigated farming production.
- 9 - Continuous research must be maintained to supply farmer with required information
- 10 - Officers stationed in changwad are paid by and receive their promotions from the Ministry on the national government level, but they are supervised and carry out the programs of the Government and Governor of

the Changwad

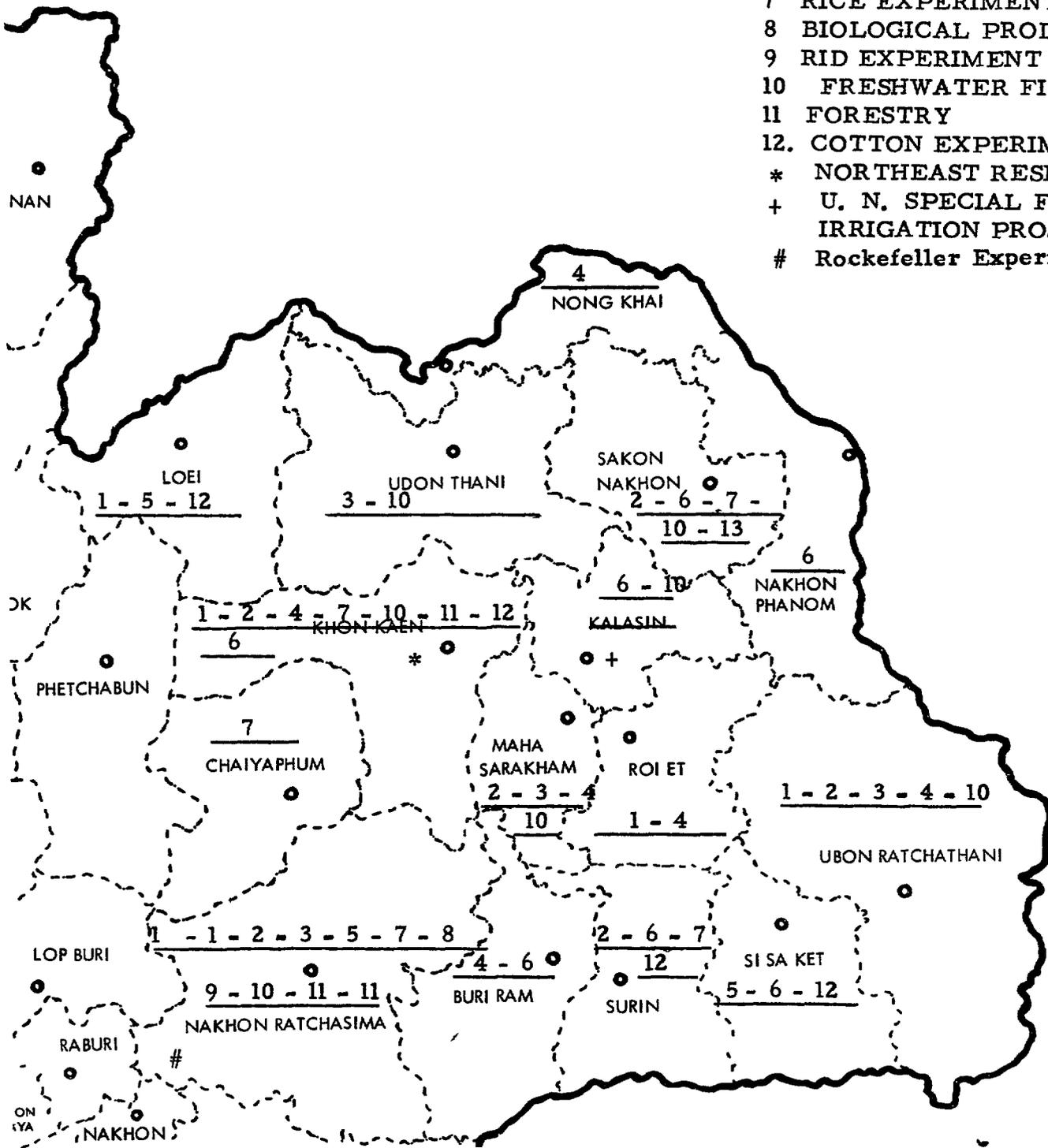
- 11 - Lack of coordination between the national level Ministries and Departments, between the Changwad and the National level, obstacles created by this procedure prevent effective implementation of extension and education programs
- 12 - The selection of the demonstration farms now made, the ones which are in use now possess ideal conditions, i.e., the water, soil fertility  
Some of the farms selected should be of an average and poor standard

#### References

- 1 - Pa Mong Study
- 2 - Education training program ARD
- 3 - Preliminary Assessment of Education and Human Resources in Thailand
- 4 - The Development of Agriculture -- Chapter 6 -- Technical Library  
630 DEV
- 5 - Kasetsart University Reports
- 6 - Thailand Electric Power Study.

NORTHEAST THAILAND --LOCATION MAP --AGRICULTURAL RESEARCH STATIONS

- 1 AGRICULTURE EXPERIMENT
- 2 LIVESTOCK BREEDING
- 3 ANIMAL NUTRITION FORAGE
- 4 SERICULTURE STATION
- 5 SEED LAC STATION
- 6 SEED MULTIPLE STATION
- 7 RICE EXPERIMENT STATION
- 8 BIOLOGICAL PRODUCT
- 9 RID EXPERIMENT STATION
- 10 FRESHWATER FISHERIES
- 11 FORESTRY
- 12 COTTON EXPERIMENT
- \* NORTHEAST RESEARCH CENT
- + U. N. SPECIAL FUND PILOT IRRIGATION PROJECT FAO
- # Rockefeller Experimental



Number and Type of Agriculture Stations  
Northeast Thailand

Department of Agriculture

Agricultural <sup>1/</sup> -----	6
Rubber -----	0
Seed Multiplication -----	9
Silkworm Culture -----	5

Department of Rice

Rice <sup>2/</sup> -----	5	-----Sub Total	25
--------------------------	---	----------------	----

Department of Fisheries

Inland Fisheries -----	7	----- Sub Total	7
------------------------	---	-----------------	---

Department of Livestock

Livestock Breeding -----	6		
Artificial Insemination -----	2		
Animal Nutrition and Forage Crops -	4		
Livestock Quarantine -----	4		
Dairy <sup>3/</sup> -----	1	----- Sub Total	7

Department of Forestry

Forestry -----	1		
Lac Stations -----	3	----- Sub Total	4

TOTAL ----- 53

- 1/ Additional 8 Disease Eradication Stations
- 2/ Additional 3 Pest and Disease Control Stations
- 3/ Station at Muak-Lek, a Thai-Danish joint venture

## VII GOVERNMENT PROMOTIONAL AGENCIES

The RTG is aware of the problems in the Northeast and is giving priority to the agricultural and agribusiness development of this area. It is improving the infrastructure in the northeast in the form of irrigation, highways, extension services, electricity expansion and development, police services. It has placed great emphasis on the development of vocational schools. Extension education is functioning, mainly in the rural areas, and the new agricultural practices are introduced via these channels. Adult and Youth clubs are organized and are strongly supported by the government and by USOM.

The Ministry of Industry is giving priority to agricultural based industries in its development promotion. The following departments at the Ministry are providing services:

- 1 - Department of Industrial Promotion This department handles the establishment of small industries, extends credit through LOSID (loans to small business), industrial estates, and small industry marketing problems.
- 2 - Department of Science This department runs pilot projects and investigates the raw materials needed for small industries.
- 3 - Thailand Management Development and Productivity Centre (TMDPC)  
This department improves the utilization of all resources used in industry.

and commerce including the men, materials, machines, and money

A special objective of the Centre is to raise the standards of management and productivity, and the training of all levels of management

4 - Board of Investment Promotes industrial investment in Thailand

Makes investment incentives available such as tax holidays, exemption of import duties on equipment, reduction of import duties on raw materials, immigration privileges, permission to own land, etc  
Greater incentives may be made available to industry based in rural areas, and those based on domestic raw materials, producing for export, etc For specifics, reference should be made to the Board of Investment

5 - Industrial Finance Corporation. Renders long term credit facilities

to prospective industrialists It was established to assist in the establishment, expansion, modernization, of private industrial enterprises, and to encourage the participation of private capital, both internal and external in such enterprises, IFC/T can provide finance in the form of long term and medium term loans with or without security, or by purchasing or subscribing for shares or other securities The organization, while sponsored by the government, is privately owned and controlled, and its main focus is on financing medium sized industries

- 6 - Applied Scientific Research Corporation of Thailand Was established by the government and UN Special Fund, with the principal responsibility of the corporation to undertake the applied scientific research to solve problems of national importance in the natural resources, agriculture, industry and administration services of the country, including health and nutrition, and to provide basic scientific information needed for national development planning It is divided into three sections, Technological Research Institute, The Agricultural Research Institute, and the Ecological and Environmental Research Institute
- 7 - USOM/ARD Emphasis is concentrated in the lowest income and most politically unstable areas of Northeast Thailand The emphasis is on development of village health and sanitation, education, agricultural development, highways, and bridge building Additional development resources are aimed toward the village level so the villager will identify himself with his government

The program was started in 1963, and has expanded and grown Manpower training and income production approaches have lately been added to the regional activities