

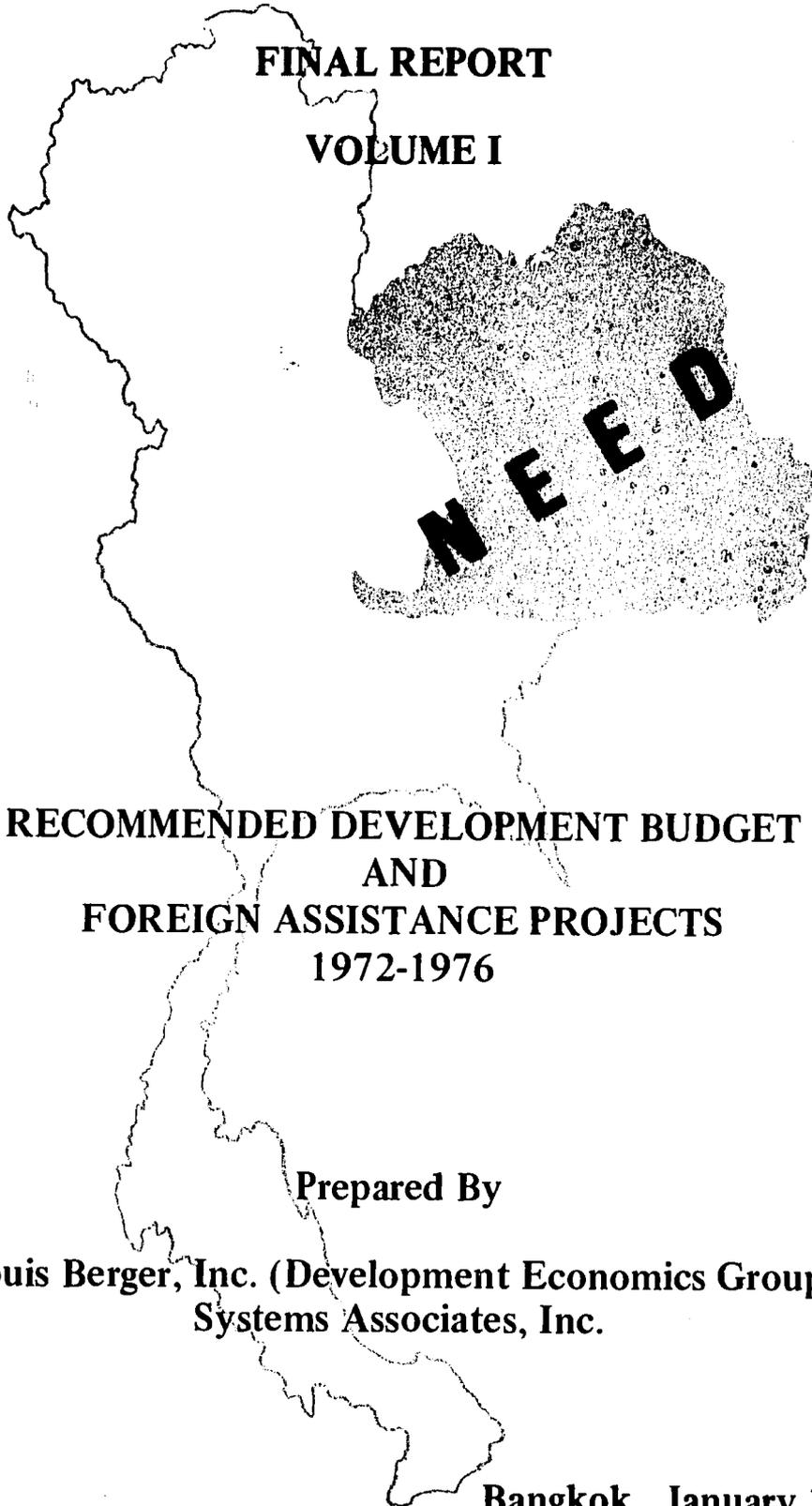
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NORTHEAST THAILAND

4930215-006801

ECONOMIC DEVELOPMENT STUDY

230p



FINAL REPORT

VOLUME I

**RECOMMENDED DEVELOPMENT BUDGET
AND
FOREIGN ASSISTANCE PROJECTS
1972-1976**

Prepared By

**Louis Berger, Inc. (Development Economics Group)
Systems Associates, Inc.**

Bangkok, January 31, 1972

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NORTHEAST ECONOMIC DEVELOPMENT

Planning Advisory Group

Louis Berger, Inc.
Systems Associates, Inc.
Joint Venture

January 31, 1972

Chairman
Northeast Economic Development Sub-Committee
National Economic Development Board
Bangkok

Dear Mr. Chairman:

We are happy to submit to you the Final Report, (two volumes) the last in a series of planning reports prepared by the Louis Berger - Systems Associates Joint Venture, together with Royal Thai Government counterpart staff, in accordance with the NEED Planning Program.

The principal purpose of this NEED Planning Document is to recommend development budget allocations and foreign assistance projects for Northeast Thailand during the Third Plan period 1972-1976. These recommendations are based on the following overall objectives for the region during the Third Plan period:

To diversify agriculture and achieve greater productivity.

To increase significantly the Region's share of agro-business processing.

To improve the use and maintenance of existing infrastructure facilities.

To emphasize human resources by the expansion of health, education and other community development facilities.

Implementation of the types of programs recommended in the following report are required to alleviate the disparity in economic development and social welfare which now exists between the Northeast and other regions of Thailand. We feel strongly that although the process will take longer than the Third Plan period it is necessary to begin at once to meet the objectives outlined above.

We would like to point out that this report represents the collaborative efforts of many RTG agencies, although the participating consultants take all responsibilities for the recommendations and opinions expressed.

Very truly yours,

LOUIS BERGER, INC.

Louis Berger
President

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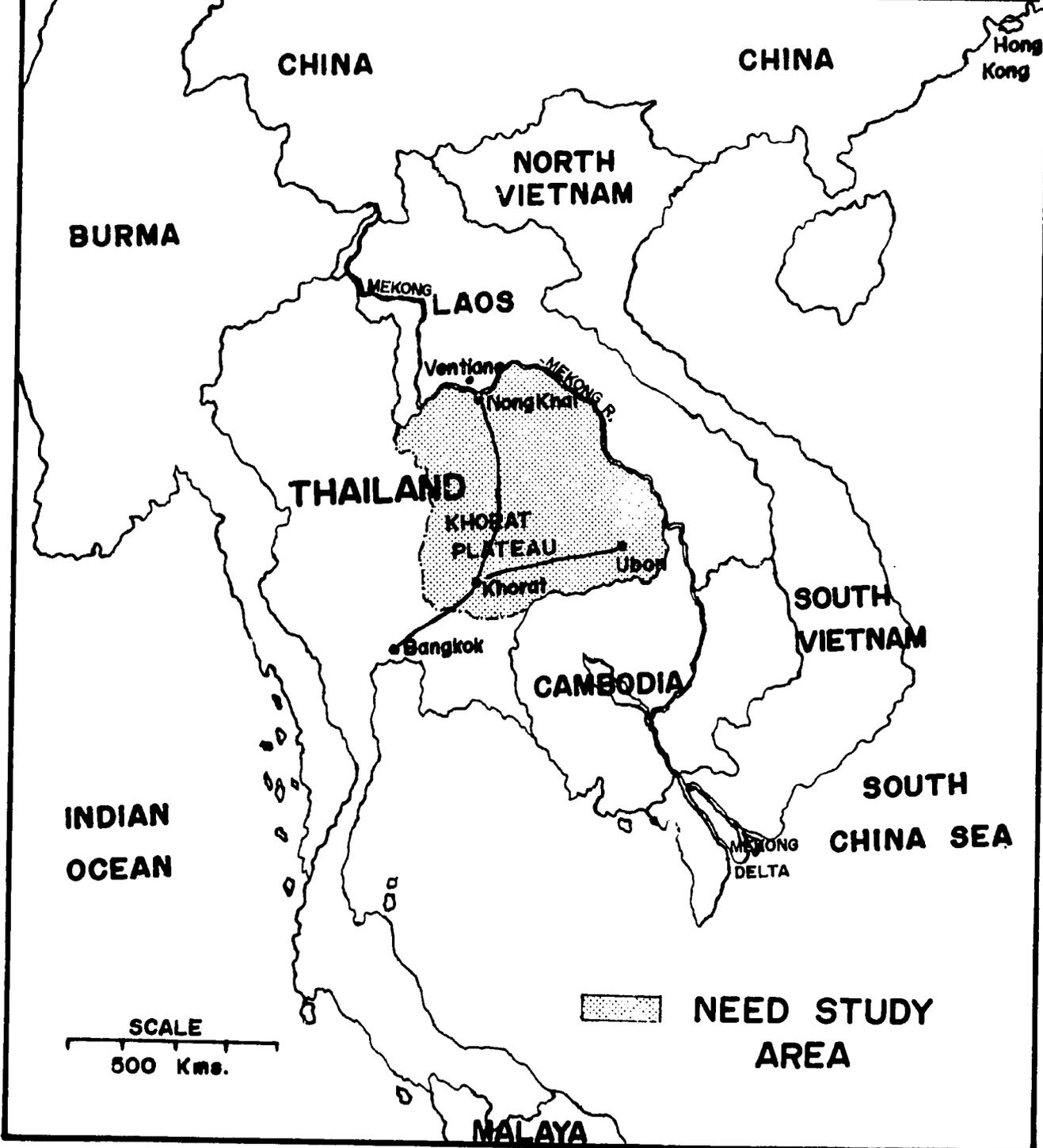
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NORTHEAST THAILAND

GENERAL STATISTIC

AREA	170,000 SQ KMS.
POPULATION (1969)	12.1 MILLION
POPULATION GROWTH RATE (1960-70)	3.3 %
GROSS REGIONAL PRODUCT (1969)	18.8 BILLION BAHT
G.R.P. GROWTH RATE (1960-69)	7.0 %
PER CAPITA INCOME (1969)	1,548 BAHT
GOVERNMENT EXPENDITURE (1969)	7.45 BILLION BAHT
DEVELOPMENT BUDGET (1969)	2.6 BILLION BAHT
GOVERNMENT REVENUE (1969)	0.33 BILLION BAHT
PRINCIPAL ECONOMIC ACTIVITY	AGRICULTURE (45% OF GRP)
PRINCIPAL CROPS	RICE & KENAF (24% OF GRP)
MANUFACTURING	INSIGNIFICANT
	20.8 BAHT = U.S. \$ 1.00



SCALE
500 Kms.

NEED STUDY AREA

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CHAPTER I
NORTHEAST DEVELOPMENT PLANNING

1972 - 1976

1.1 General Planning Strategy

The general planning strategy for the Third Development Plan for Northeast Thailand is designed to enable the region to participate in the overall economic and social development of the country during the 1972-1976 plan period and to establish a firm base for further accelerated expansion.^{1/} This strategy concentrates on establishing the levels of RTG Development Budget expenditures. It is realized that changes in government policy, foreign assistance levels and private investments also are important variables, but these factors are more difficult to control and forecast and perhaps will have less impact on the region than changes in development budget expenditures.

Because of its present disadvantaged economic position, the Northeast should be given special economic, social and political consideration. This was the intent of the First and Second Development Plan which resulted in the construction of considerable infrastructure facilities particularly in roads and dams. These were intended to give the farmer (who represents 85 percent of the population) the opportunity to increase productivity by irrigating the land and providing better access to markets. These development plans, however, did not fully supplement the construction efforts with programs which would help farmers take advantage of these new facilities. Recommendations for project implementation in the Third Plan, therefore, have been based on programs to more fully utilize the substantial infrastructure in the Northeast. Also, previous plans appear to have neglected agricultural research and extension and failed to ally it with general education for the farmer. Recommendations for the Third Plan stresses human resource development as a prerequisite for economic growth in the region. Programs for increasing industry in the region, particularly the processing of agricultural products grown in the Northeast, also are given important emphasis.

^{1/} It should be noted that the Third Development Plan for Northeast Thailand as outlined in this report represents the views of the consultants and are not necessarily those of the RTG. However, it is felt that they are similar although as a recent World Bank report has stated, "The absence of a clearly stated regional development objective has seriously handicapped regional development planning". (Proposals for Development of Northeast Thailand, December, 1971).

During the First and Second Plans the public infrastructure construction programs, combined with the establishment of the military bases in the region, stimulated the economy but were not paralleled by an equivalent growth in the major private sector, (i.e. agriculture, related processing and other activities). Implementation of the new proposals recommended for the Third Plan is intended to correct the imbalance which has been evident, and economic growth, particularly of the productive sector, should improve without the high level of public construction programs that were carried out under the First and Second Plans.

Standards of health and education services in the Northeast were found substantially lagging, so equity considerations predominate in the proposed government allocations to these important sectors. Community facilities have also been stressed as these play a fundamental role in making the development effort meaningful at the grass roots level.

1.2 Background

Since 1961, the Northeast regional production has varied between about 18 percent and 16 percent of the national production and has tended to decrease over the years. (See Table 1-1). Because of low productivity and the structure of the region's economy, government revenues are small and declining in relation to government expenditures.

The government will have to spend much more in the Northeast than it receives in revenue from the region. During the First and Second Plans, between 27 percent and 28 percent of the national development budget was used in the Northeast. (See Table 1-2). On a per capita basis this compares with 34 percent of the people; however, in terms of government expenditure versus revenue it is very high. During the First Plan, revenues were 6 to 7 percent of expenditures, in the Second Plan they will have declined to 4 or 5 percent. As the share of regional income attributable to other than agricultural production rises during the Third Plan, government revenues are expected to increase but are not likely to be more than 5 percent by the end of the period. The discrepancy between revenues and expenditures will continue to grow as shown in Table 1-3.

1.3 Recommended Development Budget

The Northeast development budget proposed by the Consultant for the Third Plan period was established by considering the best mixture of sector expenditures rather than the total amount of the budget. The result of this analysis indicated that an aggregate expenditure of ₦ 18.385 billion is required for the Northeast. This is about 42 percent more than the actual estimated expenditures in the Second Plan

TABLE 1-1
COMPARISON BETWEEN GROSS NATIONAL PRODUCTION
AND
NORTHEAST GROSS REGIONAL PRODUCTION
(Constant 1962 prices)

Year	Regional Output (¥ Million)	National Output (¥ Million)	GRP/GNP (%)
1960	10,065	56,069	18.0
1961	10,584	59,029	17.9
1962	11,476	63,793	18.0
1963	12,823	69,125	18.6
1964	12,947	73,693	17.6
1965	13,797	79,487	17.4
1966	16,265	89,190	18.2
1967	15,562	94,109	16.5
1968	16,752	102,578	16.3
1969	18,794	112,378	16.7

TABLE 1-2

FIRST AND SECOND PLAN DEVELOPMENT BUDGETS
(Including Sector Shares)
Northeast Thailand

Sector	First Plan		Second Plan	
	฿ million	% of Total	฿ million	% of Total
AGRICULTURE				
Irrigation	590	9.1%	1,102	8.5%
Crop Research & Extension	137	2.1%	250	1.9%
Forestry, Livestock & Fishing	253	3.9%	332	2.6%
Others <u>a/</u>	107	1.6%	187	1.4%
Total	1,087	16.7%	1,871	14.4%
INDUSTRY, MINING & COMMERCE <u>d/</u>				
Total	2	0.0%	10	0.1%
TRANSPORT AND COMMUNICATIONS				
Highways			3,100 ^{b/}	23.9%
Highway Maintenance			311	2.4%
Others			1,026	7.9%
Total ^{e/f/}	2,125	32.6%	4,437	34.2%
POWER				
Total	150	2.3%	375	2.9%
COMMUNITY FACILITIES AND PUBLIC WELFARE <u>c/</u>				
Total	535	8.2%	1,558	12.0%
PUBLIC HEALTH				
Total	486	7.5%	815	6.3%
EDUCATION				
Total	2,131	32.7%	3,892	30.0%
DEVELOPMENT BUDGET				
Total	6,516	100%	12,958	100%
NATIONAL DEVELOPMENT BUDGET				
Total	23,404		46,448	
REGIONAL/NATIONAL PERCENTAGE	27.8%		27.9%	

- a/ Includes Land Development Department, Land Cooperatives, Department of Credit State Enterprises budget items.
- b/ Includes ฿ 700 million for ARD roads.
- c/ Includes all water programs, community development, public welfare and urban programs.
- d/ Artesian wells previously included have been moved to community facilities.
- e/ Breakdown of total not available.
- f/ Includes ฿ 74 million for ARD roads.

TABLE 1-3
GOVERNMENT REVENUES AND EXPENDITURES
Northeast Thailand
1967 - 1976

(฿ Billion)

		<u>Expenditures</u>		<u>Revenues</u>	<u>Discrepancy</u>
		Total ^{1/}	Development ^{2/}	Total ^{1/}	Total
Second Plan	1967	5,703	2,051	283	5,420
	1968	7,007	2,268	316	6,691
	1969	7,452	2,607	331	7,121
	1970	8,421	2,913	360	8,061
	1971 ^{3/}	8,690	3,119	376	8,314
Annual Increase (%)		11.1%	11.0%	7.3%	
Third Plan	1972 ^{3/}	8,953	3,207	414	8,539
	1973 ^{3/}	9,607	3,391	455	9,152
	1974 ^{3/}	10,326	3,555	500	9,826
	1975 ^{3/}	11,169	3,780	551	10,618
	1976 ^{3/}	12,118	3,996	606	11,512
Annual Increase (%)		7.9%	5.7%	7.9%	

1/ Based on USOM/PEC analysis

2/ NEED/PAG calculations

3/ NEED/PAG projections.

period. Since the National Development budget is estimated to be ₪ 69.5 billion for the 1972-76 period the Northeast's share, therefore, is 26.5 percent.

The proposed change in budget allocations between the sectors for the Third Plan as compared with the Second Plan is that infrastructure construction, including highways, irrigation and power receive a smaller share, 29 percent against 37.7 percent,^{1/} and agriculture (excluding irrigation), community facilities, education and public health receive a larger share, 71.0 percent against 54.3 percent. Details of recommended development budget expenditures for the Third Plan period are shown in Table 1-4 and Chart 1-1.

The economic growth and diversification which can be achieved in the Northeast during the Third Plan is contingent to a large extent upon the availability of the RTG Development Budget expenditures. Changes in either the total amount of the budget or its composition will affect production targets, manpower requirements, and per capita income. The direct effect on value added from changes in the development budget on the growth rate of the region have been estimated as shown in Chart 1-2.

1.4 Regional Growth Rate and Gross Regional Product

Because crop production is critically dependent on such unpredictable factors such as rainfall and markets (particularly international), the annual growth rate of the Northeast economy has been very irregular.^{2/} It is clear, however, that during the past three years the average growth has decreased (See Chart 1-3).

The technique used to forecast GRP in terms of value added was based on growth rates for each individual productive sector; these were then aggregated to give the total gross regional product and its growth rate. The overall result is an estimated GRP of approximately ₪ 28 billion by 1976, which equals an average annual increase of 6.8 percent for the period 1972-76. This compares with a historic growth rate of 7.0 percent for the decade of the 60's,^{3/} and an estimated current growth

1/ Although in absolute terms infrastructure expenditures increased from ₪ 4.88 million to ₪ 5.323 million.

2/ There was also the impact of U.S. Government expenditure, related to military bases in Northeast Thailand.

3/ The historic growth was calculated from the least squares fit to the exponential $y = ab^x$.

TABLE 1-4

PROPOSED THIRD PLAN DEVELOPMENT BUDGETS EXPENDITURES
(Including Sector Shares)
Northeast Thailand
1972 - 1976

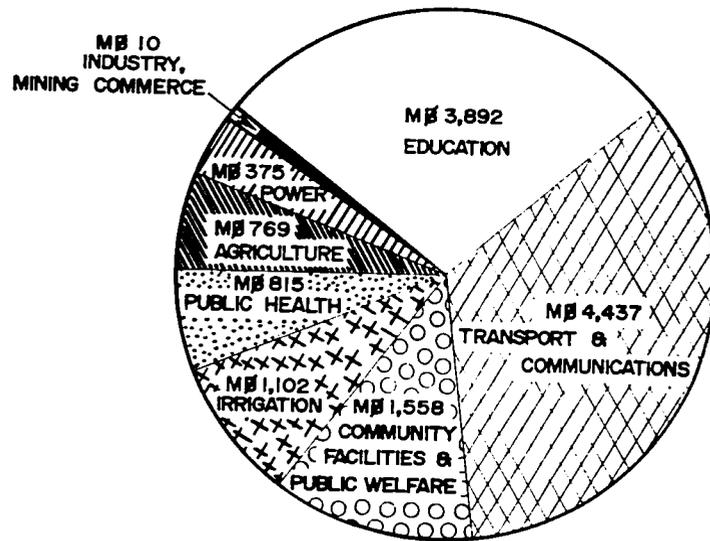
Sector	Third Plan	
	฿ Million	% of Total
AGRICULTURE		
Irrigation	914	4.9%
Crop Research & Extension	496	2.7%
Forestry, Livestock & Fishing	579	3.2%
Others <u>a/</u>	198	1.1%
Total	2,187	11.9%
INDUSTRY, MINING & COMMERCE <u>d/</u>		
Total	138	0.7%
TRANSPORT AND COMMUNICATIONS <u>b/</u>		
Highways	3,270	17.8%
Highway Maintenance	765	4.2%
Others	193	1.1%
Total	4,227	23.0%
POWER		
Total	374	2.0%
COMMUNITY FACILITIES & PUBLIC WELFARE <u>c/</u>		
Total	2,204	12.0%
PUBLIC HEALTH		
Total	2,012	10.9%
EDUCATION		
Total	7,243	39.5%
DEVELOPMENT BUDGET		
Total	18,385	100.0%

- a/ Includes Land Development Department, Land Cooperatives, Department of Credit State Enterprises budget items.
- b/ Includes ARD roads.
- c/ Includes all water programs, community development, public welfare & urban programs.
- d/ Artesian wells previously included have been moved to community facilities.

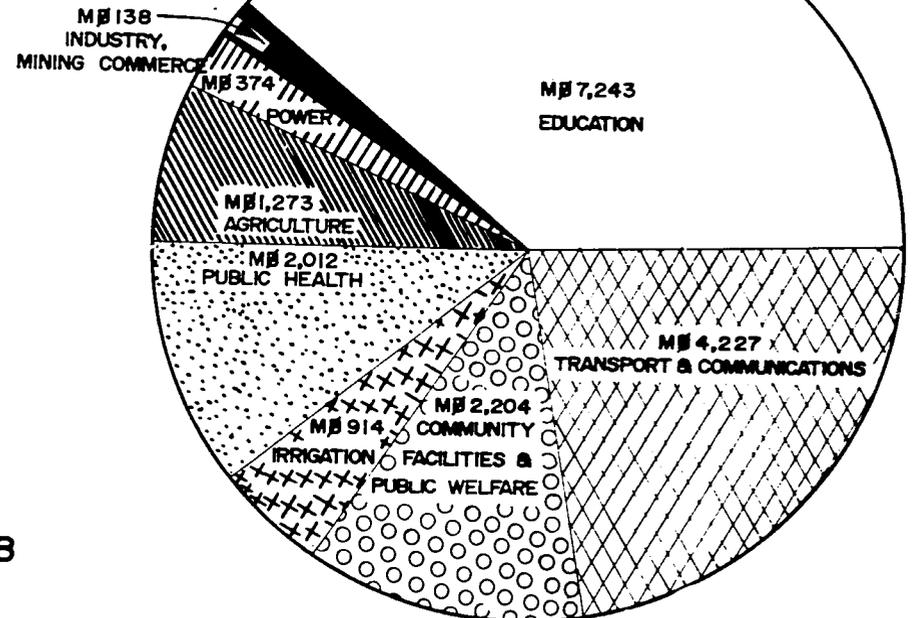
NORTHEAST DEVELOPMENT BUDGET.

THIRD PLAN

SECOND PLAN

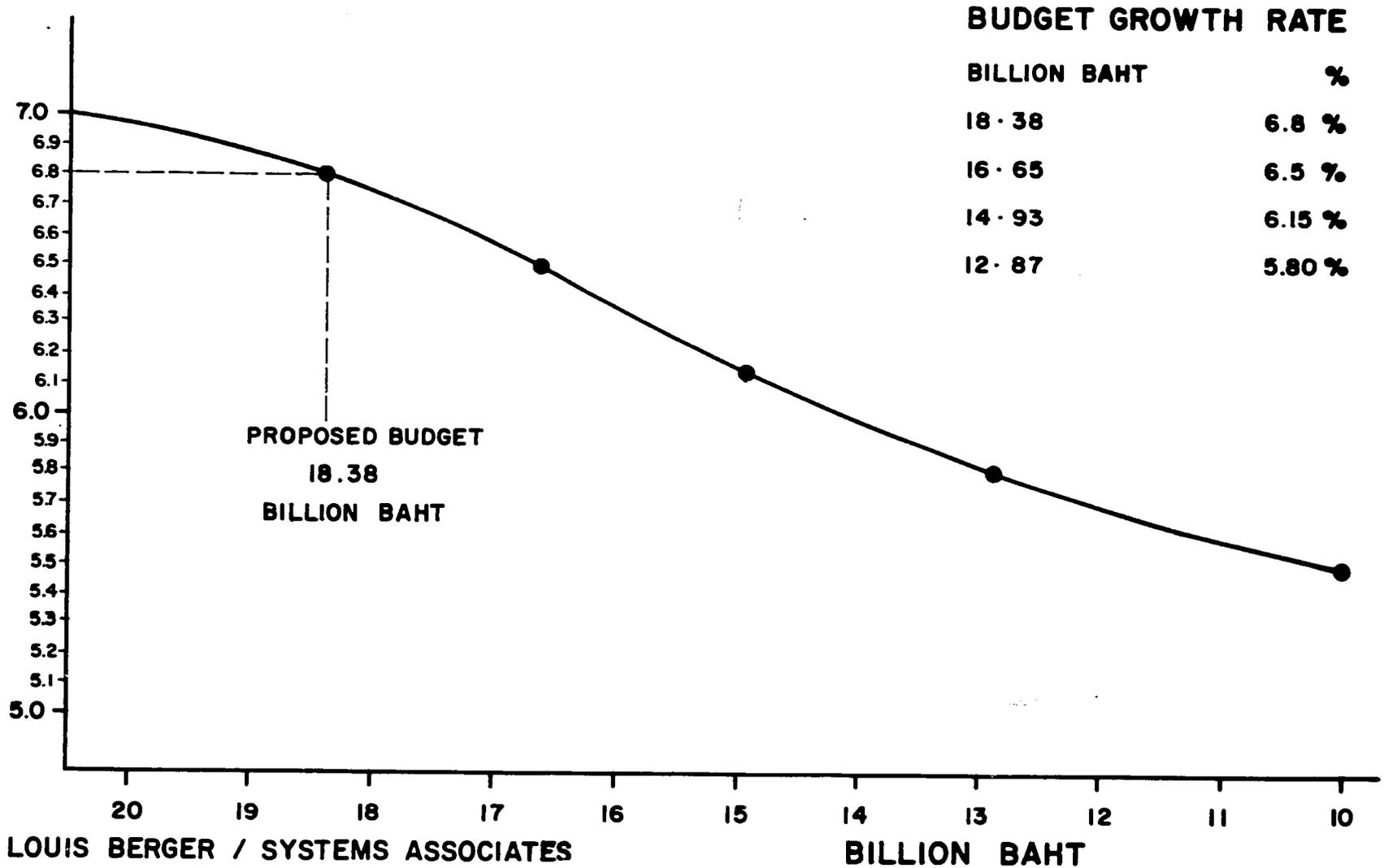


TOTAL DEVELOPMENT BUDGET M\$ 12,958



TOTAL DEVELOPMENT BUDGET M\$ 18,385

EFFECT OF BUDGET REDUCTION ON THIRD PLAN GROWTH RATE



NORTHEAST G.R.P. ANNUAL GROWTH RATE

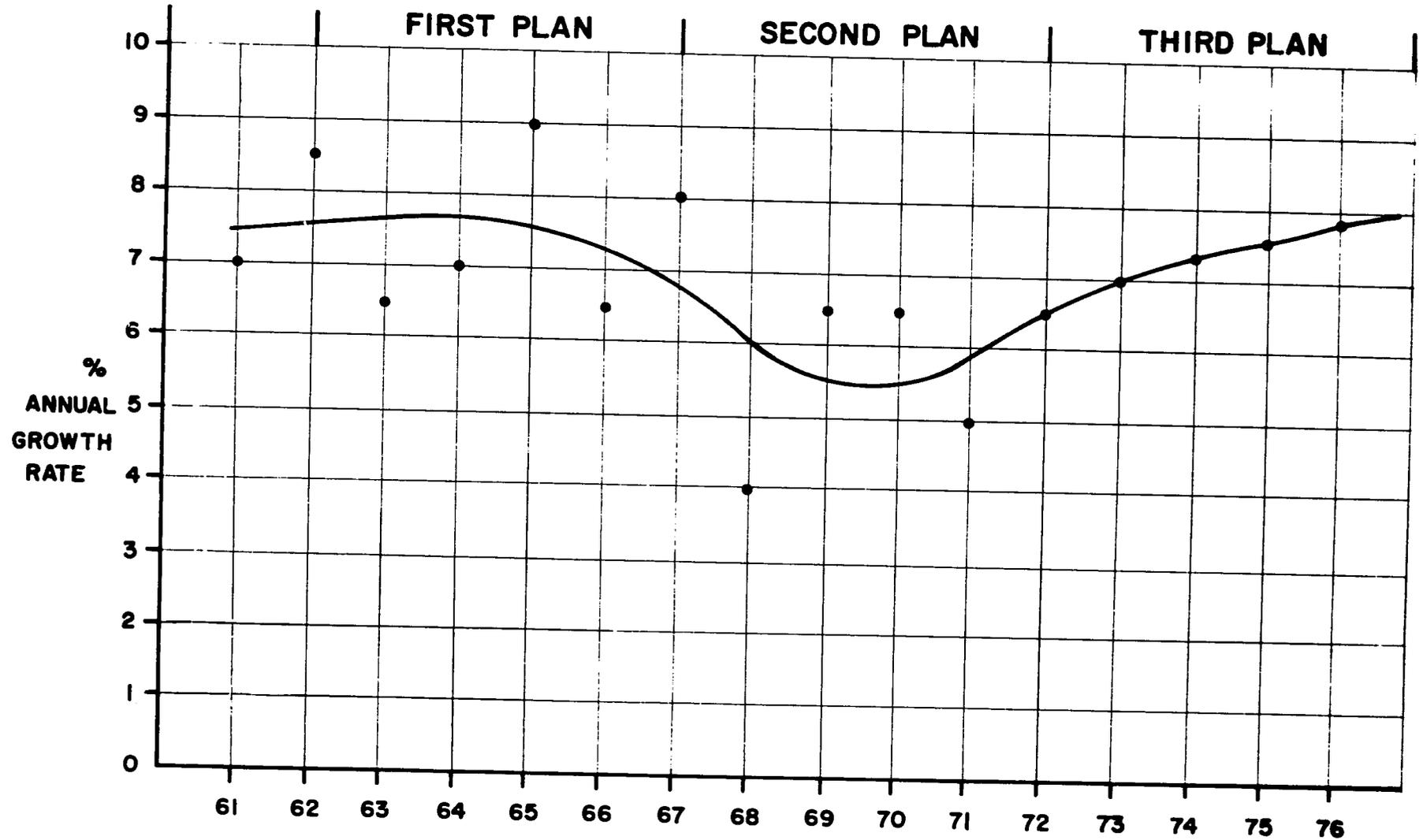
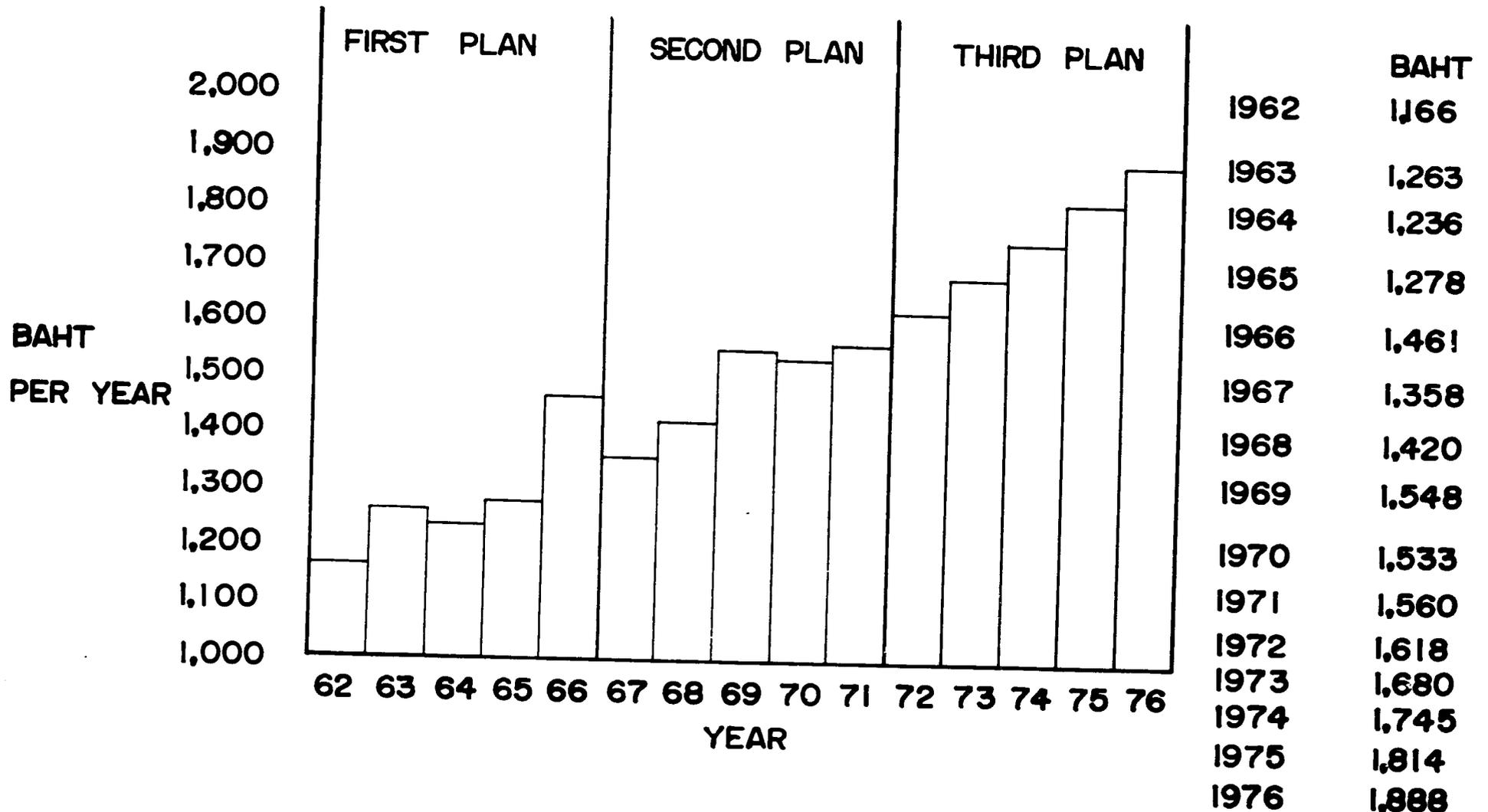


CHART 1-4

PER CAPITA INCOME IN NORTHEAST THAILAND BETWEEN 1962 & 1976 BAHT (CONSTANT 1962 PRICES)



of 5.7 percent.^{1/} An independent analysis using the Shift and Share method, gave results which are reasonably consistent with the NEED projections.^{2/}

The economic growth will increase the regional per capita income from $\text{฿ } 1,560$ in 1971 to $\text{฿ } 1,888$ in 1976 at an annual growth rate of nearly 4.0 percent. (See Chart 1-4). The planned growth rates and production values added in the normal National Accounts format are estimated in constant 1962 baht values, and are given in Table 1-5. Table 1-6 gives the structural composition of the GRP for the past and coming plan periods. This is presented in a form which shows the decline in importance of the production, processing and trade in rice, compared with that of the rest of agriculture, and of non-agricultural production.

During the course of the Third Plan period the value added from non-agricultural related production should overtake the agriculture related production value added in the gross regional product. (See Chart 1-5).

It should be emphasized that the projected annual average growth rate of 6.8 percent is based on the following:

- a) expansion of land area in rice production will be limited with new land being used primarily for crop diversification (i.e., cash and export crops);
- b) the level of education, public health and social services will be brought closer to the national average level;
- c) the level of development budget expenditures will be in the order of 18 billion baht over the 1972-1976 period;
- d) a direct government effort will be made to accelerate industrial development in the Northeast.

1.5 Manpower

Investigations of the manpower situation in the Northeast indicate little unemployment but rather widespread under-employment.^{3/} The emphasis of the manpower analysis for the Third Plan was to determine the job opportunities that should result from implementation of recommended programs.

The regional population aged 15-65 years from which the labor force is drawn will be about 6.70 million in 1972

1/ The current growth rate was calculated as the average for the period 1966-1969.

2/ See Economic Growth and Structural Changes in Northeast Thailand, by Chalmers and Cowan, March 31, 1971.

3/ Figures shown in the National Plan indicate that in some seasons rural unemployment may be as high as 50 percent while in urban areas it is not below 5 percent.

TABLE 1-5
PLANNED GROWTH RATES & TARGETS FOR SELECTED
SECTORS & PRODUCTS
1972 - 1976

	Historic % Growth Rate 1960-69 (Inclusive)	Value Added at Constant 1962 Price ₱ Million		% Growth Rate
	1960 - 69	1971	1976	1971 - 76
Agricultural Production	3.4%	8,506	10,416	4.1%
All Other Sectors	10.0%	11,537	17,595	8.8%
Gross Regional Product	6.9%	20,043	28,011	6.8%
Rice	3.4%	3,567	4,094	2.8%
Other Crops	3.2%	2,472	3,120	4.9%
Forestry	4.6%	651	882	6.0%
Fishing	8.7%	346	446	5.2%
Livestock	3.9%	1,470	1,874	4.9%
Construction	19.0%	1,529	2,043	6.0%
Manufacturing	8.0%	1,976	3,276	11.0%
Electricity & Water	36.0%	266	482	13.0%
Transport & Communications	10.8%	1,026	1,658	10.1%
Trade	8.8%	2,761	4,123	8.4%
Banking, Insurance, Real Estate	18.3%	175	320	13.0%
Government Services	6.7%	1,950	3,090	9.6%
Private Sector Services	9.1%	1,613	2,238	6.8%

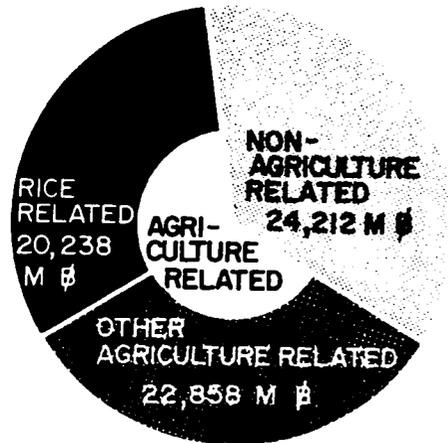
Source: National Accounts Division, NEDB & NEED/PAG

TOTAL PRODUCTION IN FIRST, SECOND & THIRD PLANS
Northeast Thailand
1961 - 1976

	Output in Value Added by Sector					
	First Plan ₱ Million		Second Plan ₱ Million		Third Plan ₱ Million	
Rice Production	16,758	24.9%	16,810	18.6%	19,389	15.8%
Rice Mills	2,810	3.4%	2,700	3.0%	3,018	2.5%
Rice Trade	1,170	1.7%	1,323	1.5%	1,281	1.0%
RICE RELATED	20,238	30.0%	20,833	23.1%	23,688	19.3%
Agriculture (Less rice) Production	19,376	28.7%	22,842	25.3%	28,838	23.5%
Agriculture (Less rice) Processing	2,130	3.2%	2,620	2.9%	5,073	4.1%
Agriculture (Less rice) Trade	1,352	2.0%	1,797	2.0%	1,905	2.0%
AGRICULTURE (LESS RICE) RELATED	22,858	34.0%	27,259	30.2%	35,816	29.2%
AGRICULTURE (RELATED)	43,096	64.0%	48,092	53.3%	60,504	49.3%
Mining (Salt)	0	0	0	0	100	0.1%
Construction (Incl. Quarries)	4,175	6.2%	8,714	9.6%	10,390	8.5%
Non-Agricultural Based Manufactures	1,758	2.6%	3,379	3.7%	5,355	4.3%
Electricity & Water	180	0.3%	965	1.1%	1,952	1.6%
Transportation	2,453	3.6%	4,063	4.5%	6,545	5.3%
Communications	92	0.1%	213	0.2%	339	0.3%
Wholesale & Retail Trade (Non-Agricultural)	5,416	8.0%	9,063	10.0%	13,483	11.0%
Banking, Insurance & Real Estate	292	0.4%	696	0.8%	1,276	1.0%
All Services, etc.	9,846	14.6%	15,113	16.7%	22,801	18.6%
NON-AGRICULTURE RELATED	24,212	36.0%	42,206	46.7%	2,221	50.7%
TOTAL	67,308	100%	90,298	100%	122,725	100%

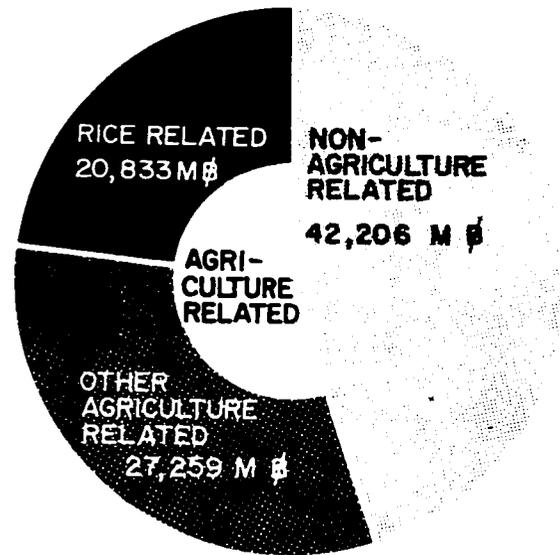
SECTOR SHARES OF GROSS REGIONAL PRODUCT

FIRST PLAN



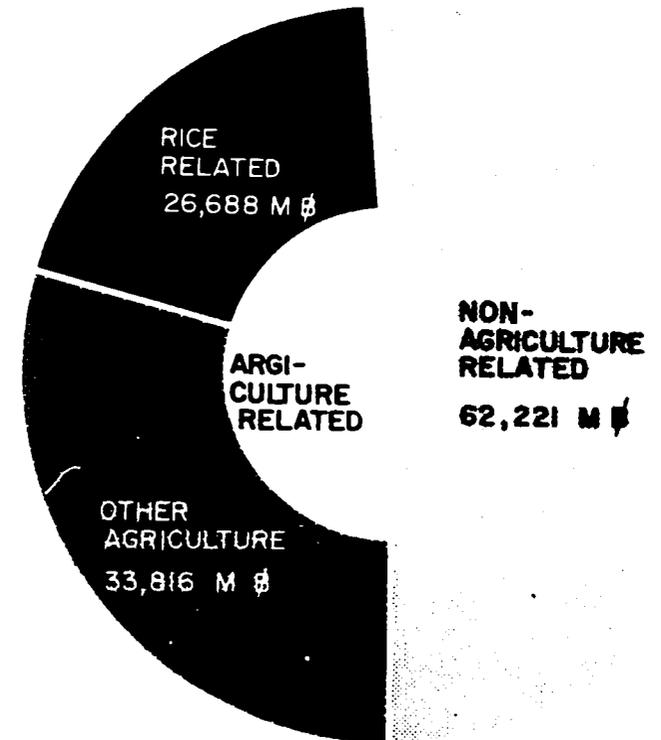
67,308 MILLION BAHT

SECOND PLAN



90,298 MILLION BAHT

THIRD PLAN



122,725 MILLION BAHT

and 7.74 million in 1976.^{1/} The labor force in 1972 is estimated to be 5.40 million, which is about 80 percent of the 15-65 year age group. On the assumption that it will remain 80 percent until 1976 the labor force will be 6.19 million in that year. A labor force of this size will meet the forecast production targets if the average increased manpower productivity is 2.8 percent per annum. The sectoral allocation under these assumptions are as follows.

	<u>Employment by Sector</u> (Million Workers)			
	<u>1972</u>		<u>1976</u>	
Rice production	1.89	(35)	1.89	(30.5)
Other crop production	1.35	(25)	1.58	(25.5)
Livestock, Forestry and Fishing	<u>1.35</u>	(25)	<u>1.62</u>	(26.2)
AGRICULTURE	<u>4.60</u>	(85)	<u>5.09</u>	(82.2)
NON-AGRICULTURE SECTORS	<u>0.80</u>	(15)	<u>1.10</u>	(17.8)
Manpower Requirement	5.40 ^{2/}	(100)	6.19	(100)

Agricultural productivity is projected to increase because of a number of changed inputs, for example, land and irrigation improvement, the use of fertilizers, pesticides and better seeds, as well as other reasons. The projected increase in productivity of 2.8 percent per annum appears reasonable as it is the same as the estimated current increase in rice yields on farms in the Northeast. As a comparison, if there were no increases in productivity the manpower requirement would be about 6.91 million, and for a 4 percent productivity increase 5.91 million. It is clear that if the forecast production was achieved without increasing manpower productivity then there would be a relatively large effect on the level of underemployment, as the labor force would increase to nearly 90 percent of the 15-65 year age group. In a 2.8 percent productivity increase there is only a small change, but for a 4 percent productivity increase the labor force would fall to 76 percent of the 15-65 year age group.

^{1/} The probable population increase in the Northeast is estimated to be 2.9 percent. However, the increase in the number of people of working age (15-65 years) will be greater than this and will probably be about 3.4 percent.

^{2/} Figures shown in the National Plan indicate that in some seasons rural unemployment may be as high as 50 percent while in urban areas it is not below 5 percent.

1.5.1 Agriculture Manpower - A manpower productivity increase of 2.8 percent per annum can be achieved and possibly exceeded while maintaining a "labor intensive" policy for agriculture and for the building and maintenance of the feeder roads required to give agricultural production improved access to market. Except in special circumstances, where modern commercialized agriculture is introduced, emphasis will be on increased productivity of the farm unit as it exists at the present time. The recommended agricultural plan for the Northeast emphasizes the inputs such as fertilizers, improved seeds, pesticides, irrigation and land improvement, which will entail the use of more manpower (as opposed to mechanization) in increasing productivity.

To be successful a manpower program must be based on improved education for the farmer; both the agricultural vocational schools and the extension services should be expanded to meet the specific requirements of farmers in the Northeast. The World Bank Loan for Improvement of Vocational Education (LIVE program) will continue in the Third Plan and provide improved training for agricultural technicians. It is recommended that the quality of agricultural extension agents be improved by a number of programs, including particularly one for in-service training, and later, one for pre-service training for agricultural graduates at the Northeast Agricultural Research Center at Tha Pra.

There is only a limited amount of land in the Northeast, and it is the aim of the Consultants' recommendations for the Third Plan, as described in Chapter II on agricultural development to increase the productivity of land to the maximum to avoid undesirable expansion into new land. Only when land productivity is maximized will full employment be realized on the land used.

1.5.2 Non-Agricultural Manpower - Increased manpower will become available for employment in the non-agricultural sectors during the Third Plan period. The promotion of agri-based processing industries will receive high priority to absorb these and to broaden the base of the economy of the region. Cottage industries will remain important and the growth of the service sectors is expected to continue to require additional manpower.

1.5.3 Migration - Historically there has been some permanent migration out of the Northeast, but an even greater amount of intra-regional migration has occurred. If the proposed programs of crop diversification and increased manufacturing are successful it is likely that no great change will occur in this pattern.^{1/}

^{1/} This is in contrast to the proposal for the planned migration out of the region of 10,000 people a year made by Hans Platenius for the World Bank in 1963. This alternative was not considered seriously since it involves an insignificant amount of migration that would not substantially change the manpower situation in the region.

Sector Plan

1.6.1 Agriculture - For the major sector of crop production, an increased rate of growth is possible despite the need to keep rice production down to avoid unnecessary surpluses. Production targets of all individual crops, based on demand and production estimates, can be achieved in a number of different ways by increasing irrigation, use of new land, use of fertilizer, agricultural credit, research and extension, or some combination of these. The recommendations for the plan propose a mixed crop development program which is a practical way of achieving diversification in the Northeast. If implemented, crop production in the region should grow by 3.6 percent per year, despite reduction in annual rice production growth rate to 2.8 percent in order to reduce accumulated surplus.^{1/}

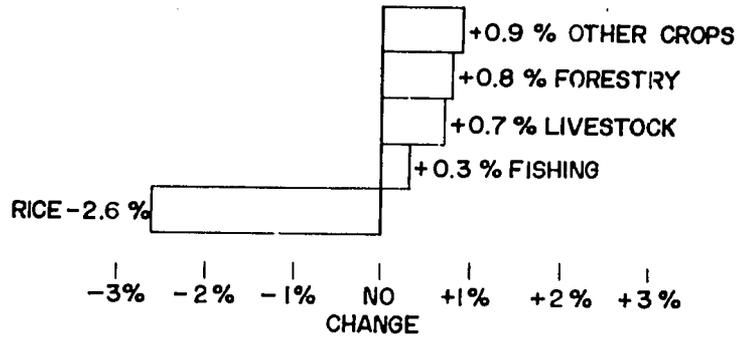
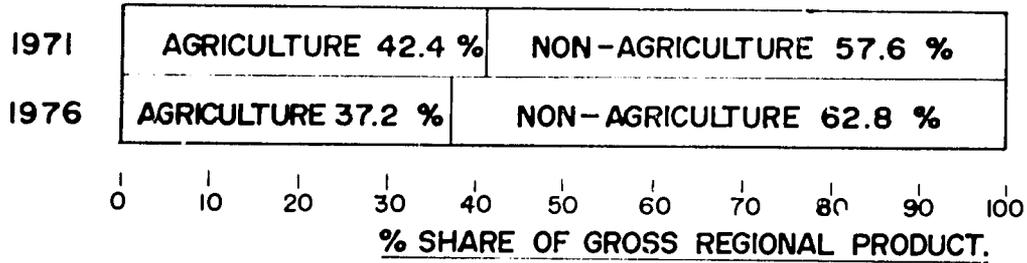
It is recommended that regional consumption and export requirements for rice be met by increasing the productivity of rice farming, rather than by the continual expansion of rice farming into new land. This also should provide for diversified crop growing into those cash crops which are suitable to the Northeast, and for which there are good markets. (Obviously there are some areas where rice should be grown on new land where existing rice land is better suited for upland crops.)

Chart 1-6 shows the change in structure of the agricultural economy as a result of recommendations for the Third Plan; cash crops (maize, sorghum, beans, cotton, kenaf, tobacco, etc.) will be a much more significant and profitable part of the agricultural economy than they are now. This change will be achieved by the implementation of:

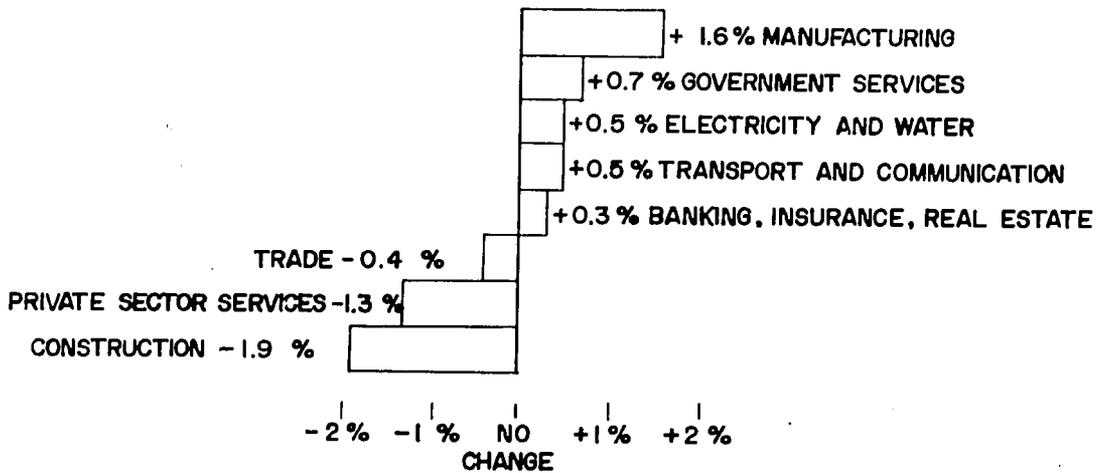
- a) programs to accelerate the rate of increase of irrigated land below existing dams, by providing canals and farm distribution systems, combined with extension services to the farmer;
- b) research into crop varieties most suitable to the conditions in the Northeast (sorghum, soybeans, maize and cotton), combined with increased extension services in all crops;
- c) improved credit services for farmers, particularly for the production of crops with an export potential;
- d) periodic market surveys to forecast demand for agricultural products.

^{1/} The forecasted rate of growth in the National Plan in rice production for the entire country is 1.8 percent per annum in order to reduce surpluses.

CHANGE IN STRUCTURE OF THE NORTHEAST ECONOMY DURING THE THIRD PLAN



CHANGE IN % SHARES OF AGRICULTURE.



CHANGE IN % SHARE OF NON-AGRICULTURAL SECTOR.

1.6.2 Industry, Mining and Commerce - The government budget recommended for the industrial development program is small -- 0.7 percent of the total (0.1 percent in the Second Plan) -- but it is recognized that industry will expand in and into the Northeast only if stimulated privately and by the government. Although only five businesses have been given promotional privileges in Northeast, (See Chart 3-1) only the Northeast Jute Mill Company is significant. The remainder have a total capital of only ฿ 2 million.

To assist in the establishment of new industries in the Northeast, the government should consider establishing a Regional Development Corporation.^{1/} Since the Northeast has been losing its share of processing, including raw materials produced in the region, the first step will be to retrieve this position. Livestock, sugar cane, tobacco, cotton, and kenaf are products which are transported out of the region for processing. Recommended programs for the Third Plan are designed to change this trend by inducing agro-businesses in these areas which will establish a more equitable share of raw material processing in the region.

To provide the necessary impetus, which would be to the whole country's advantage as well as to specific regions, the government can use incentives such as promoted industries, investment grants, IFCT and BOI support to private investment in setting up regional processing and manufacturing. Businesses for which support is desirable are slaughtering, tourism, salt mining, clothing manufacture, animal feed manufacturing, fruit and vegetable canning, soft drink manufacture, brewing, tobacco processing and cotton ginning.

1.6.3 Transportation and Communications - The transport system of the Northeast is in broad terms no longer a significant constraint to the development of the region, although it is still desirable to build certain specific new roads. An example of this is the completion of the Southern arm of the network, Route 2 from Korat to Ubon, which will tie together the rather poorer changwats of Buriram, Surin, Sisaket and Ubon more directly with the rest of Thailand, and thus lead to their more rapid development. Feeder roads to connect communities which are now isolated from the main highway network should also receive attention, but because of the wide variety of possible route choices and limited budget, construction during the Third Plan period will have to be on a priority basis in which security considerations will be influential.

^{1/} The Consultants have been informally advised by NEDB that this proposal is not in accord with government policy for the Third Plan.

Maintenance has become a factor for serious concern since these expenditures in the past have not kept pace with increases in kilometerage. During the Third Plan period maintenance budgets will be considered a part of the development program, and should receive almost twice the share it was allocated in the Second Plan, (4.2 percent compared with about 2.4 percent). Construction on new roads however, is recommended to have a share of only 17.8 percent compared with 23.9 percent in the Second Plan.

Recommendations for the Third Plan emphasizes completion of the remaining gaps in the communications network with some expansion in key areas such as microwave lines. Requirements for this program are small, amounting to only about 1 percent of the Northeast development budget.

1.6.4 Power - The strategy for electric power is to first use all potential hydro-electric power sources since these are the cheapest sources of supply. The Northeast as part of the Mekong Basin can consequently contribute significantly to the Nation's overall power development during the Third Plan.^{1/} It is recommended that the Nam Phrom Dam, (including a third 20 MW generator if sufficient progress is made) and the second stage of Lam Dom Noi, (the third 12 MW unit), proceed.

The total electric power demand in the Northeast is now 10 percent of the national total, but because of the low base and an increase in urbanization and industry, the projected growth rate is about 34 percent per annum as against a national growth rate of 25 percent.^{2/} Even with the high growth rate the Northeast will only use 13.5 percent of the nation's power by the late 1970's. The increased power demand in the Northeast can only be met by an expanded distribution system and the following projects are thus recommended: expansion of various Electric Power Production Authority systems, the Lam Dom Noi distribution system, the rural electrification project, and the project to increase the efficiency of the Provincial Electricity Authority system.

1.6.5 Community Facilities and Public Welfare - The emergence of a society from a simple long established subsistence rice economy, to a more advanced and diversified one is inevitably accompanied by social unrest, political changes and security threats to the region. The Government has long recognized this fact and many programs have been developed in the past which demonstrate concern for the people at the "grass roots" level.

^{1/} The real impact of any Mekong Basin projects will probably come after 1976.

^{2/} This is a short term forecast. Longer term forecasts are in the range of 15 percent per year.

The fundamental purpose of the strategy for the Third Plan is to help the Northeast through these difficulties, and bring it to a period of self sustained growth and stability. For this reason the following programs considered in this group are regarded as highly important:

- a) Community Water Supply;
- b) General Community Development;
- c) Urbanization;
- d) Public Welfare.

Serious municipal water problems exist in Udon and Korat, and to a lesser extent in Khon Kaen, Loei and Chaiyaphum. During the Third Plan it is proposed to complete the program at Udon, which includes both flood control and water distribution, and to complete the potable water project from Lan Takong reservoir to Korat which is now partially complete.

The need for an assured supply of drinking water in Northeast villages is emphasized by the unpredictable nature of rainfall and consequent periods of drought. For the plan period, 17,000 drinking water installations are proposed in 10,000 villages to ameliorate the situation. A Community Water Coordinating Council is also proposed.

The Community Development program in the Northeast is now well established and has stimulated the economic and physical improvement of small towns and villages. The Third Plan's policy is designed to provide further assistance in dealing with problems arising from rapid population increase, migration, urbanization and technological change. The region therefore should continue to receive more than half of the National Community Development budget to extend its Self Help Program and the Youth Volunteer Corps. The "Village Improvement" program of the Department of Accelerated Rural Development should also receive increased budget support.

Manufacturing, trade and services sectors will continue to grow faster than the agriculture sector, and urban population should increase at a rate of 8 or 9 percent per year.^{1/} This growth can present serious urban problems. The proposed programs to encourage industry within urban development poles are meant to create job opportunities which will absorb excess manpower and alleviate potential migration to the Bangkok/Thonburi area. However, for balanced social growth, an urban environment is needed which is conducive not only to industrial location, but also attractive to professional staff, especially in the medical

^{1/} Other analyses made at NEDB indicate that this rate may be high. However, it is still felt that urban population increases will be significant and can be a serious problem if programs designed to handle these increases are not implemented.

and educational fields. Legislation to reform the property tax system, particularly of increments in land values, and the control of land use through zoning, is required. An Urban Development Fund may be set up to assist regional cities and towns, which would be administered by a new Urban Affairs Department, under the Interior Ministry. The new department would include the Town and Country Planning Department.^{1/}

1.6.6 Public Health - The health situation in the Northeast, though it has improved because of the services which have already been introduced, is unsatisfactory as shown by data on morbidity, mortality and the number and distribution of health services facilities and manpower. The government will continue to expand services, particularly public health centers, but because the health problems in the region are social and cultural as well as economic, health education must be made an integral part of the program. The principal policy objectives for the Northeast will be:

- a) to extend both curative and preventive health services into remote areas;
- b) to promote the adoption of recommended health practices among the population;
- c) to expand the health infrastructure to levels commensurate with national standards;
- d) to increase the efficiency of the available manpower and physical health resources.

Approximately 40 percent of the national budget in the Third Plan period has been recommended for the region in recognition of its poor health facilities as compared with the rest of the country. However, even this will not enable the Northeast to reach the recommended national standards by 1976. First and third class health centers will achieve only 40 percent of the standard, but second class health centers and hospitals will reach nearly 90 percent. Because the health center program has the greatest potential impact on the people of the Northeast, priority to its extension should be given over other programs.

1.6.7 Education - Education standards in the Northeast fall below those of the nation as a whole. About 90 percent of eligible children are enrolled in the lower elementary school, but attendance is irregular, and about 25 percent of those enrolled fail to gain promotion to the next grade each year. At Prathom 5 level only 3.8 pupils per 1,000 population were enrolled compared with 7.7 in other changwats (except Bangkok).

^{1/} An alternative proposal is to expand the Town and Country Planning Department to undertake the task.

The main target in the Northeast is to improve education up to Prathom 4 and to increase the rate of promotion and continued enrollment in Prathom 5. This requires a lowering of the pupil/teacher ratio in the elementary school to 35 to 1, improved teacher qualifications, increased supply of teacher and decreased failure rate below the current levels, particularly in the early grades. In secondary education, the strategy must be to start at the bottom and encourage children to continue their education after Prathom 7 into M.S. 1. The pupils likely to follow this program is 18 percent of the national secondary school enrollment.

These apparently modest targets will require a budget of $\text{฿ } 6.1$ billion ($\text{฿ } 4.9$ billion for primary and $\text{฿ } 1.2$ billion for secondary education). However, there will continue to be a problem with the supply of elementary school teachers, although training facilities in the Northeast will be expanded. Therefore, it will be necessary to attract teachers trained elsewhere to work in the Northeast, which requires consideration of suitable incentives.

Vocational education, particularly that associated with agriculture, should be emphasized. Vocational guidance for those who will not qualify for education beyond Prathom 7 is recommended. The percentage of the relevant age group receiving higher education in the region is negligible, but the University of Khon Kaen will continue to be built up as rapidly as possible within the limitation of present resources.

In addition to the above a number of special programs are proposed:

- a) Text book distribution;
- b) School Rehabilitation;
- c) Teacher's housing;
- d) Education T.V.;
- e) Cooperative community training schools;
- f) Library expansion;
- g) School transport feasibility study.

In total, education will require $\text{฿ } 7.2$ billion for the Third Plan period which is almost 40 percent of the Northeast development budget.

1.7 Foreign Assistance

Projects requiring assistance are listed in the Appendix at the end of this volume.

The foreign assistance requirements for the sectoral budgets as shown in Table 1-7 are estimated to total $\text{N} 3.3$ billion. In the Northeast in recent years loans and grants have been 15 percent to 20 percent of the development budget. The figure recommended for the Third Plan is about 16 percent of the region's total development budget.^{1/}

1.8 Summary

The detailed planned growth rates and value added targets for all sectors of the economy, including many crops, individual industries, trades, and services are presented in the following Table 1-8 as a summary of the NEED Plan Targets through 1976.

^{1/} The World Bank's special Project Division which analyzed the foreign aid requirements of the Northeast during the Third Plan period identified a "core" program of projects amounting to \$296 million of which 30 percent was the estimated foreign exchange component (Op.Cit p.5).

TABLE 1-7
FOREIGN ASSISTANCE ESTIMATES

Northeast Thailand

Sector	฿ Million	\$ Million
AGRICULTURE		
Irrigation	160	
Others	180	
Total	340	17.0
INDUSTRY MINING AND COMMERCE		
Total	20	1.0
TRANSPORT AND COMMUNICATIONS		
Primary and secondary highways	376	
Feeder roads	42	
ARD roads	192	
Telephone Organization of Thailand	100	
Total	710	35.5
POWER		
Total	305	15.2
COMMUNITY FACILITIES AND PUBLIC WELFARE		
Water	377	
Community Development	188	
Urbanization	150	
Public Welfare	32.5	
Total	745.5	37.3
PUBLIC HEALTH		
Total	805	40.2
EDUCATION		
Primary	197.3	
Secondary	60.0	
Higher	80.0	
Other Second Projects	79.2	
Total	416.5	20.8
FOREIGN EXCHANGE		
Total	3,343.5	167.6

TABLE 1-8
 PLANNED GROWTH RATES AND TARGETS

Northeast Thailand
 1972 - 1976

	Historic Growth Rate 1960-1969	PLANNED PERIOD						Growth Rate 1971-76
		1971	1972	Value Added At Constant 1962 Price ₱ Million			1976	
				1973	1974	1975		
1 Paddy	3.4%	3567	3666	3769	3874	3983	4094	2.8%
3 Coconut	3.8%	45	45	45	45	45	45	0%
4 Sugarcane	-5.3%	60	62	64	66	68	69	2.8%
5 Maize & Sorghum	2.0%	132	176	190	206	224	245	13.0%
6 Groundnuts	-0.3%	79	79	81	83	86	88	2.2%
7,8,9 Beans (Mung,Castor,Soy)	-7.0%	41	42	45	48	53	60	8.0%
10 Cassava	17.4%	54	55	57	59	61	63	3.1%
11 Tobacco	1.0%	151	159	167	175	184	193	5.0%
12 Cotton	4.5%	95	106	118	130	143	156	10.4%
13 Kenaf	10.4%	629	657	676	697	719	740	3.4%
14 Kapok	-1.6%	59	61	63	65	67	69	3.0%
15 Sesame	-11.0%	10	10	11	12	13	14	7.0%
16 Garlic, Etc.	0%	210	217	224	232	239	247	3.3%
17 Vegetables	18.9%	166	179	194	210	228	247	8.2%
18 Fruits & Others	0%	741	772	801	830	857	884	3.6%
19 All Other Crops	0.8%	1843	1963	2060	2162	2278	2380	5.3%
20 All Crops	3.4%	6039	6286	6505	6733	6970	7214	3.6%
21,22 Cattle & Buffalo	3.7%	504	524	545	567	600	633	4.5%
23 Swine	6.5%	322	379	402	427	454	482	8.4%
24 Hens & Ducks	3.3%	377	389	402	415	428	441	3.3%
25 Eggs	2.0%	253	262	271	280	290	300	3.5%
26,27 Other (Incl. Dairy)	4.9%	14	15	16	17	17	18	3.9%
28 Livestock	3.8%	1470	1569	1636	1706	1789	1874	4.9%
32,33,34 Timber	14.2%	224	246	271	298	325	360	10.0%
35 Charcoal & Firewood	0.5%	288	297	306	316	325	336	3.1%
36 Other Forest Products	5.5%	139	148	157	166	178	186	6.0%
37 Forestry	4.9%	651	691	734	780	828	882	6.2%
30,31 Fishing	9.3%	346	364	383	403	424	446	5.2%
38 All Agricultural	3.7%	8506	8910	9258	9622	10021	10416	4.1%
Mining (Non construction)	0%	0	0	10	20	30	40	30%
39 Quarrying (Construction)	42.4%	243	249	265	283	303	325	6.0%
40 Construction (Private)	7.8%	829	885	945	1010	1078	1152	6.8%
41 Construction (Public)	60.2%	700	681	724	772	827	891	5.0%
42 All Construction	18.9%	1529	1566	1669	1782	1905	2043	6.0%
43 Slaughter Houses	2.6%	119	166	212	350	424	561	33%
44 Rice Mills	3.7%	555	571	587	603	620	637	2.8%
45 Sugar Mills	3.7%	22	23	24	26	27	28	4.9%
46 Other Food	4.6%	70	73	76	79	83	86	4.3%
47 All Food Manufactures	3.6%	766	833	899	1058	1154	1312	11%
48 Distilleries	7.4%	45	48	51	55	59	63	7.0%
49 Soft Drinks	11.5%	36	48	65	69	74	79	17%
50 Tobacco	-0.5%	65	68	143	147	152	163	20%
51 Wearing Apparel	9.0%	96	102	109	116	123	131	6.5%
52 Cotton Processing	12.9%	53	56	60	65	115	165	25%
53 Gunny Bags	32.8%	139	146	153	160	168	177	4.9%
54 Silk	3.5%	137	149	163	177	193	210	9.0%
55 Mats	3.4%	44	45	47	48	50	52	3.4%
Other Textiles	5.4%	29	32	35	39	43	47	10.1%
56 All Textiles	9.4%	402	428	458	489	569	651	10.1%
57 Wood & Cork	26.2%	454	490	529	572	617	667	8.0%
58 Furniture	24.2%	41	45	50	55	60	66	10.0%
59,60 Other (Machine Shops								
61,62,63 etc.)	8.6%	71	82	94	109	125	144	15.1%
64 All Manufactures	7.9%	1976	2144	2398	2670	2933	3276	10.6%
65,66 Electricity & Water	36.2%	266	312	345	384	429	482	12.6%
67 Transport (Private)	11.9%	866	961	1067	1185	1315	1460	11.0%
68,69 Transport (Public)	4.0%	110	116	110	105	110	116	1.0%
70 Communication	18.7%	50	55	61	67	74	82	10.4%
71 Trade of Import Inter- mediate goods	-2.2%	54	60	67	74	82	91	11.0%
72 Trade of Import Capital Goods	21.6%	621	677	738	805	877	956	9.0%

	Historic Growth Rate 1960-1969	PLANNED PERIOD						
		Value Added At Constant 1962 Price ₦ Million					Growth Rate	
		1971	1972	1973	1974	1975	1976	1971-76
73 Trade of Import Consumer Goods	7.3%	849	902	958	1017	1080	1147	6.2%
74 Trade of Domestic Agriculture	5.2%	657	711	769	832	900	974	8.2%
75 Trade of Mining and Manufactures	9.2%	580	641	708	783	865	955	10.5%
76 Wholesale & Retail Trade	8.7%	2761	2991	3240	3511	3804	4123	8.4%
77 Banking	19.2%	130	146	164	183	205	230	12.0%
78 Insurance & Real Estate	17.4%	45	52	59	68	79	90	15.0%
79 Education	8.1%	743	795	851	910	974	1042	7.0%
80 Medical & Health	10.1%	205	227	252	280	310	345	11.0%
81 Recreation & Entertain- ment	15.7%	182	196	212	229	249	269	8.1%
82 Domestic	3.4%	94	99	106	112	119	126	6.1%
83 Hotels & Restaurants	13.0%	473	511	552	597	646	701	8.2%
84 Laundries, Barber Shops, Etc.	6.7%	115	128	131	141	151	161	7.0%
85 Religions, Etc.	14.0%	407	432	459	488	518	550	6.2%
86 All Services	10.3%	2219	2388	2563	2757	2967	3194	7.5%
87 Ownership of Dwellings	2.6%	342	358	375	393	411	431	4.8%
88 Public Admin. & Defence	6.5%	1002	1114	1239	1377	1531	1703	11.2%
89 Non Agricultural Sector	10.4%	11537	12477	13581	14796	160931	17584	8.8%
90 Northeast Region Product	6.9%	20045	21362	22823	24406	26107	28011	6.9%
		1971	1972	1973	1974	1975	1976	1971-76

CHAPTER II AGRICULTURE

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AGRICULTURE
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CHAPTER II

AGRICULTURE

Northeast Thailand

1972 - 1976

2.1 Introduction

The purpose of the agriculture analysis is to develop useful information concerning the best public sector role during the Third Plan period, 1972 - 1976. This analytical procedure includes the development of factor of production costs (quantity inputs and returns); complete national and international demand analysis; an agricultural input - output model; and a public sector/crop value - added capital output ratio. This agriculture chapter is basically divided into two parts; the first section deals with crops and the second part analyzes forestry, fishing, livestock and other agricultural activities of the region.

2.2 Crops

The program for crops recommended by 1976 is to shift away from a subsistence economy which is based on rice, to a cash crop oriented economy emphasizing feed grain and cotton production. The past rapid decrease of virgin land would be slowed, the utilization rate of potentially irrigable land doubled and yields should increase due to the greater use of chemical inputs. The Third Plan period, therefore, should serve as a transition period from subsistence to cash cropping for Northeastern agriculture.

2.2.1 Background - Rice and upland crops combine to make up the crop category of the agricultural sector. Historically the crop category has accounted for over 70 percent of the total agricultural sector value-added in the Northeast. Rice predominates in the crop category, accounting for roughly 60 percent of crop value added. This percentage has varied little since 1960.

The history of agricultural development in the Northeast has been dominated by rice. It has been the main stay of the region's economy, the chief source of employment for the majority of its people, and the basic element in their daily diets. The limitations of nature and the content of the agricultural sciences are such that the dominant role of rice in the history of the region must be kept in mind if planning changes in the structure of the agricultural system are to be realistic and attainable.

2.2.2 Rice - Production of rice during the Third Plan period is forecasted to increase at an average annual rate of 2.8 percent as shown in Table 1-8. Although this is somewhat lower than the growth rate in recent years there is evidence that the region has accumulated a rice surplus which may amount to as much as 1,000,000 tons. Therefore NEED/PAG forecasted a lower growth rate than the expected increase in population. the area of land under rice cultivation in the Northeast increased at an annual rate of 1.3 percent during the 1960-1968 period, while the quantity, measured in metric tons of production, increased at 3.0 percent annually.^{1/} Preliminary estimates for the 1969 crop season, which have become available subsequent to making the above calculations, report production at 4,637,000 metric tons and the area of planted land at 20,187,000 rai.^{2/}

The historic trend can be broken into cyclical series to permit evaluation of short-term tendencies that may have established plateaus not revealed by study of the historic trend. This is illustrated in Table 2-1.

Explanations for the behavior of rice trends are found in the trends of competing crops, kenaf and maize. These crops combined have been the strongest recent competitors for the farmers' allocation of resources. Plantings of these two crops expanded at a precipitous rate in the closing years of the 1950's and early ones of the 1960's and because they use farm labor normally allocated to rice, rice plantings and production declined during these years, but grew again when favorable world prices of maize and kenaf influenced farmers to return to the tending of their paddies.

In the intervening years 1958-59-60 and the close of the period, areas of land planted in rice grew by an annual rate of 2.4 percent.

1/ Three year averages were employed in both units of measure 1960-61-62 and 1966-67-68 in order to partially smooth out seasonal variations.

2/ Source: National Accounts, NEDB. (This production figure has been questioned by several authorities including Northeast specialists of the World Bank. They feel a figure 500,000 to 1,000,000 tons lower would be more in line with the region's demand for rice.)

TABLE 2-1

RICE CYCLICAL GROWTH RATES

Northeast Thailand
1950 - 1968

Period	Planted Area Averaged Rai %	Production Average Tons %
1950-51-52	13,077,000 1.9	2,506,000* 0.4
1954-55-56	14,076,000 0.7	2,541,000 0.1
1958-59-60	14,491,000 3.7	2,552,000 9.4
1962-63-64	16,737,000 0.6	3,663,000 0.4
1966-67-68	17,149,000	3,718,000

Source: Ministry of Agriculture.

* Lacking data for 1950 the years 1951 and 1952 was assumed as the starting point and indicated as representative of 1951.

2.2.2.1 Productivity - Yield trends show a decline for the period 1951-1959 at a rate of 1.8 percent per year.^{1/} Since 1959, the trend has been upward. The long-term trend line for 1951-1969 experienced an annual growth of only 0.6 percent, whereas the shorter trend had a growth rate of 2.3 percent. Since the time factor was not the decisive issue, the following are offered as plausible interpretations.

a) Of the total regional land area of 104,400,000 rai, some 26,400,000 rai was incorporated in farms at the time of the agricultural census in 1963; it seemed logical that the long downward trend in rice yields during the first half of the century bespeaks the marginality of new lands into which paddies had been expanding.

^{1/} Although the NEDB used the land, they have used the figures of the MOA in its calculations, the former adjusted the ministry's production figures upward approximately one-fifth for every year. This accounts for the higher yields when the NEDB calculations are employed.

b) After several years (1955 through 1961) of a new plateau period, when yields seem to have returned upward to around the 180 kg/rai level, a new upward surge was noticeable in the trend. This surge has been consistent except for two years, one of which was characterized by a severe drought in the critical growing period.

c) Varietal improvement programs have been taking place for many years, and both the Rice Department and Extension Department, as well as other agencies, have been disseminating technical information that has begun to be available from these research programs.

d) Material inputs recommended by the scientists require cash investments if they are to be accepted and adopted by the farmer, a situation understood and acted upon by the government in recent years.

2.2.3 Upland Crops - A crop not cultivated in a flooded paddy is defined as upland. Important upland crops in the North-east are kenaf, maize, peanuts, soybeans, cassava, sorghum, cotton, tobacco and various vegetables.

The eight field crops specified covered an average of 3,596,000 rai annually for the period 1966 to 1968. Vegetables averaged 498,000 rai during the period.^{1/} These two categories represent 16.7 percent and 2.3 percent of the total Northeast planted area of 21,473,000 rai. Rice accounted for 16,117,000 rai of the total, or 77.7 percent while minor crops and fruit together consumed 712,000 rai, or 3.3 percent of the total.

2.2.3.1 Kenaf - Kenaf and related fibre plants, utilized in the making of rope and twine, have long been grown in Thailand. The crop began to assume commercial importance in the 1950's, and its production was concentrated in the Northeast where the soil and dry climate favored its cultivation. Kenaf area was 126,000 rai in 1958; this more than doubled by 1959, and was 849,000 rai in 1960. (Kenaf figures are inflated slightly by the inclusion of jute and ramie, but not by more than 10 percent.)^{2/}

^{1/} A three year average was taken to compensate for seasonal variations based on Ministry of Agriculture Statistics.

^{2/} T.H. Silcock, The Economic Development of Thai Agriculture, Cornell University, 1970, p. 79.

Three government owned gunny sack mills were established in 1949, 1952 and 1953.

Production rose rapidly from 1957 through 1966, but then fell as wholesale prices fell due to excess supply in world markets. Production in 1966 was 649,000 tons.^{1/}

2.2.3.2 Maize - Maize production in Thailand has increased significantly in the last two decades. From 1951 to 1968 maize planted areas grew from 259,000 rai to 4,700,000 rai (an increase of 17.5 percent per year.) In the same period Northeast planted area increased from 138,000 rai to 629,000 rai or 356 percent. National tonnage production increased proportionately rising from 41,700 tons in 1951 to 1,217,000 metric tons in 1968.

The Northeastern share has not kept pace with the national growth rate; its share of total planted area was 53.2 percent in 1951 and 13.3 percent in 1968. The Northeastern share of tonnage was 51.8 percent in 1951 and 11.5 percent in 1968. During the Third Plan period, however, it is expected the Northeast share will again increase if the National Plan Target of exporting 3,000,000 tons annually is to be met.

2.2.3.3 Sorghum - There are no published sorghum statistics prior to 1965, and unless data on this crop have been incorporated with those for maize, it must be assumed sorghum is a new crop in the region. Planted area in the Northeast was 20,700 rai in 1965, 29,100 rai in 1966, 25,700 rai in 1967, and 17,100 rai in 1968. Production amounted to 7,200 metric tons in 1965, 10,200 in 1966, 8,800 in 1967, and 6,000 in 1968. In 1966, Northeast area planted was 8 percent of the national total, and production was 8.8 percent. The central region is the major producer accounting for 88 percent of area planted and production in 1966. Table 2-2 illustrates regional and national area planted and production figures for 1966.

2.2.3.4 Soybeans - In 1969 there were roughly 300,000 rai of soybeans harvested in Thailand. The Northeast percentage of this total was less than 1 percent.

^{1/} The political problems in East Pakistan at the time this report is written will undoubtedly result in greatly increased kenaf production in Northeast Thailand. This has been reflected in the figure shown in Table 1-8.

The soybean area planted in the Northeast has fluctuated significantly since 1960. Korat is the major producer. In 1967 it accounted for 1,333 rai of the total 2,355 rai planted in the Northeast, or 57 percent.

TABLE 2-2
SORGHUM PRODUCTION IN THAILAND - 1966

	Region				
	Central	N. E.	North	South	W. K.
Area Planted - Rai	316,854	29,111	5,768	7,594	359,000
Production - Metric Tons	99,937	10,184	1,975	1,975	113,850
Yield kg/rai	317	350	304	260	317

Source: Manderstam Report

Some significant problems hindering the development of soybean production are:

- a) disease and pests;^{1/}
- b) low oil and protein content of the bean. Some local varieties have oil contents between 6 percent and 12 percent. Beans cannot compete on the world market unless oil contents are in the 20 percent - 22 percent range;
- c) poor seed inoculation resulting in a lack of nitrogen - fixing bacteria necessary for good seed germination;
- d) shallow plowing, excessive weeds, and poor drainage.

2.2.3.5 Cotton - Cotton has long been grown in Thailand; it became of significant commercial importance in the 1940's, when both area and quantity increased 500 percent over the previous decade. The crop continued to rise in importance through the 1950's, when it averaged 217,500 rai per year, but the big

^{1/} Details on this problem are enumerated in the Asian Development Bank's "Compac Report".

increase was in the 1960's when national planted acreage grew to a high of 724,000 rai in 1968.

Production of cotton is now concentrated in the border area between the Northeast, North and Central regions. In recent years, however, the Northeast's share of production has fallen. In 1950, 137,000 rai (or 60 percent) of the national total of 229,999 were planted in the Northeast, but during the decade of the 1960's the Northeast percentage of total national production fell to less than 33 percent and in 1968 was 26 percent.

Total cotton production in Thailand and the Northeast is affected by disease and insects. Yields are below potential due to these problems. Applications of fertilizer can increase production, but unless the proper amount of agrochemical is applied at the right time the increase will not be realized.

The sharp production drop in 1969 was due primarily to disease and pests. This problem is presently being combated by agrochemical treatment applied through a knapsack apparatus which is effective while the cotton plant is small. However, when cotton is one meter high, three knapsacks are necessary to cover one rai in one day. This limits the amount of cotton a farmer can grow and expect to treat efficiently. A more effective method might be aerial spraying.

At present very little fertilizer is used in cotton production, but many farmers have used agrochemicals. The agrochemical input has not always been effective, mainly because of poor methods of application and lack of 100 percent participation by farmers in cotton areas.

NEED/PAG's forecasted growth rate for cotton during the Third Plan period is based on a continuation of its development during the period since 1966. However, Ministry of Agriculture officials forecast a lower rate of growth of around 4.5 percent.

2.2.3.6 Tobacco - There are four types of tobacco grown in Thailand. These are: Virginia, Burley, Turkish, and indigenous. The Northeast produces Virginia, Turkish, and indigenous varieties.

Virginia tobacco is the most important commercial tobacco variety grown in the Northeast. Table 2-3 shows Northeast and Whole Kingdom production data on Virginia tobacco. Total production of Virginia tobacco in the Northeast has remained fairly constant while areas under production has declined. The land decline has been offset by increasing yields. In the Kingdom as a whole Productivity per rai has fallen while land under cultivation has increased.

Within the Northeast, Virginia tobacco is found in Khon Kaen, Nongkai, and Nakhon Panom.

The implication of Table 2-3 is that better farm management techniques and inputs are being used in the Northeast in order to increase yields. This does not appear to be true in the country as a whole.

2.2.3.7 Vegetables - Vegetable production in the Northeast tends to be on small plots and is labor intensive. Many plots are well fertilized, treated with agrochemicals and are irrigated (often with hand carried cans). Vegetables are multi-cropped. Present production locations tend to be around urban areas and in areas near Vientienne and Laos.

In the Northeast in 1966 there were 446,000 rai in vegetables, yielding 207,000 tons. In 1967 there were 548,000 rai, yielding 252,000 tons.^{1/} This represents an area increase of 22.8 percent and a production increase of 21.7 percent.

The Northeast produces less than one-third of the national total of vegetables and Northeastern productivity appears to be slightly below the national average. Therefore, the region does not appear to have a significant production advantage relative to the whole Kingdom.

2.2.3.8 Groundnuts - There is no discernible trend in groundnut production either on a national level or in the Northeast. The Northeastern share of the national total varies but averages around 25 percent.

The crop is now planted as a sideline by farmers and receives no special emphasis. There appears to be no use of fertilizers nor insecticides.

2.2.3.9 Cassava - Northeast production has been insignificant relative to other regions. Almost no production analyses of cassava have been carried out. Production levels in 1968 and 1969 appear to be around 200,000 tons.

^{1/} Annual report of Department of Agricultural Extension, Ministry of Agriculture.

TABLE 2-3

VIRGINIA TOBACCO PRODUCTION

Northeast and Whole Kingdom

Year	Northeast			Whole Kingdom			Per Cent NE/WK	
	1000 Rai	1000 kg. Production	Yield Per Rai kg.	1000 Rai	1000 kg. Production	Yield Per Rai kg.	Rai	Production
1960/61	12.7	729.3	57.4	110.0	8,833.1	80.3	11.6	8.3
1961/62	12.8	756.1	59.1	96.6	8,656.3	89.6	13.1	8.7
1962/63	11.3	720.8	63.8	93.0	8,643.5	92.9	11.7	8.3
1963/64	10.7	677.3	63.3	94.7	8,606.5	90.9	11.3	7.9
1964/65	10.0	709.5	71.0	105.7	8,857.5	83.8	9.4	8.0
1965/66	9.8	627.2	64.0	99.8	7,620.7	76.4	9.8	8.2
1966/67	9.1	726.5	79.8	107.5	7,767.3	72.3	8.5	9.4
1967/68	8.6	734.5	85.4	119.5	8,304.9	69.5	7.2	8.6
1968/69	7.0	581.2	83.0	131.5	8,186.4	62.3	5.3	7.1
1969/70	7.0	716.5	102.4	127.9	9,348.5	73.1	5.5	7.7

6-II

Source: Thailand Tobacco Monopoly and NEED PAG Calculation

2.2.4 Demand Analysis

2.2.4.1 Demand Framework - The market potential for nine Northeastern commodities was determined, and for those with a favorable demand outlook, projections on volume and value demand for the period 1972-76 were made. The demand projection for each market was for total demand. Northeast production and supply were established as a percentage of total demand.

For this analysis the market areas studied were in Thailand and the Far East. It was felt that over the Third Plan period Thailand should concentrate on those markets which were most accessible and from part of a "natural" trading region.

2.2.4.2 Sources of Demand - Table 2-4 summarizes total volume and value demand for key Northeast commodities and historic Thai market shares. An explanation and breakdown by source of Table 2-4 is found in Table 2-5.

The demand analysis shown in Table 2-4 using only Thailand and the Far East as its market, indicates that potential demand for some Northeast commodities is very good. In terms of total value, cotton demand is the strongest, the major market being Japan.

The feed grain market is also very strong and growing with Japan and Taiwan as the major importers. Soybeans have the greatest potential in terms of export value, followed by maize and sorghum. Although Thailand is a major maize exporter, its soybean and sorghum exports are now insignificant.

Tobacco demand is projected to increase only slightly since Thailand does not participate in quality tobacco exports. Vegetable demand is strong but is mostly in Thailand, with some exporting to Laos. Kenaf demand will remain constant and the competition for markets will increase. Demand for glutinous rice outside the Northeast will be almost zero. This will remain true over the plan period.

The above analysis indicated which of the Northeast's crops have significant potential for development. The next step was an analysis of the production cost of these crops in the Northeast.

2.2.5 Present Production Situation

2.2.5.1 Input-Output Analysis - An input-output analysis relating costs and responses from fertilizer (and in some cases agrochemicals) for each crop is shown in the Annex Table to this chapter. This table illustrates:

TABLE 2-4

**TOTAL DEMAND FOR THAI COMMODITIES
PROJECTIONS OF TONNAGE AND VALUE
1972 to 1976**

Commodity	Year	Total Market Size		Average Wholesale Unit Value		Historic Thai Share of Export Market - % 1/ Value	
		000 Tons	000 Dollars	(U.S. \$)	(Baht)	Qty	
Maize	1972	8,075	\$ 484,500	\$60.00	1,200	26%	22.6%
	1973	8,841	530,460				
	1974	9,683	580,980				
	1975	10,608	636,480				
	1976	11,624	697,440				
Sorghum	1972	3,689	\$ 199,206	\$54	1,080	Insignificant	
	1973	4,046	218,484				
	1974	4,436	239,544				
	1975	4,865	262,710				
	1976	5,335	288,090				
Soybean	1972	5,142	\$ 589,515	\$115	2,300	Insignificant	
	1973	5,669	650,060				
	1974	6,216	712,905				
	1975	6,788	778,625				
	1976	7,389	847,680				
Cotton	1972	1,614	\$ 968,400	\$600	12,000	Net Importer	
	1973	1,664	998,400				
	1974	1,716	1,029,600				
	1975	1,770	1,062,000				
	1976	1,827	1,096,200				
Tobacco	1972	91	\$ 107,500	\$1,700-1st grade \$ 900-2nd grade \$ 500-3rd grade	34,000 18,000 10,000	Net Importer of Virginia and Turkish	
	1973	94	111,000				
	1974	96	112,800				
	1975	98	114,600				
	1976	101	116,400				
Vegetables	1972	350	\$ 41,800	\$150	3,000	Large Portion of Laos Imports	
	1973	362	43,300				
	1974	376	44,900				
	1975	388	46,400				
	1976	402	48,100				
Kenaf	1972	320	\$ 32,000	\$100	2,000	12-15% of World	
	1973	320	32,000				
	1974	320	32,000				
	1975	320	32,000				
	1976	320	32,000				

1/ Based on averages over period 1962 to 1968
Source: NEED PAG Calculation from Agricultural demand.

TABLE 2-5
DEMAND FOR SELECTED NORTHEAST COMMODITIES
1972 - 1976

	(a)	(b)		(c)	(a)	(b)		(c)	(a)	(b)		(c)
	Market Location	Market Size 000 Tons 000 Dollars		Unit Value \$		Market Size 000 Tons 000 Dollars		Unit Value		Market Size 000 Tons 000 Dollars		Unit Value \$
Maize												
1972	National	83	4980	60	Japan	7260	435600	60	Taiwan	482	28920	60
1973	"	87	5220	60	"	7986	478080	60	"	518	31080	60
1974	"	91	5460	60	"	8785	527100	60	"	557	33420	60
1975	"	96	5760	60	"	9663	579780	60	"	599	35940	60
1976	"	101	6060	60	"	10629	637740	60	"	644	38640	60
Sorghum												
1972	National	41	2214	54	Japan	3327	179658	54	Taiwan	221	11934	54
1973	"	43	2322	54	"	3660	197640	54	"	238	12852	54
1974	"	46	2484	54	"	4024	217296	54	"	256	13824	54
1975	"	48	2592	54	"	4426	239004	54	"	275	14850	54
1976	"	50	2700	54	"	4846	262872	54	"	295	15930	54
Soybean												
1972	National	121	12100	100	Japan	4300	494500	115	Taiwan	721	82915	115
1973	"	125	12500	100	"	4700	450500	115	"	844	97069	115
1974	"	129	12900	100	"	5100	586500	115	"	987	113505	115
1975	"	133	13300	100	"	5500	632500	115	"	1155	132825	115
1976	"	137	13700	100	"	5900	678500	115	"	1352	155480	115
Cotton (Raw Fiber)												
1972	National	65	39000	600	Japan	899	539400	600	Taiwan	106	63600	600
1973	"	68	40800	600	"	923	553800	600	"	112	67200	600
1974	"	72	43200	600	"	948	568800	600	"	117	70200	600
1975	"	76	45600	600	"	973	583800	600	"	123	73800	600
1976	"	80	48000	600	"	1000	600000	600	"	129	77400	600
Tobacco												
1972	National	20	22000	1100	First Grade	32	54400	1700	Second Grade	29	26100	900
1973	"	20	22000	1100	Importers	33	56100	1700	Importers	31	27900	900
1974	"	20	22000	1100	"	33	56100	1700	"	33	29700	900
1975	"	20	22000	1100	"	33	56100	1700	"	35	31500	900
1976	"	20	22000	1100	"	34	56100	1700	"	37	33300	900
Vegetables												
1972	Northeast Region	214	21400	100	Metropolitan Bangkok	116	17400	150	Laos	20	3000	150
1973	"	221	22100	100	"	121	18200	150	"	20	3000	150
1974	"	229	22900	100	"	127	19000	150	"	20	3000	150
1975	"	236	23600	100	"	132	19800	150	"	20	3000	150
1976	"	244	24400	100	"	138	20700	150	"	20	3000	150
Kenaf												
1972	National	70	7000	100	External Demand	250	25000	100				
1973	"	70	7000	100	"	250	25000	100				
1974	"	70	7000	100	"	250	25000	100				
1975	"	70	7000	100	"	250	25000	100				
1976	"	70	7000	100	"	250	25000	100				

Source: Demand for glutinous rice outside the Northeast has fallen to almost zero. No change is expected over the plan period. Non-glutinous rice will be consumed within the Northeast. The region will not be an exporter of non-glutinous due to a continuation of tight world market conditions and increasing competition.

TABLE 2-5
DEMAND FOR SELECTED NORTHEAST COMMODITIES (Cont'd)
1972 - 1976

(a)	(b)		(c)	(a)	(b)		(c)	Total	
	Market Size 000 Tons	000 Dollars			Market Size 000 Tons	000 Dollars		Quantity 000 Tons	Value 000 Dollars
			Unit Value \$				Unit Value \$		
Hong Kong - Singapore	150	9000	60	Malaysia & Others	100	6000	60	8075	484500
"	150	9000	60	"	100	6000	60	8841	530460
"	150	9000	60	"	100	6000	60	9683	580980
"	150	9000	60	"	100	6000	60	10608	636480
"	150	9000	60	"	100	6000	60	11624	697440
Others	100	5400	54					3689	199206
"	105	5670	54					4046	218484
"	110	5940	54					4436	239544
"	116	6264	54					4865	262710
"	122	6588	54					5335	288090
								5142	589515
								5669	650060
								6216	712905
								6788	778625
								7389	847680
Hong Kong	239	143400	600	India, S. Korea, Philippines, and Others	305	183000	600	1614	968400
"	251	150600	600	"	310	186000	600	1664	998400
"	263	157800	600	"	316	189600	600	1716	1029600
"	276	165600	600	"	322	193200	600	1770	1062000
"	290	174000	600	"	328	196800	600	1827	1096200
Third Grade Importers	10	5000	500					91	107500
"	10	5000	500					94	111000
"	10	5000	500					96	112800
"	10	5000	500					98	114600
"	10	5000	500					101	116400
								350	41800
								362	43300
								376	44900
								388	46400
								402	48100
								320	32000
								320	32000
								320	32000
								320	32000
								320	32000

- a) the present production and return situation;
- b) the incremental input-output and net return situation;
- c) the yield per one kilo of incremental fertilizer;
- d) the incremental benefit/cost relationship, and
- e) the full baht return per rai.

2.2.5.2 Cost of New Land, Irrigation, and Change Agents - Increasing production by bringing new land under cultivation, irrigating land, and using change agents, all have a cost. If new land is cultivated, the financial cost to the farmer may be nothing. However, there will be economic costs to the country: required investments in schools, roads, health facilities, and other public sector inputs. Much of these costs are not paid by the actual land user but by government subsidies. Capitalizing these costs over a ten year period using historical data showed a cost of $\text{฿ } 80$ per rai for bringing new land into production.

Irrigable land now exists in the Northeast due to the large dams and canals constructed in previous plan periods. However, before the land can actually be irrigated, more infrastructure for conveying water is necessary. Two types of irrigation infrastructure development are necessary: Additional canal systems, and distribution systems. Costs for these are estimated at $\text{฿ } 116$ per rai for the two combined and $\text{฿ } 52$ per rai for distribution alone.

The final input considered for increasing production was the change agent. A constant cost of $\text{฿ } 29.25$ million for the plan period was used for each plan. This cost was determined by relating productivity increases, not accountable to other factor inputs, to historical government change agent expenditures.

2.2.6 Production Targets - Table 2-6 illustrates the Northeast agricultural crop production targets and value added each year for the period 1972-76. Four factors influenced the establishment of these targets. These factors were:

- a) national and internal demand for the product, (identified in Section 2.2.4);
- b) national production targets established for these commodities;
- c) present production trends, methods, and known constraints to production;
- d) farmers' return per rai.

TABLE 2-6
TARGET PRODUCTION OF MAIN AGRICULTURAL CROPS

Northeast Thailand
1972 - 1976

		1972		1973		1974		1975		1976	
		Product- ion	Value Added								
PADDY	M. Tons ฿ M. ^{1/}	4.438	3,666	4.563	3,769	4.690	3,874	4.822	3,683	4.957	4,094
COCONUT	M. Tons ฿ M.	0.122	45	0.122	45	0.122	45	0.122	45	0.122	45
SUGAR- CAN.	M. Tons ฿ M.	0.773	62	0.796	64	0.820	66	0.844	66	0.869	70
MAIZE & SORGHUM	M. Tons ฿ M.	0.251	176	0.272	191	0.295	206	0.320	225	0.350	245
GROUND- NUT	M. Tons ฿ M.	0.036	78	0.0371	81	0.0382	83	0.0393	86	0.0405	88
BEANS	M. Tons ฿ M.	0.0210	42	0.0224	45	0.0243	48	0.0267	53	0.0299	60
CASSAVA	M. Tons ฿ M.	0.239	55	0.248	57	0.257	59	0.265	61	0.278	64
TOBACCO	M. Tons ฿ M.	0.021	159	0.022	167	0.023	175	0.025	184	0.026	193
COTTON	M. Tons ฿ M.	0.037	106	0.041	118	0.045	130	0.050	143	0.054	156
KENAF	M. Tons ฿ M.	0.343	647	0.353	666	0.364	687	0.375	708	0.386	729
KAPOK	M. Tons ฿ M.	0.107	61	0.111	63	0.114	65	0.118	67	0.121	69
SESAME	M. Tons ฿ M.	0.003	10	0.004	11	0.004	12	0.004	13	0.005	14
GARLIC (Etc.)	M. Tons ฿ M.	0.043	217	0.045	224	0.046	232	0.048	239	0.049	247
VEGETA- BLES	M. Tons ฿ M.	0.358	179	0.388	194	0.420	210	0.456	228	0.494	247
FRUIT	M. Tons ฿ M.	0.483	772	0.501	801	0.519	830	0.536	857	0.553	884

^{1/} In Constant 1962 Price.

2.2.7 Agricultural Model

2.2.7.1 Development of Model - With the production established for the various Northeastern crop commodities, an agricultural model was developed to test the effect, costs and results of different inputs on the final crop output. The model inputs are: irrigation canal construction costs; irrigation distribution system construction costs; fertilizer costs and quantities; infrastructure (roads, schools, public construction) costs;^{1/} and change agent costs.

Because targets have been established for crop production output, the major function of the agricultural model is to vary inputs (while still attaining the production output targets), and to measure the effect of these different inputs on total cost.

The model was used to test the cost implications of five different agricultural plans -- each based on different input assumptions. The final quantity output of each commodity is the same in each plan. The costs involved are current and the benefits are the gross ex-farm gate value at 1970 prices. Because production quantity targets are set, final benefits in each plan are the same. Only costs vary because of varied production inputs. The benefit cost ratios relate total costs to total benefits.

Table 2-7 summarizes the inputs and results of each plan.

2.2.7.2 Model Results - The benefit/cost results from the model give the rankings shown in Table 2-8.

The benefit/cost ratios of all five plans are very favorable, showing almost no difference among planned B, D, and E. While the recommended plan should have as favorable a benefit/cost ratio as possible; it also should consider several other factors:

a) cultivable land area in the Northeast is limited. It is estimated a continuation of present trends would exhaust the cultivable land supply in 1984. See Chart 2-1.

b) fertilizer is expensive and to greatly expand usage will involve large scale programs for special credit or discount;

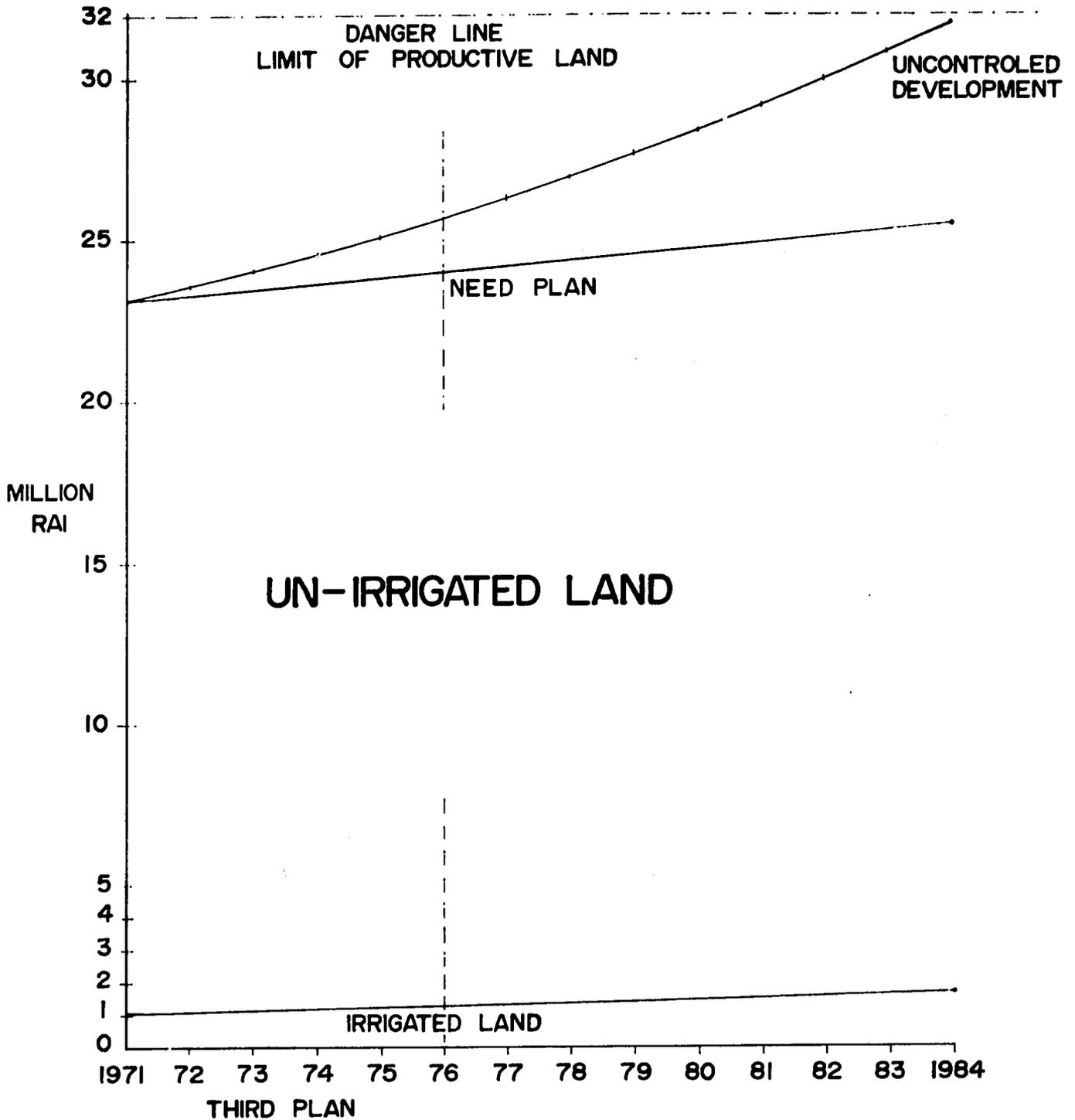
^{1/} These are economic costs which accrue to the government when farmers move into new land.

TABLE 2-7
 AGRICULTURAL PLAN SUMMARIES
 NORTHEAST CROPS
 INPUTS-OUTPUTS
 1972-1976

	1	2	3	4	5	5	7	8	9	10	11
	Canal Costs ₹ Million	Distribution Costs ₹ Million	Fertilizer Costs ₹ Million	Infra- structure Costs ₹ Million	Change Agent Cost ₹ Million	Total 1+2+3+4+5 Cost ₹ Million	Benefit ₹ Million	Benefit/ Cost 7 ÷ 6	New Non- Irrigated Land 1000 Rai	New Irrigated Land 1000 Rai	Total 9 + 10 1000 Rai
Plan A - Maximum Irrigation, No new land	174.00	78.00	552.20	315.24	29.25	1,148.69	4,269.57	3.72	319.03	1,000.00	1,318.99
Plan B - Maximum Fertilizer, No new land or Irrigation	0	0	783.20	219.18	29.25	1,031.63	4,269.57	4.14	893.00	0	893.00
Plan C - All new land	0	0	0	873.81	29.25	903.06	4,269.57	4.73	3,611.00	0	3,611.00
Plan D - No change from present trends	21.75	9.75	552.20	445.25	29.25	1,058.20	4,269.57	4.03	1,723.00	125.00	1,848.00
Plan E - Recommended	43.50	19.50	552.20	424.17	29.25	1,068.62	4,269.57	4.00	1,518.00	250.00	1,768.00

CHART 2-1

LAND REQUIREMENT FOR CROP PRODUCTION



c) large irrigation dams and delivery systems have been built in the Northeast but are now generally under-utilized;

d) a momentum exists in present agricultural patterns which planning cannot ignore. Policies can influence this momentum, but cannot drastically change it without major social upheavals.

The exact fertilizer -- new land input for each crop-- was based on what appeared to be the most reasonable expectation. In those cases where gross return was scarcely equal to fertilizer input costs, most production increases were assumed to come from new land. For other crops with significant fertilizer responses, fertilizer was assumed to be more important.

The yield response to fertilizer input was determined in the production factor section of the agriculture report in Volume II.

The unit costs which were the basis for the cost inputs were:

- a) fertilizer - ₱ 2,000 per ton;
- b) irrigation canals and distribution system - ₱ 116 per rai;
- c) irrigation distribution system - ₱ 52 per rai;
- d) infrastructure cost - ₱ 81 per rai;
- e) change agent cost - A constant ₱ 29.25 million cost for the region.

TABLE 2-8

RANKING OF MODEL RESULTS

Rank	₱/C	Plan	(Plan Description)
1	4.73	C	All new land
2	4.14	B	Maximum fertilizer
3	4.03	D	No change
4	4.00	E	Recommended
5	3.72	A	Maximum irrigation

Source: Table 2-7

2.2.8 Public Sector Role - Production constraints prevent targets attainment without public sector assistance. Problems differ for each commodity; thus programs and projects to increase production must be devised accordingly.

Because of the strong demand for certain commodities such as cotton and feed grains, target growth may be conservative. Larger public sector inputs than recommended here might result in even greater returns.

The costs of public sector roles are reflected in projects, programs, and budgets. Costs and programs discussed below are considered to be necessary for achieving production targets. If the agricultural budget is increased or reduced, it will be necessary to allocate funds on a priority basis. Priorities should be a function of demand and return per rai. Public monies should not be invested in development projects whose products have poor market potential or excessive production costs.

The public sector role falls into two categories: general programs, and special activities.

2.2.8.1 General Programs^{1/}

a) Extension service: should concentrate on assisting farmers to fully utilize irrigation systems; improving kenaf production techniques; assisting in adoption of new cotton production techniques; emphasizing maize production; spreading new sorghum varieties to farmers; and distributing and aiding production of improved soybean varieties.

b) Research and Experimentation: should concentrate on research to develop more disease resistant cotton varieties; developing higher yield maize varieties; developing disease and fungus resistant sorghum varieties; and continuing research on soybeans in different changwats in the Northeast, as well as soybean seed multiplication.

c) Expansion of Credit: Credit should be made available to complete irrigation canals and distribution systems; to aid in purchasing fertilizer for irrigated land; to aid in purchasing fertilizer for cotton, maize, sorghum, soybeans, vegetables and tobacco; and to purchase improved maize, soybean, and sorghum seed varieties.

^{1/} For specific extension, research, and credit programs and projects see specific NEED/PAG papers dealing with these subjects.

2.2.8.2 Special Activities - Special activities should include completing the irrigation canal and distribution systems; studying the feasibility of cotton spraying services and crop insurance programs; establishing stricter quality control grading centers for Thai kenaf exports; increasing trade promotional trips to Japan to assist the sale of Thai maize, soybeans, and sorghum; and developing improved market research facilities.

2.2.8.3 Budget - For the period 1967-71, the Agricultural Development Budget related to crops was $\text{P} 1,036$ million. This was allocated among:

- a) Office of the Under-Secretary (Ministry of Agriculture), $\text{P} 179.4$ million;
- b) Department of Agriculture, $\text{P} 470.80$ million;
- c) Department of Rice, $\text{P} 386.17$ million.

Prorating the Northeast share of the total whole Kingdom expenditure shows a Northeast crop development budget of $\text{P} 244$ million over the period 1967-71. This is a conservative estimate based on a 25 percent budget allocation for items not specifically assigned to a region.

The 1976 target value-added is $\text{P} 7,214$ million, an increase of $\text{P} 1,175$ million over the 1971 base of $\text{P} 6,039$ million. Using a capital output ratio of .53, a government crop development budget of $\text{P} 623$ million over the Third Plan period is necessary to achieve the targeted 1976 value added. $\text{P} 623$ million represents a 154 percent increase over the Second Five Year Plan development budget. Such an increase does not appear feasible. It is, however, possible to reduce the projected budget without affecting the target 1976 value added, by such methods as priority fund allocation, encouragement of private investment, and expansion of credit.

Through careful fund allocation, a $\text{P} 500$ million crop development budget should be sufficient to achieve the projected target.

Table 2-9 illustrates the crop development budget by item for the period 1972-76, using approximately $\text{P} 500$ million as the total five year budget.

2.2.9 Other - Special reports were written by NEED/PAG which were not used separately in the crop analysis; but give information useful in certain situations. The topics are Irrigation, Agricultural Credit, Farmers Associations, North-east Soils, Land Tenure, and Agricultural Research and Extension.

TABLE 2-9

TOTAL AGRICULTURAL CROP DEVELOPMENT BUDGET
Northeast Thailand
1972 - 1976

	<u>฿ Million</u>
I Office of Under-Secretary	
1. Agriculture Economic Research	20
2. Agriculture Development Center	
a) Ditches & Dikes Project Area	10
b) Tha Pra	55
c) Soil Fertility Survey	10
d) Agriculture Engineering	<u>2</u>
I Total	97
II Department of Agriculture	
1. Survey, Experiment and Research	
a) Research in Agricultural Extension Stations	40
b) Research & Extension in Ditches & Dikes Project Area	3
c) Plant Post Survey & Research	10
d) Botanical Survey & Research	1
e) Soil & Fertility Research	23
f) Plant Post Control Research	30
g) Plant Toxicity Research	<u>3</u>
Sub-Total	110
2. Economic Crop Development	
Cotton	30
Maize & Sorghum	30
Coconut	5
Sugar Cane	2.5
Oil Palm	1.5
Kenaf	10
Mulberry & Silkworm	25
Soybean	30
Other Economic Crops	<u>10</u>
Sub-Total	144
II Total	254

TABLE 2-9 (Cont'd)
TOTAL AGRICULTURAL CROP DEVELOPMENT BUDGET
 Northeast Thailand
 1972-1976

	<u>฿ Million</u>
III Extension Department*	
a) Seed Multiplication	20
b) Extension Service	30
c) Farm Mechanization Training	5
d) Plant Pest Control	20
e) Agricultural Extension Equipment Center	5
f) Agricultural Aviation	10
g) Rice Extension	25
h) Rice Demonstration	<u>5</u>
III Total	120
IV Rice Department	
1. Research & Experimentation	25
2. Pest Control	<u>20</u>
IV Total	45
Grand Total	<u><u>516</u></u>

* New
 Source: NEED/PAG Calculations

2.2.9.1 Irrigation - Northeast Thailand has received considerable investments in irrigation facilities over the last decade. An estimated 75 percent of total government development expenditure for agriculture went to the Royal Irrigation Department (RID) during the period of the Second Plan.

Over 150 water storage tanks in the region have been constructed under the RID program. Fourteen large dams (i.e. affecting potential irrigable areas of 5,000 hectares each, or more) have been constructed primarily for irrigation purposes.^{1/}

Altogether these tanks and dams have a potential irrigable area of 420,000 hectares, they reportedly irrigate 210,000 hectares.^{2/} However, there is some controversy over the effectiveness of this irrigation program.

A field survey conducted by NEED/PAG in the fall of 1971 indicated considerably less irrigated area for tanks and dams inspected than is shown by official figures. There appear to be problems in establishing organizations, such as farmer cooperatives, which can effectively use water once RID constructs the basic irrigation facilities.

For planning purposes it was assumed that for the present only 900,000 rai in the Northeast are irrigated. This figure is based on the 1968 Crop Cutting Survey which indicated 5.1 percent of land under rice production was irrigated. It appears that effectively irrigated land area is increasing by only 25,000 rai per year. For the Third Plan period it is projected that the government will be able to increase this rate to 50,000 rai per year, as so much of the basic infrastructure is already in place.^{3/}

It is recommended, therefore, that emphasis in the Third Plan period be placed on completing primary canals, laterals and other related facilities of existing dams and water tanks rather than undertaking entirely new projects. The capital expenditure

1/ "Tables Showing Water Resources in Thailand" Royal Irrigation Department; Bangkok, Thailand, April 1, 1970.

2/ Op. cit. p. 25.

3/ The World Bank's Northeast review recommends a project which, "would focus on the completion of irrigation works serving 40,000 ha." (op. cit. p. 17).

required for these purposes is estimated at $\text{฿} 914$ million^{1/} (approximating an estimate average cost of $\text{฿} 3,500$ per irrigated rai) for constructing irrigation canals and drainage systems.^{2/}

Benefits from implementation of irrigation projects are discussed in another section of this chapter but in general it was estimated that rice yields would increase by 50 percent on effectively irrigated land.^{3/}

Estimated foreign aid available for these irrigation projects is not likely to be substantial as the foreign exchange component of these projects is low. There is, however, a prospect of some USOM financing for an intensive labor project involving water storage tanks.

2.3 Livestock

2.3.1 Livestock Background

2.3.1.1 Introduction - Livestock is second to Crops in importance in terms of value added within the total agricultural sector. In 1968 Livestock accounted for 17.3 percent of the total agricultural sector value added in the Northeast.

^{1/} Project requests put forward by RID may be summarized as follows:

<u>Project</u>	<u>Estimated Development Budget Expenditure 1972 - 1976</u>
Nong Wai Dam	$\text{฿} 233,000,000$
Nam Oon Dam & Distribution System	$\text{฿} 264,000,000$
Lam Pao Distribution System	$\text{฿} 213,000,000$
Nam Pong Distribution System	$\text{฿} 220,000,000$
34 New Water Tanks	$\text{฿} 399,000,000$
Improvement of 154 Existing Tanks	$\text{฿} 500,000,000$
Other	$\text{฿} 4,000,000$
Total	<u>$\text{฿} 1,823,000,000$</u>

^{2/} See Nam Mun Project Feasibility Report by U.S. Bureau of Reclamation p. V-7.

^{3/} It might be noted that the U.S. Bureau of Reclamation Studies on irrigation projects in Northeast Thailand usually assume around a 500 percent increase in per rai rice production on irrigated land. (See Num Mun Feasibility Report. p. VII-9.) This of course assumes other important inputs.

The Livestock component is divided into five categories:

- a) cattle and buffalo;
- b) swine;
- c) hens and ducks;
- d) eggs, and
- e) other including dairy.

Table 2-10 illustrates the importance of each Livestock category relative to total Livestock value added. Recent trend growth rates for each category also are given.

2.3.1.2 Production - The present production situation in the Northeast is unsophisticated. With few exceptions animals graze at random on dry rice paddies, on natural pasture areas, or on wooded areas around rice fields. The only commercially significant improved pasture is on the Chokchai ranch near Pak-chong.

During the dry season, most animals are fed rice straw or crop wastes and graze over dry fields. The nutritional value of this feed is low.

TABLE 2-10

LIVESTOCK BREAKDOWN
Northeast Thailand
1968

Category	Per Cent of Total Livestock Value-Added 1968	Recent Trend Growth Rate
Cattle and Buffalo	34.0%	3.4%
Swine	21.2%	6.6%
Hens and Ducks	26.1%	3.3%
Eggs	17.5%	3.5%
Others (Inc. Dairy)	0.9%	2.0%

Source: NEDB, National Accounts Division

The amount of total grazing land in the Northeast is not known. The World Bank Study on the Northeast in 1963 by Hans Platenius gave the figures shown in Table 2-11, which would indicate that there is considerable land still available for grazing. He assumed there was 50 million rai which could actually be grazed. (This discounts 14 million rai of forest and grazing

land which could be too steep, now farmed etc., all unclassified land, and farm grazing during the dry season.) Then in 1966, the total buffalo and cattle population (5,771,000 head) had an average area of 8.7 rai per head to graze.

TABLE 2-11

LAND UTILIZATION IN NORTHEAST THAILAND

	Rai (1000)	Per Cent of Total
Land in Farm	22,585	21.6
Forest and Grazing Land	64,165	61.5
Swamps and Lakes	369	0.4
Unclassified	<u>17,269</u>	<u>16.5</u>
	<u>104,415</u>	<u>100.0</u>

Source: 1963 World Bank Study on Northeast Thailand by Hans Platenius

The land-to-animal ratio is not a constant, depending on such factors as (i) livestock quality desired, (ii) quality and "weatherability" of the pasture, (iii) availability of feed lots and feed grains.

Present livestock graze on natural grass in thin forests at costs which are low. To raise cattle by more intensive pasturing methods would involve the clearing, improved planting and maintaining of pasture, building fences, and making hay or silage to care for animals through the dry season.^{1/} The investment required would result in a higher price level for meat.

These comments do not apply to swine as they do not require grazing land.

2.3.1.3. Factors of Production - Data on livestock factors of production are lacking. Feed conversion ratios, annual weight gain and breeding practices are hard to determine. However, some production factors were developed which give an idea concerning relative return from pastures on which experiments are now being made in the Northeast. The results of this

^{1/} World Bank Report, 1963 by Hans Platenius.

TABLE 2-12

COMPARATIVE LIVESTOCK PRODUCTION
Northeast Thailand

Production (Feed) Situation	Average Consumption Per Day-Wet Season Kilograms		Average Consumption Per Day-Dry Season Kilograms		Amount of Land Necessary Carry One Animal	Period Necessary to Attain 350 Kgs.	Average Gain Per Day	Gross Sales Price*	Gross Return Per Rai Per Year
	Bulk	Protein	Bulk	Protein					
Natural Pasture (Present Conditions)	5.4	.12 ^{1/}	2.9	.02 ^{2/}	8.7	4	.24	1,400	40
Para Grass Pasture	6.4	.28 ^{3/}	6.4	.14 ^{4/}	2.0	3	.32	1,400	233
Townsville Lucerne (Pasture & Seeds)	1.0	.31 ^{3/}	7.0	.31 ^{5/}	3.0	2.75	.35	1,300	170
Irrigated Pasture Selected	16.0	.70 ^{3/}	16.0	.70 ^{5/}	1.0	1.2	.80	1,400	1,167

* Average farmgate price per live weight kilo is 4 baht.

- 1/ Total wet season consumption over animal weight gain life = 5950 kgs. bulk and 131 kgs. protein.
 2/ Total dry season consumption over animal weight gain life = 1050 kgs. bulk and 0 kgs. protein.
 3/ Total wet season consumption over animal weight gain life = 5250 kgs. bulk and 231 kgs. protein.
 4/ Total dry season consumption over animal weight gain life = 1750 kgs. bulk and 38.5 kgs. protein.
 5/ Total dry season consumption over animal weight gain life = 1750 kgs. bulk and 77 kgs. protein.

Source: ADB Compac Report, ADB Nong Wai Study, 1963 World Bank Study on the Northeast by Hans Platenius, "California Agriculture" magazine July 1969, and NEED Pag Calculations.

analysis are shown in Table 2-12. The analysis covered cattle consumption and weight gain under four different conditions: a) present pasture situation; b) para grass; c) townsville lucerne; and d) irrigated pasture. The irrigated pasture concept has not been tested in Thailand. Results shown are from a California experiment. Because of the exceptional results in California, it is suggested that irrigated pasture experimentation be conducted in the Northeast.

2.3.2 Demand

2.3.2.1 Thailand Market - The actual consumption of meat in Thailand is unknown although various estimates exist. The 1962 Household Expenditures Survey figures on meat consumption by region are shown in Table 2-13.

If the whole Kingdom average from Table 2-13 is applied to 1970, then total meat consumption in Thailand was 11.2 kgs. x 37 million people or 414,400,000 kgs. of meat. This figure would not include meat consumed by tourists or foreign residents.

If it is assumed that average per capita meat consumption rose from 11.2 kgs. in 1962 to 15 kgs. in 1970, then total consumption would have been 555 million kgs. rather than the 414 million kgs. shown previously.^{1/}

TABLE 2-13

THAILAND MEAT CONSUMPTION BY REGION

	<u>Whole Kingdom</u>	<u>Central</u>	<u>Northeast</u>	<u>North</u>	<u>South</u>
Kilograms/Yr.	11.2	11.0	8.1	13.2	10.6

Source: 1962 Household Expenditure Survey

^{1/} Financial Post, p. 6, December 24, 1970, shows annual per capita meat consumption in Thailand to be 18.2 kgs.

For total national demand in 1970, 414 million kgs. would be a lower limit and 555 million kgs. should approach the maximum. An average of 485 million kgs., therefore, is assumed. Broken down by type, total estimated 1970 Whole Kingdom demand was:

- a) 3,114,286 hogs
- b) 417,143 cattle and buffalo
- c) 100,000,000 fowl

Total meat consumption increase will depend on rate of population and disposable income growth. Per capita meat consumption has an income elasticity of one according to an FAO study in Thailand. This should result in total consumption increases of between 4 percent and 5 percent per year through 1976. This implies a slaughter rate by 1976 of 4 million swine, 540,000 cattle and buffalo, and 130 million poultry.

2.3.2.2. Export Market - The Far East as a region is a net importer of pork, beef, and poultry meat.^{1/} In 1967 the deficit in these items was:

	<u>Deficit Volume</u>	<u>Value of Deficit</u>	<u>Value Per Unit of Import</u>
(1) Beef	20,241 tons	\$ 19,878,000	\$ 990
(2) Pork	16,445 tons	\$ 8,023,000	\$ 495
(3) Poultry Meat	24,326 tons	\$ 14,233,000	\$592

The most significant importers of meat products are: Japan - beef; Hong Kong and Japan - Pork; Hong Kong, Japan and Singapore - poultry.

The fact that Thailand is not exporting these items implies lack of productive capability or the non-competitive quality of Thai products.

In the case of beef to Japan, the problem is one of quality. Japan is striving for 90 percent beef self-sufficiency by 1985.^{2/} In the meantime the country has adopted very strict import rules on beef to prevent the entrance of foot and mouth disease and few countries are allowed to sell beef to Japan.

^{1/} 1969 FAO Trade Yearbook.
^{2/} ADB Compac

It is questionable whether the Japanese market warrants the effort. Imports were 13,000 tons in 1968, (equivalent to roughly 65,000 head of cattle), not a large number in light of the potential competition, especially Australia. A 10 percent share of market would only be 6,500 head per year. That is insignificant compared to Thailand consumption.

The pork and poultry meat markets in Hong Kong and Singapore appear to be growing and should be analyzed more carefully. Unlike cattle they require no large investment in pasture and can be raised by small farmers. These products may be more suitable for Thai exports than beef.

In 1968 pork and poultry imports by country were:

	<u>Hogs</u>		<u>Poultry</u>
Hong Kong	311,500	Hong Kong	11,189,715
Japan	<u>149,771</u>	Japan	9,260,000
Total	<u>461,271</u>	Singapore	<u>2,473,714</u>
		Total	<u>22,923,429</u>

2.3.2.2 Tourist Market - Roughly 400,000 tourist visit Thailand annually and each stays an average of four days. Tourists eat an estimated average of two kilos of meat which equals 800,000 kilograms per year. Approximately 50 percent of this beef, pork and chicken are equally divided in the remainder.

In terms of live animals, the above weight implies a yearly consumption of 2,286 cattle (at 175 kg. carcass weight), 2857 hogs (at 70 kg. carcass weight), and 114,285 chickens and ducks (at an average 1.75 kg. dressed out weight.)

Summary:

The livestock market in Thailand over the Third Plan period appears favorable. Demand for Northeast animals in 1972 should be for 227,000 cattle and buffalo, 1,133,000 swine and 26 million fowl. This demand will increase through 1976.

Export prospects are not as favorable, but due to the high Thai national demand, livestock industry growth should not be constrained.

2.3.3 Production Targets - Historically the Northeast has supplied 50 percent of the meat requirements of cattle and buffalo, and 33 percent of pork and poultry. This ratio should be maintained, and perhaps increased through the Third Plan period. Target figures representing the number of animals which the Northeast should supply to meet Thai meat demand are shown in Table 2-14. Exports are not expected to be significant over the plan period.

TABLE 2-14

ANIMALS AVAILABLE FOR SLAUGHTER (TARGET)
Northeast Thailand
1972 - 1976

<u>Year</u>	<u>Swine</u>	<u>Cattle and Buffalo</u>	<u>Poultry</u>
1972	1,133,300	227,500	36,400,000
1973	1,184,667	238,000	38,039,000
1974	1,238,000	248,500	39,750,000
1975	1,294,000	260,000	41,539,000
1976	1,352,000	371,500	43,408,000

Note: Based on Northeast supplying 33 percent of swine and poultry and 50 percent of cattle and buffalo.

Source: NEED/PAG calculations.

2.3.4 Public Sector Role and Cost - Present production methods in the Northeast result in poor quality, low weight animals. As more land is brought under crop cultivation and as forests are cleared, there will be less and less natural pasture available for feeding livestock, resulting in thinner, poorer quality animals and a diminishing herd. If this is to be avoided, the Government must establish programs and projects designed to overcome present production constraints.

Priorities should include pasture improvement programs including experimentation with irrigated pasture; disease control concentrating on foot and mouth disease, brucellosis, anthrax, white scours, and hemorrhagic septicemia; improved breeding; and major extension efforts to pass on research results to the farmer.

Table 2-15 gives the Department of Livestock development budget breakdown over the Second Plan period 1967-1971, for the whole Kingdom, for the Northeast, and the suggested Third Plan budget. Emphasis during the Second Plan was on improving animal breeds and controlling disease. The Third Plan should place even more emphasis on these problems since they have not been solved. In addition more work should be done in the areas of nutrition (pasture research) and veterinary research. The Second Plan did not specify pasture improvement; it is assumed to be under animal nutrition for the Third Plan. Finally, a separate category of Livestock Extension is added to the Third Plan to assure funds for the agents whose responsibility it will be to pass all research and experimental results on to the farmer to assist him in his own improvement efforts.

To meet these needs the Third Plan Livestock Development Budget should be increased 76 percent over the Second Plan budget.

2.4 Forestry

2.4.1 Introduction and History - In terms of total value added, forestry ranks third in agricultural importance, accounting for 7.5 percent of total agricultural value added in 1968. Its historical growth rate was 4.6 percent per year for the period since 1960, but its more recent trend growth rate has been 6.5 percent per year.

Table 2-16 illustrates the relative importance of the three sub-categories to forestry as a whole, and their recent growth rates.

Charcoal and firewood have always been the most important sub-categories in forestry. There has been very little commercial lumbering.

The historical pattern of forestry exploitation was one of cut and burn, a result of shifting cultivation and expansion into new land to increase crop production. Forest land has declined from 60 percent of the Northeast total area in 1937 to 46 percent in 1961-1962.^{1/} More recently the Land Department of Thailand reported 39 percent of the Northeast is in forests.

In spite of the high percentage of forest land, only 20 percent of it produces sawn lumber in commercial quantities.^{2/} Commercial activity is not significant.

^{1/} FAO - Gaertner and Beuschel, Forest Inventory of Northeast Thailand 1962.

^{2/} Hans Platenius, "World Bank Report on Northeast Thailand", 1963.

TABLE 2-15

LIVESTOCK DEVELOPMENT BUDGET BREAKDOWN
Northeast Thailand
Second vs Third Plan

	<u>Second Plan</u>		<u>Third Plan</u>
	<u>Whole Kingdom</u> ฿ Million	<u>Northeast</u> ฿ Million	<u>Northeast</u> ฿ Million
Department of Livestock			
1. Livestock Improvement and Ext. Ser.			
a) Improvement of Animal Breeds	107.37	53	60
b) Distribution of Animal Breeds	40.76	21	25
c) Improvement of Expan. of Swine breeds	20.41	10	20
d) Promotion of Dairy Cow Raising	10.57	5	10
e) Livestock Development in Ditches and Dikes Area	8.44	4	6
f) Animal Nutrition	13.77	7	30
g) Farm Extension Service	<u> </u>	<u> </u>	<u>30</u>
Sub-Total	201.32	100	181
2. Prevention and Control of Animal Disease			
a) Animal Diseases Control	135.55	68	100
b) Vaccine Production	<u>32.63</u>	<u>16</u>	<u>32</u>
Sub-Total	168.18	84	132
3. Research			
a) Veterinary	12.00	6	20
b) Animal Husbandry	<u>9.54</u>	<u>4</u>	<u>10</u>
Sub-Total	21.54	10	30
Total	<u>391.04</u>	<u>194</u>	<u>343</u>

Source: The Second National Economic and Social Development Plan and NEED/PAG Calculations.

TABLE 2-16

FORESTRY PRODUCTION AND TRENDS
Northeast Thailand

Subcategory	Percentage of Total Forestry Value Added 1968	Current Trend Growth Rate
Timber	37.3%	4.4%
Charcoal and Firewood	45.9%	0.4%
Other Forest Products	16.7%	6.0%

Source: NEED/PAG and NEDB National Accounts Division

2.4.2 Present Production Situation - Forests continue to be illegally depleted with few attempts at reforestation programs. The decline in forest land also reduces pasture land for cattle. Continuation of present trends will result in a shortage of wood for domestic uses (charcoal and firewood), no commercial potential, and a shortage of pasture land. Only scrub areas will remain if present trends continue.

2.4.3 Demand - Forest products trade is important in the Far East, but Thailand is not participating.

Preliminary surveys show a fairly significant demand for forest products in Japan. Japan is one of the major importers of tropical forest products. Japan is one of the major importers of tropical forest products. The Philippines, Malaysia and Burma are major suppliers along with New Zealand. North America also exports logs to Japan. Indonesia is now increasing production to meet the demand. Taiwan, Singapore, and South Korea are processing and exporting plywood and veneer made from imported tropical logs.

2.4.4 Problems - Forestry could become significantly important to the Northeast. However, before improvement over the present situation can occur, several problems must be overcome. The most serious are:

a) a lack of knowledge concerning actual forestry resources, i.e., no agreement of actual amount of land in forests;

lack of data on tree inventory by variety or quality, and production; lack of cost data;

b) no comprehensive planning or market studies for forest products;

c) lack of control over illegal cutting and squatting and farming in forest reserve areas.

2.4.5 Public Sector Role - to develop forestry by reversing present trends, the government must take a very active role, which should commence during the Third Plan period. If it does not, forest lands will be further depleted, making any restoration programs more costly. The major public sector efforts in the Third Plan should include promulgating policy measures to curtail illegal cutting; making a comprehensive market study, both national and international to determine demand for individual forest products; inventorying existing forest resources by variety, quality, and quantity; beginning forest land development programs emphasizing those varieties for which there is a market; and investigating concessions to private industry for developing and maintaining forest lands.

The recommended budget for the Third Plan is 14 percent higher than the Second Plan budget (See Table 2-17) to reflect the importance of implementing those measure considered necessary to rectify the present deteriorating situation in forestry.

2.5 Fishing

2.5.1 Introduction - Fishing is the smallest of the four categories in the Agricultural Sector. In 1960 the value added from fishing in the Northeast was 2.6 percent of the total agricultural value added. By 1968 fishing had increased to 3.8 percent of the total, due mainly to a sharp increase in 1965.

The historic compound annual growth rate from 1960 through 1969 was 8.7 percent. However, the trend from 1965 through 1969 was only 5.2 percent per year.

Fishing has not been significant in the Northeast because of the lack of year round bodies of water. This has limited fish production primarily to rivers. Per capita fish consumption in the Northeast has been the second lowest in the Kingdom at 8.8 kilos per capita per year.

2.5.2 Present Production - In 1968 more assistance was given to the Northeast in terms of number of ponds, rice paddies and reservoirs stocked than to any other region. This is illustrated in Table 2-18.

TABLE 2-17

FORESTRY DEVELOPMENT BUDGET BREAKDOWN
WHOLE KINGDOM AND NORTHEAST
Second vs Third Plan

	Second Plan		Third Plan
	Whole Kingdom	Northeast	Northeast
	(P Million)		

Department of Forestry

1. Survey and Research

a) Forest Resources Survey	26.14	6	15
b) Silvicultural Research	8.74	2	4
c) Watershed Management Research	22.53	5.5	5
d) Botanical & Zoological Research	4.04	1	1
e) Wood Technology Research	<u>13.25</u>	<u>4</u>	<u>3</u>
Sub-Total	74.70	18.5	28

2. Forest Protection and Control

a) Forest Reservation	64.84	16	16
b) Forest Protection	110.77	27	30
c) Control of Forests under Concession	77.69	20	21
d) Wildlife Conservation	<u>10.15</u>	<u>3</u>	<u>3</u>
Sub-Total	263.45	66.0	70

3. Forest Management

a) Forest Management & Improvement	55.66	13.5	15
b) Roof Forestation	105.02	27	30
c) Botanical Gardens and National Parks	<u>28.96</u>	<u>7</u>	<u>7</u>
Sub-Total	189.64	47.5	52
Total	527.79	132	150

Source: Second National Economic and Social Development Plan
(1967 - 1971) NEDB and NEED/PAG Calculation.

TABLE 2-18

NUMBERS OF PONDS, RICE PADDIES AND RESERVOIRS, THEIR AREAS AND NUMBERS OF FISH STOCKED
IN 1968 BY REGION

	Ponds		Rice Paddies		Irrigation Reservoirs		Village Ponds		Other Areas*
	No.	Fish	No.	Fish	No.	Fish	No.	Fish	Fish
North	1,134	422,455	124	118,030	12	602,660	-	-	72,400
Northeast	4,235	2,753,855	674	870,660	66	931,230	39	416,600	200,900
Central	1,067	1,297,774	26	44,050	-	-	-	-	73,850
South	84	19,374	7	4,500	-	-	-	-	60,092
Total	6,520	4,493,458	831	1,037,240	78	1,533,890	39	416,600	407,242
Northeast as Per Cent of Total	65%	61%	81%	84%	85%	61%	100%	100%	65%

* Swamps, Irrigation Ditches, and Cage Culture

Source: Report on Extension and Research at the Fisheries Station of Thailand by
H.S. Swingle and R.O. Smitherman.

In addition to the stocking programs, special studies are underway involving fish production under different conditions in different types of water bodies. Effects of fertilization, rate of stocking and feeding in ponds, reservoirs, and rice paddies are being studied. Results concerning different kinds of feeds to different kinds of fish are being obtained.

For example, in one area in Kalasin, fish culture in rice paddies produced added income of $\text{฿ } 144$ per rai. Production per rai was 18 kilograms of carp. Production per rai in rice paddies in the Northeast varies from 18 kilos in Kalasin to 42 kilos in Udorn.

Study results have been obtained showing the beginning of a technological data base which, if applied to the Northeast, can result in the ability to increase fish yields under various conditions.

2.5.3 Demand - At the present time demand in the Northeast appears to be a function of supply. People would eat more fish if more were available. The point where this would cease to be true has not been determined, but it should be well above production levels. Exports will not occur at present or in the near future. Demand should be a constraint over the Third Five Year Plan period.

2.5.4 Problems - The key problems concerning fishing in the Northeast can be divided into three categories:

- a) lack of good data;
- b) shortage of fishery extension agents;
- c) poor condition of facilities at some fishery stations, or lack of facilities for adequate research.

2.5.5 Public Service Role - Development programs which should be stressed by the Government during the Third Plan period include improving facilities at fishery stations; continuing fish research applicable to the local area; doing consumer studies to determine type of fish to develop; and improving the Fishery Extension Service in terms of increasing the number of farm demonstrations.

The Second Plan budget was inadequate to carry out the necessary programs discussed above; some were not even attempted. Table 2-19 shows the recommended Third Plan budget which is 100 percent greater than the Second Plan.

2.6 Land Development, Cooperatives, Credit, and State Enterprises

The 1967-1971 development budget for these four categories for the whole Kingdom and the Northeast is shown in Table 2-20.

Except for credit these budgets appear adequate for the Third Plan period. Because of the emphasis on credit and the need to expand it, the Northeast credit budget has been doubled for the period 1972-1976. The credit budget will be even higher when regional allocation is made of the high national credit budget. The other budgets have been held constant. Tables 2-20 and 2-21 show the Third Plan budget for these items and the annual breakdown.

TABLE 2-19

FISHING DEVELOPMENT BUDGET BREAKDOWN
WHOLE KINGDON AND NORTHEAST
Second vs Third Plan

	Second Plan		Third Plan
	Whole Kingdom P Million	Northeast P Million	Northeast P Million
Department of Fisheries			
1. Development of Fresh Water Fishery			
a) Fresh Water Fishery Development	115.76	29	35
b) Fishery Development in Ditches & Dikes	8.96	2	2
c) Rehabilitation of Public Fishing Areas	19.35	4	4
d) Fresh Water Fishery Research Institute	6.00	1.5	2
e) Regional Agricultural Research Centers	4.11	1	6
f) Huay Sithon Fishery Demonstration	<u>1.50</u>	<u>1.5</u>	<u>3</u>
Sub-Total	155.68	39.00	52
2. Development of Brackish Water Fishery			
a) Brackish Water Fishery Development	8.53	2.00	3
3. Development of Marine Fishery			
	103.39	0	0
4. Development of Fishing Occupation			
a) Development of Fish Processing Industries	6.20	1	3
b) Fishery Training Center	<u>3.55</u>	<u>1</u>	<u>3</u>
Sub-Total	9.75	2	6
5.* Expanded Extension Service	0	0	20
6.* Market Research on Consumption & Distribution	<u>0</u>	<u>0</u>	<u>5</u>
Total	277.35	43	86

* New

Source: Second National Development Plan NEDB and NEED/PAG Calculations.

TABLE 2-20

LAND DEVELOPMENT, COOPERATIVES, CREDIT
AND STATE ENTERPRISES BUDGET BREAKDOWN
WHOLE KINGDON AND NORTHEAST
Second vs Third Plan

	Second		Third
	Whole Kingdon	Northeast	Northeast
Land Development	363	91	91
Cooperatives	320	80	80
Credit	43	11	22
State Enterprises	<u>66</u>	<u>5</u>	<u>5</u>
Total	792	187	198

Source: Second National Plan and NEED/PAG Estimates.

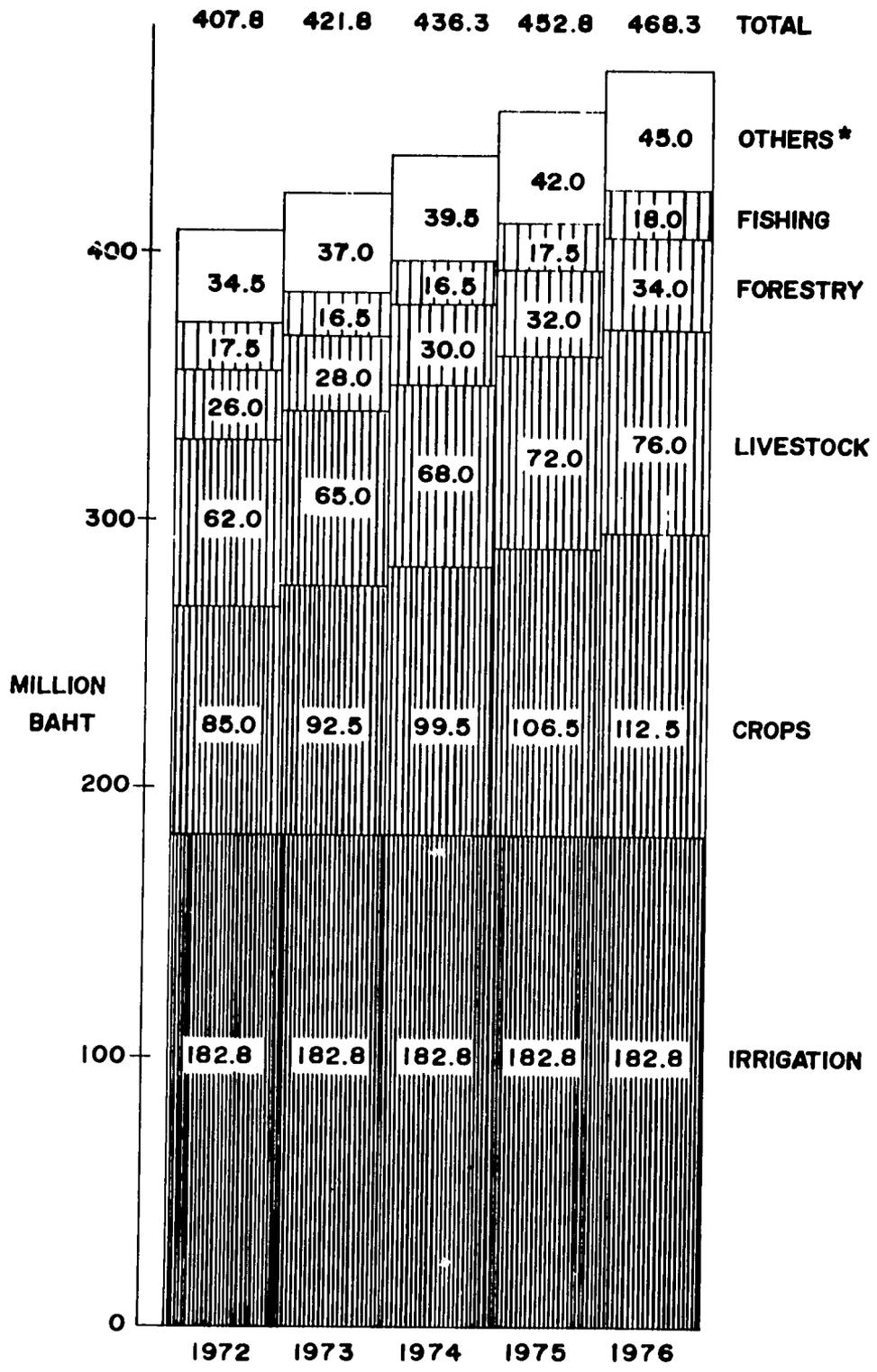
TABLE 2-21

ANNUAL BREAKDOWN
Third Plan - Northeast Thailand

	1972	1973	1974	1975	1976	Total
Land Development	16	17	18	19	21	91
Cooperatives	14	15	16	17	18	80
Credit	3.5	4	4.5	5	5	22
State Enterprises	1	1	1	1	1	5
Annual Total	34.5	37	39.5	42	45	198

Source: NEED/PAG Calculations.

AGRICULTURAL DEVELOPMENT BUDGET ALLOCATION BY YEAR NORTHEAST THAILAND 1972 - 1976



* INCLUDES LAND DEVELOPMENT, COOPERATERES, CREDIT AND STATE ENTERPRISES.

A N N E X

TABLE
OF
FACTORS OF PRODUCTION
FOR NINE NORTHEAST COMMODITIES
AND RETURNS PER RAI

Product	1		2		3		4		5		6		7		8	
	Present Yield Kgs. Per Rai	Farm Price ₪ Per Kilo	Present Fertilizer use Per Rai Kgs. ₪	Present Agro-chemical Per Rai Kgs. ₪	Present Return Per Rai 1x2 + (3+4)	Incremental Fert. Per Rai Kgs. ₪	Incremental Agro-chemical Per Rai Kgs. ₪	New Yield Per Rai Kgs.								
RICE 1 1/2	190	0.8	2.5 5.0	.012 0.2	146.8	27.5 55	1.1 20	340								
2						35.0 70	2.2 40	450								
3						40.0 80	3.4 60	550								
MAIZE 1 1/2	280-300	0.8	0 0	0 0	240.9	16.0 32	- -	369								
2						19.2 38	- -	384								
3						52.8 106	- -	370								
4						38.4 77	- -	422								
5						54.4 109	- -	351								
6						88.0 176	- -	399								
SORGHUM 2/																
9278 a	169	0.75	0 0	0 0	126.8	16.0 32	- -	248								
9278 b	169				126.8	32.0 64	- -	371								
9278 c	169				126.8	48.0 96	- -	383								
8411 a	252				189.0	15.0 32	- -	321								
8411 b	252				189.0	32.0 64	- -	376								
84 (NSC) a	296				222.0	16.0 32	- -	362								
84 (NSC) b	296				222.0	32.0 64	- -	444								
84 (NSC) c	296				222.0	48.0 96	- -	429								
SOYBEAN 1 1/2	135	2.0	0 0	0 0	270.0	35.0 70	1.7 30	160								
2	135					42.5 85	2.3 40	220								
3	135					50.0 100	2.8 50	300								
COTTON 1 1/2	120	4.0	2.5 5.0	11.2 200	275.0	40.0 80	11.2 200	220								
2	120					47.5 95	16.0 300	300								
3	120					60.0 120	22.5 400	400								
TOBACCO	NE WK				NE WK	NE Productivity Increasing										
Virginia 1/2	90 68	13.4155/			1206.9 911.9	NE Major Producer of Turkish										
Turkish	125 -	-				NE Productivity Declining										
Local 3/4	156 212	6.705/			1045.21420.4											
VEGETABLES	NE WK															
Composite 6/	764 828	1.787/			1360 1474											
Tomato 6/	410 445	6.002/			2460 2670											
Zucchini	200 -	2.00	0 0	0 0	400	40 96	- -	250								
PEPPERS	NE WK				NE WK											
	217 220	2.00	0 0	0 0	434 446	UNKNOWN										

9	10	11	12	13	14	15	16	17	
Incremental Yield Per Rai Kgs. 8-1	Incremental Return Per Rai ₪ 2x9	Incremental Cost Per Rai ₪ 6+7 ₪	Net (Loss) Incremental Return 10-11 ₪	Incremental Prod./Kg. of Incremental Fertilizer 9-6	Value of 13 13x2 ₪	Cost of 1 Kg. Fertilizer and Agro-chemical Ade-quate for 13 ₪	Incremental Benefit/Cost 14-15	Full ₪ Return Per Rai 8 x 2 - (11+3+4)	Product
150 260 360	120 208 288	75 110 140	45 98 148	5.5 7.4 9.0	4.4 5.9 7.2	2.33 2.67 2.99	1.89 2.21 2.41	191.8 244.8 294.8	RICE 1 ^{1/} 2 3
69 84 70 122 51 99	55 67 56 97 41 79	32 38 106 77 109 176	23 29 (50) 20 (68) (97)	4.3 4.4 1.3 3.2 0.94 1.1	3.5 3.6 1.1 3.2 0.8 0.9	2.0 2.0 2.0 2.6 2.0 2.0	1.41 1.80 0.55 1.30 0.40 0.45	263.2 269.2 190.0 261.0 172.0 143.0	MAIZE 1 ^{1/} 2 3 4 5 6
78 202 214 69 124 66 148 133	58.5 151.5 160.5 51.8 93.0 49.5 111.0 99.6	32 64 96 32 64 32 64 96	26.5 87.5 94.5 19.2 29.0 17.5 47.0 33.6	4.9 6.3 4.5 4.3 3.9 4.1 4.6 2.8	3.7 4.7 3.4 3.2 2.9 3.1 3.5 2.1	2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0	1.85 2.35 1.7 1.6 1.45 1.55 1.75 1.05	154.0 214.3 191.1 208.8 218.0 239.5 269.0 225.8	SORGHUM 2/ 9278 a 9278 b 9278 c 8411 a 8411 b 84 (NSC) a 84 (NSC) b 84 (NSC) c
25 85 165	50 170 330	100 125 150	(50) 44 180	0.7 2.0 3.3	1.4 4.0 6.6	2.13 2.36 2.55	0.66 1.69 2.59	220.0 315.0 450.0	SOYBEANS 1 ^{1/} 2 3
100 180 280	400 720 1120	280 295 520	120 325 600	2.5 3.8 4.7	10.0 15.2 18.8	7.0 8.5 8.6	1.4 1.8 2.2	395.0 600.0 875.0	COTTON 1 2 3
WK Productivity declining Imported Virginia Value = 30.7 ₪ Kg.								1206.9 ^{8/}	TOBACCO Virginia
WK Productivity declining								1045.2 ^{8/}	Turkish Local
								1360 ^{8/} 2460 ^{8/}	VEGETABLES Composite Tomato
								404	KENAF
150	100	96	4	1.25	2.50	2.40	1.04		GROUNDNUTS

NOTES: 1/ For conditions see text
2/ I.S. Varieties
3/ 1967-1969 averages
4/ 1964-1966 averages

5/ Wholesale prices
6/ 1965-1966 averages
7/ Fluctuates depending on season
8/ N.E. Gross return

CHAPTER III MANUFACTURING, MINING, AND MISCELLANEOUS

CHAPTER III

MANUFACTURING, MINING, AND MISCELLANEOUS

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CHAPTER III

MANUFACTURING, MINING AND MISCELLANEOUS

Northeast Thailand

1972 - 1976

3.1 Manufacturing

The government's direct participation in manufacturing in the Northeast during the Second Plan period consisted of a limited budget for small loans. This sector, however, is potentially the most dynamic of the basic output sectors.

3.1.1 Trends - Historically manufacturing in the Northeast has been based around a small shops industry. The 1964 census listed 76,687 establishments with 170,894 employees, or 2.23 per establishment. Only 440 or 0.25 percent were establishments with 10 or more employees, and only gunny bag factories in Korat and Udorn can be considered large employers with over 500 workers. In terms of value added, manufacturing in the Northeast consisted essentially of basic food processing; in 1969 rice mills accounted for 32.5 percent gross regional product in manufacturing. This percentage has been decreasing, however, as there has been diversification in the region's industrial mix.

After food processing, wood and textile products rank most important. Textiles showed relatively slow growth and the region's share of production dropped from 54 percent of the Kingdom's total in 1960 to 23 percent in 1969, as economies of scale, general production cost advantages, and imported fabrics favored the Bangkok metropolitan area. On the other hand, wood and cork products had a substantial growth in the regional share of production (12 percent in 1960, and 28 percent in 1969); annual growth rates of 26 percent were the highest of all the Northeast's industry groups. Much of this was related to the construction boom in the region during the latter half of the decade.

A few other industries also expanded rapidly in the 1960's. There was a trebling of distilleries output and a doubling in soft drink production.^{1/} Other fast growth industries included ice manufacturing, gunny bag production, metal products and transport equipment repairs. Metal processing, machine shops and particularly repair services of autos and motorcycles, all had growth rates very much in excess of growth rates at the national level, partly because of the relatively insignificant base in 1960. It is this latter group which responds more directly to income changes as its elasticity is relatively high. In absolute terms, however, they were small (about 5 percent of total manufacturing output), and these activities were spurred by the increasing amount

^{1/} NSO records for Northeast Thailand.

in construction and military base establishment in the region during the past decade.

The government's budget for small loans 1964-1968, amounted to $\text{฿}25$ million, which was negligible in its impact on manufacturing. The amount loaned by the Department of Industrial Promotion, Ministry of Industry was actually $\text{฿}8.5$ million.1/

The following shows Northeast Manufacturing sector output compared with the whole Kingdom.2/

	<u>1960</u>	<u>1965</u>	<u>1969</u>
Northeast	824	1,230	1,791
Whole Kingdom	7,019	11,289	16,482
% NE/WK	11.7	11.3	10.3

3.1.2 Basic Problems - The declining role of manufacturing in the Northeast was attributable to several factors:

a) large government inputs for infrastructure and military base activities pushed up the construction and services sector faster, relative to manufacturing than under normal conditions;

b) the type of industries that predominate in the Northeast. Food processing (including slaughtering), and textiles typically represent slow growth industries;

c) the regional proportion of industries dependent on local raw materials was still rising, while in the whole Kingdom this proportion was falling; an indication of less rapid diversification of industrial activity in the Northeast;3/

d) large fluctuations in raw materials, due to climate and soil conditions, create supply problems relatively more significant in the region than in the country as a whole;

e) a geographical disadvantage, i.e., shipment of goods must cross a mountain range to reach the central plain and export markets thereby increasing transport costs. All other regions have direct connection to the Bangkok metropolitan area by means of water transport.

1/ NSO records for Northeast Thailand.

2/ Based on 1962 prices.

3/ See NEED/PAG Stage 3 Report, Chapter 4.

f) an inability of the region to attract private capital which is further aggravated by uncertainties concerning local insurgency.

138p
92
230

3.1.3 Objectives - To help the Northeast to participate to the fullest extent in the overall economic expansion of the country, and to establish a firm base for further accelerated development, the recommended plan for the 1972-76 period emphasizes the importance of industrial development. The government budget required for the industrial development program would be small, 0.7 percent of the total (0.1 percent in the Second Plan), but it is now recognized that positive steps must be taken by the government to stimulate both private and government's industry to expand in and into the Northeast. Five businesses have been given promotional privileges in the Northeast, 1/of which only the Northeast Jute Mill Company is of any significance. The remainder have a total capital of only \$2 million.

To assist in the establishment of new industries in the Northeast the government might consider the possibility of setting up a Regional Development Corporation even though it appears that such an institution would not be in accord with present national policies for the Third Plan period.

The Northeast has been losing its share of processing over the last decade, even of raw materials produced in the region, and the first step will be to retrieve this position. Chart 3-2 is an example of this and shows the relation of slaughtering value added to livestock production value added. Proportionately, less and less of the livestock is being processed in the region. It proposes to reverse this trend and eventually establish a more equitable share of meat processing for the region. It is realized that factors of production may be higher in the Northeast but nevertheless such steps are necessary if the region is to develop to a more comparable position with other regions.

3.1.4 Planned Targets - Agri-oriented industries, which produce vegetable oils, animal feed, canned goods and fish, processed meat and by-products, are subject to inadequate raw materials supplies and to time lags of three years, and must be diversified if they are to make a significant contribution toward the total sector output. Those industries which are already concerned with the processing of raw materials produced in the Northeast offer opportunities for more rapid expansion. If the region gets as big a share of the processing business as might be economically justified, the following shift in raw material processing could occur:

1/ See Chart 3-1.

CHART 3-1

NORTH
9 FACTORIES

- NORTHEAST**
- 1 KALASIN
 - 2 KHON KAEN
 - 3 CHAIYAPHUM
 - 4 NAKHON PHANOM
 - 5 KHORAT
 - 6 NONG KHAI
 - 7 BURIRAM
 - 8 MAHASARAKHAM
 - 9 ROI-ET
 - 10 LOEI
 - 11 SISAKET
 - 12 SAKONNAKHON
 - 13 SURIN
 - 14 UBON
 - 15 UDORN

- NORTH**
- 1 KAMPHAENG PHET
 - 2 CHIANG RAI
 - 3 CHIANG MAI
 - 4 TAK
 - 5 NAKHON SAWAN
 - 6 NAN
 - 7 PHICHIT
 - 8 PHITSANULOK
 - 9 PHETCHABUN
 - 10 PHRAE
 - 11 MAE HONG SON
 - 12 LAMPANG
 - 13 LAMPHUN
 - 14 SUKHOHAI
 - 15 UTTARADIT
 - 16 UTHAI THANI

KOSA HOTEL
10.0 m

ROIET SILK CO.
1.0 m

NORTH EAST
5 FACTORIES

SURIN SILK CO.
0.6 m

CENTRAL
202 FACTORIES

N.E. JUTE MILL
75.0 m

TAPIOCA MILL PIMAI
0.5 m

PROMOTED INDUSTRIES THAILAND
237 FACTORIES
6,998 m CAPITAL

BANGKOK THONBURI SAMUT PRAKAN
159 FACTORIES

- CENTRAL**
- | | |
|-----------------|-------------------|
| 1 PHRA NAKHON | 14 CHACHOENGSAO |
| 2 THON BURI | 15 SAMUT SAKHON |
| 3 NONTHABURI | 16 SAMUT SONGKRAM |
| 4 PATHUM THANI | 17 SAMUT PRAKAN |
| 5 NAKHON PATHOM | 18 LOP BURI |
| 6 RATCHA BURI | 19 SUPHAN BURI |
| 7 PETCHA BURI | 20 AYUTTHAYA |
| 8 SING BURI | 21 ANG THONG |
| 9 KANCHANA BURI | 22 NAKHON NAYOK |
| 10 CHON BURI | 23 TRAT |
| 11 CHANTHA BURI | 24 SARA BURI |
| 12 CHAINAT | 25 PRACHIN BURI |
| 13 PRACHUAP | 26 RAYONG |

SOUTH
8 FACTORIES

- SOUTH**
- 1 CHUMPHON
 - 2 RANONG
 - 3 SURAT THANI
 - 4 PHANG NGA
 - 5 NAKHON-SI-THAMMARAT
 - 6 PHUKET
 - 7 KRABI
 - 8 PHATTHALUNG
 - 9 TRANG
 - 10 SATUN
 - 11 SONGKHLA
 - 12 PATTANI
 - 13 YALA
 - 14 NARATHIWAT

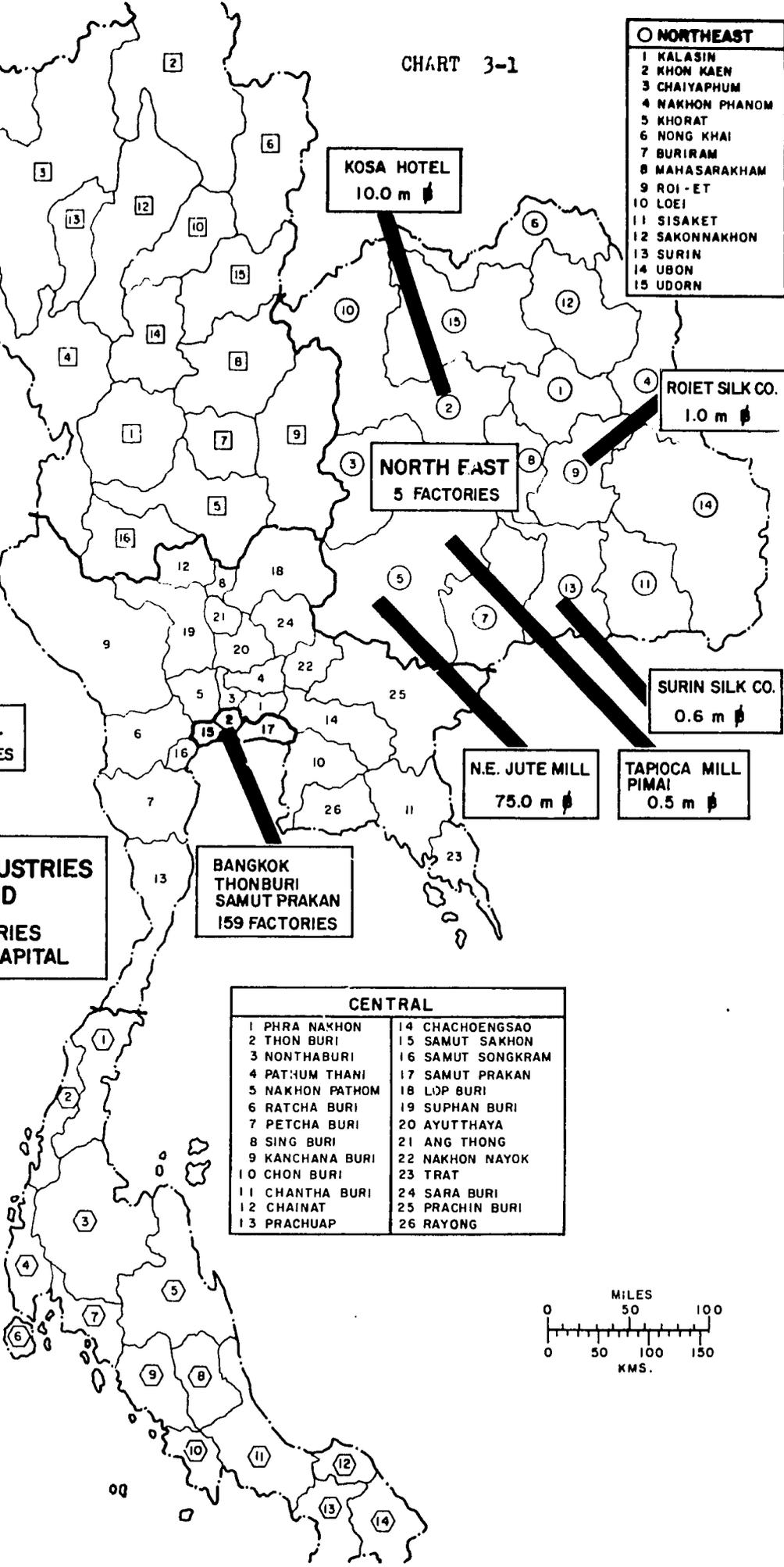
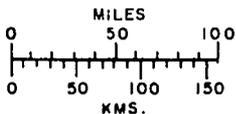
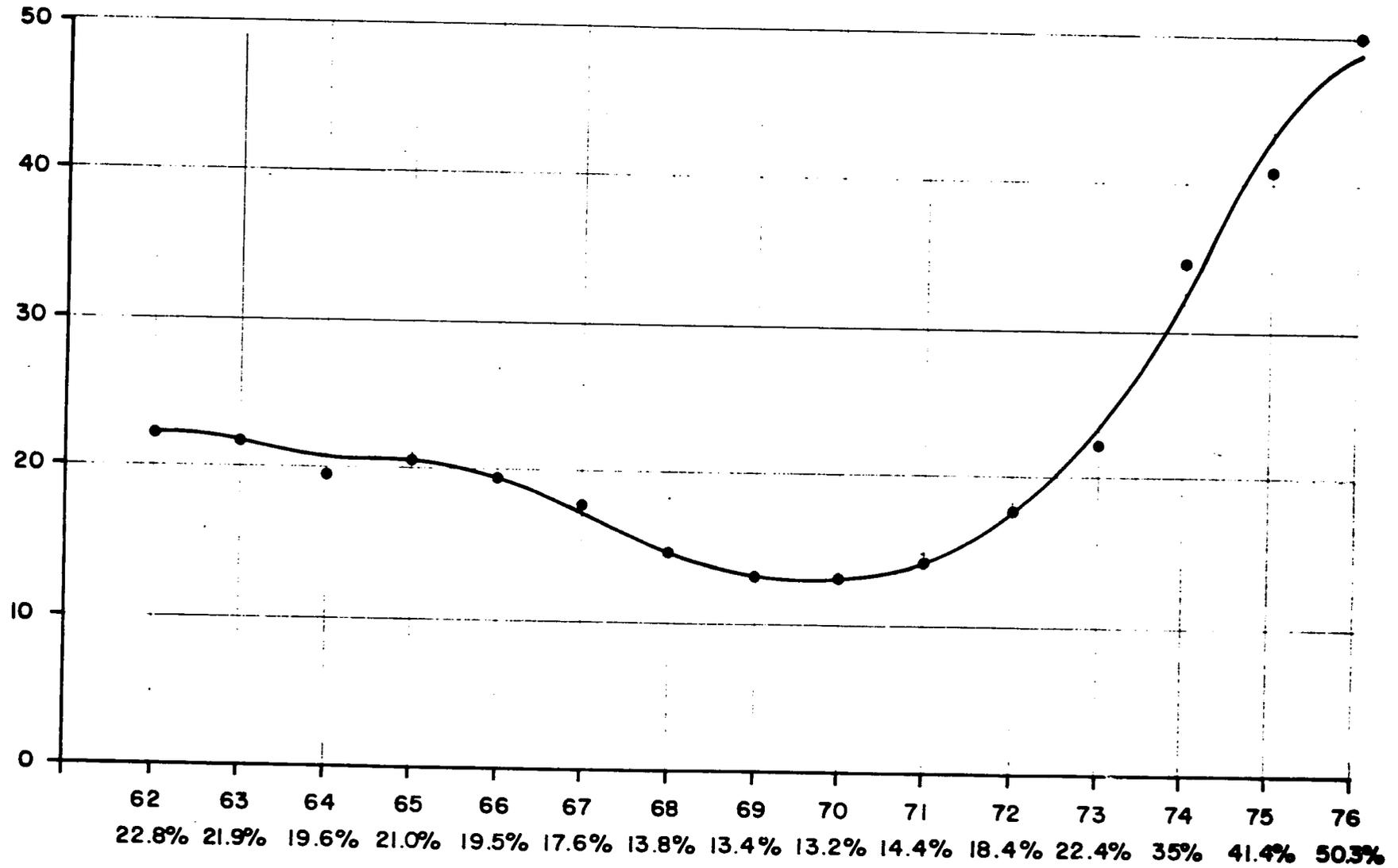


CHART 3-2

RATIO OF SLAUGHTERING TO LIVESTOCK PRODUCTION (IN TERMS OF VALUE ADDED)



Percent of Local Raw Materials Processed
In Northeast, Present and Proposed
(See also Chart 3-3)

	<u>1970</u>	<u>1976</u>
Livestock	33%	59%
Sugar Cane	34%	43%
Tobacco	25%	50%
Cotton	28%	56%
Kenaf	45%	78%

Source: NEED/PAG Calculations

More processing in the Northeast in line with the above would contribute an estimated \$600 million, or nearly 20 percent of the targeted manufacturing sector value output. However, this assumes that these production shifts will result in a lower net cost of production and distribution since some of the region's higher costs (e.g. power, water, etc.) should be offset by some of its lower costs (e.g. labor, land, etc.).

Other products recommended for special attention include timber and derivative products, silk, beverages, and those connected with machine shops and vehicle repair.

The Northeast produces 22 percent of the nation's timber. Saw-milling has grown rapidly, but linkage into furniture and other wood product making has not been fully developed. The region is now responsible for only 4 percent of the Kingdom's furniture production. Planned expansion will be slow.

Silk represents a major product of the Northeast (90 percent of national production) and is recommended for a major expansion.

Many consumer items can be produced in the Northeast. With a population of 15,000,000 by 1976, self sufficiency is possible in the production of items such as soft drinks, beer, packaged foods, soap, tobacco, footwear and basic garments, etc. Rapid growth in the machine shop and vehicle repair categories is also indicated.

There will be a continuing need for studies leading to proposals for the establishment of particular processing facilities, based on markets, raw material availability, production, and transport costs, etc.

Table 3-1 summarizes planned value added and investment needs for the manufacturing sector. These are based on the project and program proposals indicated below. Accordingly, manufacturing would grow at an average annual rate of 11.0 percent from 1971 to 1976 contrasted with 8.0 percent from 1960 to 1969.

3.1.5 Government Policy - Centralization of industry is typical in developing areas with inadequate infrastructure, limited supply and other dependent services in outlying regions. This concentration is compounded when a full scale import substitution policy is adopted. Under those conditions decentralization is difficult. However, in Northeast Thailand a substantial infrastructure, particularly in transportation is already available (including a potential direct outlet by sea via Sattahip Port). This makes it possible to realize the industrial potentials inferred in the previous section.^{1/}

The RTG has a variety of controls and incentives available such as promoted industries, investment grants, IFCT and BOI support. It is also the owner of a number of state industries. If committed to minimizing regional income disparities and to decentralization, the government can seize upon industrial development as a means of both increasing regional income and relieving congestion in the Bangkok metropolitan area.^{2/} Especially where favorable factor endowments are likely to exist, the following industrial development policies are recommended:

a) extend privileges for private investments in the Northeast based on business and import tax concessions, special utility rates, repartition of capital where applicable, absorption of transport differentials for essential imported capital equipment and direct loans where appropriate. Further

1/ In the words of the World Bank Study of the Northeast, "It is now widely realized among planners in Thailand that, even under the most optimistic assumptions about attainable agricultural growth in the Northeast, a regional income growth which, at a minimum, is sufficient to arrest the trend toward the gradual deterioration of the Northeast's relative position vis-a-vis the rest of the economy, cannot be attained without a substantial restructuring of the "industrial mix" of the regional economy through rapid development of the agro-business and manufacturing sector. Economic development in the Northeast cannot be attained with mere emphasis upon the creation of infrastructure and upon the elimination of obvious marketing bottlenecks, but will require systematic government promotion of industrial development in the region (Op. Cit. 7)."

2/ This does not imply an enlargement for state enterprises would counteract national policy for the Third Plan. Rather, it would involve a relocation of facilities for existing state enterprises or their planned expansion facilities.

TABLE 3-1

PRIVATE INVESTMENT REQUIREMENTS - MANUFACTURING
Northeast Thailand
1972 to 1976

Industry		(฿ Million at 1962 prices) ^{1/}					VAI Value Added Increment
		1972	1973	1974	1975	1976	IR Investment Required
Slaughtering	VAI	-	-	90	124	211	425
	IR	-	120	50	4	-	174
Sugar Mills	VAI	4	5	5	5	7	26
	IR	4	5	-	-5	-	9
Tobacco Mfg.	VAI	-	72	72	74	81	299
	IR	80	15	5	-	-	100
Cotton Process.	VAI	-	-	-	46	91	137
	IR	-	-	80	30	-	110
Gunny Bags	VAI	14	14	15	15	16	74
	IR	-	2	2	1	-	5
Silk	VAI	11	19	27	36	46	139
	IR	9	9	9	9	9	45
Wearing Apparel	VAI	1	2	3	4	5	15
	IR	5	-	-	-	-	5
Wood Products	VAI	8	12	17	22	28	87
	IR	6	6	6	6	5	29
Furniture	VAI	1	2	3	4	5	15
	IR	2	2	1	-	-	5
Brewery	VAI	6	9	13	17	21	66
	IR	20	-	-	-	-	20
Soft Drinks	VAI	12	29	33	38	43	155
	IR	30	10	10	-	-	50
Other Mf.	VAI	6	10	14	19	25	74
	IR	8	4	4	4	5	25
Total	VAI	63	174	292	404	579	1,512
	IR	164	173	167	54	19	577

^{1/} Investments shown need to be inflated by 16 to 20% to give current prices.

Source: NEED/PAG Estimates

concentration in the Bangkok area of industries processing regional raw materials should be discouraged;

b) encourage state enterprises, especially the Livestock Trading Corporation, Government Cold Storage Organization, Tannery Organization, Thai Jute Company, Tobacco Monopoly, Public Warehouse Organization, Sugar Organization, etc. to coordinate their policies in accordance with (a) above. Each agency should conduct feasibility studies to see if its services can be extended to a location in the Northeast, while limiting undue expansion in the Bangkok metropolitan area;

c) support industry sector planning to guide urban development, to establish industrial/commercial bases and growth centers (development poles): emphasis on costs of industrial location to the government in terms of: promotional privileges, urban congestion and migration and public welfare.

3.2 Mining

Mining (exclusive of quarrying) is as yet of little significance in the Northeast. There is some research sponsored by government and private interests in changwat Loei (particularly iron and copper mining), but it has not reached the level of commercial exploitation.^{1/} The Department of Mineral Resources (Ministry of Industry) allocated $\text{฿}4.7$ million from 1961 to 1964 to a copper survey in Korat, contributed about $\text{฿}1$ million toward a United Nations geological survey of the region in 1966, and budgeted $\text{฿}1.7$ million in 1967 for a base metal survey in Loei, government allocation for mining thus totalling $\text{฿}7.4$ million in the decade.^{2/} So far no significant private investments have been made.

A proposal to investigate the possibilities of mining rock salt, the biggest known mineral asset of the region, during the Second Plan period, was evidently not followed up. It is again suggested that this be done, particularly in view of the alleged deteriorating quality of salt now being produced along Thailand's coasts.^{3/} Rock salt formations are usually accompanied by valuable potassium and other compounds, and the opening of a mine at Chaiyaphum with government assistance and

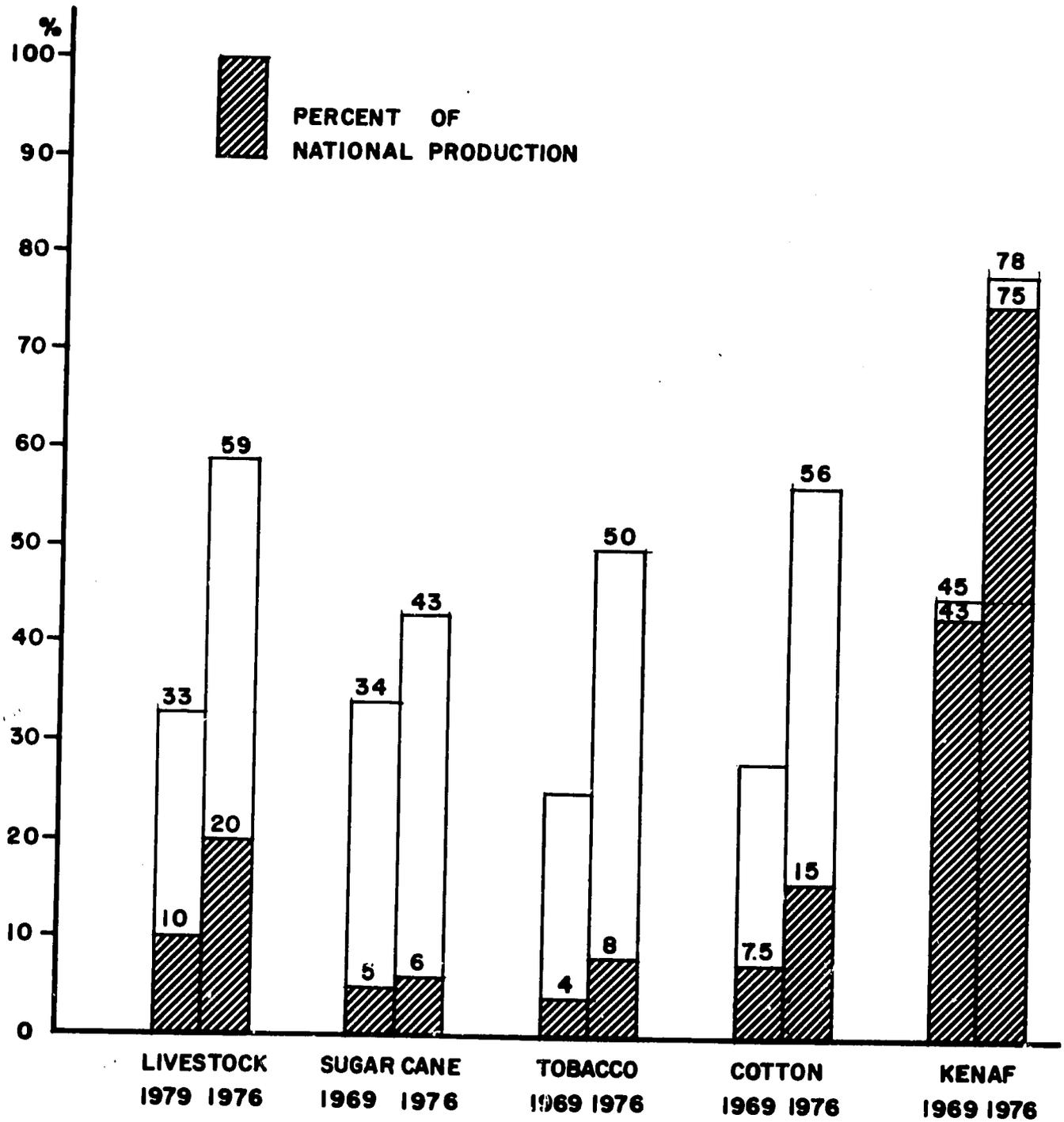
^{1/} There is a government plan to expand mineral development in Loei during the Third Plan but details are still in the planning stage.

^{2/} Based on data for the Northeast by the National Statistics Office.

^{3/} Tanya Phonanan, "Our Salt is not Salty", Bangkok Post, March 25, 1971.

CHART 3-3

PROPOSED INCREASES BY 1976 PERCENTAGE OF SELECTED RAW MATERIALS TO BE PROCESSED IN NORTHEAST



BASED ON VALUE ADDED RELATIONSHIPS : PROCESSED GOOD TO RAW MATERIALS

research support is recommended once a feasibility study has established its potential.

Initial private investment of ₪ 10 million is required with the Mineral Resources Department to contribute another ₪ 4 million.

More intensive geological survey by this Department is necessary, as the potential mineral resources base of the region is still not fully known. At least ₪ 6 million should be allocated for this purpose, which is a small portion of the national target of ₪ 150 million in government support for mining.

Quarrying involving non-metallic building materials which experienced rapid growth (43 percent a year) during the construction boom in the Northeast in the past decade, is expected to expand more slowly in the Third Plan period. An estimated ₪ 30 million in private investment is expected to boost production value added by about ₪ 96 million, with a projected annual growth rate of 6 percent per year (See Table 3-2).^{1/}

3.3 Trade and Tourism

3.3.1 Trade Sector - Table 3-3 shows the estimated private investment requirements to meet the trade (and private services) sector targets indicated in Chapter I. An approximate capital/output ratio of 1:3 is assumed. By far the largest investment will be in wholesale and retail trade linked to manufacturing, the latter being assigned a large growth target (11 percent p.a.), while derivative trade value added is estimated to grow 10.5 percent a year during the plan period. Basic manufacturing linkage effects might create additional expansion toward the end of the plan period. It should also be noted that investment in the tertiary sectors builds up more gradually than with manufacturing, in which large outlays for plant and equipment are made at irregular intervals.

Experience has shown that local banks are more inclined to reinvest earnings in the local community. Therefore, it is recommended that further investigations be made on the desirability of establishing purely regional private banks.

^{1/} The artesian well program is discussed in Chapter II.

TABLE 3-2

SECONDARY AND TERTIARY SECTOR TARGETS AND BUDGETS
Northeast Thailand
1972 to 1976

(฿ Million)

Sector		1972	1973	1974	1975	1976	1972 - 1976 Growth rate from 1971-76	Foreign Assis- tance
Manufacturing	VA	2,144	2,398	2,675	2,933	3,276	(1,300) 1/ 577 -/ 90	11.0%
	IR	164	173	167	54	19		
	GR	29	26	13	11	11		
Mining & Quarrying	VA	249	275	303	333	365	(122) 1/ 40 -/ 10	8.5%
	IR	11	10	7	6	6		
	GR	1	6	3	-	-		
Trade	VA	2,991	3,240	3,511	3,804	4,123	(1,362) 1/ 820 -/ 30	8.4%
	IR	134	149	164	179	194		
	GR	4	5	6	7	8		
Private Services ^{2/}	VA	1,922	2,058	2,211	2,378	2,554	(770) 1/ 181 -/ 8	7.4%
	IR	30	32	37	39	43		
	GR	4	3	1	-	-		
Private Transport	VA	961	1,067	1,185	1,315	1,460	(594) 1/ 295 -/ -	11.0%
	IR	55	57	59	61	63		
	GR	-	-	-	-	-		
Totals: Secondary & Tertiary Sectors (Private)	VA	8,267	9,038	9,885	10,763	11,778	(4,148) 1,913 138	9.3%
	IR	394	421	434	339	325		
	GR	38	40	23	18	19		

1/ Represents Five Year Increment

2/ Includes Banking, Insurance, Ownership of Dwellings, Tourism and other private services.

VA Value Added
IR Private Investment Require
including State Enterprises
(except Tourist Organization).
GR Government input requirement

NOTE: Estimates are at constant 1962 prices.

Source: Estimated by NEED/PAG.

TABLE 3-3

PRIVATE INVESTMENT IN TRADES AND SERVICES
Northeast Thailand
1972 to 1976

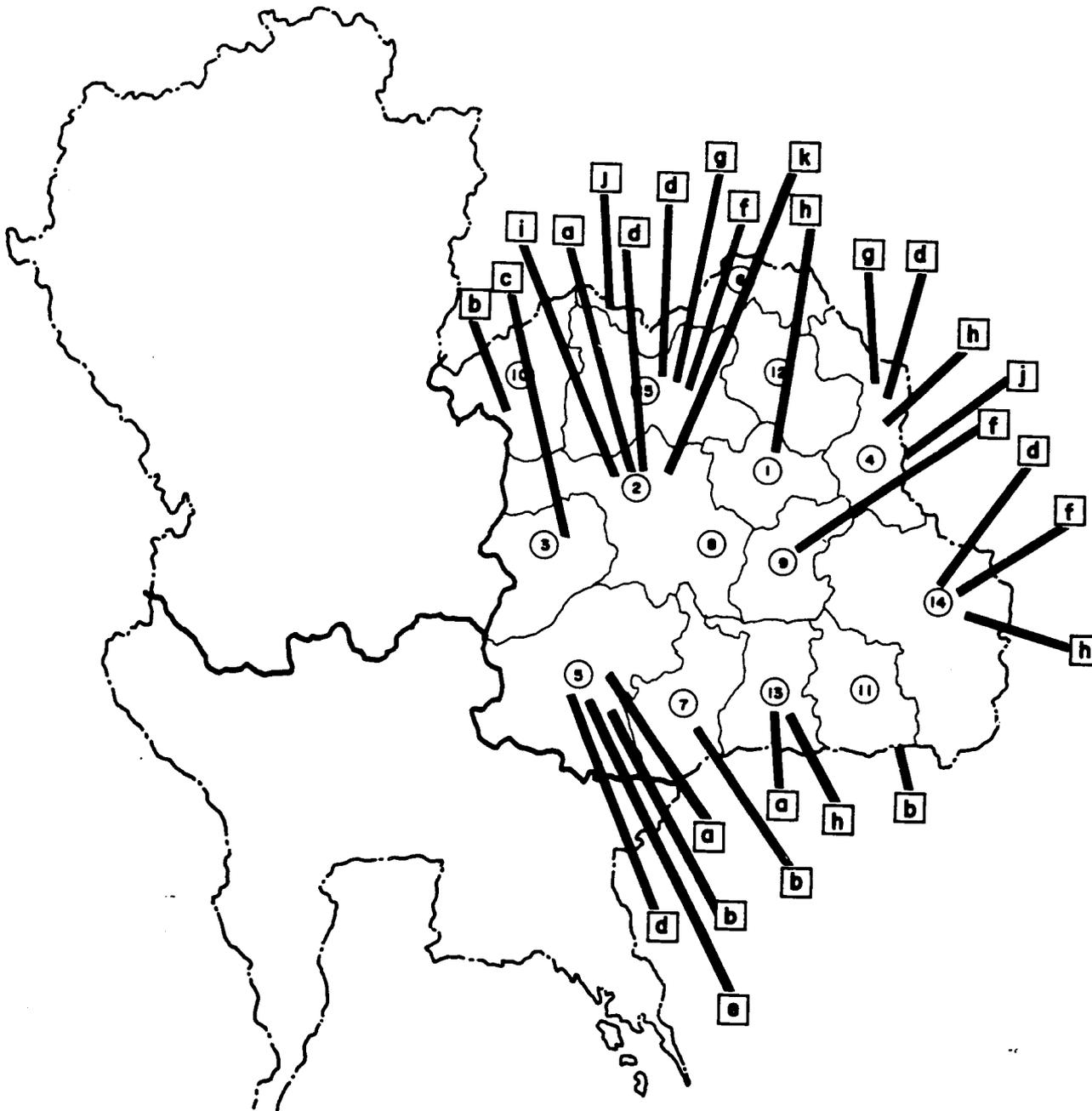
(฿ Million at 1962 prices)^{1/}

Industry		1972	1973	1974	VAI Value Added Increments		
					IR	Investment Required	1972-1976
Trade from Manufacturing (and Mining)	VAI ^{1/}	61	67	75	82	90	375
	IR	20	25	30	35	40	150
Trade from Agriculture	VAI	54	58	63	68	74	317
	IR	18	19	20	21	22	100
Trade of Intermediate & Capital Goods	VAI	62	68	74	80	87	371
	IR	20	22	24	26	28	120
Trade of Import Consumer Goods	VAI	53	56	59	63	67	298
	IR	16	18	20	22	24	100
Banking	VAI	16	18	19	22	25	100
	IR	8	8	9	9	10	44
Insurance & Real Estate	VAI	7	7	9	11	11	45
	IR	2	2	3	3	3	13
Other Services (Recre- ation, Restaurants, Barbers, etc.)	VAI	70	74	79	86	92	401
	IR	18	20	23	25	28	114
Private Transportation	VAI	95	106	118	130	145	594
	IR	32	36	40	44	48	200
Ownership of Dwellings	VAI	16	17	18	18	20	89
	IR	4	4	4	4	4	20
Total	IR	138	154	173	189	207	861

Source: NEED/PAG Estimates

^{1/} Investments shown need to be inflated by 16 to 20 percent to give current prices. See chart 3-4 for location diagram.

CHART 3-4



NORTHEAST	
1	KALASIN
2	KHON KAEN
3	CHAIYAPHUM
4	NAKHON PHANOM
5	KHORAT
6	NONG KHAI
7	BURIRAM
8	MAHASARAKHAM
9	ROI - ET
10	LOEI
11	SISAKET
12	SAKONNAKHON
13	SURIN
14	UBON
15	UDORN

a	SLAUGHTERING
b	TOURISM
c	SALT MINING
d	INDUSTRIAL ESTATE
e	READY WEAR CLOTHING
f	ANIMAL FEED
g	FRUIT & VEGETABLE CANNING
h	SOFT DRINK MANUFACTURE
i	BREWING
j	TOBACCO PROCESSING
k	COTTON GINNING

**NEW INDUSTRIES
LOCATION**

Government support for the trade sector is ₪ 150 million for the whole Kingdom. It is suggested that 20 percent or ₪ 30 million be allocated to the Northeast for its warehouse and market research programs. Other government supported activities are indicated in sector programs directly associated with agriculture and manufacturing.

3.3.2 Tourism - With projected decline in traditional Thai exports, the vigorous growth of the nation's tourist trade indicates this may become the nation's leading foreign exchange earner in the present decade.^{1/} The Third Development Plan assigns a high priority to tourist promotion, in order to exploit any unique endowments in terms of culture, archaeology, wild life and scenery.

In the Northeast, tourism is virtually nonexistent despite a good potential for both national and international tourism. A program involving monument restoration was included in community development (Chapter VIII). In addition it is recommended that:

a) The Tourist Organization of Thailand should promote the establishment of guest houses (following a pattern like Malaysia's or Burma's), with a goal to construct one each at Pookradung, Phimai and Phanomrung Buriram at a cost of ₪ 1.5 million each, and a fourth at Kantaralak (Khao Phra Wiharn), in the event that Cambodia - Thai relations become normalized during the Third Plan period. This also could be done with private financing.

b) The Forestry Department investigate the feasibility of establishing additional national parks and wildlife preserves in the region, which would serve both conservation and tourist promotion purposes. This would be done in conjunction with a national program.

c) Effort be made through TOT to get travel agents and other private promoters of tourism to publicize the Northeast as an attraction for tourists.

^{1/} Excluding tourism associated with U.S. Military personnel stationed in Southeast Asia.

CHAPTER IV TRANSPORT AND COMMUNICATIONS

CHAPTER IV
TRANSPORT AND COMMUNICATIONS
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CHAPTER IV

TRANSPORT AND COMMUNICATIONS

4.1 Introduction

The period 1965-1970 showed a rapid expansion of the transport and communications facilities in the Northeast (see Table 4-1). An analysis of the transport infrastructure indicates that it no longer represents a significant constraint to economic development.^{1/} However, new or improved communications facilities are still required to insure the continued development of the region in the following areas:

a) completing the remaining gaps in the primary and secondary road network and in the communications system;

b) upgrading existing roads where necessary to handle higher volumes of traffic at reduced costs;

c) developing a maintenance program to keep existing roads in a state of repair justified by projected traffic volumes;

d) constructing feeder roads to accelerate agricultural development and to provide security in remote areas.

In addition it is important to better coordinate the various organizations which plan, construct and maintain highways and related facilities; otherwise, large outlays of resources may be wasted.

4.2 Goal of the Transportation and Communication Sectors

The major goal of the transportation and communication sectors during the Third Plan is to assist the primary and secondary sectors in meeting their targets for economic growth by:

a) reducing the cost of transportation to Northeast suppliers and consumers of goods and services;

b) reducing traffic congestion at major urban centers;

c) linking all areas of the Northeast with the rest of the Kingdom through a communications network.

^{1/} See Dr. William Wallace, "An Analysis of Northeast Thailand's Transport Network as a Constraint to Economic Development", NEED/PAG, June 1970.

TABLE 4-1
GROWTH IN SURFACE TRANSPORT NETWORK
Northeast Thailand

		(Length in Kilometers)	
		<u>1965</u>	<u>1970</u>
1.	Road Network		
	a. Department of Highways Network		
	Paved	855	2,806
	Unpaved	3,033	3,114
	Total THD Network	3,888	5,920
	b. Non-THD Road (unpaved)	1,000	3,525
	c. Total Roads	4,888	9,445
2.	Railroad Network	811	1,063
3.	Waterways		
	a. Mekong (Khemarat to Sri Chieng Mai)	650	650
	b. Other	300	300

Source: THD, RSR and NEED/PAG estimates

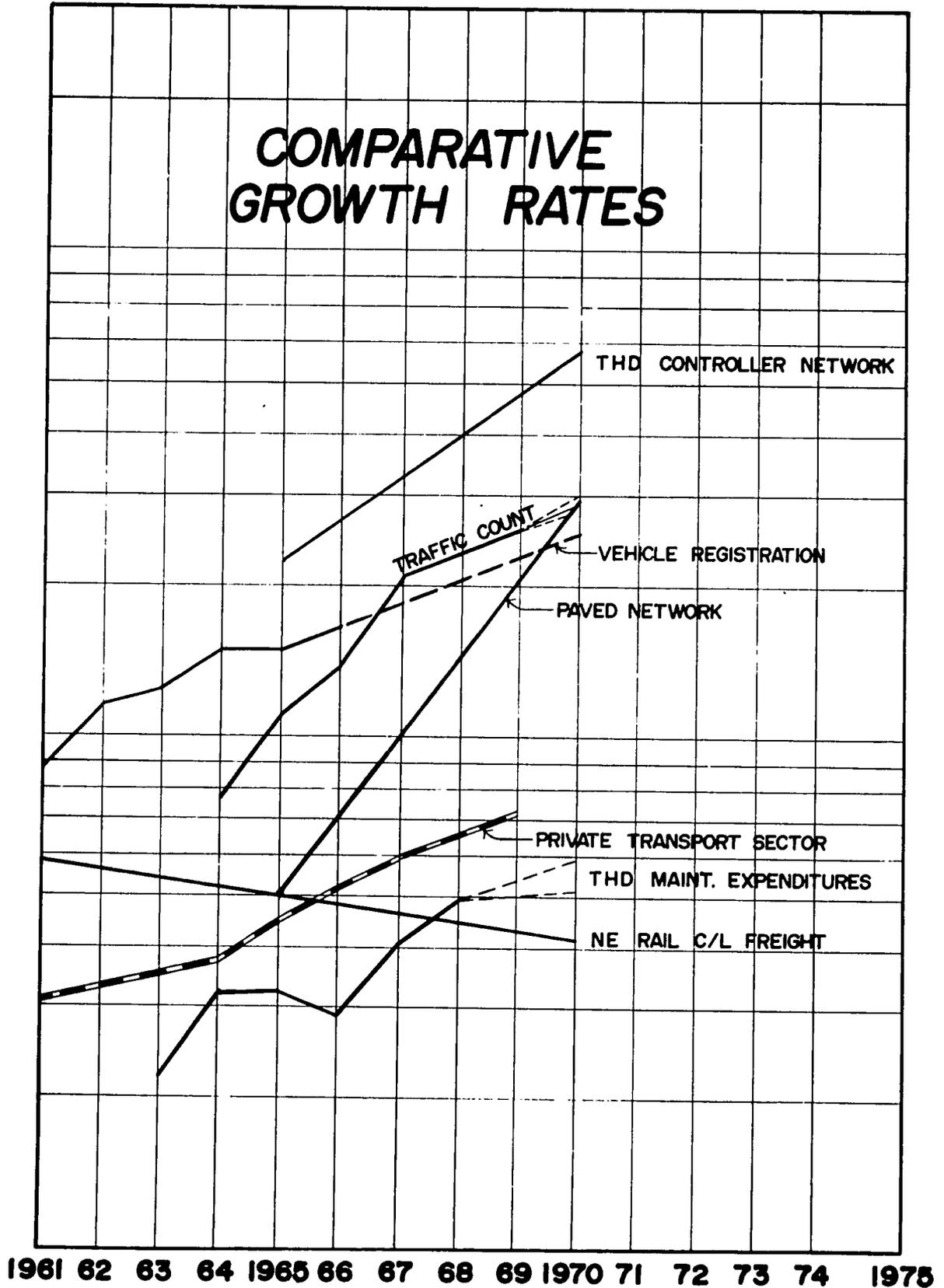
Since the Northeast is threatened by insurgency, subversion and social unrest, the maintenance and improvement of security in all its areas are also major goals of the transport and communication sectors.

4.3 Background

4.3.1 Road Facilities - The Northeast had relatively few roads until the late 1950's. In 1957, the "Friendship Highway" (Rt. 2) was constructed between Saraburi and Korat;

CHART 4-1

TRANSPORTATION TRENDS NORTHEAST THAILAND



later it was extended to Nong Khai. By 1965, a paved network, basically an extension of the Friendship Highway totalling about 800 kms, had been opened; this network largely paralleled the Nong Khai railroad line. Also by 1965, feeder roads were connected to Friendship Highway, totaling 2,000 kms of unpaved all-weather roads. With exceptions of Burirum, Surin and Sisaket, all changwats in the Northeast had highway connections to Bangkok.

In 1971, those highways, which are the responsibility of the Department of Highway (THD) to maintain, but were not necessarily built by THD, amount to 7,227 kms, of which 3,348 kms are paved, as shown in Table 4-2. The hard surface network has increased by approximately 2,000 kms while the number of all-season unpaved roads controlled by the THD has remained relatively constant during the period 1965-1970. However, the unpaved roads built by agencies other than the THD have increased by about 2,500 kms during the same period.1/

The majority of roads in the THD network in the Northeast can be classified as all-weather. Between 1965 and 1969 the length of this network increased by 26 percent with the paved portion increasing by 167 percent. The Northeast's share of the national network has remained relatively constant, between 30 to 33 percent of the total, which is in proportion to its share of the total population. However, this region's share of paved roads in 1970 was less than 30 percent of the THD whole Kingdom paved network.

The improved road network has generated considerable traffic by lowering the average operating cost per kilometer, reducing transit time, and by improving the quality of surface travel. Coupled with income growth, these factors have led to an expansion in motor vehicle registrations from 8,910 vehicles in 1960 to about 24,000 (Excluding motor cycles) by 1970.2/

Other factors influencing traffic growth are population increases and development of two export crops, maize and kenaf, which were introduced into the Northeast during the 1960's.3/

1/ There also are an estimated 14,000 kms of tracks, trails and access roads for which no accurate data on their growth are available.

2/ Motor cycles registrations increased from 1,237 units to about 40,000 units.

3/ Another important aspect of traffic growth during this period is related to the four Thai air bases which were greatly enlarged to accommodate U.S. Air Force Activities.

TABLE 4-2

THD CONTROLLED HIGHWAY AND ROAD SYSTEM

Northeast Thailand

Type of Highway	Length in Kilometers						
	1965	1966	1967	1968	1969	1970*	1971*
Primary & Secondary System							
Paved	811	790	896	1,380	2,115	2,606	2,901*
Unpaved	2,300	2,448	2,302	1,909	1,137	1,314	1,174*
Total	3,111	3,238	3,198	3,289	3,252	3,920	2,080*
% of National System	33	31	34	34	33	37	35
Provincial or Feeder Road System							
Paved	44	44	110	121	169	200*	447**
Unpaved	733	736	1,156	1,379	1,486	1,800*	2,700**
Total	777	780	1,266	1,500	1,655	2,000	3,142**
% of National System	28	26	32	29	29	32	39
Total Controlled by THD							
Paved	855	834	1,006	1,501	2,284	2,806	3,348
Unpaved	3,033	3,184	3,458	3,288	2,623	3,114	3,879
Total	3,888	4,018	4,464	4,789	4,907	5,920	7,227
% of National System	32	30	33	32	31	34	37

* Estimated ** Target

Source: THD, 1965 - 1971 Primary and Secondary and 1965 - 1969 Provincial Systems. 1970 values for the Provincial System; estimated and 1971 values are the targets set in the Second Plan.

The THD has been recording traffic volumes at selected points in the Northeast since the early 1960's. (See Table 4-3.) The steep rises in traffic between 1965-1969 correlates with the period of greatest road construction and improvement and with the construction of the four RTAF bases. Future traffic growth rates are expected to decline with completion of major highways and reduction in activities related to the war in Vietnam.

Maintenance during the last five years has not kept pace with the expanding network as illustrated in Table 4-4. The Northeast has not received a share of the highway maintenance budget proportional to its kilometers of road. (It is realized that initial requirements for maintenance do not increase as rapidly as the network; i.e., a road which is well constructed has a three to four year lag period between its completion and the need for large maintenance expenditure. However, this period of grace is coming to an end, and within the next five years a sizeable expenditure on maintenance should be made.) Also, many of the numerous roads built by non-THD agencies have in the past year or two become impassable to all traffic except light vehicles.^{1/}

4.3.2 Proposed THD Programs and Projects for the Third Plan - The THD program for the Third Plan consists of the following primary and secondary highway project:

a) Completion of on-going projects - (429 kms.). There are four major construction projects which began in the Second Plan and are scheduled for completion between 1972-1975. One project, the completion of Rt. 24 between Korat and Ubon, will provide one of the Northeast's most underdeveloped areas with a direct highway connection to Korat and Bangkok. This project is expected to be completed by 1972 or 1973. Other ongoing projects which should be completed in the Third Plan are Rt. 210, Wangsapang - Udorn, Rt. 212, Nong Khai - NKP, and Rt. 221, Kanthralak - Khao Pravaharn.

b) Construction of by-pass roads - (104 kms.). Road capacity in urban areas with large volumes of traffic should be increased by construction of by-pass roads. There are five such projects planned for the Northeast by the THD during the Third Plan period. One project is the by-pass between Sikew and Chokchai which will divert traffic from Rt. 24 from the heavily congested areas around Korat and shorten the distance for traffic coming north on Rt. 304 to destinations west of Korat. The other by-passes include roads around Ubon, Nakornsawan, Udorn and Kalasin.

^{1/} "Highway Sufficiency Survey Report", NEED/PAG paper #41, November 1970.

TABLE 4-3
 AVERAGE DAILY TRAFFIC AND GROWTH RATES
 Major Northeast Highways

Route	Location	Number Traffic Count Stations	Average ADT 1969	1965-1969 Compounded Growth %	1968-1969 Growth %
1 Rt 2	Saraburi - Korat	3	4308	22	4
2 Rt 2	Korat - Khon Kaen	3	2522	18	12
3 Rt 2	Khon Kaen - Udorn	3	2674	17	7
4 Rt 2	Udorn - Nong Khai	1	2288	22	13
5 Rt 22	Udorn - Sakonnakorn	2	1031	33	-2
6 Rt 23	Banphai - Mahasarakham	2	1138	12	6
7 Rt 212	NKP - Ubon	3	380	16	-4
	AVERAGE		2070	20	5.1

NOTE: The ADT figures used here include some local traffic; the exact magnitude of of the local traffic is difficult to estimate and can vary considerably from station on which the effects of local traffic was minimal.

TABLE 4-4
DEPARTMENT OF HIGHWAYS MAINTENANCE BUDGET
Primary & Secondary Highways
(฿ 000,000)

Division	1965	1966	1967	1968
Korat	12.8	10.1	17.6	16.9
Khon Kaen	10.3	10.1	14.0	14.9
Ubon	11.9	9.0	12.0	17.7
Total N.E.	35.0	29.5	43.6	49.5
National Budget	137.3	130.8	163.3	202.7
% National Budget	25	23	27	24
% National System	33	31	34	34

Source: THD Primary Roads; TTCS; Secondary Roads.

c) Continuation of Paving and construction programs started in the Second Plan - (761 kms.). The paving program begun during the Second Plan is proposed to continue into the Third Plan as part of the overall target of completing the primary and secondary highway system. The Chumpae - Loei Rt. 201 Highway, (97 kms) has been upgraded to an all-weather laterites road with reasonably good geometric characteristics. Present traffic is estimated around 250 ADT.^{1/} Other sections of Rt. 201 already have been upgraded to a paved road. There are five other roads on which upgrading to paved condition is estimated to be economically justifiable based on reduction in vehicle operating costs. However, there are six other highways proposed by the THD as part of the paving program which

^{1/} The average of the estimated ADT from the sufficiency survey and 1969 THD traffic count data.

do not appear to be justified solely on projected traffic benefits. In these instances security considerations are the main justification.

d) Projects for foreign assistance - (573 kms). Foreign assistance is being sought during the Third Plan for the following:

- (i) construction of two additional lanes for Friendship Highway between Saraburi and Korat where present traffic is over 4,000 ADT according to THD. Although traffic growth rates are declining (4 percent in 1969 compared with 22 percent from 1965 to 1969) it is felt that the traffic generated by the completion of Rt. 24 will make this an economically justifiable project;
- (ii) completion of Rt. 202 between Prathai and Chaiyaphum;
- (iii) construction of a feeder road (Muaglek to Chaibadarn) is a possible candidate for a loan (53 kms) based on an economic reconnaissance study;1/
- (iv) upgrading of the Korat to Nong Khai Road which will have an estimated average of 2,000 to 3,000 ADT by the end of the Third Plan;

e) Resurfacing and rehabilitation - (646 kms). Resurfacing of existing roads is required as the primary and secondary highway system ages, since older portions periodically require new surfaces. This resurfacing program involves 343 kms primarily on Rt. 2 between Pakchang and Nong Khai.

Rehabilitation requires rebuilding portions of the paved network which has failed due to faulty construction. This program would encompass 303 kms of highways.

f) Feeder or Provincial Road Construction Program - (1,547 kms). The feeder or provincial road construction program is scheduled to continue during the Third Plan period. The two aspects of this program involved road building based on a) traffic

1/ T. P. O'Sullivan "Identification of Feeder Roads for World Bank Feasibility Study".

criteria, and b) agricultural development 1/ and security factors. Much of feeder road construction program proposed in the THD program is based on the latter justification.

The target set for the feeder road program is approximately 1,500 kms divided as follows:

- a) The feeder road construction program - (993 kms):
 - 146 kms, using economic criteria;
 - 236 kms, using a combination of security and economic criteria;
 - 391 kms, primarily for security reasons;
 - 165 kms, roads to be built by the mechanical center in Khon Kaen;
 - 35 kms, loan project.
- b) The feeder road paving, upgrading and rehabilitation program - (585 kms):
 - 405 kms, using economic criteria;
 - 180 kms, primarily for security reasons.

4.4 Maintenance Program

In the past, recurrent expenditures have not been considered a part of the development budgets but there will be such consideration during the Third Plan. Seal coating on paved roads would generally be accepted as maintenance items since this is usually done with Department of Highway's equipment and personnel. However, there is some controversy whether resurfacing (the application of a new asphalt or laterite surface in order to restore its strength, impermeability and riding qualities) should be included as a maintenance cost.

Some of the maintenance requirements in the Third Plan are shown under estimated expenditure for capital projects.2/ However, these projects fall short of the requirements for resurfacing the paved network. There will be maintenance requirements other than resurfacing in the next Third Plan, and it may

1/ It is recognized that areas for planned agricultural production increases, and the location of processing facilities must be related with the establishment of feeder road priorities, but it would be premature to assign priorities at the present time until the review of project recommendations is complete.

2/ Approximately 643 kilometers will be resurfaced under capital projects.

be desirable for the RTG to seek foreign assistance in this area.1/

4.5 Recommended Priorities

4.5.1 Primary and Secondary Highways - The maximum potential number of roads that warrant consideration during the Third Plan are shown in Table 4-5. Based on the Sufficiency Survey 2/ and Threshold Analysis Studies 3/ an order of priority was established for these projects. Other roads were not considered since the THD recommendations for primary and secondary roads included all possible projects.

The cutoff point for implementing these projects will depend on available resources. Estimated high and low budget costs are $\text{P}1,525$ to $2,613$ million (See Table 4-14). If all projects are undertaken by 1976, primary and secondary kilometerage in the Northeast would total 4,500 kms and virtually the entire network would be paved. This program is justified in that it connects all important economic centers within the region, and outside of it as well. Also, vehicle operating costs on roads averaging 250 ADT's will be sufficiently reduced to justify the investment and will yield benefits approximated at a 10 percent return.4/

1/ "Highway Maintenance Needs Study", July 1970, was used by the THD as the basis for requesting an 18 million dollar loan from the World Bank for new equipment. This study did not give any details concerning how this equipment would be used, or attempt to estimate benefits.

2/ "Northeast Thailand Highway Sufficiency Study", NEED/PAG; 13 January 1971.

3/ "Highway Improvement Threshold Analysis", NEED/PAG; 4 December 1970.

4/ AT 250 ADT with $\text{P}0.58$ (see Highway Improvement Threshold Analysis Table 4) per vehicle kilometer as the total reduction in vehicle operating cost, it is estimated that the return on a capital expenditures of $\text{P}1164$ million for 1436 km. (category 2,5, M & 80 Km. of S) is 10 percent. This calculation is based on formular number (4) of the Threshold Analysis;

$$K = \frac{Km}{\Delta C} (M_{FU} + M_{VU} (ADT)(1+o) - M_{FI} - M_{VI} (ADT)(1+o) + 365 (ADT) (\bar{O}_U - \bar{O}_I))$$

where: K = rate of return; Km = total kilometerage;
 ΔC = total construction cost; M = maintenance cost components; o = overloading (assumed to be 2 percent);
 $\bar{O}_U - \bar{O}_I$ = operating cost savings = $\text{P}0.58$.

$$= \frac{1436}{1164} (\text{P million}) \quad (5000 + 73.6 \times 250 \times 3 - 23,600 - 10.6 \times 250 \times 3 + 365 \times 250 \times 0.58).$$

= 10 percent

TABLE 4-5

PRIMARY AND SECONDARY ROADS

Summary of THD Highway Program 1972-1976

Type Project	Kilometers	Estimated Cost (P 000,000)
1. On going	429	645.4
2. By passes	104	132.6
3. Paving	161	766.8
4. Foreign Aid	573	752.0
5. Resurfacing	647	316.5
Total	2,514	2,613.3

Source: Highway Department

It is unlikely, however, that sufficient resources will be available to construct all the roads in the THD program. Therefore, the following represents the categories into which the proposed primary and secondary road projects have been ranked by priority:

Category

- 1) Ongoing road construction projects have been given first priority because a large portion of these costs already have been incurred and therefore their marginal returns will be high.
- 2) Five roads are placed in the second category. It is estimated that each project will yield a return of over 12 percent during the five year period based only on user savings.
- 3) Four by-pass roads with ADT's estimated greater than 800 are shown in this category. Their rate

of return also should exceed 12 percent during the first year.1/

- 4) This category represents the proposed maintenance programs which has an estimated benefit/cost ratio greater than 1.5 at a discount rate of 12 percent.2/
- 5) This category includes the resurfacing program for roads which have a first year rate of return greater than 12 percent based on ADT's greater than 290.3/

1/ Based on an increased vehicle operating speed from 40 to 70 kms per hour, the user savings are estimated at $\text{N}0.58/\text{kilometer per ADT}$.

$$\text{Where ADT} = \frac{K(I)}{\text{User saving} \times 365}$$

K = discount factor, 12 percent
I = investment cost which is between 1.2 to $\text{N}1.5$ million per kilometer

When these roads are completed the estimated ADT should vary from 700 ADT for an average investment cost of $\text{N}1.2$ million per km to 850 ADT for $\text{N}1.5$ million per kilometer.

2/ It is estimated that not maintaining a road decreases the service life of the surface 50 percent with operating costs increasing each year on straight line basis. For example at 500 ADT, the following would be the added cost of maintenance compared to the increased user costs assuming resurfacing once in 10 years with maintenance:

	Maintenance Cost/ADT		Present Value @ 12 percent	Yearly increase in vehicle operating costs with no maintenance		Present Value @ 12 percent
	(1)			(2)		
Year 1	$\text{N} 0.15$)			$\text{N} 0.0$)		
" 2	0.15)			0.14)		
" 3	0.15)	0.54		0.28)		0.91
" 4	0.15)			0.42)		
" 5	0.15)			0.58 (Max.))		

$$B/C = \frac{0.91}{0.54} = 1.69$$

$$3/ \text{ADT} = \frac{K(I)}{\text{User saving} \times 365} = \frac{.12 (513,000)}{.58 \times 365} = 291$$

- M) Military projects are designed for security reasons and as such are outside the realm of ranking by economic priorities.
- S) The Thai government intends to discuss projects in this category with foreign donors for grants and loans; highest priority is given to the construction of two additional lanes on the Saraburi to Korat Highway. The other projects in this category have a lower priority.
- O) Projects in this category were omitted from ranking and should be dropped until additional supporting justification is submitted.

Table 4-6 summarizes by category the length of road and estimated total cost of the above.

4.5.2 Feeder Road

Introduction - The THD feeder road program is aimed at; a) improving existing feeder roads to accommodate high traffic volumes; and b) building new roads into areas presently without transport facilities. Using THD and Sufficiency Survey traffic data, a summary of the upgrading and rehabilitating program is shown in Table 4-7. (Upgrading consists of paving the road surface and constructing permanent reinforced concrete bridges.) A maximum program for feeder roads should consider the 57 recommended by the THD; however, traffic data are available on only 27; therefore, the remaining 30 were considered on the basis of agricultural and developmental aspects.

Specific recommendations by category are based on the following:

Category 1 Upgrading Program

Of the 27 roads with THD traffic information, 18 have ADT's greater than 200 indicating a rate of return on these projects over 12 percent.^{1/} The majority of the roads will have a low to intermediate paved surface (surface treated rather than high quality surface such as asphalt concrete)^{2/} and permanent bridges of reinforced concrete.

^{1/} Based on the "Highway Improvement Threshold Analysis", roads with ADT's as low as 200 can be justified on user and maintenance savings.

^{2/} THD F₂ roads have a low and F₁ roads have an intermediate surface type. F₃ roads have concrete (soil aggregate) surfaces.

TABLE 4-6

SUMMARY OF RECOMMENDED THD HIGHWAY PRIORITIES FOR THIRD PLAN

Primary and Secondary Roads Northeast Thailand

1972 - 1976

Category	Type Project	Kilometers to be Constructed	Estimated Cost (฿ 000,000)
1	On-going	429.0	645.4
2	Paving (upgrading)	313.5	255.0
3	By-passes	81.2	112.3
4	(Maintenance) Entire Network	-	765.0
5	Resurfacing	594.1	316.5
M	Military	447.7	511.8
O	Omitted	75.3	20.3
S	Special	573.0	752.0
		2,513.8	3,378.3

TABLE 4-7

SUMMARY OF PROPOSED THD

Feeder Road Program Priorities for the Third Plan

Northeast Thailand 1972 - 1976

NEED/PAG Category	Justification	Length (Kms)	Cost (฿ 000,000)
1	Traffic	573.9	374.4
U	Traffic & Agriculture	295.0	190.2
2	Agricultural	279.1	139.4
0	Other	413.3	274.3
S	Sub-total	1,561.3	978.3
	Special*	53.0	42.0
	Total	1,614.3	1,020.3

*Loans

Category U

These roads are scheduled to be upgraded but traffic is not sufficiently high to use vehicle operating cost reductions as their sole benefit. However, if agricultural benefits are assumed to be equal to user savings upgrading these roads can be justified in the latter years of the Third Plan.

Category 2 and 0

Roads in these categories have low priority because of high construction costs and lack of traffic. Although considerable developmental or agricultural benefits could be realized from these roads, their estimated construction costs render the justification marginal. Therefore, these feeder roads have been divided into Category 2 and 0. The average cost in Category 2 is ₦ 500,000 per Km and in Category 0 ₦664,000 per Km. Roads in Category 2 might generate sufficient agricultural benefits to justify their construction but roads in Category 0 have construction costs too high to be justified until more data are available. It is recommended that the average cost of feeder roads in Category 0 be reduced by lowering the design and construction standards before they are considered for construction.

4.5.3 Maintenance Expenditures - Preliminary estimates of highway maintenance expenditures are made using the criteria developed in the "Highway Improvement Threshold Analysis".^{1/} This method assumes:

- a) paved network is 3,000 kms;
- b) unpaved network is 5,000 kms;
- c) two percent of vehicles are grossly overloaded; (This is less than the figures used in the Threshold Analysis since it is assumed that greater emphasis will be placed on enforcing existing codes on vehicle loads.)
- d) traffic averages 500 ADT's on the paved network and 50 ADT's for the unpaved network.

Using the formulas developed in the "Threshold Analysis",^{2/} the maintenance budget should average ₦ 195 million ^{3/}

1/ "Highway Improvement Threshold Analysis", Op.Cit.

2/ Op.Cit., pp. 22, 28 and 30.

3/ Average Yearly Maintenance Expenditure
Paved Roads 3,000 [24,760 + 9.0(500) (1+2)] = ₦114,780,000 yr.
Unpaved Roads 5,000 [5,000 + 73.6(50) (1+2)] = ₦ 80,200,000 yr.
Estimated average annual expenditure = ₦194,980,000 yr.

per year throughout the Third Plan if resurfacing is included, or ₪ 153 million 1/ without resurfacing paved roads. Over the Third Plan period, the total budget for maintenance is estimated at ₪ 765 million without resurfacing or ₪ 1 billion with resurfacing. These estimated requirements are considerably higher than the present levels as shown in Table 4-4.

4.5.4 Accelerated Rural Development Program - Beginning in 1964, the ARD Program was to provide effective rural development at the village level and to improve security through better relationships between the people and the administration.2/ To do this, it was necessary to strengthen decentralize changwat administration to provide local coordination of rural programs. This change in changwat administration has emphasized road building activities which account for about 70 percent of the ARD budget.

Initially the ARD road building program was outside the scope and responsibility of national transport planning; however, including the ARD program within the scope of the Third Plan for transportation development is now being considered.

The present condition of the entire ARD network is unknown. The NEED/PAG Sufficiency Survey indicates that portions of it may have badly deteriorated since maintenance has been of secondary importance. Therefore, ARD roads which are built to all-weather standards appear to become impassable during part or all of the year after two or more rainy seasons. This problem has resulted in part from administrative rules on maintenance procedures which initially required that a road not be maintained for two years following its construction; this rule has now been relaxed to one year. It is being recommended that if ARD roads are to serve their intended purpose of providing access to remote areas of the Northeast, this rule on road maintenance should be removed altogether.

Maintenance of the ARD road network should be given primary importance during the Third Plan period. Maintenance estimates for the present ARD network of approximately 2,800 kms^{3/}

-
- 1/ Average Yearly Expenditure on Resurfacing Paved Roads
Paved Roads 3,000 $[9,760 + 2.8(500)(1+2)] = ₪ 41,880,000$ yr.
- 2/ The ARD program initially included only Northeast changwats, but now includes Northern and one Southern changwat. However, the bulk of the ARD program is still in the Northeast.
- 3/ This includes all ARD roads built since 1964.

(assuming that 2 percent of the vehicles are overloaded and have 15 ADT's) may be computed based on the following formula from the Threshold Analysis:

$$2,800 [5,000 + 73.6 (15) (1 + 2)] = \text{P} 23,273,600$$

This figure does not include cost of reconstruction and rehabilitation of roads which are so deteriorated that ordinary maintenance cannot restore them to their original condition. The P 23.3 million estimated as required for road maintenance is more than twice the figure allocated for FY 1971. Also, it should be noted that as traffic increases during the period of the Third Plan, so should maintenance.

New construction of ARD roads is based on an estimate that the ARD annual budget for road construction will level off at P 350 - 400 million. The number of kilometers of road to be built during the Third Plan should be around 3,000. However, based on recent figures ^{1/} and the assumption that ARD's construction cost per kilometer of road will decrease to between P 250,000 to P 300,000, the annual level of construction will probably range from 800 to 1,000 kms a year. This figure assumes that existing network is maintained.

Based on this information, Table 4-8 summarizes two possible levels of expenditures for the ARD program during 1972-1976.

4.6 Railroads

4.6.1 Background - There are presently 1,063 kms of rail line in the Northeast representing 28 percent of the total national network. Changwats served directly by this system are Korat, Khon Kaen, Udorn, Nong Khai, Buriram, Surin, Sisaket and Ubon.

In the Northeast, the railroad network has existed for over 70 years, Korat having been served by a railroad since the early 1900's. Extensions from Korat to Nong Khai and to Ubon have been in operation for 40 and 20 years, respectively. During the last five years, the 251 kms Korat by-pass on the Nong Khai line was opened to reduce the gradient through an escarpment.

4.6.2 Past Projects, Programs, and Performance - A program of modernization is presently underway and will be almost

^{1/} In 1970, ARD completed 945 kms of road which is appreciably higher than the average since 1964.

TABLE 4-8
ESTIMATED ARD BUDGET
Third Plan Period

Item	ARD Budget Average Estimate per year		ARD Budget for Third Plan		ARD Budget for Northeast	
	High	Low	High	Low	High	Low ^{1/}
<u>RTG</u>						
1. ARD Budget (000,000 ₪)	400	350	2,000	1,750	1,600	1,400
2. Roads (70% of 1)	280	240	1,400	1,200	1,160	960
<u>USOM</u>						
3. Total Budgeted	80	60	400	300	320	240
4. Roads (80% of 3)	64	48	320	240	256	192
5. In pipeline			180	180	144	144
6. Sub-Total Roads (4+5)	64	48	500	420	400	336
7. Total road (2+4+5)	344	288	1,900	1,620	1,560	1,296
8. Total (1+3+5)	480	410	2,580	2,230	2,064	1,784
Output length (kms)	1,000	800	5,000	4,000	4,000	3,200
Cost per km (₪)						
RTG & USOM (includes maintenance)			380,000	405,000	380,000	405,000
Cost per km (₪)						
RTG Component			280,000	300,000	280,000	300,000

^{1/} Northeast estimated to represent 80% of the ARD budget for the Third Plan.

completed by the end of the Second Plan. The program intends to reduce costs and improve efficiency and service by increasing train speeds and loads. The program involved:

- a) the replacement or strengthening of existing bridges to carry a 15 ton axle load, and
- b) the replacement of old 50-60 lb. per yard rails by long welded 80 lb. rails.

Carload (CL) freight originating in the Northeast had declined from a high 861,000 tons in 1962 to 370,000 tons in 1969, (Table 4-9). Revenues have also declined during the same period but at a slower rate. However, passenger traffic has been increasing during the last decade at an average rate of 1.7 percent per year, and revenues at 4 percent as shown in Table 4-10.

The 1969 utilization of the present rail system in the Northeast averages only 338 tons a day per route kilometer. This figure compares with a national average for freight traffic of 1,440 tons per day per kilometer.

Railroad expenditures during the Second Plan were $\text{P} 128$ million. Estimated expenditures for the Third Plan are made up from the following projects:

a) Replacement of rail	$\text{P} 21$ million
b) Miscellaneous Projects estimated at 2 million P per year	$\text{P} 10$ "
c) Feasibility Study - Link to Sattahip line estimated	<u>$\text{P} 2$</u> "
Total	$\text{P} 33$ million

The Klong Sip Kaot-Ban Phachi cut-off project is aimed at connecting the Eastern line with the Northeastern and Northern lines. This project would enable RSR to transport goods from the deep water port at Sattahip and the oil refineries at Sri Racha to Northern and Northeastern regions of the country, by-passing Bangkok once the rail line to be built to Sattahip is completed.

4.7 Waterways

In the Northeast the major river system is the Mekong River and Mun and Chi Rivers which flow eastward draining into the Mekong. Traffic on these rivers is essentially local since rapids and low flows during the dry season impede the development of these river basins into a viable navigational system.

TABLE 4-9

STATISTICS OF COMMODITIES TRANSPORTED

State Railway of Thailand - Northeast Line (1960 - 1969)

Year	C.L. Freight (000,000 tons)	Revenue (000,000 ฿)	Ton - Kilomets (000,000)
1960	0.610	43.1	-
1961	0.597	43.6	-
1962	0.861	61.0	-
1963	0.673	48.5	-
1964	0.715	50.0	-
1965	0.624	41.5	-
1966	0.610	34.5	-
1967	0.757	39.8	-
1968	0.470	25.8	161.6
1969	0.370	20.6	131.3

Source: State Railway of Thailand

TABLE 4-10

PASSENGER STATISTICS FROM STATIONS IN THE NORTHEAST

	No. of Passengers (000,000)	Revenue (000,000 ฿)
Calendar 1960	7.7	46.1
Fiscal 1961 (9 months)	6.0	47.3
" 1962	8.3	52.1
" 1963	8.9	58.4
" 1964	8.6	59.4
" 1965	8.2	52.3
" 1966	9.0	56.4
" 1967	9.8	67.0
" 1968	9.9	73.5
" 1969	9.1	68.6

Source: State Railway of Thailand IV-21

The Mekong River which forms the border between portions of Thailand and Laos has limited possibilities of developing into a navigable waterway with large traffic flows due to rapids just north of the confluence of the Mun and Mekong Rivers. Present security situations in Laos limit the studies considering the elimination of the rapids during the Third Plan period.

There are numerous ferry crossings along the Mekong River with the major crossing at Nong Khai. No public investments are necessary in improved ferry crossings during the Third Plan until the Asian Development Bank completes its review of a proposed bridge at Nong Khai, and Vientiane.

4.8 Aviation

4.8.1 Aviation in the Northeast - At the present there are six airports open to civil aviation: Nakorn Phanom, Udorn Thani, Khon Kaen, Ubon, and Sakon Nakorn. Table 4-11 gives the physical characteristics of these air fields. All of these airports were opened to traffic prior to 1967, although Khon Kaen has recently been improved. Nationally, the Northeast accounts for 8 percent of the air passengers traffic; Thai Airways Company (TAC) is the only domestic scheduled passenger carrier serving the Northeast.

Much of the present air traffic to and from the Northeast is connected with the presence of American personnel stationed at RTAF bases. As they are withdrawn it is expected that traffic will decline. Therefore, no expansion in airports or equipment other than what can be provided by TAC is foreseen.

Past expenditures for improving the civilian airports and aviation facilities in the Northeast have been small, amounting to only \$ 26.5 million during the period 1967-1971. The improvement of Khon Kaen airport amounted to \$ 21.8 million.

4.8.2 Aviation Projects in Northeast During the Third Plan - The construction of Loei Airport will probably be the one major project undertaken during the Third Plan. The capital expenditure program for the Third Program in the Northeast for aviation is shown in Table 4-12. A second airport construction project recommended by the Civil Aviation Department at Nakorn Phanom is not likely to be constructed during the Third Plan since there is already a military airport which can be used for civil aviation.

TABLE 4-11

COMMERCIAL AIRPORTS IN NORTHEAST

1970

Airport	Runway Surface	Dimensions (meters)			Runway Lighting	Terminal
		Runway	Taxiways	Parking APRONS		
Khon Kaen	DBST	30 x 1500	15 x 125	60 x 90	Yes	Yes
Udorn	Concrete	38 x 3049	22 x 250	60 x 120	Yes	Yes
Ubon	"	38 x 2732	22 x 270	60 x 120	Yes	Yes
Sakon Nakorn	DBST	20 x 1400	20 x 100	40 x 120	-	-
Nakhon Phanom	AC	45 x 1200	NONE	Unpaved	-	-
Nong Khai	Laterite	40 x 1200	NONE	Unpaved	Yes	Yes

DBST = Double Bituminous Surface Treatment

AC = Asphalt Concrete

Source: NEDB

TABLE 4-12

EXPENDITURES ON AIRPORTS IN NORTHEAST

1972 - 1976

(฿ 000,000)

Item	1972	1973	1974	1975	1976	1972-1976
1. Loei Airport						
a. Land Acquisition 2,000 rai @ 5,000 ฿ per rai	10.0					10.0
b. Construction Runway Tower & etc.		10.0	13.0 1.5			23.0 1.5
c. Equipment				2.7*	0.1*	2.8
Sub-total	10.0	10.0	14.5	2.7	0.1	37.3
2. Improvement of Existing Airports	1.0*	1.0*	1.0*	1.0*	1.0*	5.0
Total	11.0	11.0	15.5	3.7	1.1	42.3

* Estimated

Source: NEDB

4.9 Communications Sector

4.9.1 Introduction - During the Second Plan period there was a significant expansion of communications facilities in the Northeast. This expansion included the extension of the existing post and telegraph network, the completion of the major telephone trunk lines to the region, expansion of local telephone exchanges and the introduction of television and construction of additional local radio stations. Third Plan programs for the Northeast will continue this expansion program as described below.

4.9.2 Telephone Organization of Thailand (TOT) - Microwave telephone and telecommunication network started during the Second Plan will be completed while its expansion into remote areas is expected to continue. More specifically the telecommunication program will concentrate on:

- a) increasing the long distance microwave network by building eight more links;
- b) transmission of T.V. programs through the microwave system. The completion of eight long distance telephone projects in the region will provide links between:

Saraburi - Korat
Korat - Pak Chong - Sikhiu - Pak Thong Chai
Ubon - Ban Dan
Udorn - Kumphawapi
Udorn - Lamphu
Loei - Chiang Khan
Nong Khai - Thai Ba
Sakhon Nakorn - Swang Dan Din

The Saraburi - Korat link should receive highest priority. At present, the cable serving this section has high maintenance cost and does not provide enough channels for T.V. transmission. Closely related to this project is the building of microwave connections between Sikew, Pak Chong, and Pak Thong Chai and the Saraburi - Korat trunk line. The other six projects involve connecting remote areas with the main trunk lines.

The estimated cost of the long distance telephone projects is $\text{P} 71$ million. The cost of providing T.V. program transmission on facilities in the Northeast is estimated at $\text{P} 23$ million.

During the Third Plan, the provincial exchanges are to be expanded to include 13,700 new switching lines and 16,550 new subscriber lines by 1976, when there will be 40,050 subscriber lines in the Northeast. Manual switchboards will be

discontinued by 1976. It is estimated that the total cost of the provincial telephone projects between 1972-1976 will be ฿ 75 million.

TOT is presently making a feasibility study of these projects to determine benefits.

TOT is considering applying for a loan from the World Bank and/or Asia Development Bank to finance the foreign exchange component of these costs estimated to be ฿ 100 million.

Table 4-13 summarizes TOT's investment program in the Northeast during the Third Plan. Consideration might be given during the Third Plan to integrate portions of the telecommunication network operated by the Ministry of Interior with the TOT's network. This could help eliminate duplicate facilities.

TABLE 4-13

TELEPHONE ORGANIZATION OF THAILAND

Investment Program for the Third Plan (1972 - 1976)

Northeast Region

Project	฿ million		Total
	Local Currency	Foreign Exchange	
Provincial Telephone	29.0	46.2	75.2
Long Distance Telephone	43.1	36.7	79.8
T.V. Program Transmission	6.1	17.1	23.1
Total	78.1	100.0	178.1

Source: Telephone Organization of Thailand

4.10 Administrative Requirements

4.10.1 Axle Load and Traffic Code Enforcement - Observations made during NEED/PAG field survey indicate that as many as 4 percent of the vehicles on inter-urban highways are heavily overloaded. Extensive overloading affects the highway network and the vehicles operating over this network by accelerating deterioration of the facility, and increasing annual maintenance and vehicle costs.

A target for the Third Plan should be to reduce overloading. At present, there are no weighing stations in the Northeast. Even if weighing stations are introduced, it is doubtful that overload enforcement would occur without some type of penalties to the economy. Therefore, other methods of overload enforcement, such as requiring that the number of axles on logging trucks be increased, might be considered.

Even if it is assumed that overloading will drop to 2 percent ADT, the magnitude of the increased maintenance cost due to this condition is $\$ 63,800,000$ per year or $\$ 319$ million over the Third Plan.^{1/}

4.10.2 Research - Collecting better highway traffic data on a long term basis should be emphasized. From the planner's point of view heavy reliance is placed upon the accuracy of traffic data for determining user savings (benefits), and viability and time phasing of a new project. The Department of Highways has collected traffic data on the primary and secondary road system for some years.^{2/} This traffic data includes type and number of vehicles, but has no information concerning origin and destination of the vehicles or of goods transported. In addition, the location of many of the traffic count stations are close to urban areas or at intersections.

4.10.3 Consolidation of Highway Construction - There are many agencies building roads in the Northeast such as ARD, DOLA, RID, and MDU. Including these roads in the THD networks should be considered. However, coordination between these various agencies would be required if such is a desired goal.

4.11 Summary of Transportation and Communication Sectors Budget Levels

Table 4-14 estimates high and low levels of expenditures on transportation and communication sectors for the Third Plan.

1/ Paved Roads 3,000 [(9.0) (500) (2)]	= $\$ 27,000,000$ per year
Unpaved Roads 5,000 [(73.6) (50) (2)]	= $\$ 36,800,000$ per year
Cost per year	$\$ 63,800,000$ per year
or 5 years x $\$ 63,800,000$ per year	= $\$ 319,000,000$

2/ In 1969, THD collected traffic data on some feeder roads in the Northeast.

TABLE 4-14
 ESTIMATED DEVELOPMENT BUDGET EXPENDITURES
 Transportation & Communication Sectors
 Northeast Thailand
 1972 - 1976

Item	Kilometers	฿ Million
<u>HIGH BUDGET ESTIMATE</u>		
A. Transport		
1. Highways		
a) Primary & Secondary System	2,513	2,613
b) Feeder Road System	1,614	1,020
c) Maintenance	All	1,000
d) Accelerated Rural Development	<u>4,000</u>	<u>1,160</u>
Sub-total: Highways	NA	5,793
2. Railroads	0	33
3. Aviation (1 New airport)	<u>NA</u>	<u>42</u>
Sub-total: Transport		5,868
B. Communication		
1. Telephone Organization of Thailand	NA	169
2. Post and Telegraph	<u>NA</u>	<u>24</u>
Sub-total: Communications	NA	193
C. Total: Transport & Communication		6,061
<u>LOW BUDGET ESTIMATE</u>		
A. Transport		
1. Highways		
a) Primary & Secondary System	1,516	1,525
b) Feeder Roads	1,202	746
c) Maintenance	All	765
d) Accelerated Rural Development	<u>3,200</u>	<u>960</u>
Sub-total: Highways		3,996
2. Railroads	0	33
3. Aviation	<u>NA</u>	<u>5</u>
Sub-total: Transport		4,034
B. Communication		
1. Telephone Organization of Thailand		169
2. Post and Telegraph		<u>24</u>
Sub-total: Communications		193
C. Total: Transport & Communications		4,227

4.12 Recommendations

It is recommended that the projects implied by the low budget projections shown in Table 4-14 be adopted as the Third Plan Transport and Communications program for the Northeast. This projection, rather than the high or any intermediary one, is recommended for the following reasons:

- a) projects that would be implemented represent ones which generally have apparent economic benefits;
- b) the overall program level is within administrative, supervisory and organizational capabilities of the agencies responsible for implementation;
- c) total national development funds probably will not be sufficient to finance the high estimate of each sector plan.

Assuming this recommendation is adopted, the RTG development budget expenditure by year for the Third Plan Northeast Transport and Communications Sector would be:

	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>Total</u>
Ø million	787	813	838	862	927	4,227

The amount of foreign aid associated with the program described above would total an estimated Ø 710 million. This aid would be distributed as summarized:

<u>Sub-Sector</u>	<u>Million</u>
Primary and Secondary Highways	376
Feeder Roads	42
ARD	192
TOT	100
RSR	-0-
Aviation	-0-
	—
Total	710

CHAPTER V POWER

CHAPTER V

POWER

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CHAPTER V
SECTOR PLAN FOR POWER
Northeast Thailand
1972 - 1976

5.1 Introduction

That electric power is essential for accelerating the rate of economic development cannot be denied. Both Thailand's First and Second Development Plans gave explicit consideration to making low cost power widely available. In the plan for 1972-1976 this is still a basic objective.

The RTG strategy for the development of this sector is to first make use of all potential hydro-electric power sources since they represent the cheapest source of supply. It is realized, however, that there is a limit to the hydro-potential of the country particularly when there are other demands for water (e.g., irrigation).

Northeast Thailand is in a relatively favorable position to the rest of the Kingdom for hydro-electric power. Two large rivers flow through the region and its borders on the Mekong. The following parts of this section indicate the Third Plan power programs which will utilize these resources.

5.2 Recent Trends in Power Development

Estimates of the growth of electric power demand in Thailand in recent years indicates an average annual increase of 28 percent.^{1/} To satisfy this demand major hydro and thermal facilities have been built throughout the country. These projects have increased the supply of electric power from less than 300 megawatts (MW) in 1961 to nearly 900 MW by 1968.^{2/}

The major electric power projects have been the Yanhee hydro-electric complex in Northern Thailand, expansion of thermal facilities around Bangkok and two hydro projects in Northeast Thailand (Nam Pong and Nam Pung). However, these facilities in addition to scattered diesel driven generators, have not been sufficient to satisfy demand. Therefore, additional power projects are being implemented or are seriously being considered.

^{1/} Pa Mong Feasibility Study, Bureau of Reclamation p. VIII - 12.

^{2/} Ibid. p. VIII - 3.

These include:

- a) further expansion of the Yanhee Dam project through installation of three more 70 MW generators;
- b) construction of a new hydro facility at Quae Yai with an ultimate capacity of 720 MW;
- c) utilization of power from the Nam Ngum hydro-electric facility in Laos. (This dam is scheduled for operation in late 1971 or early 1972 and will have an ultimate capacity of 135 MW);
- d) construction of the Sirikit Dam in Northern Thailand with an ultimate capacity of 500 MW;
- e) completion of the Lam Dom Noi and Nam Phrom dam projects in Northeast Thailand. Together these will have 96 MW of generating capacity;
- f) completion of a new fossil - fuel power plant in South Bangkok with ultimate total capacity of 1060 MW.

In addition to the above which may be classified as "firm" projects since they are either under construction or under intensive study, there are a number of "possible" projects for the further development of electric power. Foremost among these "possible" projects is the proposed Pa Mong Dam on the Mekong River. This facility has an estimated cost of over \$1,000,000,000 and a planned first stage capacity of around 4,000 MW. There is also a possible nuclear power plant project of 500 MW capacity.

5.3 Projected Electric Power Demand

A relatively recent study^{1/} of the demand for power in Thailand projected an annual average growth rate of 22 percent for the period 1968-1978.^{2/} This projection was considered to be conservative, however, by the people who made it. Several other studies made during the last few years indicate a yearly increase in power demand in Thailand of 25 percent or more in the near future but declining to 8-10 percent after 10 or more years.^{3/} The Pa Mong Stage One Feasibility Report made by the U.S. Bureau of Reclamation based on its demand analysis on a growth rate of 25.3 percent in 1968, declining to 7.8 percent by 1978.^{4/}

^{1/} Cornell, Howland, Hayes & Merryfield, Thailand Electric Power Load Forecast 1970-1990, October 1969.

^{2/} Ibid. p. - 11.

^{3/} Thailand Electric Power Study December 1966.

^{4/} Op. Cit. p. 111 - 119.

The estimated demand for electric power in Northeast Thailand in all projections shows a higher annual growth rate than that for the whole Kingdom: (34 percent vs 25 percent for the period 1967-78 1/) However, the present total electric power demand in the Northeast is only 10 percent of the national total, and even with a 50 percent higher average annual growth rate the total demand in the Northeast would still be only 13.5 percent of the national total by the late 1970's.2/

5.4 Proposed Third Plan Development Program

The proposed RTG plan for developing electric power is based on a requirement to increase generating capacity by 1340 MW during the 1972-1976 period. Of this amount 38 percent is expected to come from expanded hydro facilities and 62 percent from expanded thermal facilities. The Northeast's share of this program is primarily in the expansion of hydro facilities. In addition there are requirements for transmission lines, rural electrification, and related facilities. Table 5-1 summarizes the proposed power development projects for Northeast Thailand.

Implementation of the proposed program would result in the Northeast receiving 22.5 percent of the total RTG power development budget during the 1972-1976 period. This compares with a 15 percent allocation in the First Plan when the major share of the budget went to the Yanhee Project, and a 25 percent allocation in the Second Plan when expenditures were being made for four hydro projects in the Northeast, (Nam Pung, Nam Pong, Nam Phrom and Lam Dom Noi) and expansion of its distribution system.3/

5.5 Recommended Power Projects

a) Continuation of Nam Phrom Dam. This is necessary to meet the scheduled increase in hydro-power generation capacity. A favorable financial rate of return can be expected assuming present demand forecasts are accurate with a rate of $\text{฿}0.24$ per KWH.

This project is recommended. The only question is whether Stage II (installation of a third 20 MW generator)

1/ Op. Cit. p. 11.

2/ Ibid p. - 11.

3/ It should be noted that as Thailand's electric power transmission lines become tied together into a national grid (expecting the Southern Region) the concept of regional allocation is less meaningful. Although there still are regional benefits from construction, the supply of power cannot be simply related to regional demand.

TABLE 5-1

PROPOSED ELECTRIC POWER EXPENDITURES
Northeast Thailand
Third Development Plan

Source of Financing (฿ million)

<u>Project</u>	<u>Development Budget</u>	<u>Loan</u>	<u>State Enterprise</u>	<u>Total</u>
1. Nam Phrom Dam Phase I	50.36	80.27	17.21	147.84
Phase IIa/	20.00	-	10.00 ^{b/}	30.00
2. Dom Noi Dam Phase II	-	12.50	7.50	20.00
3. Various EPPA Sys. Expan. ^{c/}	-	46.40	53.50	99.90
4. Transmission Lines to Nam Ngum	50.00	70.40	42.00	162.40
5. Transmission Line between NE & WK	-	16.60	20.80	37.40
6. Dom Noi Distribution Systems	43.00	27.14	-	70.14
7. Rural Electrification ^{c/}	55.92	51.74	41.85	149.51
8. Existing PEA System Expansion ^{c/}	39.90	-	30.10	70.00
9. Mekong Development Projects	79.00	-	-	79.00
10. Pa Mong Feasibility Studies	36.00	-	-	36.00
11. Mekong River Pumping Stations	73.00	-	-	73.00
12. Pak Mun Dam Construction	264.00	396.00	-	660.00
<hr/>				
Total Northeast	711.18	701.15	222.96	1,635.19
Whole Kingdom	3,156.67	5,497.60	4,275.17	12,929.44
Percent NE:WK	22.50%	12.74%	5.20%	12.60%

Source: NEBD

a/ 1976 or later

^{b/} Estimated

^{c/} Based on NE receiving one third of WK allocation

will be ready for implementation during the Third Plan period. If it is, it should proceed.

b) Lam Dom Noi - Stage II. The same recommendation made above for Nam Phrom applies to this project which involves the installation of a Third 12 MW unit.

c) Various Systems Expansions for the Electric Power Production Authority. This project requires no budget allocation; rather, funds are received as a result of transfer from state enterprises in the case of EPPA itself. The allocation to the Northeast for this project amounts to one-third of the total.

Details are lacking on which to make specific benefit cost calculations. However, the project appears necessary in order to provide a greater demand base for the increased electric supply that will be available. It is therefore recommended.

d) Transmission Lines to Nam Ngum Dam in Laos. These are included since Thailand and Laos have worked out an electric power sharing arrangement under which Nam Ngum will effectively be integrated into Thailand's distribution grid. This arrangement is advantageous to both countries and should be financially remunerative. It is recommended.

e) Transmission Lines to Connect the Northeast Grid with the Rest of the Kingdom. This is a highly desirable project which will enable electric power transfers between the region and the rest of the Kingdom. It is estimated that as much as 80 MW of capacity can be shifted through this connection. This benefits the cost of comparable duplicate facilities. It is recommended.

f) Lam Dom Noi Distribution System. This is an obviously essential part of the project which already is half completed. These facilities are for transmission lines to Ubol, Sisaket, Surin and parts of Roi-Et. It is recommended.

g) Rural Electrification. These projects provide power to communities which have assured authorities that they will have a minimum of 150 subscribers. Reportedly there is a three to four year backlog in demand which this project would attempt to reduce. The financial returns of rural electrification are predicated on charges covering operating and maintenance expenses, but not capital investment. The allocation for the Northeast is one-third the total for the nation. It is recommended.

h) Expansion of the Provincial Electric Authority System. This project is based on an allocation of one-third the national total. It is designed to increase and improve the efficiency of energy transmission and the electric power sub-station through installation of additional connecting lines. It will cope with the region's demand for additional electric power. It is recommended.

i) Mekong Development Projects. These include feasibility studies, demonstration activities and a ship-building training center at Nong Khai. Details and justification for these projects are insufficient to form a recommendation.

j) Pa Mong Feasibility Studies. These are definitely warranted since the future power development in the Northeast, and Thailand as well, depends on whether Pa Mong is built and when. The recently completed U.S. Bureau of Reclamation study on Pa Mong indicated that additional studies are required before a firm decision can be made. The IBRD has also indicated the need for more studies. It is recommended.

k) Mekong Pumping Stations. This project provides water from the river to irrigation schemes at Nong Khai, Nakorn Phanom and Ubol. There are considerable problems with existing Mekong River pumping stations, and irrigation schemes have generally had a record of poor performance. This project is not recommended.

l) Pak Mun Hydro-Electric Project. This project shows the need to resolve the issue about Pa Mong. If Pa Mong is not constructed or if its construction is delayed until mid-1980 or later, Pak Mun appears justified. (It is estimated to have an internal rate of return of over 10 percent.) However, if Pa Mong comes on stream in the 1970's or in the early 1980's, Pak Mun would not appear justified. No recommendation, therefore, is made.

Based on the above, recommendations for implementing the proposed projects may be summarized as follows:

TABLE 5-2

RECOMMENDATION FOR PROPOSED POWER PROJECTS
Northeast Thailand
1972 - 1976

<u>Category</u>	<u>National Development Budget Required</u> (฿ million)
Total Projects Proposed	711.18
*High Recommendation	638.18
**Medium Recommendation	374.18
***Lowest Recommendation	275.18
*Excludes only Mekong River pumping stations	
**Excludes above plus Pak Mun project	
***Excludes above plus Mekong Development Project and Nam Phrom Phase II	

5.6 Conclusion

Power is essential for accelerating economic development in Northeast Thailand. The demand for power in the Northeast will continue to grow at a high rate. Plans to increase the supply of power appear realistic and should be economically and financially viable at existing rates and at projected growth in demand. The major problem is to decide on the eventual outcome of Pa Mong since otherwise serious over or under investments can be made.

For planning purposes a figure of $\text{฿}374.18$ million is used as the estimated RTG development budget expenditure in Northeast Thailand during the period of the Third Plan. These projected expenditures are estimated to be spread over the five year period as follows:

1972	1973	1974	1975	1976	Total
65	70	75	80	85	375 ฿ million

The amount of foreign aid required for the recommended projects is approximately $\text{฿} 305$ million (See Table 5-1). Most of this aid has already been committed or agreed upon and will be in the form of foreign loans. With the possible exception of the rural electrification project, all loans should be amortized from additional revenues generated by the project. Rural electrification should be financed in part through grants. Therefore, no major obstacles are foreseen in financing the proposed electric power development program.

It should be emphasized that future power studies should concern themselves with total national demand and total national potential sources of power. Only through such a comprehensive approach can the problems raised by such projects as Pa Mong and Pak Mun be ameliorated.

CHAPTER VI SOCIAL SERVICES

CHAPTER VI
SOCIAL SERVICES
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CHAPTER VI

SOCIAL SERVICES

Northeast Thailand
1972 - 1976

6.1 Introduction

This sector contains a variety of program activities which may be divided into four basic groups:

- a) Community Water Supply
- b) General Community Development
- c) Urbanization
- d) Public Welfare

These programs which make up 12 percent of the regional development budget generally deal with development activities at the "grass root" level. As such they are most essential, as direct contact and communication with the rural population is a prerequisite for successful implementation of plan objectives.

6.2 Community Water Supply

Agencies responsible for maintaining and increasing household as well as industrial water supply in the province and rural areas include:

- a) Department of Public and Municipal Works
- b) Department of Local Administration
- c) Department of Mineral Resources
- d) Department of Health
- e) Royal Irrigation Department
- f) Department of Community Development^{1/}

The activities of these departments are supplemented in the Northeast by special programs of ARD, MDU and the Department of Welfare's re-settlement schemes.

^{1/} The responsibility for artesian wells has been recently transferred from the Department of Mineral Resources.

Basic objectives of these programs are to:

- a) make drinking water available to all residences of villages and municipalities;
- b) overcome seasonal water shortages;
- c) improve the general environmental health and sanitation conditions of the region;
- d) supply sufficient water for industrial use.^{1/}

The following summarizes the preliminary budget requirements for municipal water supply projects (budgets include internal loans):

<u>฿ Million</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1972 - 1976</u>
Korat	40	40	40	40	40	200
Udonn Flood Control	60	30	5	5	5	105
Udonn Water Distribution	20	20	10	5	5	60
Khon Kaen, Loei and Chaiyaphum Systems	5	10	25	35	25	100
Other Provincial Systems*	10	10	10	10	10	50
Total	135	110	90	95	85	515

* More than ฿ 80 million has been requested by the Department.

Municipal water schemes lend themselves to long term loans, both foreign and domestic, as the consumers of water services can be made to pay a direct fee.^{2/} Accordingly the following loan program is suggested:^{3/}

<u>฿ Million</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1972 - 1976</u>
Foreign (+Domestic) Loans	100	75	50	50	25	300
Leaving a RTG Budget requirement of:	35	35	40	45	60	215

Rural water supply programs fell under the following departments:

1. Public Works Department - artesian well program generally has no application to the Northeast.
2. Department of Local Administration - operates an extensive small water supply project, consisting largely of supplying and installing water jars and 400 gallon metal or 150 cubic meter concrete tanks built with village labor.

^{1/} In 1971, about 40 percent of the nation's 50,000 villages were supplied with a source of potable water. It is expected that in 1976 this will reach over 60 percent.

^{2/} The charge is usually a flat fee, although differential rates based on household and industrial use have been recommended from time to time.

^{3/} During the Second Plan period an amount of nearly 80 percent of the national requirement was for foreign loans.

3. Department of Mineral Resources - which is part of the Ministry of National Development, operated an artesian well program which reportedly has been turned over to the Department of Community Development.

4. Public Health Department - has a potable water supply program scheduled for 100 village water schemes per year, or 500 during the Second Plan period.

5. The Department of Accelerated Rural Development - constructs wells, ponds, and deep wells.

6. Royal Irrigation Department and other Agencies - deals with community water supply facilities to the extent that it builds small catchments for rainwater storage.

Department of Welfare and its programs and budgets are considered in section 6.5 below.

6.2.1 Summary: Community Water Supply - Table 6-1 presents a summary of the recommended budget for the foregoing projects and programs. Apart from the municipal water schemes, these programs represent 17,477 installations for an estimated 10,365 villages (See Table 6-2).^{1/} However, the actual number of villages affected may be smaller, and more than one program may be applied to the same village.

6.2.2 Administrative Requirements - In addition to the foregoing budget targets, it is recommended that consideration be given to:

a) shifting responsibility for the water supply systems now constructed by the Public Health Department to the Public Works Department, but leaving the Health Department in charge of testing water supplies for potability and pollution control;

b) emphasizing the need for adequate maintenance of all water systems;

c) integrating all potable water projects with general environmental health and sanitation education;

d) experimenting with alternative water supply systems;

e) establishing a Community Water Coordinating Council representing all relevant agencies to carry out the general aim of the National Rural Water Supply Project (supplying all villages with adequate water), to insure proper coordination, set priorities and check on implementation.

^{1/} There are 15,000 villages in the Northeast.

TABLE 6-1

COMMUNITY WATER PROGRAM BUDGETS
Northeast Thailand
1972 - 1976

Program	1972	1973	1974	1975	1976	1972-1976	
						RTG	Foreign & Domestic Loans
1) Department of Public Works:							
a) Provincial Water Supply	35	35	40	45	60	215	300
b) Village Wells	2.3	2.5	2.7	2.9	3.1	13.5 ^{1/}	
2) DOLA: Village Water Facilities	10	10	10	10	10	50	15
3) Department of Mineral Resources* <u>Artesian Wells</u>	34	36	38	40	42	190	8
4) Department of Health: <u>Potable Water</u>	14.7	16.5	18.3	20.2	22	91.7	2
5) ARD: Small Water Projects	19	21	19	15	13	87	50
6) RID: Rainwater Catchments	6.1	7.6	8.1	9.1	10.2	41.1	
7) Unassigned: Flood Control	20	20	10	-	-	50	
Total Budget:	141.1	148.6	146.1	142.2	160.3	738.3	375

* This may now be considered as the Department of Community Development

^{1/} These village wells will be incorporated into the DOLA program.

Source: Compiled by NEED/PAG based on data supplied by Social Projects Division, NEDB.

TABLE 6-2
VILLAGE WATER FACILITIES ADDITIONS

Northeast Thailand
1972 - 1976

<u>Agency</u>	<u>Type and Number Installation</u>	<u>Number of Villages Served</u>
Public Works Department	82 Wells (Various types)	70
DOLA	8,000 Small Tanks	
	1,408 Small Ponds	2,700
	100 Concrete (150m ³) Tanks	
Mineral Resources and/or Community Development	3,500 Deep (artesian) Wells	3,500
Public Health	167 Supply Systems	375
ARD	690 Shallow Wells	
	1,330 Small Ponds	3,200
	1,700 Deep Wells	
RID	500 Rainwater Catchments	500
Total	17,477 Installations	10,365

Source: Social Projects Division, NEDB

6.3 Community Development^{1/}

Community Development represents supporting services designed to stimulate the economic and physical improvement of small towns and villages by assisting local leadership, and thereby improving the social and political milieu of the community. Most of the programs are based on self-help participation and achieve the foreign objectives by:

- a) encouraging education;
- b) helping rural population to adopt to new life patterns in their communities;
- c) exercising individual initiative to plan one's future;
- d) participating in various cooperative projects.^{2/}

Several agencies are engaged in furthering these objectives, and their basic program targets and objectives are given in the following section.

6.3.1 The Community Development Department - This branch of the Ministry of Interior operates six main programs and four subsidiary ones, designed to:

- a) accelerate production and income increases;
- b) promote construction of public properties;
- c) improve health and sanitation;
- d) upgrade education, recreation and youth training;
- e) promote rural culture, good citizenship and local government.^{3/}

For the Third Plan period the following basic goal has been specified; assistance in making adjustments arising from rapid population increase, migration, urbanization, and technological change.

The principal program of the Community Development Department is called "Opening of Area Coverage". In effect its main purpose is to construct (with volunteer labor) local roads,

1/ Comments were received by NEED/PAG from the Department of Community Development on an earlier version of this report which changed some of the details of the following, but not the substance.

2/ See Community Development Accomplishments, C.D. Dept., Ministry of Interior (1966), p.1.

3/ Ibid. p.2.

water facilities, public buildings, etc.^{1/} In addition, special agricultural schemes (e.g., livestock, commercial and cottage industries) are supported as a voluntary cooperative basis. Another goal is training local leaders.

Increasing success of this program is indicated by the fact that between 1962 and 1969, the local baht contribution toward village CD projects ranged from 55 to 76 percent of the total expended.^{2/} For the period 1960 to 1971 it is estimated that this program has affected 32 percent of the nation's population, including over 17,000 villages, 1,670 tambon and 180 amphoe.^{3/} The program is to be expanded from $\text{P} 302$ million budgeted in the Second Plan period to $\text{P} 458$ million in the Third Plan.^{4/} The targets are to extend services to 100 more amphoe, 900 tambon and 10,000 villages.

On the other hand, several problems remain, making it difficult to expand CD programs rapidly. These include personnel shortages (largely due to low salaries and incentives), the consequent dilution of programs as staff is spread too widely; and general administrative problems of coordinating with other government programs, the problems of which are to be undertaken by recently established CE coordinating committees.

6.3.2 The Department of Accelerated Rural Development
ARD operates a comprehensive program entitled "Village Improvement". This is active in all ARD changwats and contemplates a five year budget of $\text{P} 200$ million in foreign assistance. The program includes miscellaneous activities, other than roads and water projects which are discussed in other sections of this report. As with other ARD budgets, 70 percent of the agency's proposed total budget is allocated to the Northeast, amounting to $\text{P} 210$ million or $\text{P} 42$ million per year during the period 1972-1976.

6.3.3 The Departments of Fine Arts and Religious Affairs - These departments are scheduled to be transferred from the Ministry of Education to the Ministry of Interior. Only education and teacher training activities will remain in the Education Ministry.

Fine Arts is concerned with several programs of which museum administration and archaeology are the chief ones.

The Department of Religious Affairs programs are largely concerned with the promotion of religious activity, including assistance for the rehabilitation and maintenance of temples.

1/ For the purpose of this report this program is called the Rural Self-Help Project.

2/ Community Development in Thailand, Community Development Department, Ministry of Interior, 1970, p. 34.

3/ Ibid., p. 32.

4/ Rural Self-Help Project, Op.Cit.

6.3.4 Community Development Summary - Table 6-3 gives the departmental budgets for this section on Community Development proposed for the Third Plan, including suggested foreign assistance.^{1/}

6.4 Urbanization

Urbanization greatly reflects the state of agricultural development, as relatively large population increases and rises in productivity are responsible for migration to the cities. More direct concern with urban expansion as a part of agricultural development can stem from what is now a general drift from the land and low income towns to larger cities--especially Bangkok--into a more systematic absorption of manpower in the urban areas of the region.

Because of the magnitude of this problem special attention is given here to the issue of urbanization as part of the total Community Development sector.

6.4.1 Manpower and Migration Issues - Including sanitary districts, the urban population of the Northeast was estimated at 1,100,000 in 1970. According to one study its growth is projected at about 6 percent per year, reaching 2 million persons by 1980.^{2/} This is double the region's total population rate, and indicates that urban areas are projected to grow about 33,000 to 40,000 a year from natural population increases, with similar amounts from immigration.

In 1972, the labor force (i.e., all persons ages 15 to 65) in the Northeast is estimated at 5.4 million, with 4.6 million in rural areas and .8 million elsewhere.

The projected labor force will be 6.2 million, with 5.1 in agriculture and 1.1 in other sectors by 1976. The non-agricultural labor force component will increase by 300,000 from 15 percent to 18 percent. Of the 300,000 labor force entering non-agricultural employment, at least 250,000 can be expected to move into urban areas. Although most of these migrants are likely to be in the 15 to 25 year age group, another 125,000 dependents are estimated to accompany them. Thus, 75,000 persons per year or nearly twice as much as was assumed by the WHO study, can be expected to leave the farms.

1/ In the comments received from the Department of Community Development, the figures given for the Third Plan period amounted to $\text{P} 411$ million vs $\text{P} 299$ (or $\text{P} 345$ million high projection) million as shown in Table 6-3.

2/ A Health Survey of the Lower Mekong Basin, WHO, New Delhi, 1968, p.73.

TABLE 6-3

COMMUNITY DEVELOPMENT AGENCIES

Third Year Plan Budgets
Northeast Thailand
1972 to 1976

(฿ Million)

6-IA

Agency and Program	1972	1973	1974	1975	1976	1972-76	Percent of Proposed National Budget %	Foreign AID
Community Development Department								
Rural Self-Help Projects (High Target)	44 (53)	43 (51)	45 (54)	47 (57)	50 (60)	229 (275)	50 60	40 (46)
Youth Volunteer Corps	4	4	4	4	4	20	133	
C.D. Technical Center	1	8	3	3	3	18	33	
Community Leader Training	3	3	3	3	4	16	50	
Pre-school Age Children Centers	0	1	1	1	1	4	50	
Others	2	2	2	3	3	12	50	
Total C.D. (High Target)	55 (64)	62 (70)	58 (67)	60 (70)	64 (74)	299 (345)	52 (60)	40 (46)
ARD	42	42	42	42	42	210	70	139
Fine Arts	12	12	12	12	12	60	38	5
Special Project (High Target)	2 (3)	2 (3)	2 (3)	2 (3)	2 (3)	10 (15)	10 (41)	4 (5)
Religious Affairs (High Target)	26 (33)	27 (33)	27 (34)	27 (34)	27 (34)	134 (168)	40 (50)	
Total Community Development Agencies (High Target)	137 (154)	145 (160)	141 (158)	143 (161)	147 (165)	713 (798)	51 (57)	188 (195)

Source: Estimated by NEED/PAG

How many will actually move out of the region, and how many will migrate from urban areas in the Northeast to Bangkok, etc., is not known. In addition, chronic conditions of underemployment persons will generate migration, although the rate of growth in job opportunities elsewhere in the region or nation will influence this.

Given these considerations, the urban population increase in the Northeast is likely to be closer to 8 percent with 5 percent attributable to migration. This results in an urban population of 1,680,000 by 1976, (contrasted to 1,560,000 estimated by WHO)^{1/} and aggravated by employment cutbacks arising from the reduction or elimination of military bases in the Northeast.^{2/} Even more clearly then, migrants must be encouraged to remain in the region in order to prevent already strained municipal facilities in the Bangkok area.

6.4.2 Basic Objectives - The necessity to deal with urbanization both in terms of employment and facilities planning is obvious. Basic objectives, therefore, should:

a) encourage urban development poles in the region and alleviate potential migration to the Bangkok/Thonburi metropolitan area;

b) create more job opportunities by increasing the share of the region's raw material processing and consumer goods production, by special investment incentives,^{3/} and by generally building an economy based on good practices in industry, government administration, and education;

c) prepare for absorption of the labor force which may be displaced by curtailing military bases in the region;

d) establish an urban environment which is conducive not only to industrial location, but also attractive to professional staff, especially in medical and educational fields, and which makes cities and towns generally pleasant places in which to live.

6.4.3 Urban Facilities - Given reasonable assurance that appropriate land use and tax reforms are carried out, it is recommended that a new urban affairs department be established in the Ministry of the Interior. This department would absorb Town and Country Planning and administer a special Urban Development Fund designed to assist cities and towns.^{4/}

^{1/} Other NEDB studies suggest a lower growth rate than 8 percent.

^{2/} See NEED/PAG Staff Memorandum #9, "Policies to Cushion Effects of U.S. Military Base Cutbacks", May, 1969.

^{3/} See Chapter on Industry Sector.

^{4/} An alternative proposal is to expand the Town & Country Planning Department to undertake the tasks.

For the Northeast a budget of $\text{฿} 50$ per urban resident per year is proposed (with $\text{฿} 60$ per person as a high target) to develop urban amenities (in addition to water supply systems). This would result in the following Five Year Budget:^{1/}

	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1972 - 1976</u>
Estimated Urban population (000) ^{2/}	1,235	1,334	1,441	1,556	1,680	514 (increased from 1971)
Budget ฿ Million	72	66	72	78	84	372
(High Target)	(84)	(79)	(86)	(94)	(102)	(445)

Other public buildings (schools, hospitals, libraries, government, police, welfare housing, etc.) are included elsewhere, as are water supply and flood control. Adequate sewage and refuse disposal should receive priority, but the remaining programs will be governed by town plans. To the extent that some programs are financed largely from user charges, substantial support from foreign assistance loans should be feasible. Therefore a supplementary budget of 40 percent or approximately $\text{฿} 150$ million in foreign loans is recommended, (or $\text{฿} 178$ million for the high target).

6.5 Public Welfare

6.5.1 Public Welfare Department - The largest program of the Social Welfare Department in rural areas are the self-help land settlement schemes. In 1970 there were 53 of these, and 15 in the Northeast. They include resettlements arising from the displacement of communities by major irrigation and hydro-electric projects.

Aside from these 15 land settlement projects, there are provincial welfare offices in changwats, two homes for the aged, one home for the destitute, one home for socially handicapped women and two homes for children. Most of these are located in Korat. The land settlement program is the only program which reaches a significant number of people. Presently an estimated 8,000 families or 44,000 persons in the Northeast are involved in these schemes.

1/ Assumes a somewhat higher per capita investment in the first year.

2/ 1166 in 1971.

In addition to those of the Public Welfare Department, programs of the Department of Labor and Department of Land are included in this section. The former deals with employment services and specialized occupational training, and the latter with distribution of land. The land distribution program, both for small and large plots, has functioned primarily in Loei, Sakon Nakhorn, Chaiyaphum, Korat and Udorn and most recently Surin.

Table 6-4 shows the budgets for the Northeast from 1961 to 1969. Cost of settlements varies widely, but guided by past experience, the required program costs for the Third Plan were estimated.

The following summarizes the resettlement schemes and suggested budgets.

<u>Project</u>	<u>Resettlement Target^{1/}</u> (Persons)	<u>Period</u>	<u>Cost (฿ Million)</u>
Lam Dom Noi	6,000	1969 to 1973	24
Lam Nam Oon	7,500	1969 to 1974	30
Lam Pao	12,300	1970 to 1976	49
Lam Tha Kong	2,600	1970 to 1972	9
Ubolrathani (General Land Settlement)	6,000	1972 to 1976	24

For the nation as a whole, ฿ 87.5 million has been budgeted so that the Northeast requirements leave little for the three main projects in other regions. It is suggested, therefore, that part of the government general self-help settlement program budget be allocated in order to allow more for resettlements. The proportion of Northeast budgets as part of the total national self-help settlements has been about 15 percent. This is because the Northeast benefits substantially from other programs (see also Land Department below). ฿ 31.7 million has been estimated for this purpose.

Other welfare program activities operating in the Northeast include a range of small (usually no more than one million baht a year) specific public assistance programs for

1/ Three of the resettlement projects will be terminated during the Third Plan period, and ฿ 82 million is actually allocated for 1972 to 1976 during which period no new major dam projects are programmed in the Northeast (See Table 6-5).

TABLE 6-4

LAND SETTLEMENT BUDGETS
(Department of Welfare)
Northeast Thailand
1961 - 1976

(฿ Million)

	General Lard Settlement	Lampao	Lam Nam Con	Ubolrat ^{1/}	Lam Tha Kong	Lam Dom Noi	Total All Settlement
1961	.5						.5
1962	2.2						2.2
1963	3.1						3.1
1964	5.0						5.0
1965	3.9	7.9		11.1			16.1
1966	2.0	6.1		9.0			20.8
1967	3.9	4.4		5.1	.2		13.3
1968	3.8	3.3		4.6	4.0		16.9
1969	5.6	2.9	5.5	6.8	3.0		14.9
1970	5.7	2.9	8.5	n.a	2.4	.3	16.4
1971	5.8	7	5.0	n.a	3.2	8.0	30.4
					3.2	8.0	34.0
1972	5.9	9	5.0	2.0	2.6	6.0	30.5
1973	6.0	9	4.0	4.0		1.7	24.7
1974	6.3	8	2.0	6.0			22.3
1975	6.6	6		6.0			18.6
1976	6.9	5		6.0			17.9
1972 to 1976	31.7	37.0	11.0	24.0	2.6	7.7	114.0

^{1/} From 1972 the Ubolrat will be a general land settlement program.

Source: 1961 - 1969 Data Compiled by National Statistics Office
1970 - 1976 NEED/PAG estimates

the aged and crippled, indigents, prostitutes, general child welfare, and flood and other disaster relief etc. All of the welfare programs are institutionalized at Korat, (except for one child welfare center at Nong Khai) and amounted to about a ฿ 6 million budget in 1969.

Table 6-5 summarizes the budget targets for the Department of Welfare.

Low income family housing is the only program in which foreign aid was considered; the Welfare Department budget of ฿ 137 million for 1967-1971 was supplemented by a request of ฿ 200 million for the Bangkok metropolitan area. ฿ 30 million is recommended for this purpose in the Northeast for the Third Plan.

Thought is currently being given to instituting old age and survivors insurance benefits (social security); however, this program will be worked out at the national level. To suggest separate allocations for the Northeast at this time would be premature.

6.5.2 Department of Land - This agency is concerned with distribution of small (up to 1,000 rai) and large (over 1,000 rai) plots and preparing cadastral maps.

The small plots program five year target is to distribute 60,000 lots representing 1,750,000 rai at a cost of ฿ 39 million. Twenty-five percent of this or 15,000 lots of an average 29 rai size requires a budget of ฿ 7.3 million for the Northeast.

6.5.3 The Department of Labor - This agency operates employment services and counselling, occupational training programs,^{1/} labor protection and statistical services. The national budget request for these services has been increased from ฿ 43.6 million for the Second Plan to an estimated ฿ 86.0 million for the Third Plan. The scope of this department's activities (including enforcement of labor laws, industrial safety, research, etc.) applies largely to the more industrialized areas of Thailand. In the Northeast, the most important effort of this department is attempting to alleviate employment problems arising from rural to city migration and from the potential closing of military bases in the Northeast. The Department's occupational training and orientation program is its largest in terms of budget. Because of its relevance to the particular problems of the Northeast, at least one half of the national

1/ Occupational promotion programs by DOLA do not apply to the Northeast.

TABLE 6-5

PUBLIC WELFARE BUDGETS
Northeast Thailand
1972 - 1976

(฿ Million)

	1972	1973	1974	1975	1976	1972-76	% of National Budget	Foreign Assistance
<u>Department of Welfare:</u>								
General Land Settlement	5.9	6.0	6.3	6.6	6.9	31.7	15%	-
Resettlement Programs	28.6	20.7	16.0	10.0	7.0	82.3	94%	-
Youth Welfare	4.2	4.5	4.8	5.1	5.4	24.0	15%	-
Low Cost Housing	3.0	4.5	6.0	7.5	9.0	30.0	10%	30.0
Other Welfare	15.8	16.3	16.8	17.3	17.8	84.0	17%	-
Department Total	57.5	52.0	49.9	46.5	46.1	252.0	20%	30.0
<u>Department of Land:</u>								
Small Plot Distribution	1.5	1.3	1.4	1.5	1.6	7.3	25%	-
Large Plot Distribution	6.0	6.2	6.2	6.2	6.3	30.9	75%	-
Land Title Acquisition Program	4.5	4.5	4.5	4.5	4.5	22.5	50%	
Aerial and Cadastral Mapping	6.0	6.2	6.3	6.5	6.8	31.8	50%	1.0
Department Total	18.0	18.2	18.4	18.7	19.2	92.5	50%	1.0
<u>Department of Labor:</u>								
Occupational Training and Counselling	4.5	4.5	4.5	4.5	4.5	22.5	50%	-
Other Programs	2.7	2.7	2.7	2.8	2.8	13.7	33%	1.5
Department Total	7.2	7.2	7.2	7.3	7.3	36.2	42%	1.5
Total Public Welfare	82.7	77.4	75.5	72.5	72.6	380.7	25%	32.5

Source: NEED/PAG Estimates

budget of \$ 45 million is recommended with one third of the remaining departmental programs to be allocated to the Northeast. This is summarized in Table 6-5. A minor amount (\$ 1.5 million) of technical assistance is indicated in connection with manpower programming and statistical research.

6.6 Summary - Social Services

The total preliminary budget proposals for all combined programs discussed in this Chapter, together with recommendations for foreign assistance are summarized in Table 6-6.

TABLE 6-6

PROPOSED SOCIAL SERVICES BUDGET SUMMARY
Northeast Thailand
1972 - 1976

(฿ Million)

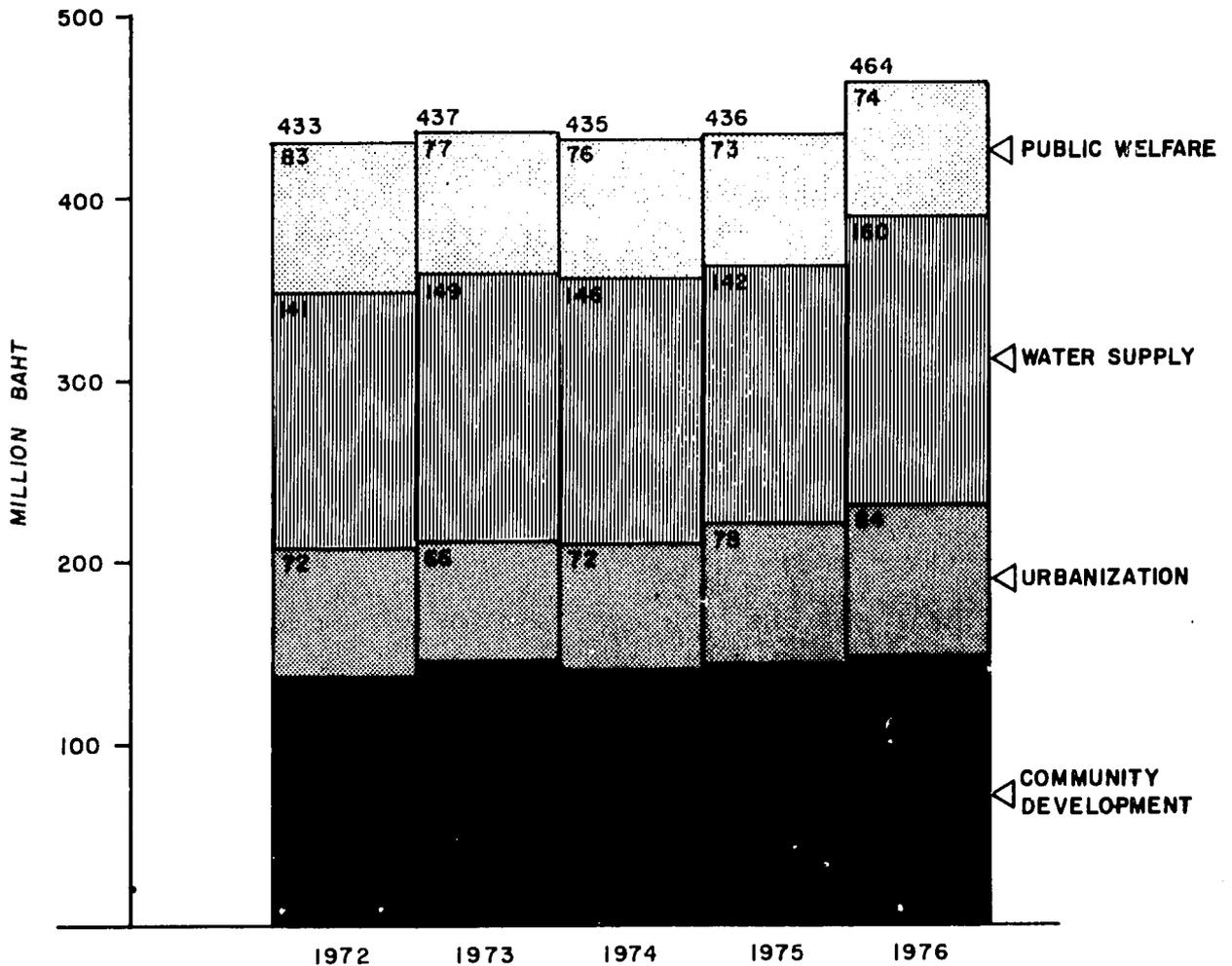
Program	1972	1973	1974	1975	1976	1972-1976	Foreign Assistance
Department of Public Works	37.3	37.5	42.7	47.9	63.1	228.5	300.0
Department of Mineral Resources	34.0	36.0	38.0	40.0	42.0	190.0	8.0
Department of Health	14.7	16.5	18.3	20.2	22.0	91.7	2.0
DOLA, ARD, RID, etc.	55.1	58.6	47.1	34.1	33.2	228.1	67.0
1. Total Water Programs	141.1	148.6	146.1	142.2	160.3	738.3	377.0
Community Development Department	55.0	62.0	58.0	60.0	64.0	299.0	40.0
ARD	42.0	42.0	42.0	42.0	42.0	210.0	139.0
Fine Arts and Religious Affairs Department	40.0	41.0	41.0	41.0	41.0	204.0	9.0
2. Total Community Department	137.0	145.0	141.0	143.0	147.0	713.0	188.0
3. Urbanization	72.0	66.0	72.0	78.0	84.0	372.0	150.0
Department of Welfare	57.5	52.0	49.9	46.5	46.1	252.0	30.0
Department of Land	18.0	18.2	18.4	18.7	19.2	92.5	1.0
Department of Labor	7.2	7.2	7.2	7.3	7.3	36.2	1.5
4. Public Welfare Total	82.7	77.4	75.5	72.5	72.6	380.7	32.5
Grand Total	432.8	437.0	434.6	435.7	463.9	2,204.0	747.5
(High Target) ^{1/}	(456.8)	(467.0)	(465.6)	(468.7)	(503.9)	(2,362.0)	(780.5)

^{1/} See Community Development and Urbanization Section.

Source: Estimated by NEED/PAG

CHART 6-1

**COMMUNITY FACILITIES AND PUBLIC WELFARE
BUDGET SUMMARY
THIRD PLAN
NORTHEAST THAILAND**



SOURCE : ESTIMATED BY NEEDPAG.

CHAPTER VII PUBLIC HEALTH

CHAPTER VII
PUBLIC HEALTH
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CHAPTER VII

SECTOR PLAN FOR PUBLIC HEALTH

Northeast Thailand
1972 - 1976

7.1 Introduction

It is generally accepted that public health measures are beneficial to individuals as well as to economic development in general. Like education, public health support is considered an investment, rather than just a consumer service, as it encourages the growth and development of human resources by reducing physical and mental disabilities. One of the major requirements in the Northeast region is the further extension of health services into rural areas.

The health sector includes both public and private services. The latter is concerned primarily with the treatment of patients on a fee-for-service basis and focuses on curative aspects. Public health services are financed for the most part from general government revenues, and are concerned with both curative and preventive activities such as immunizations, campaigns against specific diseases, improving nutritional and sanitation practices and promoting the adoption of recommended health practices through health education. The proposals considered here primarily concern the activities of the Ministry of Public Health. They exclude those operated by other government agencies (e.g., military and police health facilities), public enterprises, municipalities and private medicine.^{1/}

The Ministry of Public Health includes four major divisions. Each of these divisions maintains programs in the Northeast: a) The Office of the Under Secretary, in addition to providing supporting and administrative programs, operates the malaria eradication program. b) The Department of Medical Sciences is primarily concerned with research. c) The Department of Medical Services operates the 17 provincial hospitals,^{2/}

^{1/} Potable water projects operated by the Health Department are considered separately under community facilities. (See Chapter 6.)

^{2/} One in each changwat plus Yasothon, (Ubon) and Mudahan (Nakorn Phanom). Three provincial hospitals in the Northeast were to be upgraded to regional hospitals during the Second Five Year Plan period, however, this was not formally consummated.

three psychiatric hospitals and services (at Khon Kaen, Korat and Ubon), nurses' training, treatment for drug addiction and mobile units. d) The Department of Health is the public health wing of the Ministry. It operates thirteen special programs through the changwat health offices, as well as the various health stations located in villages and towns in the changwats.

7.2 Trends and Problems

The health situation in the Northeast is unsatisfactory as shown by data on morbidity, mortality and the number and distribution of health services, facilities, and manpower. In 1969 mortality in the Northeast was 730 per 100,000 population, compared with 670 for the Kingdom as a whole. However, the death rate has been declining since the mid-sixties.^{1/}

A recent WHO health survey in 15 Northeast changwats (plus Chiangmai) suggests that there is hardly a healthy person in the region.^{2/} Chronic conditions include intestinal parasites, dysentary, and inadequate diets. Near chronic conditions include trachoma, leprosy, and tuberculosis. These conditions result from unfavorable economic conditions on the one hand and from a complex of social and cultural conditions on the other. According to the WHO report, for example, protein malnutrition is fairly widespread among the rural population. This syndrome results as much from food and culinary habits as from the absence of protein in the diet. Other conditions such as intestinal infections result primarily from food and sanitation practices. These conditions indicate that health problems are in a large measure social problems, and that any strategy for the improvement of health in the Northeast must consider health education as an integral part.

^{1/} Statistics from the Division of Vital Statistics, Ministry of Public Health, indicate higher birth rates. Death rates for children under one year of age, infant mortality rates and stillbirths are reported actually lower in the Northeast than in the whole Kingdom, while the Northeast has higher death rates in terms of maternal deaths, tuberculosis and malaria. All of the series shown indicate improvements in the Northeast during the 1965 to 1969 period. It can be assumed therefore that expansion of health services in the Northeast in recent years have been at least in part responsible for improved conditions.

^{2/} J. Biebdraeger and Z. J. Buzo, Report on a Health Survey of the Lower Mekong Basin, New Delhi: World Health Organization Regional Office for Southeast Asia, 1968.

Table 7-1 shows the number of health stations, hospital beds, doctors and nurses employed in government programs in the Northeast. Table 7-2 compares the existing medical facilities and staff ratios to population among Thailand's regions. Even though facilities have been expanded in recent years in the Northeast, in 1970 the region remains at a substantial disadvantage when contrasted with other regions.

The number of physicians in general hospitals has actually declined, although it should be noted that private clinics,^{1/} health stations and other government medical facilities are not included. Assuming one doctor per first class health station, the total number of physicians in the Northeast is not likely to be more than 250 at the present time, or approximately 50,000 persons per physician. This contrasts with approximately 9,000 persons per physician (all types) for the Kingdom as a whole. Moreover, little progress has been made in attracting physicians to the Northeast where living conditions and the opportunities for supplementary private practices are less favorable than in the Bangkok metropolitan area.

In spite of doctor shortages there is some improvement in the health sector generally. The contribution of the health and medical sector to the regional GNP has increased at an average annual rate of 10 percent over the past five years; the number of health stations has almost doubled; and campaigns against malaria, yaws, smallpox, cholera, tuberculosis and other diseases have reduced the incidence of these diseases.^{2/}

7.3 Budgets

Historic budget data indicate, in terms of growth rates and percentage changes of Northeast to whole Kingdom, that public health efforts in the Northeast have expanded more quickly than for the nation as a whole. Thus Northeast allocations increased from 9.6 percent in 1961 to 13.9 percent in 1960.^{3/}

The rate of growth for the national health budget was 254.5 percent (exclusive of water supply) or 17.0 percent per year from 1961 to 1969, while the reported budgets for the Northeast increased 416.5 percent or 22.5 percent per year in the same period. This indicates that per capita health care

^{1/} The private sector includes one 10 bed hospital, clinics, pharmacies and other facilities and staff for which no regional data were obtained.

^{2/} J. Biebrager & Z. J. Buzo, Op. Cit.

^{3/} See Appendix Table H-3 for detail.

TABLE 7-1

BASIC HEALTH FACILITIES

Northeast Thailand

1960, 1966, 1970

	<u>1960</u>	<u>1966</u>	<u>1970</u>
General Hospitals	15	17	17
General Hospital Beds	1,950 ^e	2,695	3,722
Psychiatric Hospitals	2	2	3
Health Stations			
First Class	19	56	59
Second Class	155	306	599
Midwifery (Third Class)		383	590
Doctors (General Hospitals) <u>1/</u>	125 ^e	156	148
Nurses (General Hospitals)	326	382	486

1/ Includes Dentists

(e - estimates)

- Sources:
- a) Division of Vital Statistics, Officer of Under Secretary, MoPH.
 - b) Statistical Report, Department of Medical Services, MoPH, 1966.
 - c) Social Projects Division, NSO

TABLE 7-2
 SELECTED PUBLIC HEALTH DATA
 Thailand Regions
 1970

Region	Population Per					
	General Hospital (000)	General Hospital Bed	Psychiatric Hospital (000)	Doctor (Public) (000)	Nurse (000)	First Class Health Center (000)
Bangkok/Thonburi	668	971	890	17	6.0	-
Central (Excludes B/T)	304	1,699	4,506	41	15.0	127
South	267	1,920	2,400	44	19.0	120
North	439	2,670	4,112	63	19.0	161
Northeast	729	3,332	4,133	84	26.0	210

Source: Social Projects Division, NEDB.

in the Northeast has been given greater attention relative to the whole Kingdom. Actual expenditures for this period in the Northeast, as indicated by Health Ministry officials, have been virtually equivalent to budget allocations.

7.4 Health Sector Policy Objectives

The principal policy objectives in public health for the Northeast are as follows:

a) to extend both curative and preventive health service into the remote rural areas;

b) to promote the adoption of recommended health practices among the population;

c) to expand the health infrastructure, particularly in rural Northeast Thailand, to levels commensurate with national standards;

d) to increase the efficiency of available manpower and physical resources by promoting cooperation between various programs and departments, which would eliminate duplication of services, and relieve highly trained personnel of administrative tasks.

e) to expand the family planning program in line with the National objective of reaching population growth.

7.5 Targets

7.5.1 Health Centers - Recommended Health Department standards have recently been revised to suggest one first station class for each 50,000 population and in addition one second class station for each tambon, plus midwiferies (third class stations) for each 5,000 population not otherwise served. For the Northeast this would mean 300 first class stations (one in each amphoe and about 150 in the larger tambons), and 1,200 second class stations to cover the remaining tambons. To the extent that midwifery services are provided at first and second class centers, a balance of 1,500 midwifery units will be needed for the rural areas not conveniently served by first and second class stations.1/

1/ In addition the concept of Special Class health stations has recently been introduced with one unit operating in the Northeast at Banphai. These stations have expanded and specialized facilities.

In recognition of the Northeast's lag behind the rest of the country in health facilities, the Public Health Ministry has decided to concentrate on the development of health stations in the Northeast by allocating to the region one-half of the projected national health facilities targets. This would mean providing the following additions:

- First class station - 50 or ten per year*
- Second class station - 690 or 138 per year*
- Midwifery centers - 500 or 100 per year*

* Recent comments received from the Ministry of Health indicate that the RTG is planning to construct 8,109 and 54 first, second and midwiferies health stations per year vs the figures shown here.

If these targets are followed, by 1976 the Northeast will have:

		<u>Health Stations Required</u>	
(60 + 50)	or	110 out of	300 1st class
(659+690-45) <u>1/</u>	or	1,304 out of	1,200 2nd class
(732+500-75) <u>1/</u>	or	957 out of	1,500 3rd class

This represents a substantial increase in facilities over the existing number of health stations.

Since the Northeast targets would result in an excess of second class stations, with shortages remaining in first and third class facilities, a revised program is recommended as shown in Table 7-3. This program assumes an equivalent budget as originally contemplated by the Health Department, but it reallocates the cost of 104 second class centers 2/ to more first and third class centers. The revised targets 3/ are included in Table 7-3.

1/ Allows for 45 2nd class stations to be upgraded to 1st class and 75 midwiferies to be upgraded to 2nd class stations.

2/ 149 in excess of these required by 1976, less 45 needed to replace those upgraded first class centers.

3/ Based on diverting \$22,880,000 from proposed second class centers to \$10,000,000 for first class and \$12,880,000 to third class centers.

TABLE 7-3

HEALTH CENTERS
Construction Targets and Preliminary Budgets
Northeast Thailand
1972 to 1976

	Existing 1970 #	Additions 1971 ^{1/}		1972		1973		1974		1975		1976		Additions 1972-76		Planned 1976 #
				#	¥ mil.	#	¥ mil.	#	¥ mil.	#	¥ mil.	#	¥ mil.	#	¥ mil.	
1st Class	59	1	Addition	12	10.2	12	10.2	12	10.2	12	10.2	12	10.2	60	51.0	120
			New	3	3.0	3	3.0	3	3.0	3	3.0	3	3.0	15	15.0	
			Upgrade	9	7.2	9	7.2	9	7.2	9	7.2	9	7.2	45	36	
			(Higher Target)	12	(10.2)	12	(10.2)	14	(12.2)	15	(14.0)	16	(15.8)	69	(62.4)	(129)
				(3+9)		(3+9)		(5+9)		(5+10)		(5+11)		(21+48)		
2nd Class	599	60 Const. required	Net Addition	108		108		108		108		109		541		1,200
			New	62	13.64	62	13.64	62	13.64	62	13.64	62	13.86	311 ^{2/}	68.42	
			Upgrade	55	9.35	55	9.35	55	9.35	55	9.35	55	9.35	275	46.75	
			(Higher Target)	108	(22.99)	86+55	(22.99)	86+55	(28.27)	86+55	(28.27)	87+55	(28.49)	658 ^{2/}	(131.0)	(1,272)
3rd Class	590	142	Construction	146	8.03	147	8.08	147	8.08	147	8.08	147	8.08	734 ^{3/}	40.35	1,191
Midwiferies			Net Addition	91		92		92		92		92		459		
					41.27		41.27		41.27		41.27		41.49		206.52	
			(Construction Budget required)		65.5		74.0		83.0		92.5		103.0		418.0	
			(Operational Budget estimate)													
			Total		107		115		124		134		144		624	
			Higher Target Const.		41.2		41.3		(48.6)		(50.4)		(52.4)		(233.8)	
			Operational		65.5		74.0		(99)		(107)		(114)		(459)	
			Total		107		115		(147)		(157)		(166)		(693)	

^{1/} Based on 2nd Plan targets (50% of National)

^{2/} Deduct 45 units which were upgraded to 1st class

^{3/} Deduct 275 units which were upgraded to 2nd class

Source: NEED/PAG ESTIMATES

7.5.2 Manpower Requirements - Training programs at the national level are said to be slowly producing the required practitioners.^{1/} Accordingly the Health Department has now upgraded the staffing pattern of health centers. Whereas each first class center was supposed to have a professional staff of 9, this has been raised to 15;^{2/} each second class station staff would be increased from two to three (from three to four at the amphoe level), and midwiferies would continue to be staffed by one midwife.

The proposed staffing is as follows.

- 1st class centers : 1 physician, 3 nurses, 3 sanitarians, 3 practical nurses, 2 midwives, 1 technician, 1 dental technician, 1 clerk
- 2nd class centers : 1 practical nurse, 1 sanitarian, 1 midwife
- 3rd class centers : 1 midwife

Table 7-4 indicates the staffing requirements in accordance with the health center targets noted above. It is assumed that the recommended staff levels can be achieved by 1976, although this will be difficult in view of existing shortages which must be filled, and the difficulty of attracting and holding physicians, and trained nurses in the rural areas.

7.5.3 Higher Target Alternative - Since the health center program represents one of the most decentralized of all government services, it has the greatest impact potential on the rural population. Priority to its extension is, therefore, recommended over other programs. Substantial expansion of training medical personnel is being contemplated at the national level. A higher level target beginning with 1974 is suggested, with 153 amphoe and 1,248 tambon in the Northeast. It will be possible under the higher target to have 129 first class health stations located in 129 amphoe towns by 1976. Together with 17 amphoes, including 15 muang amphoes now serviced by provincial hospitals, 146 of 153 amphoes will have hospitals or first class health centers by 1976. The remaining seven amphoes can be serviced by second class health centers (and can be upgraded to first class centers after 1976). The high 1976 target for second class stations recommended

^{1/} See "Public Health in Thailand", Ministry of Public Health (1968).

^{2/} Few in fact now have a staff of nine in the Northeast.

TABLE 7-4

(Abbreviated)
 RECOMMENDED NUMBER OF HEALTH CENTERS
 AND STAFFING REQUIREMENTS
 Northeast Thailand
 1971 - 1976

	1971 ^e	1972	1973	1974	1975	1976	Net Increase 1971-1976
Stations:							
First Class	60	72	84	98	113	129	69
Second Class	659	767	875	1,007	1,139	1,272	613
Third Class	732	823	912	1,007	1,099	1,191	459
Staffing:							
Doctors	50	64	78	94	113	129	79
Nurses	60	120	180	249	318	387	327
Practical Nurses	-	280	570	890	1,218	1,530	1,530
Sanitarians	779	935	1,091	1,280	1,469	1,659	880
Midwives	1,451	1,686	1,922	2,188	2,454	2,721	1,270
Laboratory Technicians	-	24	48	75	102	129	129
Dental Technicians	-	24	48	75	102	129	129
Clerks	-	24	48	75	102	129	129

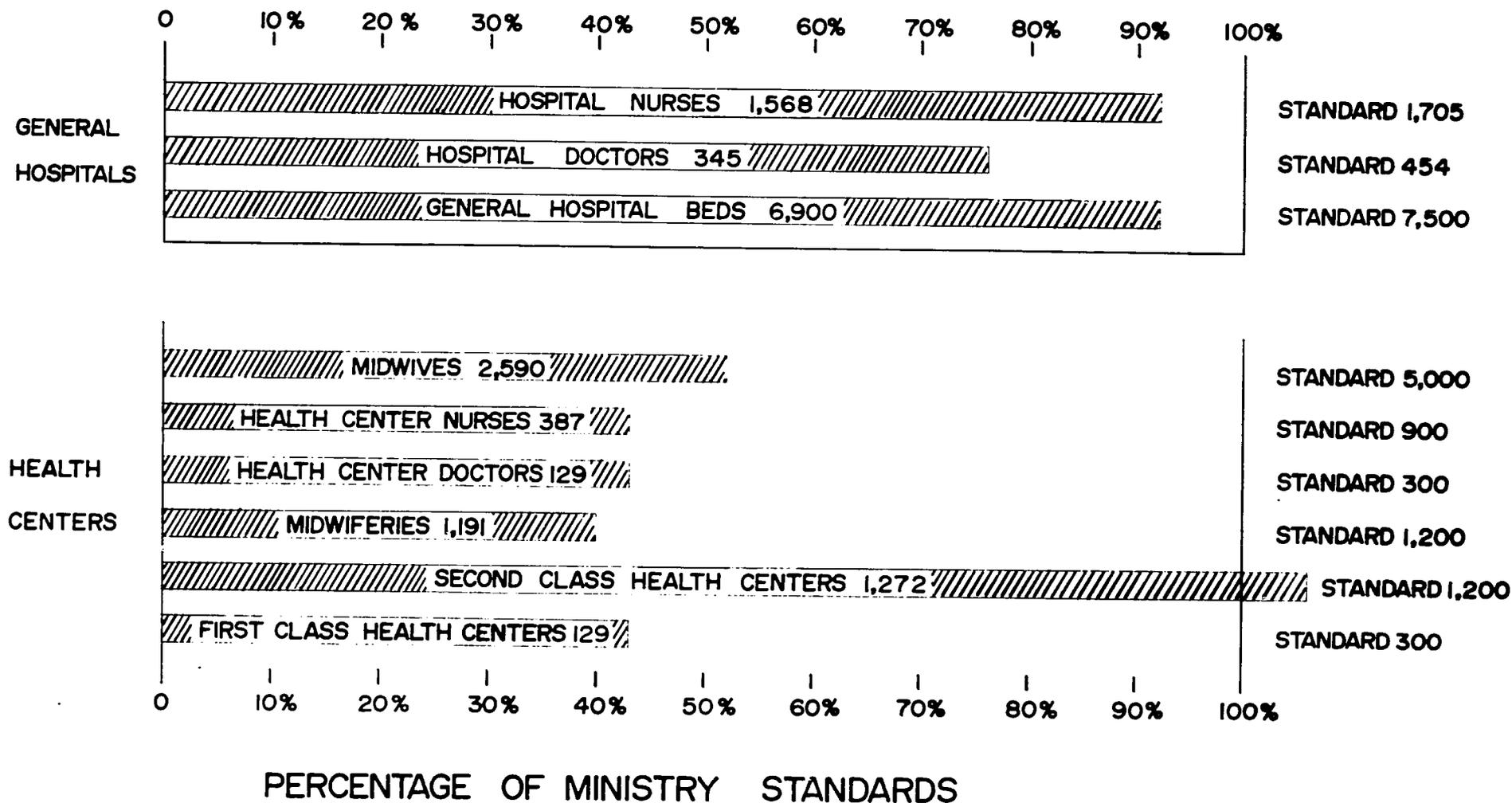
NOTE: Consideration of Special Class Stations not included.

Source: NEED/PAG

(e - estimate)

CHART 7-1

NORTHEAST THAILAND PUBLIC HEALTH FACILITIES AND STAFF 1976 TARGETS RELATED TO MINISTRY OF PUBLIC HEALTH STANDARDS



here provides each tambon with this service (1,248 units). In addition 7 units for amphoes without first class facilities and 17 supplementary units to serve outlying areas of the larger changwat and district towns for a total of 1,272 by 1976 are recommended (1,248 + 24 or 1,272, 72 more than the lower target). Since the target for midwiferies was already accelerated in accordance with the revisions suggested above and since these will require more than one-half (1,060 of the 2,030) the midwives to be trained nationally, the same number of third class stations as before is recommended. The low and high targets are summarized as follows:

	Number of Facilities by 1976		
	1st Class	2nd Class	Midwiferies
Low	120	1,200	1,191
High	129	1,272	1,191

Added Staff Required

	<u>Doctor</u>	<u>Nurses</u>	<u>Sanitarians</u>	<u>Midwives</u>	<u>Practical Nurses</u>	<u>Other</u>
Low	70	360	781	1,180	1,440	360
High	79	387	880	1,270	1,530	387

As more staff become available, especially during the latter part of the plan period, this can be added to the existing first class health centers.

7.5.4 Hospital Beds - The WHO Survey in the Northeast indicates high bed use in the Northeast, and that this varies according to distance and time involved in reaching a hospital.^{1/} The study recommended a population to hospital bed ratio of 2000:1. This standard is used in establishing targets for hospital beds in the Northeast.

As of August 1970, there were 3,722 beds in the 17 provincial hospitals of the Northeast. In addition, the first class health stations contained nearly 600 beds and it is planned to add 120 beds per year (10 beds per first class station), or 600 beds during the Five Year Plan period under the minimum recommended program (or nearly 700 beds in accordance with the higher target). Health stations, however, provide only limited hospital facilities. They are rated arbitrarily, therefore, as one-half of the standard hospital bed service.

The Northeast's 1976 population is expected to reach 15 million, requiring 7,500 hospital beds to meet the 2,000

^{1/} J. Biebrager and Z. J. Buzo, Op. Cit.

population per bed standard.^{1/} The low and high targets (see Table 7-5) are based on meeting the 7,500 bed requirement by (a) a combination of general hospital and health center beds, and (b) by general hospital beds only. Alternative (a) represents an increase of 592 beds per year. Alternative (b) suggests 712 beds per year.^{2/} These rates of growth are compatible with nationwide targets for provincial hospital beds of 1,460 per year or a total of 7,300.^{3/} The proposals for the Northeast include a 400 bed hospital to be attached to the University of Khon Kaen Medical Center.

Based on Table 7-5 above there was one doctor for every 17.2 general hospital beds in the Northeast in 1966, and one doctor for every 25.1 beds in 1970. The number of beds for each nurse increased from 7.1 to 7.17 in the same period. While national plan targets for the Second Five Year Plan were to be one doctor for every 12 beds and one nurse for every four by 1971, these relationships were not obtained.

For 1976 the national targets for provincial hospitals are:

one doctor for every 16.7 beds;

one nurse for every 4.4 beds;

one nurse's aide for every 4.4 beds.

In addition provincial hospitals employ one or two dentists each, one pharmacist and a limited number of laboratory and other technicians, although laboratory work is usually performed by the nursing staff.

Applying the foregoing per bed ratios to the hospital program (exclusive of health centers) will require 265 more doctors, 1,038 more nurses and 1,243 more nurses' aides for the lower target of hospital beds suggested. While the nurse and nurse aide requirements can be met based on national targets, the requirement for doctors would usurp 71 percent of the planned increase in the number of provincial hospital physicians. With 40.5 percent of the nation's provincial hospital beds targeted for the Northeast, there would be insufficient

^{1/} See Chart 7-1.

^{2/} Another alternative would be to establish community clinics; however, this approach would increase considerably the cost per bed.

^{3/} Recently received comments from the M.P.H indicate a requirement of only 6,809 hospital beds.

TABLE 7-5

GENERAL HOSPITAL BED AND STAFF REQUIREMENTS
Northeast Thailand
1972 to 1976

Provincial	1970	1971 ^e	1972	1973	1974	1975	1976	Additions 1972 - 1976		
								Total	Per Year	Ratio of Nation & Targets
Hospital Beds (high target)	3722	3940	4452 (4572)	4964 (5204)	5476 (5836)	5988 (6468)	6900 ^{2/} (7500) ^{2/}	2960 (3560)	592 ^{2/} (712) ^{3/}	40.5 (48.8)
First Class Health Centers ^{1/} (high target)	295	300	360	420	480 (490)	540 (565)	600 (645)	300 (345)	60 -	60.0 (64.5)
Provincial Hospital Staff Requirements ^{2/}										
			<u>1976 Bed to Staff Ratios</u>							
Doctors		150	189	228	267	306	345	195	39	52.1
	20:1 ^{3/}	150	203	256	309	362	415	265	53	70.8
(high target)	16.7:1	150	(209)	(269)	(329)	(389)	(449)	(299)	(60)	(80.0)
Nurses	4.4:1	530	738	946	1153	1360	1568	1038	203	39.0
(high target)	4.4:1	530	(765)	(1000)	(1235)	(1470)	(1705)	(1175)	(235)	(43.4)
Nurses' Aides	4.4:1	325	583	841	1100	1359	1568	1243	259	31.2
(high target)	4.4:1	325	(601)	(876)	(1152)	(1428)	(1705)	(1380)	(276)	(42.2)

^{1/} Hospital Bed Equivalent

^{2/} Includes proposed 400 bed University of Khon Kaen Medical Center Hospital

^{3/} 20:1 is recommended level by consultant

Source: Compiled by NEED/PAG.

(e - estimate)

doctors for the provincial hospitals in other regions. For this reason the higher target of supplying one provincial hospital bed for every 2,000 population in the Northeast by 1976 is not recommended.

If the bed to doctor ratio is changed to 20:1, the doctor requirement will be reduced to 345 (instead of 415), for a five year increase of 195, which represents 52.1 percent of the national program for provincial hospital doctors. The 20:1 ratio is considered acceptable by Ministry officials. However, that there may not be sufficient incentives for these additional doctors actually to locate in the Northeast will continue to be a problem. The proposed practice of compulsory internship of at least two years service in provincial hospitals is not a long-run solution.

7.5.5 Other Program Targets - Targets for the many various programs operated by the Ministry of Public Health are indicated in connection with proposed budgets as given in the following section.

7.6 Plan Budgets

7.6.1 Health Centers - The required budget for the health center program is incorporated in Table 7-3. The construction costs used are based on estimates provided by the Department of Health; they are as follows (1972 to 1976 average):

<u>Type</u>	<u>New</u>	<u>Upgraded</u>
1st class centers	¥ 1,000,000	800,000
2nd class centers	220,000	170,000
Midwiferies	55,000	-

This requires a construction cost for the combined health center program amounting to ¥206.6 million for the plan period at the lower target and ¥233.8 million for the higher target.

7.6.2 Hospital Beds - For the purpose of this report only a rough calculation of provincial hospital budget requirements were made.

This is shown as follows:

	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1972-76</u>	<u>%NE of WK</u>
Bed Ratio NE/WK %	21.6	22.5	23.3	24.0	24.6		
National Budget \$ million	300	340	380	420	460	1,900	
Northeast Budget \$ million	64.8	76.5	88.5	100.8	113.2	443.8	23.4%
High Target NE/WK %	22.2	23.6	24.9	25.9	26.9		
\$ million	66.6	80.2	94.6	108.8	123.7	473.9	24.9%

7.6.3 Other Program Budgets - Department of Health

Providing health centers and provincial hospital beds represent the two largest programs in the public health sector. There are several additional programs concerned with health care in the Northeast and administered principally by three Ministry Departments. National targets have been established for each of these programs; however, budgets for these targets have been received to date only from the Department of Health.

The budget allocations are given in Table 7-6.1/ It should be noted that the proposed budgets reflect Health Department requests. It is urged that the health programs be supported and given a high priority to the extent that among their chief benefits is the increasing capacity of the Department's services to be extended into remote areas. However, some changes in allocation among the programs may be in order.2/

7.6.4 Programs and Budgets - Other Departments and Agencies

For programs operated by other than the Health Department, the following budgets were estimated for the Northeast.

1/ Village Water Supply excluded; see Chapter VI.

2/ For example, more emphasis might be given to maternal health care and less to Venereal Disease.

TABLE 7-6
PUBLIC HEALTH PROGRAM BUDGETS
Northeast Thailand
1972 to 1976
(฿ Million)

Program	1972	1973	1974	1975	1976	1972-1976
Venereal Disease Control	15.8	20.4	25.1	29.6	34.4	125.3
Maternal and Child Health	23.1	23.7	22.1	26.5	22.9	118.3
Leprosy Control	15.0	15.4	15.8	16.3	16.7	79.2
Community Health Development	11.5	12.7	14.0	15.4	16.9	70.5
Training Health Officials	8.6	8.3	8.9	7.5	13.0	46.3
Tuberculosis Control	6.0	6.9	9.5	8.0	8.1	38.5
National Epidemiology	2.7	3.1	3.4	3.7	3.9	16.8
Health Education	2.1	4.0	2.9	3.3	3.7	16.0
Rural Nutrition	2.0	2.4	2.9	3.5	4.1	14.9
School Health	.9	1.3	1.7	2.1	2.5	8.5
Occupational Health ^{1/}	1.7	1.2	1.1	1.2	1.3	6.5
Water Pollution Control	.7	.7	.7	.8	.8	3.7
Trachoma and Conjunctivitis Control	.3	.6	.6	.7	.7	2.9
Hemorrhagic Fever Control	.4	.4	.5	.5	.6	2.4
Chinese Liver Fluke Control	.4	.3	.3	.3	.3	1.6
Total ฿ million	91.2	101.4	109.5	119.4	129.9	551.40

^{1/} One-third of national program allocation.

	<u>฿ million/year</u>	<u>Five Year Total</u>
a) Malaria control	10	50
b) Psychiatric hospitals	30	150
c) Nurses Training <u>1/</u>	9	45
d) Drug Addiction & Misc.	4	<u>20</u>
Total ฿ million		265

In addition, new programs are to include:

e) Family Planning	8	40
f) Mobile Dental Units	0.25	1.25
g) University of Khon Kean Health Science Center		80

The Public Health program recommended here does not include village potable water supply.2/ This is discussed in the section on community facilities.

7.6.5 Foreign Assistance - Programs for which loans and grants have been indicated include:3/

<u>Program</u>	<u>Estimated Funding</u> (฿ million)
Trachoma	.85
Epidemiology	1.65
Nutrition	1.22

1/ Includes one nurse school at Korat; one for practical nurses at Ubon and one midwifery school at Khon Kaen. Additional student nurses are now being enrolled at the University of Khon Kaen.

2/ Also special support funds for government enterprise and private hospital support have been considered.

3/ Based on Health Department Proposals which assumes 50% allocated to the Northeast.

<u>Program</u>	<u>Estimated Funding</u> (฿ million)
Tuberculosis	3.00
Maternal & Child Health Care	9.00
Leprosy	<u>1.70</u>
Department of Health Total	17.42
University of Khon Kaen Health Science Center	80.0
Other Miscellaneous (Dental Care, Health Training, etc.)	<u>.60</u>
Total suggested to date	<u><u>98.02</u></u>

Assistance for public health in Thailand was not specifically indicated by the consultative group meeting on external assistance requirements for Thailand. Since medical facilities and services (including family planning) require substantial technical assistance and equipment inputs,^{1/} an estimated 40 percent of the public health budget should be the target for foreign aid financing. This ratio would be similar to the Public Health assistance in the Second Plan period.

7.7 Planned Budget Summary

The following represents the proposed public health program budget tables recommended for the Third Plan in millions of ฿:

<u>Targets</u>	<u>Low</u>	<u>High</u>	<u>Recommended</u>
Health Centers	624	693	693
Other Department of Health Programs ^{2/}	551	551	551
Provincial Hospital Beds	444	474	444
Family Planning	40	40	40
University Health Science Center	15	18	18

^{1/} Laboratories, medications, vehicles including ambulances, medical and dental tools, etc.

^{2/} Excluded Potable Water Supply Program.

TABLE 7-7

PUBLIC HEALTH PROGRAM SUMMARY BUDGET
 Northeast Thailand
 1972-1976
 (฿ million)

<u>Project</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1972-1976</u>
Health Center Construction						
69 1st class	10.2	10.2	12.2	14.0	15.8	62.4
658 2nd class	23.0	23.0	28.3	28.3	28.5	131.4
734 Midwiferies	8.0	8.1	8.1	8.1	8.1	40.4
Operating Costs	65.5	74.0	99.0	107.0	114.0	459.0
<hr/>						
Health Center Program Total	106.7	115.3	147.6	157.4	166.4	693.4
256 Provincial Hospital Beds	64.8	76.5	88.5	100.8	113.2	443.8
Other Department of Health Program	91.2	101.4	109.5	119.4	129.9	551.4
Family Planning	8.0	8.0	8.0	8.0	8.0	40.0
Other Programs	53.2	53.2	53.2	53.2	53.2	266.0
Khon Kaen University Health Science Center	3.0	4.0	4.0	4.0	3.0	18.0
<hr/>						
Total Public Health Development Budget	326.9	358.4	410.8	442.8	473.7	2,012.6

Source: Estimated by NEED/PAG

CHAPTER VIII EDUCATION

CHAPTER VIII

EDUCATION

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CHAPTER VIII

EDUCATION SECTOR PLAN

Northeast Thailand
1972 - 1976

8.1 Introduction

Benefits from general education are accepted as a basic prerequisite to social and economic development. As such, education is considered today as a critical long term investment, and not merely a service. The development and achievement of a more complex agriculture presuppose a literate population which can cope with abstract ideas and their organization; therefore, educational development requirements are crucial to the Northeast plan.

An estimated nine out of ten eligible school age children in the Northeast are enrolled in lower elementary school (Prathom 1 - 4). However, many of these children do not attend regularly for a number of reasons, and approximately 25 percent of those who enrolled fail to gain promotion to the next highest grade each year. Although the percentage of students who finish Prathom 4 and go on to Prathom 5 has increased slightly each year during the past decade, by 1969 barely one in five who finished Prathom 4 had entered Prathom 5; and only about two in three who finished Prathom 7 enrolled in M.S.1.1/ In short over 90 percent of those who enroll in Prathom 1 never enroll in M.S.1. Several factors account for this:

- a) the lack of adequate school facilities, and particularly, qualified teachers at all grade levels;
- b) inability to pay for school materials, uniforms, and room and board when higher grade schools are not locally available;
- c) generally low quality of education in terms of curriculum and inability to enforce standards and attendance.

1/ By contrast 30 to 40 percent continue from Prathom 4 to Prathom 5 in other sections of the Kingdom, and over 80 percent continue to the upper elementary in Bangkok. The foregoing is based on the 1967 School and Teacher Census.

The enrollment data for the Northeast indicates that the percentage of students who finished Prathom 4, and continued in Prathom 5 increased from about 10 percent in 1964 to 22 percent in 1970. However, those finishing Prathom 7 and going on to M.S.1. decreased because of lack of available facilities. Drop out rates between secondary grades M.S.3 to M.S.4 has also been increasing, although only slightly and some of this is due to transfers to schools outside the region. Those secondary pupils who can afford it are sent to the Bangkok metropolitan area for schooling. As a result enrollments in secondary schools in the Northeast is small, with only 16 percent of the national total in 1968. Approximately 700 pupils attended M.S.5 in 1968 (4,000 in 1970) in Northeastern schools out of a population of 12 million.

There are no estimates to determine how many of those trained outside of the region return to increase the region's skilled manpower potential; however, observations indicate that with limited job opportunities, few are likely to settle in the Northeast.

The Northeast's education budget fluctuated between about 20 percent and 25 percent of the national total budget for education from 1961 to 1969 and has gained as a percentage of GRP.^{1/} The latter, however, must be qualified since repeater rates make elementary education in the Northeast more expensive than for comparable education in the country as a whole. For this reason the Northeast's budget for elementary grades as a percent of the total Northeast education budget has not changed much in the last five years, while at the national level the percentage spent for elementary school education, especially Prathom 1 to 4, has been decreasing.

8.2 Education Policy

The National Education Council generally formulates education policy and has drafted the proposed Third Plan, which considers all aspects including curriculum context, teaching methods, etc. This policy applies to the regions as well, with the following special requirements suggested.

^{1/} These percentages are based on Bureau of the Budget data on sector budget totals.

a) increase the Northeast's share of the national education development budget in order to reverse present trends of rising pupil/teacher ratios, failure rates, lowering of teacher qualifications, declining teacher supply, etc;

b) discourage the need for secondary and vocational students to receive their schooling outside of the region by providing more adequate facilities locally;

c) provide education which is relevant to the needs for a rural developing region; (the vast majority of those who enroll in school will not aspire to attend the university). Introduce materials, at least on the upper elementary level, on rural living, agriculture, community development, health, nutrition, sanitation and so on;

d) make relevant terminal vocational education available to those who do not elect or cannot qualify for academic education beyond grade 7; provide better vocational guidance toward specific regional manpower requirements based on the collective thinking of appropriate ministries affecting agriculture; commerce and industry.

8.3 Targets - General Education

8.3.1 Prathom 1 - 7 - Targets have been estimated on the assumption that the RTG will continue a policy of universal education for grades 1 to 4 and that enrollment at all other grade levels is to be increased, with universal education achieved in grades 1 to 7 by 1987.

Several key factors are used to determine targets. Budget requirements (and supplementary program/project inputs) are then indicated at varying target levels. These factors include:

- a) population;
- b) student/teacher ratios;
- c) dropout rates, especially between Prathom 4 and 5, and between Prathom 7 and M.S.1;
- d) regional share of student enrollment;
- e) enrollment share of population.

Basic requirements for the number of teachers, schools, and classrooms have been calculated. The estimates are based on enrollment forecasts by the Educational Planning Office of the Ministry of Education and assume a "moderate" level of population growth at 2.9 percent a year for the Northeast during the plan period.

Table 8-1 shows the anticipated enrollment and teacher requirement at elementary levels under the following conditions:

Alternative I. Student/teacher ratios are to be maintained at the present 38 to 1 level.

Alternative II. A 35 to 1 student/teacher ratio by 1976.

Alternative III. A 35 to 1 student/teacher ratio for Prathom 1 to 4, and a 30 to 1 student/teacher ratio for Prathom 5 to 7.

Table 8-1 indicates the number of additional teachers required by 1976 under these alternatives.

In addition, the following adjustments to the computed teacher totals must be considered:

a) a target of reducing failure rates (estimated at 30 percent in Prathom 1) by one half to 15 percent will create a drop in enrollment by 1976 of about 80,000 resulting in a teacher saving (at 35:1) of about 2,300 staff;

b) since enrollment data includes private schools, a deduction of 5 percent in the projections of teaching staff is made.

Alternative I. 10,350^{1/}more teachers are needed for Prathom 1 to 7 if the present student/teacher ratio of 38:1 is to continue.

Alternative II. A minimum requirement at 13,000^{2/} additional teachers must be targeted, based on:

- a) 35:1 student/teacher ratio, Prathom 1-7;
- b) reduction in failure rates by one half;
- c) decrease in the dropout rate to 69 percent for Prathom 4 to Prathom 5.

Alternative III. A higher level requirement of 14,300^{3/} additional teachers based on:

- a) 35:1 student/teacher ratio Prathom 1-4; 30:1 for Prathom 5-7;
- b) reduction in failure rates by one half;
- c) decrease in the dropout rate to 69 percent for Prathom 4 to Prathom 5.

^{1/} 10,895 less 5 percent,

^{2/} 16,000 less 2,300 (from reduction in failure rates) less 5 percent of 13,700.

^{3/} 17,400 less 2,300 (from reduction in failure rates) less 5 percent of 15,100.

TABLE 0-1

PRIMARY SCHOOL DEVELOPMENT COST REQUIREMENT

(Teacher Salaries and Construction)
Northeast Thailand, 1972 - 1976

	1972	1973	1974	1975	1976	1972 - 1976
Enrollment (000) Following Year Increase	(1,891)	(1,972)	(2,051)	(2,137)	(2,237)	
	(81)	(79)	(86)	(100)	(120)	
ALTERNATIVE I						
Teachers Required (000)	(49.8)	(51.9)	(54.0)	(56.2)	(58.9)	
Annual Cost ^{1/} (Mil.฿)	716.6	768.0	820.4	877.3	941.9	4,124.2
Required New Facilities Cost ^{2/} (Mil.฿)	243.0	237.0	258.0	300.0	360.0	1,398.0
Total Budget (Mil.฿)	959.6	1,005.0	1,078.4	1,177.3	1,301.9	5,522.2
ALTERNATIVE II						
Teachers Required (000)	(50.6)	(53.6)	(56.7)	(60.0)	(63.9)	
Annual Cost ^{1/} (Mil.฿)	728.1	793.1	861.2	936.4	1,022.6	4,341.4
Required New Facilities Cost ^{2/} (Mil.฿)	243.0	237.0	258.0	300.0	360.0	1,398.0
Total Budget (Mil.฿)	971.1	1,030.1	1,119.2	1,236.4	1,382.6	5,739.4
ALTERNATIVE III						
Teachers Required (000)	(50.6)	(53.6)	(56.8)	(61.1)	(65.4)	
Annual Salary ^{1/} (Mil.฿)	728.1	793.1	863.6	952.8	1,046.0	4,383.6
Required New Facilities Cost ^{2/} (Mil.฿)	243.0	237.0	258.0	300.0	360.0	1,398.0
Total Budget (Mil.฿)	971.1	1,030.1	1,121.6	1,252.8	1,406.0	5,781.6

^{1/} @ 14,400 ฿ per teacher in 1972 with annual ฿ 400 increments to ฿ 16,000 (includes salaries and offer costs).

^{2/} @ 3,000 ฿ per additional student.

Note: Number of teachers in 1971 = 48,000.

Source: Education Planning Division, MoE.

(฿ million)

	<u>Teacher Costs</u>	<u>Classroom Costs</u>	<u>Total Costs</u>
Alternative I	4,124.2	1,398.0	5,522.2
Alternative II ,	4,314.4	1,398.0	5,739.4
Alternative III	4,389.3	1,398.0	5,781.6

To the extent that the supply of teachers can be met by 1976 (See Section 8.6 below), Alternative III is recommended.

Adjusting for lower failure rates, and for estimated private school enrollment (Prathom 1 to 7) of 5 percent, the following primary school budget totals for the Five Year Plan period are obtained:

Alternative I	Million ฿ 5,245.9
Alternative II ^{1/}	Million ฿ 4,892.3
Alternative III ^{1/}	Million ฿ 4,932.4

8.4.2 Budgets - Secondary Schools - Table 8-2 presents budget requirements for secondary schooling (including vocational M.S.1 to 6) given two alternative enrollment targets. A 25 percent deduction has been allowed for private school enrollments.

Alternative I

Target (161,000 less 25 Percent) = 121,000 students,
6,050 teachers

Student increment requiring new facilities = 51,000

Student/Teacher ratio 20:1 during Plan period

^{1/} Alternatives II and III assume failure rate reductions from 30 percent to 15 percent by 1976 resulting in teacher savings of 2,300 (or ฿ million 349.6 at average salary of 15,200 for five years), and classroom cost savings for about 80,000 students of ฿ 240 million.

SCHOOL ENROLLMENTS AND NUMBER OF TEACHERS NORTHEAST THAILAND THIRD PLAN

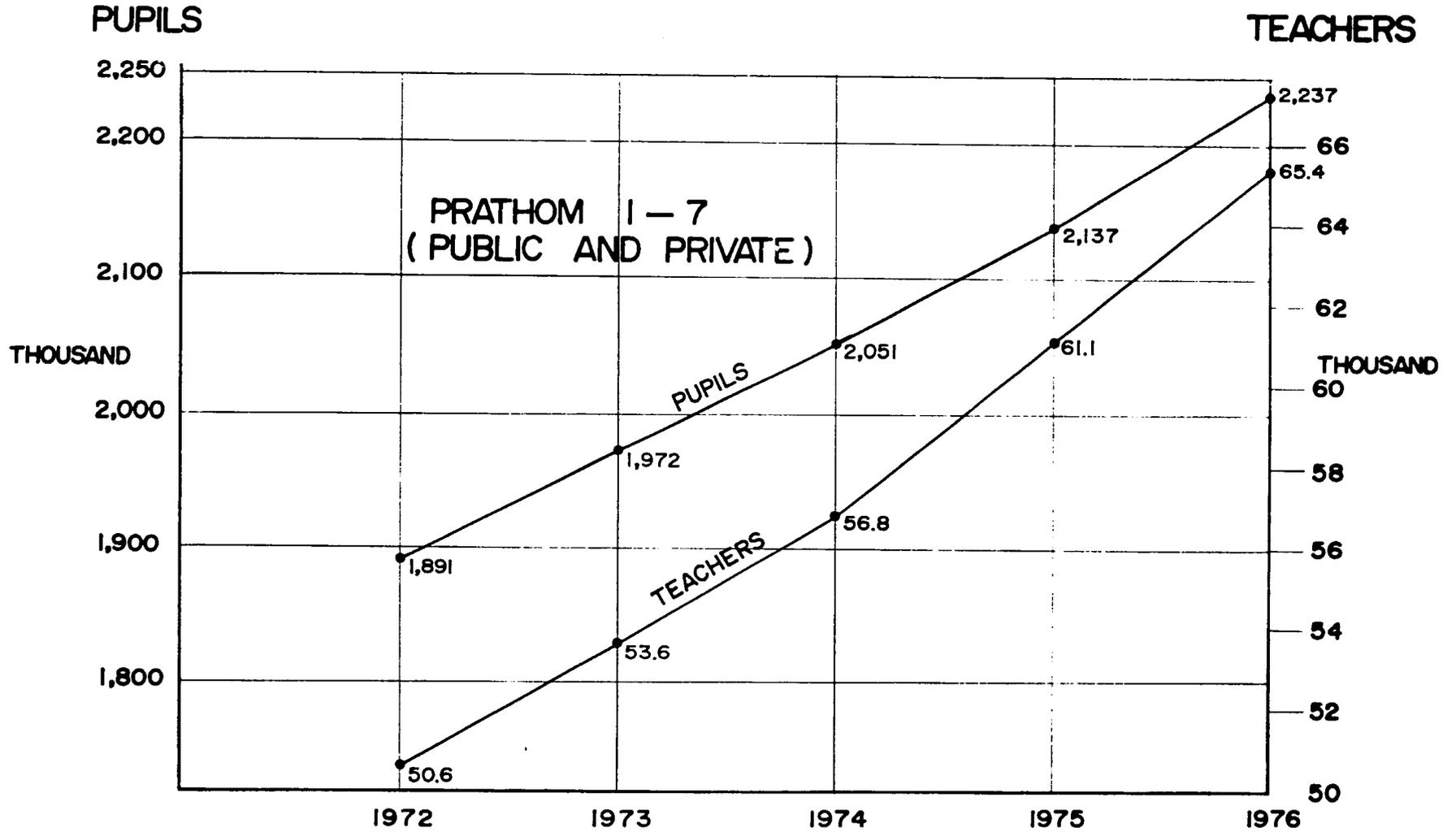


TABLE 8-2

SECONDARY EDUCATION

ENROLLMENT AND BUDGET TARGETS
Northeast Thailand
1972 - 1976

	1972	1973	1974	1975	1976	1972-76
ALTERNATIVE I						
Enrollment (000)	(81)	(88)	(99)	(110)	(121)	
Following Year Increase (000)	(7)	(11)	(11)	(11)	(11)	
Required New Facilities Cost <u>1/</u> (฿ Million)	52.5	82.5	82.5	82.5	82.5	382.5
Teachers (ST = 20:1)	(4050)	(4400)	(4590)	(5500)	(6050)	
Annual Teacher Cost <u>2/</u> (฿ Million)	81.0	92.4	108.9	126.5	145.2	554.0
Total Cost (฿ Million)	133.5	174.9	191.4	209.0	227.7	936.5
ALTERNATIVE II						
Enrollment (000)	(81)	(93)	(111)	(136)	(170)	
Following Year Increase (000)	(12)	(18)	(25)	(34)	(45)	
New Facilities Cost <u>1/</u> (฿ Million)	90.0	135.0	187.5	255.0	337.5	1005.0
Teachers (ST = 20:1 1972 16:1 1976)	(4050)	(4900)	(6150)	(8000)	(10650)	
Annual Teacher Cost (฿ Million)	81.0	102.9	135.3	184.0	255.6	758.8
Total Cost (฿ Million)	171.0	237.9	322.8	439.0	593.1	1763.8

1/ @ 7,500 Baht per additional student

2/ @ 20,000 Baht per teacher (1972)
to 24,000 Baht per teacher 1976) (salary and other costs)

ALT. I equals 18 percent of National enrollment

ALT. II equals 25 percent of National enrollment

Note: Number of teachers in 1971 = 3,500

Source: Education Planning Office, MoE.

VIII-8

Classroom costs per student = ₦ 7,500 (1972 to 1976 average) 1/

Cost per teacher = ₦ 22,000 (1972 to 1976 average) 2/

Total Classroom construction cost is ₦ 382.5 million

Total Instructional cost is ₦ 554.0 million

Total Secondary Education Development cost is ₦ 936.5 million

Alternative II

Target (226,000 less 25 percent) = 170,000 students;
10,650 teachers

Student increment requiring new facilities = 134,000

Student/Teacher ratio declining to 16:1 by 1976

Classroom costs per student = ₦ 7,500 (1972 to 1976 average)

Cost per teacher = ₦ 22,000 (1972 to 1976)

Total Classroom construction cost is ₦ 1,005.0 million

Total Instructional cost is ₦ 758.8 million

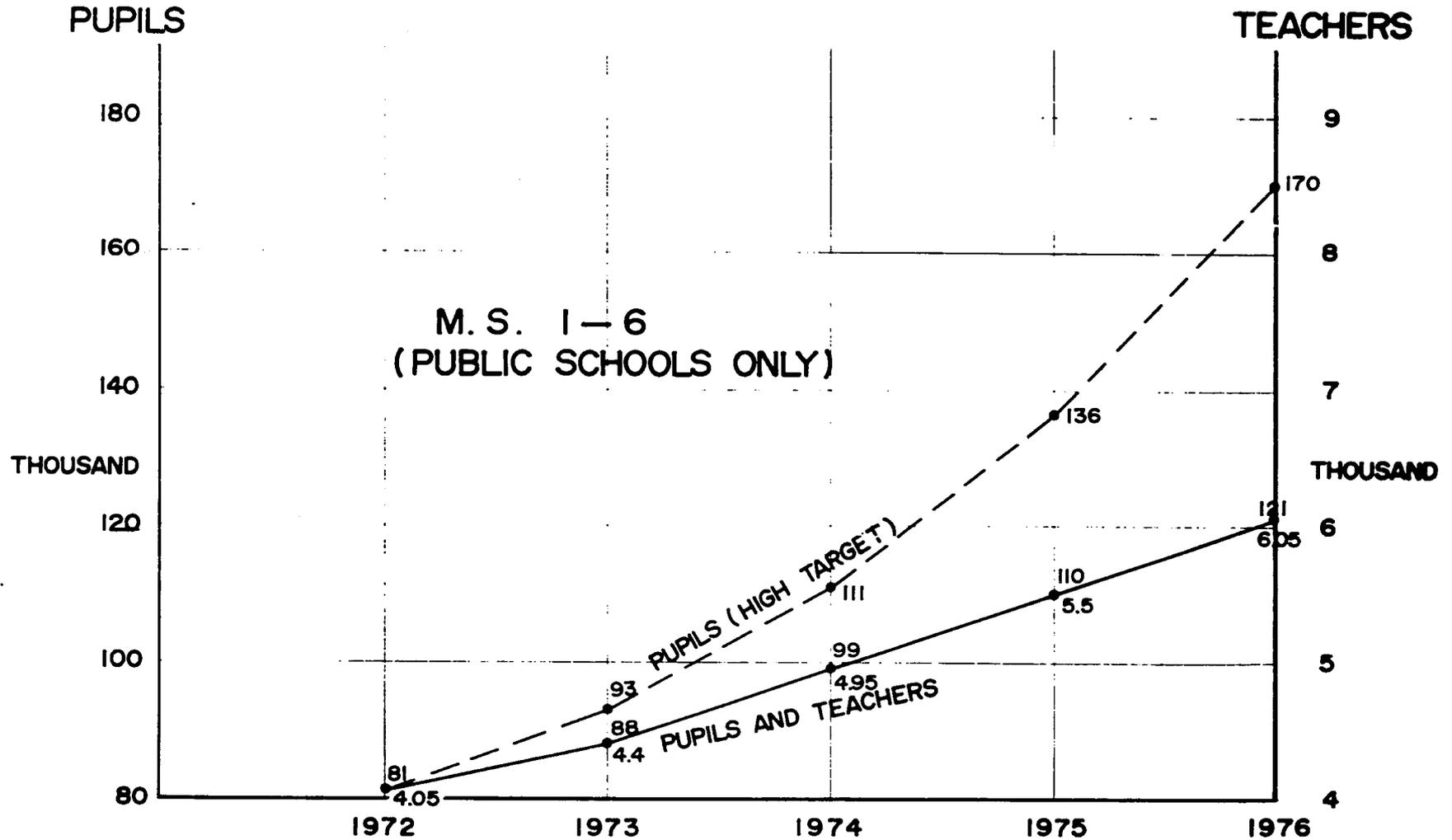
Total Secondary Education Development cost is ₦ 1,763.8 million

Alternative I is recommended as a minimum target whereas Alternative II requires an increment of secondary and vocational teachers in excess of what is likely to be supplied by 1976. Additional alternatives should be considered which would result in an output of students and teachers between the two target levels. Adjustments should be made during the plan period in accordance with teacher training output results.

1/ Secondary education, and especially vocational courses require more permanent structures and equipment than rural elementary schools, many of which typically use local facilities.

2/ Teacher cost estimated at 50 percent above elementary school teacher costs.

SCHOOL ENROLLMENTS AND NUMBER OF TEACHERS NORTHEAST THAILAND THIRD PLAN



8.5 Education Sector Programs and Projects

8.5.1 Teacher Training Prathom 1 - 7 - Table 8-3 summarizes the teaching staff requirements for the various alternative plans discussed in the previous sections. The estimates allow for a 7 percent retirement or attrition rate per year to replace staff 1/ in addition to the new teacher needs based on expanding enrollment. It is clear that achieving the recommended pupil/teacher ratio demands a substantial effort to provide the required supply of teachers. In accordance with Alternative II, 32,900 more elementary teachers or 6,600 per year are required by 1976, and for Alternative III the required number is 34,400 or 6,600 per year.

The current teacher college and training schools in the Northeast had an enrollment of about 2,000 trainees in 1969 compared with 22,000 in the Whole Kingdom. 2/ The Ministry of Education estimates that 80 percent of student teacher training enrollment enter the teaching profession after graduation. At present trends, then, the Northeast can supply only 1,600 of the 6,600 or 6,900 needed yearly for Prathom 1 to 7; thus 5,000 to 5,300 must be attracted from teacher training schools outside the region (assuming all those now trained in the Northeast will stay there).

Indication are that self-sufficiency in teacher certification are unlikely for the Northeast by 1976. Furthermore the problem is not only one of number, but also qualification of teachers. A substantial effort toward retraining and supplementary training for present teachers must be made.

Acceleration of the Northeast's teacher training effort is clearly indicated. However, specific program recommendations hinge on the availability of faculty at the various training institutions, which limits the growth of teacher training facilities. In recent years enrollments in teacher colleges have increased rapidly at the national level. 3/

1/ Based on Educational Planning Department, Ministry of Education estimates. (Another estimate of between 3.6 and 6.0 percent has been used by Nicholas Bennett in projecting Teacher Training enrollment).

2/ Based on Educational Planning Department, Ministry of Education estimates.

3/ See Education in Thailand Op. Cit., page 132.

TABLE 8-3

PRIMARY AND SECONDARY PUBLIC SCHOOL TEACHER REQUIREMENTS
Northeast Thailand
1972 - 1976

<u>Primary Schools</u>	<u>5 Year Requirement</u> ^{1/}	<u>Trained in N.E.</u>	<u>5 Year Supply Needed from Outside of Region</u>
<u>Alternative I</u>			
Replacements	17,400		
New	<u>10,400</u>		
Total	27,800	12,600 ^{2/}	15,000
<u>Alternative II</u>			
Replacements	17,800		
New	<u>15,100</u>		
Total	32,900	12,700 ^{2/}	20,200
<u>Alternative III</u>			
Replacements	17,900		
New	<u>16,500</u>		
Total	34,400	12,700 ^{2/}	21,700
<u>Secondary Schools</u>			
<u>Alternative I</u>			
Replacements	1,545		
New	<u>2,550</u>		
Total	4,095	800	3,295
<u>Alternative II</u>			
Replacements	1,860		
New	<u>7,150</u>		
Total	9,010	800	8,210

^{1/} Assumes 7 percent of teaching staff retires annually.

^{2/} Assumes elementary teacher training graduates can be expanded to 1,000 annually with 90 percent entering the profession by 1976, e.g.; 1972 - 1,600; 1973 - 2,000; 1974 - 2,500; 1975 - 3,000; 1976 - 3,600.

Source: NEED/PAG ESTIMATES

One more training school is scheduled to begin operation at Buriram by 1972. However, in order to curtail overhead costs in administrative and teacher training staff, a policy of expanding present facilities rather than building new training schools and colleges (including the University of Khon Kaen) is preferred. Also the current practice of using secondary school facilities to accelerate teacher training should be encouraged.

The cost per trainee in 1969 was $\text{฿} 10,000$ per year. For the Third Plan a cost of $\text{฿} 12,500$ is assumed. This allows for increased allowances and better housing in order to attract more training staff to the Northeastern schools. 1/

The target is for 4,000 graduates a year by 1976, requiring a budget of $\text{฿} 50$ million for that year. With improved teaching facilities and incentives it is assumed that by 1976, 90 percent (or 3,600) rather than 80 percent will actively enter the teaching profession. This will reduce the present deficit for elementary school requirements from 5,000 to 3,000, in order to meet the goal of 6,600 teachers entering by 1976.

The question remains: can an annual elementary school teacher deficit of 3,000 to 3,300 be supplied from training schools outside of the region? By 1976 the annual teacher certification rate at all levels will exceed 30,000 per year. 2/ Assuming 9,000 or 30 percent will enter private school and non-teaching occupations, 21,000 graduates will be available for all regions. This is sufficient to supply 7,200 teachers per year to the Northeast in accordance with the recommended alternative III target, and it is feasible to make up the Northeast's five year deficit of 21,700 elementary teachers from training programs outside the region.

8.5.2 Teacher Training - Secondary Schools - The two teacher target alternatives for public secondary schools require 6,000 and 10,650 respectively by 1976. Allowing for an annual 7 percent retirement rate this will require 4,095 or 9,010 (820 or 1,800 per year) more teachers during the Plan period in accordance with alternatives I and II. About 800 of these can be expected to be graduated from Khon Kaen University and the college of Education at Mahasarakham by 1976. These two sources will be

1/ See also Teacher Housing Project below.

2/ Bhuntin Attagara and Ratana Tanboontek, the Preparation of Teachers, Department of Teacher Training, 1970.

supplemented by a proposed Khon Kaen University Education Extension Division and together these facilities will eventually become the main source of supplying secondary school teachers in the Northeast. This Division would also assist in retraining and supplementing courses for present teachers. Meanwhile a secondary school teacher deficit of 3,300 to 8,200 will have to be made up from personnel trained outside of the region.

It is unlikely that the higher target needs of 8,200 more staff (1,640 annually) can be realized by 1976. Alternative I requires 3,300 teachers (or 660 annually to be imported to the region. This appears more reasonable. As accelerated training programs become feasible, targets should be revised periodically. Meanwhile, the problem remaining is not insufficient teacher trainee enrollment, but getting an adequate staff to teach the trainees. 1/

No separate budget is allocated here for the University of Khon Kaen as it is included in the higher education development budget. For the Teachers College at Mahasarakham a budget of ฿ 5 million by 1976, based on a targeted enrollment of 4,000, is recommended.

The combined elementary and secondary school teaching requirement in the Northeast is for 7,720 staff per year. This does not include private education needs and supplementary teachers for retraining, adult education and other miscellaneous programs. Combined teacher training establishments in both elementary and secondary schools should follow a policy of encouraging recruitment from amphoe and tambons with a view to placement in schools in the same communities. Developing a corps of indigenous teachers could alleviate teacher shortages and make the region more self-sufficient. Presently it is difficult to attract teachers to the region from the outside. A number of reasons account for this, such as lack of social services, lack of adequate housing and other fringe benefits, and unfavorable attitude toward living in the provinces generally.

Presently teachers salaries are low by Thai civil services standard (฿ 540 per month for lower elementary to ฿ 1,150 with a Thai Bachelor degree) and many have to supplement their income with outside jobs. 2/ This is difficult to do in the provinces. Teachers work long hours; they have heavy teaching loads; and

1/ Ibid.

2/ Education in Thailand, Op. Cit., p. 128.

many must assume extra teaching activities such as counseling student groups and so on. In such circumstances, teachers should be given extra compensation.

Consideration should be given to increasing the salaries of teachers generally in order to attract more persons to the profession. 1/ In addition every effort should be made by DOLA and the Ministry of Education to replace its Changwat and Amphoe administrative personnel who are qualified teachers, with other staff in order to get more teachers into the classrooms. 2/

8.5.3 Vocational Education - Because of the emphasis on building up agricultural productivity in the Northeast, particular attention is given in vocational education in agriculture.

Two of seven schools - Kalasin and Surin - are included in the LIVE (World Bank Loan for Improvement of Vocational Education) project. They are replacing all their old classroom buildings, dormitories, dining halls, laboratories, barn and work shops with modern structures.

It is recommended that all schools be brought up to the level of those in the LIVE program, with each school having a suitable operation and maintenance budget. An enrollment target of 4,000 students at $\text{฿ } 7,500$ per pupil to cover more adequate facilities, or $\text{฿ } 30$ million is therefore recommended for 1976.

The system is administered by the Ministry of Education, and to make the school curricula more useful in agriculture., an advisory committee of members from all agricultural agencies should be created.

The following steps are recommended to assess vocational education needs in the Northeast: 3/

a) All vocational training programs, industrial, commercial agricultural, ARD, CD, Training Institutes, etc. should be evaluated by an appropriate working group composed of the

1/ Ibid, p. 204 ff. Note also in the Northeast teachers recruited by DOLA often are given security officer assignments--extra pay is given for this--but this leaves less time for actual teaching duties.

2/ For a review of teacher training requirements, see also Bhuntin Attagara and Ratana Tanboontek, Op. Cit.

3/ See NEED/PAG staff Memoranda #11, May 1969 and #36, June 1970.

Vocational Education Department and the Department of Labor. This should be done as soon as possible. Until the results of present training programs are better understood, undesirable practices will continue, particularly the lack of coordinating the skills with actual demand.

b) No new programs (except inservice training, see below) are recommended before better knowledge of existing resources has been obtained, i.e., number of competent teachers, experience, equipment, teaching materials, and students capable of being taught.

c) Training in agriculture should be guided by a joint board composed of the Ministries of Agriculture, National Development and Education; for other educational fields a board should be composed of the Ministries of Industry, Economic Affairs and Education, in order to get better coordination between the supply of and demand for particular skills.

8.6 Note on Foreign Assistance

Approximately ¥ 580 million was programmed for foreign assistance (loans and grants) to education for the Second Plan period. ¥ 360 million was actually provided for the years 1967 to 1970; with about one half to rural school development. This represents 2.4 percent of the government education budget of about ¥ 15,000 million for 1967-70. In accordance with the recent consultive group proposal, approximately \$50 million is to be made available for the Third Plan, about \$10 million of which is allocated to Kasetsart University expansion. The National Education Council has set a goal of nearly ¥ 2 billion (or twice the amount set by the consultive group) in foreign assistance, representing about 6 percent of the proposed national budget for education. Specific allocations for the Northeast are not indicated.

In recommending assistance to education in the Northeast a level of 4 percent for primary and 5 percent for secondary has been proposed. The following indicates the suggested foreign assistance targets representing 5.7 percent of the government budget.

Millions	¥ 197.3	or	\$ 9.9	Primary Education
	60.0	or	3.0	Secondary Education
	80.0	or	4.0	Higher Education ^{1/}
	<u>79.2</u>	or	<u>3.9</u>	Other School Projects
Total	¥ 416.5	or	\$ 20.8	

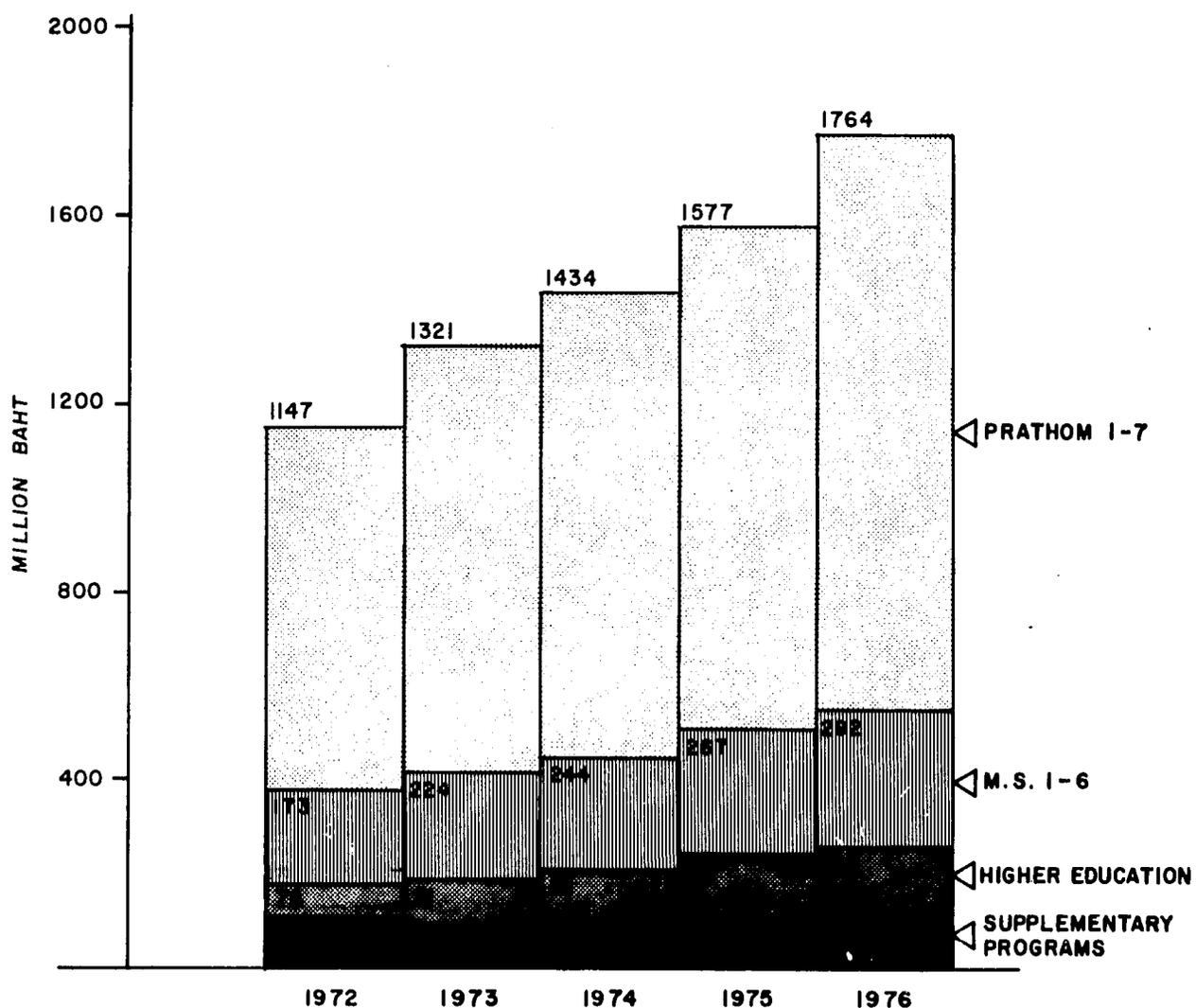
This assistance will be primarily for classroom, laboratory and other facilities equipment, vehicles for mobile units, printing presses, books, visual aids, etc.

The total proposed Education Sector Budget for the Northeast is given in Table 8-4.

1/ Principally toward a medical school facility.

CHART 8-3

**EDUCATION SECTOR BUDGET
THIRD PLAN
NORTHEAST THAILAND**



SOURCE : ESTIMATED BY NEEDPAG.

TABLE 8-4
THIRD PLAN PUBLIC EDUCATION BUDGET
Northeast Thailand
1972 - 1976

(Million Baht)

	1972	1973	1974	1975	1976	1972-76	Foreign Loans and Grants
Elementary Education ^{1/}	(786)	(899)	(963)	(1056)	(1188)	(4892)	197.3
Elementary Education	786	899	969	1069	1209	4922	
Secondary Education ^{1/}	(134)	(175)	(191)	(209)	(228)	(937)	
Secondary Education	173	224	244	267	292	1200	60.0
Secondary Education ^{2/}	(171)	(238)	(323)	(439)	(593)	(1764)	
Subtotal:							
Teacher Training	28	32	37	43	50	190	
Agricultural Schools	20	22	23	27	30	122	
Vocational & Trade Schools	27	32	37	42	48	186	
MS 1 to MS 5	98	138	147	155	164	702	
Higher Education	51	62	76	56	98	373	80.0
Other Schools ^{3/}	24	29	35	41	48	177	8.9
Supplementary Programs	133	107	110	114	117	561	70.3
Subtotal:							
School Rehabilitation	40	40	40	40	40	200	10.0
Text Book Distribution and Scholarships	5	5	5	5	5	25	2.0
Teaching Aids & Misc.	4.5	4.5	4.5	4.5	4	22.5	8.0
Mass Media Pilot Project	9	10	10	10	10	49	12.0
School Transport Feasibility Study	2	-	-	-	-	2	
Teacher Housing	25	25	25	25	25	125	6.3
Cooperative Community Schools	15	5.5	5.5	5.5	5.5	37	8.0
In Service Training	1	1	1	1	1	5	
Library Expansion	12	15.6	19.2	22.8	26.4	96	24.0
Total Recommended Budget	1147	1321	1430	1577	1764	7243	416.5
(High Target)	(1145)	(1335)	(15513)	(1749)	(2065)	(7807)	

^{1/} Low Target.

^{2/} High Target.

^{3/} Includes Kindergarten, Adult Education and Special Schools.

Source: NEED/PAG Estimates.

APPENDIX

LIST OF RECOMMENDED FOREIGN ASSISTANCE PROJECTS

Project	Brief Description	Estimated Cost (# Million)			Remarks
		Total	Local	F/X	
Agriculture Crops:					
1. Soybean Seed Multiplication and Testing (reasearch) Agriculture Department	To establish soybean seed testing multiplication centers throughout the Northeast with emphasis on irrigable areas.	20	18.75	1.25	Successful soybean production requires more testing throughout the Northeast followed by distribution of good seeds.
2. Soybean Extension and Demonstration Extension Department	To establish soybean demonstration centers in district Northeast regions with emphasis on farmer contract and training.	7		*	Demonstration and farmer training are essential if improved varieties are to be given and increased production attained.
3. Maize and Sorghum Research Agriculture Department	To establish maize and sorghum research centers in irrigable areas in the Northeast. Also to work on seed multiplication.	20	18.75	1.25	Increased production requires more testing throughout the region and development of adequate supplies of improved seeds.
4. Maize and Sorghum Extension and Demonstration Extension Department	To establish demonstration centers in irrigable areas with emphasis on farmer contact and training.	7		*	Farmers use of improved seeds and techniques will be facilitated by proper demonstrations and training provided by the Extension Service.
5. Cotton Research Agriculture Department	To expand facilities and do more cotton research to develop more disease resistant varieties and more effective insecticides. To concentrate in Loi.	20		*	Cotton production is falling even though Thailand is a cotton importer due to disease and pests. More research is necessary to overcome these problems.
6. Coconut Research Agriculture Department	To do more regional research on coconut development as a cash crop.	5		*	Little is now known of coconut potential in the Northeast. Before farmer programs can be developed, more production research must be carried out.

* See General Assistance to Overall Agriculture Program.

Project	Brief Description	Estimated Cost (£ Million)			Remarks
		Total	Local	F/X	
7. Coconut Extension Department	After completion of coconut research, Extension Service can begin working with farmers to encourage coconut production.	3		*	This assumes successful research and economic production potential. Project should start in year four.
8. Kenaf Research Agriculture Department	To continue kenaf research to develop better methods of processing.	5		*	Farmer processing techniques need to be improved if kenaf quality is to remain competitive on the world market.
9. Kenaf Extension; Extension Department	To continue working with farmer to aid them in improving production and processing.	10		*	Until better production and farmer processing techniques are adopted quality problems will continue to hamper exports.
10. Mulberry-Silkworm research Agriculture Department	To develop proper production techniques for silkworms and proper mulberry production.	5	2.5	2.5	Present silk production techniques are inefficient and limiting potential sales to the world market.
11. Mulberry Silkworm Extension, Extension Department	To work with farm groups on improving production techniques and aiding in establishing rearing and reeling stations.	20	10	10	Details for this project are being worked out by the ADB Compac Team.
12. Other Economic Crop Development Agriculture Department.	To carry out research at existing research stations on other potential economic crops - cassava, groundnuts, mung beans, oil palm, sugar cane, and any other appearing to have potential.	15		*	Other economic crop potential may exist in the Northeast and research should be underway to discover what crops may have this potential.
13. Agriculture Department General Survey Experiment and Research	To continue general research and experimentation programs. Includes soil fertility studies, disease control programs, and the like.	110		*	General research programs should be continued in order to develop the necessary data bank to facilitate future specific projects.

* See General Assistance to Overall Agricultural Program.

Project	Brief Description	Estimated Cost (P Million)			Remarks
		Total	Local	F/X	
14. Agriculture Extension - General Program	To emphasize more effective farmer contact through increasing the number of personnel, the quality of training, the farmer instruction aids, and the mobility of extension workers.	53	50.5	2.5	The effectiveness of the Extension Service must be improved if the research results are to be passed on to the farmer and result in increased production.
15. Agricultural Economics research Office of Under Secretary	a) Agricultural Statistics Collection			*	Statistics, production, economics, and marketing research and analysis are necessary for the development of effective agricultural development schemes.
	b) Agricultural Production Economics			*	
	c) Marketing Studies			2.5	
	d) Special agricultural economics studies at the Northeast Agricultural Center - Kohn Kaen and Huay Sithon.			*	
	15 Total	97			
16. Rice Research and Experimentation and Pest Control	Continued research and experimentation with different varieties in irrigable areas.	45		*	The results should aid in increasing yields and thus freeing up more land for cash cropping purposes.

* See General Assistance to Overall Agricultural Program.

Project	Brief Description	Estimated Cost (# Million)			Remarks
		Total	Local	F/X	
<u>Crops Foreign Exchange:</u>					
Technical Assistance <u>1/</u> a) Soybean b) Maize and Sorghum	Technical production experts to spend 24 man months over the five year plan period at the research centers in the different irrigable areas to assist in testing and analyzing results.	2.5	-	2.5	This is to provide on-site assistance to Thai agronomists. Practical production experts are necessary.
Extension Advisor <u>2/</u> Northeast	One man for two years in the Northeast to work with the regional extension service as an advisor. Should concentrate on organizational problems and specific regional level problems which hinder the effectiveness of the service.	2.5	-	2.5	There is a need for a regional advisor to identify real regional problems and needs and overcome the problems. Someone with a strong background in Extension Work is needed.
Marketing Advisor <u>3/</u>	To assist in the establishment of a better market information service in terms of market intelligence and distribution analysis. 24 man months.	2.5	-	2.5	The establishment of a full time market research service is necessary to facilitate development plans. Present information is not centralized or made current. Gaps exist and no method of passing information to other agencies exists.

1/ This is the foreign exchange portion of items 1 and 3.

2/ This is the foreign exchange portion of item 14.

3/ This is the foreign exchange portion of item 15.c.

Project	Brief Description	Estimated Cost (£ Million)			Remarks
		Total	Local	F/X	
Extension Service Mobility Increase <u>1/</u>	To improve its assistance capability the Extension Service needs to increase mobility. Agents need to contact farmers, to assist farmers in getting to demonstration plots, and to move equipment and materials. Necessary Vehicles: 8 Jeeps 30 Motorcycles	.470 .315	0	.470 .315	This equipment will be used initially in a program to encourage multiple cropping, and then will be used for various extension programs.
Extension Service Instruction Equipment and Farm Aids <u>2/</u>	To purchase visual aids, instruction equipment, and tools to assist in farmer training and instruction.	10	0	10	Items such as projectors, written materials, and special farm equipment.
* General Assistance to overall Agricultural Program	Program and project operation often require special foreign inputs or general assistance. These cannot be allocated specifically for a five year plan but should be anticipated in a general budget.	40	-	40	This is based on a 15% foreign exchange portion of the total plan budget.

1/ This program is not included in the above discussion.

2/ This program is not included in the above discussion.

Project	Brief Description	Estimated Cost (฿ Million)			Remarks
		Total	Local	F/X	
<u>Agriculture Livestock:</u>	Total livestock budget for the five year period is 343 million baht.				
	Priority areas for public sector are:				
	1. Pasture Improvement 2. Disease Control 3. Improved Breeding 4. Improved Extension Service Contact with Farmers				
1. Pasture Research	Projects: Development of pasture research facilities on Livestock Stations now located in the Northeast. Foreign pasture experts and necessary foreign seeds and materials should account for 1/3 of total cost.	30	20	10	No major livestock program can be undertaken until the feed problem is resolved. Thus pasture research has not been undertaken on an extensive enough scale to resolve the problem.
2. Disease Control	To continue disease control research; to mass produce or purchase vaccine; and to analyze feasibility of establishing foot and mouth disease free zones within the Northeast. Foreign technical assistance and materials will be necessary.	132	122	10	The disease problem is not resolved in the Northeast. This affects the quality.
3. Improved Breeding	To continue present breeding programs for cattle and swine - both through natural means and with artificial insemination. Some foreign exchange costs for materials and possibly animals will be invoiced.	80	70	10	Present average livestock standards are low and only continued breeding work will improve them.

Project	Brief Description	Estimated Cost (£ Million)			Remarks
		Total	Local	F/X	
4. Livestock Extension Service Improvement	<p>Direct contact between farmers and Livestock Extension agents is still limited. Research results are not reaching the farmer.</p> <p>Over the Third Plan period a complete analysis of the extension service in the Northeast should be carried out and money allocated to overcome bottlenecks. This could include funds to increase manpower, training, mobility, and demonstration plots. Also included are funds for breeding services and AI services. Foreign exchange costs should cover the cost of technical assistance and equipment necessary for the improvement.</p>	55	47	8	No significant improvement in the livestock situation will occur until the communication system between farmers and the Extension Service improves.
5. Dairy Development	To continue to expand the dairy industry in Thailand. Research must be continued and facilities expanded.	10	10	0	The development of a beef herd requires a dairy development. Milk products are imported and could be substituted for by local production if quality and standards are maintained.
6. Research and Experimentation	To continue general research on the veterinary and animal husbandry level.	36	36	0	Such research is a necessary part of the animal industry.

Project	Brief Description	Estimated Cost (£ Million)			Remarks												
		Total	Local	F/X													
<u>Agriculture Fishing:</u>	<p>The Third Plan Fishing budget is 86 million baht. Public Sector priorities are:</p> <ol style="list-style-type: none"> 1) Improvement of Fishing Station Facilities 2) Continued Research 3) Increase number of personnel 4) Increase Fishing - farmer contact - particularly through more demonstrations. <p>The foreign exchange component of the budget can only be estimated at 15%. Actual foreign exchange costs may be higher due to technical assistance costs and fishing equipment costs.</p>	86	73	13													
<u>Agriculture Forestry:</u>	<p>Total forestry budget for the Third Plan period is 150 million baht. The plan emphasis should be on:</p> <ol style="list-style-type: none"> 1) Forestry Conservation and Control 2) Forestry Inventory 3) Reforestation 4) Research <p>Budget Allocations are:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Survey and Research</td> <td style="width: 10%; text-align: right;">28</td> <td style="width: 10%; text-align: right;">28</td> <td style="width: 10%; text-align: center;">-</td> </tr> <tr> <td>Forest Protection and Control</td> <td style="text-align: right;">70</td> <td style="text-align: right;">70</td> <td style="text-align: center;">-</td> </tr> <tr> <td>Forest Management</td> <td style="text-align: right;">52</td> <td style="text-align: right;">52</td> <td style="text-align: center;">-</td> </tr> </table> <p>Forest Exchange Allocation:</p>	Survey and Research	28	28	-	Forest Protection and Control	70	70	-	Forest Management	52	52	-				<p>Most of these expenditures involve local costs as they deal with local functions of the Forestry Department.</p>
Survey and Research	28	28	-														
Forest Protection and Control	70	70	-														
Forest Management	52	52	-														
<u>Nursery Establishment</u>	<p>To assist in establishment of nurseries in Korat and Sakol Nakorn and to develop plantations as demonstration areas.</p>			3	<p>This covers cost of advisors and materials necessary in the nurseries.</p>												

Project	Brief Description	Estimated Cost (฿ Million)			Remarks
		Total	Local	F/X	
<u>Transport</u>					
1. Saraburi Korat Highway	Construction of two additional lanes of Friendship Highway totaling 148 kms.	296.0	150.0	144.0	Present traffic 4,000 ADT
2. Korat - Nong Khai Highway	Upgrading of existing road totaling 260 kms.	576.0	300.0	276.0	Present traffic 2-3,000 ADT
3. Chaiyaphum - Pratai Road	Completion of construction of road which with Lomsak-Chumpae Highway will provide surface communications between the Northeast and North Thailand.	80.0	40.0	40.0	
4. Feeder Road	Construction of a 53 Km Feeder Road between Muaglek and Chaibadarn	42.0	22.0	20.0	Study included in T.P.O'Sullivan Feeder Roads Feasibility Study.
5. ARD Roads	Construction of approximately 800- 1,000 Kms. of Feeder type roads by the Accelerated Rural Development Agency.	750.0	500.0	250.0	Usually financed by USOM.

Project	Brief Description	Estimated Cost (฿ Million)			Remarks
		Total	Local	F/X	
6. Highway	Purchase of equipment to increase and improve present maintenance standards of THD and ARD.	100.0	20.0	80.0	Should be preceded by Study.
7. Highway Organization Study	Technical assistance program to study overall organization, responsibilities and budget of agencies responsible for highway construction and maintenance.	5.0	1.0	4.0	May incorporate study for maintenance equipment.
<u>Communications</u>					
1. Post Telegraph	Expansion of telecommunications system.	178.0	78.0	100.0	May be joint World Bank-Asia Development Bank project.
<u>Power</u>					
1. Nam Phrom Dam	Continuation of construction of Stage I of a hydro-electric facility with initial capacity of two 20 MW units.	147.0	67.0	80.0	Foreign exchange financing appears arranged.
2. Lam Dom Noi Dam	Expansion of existing hydro-electric facilities to increase capacity 12 MW to total of 36 MW.	20.0	12.5	7.5	Foreign exchange financing appears arranged.
3. Electricity Generating Authority of Thailand (EGAT)	Expansion of existing facilities for transmission and connection of electric power lines and substations	100.0	54.0	46.0	Foreign exchange financing appears arranged.
4. Nam Ngum Dam (Laos)	Construction of transmission lines to tie-in Thai grid system with Laotian power source.	162.0	92.0	70.0	Foreign exchange financing appears arranged.
5. Northeast Grid System	Construction of additional transmission lines and substations to tie the Northeast into the national grid system.	37.0	17.0	20.0	Foreign exchange financing appears arranged.

Project	Brief Description	Estimated Cost (฿ Million)			Remarks
		Total	Local	F/X	
6. Lam Dom Noi Dam	Construction of distribution lines to connect the hydro-electric facilities with electric power customers.	70.0	43.0	27.0	Foreign exchange financing appears arranged.
7. Rural Electrification	Expansion of electric facilities to communities which have pledged at least 150 customers.	150.0	98.0	52.0	
8. Pak Mun Dam	Proposed new hydro-electric facility with 108 MW capacity and estimated rate of return near 10%.	660.0	264.0	396.0	Feasibility Study made by French firm.
9. Electric Power Feasibility Study	To analyze the overall power requirements of Thailand and determine the least cost system for meeting the demand.	10.0	5.0	5.0	This study is required to arrive at a decision regarding Pa Mong Dam.
<u>Water Projects</u>					
1. Korat Water Supply	Expansion and improvement of potable municipal water system to alleviate dry season water rationing.	200.0	80.0	120.0	
2. Udorn Water Treatment & Distribution	Construction of additional water treatment and distribution facilities related to the Huai Luang Storage Dam to provide year round potable water.	60.0	20.0	40.0	
3. Udorn Flood Control	Construction of supplementary Storage reservoirs channels, improved drainage, and completion of storage reservoirs to provide Flood Control.	105.0	40.0	65.0	
4. Three Cities Water Supply Projects	Construction of additional water supply facilities at Khon Kaen, Loei and Chaiyaphum.	100.0	50.0	50.0	

Project	Brief Description	Estimated Cost (฿ Million)			Remarks
		Total	Local	F/X	
5. Other Provincial Water Supplies	Expansion of water distribution facilities at 10 changwat capitals in Northeast.	50.0	25.0	25.0	Under Department of Public Works Control.
6. Village Water Facilities	Supply and install water jars, (400 gallon metal) or 150 cubic meter concrete tanks in 2,700 villages.	65.0	50.0	15.0	Under Department of Local Administration control.
7. Artesian Well Program	Sinking of 3,500 wells throughout the Northeast during the Third Plan Period.	198.0	190.0	8.0	Under Department of Mineral Resource control.
8. Village Potable Water	Construction of 167 potable water schemes to serve 375 villages throughout the Northeast.	94.0	92.0	2.0	Under Department of Health control.
9. ARD Small Water Projects	Construction of 69 shallow wells, 1,330 small ponds and 1,700 deep wells in 3,200 Northeast villages.	137.0	87.0	50.0	Under Accelerated Rural Development Agency.
<u>Community Development</u>					
1. CD Program	Includes rural self-help program, youth volunteer corps, CD Technical Center, Community leader training and pre-school age children education program.	339.0	299.0	40.0	Under Ministry of Interior control.
2. Village Improvement Program	An ARD program for construction of miscellaneous facilities for community development.	349.0	210.0	139.0	
3. Fine Arts Program & Religious Affairs	Improvement of museum administration, archaeology investigations, monument restoration, and temple up-keep and repair.	79.0	70.0	9.0	

Project	Brief Description	Estimated Cost (฿ Million)			Remarks
		Total	Local	F/X	
4. Urbanization Improvements	Includes construction and improvements of facilities required for urban growth. These include, street surfacing, lighting public parks, five stations, etc.	522.0	372.0	150.0	
5. Low Cost Housing	Construction of 1,200 low cost housing units, principally at Korat, for indigent welfare recipients.	60.0	30.0	30.0	Under Ministry of Welfare Control.
<u>Education</u>					
A. <u>Principal Programs:</u>					
1. Elementary Education (Prathom 1-7)	To provide for 2.1 million public school children by 1976. Construction of schools and provision of teachers to staff elementary school levels with reductions of in-student teacher ratios from 38:1 to 35:1 (P1-4) and to 30:1 (P5-7).	5129.3	4932.0	197.3	Department of Local Administration (P5-7)
2. Secondary (MS 1-5)	To provide for increase to 121,000 students through adequate school and facilities construction and provision for 6,050 teachers.	722.0	702.0	20.0	Department of Upper Elementary Education (P5-7)
3. Vocational Schools	To provide for expansion and improvements in vocational schooling policies.	206.0	186.0	20.0	Secondary Education Department
4. Agricultural Schools	To expand LIVE program to all 7 agricultural vocational schools.	132.0	122.0	10.0	Vocational Education Department

Project	Brief Description	Estimated Cost (฿ Million)			Remarks
		Total	Local	F/X	
5. Teacher Training	To increase capability of Region to train teachers by certifying 12,700 elementary and 800 secondary teachers by 1976. This also includes facilities.	200.0	190.0	10.0	Vocational Education Department
6. Higher Education	University of Khon Kaen Expansion, including faculties of Education and Medicine, and other institutions.	453.0	373.0	80.0	Teacher Training Department
7. Other Schools	Support for Kindergarten, special schools for the handicapped, and adult education.	185.9	177.0	8.9	Office of Prime Ministers
B. <u>Supplementary Problems:</u>		631.3	561.0	70.3	
8. School Rehabilitation	Part of National Program to rehabilitate schools at all educational levels.	210.0	200.0	10.0	DOLA and Ministry of Education.
9. Text Book Distribution and Scholarships	Provide free textbooks and scholarship assistance to indigents.	27.0	25.0	2.0	DOLA
10. Teaching Aids	To supplement textbook and present classroom facilities.	30.5	22.5	8.0	DOLA and Ministry of Education
11. Mass Media Pilot Project	To test feasibility of using television for basic and supplementary education; introduce 200 community receivers in selected tambons (changwats Khon Kaen, Mahasarakam, Kalasin).	61.0	49.0	12.0	National Education Council
12. School Transport Feasibility Study	Determine if school transport between village and tambon costs less than expanding village schools for Prathom 5 to 7 education.	2.0	2.0	-	Department of Elementary Education (P5-7)

Project	Brief Description	Estimated Cost (₪ Million)			Remarks
		Total	Local	F/X	
13. Teacher Housing	Provide 2,500 housing units for teachers living away from their own communities.	131.3	125.0	6.3	Upper Elementary and Secondary Education Dept.
14. Cooperative Community Schools	Use existing skilled labor for instructors at 30 tambons with schools to be the responsibility of the community.	45.0	37.0	8.0	Community Development
15. Inservice Training	Place candidates for vocational training with private firms on an apprenticeship basis.	5.0	5.0	-	Vocational Education Department
16. Library Expansion	Establish 60 library units, including one mobile unit, at amphoe level.	120.0	96.0	24.0	(Unassigned)
<u>Public Health</u>					
1. Health Centers	Construction and expansion of 69 first class, 613 second class, and 459 midwifery health centers to raise Northeast standards comparable to other regions.	982.8	692.8	290.0	Department of Health
2. Provincial Hospitals	Construction of new hospitals or expansion of existing ones to increase the number of beds by 2,560, to meet standards similar to other regions.	653.8	443.8	210.0	Department of Medical Services
3. Disease Control and Related Programs	Public health projects to control and eradicate disease or improve methods and staff for treating the affected.	641.4	551.4	98.0*	Department of Health

* Includes ₪ 18 million actual departmental requests to date.

Project	Brief Description	Estimated Cost (฿ Million)			Remarks
		Total	Local	F/X	
4. Family Planning	Implementation of a program to reduce population growth rate to 2.5-2.75% by distribution of various birth control devices and programs.	65.0	40.0	95.0	Official of the Undersecretary
5. Khon Kaen University	Continuation of support for the university's Health Science Center.	98.0	18.0	80.0	Prime Minister's Office
6. Malaria Control	Program to eradicate and control malaria through spraying and other measures.	72.0	50.0	22.0	Office of the Undersecretary
7. Psychiatric Hospitals	Expansion of three hospitals in the Northeast to provide psychiatric treatment.	222.0	150.0	72.2	Department of Medical Services
8. Nurses' Training	To provide one nursing school at Korat, one for practical nurses at Ubon, and one midwifery school at Khon Kaen.	50.0	45.0	5.0	Department of Medical Services
9. Drug Addiction	To train staff and provide facilities for treating drug addicts.	23.0	20.0	3.0	Office of the Undersecretary
10. Mobile Health Units	Purchase and operation of 5 mobile health units to develop a pilot program for out-patient treatment in rural areas.	6.3	1.3	5.0	Department of Health
<u>Industry</u>					
1. Cottage Industry Support	To promote the development of local industry by establishing provincial marketing units.	6.0	6.0	-	

Project	Brief Description	Estimated Cost (£ Million)			Remarks
		Total	Local	F/X	
2. Small Business Assistance	To provide "seed" capital for cottage industries and small scale manufacturers and provide firms with assistance in marketing, financial, and technical issues.	35.0	30.0	5.0	Issues may be subscribed by foreign lending institutions.
3. Regional Development Corporation	Establish a Northeast Development Bank to promote and finance industrial development in the region.	600.0	300.0	300.0	
4. Forestry Resource Study	Survey and inventory of all forest reserve areas in the Northeast with emphasis on economic programs and policies for optimizing their utilization.	7.0	3.0	4.0	
5. Industrial Estates	Prepare sites to attract the construction of plants and factories to the Northeast.	32.0	17.0	15.0	
6. Miscellaneous Pre-Investment Studies	Provide a fund for financing preliminary investigation by private firms to establish potential for investments in the region.	10.0	5.0	5.0	
7. Tourism Study	Investigate the potential for developing tourism in Northeast Thailand.	2.0	1.0	1.0	