POTENTIAL AGRICULTURAL RESOURCES OF THAILAND

by

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Chapter I

THE PROBLEM, SCOPE AND METHOD OF STUDY

Thailand produces ample food to feed its people, although not all Thais are well fed. Agricultural production provides not only enough food for domestic consumption but also most of the exports from Thailand. Imports of agricultural products were only about 25 to 30 percent of the value of exports. Indeed, Thailand now produces ample food to feed her present population. This statement, nevertheless, does not consider the quality of the diet but only the amount of food available.

The problem of ample food for the next fifty years is serious since more people means that more agricultural products are needed to feed, clothe, and shelter the population. To see how important is the problem, Table 1 shows the population growth for the past 50 years.

An increase of 2 percent each year adds 400,000 people when the population is 20,000,000. At this rate of growth, Thailand's population will pass the 60 million makr by 2007 A.D. Population experts say that the annual increase will be more than 2 percent in the next few years. The increasing rate of growth in population is not because more babies are born but because more babies live to be adults.

Table 1. Thailand's population growth for the past 50 years.

Year	Population	Annual Increase
1911	8,266,408	
1919	9,207,355	1.2%
1929	11,506,207	2,2%
1937	14,492,000	3.0%
1947	17,478,000	1.9%
1955	20,400,000	2.0

Source: Central Statistical Office, National Economic Council, Bangkok.

Medical advance, efficient health services, better diets, better public water supply and less disease all result in more babies living to be adults. Life expectancy, in the meantime, will be longer. This means that there will be more "too-old-to-work" people as well as "too-young-to-work" people to be fed. Will Thai farmers produce enough agricultural products for more than 60,000,000 people in 2007?

When there are 3 times as many people as now, will Thailand need 3 times as much food and other agricultural products? Surely, it will be more than that. Thailand wants its population to be better fed than now. This requires more quantity and better quality of food and other agricultural products for each person. How can Thai farmers meet the challenge? Thailand exports much agricultural products. The money received for exports is used to buy

many essential imports. It is generally realized that if the Thai people are to have more things for better living, exports must be increased and developed. Money from exports also is used to develop the country and to maintain and promote national stability and welfare. Agricultural exports must be continued, or increased, if Thailand is to develop as a strong and progressive nation. So present agricultural resources, both natural and human, must be intensively and efficiently utilized. New land also must be brought into use to the extent physically and economically possible. Much more agricultural production is needed for the future.

Agriculture is the first step to a better living for the people of Thailand, both for use at home and for export. Agricultural products accounted for about 85 to 90 percent of all exports, and agriculture provides employment for 85 percent of the people. Income from agriculture is 45 to 55 percent of the national income of Thailand. But the income is not as much as the country wants for its people in the future. Per capita income in the U. S. dollar equivalents in several countries in 1950/54 is shown in Table 2.

General Problem

Potential agricultural resource use in Thailand may be

Table 2. Per capita income in the U. S. dollar equivalents in selected countries in 1950-1954.

Year	Thai-land	Burma	Philip-pines	Japan	Canada	Mexico	Spain
1950	59	31	124	113	1,026	168	128
1951	67	36	134	149	1,182	204	196
1952	67	39	133	169	1,276	220	208
1953	73	44	138	188	1,292	207	221
1954	69	43	139	194	1,234	237	239

Source: (23, p. 124)

considered as a derived problem. The basic problems are population growth, change in the pattern of demand, or the combined movement of both, and other activities designed to stimulate economic development.

Thailand is thus confronting urgent and complex problems. What can be done? What can Thailand do to make the best of its situation? How could Thailand allocate or reallocate its natural and human resources in order to meet the problems? In the last analysis, Thailand should do what is necessary to increase per capita real income, increase production, and improve its income distribution system. To increase production, productive factors must be wisely and efficiently used and combined. There are two possibilities of increasing production: new method of cultivation, fertilizer, good seed and better breeds, and new equipment must be brought into use. This alternative

method can be called "intensified production". On the other hand, new land must be cleared for use, or the quantity of land use must be expanded. This method is known as "extensive production". To keep pace with the changing economy, the weakening of any one sector of the economy must be more than compensated by the growth of another sector if economic growth is to continue.

Another relevent problem is the fact that rice export, the major one of the country, is likely to decline. Causes of this phenomenon may be classified into two elements: internal and external. The internal element consists of population growth and increasing rice consumption, limitation of good arable land, and depletion and erosion of soil. External element consists of competition by other rice growing countries, completion of rice self-sufficing program of countries usually importing Thai rice, and recent increase of substitution of other crops such as wheat, barley, oats for rice in several countries in the rice eating area (31, p. 33).

During the last few decades, agricultural land in the fertile central plain has increasingly shifted to other uses. Looking to the future, if the productivity of agriculture stays unchanged or if it increases but not in proportion with the degree of the growing demands of the population which increases about 2 percent each year, Thailand may find it necessary to import rice or other

agricultural products. Together with a decline in yield per acre, a thorough consideration must be given aggregative demand and supply estimates of land use. Over the next 50 years, thousands of acres of agricultural land will be shifted to industrial, residential, transportation (roads and airports), and recreation uses. The city or urban-industrial growth is expected and the way of life associated with it are taking more land. Also additional thousands of acres of cropland subjected to severe erosion hazards will probably be shifted to non-crop uses.

What can be done to compensate for these deteriorations? These circumstances make it increasingly evident that Thailand must plan for the future and to think over the problem of allocation and potential use of agricultural resources.

This study is designed to throw some light on these problems by examining the framework within which potential agricultural resources, both natural and human, need to be developed. It also deals with the evaluation of some practices now employed and calls attention to some recommendations justifiable to the establishment of policies and programs.

Focus of Study

The main objectives of this study are:

1. To consider the present use of the agricultural resources and clarify the potential resources Thailand could acquire and bring into use.
2. To analyze the available data relevant to agricultural resource development problems.
3. To scrutinize past, present, and prospective plans or policies dealing with the development of resources.
4. To use physical, economic, and institutional elements as a framework for analysis.

Sources of Data and Method of Study

Literatures used in this study come from several sources. Most of the available statistical data and information were assembled from the various government departments of Thailand. Also, some are from official and private periodicals, magazines or newspapers in Thailand.

There are a few books written about resource use and the economy of Thailand either as private projects by Thai writers or by foreigners. Available data and information were usually drawn from government materials and foreign sources. Before 1900, government records were few. Furthermore, the reliance on government records after 1900 has limitations; since the probable margin of error of statistics used is often quite high and cannot be estimated

or allowed for. However, the quantity and reliability of statistics and data has improved in recent years.

Having worked in the capacity of a government official for the Ministry of Cooperatives in Thailand during 1949-1953, the writer had experience in organizing and supervising the Cooperative Credit Associations in the rural areas of Thailand. This gave him the opportunity of coming directly in contact with some problems pertaining to agricultural resource use in the Kingdom.

This study will be conducted and based on deductive, inductive and comparative reasoning methods. The inductive method is involved in the analysis of the cause and effect of different economic phenomena. Available data and documents pertaining to the specific phenomena are helpful in forming ideas relative to the causes of existing conditions. The deductive method provides for formulating criteria with respect to policy recommendations based on the available facts in Thailand and other countries. This method also was employed in analyzing the effects of programs and policies in selected countries and in drawing conclusions on the basis of empirical experience. The comparative method is used in analyzing the policies and programs in other countries with similar or identical problems. The experiences of other countries in seeking the solution to identical problems can serve as a guide in helping Thailand solve her problems.

Chapter II

GENERAL CHARACTERISTICS OF THAILAND

This study is designed to focus on the potentiality of agricultural resource use in Thailand and accordingly a survey of the physical characteristics of the country is needed in order to gain a perspective for a better understanding of its general problems. Physical factors influence the economic life of a country, since to a large extent the physical resources of a country determine its products and the conditions under which they are produced and marketed. Thailand, due largely to its geographical location and physical resources, has come to be considered as a country of much economic and political importance. To some economic geographers, it is known as the "Rice Bowl of Asia".

Officially, Thailand was called Siam until 1939, when its name was changed to Thailand; by the end of the World War II, the name had been changed officially back to Siam, but in 1947 it was again changed to Thailand, which means freedom and national independence. Throughout its recorded history, Thailand having a largely homogeneous population, has never been a colony, even though her neighbors on every side had fallen under foreign rule during the period of French and British colonial expansions of the nineteenth century.

Since 1932 Thailand has been a constitutional monarchy by revolution. However, long accustomed to a strong central government, the Thai proleteriat has not developed a high degree of political consciousness. In its 30 centuries as an independent monarchy, Thailand has never known a popular revolt. In the postwar years it has been less troubled by internal strife than any other Southeast Asian country.

Location and Size

Thailand is located in the center of the Indo-Chinese peninsula between latitudes 6 and 20 and longitudes 97 and 106. Its borders touch Laos in the North, Cambodia in the East, Malaya in the South and Burma in the West. The total area is about 200,148 square miles or 126.5 million acres, somewhat smaller than Texas or France.

Thailand falls into four natural regions, namely, Northern, North-eastern, Central and the Southern. The Northern region, a land of mountains and valleys, the forests and pastures of which permit considerable grazing and the exploitation of forest products, particularly teak. This region has four large rivers -- Ping, Wang, Yom, and Nan. Along the larger streams occur long level basins having soil particularly suitable for cultivation of rice and tobacco and these areas are intensively cultivated.

The Northeastern region is composed of high undulating plateaus. There are four major rivers -- Mool, Shee, Pao, and Songkrarm. Two of them run in parallel directions from West to East across the wide valley, to join each other at Pimool, Province of Ubol, near the Laos boundary and then fall into the Mekong River. The soils are generally sandy loams and are very low in plant nutrients. This region is at times flooded during the rainy season but the need for water is greatly felt during the dry season. Soil and climatic conditions make this region suitable for raising livestock and growing upland crops. Also today, a considerable area is under paddy.

The Central region is a vast plain of small slopes, with Nakon Sawan as the apex, which widens gradually as it approaches the sea south of Bangkok. The soil is of dark heavy clay and is particularly suited to rice cultivation. Every year the plain receives inundation from the Chaophya, the Meklong and Prachin rivers. The southern parts of the plains are intersected by a network of canals that are used for irrigation, drainage and transportation. Generally one crop only is raised each year.

The south consists of the peninsular section of the country and has high rainfall. It is drained by the Park Chon River, the lower course of which has the appearance of a drowned valley. The northern part of the peninsular is rather dry and some soils are also saline. Down south, rain

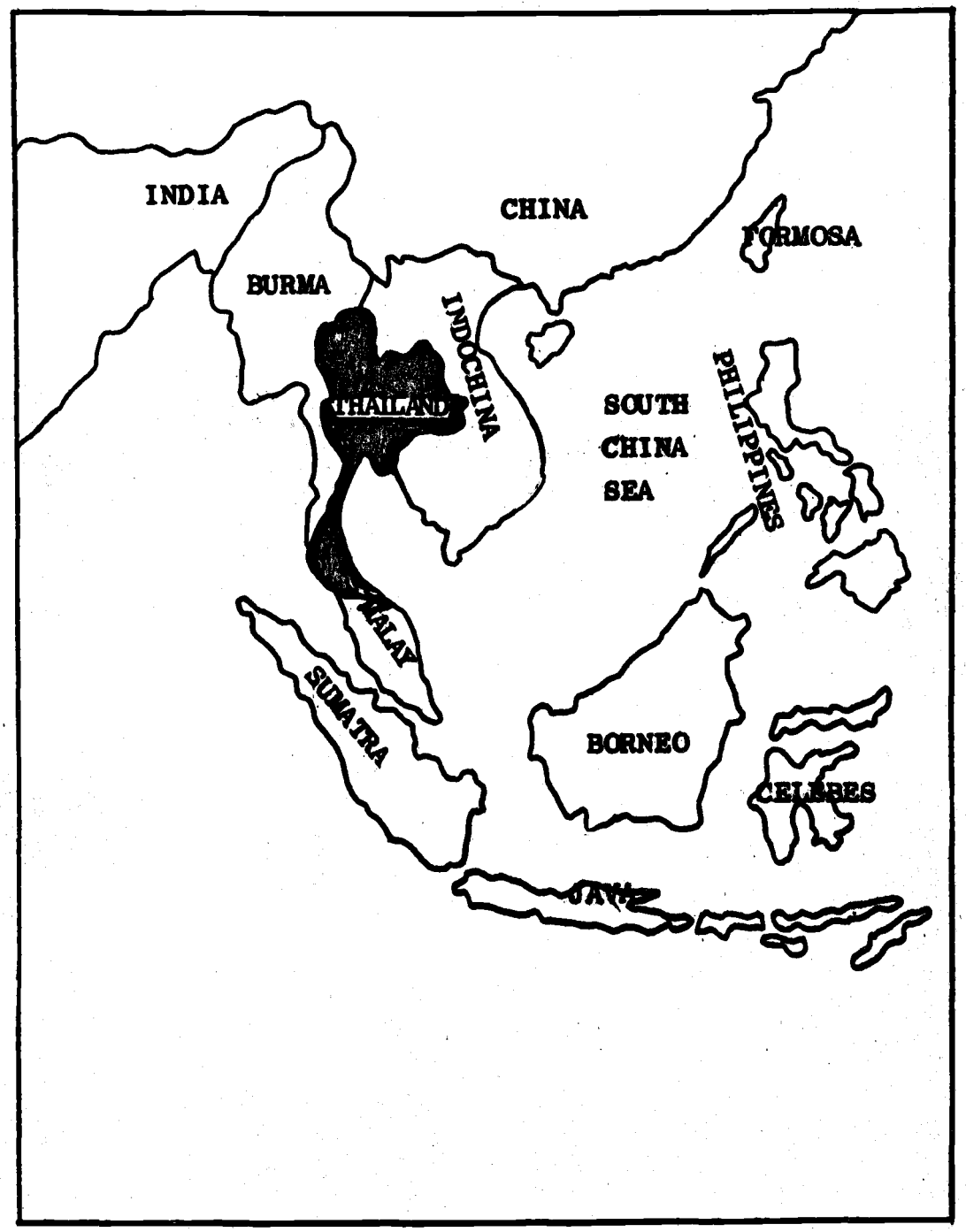


Figure 1. Geographic Location of Thailand

is more plentiful and high forests are common on poor sandy loams and sandy clay loam soils. The well drained soils of this region are suitable for growing some fruits, rubber, and coconuts.

Climate and Rainfall

Generally speaking, Thailand has a temperate-to-warm climate and there are three distinct seasons. They are referred to as the hot season, the rainy season and the cold season. The hot season begins in March and ends in May, the rainy season runs from June to October and the cold season lasts for four months -- November, December, January and February. The average daily variation in temperature during the cold season is from 53°F to 80°F, and the minimum temperature recorded was 41°F. The average temperature in Bangkok, the capitol of the country, ranges from 62°F in December to over 96°F in March, with a mean temperature of about 82°F. In the south, the temperature seldom falls to 60°F and rarely goes above 90°F. In the north and northeast regions farther from the seas and shut in by mountains, temperatures sometimes exceed 100°F. in the hot season and frequently fall to 45° to 50°F in the cold season. The warmest season is between March and May, the period of least cloudiness.

Broadly speaking, Thailand as a whole, has a rainy

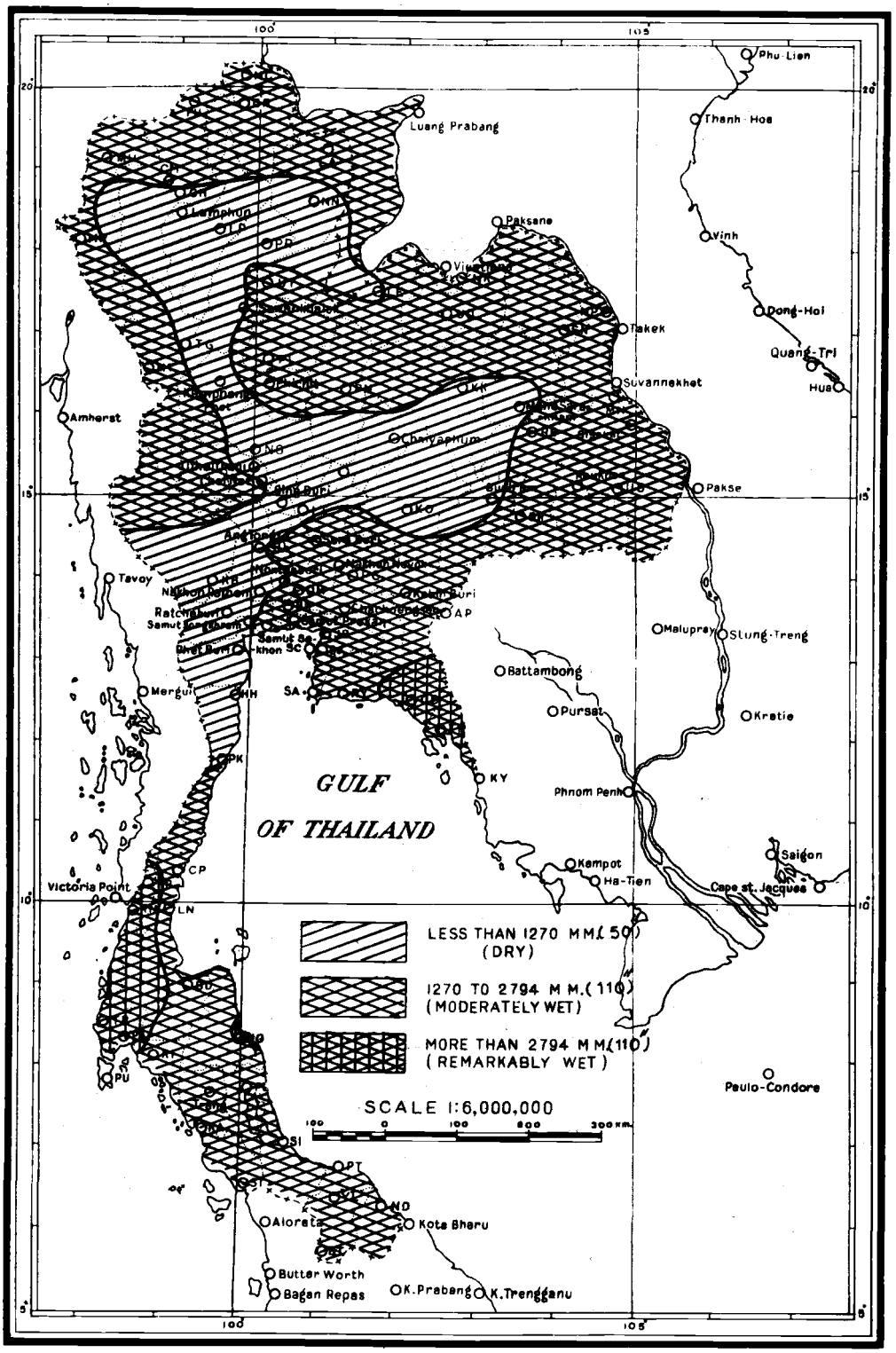
season beginning in May and ending in October and a dry season from November to April, except in the south section of the country. The types of rains are Orographic and Cyclonic and both have a large influence on the country. During May and September, the southwest winds from the Bay of Bengal and the Gulf of Thailand bring in rainbearing clouds. The rain often comes in the form of afternoon squalls. Frequently, there is a "break in the rains", a hot, humid, sunshiny, nearly rainless period of some weeks in August. In central, northern and northeastern Thailand, very little rain falls between October and April. The eastern coast of the South is sheltered from the southwest monsoon but receives rain between October and January when northeast trade winds are strong.

Rice, the most important product of Thailand, requires about 1800 mm. or 70 inches of water to grow to maturity (23, p. 7), but the amount of rainfall in most sections of the country is short of this figure (Table 3 and Figure 2). Also, it is important to note that there is much variation in rainfall from one year to the next in all regions of the country. This makes rice culture a hazardous business unless supplemented irrigation is possible.

As Thailand is situated near the Equator and has no high mountains, there is no snow as precipitation.

Figure 2

AVERAGE ANNUAL RAINFALL OVER THAILAND



Source: Department of Forestry, Bangkok.

Table 3. Average rainfall in Thailand.

Region	Average Rain in Rainy Season	Average Rain for the whole year
North (West to East)	28- 39 in.	31- 47 in.
North Eastern (West to East)	28- 39 in.	31- 47 in.
Central (East to West)	39- 43 in.	47- 79 in.
South (East Coast)	59-118 in.	79-157 in.
South (West Coast)	94-118 in.	138-157 in.

Source: (23, p. 7)

Methods of Communication and Transportation

As communications and transportation facilities are improved, commerce and trade rise to higher levels. Prosperity becomes more widespread. Above all, new ways of thinking, living, and behavior are brought to the common people. The country becomes one body. There is less isolation in reality and in thought.

Methods of transportation in Thailand at the present time can be classified into three types: land, water, and air. In 1954, the railways comprised more than 2,000 miles, with 374 locomotives, 591 passenger rolling-stock, and 6,223 freight cars (32, p. 92). Bangkok is the center of an extensive network of meter-gauge state-owned railways which extend to the north, the northeast, southeast into

Cambodia, southwest to the Gulf and south into Singapore and Penang. The railway to Burma (the so called "death railway", that was built during World War II by the Japanese with the labor of Allied prisoners of war) is used to only a limited extent. In 1956 a railroad had extended from Udon Thani in northeastern Thailand to the Laotian frontier and certain rolling-stock and telecommunication equipment, critical for military reasons, were provided for the Thai State Railroad under the United States aid program.

Highways, formerly built only as feeders for the railway, have been greatly extended in the past 20 years. Trunk roads are gradually being extended. It is possible to travel on fair roads over much of Thailand today, though there are still "gaps" here and there between some of the important road systems. In 1950, Thailand had more than 4,000 miles of national highway and more than 800 miles of provincial road (32, p. 95). Under a three-year highway program the plan is to construct 5,453 miles of provincial road and 3,375 miles of trunk roads to connect all regions of the country (8, pp. 221-222). In the last few years, major emphasis was given to highway improvements with the United States' technical assistance and aid for economic and and military projects. An economically and military important highway leading to the northeast was expected to be completed in 1957. Rehabilitation and strengthening of key roads in various other parts of the country is also

taking place.

It is noticeable that most of the villages, towns and cities in Thailand are situated on or close to a river or a canal because waterways were and still are major veins of transportation and communication of the country (Table 4). Bangkok itself was long known as the "Venice of the Orient" because of its extensive canal system. The canals and rivers are still in use although the majority of traffic is now on land. It is true that water transportation is slower, but it is still cheaper for transportation of bulky and heavy products like rice and lumber. On the other hand, waterways are used, more or less, to fill the gaps between some of the important road systems. There are, however, several obstacles in the use of waterways as a means of transportation and communication in Thailand due to the sand bar and unreliable water in rivers and canals. Dredging and water-level keeping dams need to be operated if economical and convenient waterways are to be more useful and dependable. To achieve this aim, Chainat Dam on the Chao Phya River was erected and Yanhee Dam construction is under way. The sand bar at the mouth of the Chao Phya River had been dredged according to the plan and now 10,000 ton vessels can proceed directly to the Bangkok harbor, the major port of the country and over three-quarters of all foreign trade of Thailand passes through it.

Table 4. Amount of selected commodities transported by waterways and railroad, 1948-1950.

Kind of Transportation	Rice (1000 ton)	Rubber (1000 ton)	Teak (1000 cubic ton)
Waterways	3,254	25	199
Railroads	421	35	101*

* All kinds of lumber

Source: (26, p. 49)

Bangkok has developed into an important crossroads for air travel and transportation. Also there is air transport service to all important sections of the country.

The People

The latest census showed that Thailand had a population of about 23 million in 1956. There were about 115 persons per square mile of land area. Annual population growth is 2.02 percent (24, p. 121). The average general mortality rate a quarter of a century ago was 17 per thousand population, it is now 10.5 per thousand (5, p. 199). The life expectancy of the population is 49 and 52 years for male and female respectively (29, p. 2). The density of population is centered in the central plain and in the alluvial plains near the coast and along the basins of Chee and Mool Rivers in the northeastern region. Generally speaking, population is highest in the areas which are more fertile and also better developed. Most of the people are Thai -- racially

related to the neighboring Laos, the Shans in Burma, and the Thai people in Yunnan Province in South China and of north Viet-Nam.

The historians have concluded that the Thai people originated in southern China. Migrations of Thais southwards from their original home in China is believed to have begun about 500 to 600 A.D. because they were forced out by the northern Mongols and finally they settled in what is today Thailand. The Thai of today are, as is to be expected, not of unmixed Thai stock. There has been intermingling with Chinese and Burmese as well as Mons and Khmer.

Table 5. Population density per cultivated square mile, Thailand, 1954.

Region	Population per cultivated square mile
Central	
Delta Region of the Menam Plain	550
Western Edge of the Central Plain	630
Middle Central Thailand	730
Korat Plateau (N.E. Region)	1400
North Thailand	1930
Southern Thailand	3400

Source: (5, p. 200)

Religion

About 95 percent of the population are Buddhist. Thus, the national religion is Buddhism of the earlier and southern form, known as Hinayana. In Thailand there are over 18,000 Buddhist monasteries or Wats and there are Buddhist preists,

numbering about 150,000. Each community has a Buddhist monastery which forms a most important role in the life of the people. Around this religious hub centers the life of the Thai people from birth to death. Christian missionaries, however, have been free to establish churches, schools, and hospitals for several centuries.

Education

More than 54 percent of the population above 10 years of age are literate. Elementary education between the ages of 8 and 15 has been compulsory and free all over the country since 1921. The isolation of many rural or mountain villages as well as the continuing shortage of teachers has slowed the educational program. The rate of growth of education has been limited generally by lack of funds rather than by physical limits of personnel or facilities. Because of Thailand's highly centralized government, practically all expenditures for education as well as for other things are made by the central government. Furthermore, there are few privately financed schools. The percentage of government expenditure for education was low for many years as compared with other important items (Table 6). Until in recent years, schools operated by priests in the numerous temples throughout Thailand were an important part of the educational system.

Table 7 shows the number of schools, students, and

Table 6. Trends in government expenditures for defense, education, and the Royal Household, 1892-1956.

Year	Percentage of total ordinary expenditure		
	Defense	Education	Royal
1892	26	2	29
1900	14	4	22
1910	24	2	18
1920	27	3	12
1930	20	7	8
1935	27	11	2
1941	36	10	0.6
1945	51	5	0.4
1949	28	11	0.6
1956	32.2	18.6	----

Source: (8, p. 192)

teachers in Thailand. Vocational education and adult education are being continually advanced. Thailand's universities and most higher education institutions are located in Bangkok, the capitol of the country. In its educational program the Thai Government is now assisted by UNESCO of the United Nations and American educational specialists of the International Cooperation Administration. However, the need for adult education and agricultural extension services had been greatly felt since the end of World War II.

Table 7. Education in Thailand

Category	Year	Percent	Number
Literacy (age 10 years and over)	1947	53.7	—
College Graduates (at least 4 years in colleges)	1947		6,172
Primary and Secondary Schools	1955		21,933
Teachers	1955		96,610
Students	1955		3,251,628
Vocational Schools	1956		195
Teachers	1956		2,095
Students	1956		48,855
Higher Education*	1956		10
Teachers Numbers were not shown			
Students			
Universities	1956		5
Instructors	1956		1,338
Students	1956		24,534

* Military Academy, Naval Academy, Royal Air Force Academy, Police Academy, Survey Academy, College of Education, College of Agriculture (Chiangmai), The Technical Institute, the Southern Technical Institute (Song-khla), the Northeastern Technical Institute (Korat).

Source: Select from Bulletin of Statistics Vol. V No. 5 Nov.-Dec. 1956, p. 10-11.

Occupation

The chief occupation of the peopl is agriculture. About 85 percent of the labor force engaged in farming, fishing, lumbering, and other forest products industries. However, most people are rice producers. Available statistics on the occupational distribution of the labor force may help indicate the important role of agriculture, the mainstay of the economy of the nation.

Table 8. Employment of the people in Thailand. Number of workers in the labor force classified by industries (14 years old and over), 1947.

Occupation or Industries	Number	Percent
Agriculture, Forestry, Fishery	7,623,181	84.78
Commerce	706,974	7.86
Services	273,698	3.04
Manufacturing	195,875	2.18
Transport and Communication	65,860	0.73
Construction	8,149	0.09
Mining and Extractive Industries	4,805	0.05
Electricity and Sanitation	2,182	0.03
Others	111,374	1.24
Total Labor Force	8,992,098	100.00

Total women in labor force was 48 percent, mostly in agriculture.

Source: (29, p. 1)

Table 8 indicates that the great bulk of the people are making a living in the primary industries. The people of Thailand have not only specialized in agriculture but in one particular form of it — rice cultivation. Of course the rice farmers often have supplementary crops and occupations, but their primary occupation is that of rice cultivation. During the dry season, large numbers of farmers find employment on construction projects, principally public works, and some are self-employed in small "cottage industries", producing goods for domestic consumption. The average non-farm income per farm (income from wage, salaries, cottage industries) was $87.75 in 1953, and in 1955 it accounted for 35.2 percent of the total income of farmers (24, p. 117).

As has been indicated, the great mass of Thai are peasant cultivators. At the top of the scale is a small upper class comprised of a numerous royal family (royal titles are maintained until the fifth generation) and a far from large aristocracy consisting of a few old families and high officials. Between this class and peasantry comes a small middle class of civil servants, military and naval officers, and a few professional men. There is hardly any Thai merchant class. Practically the whole of the trade of the country is in the hands of foreigners -- the minority groups, mostly Chinese.

Minority Groups

The principal minority group is the Chinese, numbering about 3 million, forming about one-sixth of the total population, and concentrated in urban areas; the Malays in south Thailand, numbering about 700,000; the Viet-Namese in the northeast, numbering between 80,000 and 100,000, more than half of whom came as refugees from the war in Viet-Nam; and Indians, numbering about 30,000 and concentrated in urban areas (37, p. 5). These minority groups are engaged in commerce.

Basic Characteristics of Economy

Thailand is considered to be an agricultural country. Its agriculture, including forests and fisheries, is the basic income source and normally produces from 45 to 55 percent of the gross national product (24, p. 1)(Figure 3). In recent years the government has placed emphasis on industrial development which is ultimately expected to expand the gross national product and to create a better domestic market for Thai agricultural products.

Agricultural products make up 85 to 90 percent of all merchandise exports. In fact, about 50 to 60 percent of the value of total exports is usually derived from rice alone (24, p. 7). So, it is through the export of rice that Thailand obtains a large part of her foreign exchange

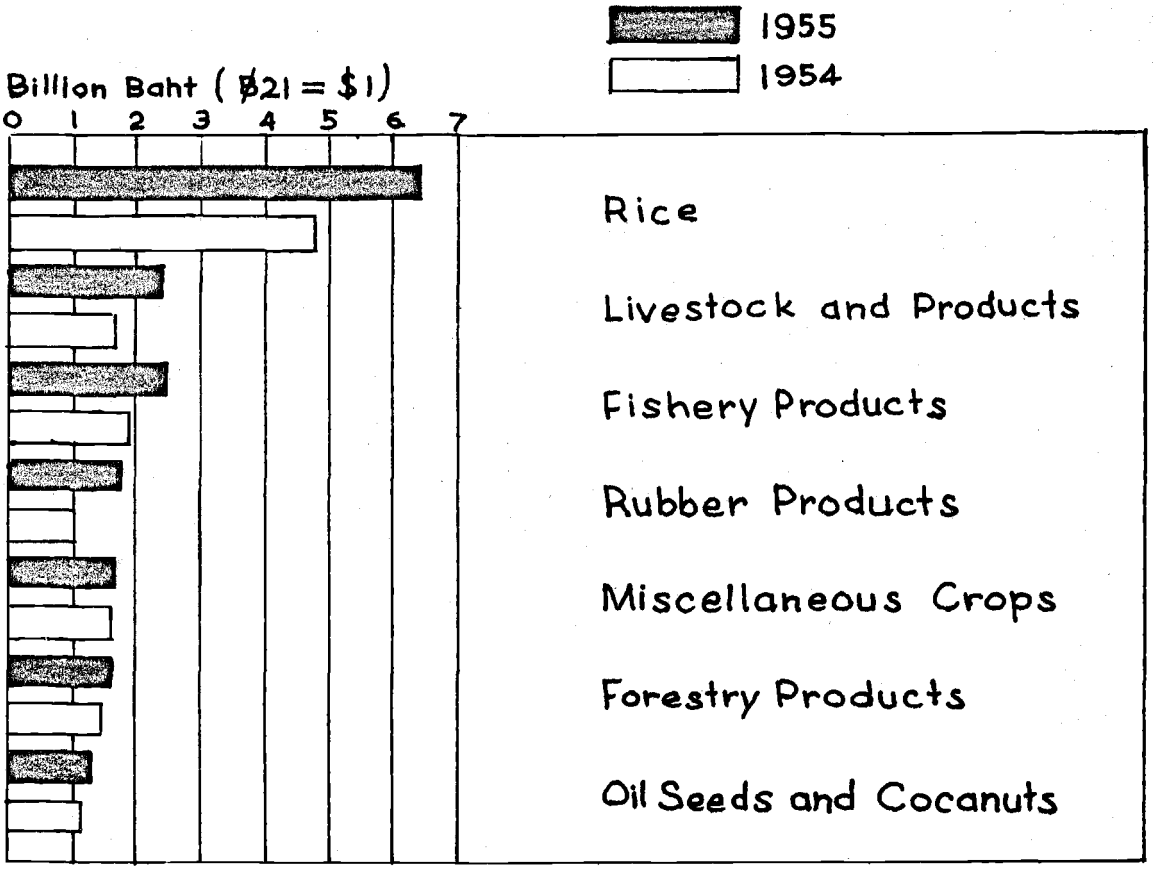


Figure 3. Value of Agricultural Products of Thailand

Source: (24, p 2-4)

proceeds. With these funds Thailand is able to import needed capital equipment, large quantities of fuel, medical commodities, and such manufactured consumer's goods as textiles, electrical supplies, kitchenware, and some luxuries. It should be clear that if rice production is reduced or if the price of rice declines, the economy of the nation will be adversely affected. Rice, therefore, is of paramount importance to Thailand's national economy and will continue to be the principal crop because of the prevailing conditions of climate, soil, water supply, and the tradition of the people. Thailand will and in fact should be an important producer of rice for use at home and abroad. But what are the prospects of making better use of Thailand's resources in the years ahead? Is there much hope for substantial improvements or are resources employed about as well as can be expected? It is toward these important questions that this thesis is directed.

Agricultural Situation

In 1950, there were 2.1 million farms in Thailand and according to the 1955 agricultural statistics of Thailand, the average size of farms was 12 acres. An average of 75 percent of the holdings was arable land; 1 percent permanent pasture land; and 6 percent other land. The average size of farm family was 6 persons, 3 of whom were workers.

In 1953, an average farm family had total liabilities of $69 and total assets of $1,117 ($1.00 = 21 baht) of which 70 percent was invested in land and buildings. Eighty-seven percent of all farm land was owned by the operators as compared with 60 and 45 percent of which was owned by the operators in Burma and India respectively (32, p. 20). Buffaloes and bullocks provide almost all the farm power. The value of hand and animal tools was $28.00. One farmer in 33 had some power equipment which usually comprised of a stationary engine-operated water pump.

Farm Prices

Using the monthly average of 1948 as a base, the wholesale price index (29, p. 20) of agricultural products in June, 1956 was 124.27 as compared with 111.86 in 1949. For foodstuffs in the same period the index was 125.17 as compared with 92.85. These price trends suggest favorable farm prices. Unfortunately, the cost of living index rose from 94.54 in 1949 to 151.29 in June, 1956. It is important to note that all preceding indexes were recorded in Bangkok. The reason is that prices paid producers are not readily available in country markets for most products. Therefore, Bangkok wholesale prices have been used to calculate value of products. For this reason the cost-price relationships in the country may differ from those in Bangkok. Nevertheless, Bangkok prices and Bangkok cost of living determine,

to a considerable extent, the prices of commodities and cost of living all over the Kingdom. Bangkok is the capitol, the center of commerce and communication, and the main port of the country.

Agricultural Production, Exports and Trends

The wholesale or farm value (value for primary product including consumption in producers' households) of the principal agricultural products was 23 percent greater in 1955 than in 1954. The gain in value, except for rubber and livestock, was almost wholly from greater production rather than price increases (24, p. 2).

All merchandise exports in 1955 were valued at 7,009.8 million baht of which 6,277.9 million baht, or 90 percent, was from agriculture. The rice export value decreased 4 percent because of price declines. However, a sharp rise (78 percent) in price and value of rubber export more than offset the decrease in rice export value.

Since 1950 there has been a definite trend toward increasing the area and production of cultivated crops. Between 1950 and 1951 the increase in upland crop area was 23 percent and for rice 6 percent. The principal increase in upland crop land has come from food crops, particularly sugar cane and maize. Area of oil seed crops and coconut has also been expanding. Rubber, the most important upland crop, has increased 7 percent in area since 1950. Fiber

crops is the only group that has lost ground, the decrease in area since 1950 amounting to 10 percent, particularly from rami displacement. Kenof is the only fiber crop to have shown a gain in area over the 6 year period. Production of the principal crops has increased 31 percent since 1950, with upland food crops and oil seeds making the largest gains.

General Economic Situation

The world economic development of recent years has contributed favorably to Thailand's economic growth. Industrialized nations such as the United States and most other Western countries have gained in manufacturing production and have raised the per capita real income of their people. This circumstance favored Thailand's economy in at least two ways. First, manufactured commodities that Thailand usually imported are more readily available, and, in some cases, now lower in price. Second, the demand for raw materials and agricultural products that Thailand ordinarily exports has generally increased. However, these events brought about some conflict between agricultural and industrial interests in Thailand as will be shown in Chapter V.

Thailand's production in the field of mining of tin, tungsten and lignite is being developed. However, in 1954,

production of tin and tungsten declined. This was the result of the low prices prevailing in 1953, and although prices were higher in 1954 miners did not think it sufficiently profitable to expand production. However, the production of tin and tungsten increased in the last three months of 1955 more than that of the same period of 1953 (27, p. 22). Lignite mining at Me Moh, Lampong in northern Thailand, started in 1955, and by the end of May 4,000 tons had been mined. Production for 1955 and 1956 was about 40,000 and 80,000 tons respectively (28, p. 21), and the target for 1958 is 200,000 tons (35, p. 182).

Table 9. Production of Selected industrial products in Thailand.

	(Thousand Metric Ton)					
Year	Tin ore	Tungsten ore	Cement	Soap	White sugar	Tobacco
1950	14.6	18.9	165.3	8.5	8.2	5.1
1951	13.4	22.2	228.7	8.2	8.0	7.0
1952	14.6	16.9	247.4	9.8	11.4	7.7
1953	15.6	26.8	288.1	10.2	13.3	7.1
1954	14.0	18.4	383.4	10.8	11.9	7.1

Source: (27, p. 22)

Trade and Payments

External trade is of prime importance to Thailand because most manufactured goods must be imported. To obtain

the foreign exchange to pay for necessary imports, Thailand must depend largely upon the sale of primary products, mainly rice, rubber, tin and teak (Table 10). From 1950 until 1954 Thailand was the leading exporter of rice in the world. Since 1954 Thailand's exports of rice are exceeded only by those of Burma. About one-third of all the rice produced in Thailand is exported (9, p. 306). Rubber, tin and tungsten concentrates are produced mainly for export, and about 20 percent of the total teak products are for the foreign market. Thailand's best customers are Japan Singapore, Malaya, Hong Kong, and the United States. Thailand imports mostly from Japan, United Kingdom, Hong Kong, and the Netherlands and United States. By 1953, Thailand's trade balance had become unfavorable and its sizable balance-of-payments deficit was reflected in a loss of more than $50 million in its foreign assets. This was due largely to rubber price declines that reduced earnings from exports while imports were increasing. Furthermore, in 1954 a break in the seller's market for rice sharply lowered the price so that export earnings were further reduced and at the end of the year the nation's official foreign assets were down to $273 million (37, p. 8).

Generally speaking, Thailand at present is on deteriorating terms of trade because it has had an unfavorable balance of trade for 8 out of 12 years since 1945 (Table 11). Several efforts were made by the government to

Table 10. Thailand's Principal Exports, 1954-1955 average.

Item	Percent of total value
Agricultural Exports	
Rice	50.4
Rubber Products	22.6
Forestry Products[1]	7.5
Miscellaneous Crops[2]	4.6
Oil Seeds and Coconuts	2.6
Livestock and Products	2.3
Fishery Products	1.8
Non-agricultural Exports[3]	8.2
Total	100.0

1 Teak, lacs and Yang are the most important products in this item.
2 Food crops, fibers, condiments, medical and miscellaneous.
3 Tin and tungsten are the major products in this group.
Source: (24, p. 9-13)

meet the situation by providing incentives to exporters. Among other things, the rice export trade was restored to private hands, abolishing a multiple-exchange rate system; relaxing export regulations on rice, tin, rubber and other products. While developing the process of export and import liberalization, attempts were being made by the government to increase revenue to compensate for the loss of revenue which may occur as a result of the change in the exchange rate system, as well as to keep pace with the growing demand for expenditure for development. The general trade picture of Thailand had taken a favorable turn in the first half of 1957, which was higher than the balance of trade of the same

period of 1956 by $22.2 million (17, p. 286).

Table 11. Ratio of exports to imports of Thailand.

Period	Total Imports (Million Baht)	Total Exports Including Re-exports (Million Baht)	Ratio of Exports to Imports
1945	109	89	81.65
1946	565	449	79.48
1947	1,386	968	69.84
1948	1,757	2,083	118.55
1949	2,280	3,777	121.80
1950	2,881	3,576	124.12
1951	3,714	4,473	120.44
1952	5,678	4,619	81.35
1953	6,472	5,772	89.18
1954	7,022	6,177	87.97
1955	7,415	7,162	96.59
1956	7,571	6,937	91.63

Source: (30, p. 10)

Fiscal and Monetary Situation

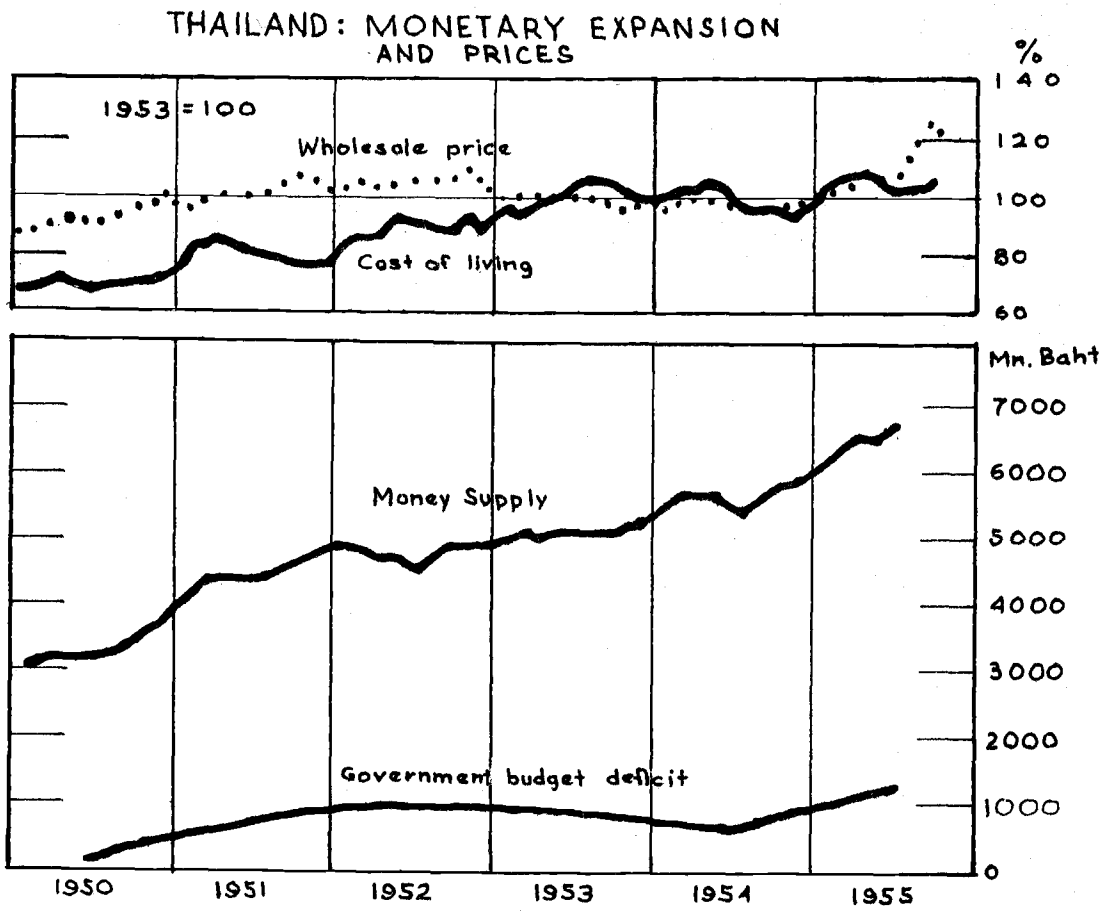
Thailand's budget has been subject to increased pressure in recent years largely because of rising defense expenditure and development requirements. As a result, deficits were large for many years (Table 12).

The government needs foreign exchange for both backing the domestic note issues, and for its expenditure abroad. The foreign exchange difficulties were eased by the revaluation of currency reserves in March 1955 (in March 1955, the government changed the exchange rate used for valuation of currency reserves from ฿12.50 to US$1, to ฿20 to US$1. The rates for gold and sterling were similary

changed. Allocation of the reserves in excess of the note issue was made in July 1955; a sum of about 1,000 million baht was used to write off government debts and about another 12,000 million baht in foreign exchange was used to set up an Exchange Equalization Fund), which enabled the government to improve the situation considerably. Monetary expansion and price movements, even so, have been on an upward trend (Figure 4).

The efforts to solve fiscal and monetary problems in Thailand will be achieved only if the government improves the prevailing budget system and, particularly, pays more attention to the possibility of increasing revenue from direct taxation, especially by an improvement in the collection system. While the present resources which can be safely mobilized for economic development are very limited and great caution is needed in fitting development to available resources, it is only by sensible and sustained development policy that the present dependence on precarious external factors can be gradually reduced.

Figure 4



Source: (35, p 185)

Table 12. Thai government revenue and expenditure.

Year	(Million Baht)		
	Total Actual Revenue	Total Actual Expenditure	Surplus (+) or Deficit (-)
1945	315	425	-110
1946	628	716	- 88
1947	994	1,035	- 41
1948	1,690	1,662	+ 28
1949	1,920	1,890	+ 30
1950	2.137	2,270	-133
1951	2.518	3,232	-714
1952	3.338	4.270	-932
1953	3,934	4,866	-932
1954	4,204	5,000	-796
1955	4,369	5,057	-688
1956	5,079	5,419	-340

Source: (15, p. 36)

Chapter III

UTILIZATION OF AGRICULTURAL RESOURCES

Land, water, forests, energy, and minerals are generally known as natural resources. However, it has been realized that a resource is a resource only in light of current technology. In other words, resources are a function of knowledge, therefore, they are passive without economic development. Erich W. Zimmerman states that "they (resources) become resources only if, when, and in so far as they are, or are considered to be, capable of serving man's needs" (42, p. 3).

Considering the above statement, the conclusion may be drawn that resources are variables so long as man's objectives, knowledge, and institutions also are variables. If man's needs and technology along with institutional flexibility exist to convert resources into economic goods and service, they may offer an inducement to economic growth.

From the standpoints of economics, one may differentiate three broad classes of resources: natural, cultural, and human. This trinity corresponds to the trinity of "factors" of production; land, capital, and labor (including management).

This chapter is directed toward the examination of land and human resources now used and those available to meet future requirements for agricultural production in Thailand.

Natural Resources

Land uses in Thailand for 1955 are indicated in Table 13. The Central zone embraces the largest area, 110.2 million rai, and had the largest area in farms, 22 percent, also the largest portion of land under cultivation, 19 percent of the total area. Farm size was largest in this zone, averaging 31 rai, but there were more tenant farmers. The average farm income of 1,663 baht was higher than in the north or northeast. About 42 percent of the total population lives in this zone.

The northeastern zone is the second largest in area with 103.8 million rai. Much of the land is poor for the cultivation of rice. Area in farms comprises 26 percent of all land and the area under cultivation is from 18 to 19 percent of the total area. Average size of farms is 27.4 rai. Water resources and soil fertility are serious problems and average net farm income is the least of the zones, being only 748 baht. About 35 percent of the Kingdom's population lives in this zone.

The northern zone, with a total area of 61.9 million rai, is mountainous. Farm holdings make up from 5 to 6 percent of the area but much of the farm land is under irrigation and can be cropped all the year around. Average farm size is the smallest of the four zones, 9.6 rai, and average net farm income was about 1,265 baht. Approximately

11 percent of the population of the Kingdom resides in this zone.

The southern zone has the smallest land area, 44 million rai, with 16 percent of the land in farms. Average farm size is 26.1 rai and an average net farm income of 2,928 baht is higher than in the other zones. This zone has about 12 percent of Thailand's population.

Table 13. Major land use in Thailand, 1955.

Use	Area (1000 rai)	Percent of area
All land in farms	61,382	19.18
Farm Woodland	5,365	1.67
Miscellaneous (not cultivated)	6,519	2.04
Rice planted	35,932	11.23
Tree crops*	5,759	1.80
Upland crops**	7,807	2.44
All cultivated land	49,498	15.47
Forest and grazing land	186,940	58.43
Swamp land	593	0.19
Roads, rivers, canals, and buildings	71,050	22.20
All land of Kingdom	319,965	100.00

* Rubber, coconuts and fruits.
** Food, fiber and other crops not elsewhere specified.
Source: (24, p. 109)

As the population increased, and as the economy developed, the land in Thailand was brought under cultivation more extensively and less intensively. Over the last 50 years, the population increased about 145 percent and

land use in rice cultivation increased 200 percent (8, p. 44).

Also there has been an increasing use of land for crops other than rice since the outbreak of World War II which stimulated production of crops such as tobacco, sugar cane, maize and cotton. Nevertheless, even in 1955 the total area of other crops was only about 5 percent as compared to paddy land.

Major causes of expansion of land utilization in Thailand during the latter part of the last century as concluded in some studies (8, p. 36-74; 1, p. 21) were the result of increased foreign demand for rice, domestic demand for foreign goods, and the development of modern ocean transportation in conjunction with the internal development of rail transportation in the country.

Soils and Crops

By the term "soil" is meant the loose surface material of the earth in which plants grow. The soils of Thailand are diverse. Robert L. Pendleton, in his "Provisional Map of Soils and Surface Rocks of the Kingdom of Siam" (Department of Agriculture, Ministry of Agriculture, 1950), classified soils all over Thailand into 21 types. The top soil of the various plains of the country are classified by the Royal Irrigation Department (23, p. 5) as follows:

(a) In the northern section — sandy clay and sandy clay loam.

(b) In the northeastern section -- sandy loam and lateristic soil.

(c) In the Central plain -- in the upper reaches, that is, above Ayuthya, sandy loam, sandy clay loam; then south of Ayuthya, silty clay.

(d) In southern section -- sandy clay and sandy loam.

The soil of Thailand is composed of deteriorated materials of the various ranges of hills in the section, which were mostly sandstone. In most places at a depth of between one meter and five meters, there is a layer of practically impervious slippery bluish clay. When near the surface and when bleached through by the heavy rain of the rainy season and baked by the hot tropical sun in the dry season, it becomes lateristic in character, called lizivium, in the Peninsula and the Southeast Asia Islands. This layer of clay, with thickness between one and four meters helps to retain water to make the land most suitable for rice cultivation, as rice requires submergence throughout its life. The soil, of the central plain, is particularly suitable for rice cultivation and, on its upper reaches is also suitable for other agricultural products.

In northern Thailand, there are valleys with less heavy soils; they are intensively cultivated. A relatively well-developed irrigation system in some places enables farmers of north Thailand to grow secondary crops of tobacco, soy-beans, peanuts, vegetables, or occasionally a second crop of rice. Crop rotation practices are employed by many

farmers. For example, one of rice is followed by one of soybeans or peanuts.

The soils in northeastern Thailand (Korat region) are, for the most part, find sandy loams relatively low in plant nutrients. Unreliable rainfall, dashing run-off, or floods in some years make the land use of this region a serious problem. In the valleys and depressions, where more water accumulated by inflow from the adjoining forested slopes during rainy season, bringing natural manure - humus, rice is grown. On slight elevations and slopes where the soils are deeper and not so poor, the forests normally grow taller and are quite dense. Commonly, in these forests, patches of an acre or more are cut and burned in the beginning of the cold season. Later they are planted to upland crops such as upland rice, cotton, sugar cane, hibicus fiber, sweet potato, and cossava. However, almost all of the cropped land in the northeastern zone is devoted to lowland rice of which 70 percent is glutinous.

It should be noted that the glutinous rice both in the north and northeastern regions is grown mainly for local consumption. Non-glutinous varieties are grown for shipment and sold in other parts of the country and for export. On the other hand, to cope with the short rainy season and uncertain weather conditions, early and medium maturing varieties of rice are usually planted while most of the rice grown in the central region is of medium and late maturing

varieties of the non-glutinous types. It is from the central area that the main bulk of rice for export is obtained.

Except for fine sandy and silty soils along the banks of the larger rivers, the Bangkok plain has heavy clays suited to rice growing. However, in the environs of Bangkok, tropical fruits, vegetables, and sugar canes are produced. These crops can be grown only by digging deep ditches and using the soil to form raised banks 4 to 6 yards wide. The banks are cultivated with great care all year round. Organic matters and fertilizers are used. Farmsteads are on the lighter soils along the river banks of this plain. By the houses are mango and other fruit trees; nearby grow plots of jute, vegetables and sugar cane. Black and white pepper were formerly produced in considerable quantities on the deep red soils formed from dark igneous rocks of the Chantaburi area. In this area at present, rubber, sugar canes, and fruit have replaced pepper. Fruit is also grown on sandy soils formed from granites and other rocks. Rice also is grown on all the low flat land on which water can be held. Coconut palms are grown on well-drained lands particularly on some of the islands.

Down south, the northern portion of the peninsula of Thailand is rather arid. Some soils are saline. Rice growing is risky, and too often the crop fails. In this event the farmers go to the forests and make charcoal.

Farther south, where rain is more plentiful, high forests are common on the poor sandy loams and sandy clay loam soils. Here rubber grows well on the well-drained soils of this region. Rice, of course, is grown on most of the plains and in the lower parts of valleys that have not been disturbed by tin mining.

Water

The importance of rice in the economy of the country has given rise to water resource development. Water policies with regard to agriculture so far are mainly directed toward irrigation in rice producing areas. Areas under water control systems at present are classified into irrigation, conservation, drainage work and flood protection (23, p. 51). About 25 percent of the land is now irrigated and additional projects are under way. However, most of the areas under water control systems are in central Thailand.

The control of water for crop use is one of important factors determining the productivity and potential use of agricultural resources of Thailand. For the greatest crop yields and the best use of the nation's resources of water and soil can come only when irrigation waters are delivered to the farmers in a way that will allow them to obtain their water when they need it and in the amounts they require. There is some evidence that in the central plains (23, p. 8), the most extensive rice producing area in the

Kingdom, that the average yield of paddy per unit area has definitely declined. One of the causes of this noticeable decline can be attributed primarily to the lack of an adequate system of water supply, as more and more paddy fields have been opened up in the upper reaches of the plain.

The rainfall during the normal crop year (June-January) in the important crop producing areas ranges between 30 and 80 inches. In spite of what may seem to be adequate rainfall, there are 60 drought years during a period of 117 years (1831-1948) (23, p. 9). During the same period the crops suffered from flood damage only four years. On the other hand, during the rainy season there may be uncontrolled flooding and periods of droughts, both of which can cause serious crop damage. Unreliable water supplies make cropping unpredictable. Even when water is made available in irrigation projects there are seldom enough laterals for satisfactory distribution to the farmers. In the case of rice, the minimum water requirements for wet rice production is about 70 inches annually under proper submerging practice.

Acreage and Yields

As a result of the population growth in each region of the country together with other major causes of expansion of land use during the latter half of the last century, the

arable land most accessible was the first to be brought into cultivation. This land use movement took place first in the central region where there are many factors favoring land utilization for rice. Some of these factors are existing networks of canals and streams providing water for irrigation and transportation, the soil, and the adjacency of the region to Bangkok, the major port of the country. Accordingly, most of the increase in rice acreage from 1855 to 1905 probably occurred in the central region when foreign demand for rice became apparent. Since 1905 the extension of rice cultivation has proceeded considerably faster in the other regions than in the central plains. The comparison is indicated in the following table.

Table 14. The extension of area planted in paddy.

Region	1903-1907*	1948-1950*	% Increase
Central	6.5	16.3	151
All other	2.2	17.1	678

* Millions of rai.
Source: (8, p. 45)

However, the central plain, has the highest proportion of land under cultivation, and it still remains the major granary of the country as can be seen by comparing the rice-land per capita there and in the other regions:

	Riceland Per Capita	
Region	1903-1907	1948-1950
Central	2.0 rai	2.3 rai
All other	0.5 rai	1.7 rai

Source: (8, p. 46)

The extension of land use for rice production in the other regions of the country was mainly required to feed their growing population. However, the surplus of rice from these regions has gradually contributed to rice exports from the central plain. The increase of rice acreage and production, the spread of rice mills over the country, and the extension of railways have made regions outside the central plain contribute increasing quantities to the total rice exports of Thailand. For example, by 1935 the amount of rice coming from the northeast reached about 275,345 metric tons (3, p. 49). Many glutinous rice growers in the north and northeast were induced to switch part of their farm land from glutinous to non-glutinous rice. This is an indication of an adaptive response to economic incentives.

Notwithstanding that the cultivated area in various regions was expanded, average yield of paddy declined. This fact is illustrated in Figures 4, 5, and 6.

The amount of decline in yield per rai or acre varied from region to region. The extension of rice cultivation without improved techniques has led to a long-run decline

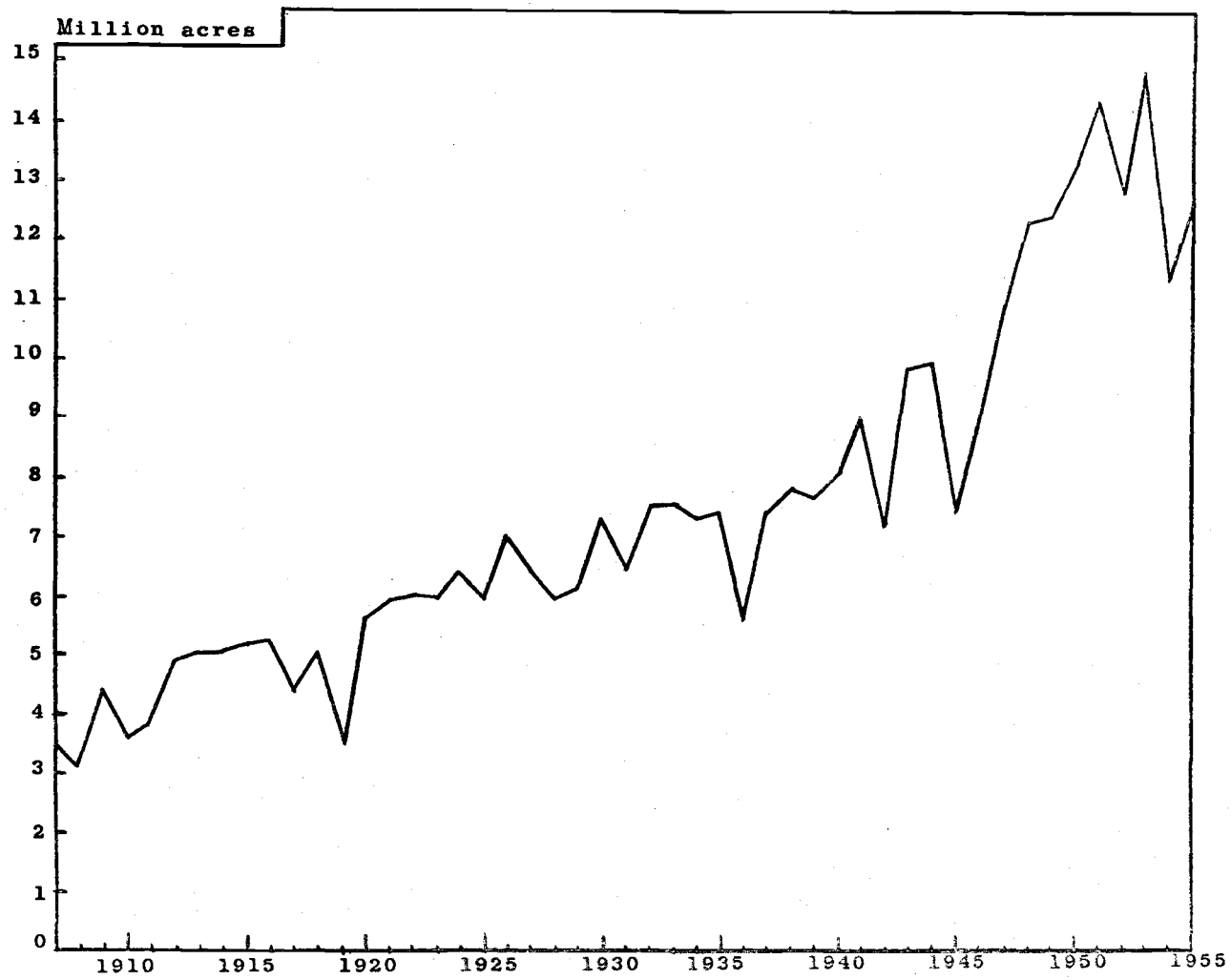


Figure 5 Rough Rice Acreage Harvested in Thailand, 1907-55.

Source: Appendix Table 1

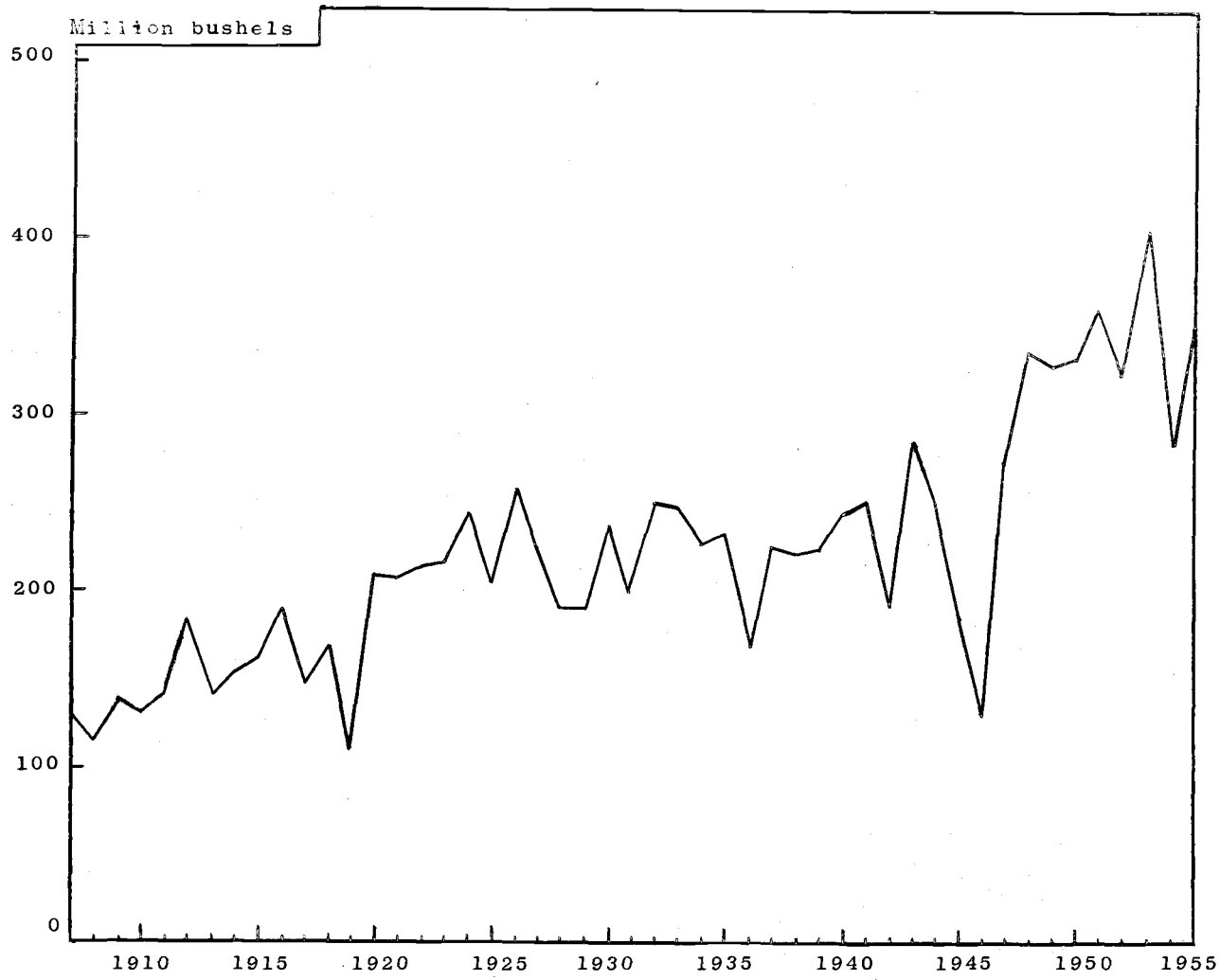


Figure 6 Production of Rough Rice in Thailand, 1907-55

Source: **Appendix Table 1**

Figure 7 Average Yield per Acre of Rough Rice in Thailand, 1907-55.

Source: Appendix Table 1

in yield per rai. This phenomenon indicates that the poorer land, or land less well provided with water, was brought under cultivation. The trend of output is indicated in Table 15.

Table 15. Annual average yield of paddy, central plain and other regions (piculs per rai).

Period	Central Region	All other
1921-1924	4.24	4.90
1930-1934	3.91	3.90
1940-1944	3.37	2.95
1948-1950	3.90	2.88

Source: Derived from Statistical Year Book of Thailand, 1952.

Geographically, the yield of paddy per rai has remained unchanged in the central and northern region but has definitely declined in the northeastern region as compared to the expansion of cultivated land and labor input.

The reason for the declining yield in the central plain is because new lands which are in most cases less fertile has been brought under cultivation and so irrigation facilities have been extended over larger areas. The advantage of superior irrigation supplies is mitigated by the fact that canals rapidly fill with silt and must be redredged to retain their effectiveness. Outside the central region yields have not uniformly decreased. In the

north yields are higher than in the central plain owing to various reasons: (1) fertile soil, (2) extensive use of small-scale, cooperative irrigation systems, (3) proximity to the stream that is the source of water while much land in the central plain receive a water supply from a stream several miles away, and (4) a less rapid expansion of the area planted in rice. The reasons for the decline in yields in the "other regions" are about the same as those in the northeast. The lower yields per rai in this region resulted primarily from: increased use of poor land, unreliable rainfall and lack of water supply, and lack of skill and knowledge of primary producers.

When grazing land and forests opened up to cropping, the quantity of buffalo and cattle in the northeast, the major source of livestock in the country, declined considerably. Farmers all over the country, especially in the central plain faced a shortage of work animals and soaring prices. Usually the purchase of draft animals represented the largest money outlay made by Thai farmers.

Human, Cultural, and Capital Resources

Labor also is an agricultural resource when it is combined with other resources to produce agricultural products. In the major part of Thailand's economy, labor is the chief input item after land.

Theoretically, the labor resource in agriculture has the greatest flexibility as to use when compared with land and capital. Except for industrial locations, land cannot be transferred for the production process. Once capital has been converted into machines and other tools of agriculture, it has few alternative uses elsewhere. Certain restrictions also apply to alternative uses of labor. These include individual skills and preferences for particular locations and types of work. As labor input is so great in Thailand's agriculture, analysis of its use is one of the principal objectives of this thesis.

Labor resources used in Thailand's agriculture are indicated in Table 16. A farm family worked 452 days per year. The average number of workers in a farm family of six was 3 persons. The comparisons of labor force engaged in agriculture to the total population (Table 8) indicates that one Thai farmer can feed only two persons including himself. Each farm worker cultivated about 9 rai per year and spent about 100 days a year on farm work, and another 41 days on non-farm work.

Can one Thai farmer cultivate more rai or acres than he does now within 100 days? Can he increase the production of his labor input? Or can he increase his farm size without adding any more acres? These questions will be discussed later.

Table 16. Average size of farm and farm family employed by geographical zones of Thailand, 1953.

Items	Northern	Northeastern	Central Plain	Southern	Whole Kingdom
	(Number Per Family)				
Average size of farm, rai*	9.58	27.38	30.69	26.13	25.62
Average size of farm family	5.19	6.59	5.86	5.22	5.90
Average number of workers in farm family	3.17	3.36	3.15	2.95	3.19
Average worker days per rai, year	5.00	3.03	4.04	5.20	3.90
On farm work, family days per year	177.00	278.00	390.00	401.00	320.00
On farm work, days per year each worker	56.00	83.00	122.00	140.00	100.00
Non-farm work, family days	171.00	143.00	98.00	114.00	132.00
Non-farm work, days per year each worker	54.00	43.00	31.00	49.00	41.00
Total family work days per year	348.00	421.00	488.00	545.00	452.00
Total days per year, each worker	110.00	126.00	155.00	185.00	141.00
Family deriving income from non-farm work:			Percent		
Labor and cottage industry	74.02	75.02	57.58	61.72	66.67
Hunting and fishing	4.89	19.72	12.88	15.88	14.32
Wood cutting	2.20	1.64	5.08	5.80	3.55
All non-farm work	81.11	96.38	75.54	83.20	84.54
On farm as percent of all work	50.91	65.87	80.00	73.51	70.92

* 2.5 rais = 1 acre
Source: (5, p. 113-114)

Income and Expense of Farm Families

Income and expense of Thailand's farm families vary considerably from region to region. However, in 1953, the average income of a farm family was $238 including the value of farm products used in the home which accounted for $84, (Table 17). Of that income, $84 was non-farm income. Average expenses per farm was $137. Thus, there was $101 left for purchase of capital goods and for saving. Low farm income was due largely to farmers having a small surplus of farm products available for sale. Nearly 89 percent of the farmers grow rice but only 45 percent have some rice surplus available for sale. A farmer in the northeastern region had less than 2 tons of paddy per year as a surplus for sale; about 2 tons in the northern region, and about 3 tons in the central part (36, p. 21).

As already indicated the non-farm income, in most cases, is small. The net result is that nearly two-fifths of all farm families earn barely enough to break even, leaving nothing for capital improvements and savings. A rural economic survey in Thailand conducted in 1934-1935 by James M. Andrews reported that 61 percent of the farmers in the central region; 18 percent in the southern region, and 17 percent in the northern, were in debt. A farm survey made in 1935 by the Division of Agricultural Economics, Ministry of Agriculture, pointed out that during the past 5 years 5 percent of the farmers in the north, 26 percent in the

Table 17. Financial status of farmers by regions, Thailand, 1953 (In baht)*.

	Central	South-Eastern	North-Eastern	Northern	South West	South	Whole Kingdom
a. Average net farm income	1,553	2,718	748	1,265	2,518	3,061	1,485
b. Total net income (a + non-farm income)	3,344	4,774	1,887	3,143	7,412	5,237	3,241
c. Value of farm products used at home	1,828	1,372	1,780	1,347	1,779	2,167	1,755
d. Family expense	3,983	3,932	1,564	2,202	5,187	3,480	2,877
e. Total family expenses and expenses for capital goods	4,999	4,963	1,810	2,479	5,818	3,865	3,432
f. Total assets	38,644	22,973	11,330	18,253	22,739	23,756	23,467
g. Liabilities							
% farmers using credit	35.27	27.91	15.77	4.12	11.39	18.29	20.69
% liabilities when compared to assets	2.50	2.08	0.80	0.22	1.50	1.64	1.79

* 21 baht = $1.00
Source: (21, Summary of Tables 8, 9, 10, 11, 12, 48, 113, and 114)

northeast, 44 percent in the central, and 20 percent in the south were using credit. For the country as a whole, only 28 percent of the farmers were using credit. This low percentage of farmers using credit may be due to the fact that farmers are unable to get enough credit at reasonable interest rates for the purpose of increasing efficiency and increasing production. This point will be developed further in Chapter IV.

However, during the postwar years, with soaring rice prices in the international markets, even though domestic rice prices were low compared to world prices, Thai farmers were considerably better off. Money, gradually began to play a significant part in the economy of rural areas.

Standard of Living of Farmers

By Asian standards farm levels of living in Thailand are relatively high and farmers are usually free of the spector of famine. However, according to the United States criteria, the standard of living of farmers in the Kingdom is still low. However, one should take into account the fact that goods and services produced in Thailand sell for much less than those produced in the United States, which means a direct comparison of incomes does not really reflect differences in levels of living.

It should be mentioned that the health and nutrition of the people has greatly improved in recent years. A few

decades ago, agricultural production in the country was severely hindered by malaria. The incidence of malaria is seasonal. It usually occurs in the tilling and harvesting season, impeding these operations and causing delay and loss in harvesting. Field work has to wait if husband, wife, or children are victims of this disease. Fortunately, it has been controlled since then by the public health services and farmers, who now with more income than before, are in a better position to buy new and effective drugs.

It is believed that malnutrition is a contributary cause to the high death rate from malaria. Therefore, another method of fighting the disease, a program developed by the government, has been to build up the resistence of the people by educating them to better dietary habits. Although regular surveys have not been made, it is probable that malnutrition and food deficiency diseases are prevalent in many parts of rural areas of the country, particularly among the farmers. Although there is no famine and farmers produce several nutrious products, it is the opinion of Zimmerman (43, p. 277), that diet-deficiency in rural areas of Thailand was more a matter of lack of knowledge of diet rather than a lack of food. The FAO Mission for Siam, even so, suggested that more pulses and fats are needed to supplement the Thai diet (34, p. 10). These can be produced in Thailand, but education will be necessary to persuade the people to accept unfamiliar foods and increase consumption

of them. Doubtless, if the standard of living and health conditions are favorable, the productivity of labor is certain to be greater than if the population is impoverished and disease-ridden. Potentiality and productivity of agricultural resources of Thailand depends, to a considerable extent, on the general good health of its human labor force.

Capital Cost of Farming

Uncultivated land has been free to anyone who would clear and cultivate it. The only charge has been a small fee to cover registration and the necessary paper work. The extension of rice cultivation required little money expenditure compared with that required for fruit and vegetable gardens. The labor of clearing the land and preparing it for cultivation was the major cost involved, and this labor was usually supplied by the cultivator himself, although in some cases hired labor was used.

The amount of seed required varied considerably since it depended upon the type of rice and the method of sowing. Selection of seeds and breeds in general is influenced by tradition, custom and individual preference of farmers in different regions. Tools and equipment used on farms, for the most part, are primitive. Water buffaloes or oxen are the main source of power for plowing. A farmer who cultivates a farm of not more than 30 rais usually use one water

buffalo or two oxen as work animals for plowing. The rest of the work on farms is mainly carried out by manual labor and with hand tools. Except for steel or iron parts, most farm tools are made at home by the farmer himself or by a carpenter in the village.

Tractor plowing was introduced during the past decade but it is still not popular among farmers. The size of farms, condition of soil texture, farm layout, cost, and farmer's preference limit the popular use of the tractor. Some farmers in the north who had plowed their fields by tractor one season (1952-1953) refused to do it the next because, they said, the tractor plowed too deep (5, p. 78).

In the central, northern and northeastern parts of the country, grain is cut with a sickle and tied into sheaves. Reaping in the south is quite different; instead of a sickle, a small, comb-like knife is used to cut the grain and reaping is done almost exclusively by women. During recent years, the use of a sickle for reaping was introduced and encouraged among farmers in the south by the Ministry of Agriculture with a view of saving time and labor.

In the northern, northeastern and southern parts of Thailand, threshing is done by hand while in central Thailand animals are used for threshing.

Looking over methods of cultivation, tools and equipment used, a Thai farmer can hardly cultivate more acres than he does now. The same amount of man hours and unit

area used now must be maintained except as methods of farming and farm tools and equipment are developed and improved.

Potential Future Use of Agricultural Resources

Agricultural resource use in Thailand still seems to be largely in the potential stage, awaiting capital, skilled management and labor, or larger markets for its development. The program of raising per capita real income and improving domestic agriculture is given high priority. This, in turn, depends upon an adequacy of such things as better farm implements, good seeds, better breeds, fertilizer and water control. Generally speaking, it depends on advancing level of agricultural and general education, improved disease control and public health, a well-planned program of agricultural development, the provision of necessary farm credit, frequently import of efficient capital items, and a stable government.

Factors Governing Potential Agricultural Resources

Agricultural resources are variable so long as man's objectives, technology and institution are other variables.

The physical supply of land is the first factor determining the potential. This includes climate, soil, topography and location. According to Table 13 (Major land use), only 15 percent of the land area is used for

cultivated crops, and less than 20 percent is in farms. Production of forests and fisheries does not come from cultivated farm land. But most of the food to feed the people of Thailand and to export comes from cultivated land. Will the cultivated land of about 20 million acres be able to produce enough food for the continually increasing population, plus exports? If not, will other land be good enough for cultivating crops?

Demand for agricultural land equals demand for agricultural products. Two important forces affecting demand for agricultural products are population growth and development of the Nation's standard of living. Because these two forces tend to increase continually, the cultivated land of Thailand today will be unable to provide enough food for future needs. To increase agricultural production, the extensive or intensive method or the combination of both must be employed.

Most of the new land that will be brought under cultivation in the future is now forest and grazing land. A small amount of swamp land can be drained for crop production. Under present conditions, how many acres of land can be brought into cultivation from grazing land and forest or swamp land? "It is estimated that there are probably another 10 million acres (25 million rais) which can be made productive" (37, p. 8). "Thailand now has almost reached the limit of natural production from her rice

lands" (22, p. 5), and Richard Pringle states: "Observations around the country, however, indicate that there are some millions of rai of highly fertile coastal and tall grass lands which can be brought into production with adequate flood and tide water control as well as more millions which can be made productive by adequate water storage or by pumping for irrigation" (14, p. 4).

The above quotations are general answers about physical future supply of arable land of Thailand. However, there are no statistics sufficiently reliable to estimate the area of arable land not now in use.

Furthermore, non-agricultural uses of land will increase in the future as the country grows and develops. Also, how many acres of present cultivated land must be given up annually due to the severe erosion damage? These are the most basic but unanswered questions that deserve urgent study and research in Thailand.

If the annual increase in paddy area planted must be increased in proportion to the annual increase in population as during the last 50 years, it follows that the cultivated land in the next 50 years must be expanded more than 150 million rai or one-half of the total land area of the country (14, p. 3).

Second, from the point of view of economic feasibility of land development, will it be better to apply available capital toward increasing production on land already under

cultivation? Or will greater returns be obtained from clearing and draining additional land in areas where undeveloped land is available? These questions will need more specific attention as demand for agricultural land grows. Technological supply may also be included in economic supply because lack of technology may mean undeveloped land cannot be economically utilized at all.

Third, potential future use of natural agricultural resources must be considered in its institutional setting. Social institutions such as laws, ordinances, regulations, administrative and judicial processes, and customs also determine potential future use of agricultural resources. Laws or regulations concerning interest rate, rights in land, tenancy, credit and taxation on agricultural resources will more or less govern the future use and productivity of land. Also, government policies pertaining to international and internal trade together with industrial development policies in the country will influence potential land use and agricultural production.

The extensive method of using land for agriculture has not seemed economically feasible because in most cases average yields per unit of area have declined when additional land was opened for development. On the other hand, increased application of fertilizer (Table 18), supplemental irrigation or other improvement measures have significantly increased yields. This statement applies to commercialized

farms in all regions. The National Economic Council notes in its report that during 1953-1954 crop year, there was less precipitation than usual, nevertheless, the response to fertilizer use on experimental farms and at the Experiment Stations of the Department of Rice, located in several regions, was favorable. The average increase in yield per unit of rai in all regions was 12 tangs (tang = a basket of paddy rice weighing about eleven kilograms). This indicates that the intensive method of utilization of agricultural resources is justificable so long as costs of incremental input factors are less than corresponding incremental revenues of output. However, the intensive method of production requires more capital inputs, more knowledge and skill of producers. Thai farmers in general are now short of requirements favorable toward the intensive method of farming. What Thailand did and plans to do to meet this situation will be discussed in the next chapter.

Possible Activities in Increasing Agricultural Production

The major objectives of agricultural production of Thailand today are to increase the quantity and quality of products and to employ input factors in production as efficiently as possible. How can Thailand increase the productivity of its labor inputs? Can Thailand increase its farm size without adding any more acres?

The sharp decline in yields is a serious matter for

Table 18. The result of experiment of fertilizer for rice growing in Thailand, 1953-1954 crop year.

*Administrative Regions	Without Fertilizer Tang Per Rai	With Fertilizer Tang Per Rai	Percentage Increase	Profit Per Rai (Baht)	Loss Per Rai (Baht)
1	32	42	31	10.00	—
2	29	40	38	19.50	—
3	18	33	83	43.50	—
4	21	34	62	31.00	—
5	31	41	32	12.50	—
6	32	39	22	—	8.50
7	29	38	31	—	7.00
8	33	47	42	35.50	—
9	33	47	42	33.00	—

*Administrative Regions: 1, 2, 7 covering the Central Zone; 3, 4 covering the Northeastern zone; 5, 6 covering the Northern zone and some part of the Central zone; 8, 9 covering the Southern zone.
Source: (27, p. 10)

Thailand. Since as far as is known, the number of man-hours required to cultivate a given area of paddy land (Rice production is a special case in this study. The analysis of production of this crop can be considered as a guiding study applicable to other agricultural products.) has not declined. The declining yield indicates that marginal increments of labor are producing smaller and smaller marginal physical products.

Improved practices that help to increase present farm production include the following:

1. In some cases land can be reclaimed for cultivation. Land too wet for good crop production can be drained. Some land now producing grass, shrubs, or trees can be cleared for cultivation. Irrigation can be developed for some land that is not now cultivated. Reclaiming new land for cultivation is costly but it may provide the fastest increase in agricultural production.

However, in all types of land reclamation and improvement, the available technical means, such as soil and land-capacity surveys, should be used to guide selection of the best land for settlement and improvement and to discourage improvement of uneconomic areas for rice or other crops, or cultivation of areas which cause serious waste of soil, forest, and other resources.

2. Greater production from cultivated lands. The large part of increased agricultural production must come

from the land now being cultivated. Greater production will result from greater and better use of this cultivated land. More intensive use means more input factors are applied to the land to make it productive.

More Irrigation. Irrigation is needed for cultivated land not now irrigated and for land without adequate water. This will result in higher yields, fewer crop failures, and double cropping in some areas. But the difficulty is that it takes much time and capital. In some instances, it involves water right development along with land reform.

Better Seeds and Better Breeds. Improved varieties of plants and better breeds of livestock produce more from the same acreage of land or the same quantity of feed. This is not so costly but requires cooperation from farmers. The agricultural extension services can do much to help achieve this objective.

Better Farming Methods. Better tillage of cultivated land and control of insects, pests, and diseases result in increased production. This requires technical knowledge by farmers and professional workers. Better planting, harvesting, and threshing methods save time, reduce labor requirements and increase yields.

Improved Soil Fertility. Chemical fertilizers, manures, crop rotation and tillage methods are ways to increase yields. Some of these are costly, and need technical knowledge, which most do not possess at present.

Improved Equipment and Tools. Better tools and equipment result in better tillage, better planting, and better harvesting. Education, demonstrations, and a well-planned and well-integrated extension program are needed, along with study and research to learn the best methods and practices to use. Improved tools and equipment may require improvement in size of fields and layout of farms.

3. Other crops or other industries. Another solution would be to help the people on farms find other crops or other industries in which the marginal productivity is greater than at present. Because of tradition, custom and inadequate knowledge of the alternatives, the farm people may not be able to weigh the alternatives in any realistic way. Therefore, they may pass up excellent opportunities in favor of familiar, traditional employment. This approach requires governmental support, training primary producers, and industrial development policies.

Together with above efforts, the extension of highways, railroads, training facilities, credit and saving facilities, agricultural experiment stations, and extension services must be developed in rural areas. Education must be made to work for the people of Thailand as in many other countries.

Chapter IV

IMPACT OF INSTITUTIONAL ARRANGEMENTS ON POTENTIAL USE OF AGRICULTURAL RESOURCES

It was estimated in 1954 by the Division of Agricultural Economics, Ministry of Agriculture, that about 5.5 million tons of paddy will be needed annually for domestic uses in the immediate future, and about 1.5 to 2.5 million tons for export. To meet these needs and to plan for the future, institutional arrangements, some of which have operated for many decades in Thailand, must be considered.

In such a country as Thailand, defects in agrarian structure are important obstacles to development as a whole. The role of government in correcting and stimulating desirable development is very essential. The reason is that farmers and their families constitute an important majority of the population. In general, they are small farmers with limited capital, with old-fashioned tools and equipment, with little knowledge and technology. But from their efforts comes the food for the nation and the major portion of national income. The "agricultural problem" of Thailand, is principally the result of several factors. These may be grouped into: economic, demographic, cultural, political, and technological.

Economic Arrangements

The government has realized that the general economic structure influences the agricultural section of the economy. Among these are the marketing mechanism for agricultural products and the market outlets in which farmers buy consumer and capital goods. To reduce the "agricultural problem", the government tends to apply the concept of "government intervention in agricultural marketing".

To help achieve the policy, provincial (Changwad) trading companies and marketing and purchasing cooperative associations have been established among the Thai people in towns and among farmers in villages.

Changwad Trading Companies

In order to help agricultural producers and consumers and to stimulate interest in trade, provincial trading companies were established first in the late 1930's, with a total of about 30 companies, located in different provinces all over the country. This was part of the program to place the Thai people in control of the economic life of the country. Since almost all of the "aliens" in Thailand are Chinese, who controlled a large share of the commercial activity in Thailand, the Changwad companies were primarily wholesale firms, although they also engaged in some retail activity, and, to a minor extent, in other activities such as rice milling. Most of the goods sold by the companies

are from government monopolies. They also sold and are selling some imported goods obtained from the Government Purchasing Bureau. In the extended program they have purchased agricultural produce in one Changwad and later sold in other areas of the country. The government, through the Ministry of Economic Affairs, granted the companies liberal credit terms when they first organized. These companies in turn assisted Thai firms by granting them liberal credit terms.

During the inflation and unsettled economic conditions of the first few years following the war, about one-third of the thirty Changwad companies ceased operations. Major causes of failure were mismanagement and corruption. However, the government still believes in the merit of provincial trading companies in helping national economic development. On July 22, 1955, the Bangkok Post reported a speech by the Minister of Economic Affairs as follows: "In encouraging the Thai people to trade, it is necessary to change a national habit" -- He explained that since the time of Naresuan, the Great, aliens have been taking over the economy of the country because the Thai people have always wanted to be government officials -- "If we do not change the situation, what would we have left for posterity?" Since then several companies have been reconstructed, bringing the present total up to 34 and in addition there are 11 branches, making a profit of 3.2 million bahts in

1956 (28, p. 31).

The National Economic Development Corporation

This government supported enterprise was set up in 1954 with the objective of developing industrial activity in the country. From the standpoint of agriculture, this corporation is of considerable help in processing and manufacturing agricultural products of the Nation. With an initial capital of 50 million bahts and later, with a 200 million baht loan from the Bank of America, the NEDC now operates four major industries: gunny bags, sugar, paper, and marble. To assure adequate quantity and quality of raw materials, the NEDC has supported farmers in the production of kenaf, jutes, and sugar cane by providing them with selected strains, capital, and better farming methods.

From 1947-1952 Thailand imported 23.5 million gunny bags a year on the average at a cost of about 200 million baht. At present there are three gunny bag plants in Thailand, producing about 6 million gunny bags a year. Limitation of raw materials and capacity of machines are responsible for the limited amount produced. Thailand consumes white sugar to the extent of about 70,000 metric tons a year. In 1956 it produced 65,765.6 metric tons of white sugar (16, p. 170, 150).

Warehousing Authority

This business authority was organized in 1955 and is operating successfully at present. Through this authority, large silos and warehouses were built in and near Bangkok, and other silos and warehouses with capacity of 500 tons were also built in 8 provinces. The major purpose of this authority is to buy paddy and other agricultural products from farmers at fair prices, using reliable weighing equipment, and then sell these products in other parts of the country for export. Other purposes were (1) to control unfair prices usually influenced by private middlemen, who nearly almost were Chinese; (2) to standardize products, and (3) to eliminate fraud in marketing agricultural products whereby middlemen take advantage of lack of knowledge of farmers and their urgent need for cash.

Irrigation Development

Irrigated areas in the country have gradually increased. Chainat Dam, serving the central plains area, is now complete except for some of the canals and field channels. Under the control of this dam, the total irrigable area is 2,430,000 acres, with 2,180,000 harvested acres. The total increase in agricultural production due to this project can be conservatively estimated as 960,000 tons of paddy or 500,000 tons of milled rice and 100,000 tons of soya beans (23, p. 26).

The Yanhee hydro-electric project, which is under construction, is expected to develop 560,000 KW of power for the central provinces and some provinces in the northeast. This multiple-purpose project will also provide irrigation, reduce floods, and in connection with Chainat Dam, provide navigation.

Transportation and Communication

Transportation and communication play significant roles in aiding agricultural development. Farmers need to transport their surplus products to markets, and need to have price quotations from different markets. Without transportation and communication, increasing production by any means will be useless because goods would not be moved to places where demand exists. Moreover, labor in backward segments of the population will be immobile and isolated. The government has realized this fact, so efforts have been made to improve and develop these basic facilities.

Cooperative Movement

In 1916 the first credit cooperative association was organized among farmers in the province of Pizanulok. Since that time, several types of cooperatives have developed, and now there are 10,504 societies with a total membership of 409,288 (28, p. 59).

There are two major economic problems the cooperative movement in Thailand has tried to overcome; one is that of

inadequate credit and the other is limited marketing opportunities.

To overcome the problem of rural indebtedness and unlimited liability cooperative credit movement was launched in 1916. It has been extended gradually over all the rice-growing areas of the country and there are now (1956) well over 9,000 cooperative active credit societies, with almost 200,000 members.

Usually the main sources of credit for Thai farmers are (a) relatives, (b) money-lenders, shopkeepers and merchants, and (c) the cooperative societies. Nearly 56 percent of the borrowers obtain loans from relatives, 27 percent secure loans from shopkeepers, merchants and money-lenders, and 14 percent get loans from cooperative societies.

The only important form of institutional credit to increase the productivity of agricultural resources is that provided by the cooperative credit societies. However, this touches only the fringe of the problem because only a small number (14 percent) of all farmers in the country obtain loans from cooperative credit societies. Farmers in the Central Plain, where most commercialized farms are located and where farm indebtedness was generally heaviest, obtained only 11 percent of credit needs from credit societies (36, p. 22).

The small percentage of loans made by cooperative credit societies is mainly due to: (1) lack of funds, and (2) lack of basic idea of the movement among farmers. Cooperative credit associations have been financed directly by the Bank for Cooperatives in most parts of the country except in the northern provinces where two provincial cooperative banks were organized in 1952. In these latter areas, the Bank for Cooperatives financed the movement only through the provincial cooperative banks. The Bank for Cooperatives, the main source of funds for the credit societies in the country, in turn depends on the Government Savings Bank for its funds. The Government Savings Bank also has limited available funds. In 1952, nearly 47 percent of the working capital of the Bank for Cooperatives was made up from funds borrowed from the Government Savings Bank. The basic idea of this institutional arrangement is to "encourage agriculturists and other persons of <u>small means</u> with needs in common to be able to form co-operative societies for the promotion of thrift, mutual help and self-help, thereby contributing towards the economic development and moral progress of the country" (The Co-operatives Act, 1928, P. 1). Members of the society can borrow funds up to a maximum of 60 percent of the value of the land held as security by the society at an interest rate of 10 percent and 8 percent per annum for short-term and long-term loans respectively.

The society pays the Bank for Cooperatives 6 percent

interest for money obtained from it. Loans from the credit societies are available only to farmers who are credit worthy and tenants, who need credit the most, are deprived of this assistance under the present arrangement.

During recent years, there has been an attempt to get every member to deposit 50 bahts annually in his society for a ten-year period.

It is important to point out that the interest charged members by credit societies is much less than that paid to private money-lenders. Yet, some members of credit societies are forced to drop out because they cannot secure enough credit.

Another notable point is that the main crop of most farmer members is rice. Each farmer member, with a farm of average size of 22 rai, produced only 4.15 tons of paddy (28, p. 58). The average yield of paddy per unit of area is low. It has been observed that members of credit societies simply receive loans but, in general, never obtain suggestions about better seeds, proper breeds, fertilizers, soil improvement, water use, or better tools and equipment from the societies or any other source.

The cooperative movement in Thailand has not originated with the people as is the case in some countries but was sponsored by the government. In spite of the well-meaning efforts of the government, the people may not be ready for cooperative development.

Other types of cooperatives contributing to potentiality and productivity of agriculture have been established under the patronage of the Ministry of Co-operatives. They include societies for financing the hire purchase of land; for colonization in underdeveloped remote areas, whereby members may borrow funds for productive purposes; for land improvements such as co-operative irrigation schemes, and for co-operative marketing of produce. Consumer co-operatives have also been developed.

To solve the problem of marketing farm products, several kinds of marketing cooperatives have been organized. So far this movement has encountered several obstacles which are; (1) lack of adequate transportation, (2) limited export quotas for rice for co-operative marketing associations, (3) lack of experience of the societies in selling agricultural products abroad, (4) in the case of rice, the Thai Rice Company did not understand the societies interest because they have no representative on the managing committee even though cooperatives own 75 percent of the shares, (5) conflicts and duplication of work among governmental agencies, (6) in some cases, the Ministry of Co-operatives is required to execute marketing projects which are not suitable for operation on a co-operative basis, and (7) lack of good management.

Agricultural Statistics

The Statistical Act of 1952 provides for the establishment of the Central Statistical Office subordinate to the National Economic Council. This agency furnishes all reliable statistics including agricultural statistics. Along with the Central Services of Statistics, the Division of Agricultural Economics, Ministry of Agriculture, also collects and develops agricultural statistics. As a result of this arrangement, farmers and agricultural marketing firms hope to be well informed about matters that concern their business. This is true of the government also. The government's decisions on agricultural policy and its administration action is expected to be more efficient.

Land Development Committee

This committee was established by the Cabint Council to examine, survey, collect, and analyze facts, finding, and data with respect to land development all over the country. The purpose of this arrangement is to lay down a land use program that would assist individuals in making more accurate decisions in selection and establishment of new enterprises and to guide governmental policy in land development of all kinds. The Land Development Committee finished its work and handed in a report to the Cabinet Council in 1955. The report was printed and released by the Chairman of the Public Occupation Improvement Committee.

From the standpoint of land economics and land policy, this report is very valuable. It contains the details of land use in administrative regions that covered all natural geographical land areas of the country. Recommendations and suggestions are given as to: (a) which area is well adapted to use for agriculture or other uses. Watershed management, forest and land conservation practices within each region are recommended, and (b) within areas made recommendations as to irrigation, cooperatives, transportation and communication, and industrial plants, suitable and needed for development of specified land areas.

The Results

As a result of efforts discussed in this chapter, agricultural production of major crops tends to generally increase. In the case of paddy, the National Economic Council (28, p. 10-11), reported that during the 1956-1957 crop year total paddy produced was 8.3 million metric tons compared with 7.3 million metric tons in the 1955-1956 crop year. Yield of paddy per rai increased from 213 kilograms per rai during the period of 1947-1956 to 228 kg (1 kg = 2½ pounds) in 1956-1957. Favorable weather, better irrigation, better seeds, and pest and disease control are considered as the factors contributing to this increase. Besides paddy, rubber, oil seeds, peas, sugar cane, tobacco, kenaf and jute, cotton, and corn yields also increased.

Table 19. Comparison in production of selected agricultural crops, 1955 and 1956 (metric tons).

Year	Rubber	Sugar Cane	Tobacco	Kenaf	Cotton
1955	133,000	2,699,000	56,000	14,000	25,000
1956	137,000	3,830,000	58,000	20,000	32,000
Increase	4,000	1,131,000	2,000	6,000	7,000

Source: (28, p. 11)

Demographic Arrangements

It is generally accepted that the fertility rate of the population on farms is relatively larger than that of other groups. Thailand is no exception. Moreover, the mortality rate among farmers in Thailand is expected to be higher because few doctors, health services, and modern drugs are available to them. Also desirable concepts of nutrition, diet, public health and sanitation have developed slowly among the people in the rural areas.

Health Service and Sanitation

By the standard of other countries of Asia, the level of health of Thai farmers is relatively good (5, p. 75), although considerable regional variation does exist.

Central Thailand, which is relatively free of malaria, has the highest level of health, the northeast has the lowest. Farmers living near the provincial capitals and district centers have easier access to modern health

facilities and show a higher level of health than those in isolated areas.

Diseases that have destroyed and hindered the agricultural human resource of Thailand are malaria, dysentary, childhood and maternal diseases, yaws, and other dibilitating diseases. If these diseases can be brought under control, "the level of health of Thai peasant will be remarkably good, considering the environment in which he must continue to live" (5, p. 175).

To reach the desirable level of public health, especially of the rural people, Thailand should have at least five times as many doctors as it now has and they must be allocated proportionally among regional areas.

However, the level of health of the rural people has been steadily improving. Much of the change that has come about has been the result of public health programs of the last fifty years, which directly or indirectly have affected farm families. Smallpox and cholera have been brought under control. Smallpox vaccination was introduced in 1840 by American missionaries, and it was made compulsory in the early part of the twentieth century. Vaccinations are now made regularly during the year by the district health officer or his representatives. Safe water supply and modern methods of sanitation in the cities have brought cholera under control.

Nutrition and Dietary Development

The work on nutrition and dietary improvement had its beginning about 30 years ago. The movement consisted principally of educational activities of various kinds to change the diets of the people in order to rectify the obvious deficiencies in such essential food factors as proteins (chiefly biological proteins) and the B complex vitamins (22, p. 99). A rough height and weight estimate was conducted in 1938 and the study pointed out the underweight condition of the population as a whole. The basic diet of rural Thailand is by no means unnourishment, but rather it is low in vitamin and mineral content, and seriously lacks fats. The few professional studies that have been made of the Thai diet rate it as adequate but in need of improvement. Consumption habits and dietary knowledge must be improved if public health is to continue improvement. As a nation Thai people are less robust than their eastern neighbors, the Japanese and Chinese, although they have attained a fairly good height (22, p. 99).

The health work was interrupted to some extent during the war but it has developed again with cooperation and assistance from the World Health Organization of the United Nations and from the United States. However, the program has developed slowly due to lack of trained personnel and equipment necessary for the work.

Generally, the Malthusian theory of population never

operated in Thailand. The Thai farmers grow many nutrious products, therefore, the problem of nutrition among them is not "lack of food" but "lack of knowledge" as already indicated.

Theoretically, population growth means two things to a society's economy: a larger market and increasing labor force. Population growth might be either an asset or a liability to the nation. This depends upon their health and productivity.

To farmers, an increase in number of members in their families, other things being equal, implies an increase in the labor force, and both capital and land per worker are accordingly reduced. Furthermore, this tends to reduce per capita income. This development can be seen in the case of farmers in some areas of the Kingdom. To help overcome this challenge, some change in cultural and political arrangements is required. For example, more education is essential and the mobility of the people needs to be increased.

Cultural and Political Arrangements

The term "culture" refers to human behavior or a way of life and the term "politics" implies the science and art of government or the theory or practice of managing affairs of public policy.

Considering the above definition, one can see the

importance of cultural and political forces that contribute to economic development or in this study, to potential agricultural resource use -- both natural and human. Without improvement and development in cultural and political arrangements, it will be unreasonable to expect any change in agriculture as well as in the national economy as a whole.

Education

No nation can progress beyond the level of progress of its people in knowledge, skill, and technology. Any change among men is a product of the educational function. The expansion and improvement of agricultural resource use in Thailand also mainly relies upon the groundwork of education.

A compulsory national primary school system came into being in 1921, but did not become widespread in the rural areas until after the 1932 revolution. A child must stay in the beginners class until he has learned to read and write, and knows the rudiments of arithmetic, then he passes into the first of the four classes or standards (pratomes), which are much the same, except that subject matter become more advanced and training more intensive. The child is taught the rudiments of ethics, arithmetic, reading, penmanship, health and sanitation, geography of Thailand, composition, spelling, craftmanship, and agriculture.

The central government prepares the textbooks and

distributes them to the village schools, but does not provide them free of charge. Village children must buy their own texts and must supply their own exercise books, slates, chalk, pencils, and other equipment.

After graduating from primary school nearly all these children go back to the land to cultivate and harvest year in and year out. No newspapers reach their homes, except in a very few rural areas. Agricultural extension services, agricultural magazines, or technical periodicals reach only a few people.

Agricultural Vocational Schools. After the 1932 revolution the new government moved vigorously to improve the situation by laying down educational programs. This included the establishment and improvement of agricultural vocational schools. There were 16 agricultural vocational schools with more than 3,500 students in 1957.

Compulsory Educational Reorganization. In 1950, the Ministry of Education drew up a reorganization plan for compulsory education, in which a seven-year program of study was to replace the present four-year one. A modification of this plan now is being tried in Cha Choeng Sao, sixty miles east of Bangkok. The government, with the collaboration of UNESCO, the Food and Agriculture Organization, the International Labor Organization, and the United States International Cooperation Administration, has undertaken an intensive educational experiment there. The central phase

of this reorganization program as it will affect village children lies not only in extending compulsory education by another three years, but also in the reorganization of teaching methods and curricula and stressing of agricultural vocational education. The results of the program have been evaluated and it was adopted on a nation-wide basis in 1956. However, this program calls for almost half of the national budget. Consequently, it was decided to implement the program over a five year period. A twenty-year period of implementations may be more realistic.

University of Agriculture. The university of agriculture, Kasetsart University, was founded in 1943. Formerly the principal policy was to provide office staff for government departments to carry out agricultural promotion work. Since that requirement has been partially filled, the present aim is more towards equipping the students for their vocation in agricultural economics, agriculture and animal husbandry, forestry, fishery, veterinary, irrigation engineering, and home economics.

Philosophy of the People

Some economists, who deal with the theory of economic development, list several factors affecting economic growth in any particular area as these: (1) institutional, (2) natural, (3) economic incentives, (4) psychological attributes of the population, (5) technological change, and

(6) capital accumulation (4, p. 3).

Thus, among other things, the attributes of the people towards work, saving, spending, investment, and the like must be favorably developed if the economic growth is to proceed successfully in Thailand. The people must channel their energies or efforts into new courses -- notably into making improvements in methods of production, increasing the efficiency of business enterprises, and government administration.

There are some attitudes, however, which are still dominant in many persons in Thailand, and which to some extent at least must be replaced.

One is the deep-seated attitude that the most satisfying occupations and positions in life are land ownership, religious learning, military achievement, and civil position in the service of the government.

Another is the ethic that a junior or subordinate should not express -- much less act upon -- his judgment in opposition to, or even independently of, an elder or superior. This attitude can be seen in government offices as well as in a typical family. This attitude inhibits some if not most individual from acting freely, and perhaps from thinking with complete freedom, in the literal or symbolic presence of an elder or superior. This change will likely be more difficult to bring about than some of the others.

Another is the attitude towards spending and saving. Some traditions and customs have a negative value from an economic viewpoint, e.g., heavy spending on various kinds of ceremonies and most people keep their savings in jewelery or cash. More must be done to encourage farmers and others to change their attitudes of spending on non-productive things and to use the facilities of savings banks and cooperative credit societies.

Another is the tenets of Buddhism. It has often been asked whether the principles of Buddhism do not create barriers to technological development. In the opinion of the writer, they do not. However, the educational system of Buddhist priests must be improved in order to give them well developed insights so they may make proper and efficient interpretation and analysis of the tenets of Buddhism for their followers. By such process Buddhism in Thailand can be helpful in the growth and development of the country.

Policy and Stability of Government

The original platform of the People's Party, which accomplished the Revolution (1932) in Thailand, was the statement that "a national economic policy must be drawn up to guarantee remunerative work to everyone" (10, p. 10). In 1933, the Ministry of Economic Affairs was established. On September 20, 1933 the Ministry of Economic Affairs

outlined its policy for the welfare of the people concerning agriculture as follows:

"... Assistance should be given to agriculture as follows:

1. To consider ways and means of providing agricultural credit and in particular to extend the system of Cooperative Credit Societies, to establish silos for the storage of paddy, to make advances on the paddy so stored, and finally to establish a Central Agricultural Credit Institution.

2. To consider ways and means whereby agriculturists who do not own land may acquire possession of land, and in particular to consider whether the attainment of this end may be facilitated by the establishment of Cooperative Land Purchasing Societies.

3. To extend agricultural experimental stations in order:
   (a. to discover means of lowering the costs of production.
   (b. to improve the quality of agricultural produce.
   (c. to disseminate among technical primary schools knowledge gained from such experiments.
   (d. to encourage the cultivation of other crops after the rice-planting season, so as to provide employment for the farmers throughout the year.

4. To extend the irrigation system to assist agriculture.

5. To assist those who desire to take up agriculture but find themselves handicapped by the lack of lands or knowledge by:
   (a. engaging experts to make survey of vacant lands with a view to advising the government of the suitability of different soils for crop-raising.
   (b. considering on the basis of the foregoing survey, the expediency of undertaking schemes of colonization.

(c. giving any necessary advice.

6. To encourage the cultivation of other crops besides rice..." (10, p. 75)

Since that time it can be said that the government has followed the foregoing policy of the People's Party. Even though the degree of enforcement of the policy varied from one government to another, the accomplishment of the policy and the program since then has generally advanced.

Technological Arrangements

This section deals with possible means of increasing the quantity and quality of production of lowering costs and general improvements in efficiency.

Agricultural Experiment Stations

Several agricultural experiment stations, rice experiment stations, livestock breeding stations and fishery experiment stations were created in every region of the country. These stations are beginning to make a significant contribution to the farmers of the nation. For example farmers may obtain fingerlings free of charge from the fishery stations.

Department of Rice

Because of the importance of rice in the nation's economy, the Department of Rice was established in 1956 to

carry on technical functions with respect to this product. The objective was to improve both the quantity and quality of rice.

Agricultural Extension Services

So far, there is no integrated agricultural extension service in the Kingdom. Each department does its own extension work. Conflicts and duplications of work are common. The need for an efficient extension service has been felt strongly during recent years.

Use of Fertilizers

During the last few years the use of artificial fertilizers by farmers in Thailand has been developed. This is the result of government encouragement based on the favorable consequence of experiments with fertilizers as indicated in Chapter III, Table 18.

In many cases low prices for paddy compared to high cost of fertilizers and small volume of farm business has made the use of synthetic fertilizers unprofitable. However, chemical fertilizers are used widely by the commercial vegetable growers near Bangkok, by well-to-do farmers, and by the members of cooperative associations in some areas in the Central Plain.

In all regions of Thailand except the Northeastern region, farmers make little use of animal manure in their rice fields. The low-level areas have no need of it, for

their soil is fertilized by annual flooding. The water flowing into the rice fields may come from the annual inundation of the rivers, may be diverted into rice fields from nearby streams, or the water may simply be rain water plus runoff from adjacent slopes covered by forests, as in many parts of the Northeastern region. Under these conditions, water does bring in a certain amount of sediment and salts in solution. Thus, the soil is enriched to some extent by small amounts of plant nutrients every year. This is one of the reasons why rice can be produced on some field year in and year out, without soil improvement. Consequently, the matter of fertilization has not been seriously considered by farmers in general.

Manure is used to a limited extent to fertilize vegetable gardens and other plant beds of the house compounds in northern Thailand, but only in the Northeastern region is it used systematically and extensively. Here, because animals are relatively numerous and because they are corralled, there are large manure heaps. Without this fertilizer, the Northeastern farmers could not grow the vegetables, tobacco, onions and other crops that are necessary to supplement their livelihood. The poverty of the soil in the Northeast has led the farmers to utilize another natural fertilizer, termite nest mounds, which often reach 2 or 3 yards in height and may be 5 to 6 yards in diameter. These nests, made of a sandy clay brought up by the termites

from a depth of a yard or more below the sandy top soil, are fairly rich in plant nutrients and are further enriched by the termite activity.

A few months ago, a fertilizer plant was built in the vicinity of Bangkok. Garbage in Bangkok and nearby cities will be converted into fertilizer. This industrial plant was started by a British concern at an estimated cost of ₱2,500,000. This movement will play a significant role in agricultural production. However, considerable attention should be given to educating farmers in the proper use of chemical fertilizer otherwise they may even decrease yields. At the same time natural manures that farmers generally use should be promoted and developed because a majority of farmers seem to benefit from using what they already possess at no money cost.

Mechanization of Farming

Generally speaking, the present economic or social structure of the country is not ready for mechanization of farming. Over 80 percent of all rice in Thailand is transplanted and grown in small, irregular shaped paddy fields surrounded by dikes. Only in the broadcast-rice area of the central plain would the use of tractors be practical, but even here the average holding is less than 25 acres and obviously would not pay a farmer to own a tractor for use on such a small area.

However, rising costs of production in the Central region are already creating serious problems for the rice farmers. The use of labor-saving devices to keep production costs down seems to be a solution.

It is evident that the cultivation of the crop with the aid of tractors is possible, although further modifications of the implements as well as of the tractors may be required. Mechanical cultivation in the rice lands of Thailand has been under trial at the Rangsit Experiment Station. This station started a field scale experiment on a farm of 741 acres with the idea of determining under actual working conditions, the economics of farm mechanization. The available information indicates that prospects are good (3, p. 67). Employing the use of the tractor for puddling the land has been tried with success. However, plowing out corners, carting, and other odd jobs can be done more economically by buffaloes than with a tractor, even on fairly large farms.

The greatest of obstacles experienced was with the use of the harvester. A large rice farm could be plowed by tractor and planted by hand or the broadcast method with a minimum of labor, but harvesting a large area by hand labor would be too costly. The remedy is, of course, machine harvesting by reaper, binder, or combine. However, the problem is that paddy lodges badly. To produce a standing crop it is essential that the depth of water in the paddy

fields be rigidly controlled to no more than 16-20 inches in height (5, p. 193). By careful control of water the government experiment showed that rice could be harvested by binder. However, during the harvest in January there was heavy rain, which laid the plants flat on the ground and it was necessary to harvest by hand at high cost.

In summary, mechanization of farming for parts of the Central Plain is favorable, due to: (1) the size of land holdings is relatively large and there are owners of extensive areas; (2) the land is flat and where floating rice is grown, the fields are large; (3) the prevailing practice on most of these farms is to plow the land dry and sow the seed broadcast; (4) there is a shortage of buffaloes and the present preparatory cultivation is very inefficient, the fields often being full of weeds; and (5) there are some uncultivated lands and areas of abandoned rice land that could be brought under cultivation.

The factors against mechanization are: (1) lack of spare parts and trained men to keep machinery in continuous operation; (2) problem of obtaining suitable types of rice with straw sufficiently stiff in broadcast areas so that harvesters can be used; (3) problem of getting the land properly dry for efficient use of harvester and combine; and (4) problem of inaccessibility of the interior areas. Unless these disadvantages are removed, mechanized rice production in the Central area cannot be accomplished

economically.

So far, to overcome the cost of buying a tractor, "custom plowing" is practiced by some cooperative societies and by groups of farmers in the Central Plain.

However, further study and research on kind, size, and efficient design of the machinery or other labor-saving devices is essential.

Chapter V

RELATIONSHIP OF AGRICULTURE AND INDUSTRIALIZATION

This chapter is designed to consider the relationship between agriculture and industrialization during the process of agricultural development. The emphasis, however, will be laid upon industrial development concurrent with effective expansion and productivity of agriculture as a whole.

Disguised Unemployment in Thailand

Agricultural economists have estimated that Thailand can support a population of at least 100,000,000 (5, p. 200), although many improvements would be necessary in order to maintain a reasonable standard of living for such a population. However, the objective should be not only to maintain but also to increase per capita real income of the people.

The preceding chapters show that disguised unemployment exists in the agriculture of Thailand at present. Total work days per worker living on farms were only 141 days per year. The remainder, in general, is unemployment or uneconomic employment. If there were productive industries such as road or highway construction, government or school building, or manufacturing plants that could use this

surplus labor force, Thailand of course would have increasing national output. This requires efficient fiscal policy by the government and industrial development in the Kingdom.

Industrial Evolution and Agricultural Development

Some may ask that "can any agricultural country achieve its economic development without developing its industrialization?"

In its modern context, economic growth in a country is not a one-sided development. Agriculture and industry must develop together. Another way of describing economic growth is in terms of a greater commercialization of economic activities. However, some say that, a country whose economic activity is based largely on a subsistence agriculture, could, without becoming industrialized, experience remarkable economic growth through change in productive techniques and marketing procedures which bring about greater inter-regional trade. Very likely Thailand could make considerable progress by simply increasing agricultural production, encouraging internal trade and then export the balance. However, internal trade in agricultural products would not amount to very much because the climate, soil, and topography are fairly homogeneous throughout the country. In any case more processing of products moving in both

internal and external trade would be necessary. This processing can be an important part of urban industrialization. Thus, industrial development is obviously needed by an agricultural country even in the short run.

In the long run, as economic growth occurs, the primary industries must constantly release labor resources to secondary and tertiary industries. This must occur if the standard of living of the nation is to improve. It can be seen that an agricultural country can hardly have economic growth without, to some extent, industrialization. As a matter of fact, it is a firmly established generalization that every great region of the world where living standards tend to be high, agriculture is relatively small as a field of employment. Rich agricultural countries such as New Zealand, Australia, or Argentina are really no exception. The ratio of farm to total working population in these countries is far below the world average, which is probably around 60 percent, and is steadily decreasing because of the expansion into secondary and tertiary industries (13, p. 3).

During the last few decades, several efforts were and have been made to stimulate industrial development in Thailand as already discussed in Chapter IV. However, there exist several factors which retard industrial evolution in the Kingdom. They may be classified into two groups: generating and limitational factors. Generating factors include enterpreneurship and technology. Limitational

factors consist of material agents, population, effective demand, capital and savings.

Risk taking and management that made up enterpreneurship are very limited in economic activity outside agriculture in Thailand. This may result from habit pattern, lack of knowledge and experience as well as limitation of technology. For this reason, most of the manufacturing industries are government-initiated or jointly initiated or initiated by foreigners.

On the other hand, material agents suitable for large-scale industry such as development of coal, mineral and power resources seem to be scarce or they are not economically accessible under present conditions. Furthermore, the quality of the population, effective demand, investment, and capital accumulation are likely to develop slowly in Thailand.

It may be worthwhile to note that the conventional assumption that labor is mobile within a country does not apply very well in Thailand. For instance, the growth of trade and commerce after 1850 led to an increase in demand for wage labor. Since rice cultivation and land ownership have become attractive, few Thai people were very willing to become wage laborers. From their viewpoint, wage laborers make a living under conditions of slavery which was abolished in 1905. This reaction brought about Chinese labor immigration which actually started long before 1850.

By 1900, the Chinese were arriving in Bangkok at the rate of 18,000 per year and even larger numbers in the Southern region. In the 1920's Chinese arrivals at the port of Bangkok ranged from 70,000 to 140,000 per year (8, p. 211), but some considerable number returned to China. They filled the bulk of the jobs in commerce and industry. They became enterpreneurs as well as laborers and craftsmen. There is no evidence to indicate that the government paid much attention to this phenomenon. The rise in wages was not enough to attract the Thai away from agriculture and to introduce other changes which might have occurred. Instead, the division of labor between the Chinese and Thai seemed to be encouraged. Consequently, the Chinese became more skillful in retail and wholesale trade, rice milling, middlemen activities and wage earning. This made it difficult for an outsider to break in even though they may have wished to do so. The situation prevailed because the Thai had no opportunity to gain experience, nor were the prospective rewards adequate to draw them out of agriculture. Chinese employers would favor Chinese workers, and Chinese wholesalers would almost automatically quote better prices to Chinese retailers than to Thai. An efficient solution to the problem of increasing the mobility of labor is essential if Thailand is to achieve some industrial development which in turn will improve agricultural resource use.

The Role of Government

The government seems to realize the weakpoints of agriculture in the economy and also understands the importance of industrial development and that it must coincide with agricultural improvement. An instance is that on October 21, 1955 the government issued a notification under the Industrial Promotion Act of 1954 outlining its policy on foreign investment in industries in Thailand. It states that investments in industries, whether Thai or foreigner, can be made freely. The government will not interfere in the normal operation of an industrial enterprise and will not give special privileges to any person or government organization which is engaged in a similar business. The government also states that it would not nationalize any industry.

So far, there are few private enterprises, both Thai and foreign, taking advantage of this announced policy. Consequently, it seems that the major part of industrial investment must come from the government. This will be difficult because an increasing proportion of the national budget is used for defense as is shown in Table 20.

History shows that in some countries industrial development has generally been promoted by foreign capital investment in areas of production, which supply an export market and which employ much capital and comparatively little

Table 20. Relative importance of government expenditure, by items, 1953-1957.

Item	1953	1954	1955	1956	1957
Economic Affairs	12.0	11.7	12.9	11.3	10.2
Public Welfare	8.1	5.2	4.3	8.5	5.9
Education, Public Health and Justice	7.9	7.4	6.4	8.0	7.5
Defense and Interior	33.8	33.4	34.0	48.0	44.1
Other	38.2	42.3	42.4	24.2	32.3
Total	100.0	100.0	100.0	100.0	100.0

Source: (16, p. 18)

labor. Industrial development of this kind may achieve considerable expansion in production, and a high rate of profit, without greatly benefiting the agricultural population as a whole, and without contributing much to an increase in agricultural production. A study made by the Department of Economic Affairs, United Nations (33, p. 85), pointed out that in Africa, the expansion of the mining industry threatens the maintenance of local food production; in the Middle East, the very large expansion of oil production in recent years has not led to any general improvement in methods of cultivation or any large rise in standards of living.

To avoid the effect of such one-sided development, therefore, and to obtain the full benefits which a wider measure of industrial development can bring to the

improvement of the agricultural people, it is necessary that Thailand should plan general industrial development on a much wider basis, and should ensure that such development serves the needs of agriculture.

> "cottage and small-scale industries will and should be maintained in Thailand for a long time... What is needed are hand tools, small machines, and equipment to suit a country with scarce capital and abundant labor. Only in a few cases does the factory system seem warranted in the present economic setting... The best possibilities are likely to be basic clothing and food...",

said Dr. Gerald E. Korzan, in his article "Resource Use in Thailand" (9, p. 308). The writer concurs in this view. This is the realistic direction industrial development should take if it is to promote Thailand's economy.

Furthermore, the government should efficiently aid the formation of cooperative industrial organizations and trade associations; set standards, enforced by its own inspectors; provide cheap electrical power; educate artisans in the use of modern equipment utilizing electricity; establish research and technical institutes, and diffuse the results of such research. Also, credit facilities, reasonable tax on capital and capital investment are required for industrial growth. In some cases, protective tariffs should be used to foster desirable infant-industries within a necessary period of time. This may mean some conflict between agricultural and industrial interests. It is natural

for the primary producers to object to the higher prices for manufactured goods which they have to pay because of tariffs, and for the infant-industrial enterpreneurs to desire protection against competition from abroad. Only well-planned fiscal and industrial development policy can solve this problem. On the other hand, the government may need revenue from imported manufactured goods. This problem can be solved by imposing an excise tax on the domestically produced output, equal or somewhat below the import duty.

In order to attract foreign capital investment, some improvements are needed. First of all, unpredicable change in government policy as to import duties on raw materials and machinery, and as to taxes, rates of profit, and transfer of funds must be eliminated. Second, corruption must be completely controlled and cooperation from government agencies must be available. Third, institutional arrangements must encourage industrial development not impede it. Finally, fear of external aggression must be reduced by means of effective foreign policy. Furthermore, international trade and international co-operation in stimulating development should be promoted and developed.

Chapter VI

SUMMARY AND CONCLUSIONS

Potential use of agricultural resources is becoming an increasingly serious problem in Thailand. The problem stems from such factors as the continually increasing population, change in the pattern of demand, and economic development requirements.

Thailand faces the problem of increasing and improving its agricultural output both for use at home and for export. This calls for determining the most efficient alternative uses of agricultural resources, both natural and human. However, one must view potential use of the resources of Thailand in their physical, economic, and institutional setting. Also, no two countries have exactly the same combination of resources, so a direct comparison of use is illogical.

In the case of resource development under the extensive method, the expansion of the agricultural industry has absorbed a vast majority of the national labor force as well as considerable land resources. This economic effort, however, has placed the emphasis, in most case, upon one crop -- rice production. This crop feeds the nation and is a major source of foreign currency. But the increase in rice acreage during the latter part of the last century has led to a long-run decline in yield per acre. The decline

in yield per unit of area indicates that the poorer land, or land less well provided with water, was brought under cultivation and the resource use has expanded without improvement in production techniques.

Physical supply of land for agriculture, especially for rice production, is limited. It is limited by nature, other alternative uses, and by economic feasibility. Most of the good land is now cultivated.

The large part of any potential increase in agricultural production must come from greater and better use of the present cultivated land and present labor force now on farms. For one thing, this approach requires more irrigation, better seeds and better breeds, improved soil fertility, and improved equipment and tools. At the same time farmers must learn how to properly use these inputs and generally improve farm practices. Also, consideration should be given to including crops other than rice and to moving people into industries where the marginal productivity is greater than in agriculture. Educating and training of primary producers, sound industrial policies, and the proper institutional setting must be developed together.

Relative to mechanization, changes have been slow in Thailand. The size of farms, condition of soil texture, farm layout, costs, and farmers' knowledge and preference limit the rapid movement toward the use of machinery.

However, continuing study and research on kind, size, and efficient design of machinery or other labor-saving devices is essential. The logical way to begin is to educate farmers to the proper use of what resources they already possess. For example, domestic manure use should be encouraged and developed and the method of transporting rice sheaves from field to threshing ground should be changed from man-labor to animal-labor. Threshing by buffaloes should be promoted and developed in every part of the country.

With institutional arrangements providing a favorable setting, industrial development concurrent with effective expansion and productivity of agriculture as a whole should be the general plan. In its modern context, economic growth in a country is not a one-sided development. Agriculture and industry must develop together. However, if progress is to continue, or be accelerated, the people as a whole must understand what is involved. That is, the attributes of the people toward work, spending, saving, and investment must be improved. The people must channel their energies or efforts into new course -- notably into making improvements in methods of production, increasing the efficiency of business enterprises, and government administration. Only through education can the people of Thailand be stimulated to new and better things.

Industrial development will provide more off-farm

employment opportunities for farm surplus labor. However, industrial development as well as improvements in agriculture are bound to be slow because capital accumulation, skilled enterpreneurship, technical know-how, and institutions change slowly. The idea is to strive for continuous, steady development of resources but probably in no spectacular way.

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APPENDIX

Acreage, Production, and Yield of Paddy in Thailand, 1907-1955.

Year	Harvested Area (Acres)	Total Yield (bushels)	Average Yield Per acre (bu.)
1907	3,463,080	126,481,422	36.5
1908	3,132,880	115,895,511	37.0
1909	4,382,160	135,287,200	34.1
1910	3,631,268	131,249,869	39.8
1911	3,780,770	141,123,956	37.4
1912	4,929,744	179,774,311	36.5
1913	5,019,139	139,783,389	27.9
1914	5,045,148	151,966,311	30.1
1915	5,143,580	160,324,400	31.1
1916	5,197,512	182,474,089	35.6
1917	4,391,560	146,445,644	33.3
1918	5,023,518	165,795,822	33.0
1919	3,509,252	111,229,956	31.7
1920	5,598,396	208,995,867	37.4
1921	5,890,612	207,165,687	35.2
1922	6,005,304	212,644,133	35.4
1923	5,911,776	215,518,000	36.5
1924	6,395,556	242,093,156	37.9
1925	5,967,156	205,424,711	34.4
1926	6,961,928	256,029,378	36.8
1927	6,384,172	223,600,133	35.0
1928	5,964,136	190,191,556	31.9
1929	6,112,084	189,832,444	31.1
1930	7,273,996	236,445,867	32.5
1931	6,452,996	199,410,044	30.9
1932	7,528,512	250,658,356	33.3
1933	7,535,320	245,334,444	32.6
1934	7,332,065	225,250,667	30.7
1935	7,427,343	231,580,133	31.2
1936	5,565,360	165,582,889	29.8
1937	7,358,473	223,190,578	30.4
1938	7,821,533	221,619,289	28.3
1939	7,680,651	223,422,133	29.0
1940	8,086,850	241,200,356	29.9
1941	9,068,716	250,839,244	27.7
1942	7,236,336	189,536,889	26.2

(cont)

Year	Harvested Area (Acres)	Total Yield (bushels)	Average Yield Per acre (bu.)
1943	9,857,298	279,347,556	28.3
1944	9,908,347	250,228,711	25.2
1945	7,408,866	181,233,911	24.5
1946	8,772,834	128,742,889	24.9
1947	10,706,356	269,766,222	25.1
1948	12,324,762	334,862,711	27.2
1949	12,406,460	327,444,844	26.3
1950	13,236,562	332,238,844	26.1
1951	14,340,519	358,888,329	25.0
1952	12,825,519	323,443,689	25.2
1953	14,827,119	403,657,467	27.2
1954	11,309,651	279,586,073	24.7
1955	13,306,353	352,077,004	26.4

Source: Division of Agricultural Economics, Office of the Under-Secretary of State, Ministry of Agriculture. Bangkok.