ECONOMIC AND ENGINEERING STUDY

GRAIN STORAGE AND MARKETING SYSTEM

VIETNAM

UNITED STATES AGENCY FOR
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PREFACE

Since the year 1964 when the nation of South Vietnam first imported rice to feed the population, extensive effort has been directed toward implementing a crash program to increase the nation's rice production. The Ministry of Land Reform and Agriculture initiated a program to introduce the new varieties of TN-8 and TN-5 in the hopes that their higher yields would restore South Vietnam to a surplus rice producing nation. Ministry of Land Reform and Agriculture personnel assisted by United States Agency for International Development (USAID) specialists planned a program, established goals and initiated a massive educational effort to introduce to the farmers the productive potential of the new varieties. Information was distributed to farmers on the cultural and fertilization practices that were needed to realize the higher yields. New seeds, fertilizers and credit were made available and the results have been almost instantaneous in changing the declining trend of rice production to an increasing trend of production.

The problems associated with changes in varieties, harvest periods and seasonal volumes became apparent when the first "new" rice was harvested during the rainy season. Rice storage problems, which were not serious while the nation was a deficit producing country, became critical as harvest periods changed and volumes of rice entering the market increased. Due to the shortage of storage in some areas of the nation, supplies of rice often were short while surplus quantities were waiting for processing or shipment in other areas.

The stocks of rice in Saigon, which in 1968/69 became too large, suffered greatly from insect and other losses. The lack of proper distribution

facilities resulted in excessive transfer losses, periods of shortages in some areas of the nation, low paddy prices in other areas, and the destruction of the confidence in the farmer, miller and consumer in the entire rice marketing system of South Vietnam. These problems, accompanied by the added burden of marketing a new kind of rice--which carried with it the hopes of restoring South Vietnam to its dominance as a rice exporting nation--magnified the need for improved and more efficient marketing facilities. It soon became evident that if the full benefits of the production efforts of the nation were to be realized, a more modern and practical system of storage, handling, drying and marketing of rice, in line with agricultural needs, would be necessary.

At the request of the Ministry of Land Reform and Agriculture and the Ministry of Economy, USAID initiated a study of the storage, handling, drying and marketing of grains in South Vietnam. In July 1969, the firm of Wildman Agricultural Research, Inc., of Toledo, Ohio, (formerly Sharp-Cravens Research, Inc.) was engaged to study the storage, handling, drying and marketing needs of the nation. The study was designed to determine the size, location and kind of grain storage and handling facilities needed to efficiently meet the needs of the nation over the next ten years. Emphasis was given to a study of the marketing and assembly problems at the village and hamlet level as well as to the major ports and terminal markets of the nation. The problem of drying the new rice, which would be harvested during the rainy season, also was studied. In addition to recommending the facilities, the study would produce preliminary designs and cost estimates of each facility and the description of the type of supporting programs to assure the success of the operation of the recommended facilities.

A study team consisting of John W. Sharp, Project Leader and Agricultural Economist; Kathryn M. Wildman, Agricultural Statistician; William R. Morrison, Agricultural Economist; and Raymond C. Pelon, Grain Storage Design Engineer, arrived in South Vietnam in late August. During the study period in South Vietnam, the team made extensive investigation in all major areas of the nation. Numerous villages and hamlets were visited where hundreds of interviews were made with a sampled cross-section of the producers, marketers, millers, processors and consumers of the grains in the nation. Past research was reviewed and personnel from the Government of the Republic of Vietnam (GVN) and USAID were interviewed. These sources assisted greatly in providing information which was extremely valuable to the research program. Focus was directed to an intensive study of the marketing problem alone and not to the agronomic and cultural problems of rice and other grain production problems.

To better accomplish the research objectives in South Vietnam, Wildman Agricultural Research, Inc. entered into a subcontract with a South Vietnamese firm, Vietnam Finance & Investment Consultants (VIFIC), 277 Hai Ba Trung, Saigon, who assisted the study team in gathering information and data for the analysis. The services of Mr. D. N. Long and his associates were invaluable in carrying out the field work portion of this research.

Acknowledgment is made and deep appreciation is expressed to the many officers of the Ministry of Land Reform and Agriculture, the Ministry of Economy and USAID. Those officials and their staff, both in Saigon and in the provincial and district capitals, spent many hours in assisting the team and providing information for the members of the team. Members of the rice trade,

transportation agencies, banking interests and related areas and the Military Assistance Command, Vietnam (MACV) provided important data and contributed freely of their time.

The study team wants to acknowledge these groups for unselfishly giving of their time to assist the team. Their efforts were most helpful and greatly appreciated.

NOTES

During the course of development of the nation of South Vietnam, many administrative changes have been made with respect to provincial boundaries. In order to avoid repetition, all these changes--as documented by the National Institute of Statistics--are shown at this time:

CHUONG THIEN PROVINCE, established on December 24, 1961, was previously included as parts of Phong Dinh, Kien Giang and Ba Xuyen provinces.

QUANG TIN PROVINCE, established on July 31, 1962, was previously included as a part of Quang Nam province.

PHU BON PROVINCE, established on September 1, 1962, was previously included as parts of Phu Yen and Pleiku provinces.

HAU NGHIA PROVINCE, established on October 26, 1963, was previously included as parts of Long An, Tay Ninh and Binh Duong provinces.

GO CONG PROVINCE, established on December 20, 1963, was previously included as a part of Dinh Tuong province.

BAC LIEU PROVINCE, established on October 1, 1964, was previously included as parts of Ba Xuyen and Chuong Thien provinces.

CHAU DOC PROVINCE, established on October 1, 1964, was previously included as parts of An Giang and Kien Giang provinces.

PHUOC THANH PROVINCE (established in 1961) was abolished on July 1, 1965, and annexed to Bien Hoa, Binh Duong, Phuoc Long and Long Khanh provinces.

SA DEC PROVINCE, established on September 24, 1966, was previously included as a part of Vinh Long province.

In order to maintain uniformity and present all data (historical and projected) within the confines of forty-four provinces and four military regions,

data for the six autonomous municipalities of Hue, Da Nang, Da Lat, Cam Ranh, Saigon and Vung Tau have been respectively included in that data for Thua Thien, Quang Nam, Tuyen Duc, Khanh Hoa, Gia Dinh and Phuoc Tuy provinces. In addition, Con Son Island, abolished as a province in 1965 and made a special administrative zone, has been included with Phuoc Tuy province.

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CHAPTER I

DESCRIPTION OF SOUTH VIETNAM

Government

Geography

Climate

- Rainfall
- Temperature
- Humidity

CHAPTER I

DESCRIPTION OF SOUTH VIETNAM

The people of South Vietnam have a long and interesting history dating back to almost 3000 B.C. They originated physically and culturally from a mixture of Sino-Tibetan and the early Indonesian or Malay type. During the early years of their existence, the people in the Vietnam area were ruled by the Chinese; however, by the year 938 A.D., the China dynasty was overthrown and a free Vietnamese state was established. The nation remained free, except for intermittent intrusions of the Chinese, until the French occupation in 1858. France established the nation of French Indo-China, which included Vietnam (North and South), Cambodia and Laos. The French domination lasted until their defeat in 1954 and, as a result of the conferences in Geneva in 1954 which ended the Indo-China war and dissolved French Indo-China as a separate union, the independent nations of South Vietnam, North Vietnam, Cambodia and Laos were formed.

The democratic government of South Vietnam was formed in 1954 and to date has never conducted the affairs of the nation under peaceful conditions; thus, most of the South Vietnamese people have never lived under peaceful conditions. In spite of these hardships, the new nation has progressed in the solution of the problems which were characteristic of a developing nation.

Much has been written about the recent history of the political and economic development of South Vietnam and the documentation of the facts relative to these developments is readily available in libraries throughout the world.

Government

The Government of the Republic of Vietnam (GVN) is a constitutional government based on representation of the people who elect a president, a vice president, and the representatives to the upper and lower house of the national assembly. The affairs of the GVN are directed through the offices of 18 ministries with the ministers appointed by the president (Figure I).

The Ministry of Land Reform and Agriculture and the Ministry of Economy are the two ministries with active interest in the storage and marketing of rice. These two ministries have representatives in each of the provincial capitals. The nation is now divided into four military regions (I, II, III and IV Corps) and 44 provinces, each with its own sub-governmental structure and organization and a provincial capital (Figure II). The provinces are divided into districts with their district capitals and a local governmental structure. Within the nation are located over 2,550 villages and approximately 13,850 hamlets--each with its own local governmental organization.

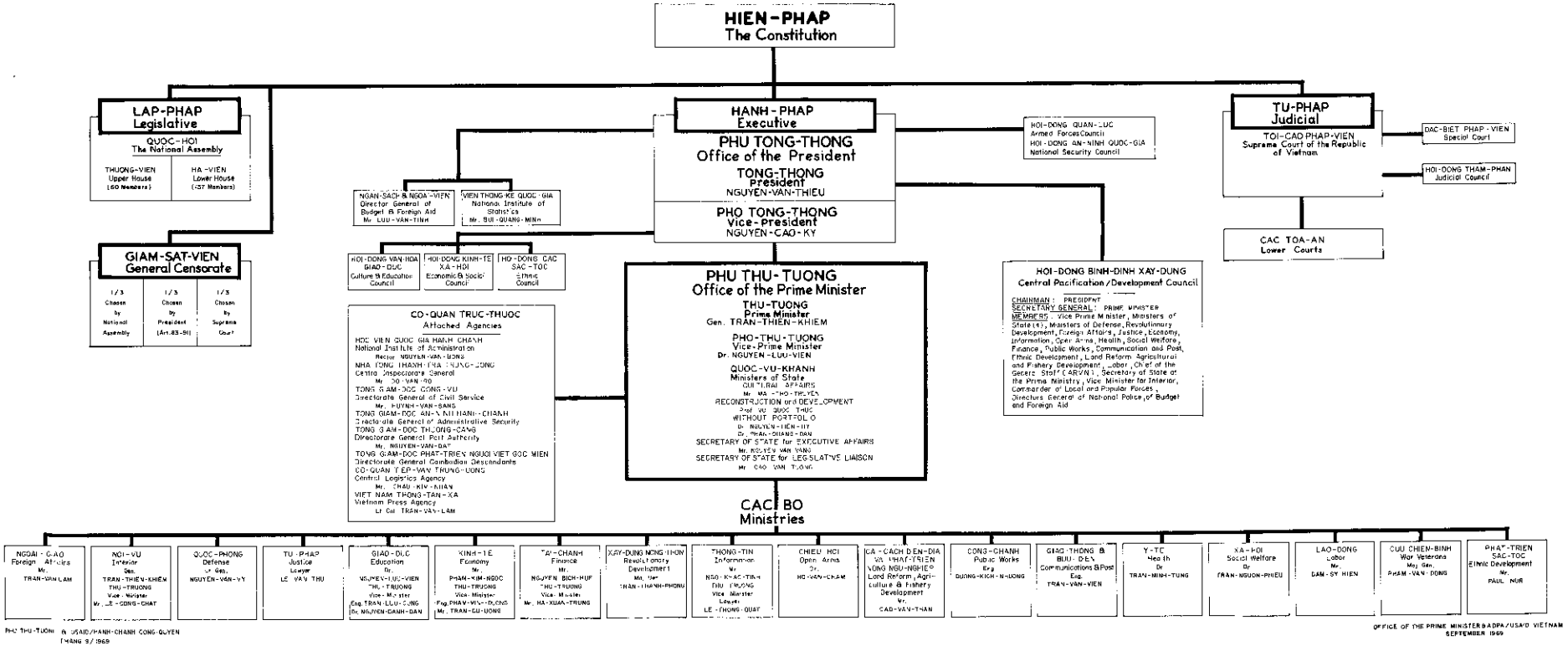
Geography

South Vietnam is a tropical country bordered on the north by North Vietnam, on the west by Laos and Cambodia, and on the south and east by the China Sea. The nation can be divided into three geographic regions: the Delta, the Central Highlands and the Central Lowlands.

The Delta region is located in the southern portion of the nation and is formed by the lowlands of the Mekong River which splits into many tributaries

FIGURE I

CHANH-PHU VIET-NAM CONG-HOA
The Government of Vietnam



PHU THU-TUONG & USAID/PANH-CHANH CONG-QUYEN
THANG 9/1969

OFFICE OF THE PRIME MINISTER & ADPA/USAID VIETNAM
SEPTEMBER 1969

FIGURE II

ADMINISTRATIVE DIVISIONS
SOUTH VIETNAM

as if flows to the sea. The principal channels of the river are the Mekong River and the Bassac River (Figure III). The Delta area, which is the principal agricultural area, produces approximately 70 percent of the nation's rice. The flooding of the Mekong River, resulting from the heavy rains in the headwaters of the river, provides ideal conditions for the production of rice. The land in the Delta region rises only slightly above sea level and much of the coastal area is plagued with the problem of saltwater intrusion.

The Central Lowlands encompasses the coastal area from the Saigon area to the northern boundary. Although parts of the Central Lowlands are near sea level, the mountains on the west rise sharply and, in some cases, extend to the sea. Much of the population of the northern two-thirds of the nation lives in the coastal areas of the Central Lowlands.

The Central Highlands encompasses the mountainous and plateau areas to the west of the Central Lowlands to the Cambodian and Laotian borders. The area is thinly populated, covered by forests, and consists of rugged country which has little or no agricultural production potential.

Saigon is the nation's capital and is located on the Saigon River, one of the branches of the Dong Nai River, about 72 kilometers from the China Sea. In addition to being South Vietnam's capital, it is South Vietnam's largest city (population estimated at approximately 2.8 million in metropolitan Saigon in 1968) and one of its principal seaports. The city of Hue, a small seaport in the northern part of South Vietnam, is considered to be the cultural and religious capital of the new nation. Its history as a city dates back to the very early developments of the social and cultural structure of the Vietnamese people. Other

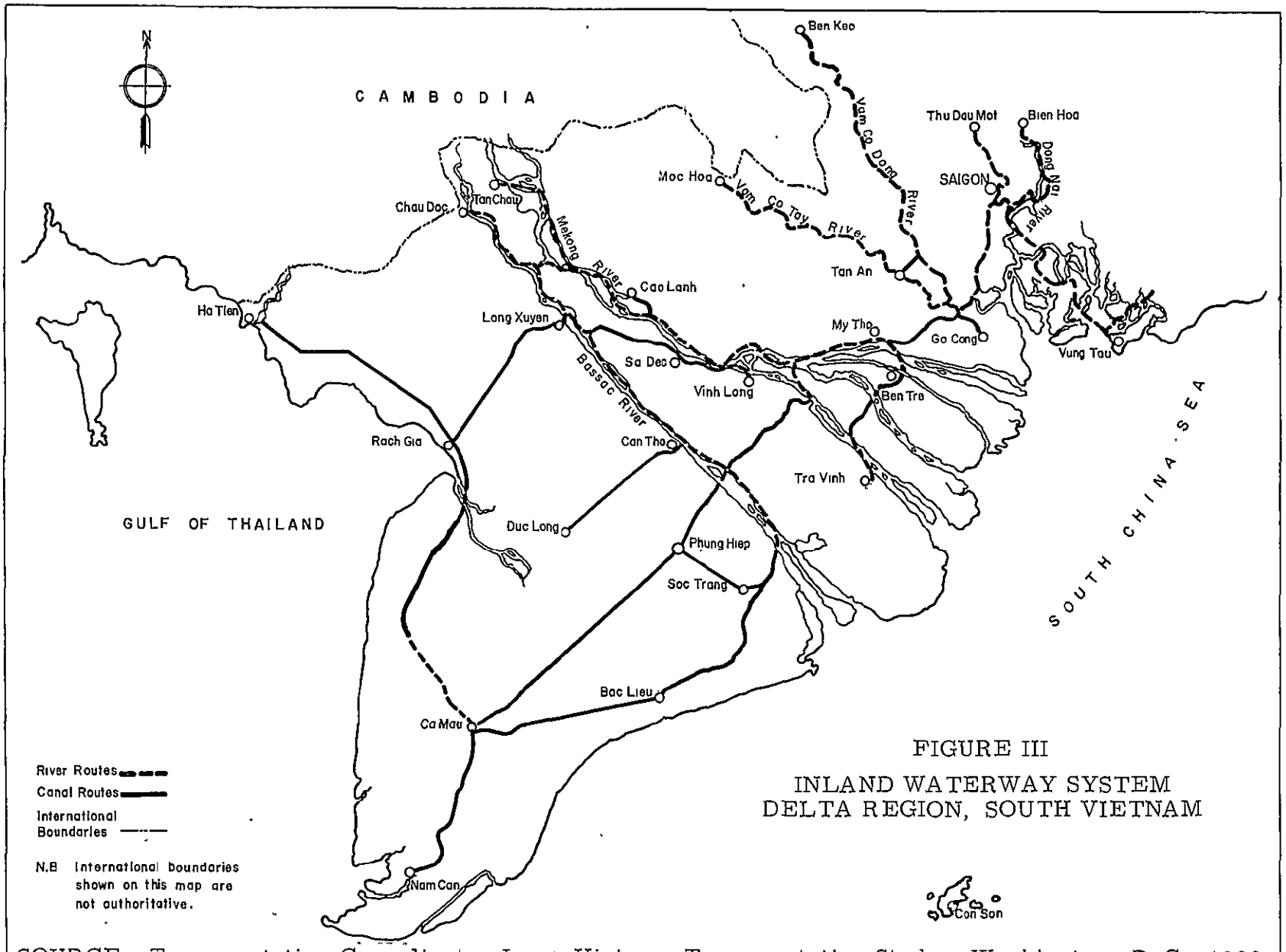


FIGURE III

INLAND WATERWAY SYSTEM
DELTA REGION, SOUTH VIETNAM

SOURCE: Transportation Consultants, Inc.; Vietnam Transportation Study. Washington, D.C., 1966.

important seaports are Da Nang, Qui Nhon and Cam Ranh. There are many other secondary ports in the nation since water is the most important means of transporting economic goods throughout South Vietnam.

Future plans for the development of the transportation potential of the Mekong River will increase the importance of such inland ports as Can Tho, Long Xuyen, Vinh Long and other cities located on the major tributaries of the Mekong River.

Climate

Rainfall

The climate of South Vietnam is tropical; however, considerable variation occurs in climatic conditions along the long north-south distance covered by the nation. The rainy season in the southern part of the nation, which is controlled by the southwest monsoon, begins in May and extends to November. The southern part receives little or no rainfall during the months of December, January, February and March (Table 1).

The provinces in the extreme northern part of the nation, where the weather is controlled by the northeast monsoon, have their rainy season starting in September and October and ending in January. The dry season in this area occurs during the months of February through August.

The maximum average monthly rainfall in the nation occurs in Da Nang

TABLE 1

AVERAGE MONTHLY RAINFALL AT SELECTED STATIONS IN SOUTH VIETNAM, 1966, 1967 AND 1968

Month	Hue	Da Nang	Pleiku	Qui Nhon	Ban Me Thuot	Nha Trang	Da Lat	Phan Thiet	Saigon	Vung Tau	Rach Gia	An Xuyen
						(Millimeters)						
January	270.6	90.8	3.4	95.6	12.2	80.9	12.7	3.4	15.7	2.7	8.7	26.8
February	97.6	26.8	23.7	26.0	0.3	11.8	0.9	Nil	0.1	Nil	3.2	1.0
March	35.7	3.6	21.9	32.4	7.4	18.4	69.2	8.0	20.0	24.0	42.0	63.5
April	106.9	14.6	114.4	28.3	79.6	94.2	132.2	29.8	52.3	6.3	161.6	58.4
May	71.0	82.5	380.7	75.8	221.8	82.1	320.5	154.4	348.0	183.3	333.9	329.6
June	66.2	70.6	222.6	43.2	160.3	24.4	190.6	87.3	255.3	168.9	235.4	336.7
July	55.3	69.1	367.7	46.3	303.6	28.4	174.9	183.0	294.3	226.5	326.6	450.4
August	139.2	152.9	441.6	104.3	319.4	65.8	159.7	172.9	274.6	214.6	270.8	325.3
September	315.4	310.4	278.2	115.4	257.1	92.3	288.6	170.3	394.4	201.6	175.5	228.6
October	507.8	682.6	244.7	446.1	121.7	258.7	262.4	159.6	302.7	243.1	257.0	368.0
November	446.5	258.9	77.3	242.8	86.1	212.1	99.2	42.1	115.1	62.9	88.7	132.7
December	264.0	269.0	11.8	169.7	14.8	180.8	23.4	-7.3	33.5	4.1	37.6	48.6

SOURCE: Directorate of Meteorology, as published in Vietnam Statistical Yearbook, National Institute of Statistics.

and Hue during the month of October. Rainfalls of more than 300 millimeters in a 24-hour period are not uncommon for these two cities. Heaviest rainfall in the southern provinces of the nation occur in the province of An Xuyen during the month of July. Although the rains are heaviest in the Delta region during the rainy season, the flooding of the Mekong River does not usually occur until the months of October and November due to the later rainy season in the northern headwaters of the river basin. Although the rainfall in the agriculturally rich Delta region is considered heavy during parts of the year, supplemental irrigation and water management are needed to extend the cropping season beyond one crop of rice.

Temperature

The temperature of South Vietnam is tropical and in some areas of the nation, temperature variations throughout the year are very small. Saigon, for example, has an average monthly low temperature of 25.5° C. in January and an average monthly high temperature of 28.9° C. in April (Table 2).

The temperatures in the Delta are similar to those in Saigon. In contrast to the rather stable temperatures in the Saigon and Delta regions, the northern provinces have considerable temperature variation throughout the year. The city of Hue, for example, has an average monthly low temperature of 19.8° C. in January and an average monthly high temperature of 30.0° C. in July. In some parts of the mountainous areas of the Central Highlands, the temperatures are lower than in Hue. For example, in the mountainous area around the city of Da Lat, hail will fall during the months of April and May and often is sufficiently severe to cause damage to the crops in that area.

TABLE 2

AVERAGE MONTHLY MEAN TEMPERATURES AT SELECTED STATIONS IN SOUTH VIETNAM, 1966, 1967 AND 1968

Month	Hue	Da Nang	Pleiku	Qui Nhon	Ban Me Thuot	Nha Trang	Da Lat	Phan Thiet	Saigon	Vung Tau	Rach Gia	An Xuyen
						(Centigrade Degrees)						
January	19.8	21.5	19.1	23.1	20.4	24.2	19.1	24.8	25.5	24.5	25.6	25.0
February	19.4	21.7	19.9	23.5	21.6	24.6	19.8	25.1	26.8	24.6	26.4	25.7
March	23.4	24.6	22.8	25.4	24.5	26.1	21.6	26.4	27.9	26.1	27.5	26.4
April	25.8	26.4	23.4	27.2	25.3	27.5	22.1	28.0	28.9	27.7	28.3	27.6
May	28.4	28.6	23.4	28.7	25.0	28.2	22.2	28.1	28.1	27.4	28.1	27.1
June	29.6	29.5	22.9	29.1	24.6	28.5	22.0	27.8	27.9	26.9	28.2	27.2
July	30.0	29.7	22.6	29.5	24.1	28.5	21.7	27.1	27.4	26.2	27.5	26.7
August	29.3	29.2	22.1	30.2	23.9	28.5	21.7	26.9	27.4	25.9	27.5	26.8
September	26.8	27.2	21.9	28.5	23.5	27.8	21.3	27.0	27.1	25.9	27.7	26.9
October	25.3	25.9	21.2	26.6	23.0	26.7	20.7	26.8	26.9	25.8	27.2	26.4
November	24.1	24.9	20.3	25.8	22.1	26.0	20.1	26.4	27.0	25.8	27.1	26.5
December	21.9	23.0	19.2	24.3	20.9	24.8	19.6	25.6	26.4	24.8	26.5	25.5

SOURCE: Directorate of Meteorology, as published in Vietnam Statistical Yearbook, National Institute of Statistics.

Humidity

The relative humidity of the entire nation is high during most of the year. In some areas of South Vietnam, the relative humidity will sometimes fall below 70 percent during parts of the dry season; however, the more common relative humidity in most parts of the nation is in the mid 80's (Table 3). The high relative humidity in the Delta area makes it difficult to dry the rice at harvest.

TABLE 3

AVERAGE MONTHLY MEAN RELATIVE HUMIDITY AT SELECTED STATIONS IN SOUTH VIETNAM, 1966, 1967 AND 1968

Month	Hue	Da Nang	Pleiku	Qui Nhon	Ban Me Thuot	Nha Trang	Da Lat	Phan Thiet	Saigon	Vung Tau	Rach Gia	An Xuyen
						(Percent)						
January	90.7	85.8	77.2	84.6	82.5	78.9	75.0	75.7	69.8	81.3	78.4	85.0
February	91.1	83.1	74.7	81.8	77.3	78.9	71.2	75.1	66.7	81.2	75.5	82.5
March	85.9	83.4	71.9	85.1	73.3	81.9	71.1	78.1	68.1	82.7	78.1	84.0
April	82.5	82.3	76.3	83.2	75.4	81.6	76.7	77.4	70.5	81.0	80.2	80.2
May	74.7	78.3	85.3	80.1	82.8	82.0	83.6	81.0	76.2	86.1	85.6	88.8
June	70.6	74.8	88.2	78.9	85.5	80.7	85.0	82.0	78.7	88.6	84.5	87.7
July	67.9	73.5	91.2	74.3	88.0	80.0	85.6	83.7	80.9	90.1	86.7	89.1
August	72.3	76.8	93.5	68.5	88.8	80.4	86.3	84.2	81.1	91.0	86.6	88.5
September	81.9	82.9	90.4	76.0	89.0	80.4	86.6	83.2	81.4	89.9	84.5	87.3
October	85.0	83.3	85.4	83.7	87.3	83.7	84.3	83.2	82.0	87.9	84.7	88.7
November	86.3	83.6	81.2	82.4	85.1	81.8	79.5	79.1	78.5	82.8	81.3	86.3
December	87.2	85.9	79.0	84.0	84.8	80.9	77.2	76.7	72.7	82.2	80.3	84.1

SOURCE: Directorate of Meteorology, as published in Vietnam Statistical Yearbook, National Institute of Statistics.

CHAPTER II

THE GENERAL ECONOMY

General

Import-Export Balance

Banking

CHAPTER II

THE GENERAL ECONOMY

General

Prior to the separation of Vietnam into the northern and southern parts, the industrial area of the nation was centered around Hanoi where the mineral resources were located. The south was the center of agricultural production with the Delta being the "rice bowl" of the nation. When Vietnam was divided in 1954, South Vietnam was left with little or no industrial complex. More than 85 percent of South Vietnam's population lived in the rural areas; thus, the new nation had only its exports of rice to develop foreign exchange.

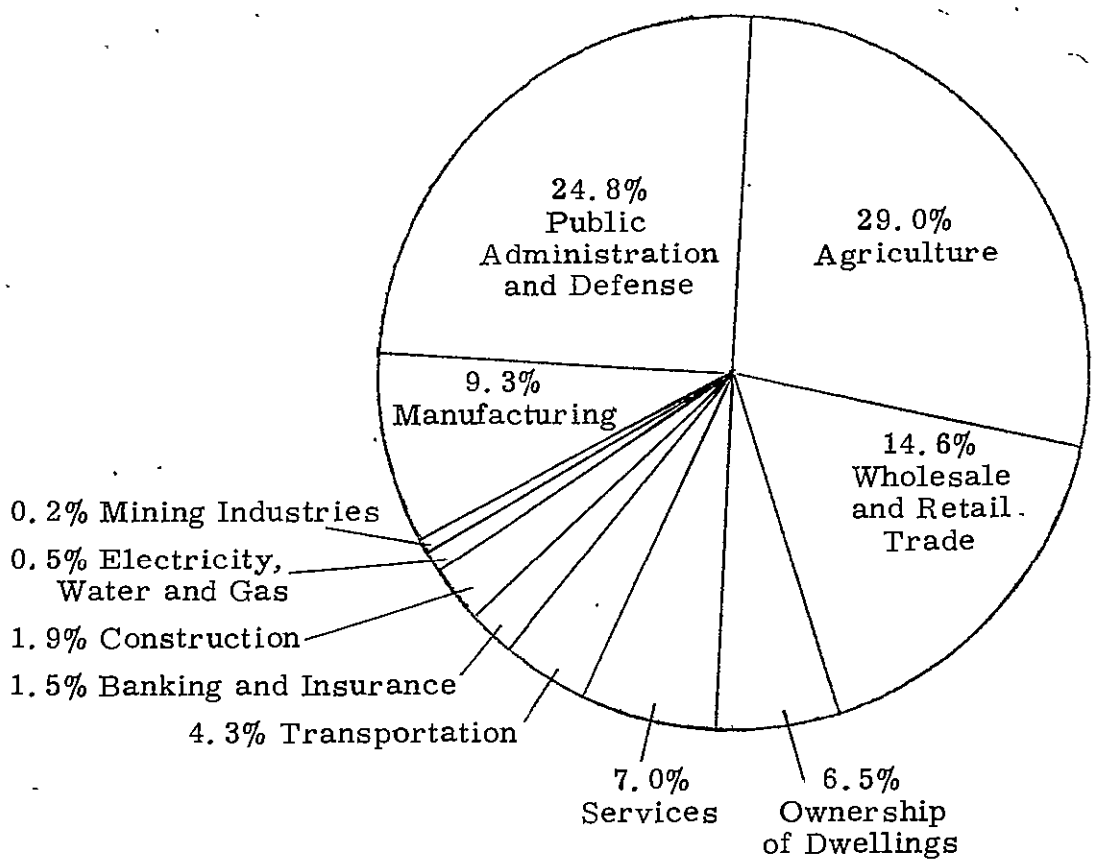
After the division of Vietnam into North Vietnam and South Vietnam in 1954, South Vietnam started to develop its industrial complex and emphasis was placed on the textile, cement and paper industries. Progress in the development of other areas of manufacture and assembly of industrial and consumer goods reduced the dependence of the economy on imported industrial products. Although most metal products and other sophisticated mechanical and consumption products still must be imported, national goals are being established which will place South Vietnam at a near self-sufficient basis on non-military consumer goods within the next few years.

Although agriculture has historically contributed the largest share to the Gross Domestic Product, the burden of war has caused the budget for public administration to increase to a point where it is second in importance in the

general economy. Agriculture accounted for 36.4 percent of the Gross Domestic Product in 1960 and even though its amount more than doubled by 1966, its proportion of the Gross Domestic Product decreased to 29.0 percent. The public administration and defense total more than quadrupled during the same period and its proportion increased from 16.8 percent in 1960 to 24.8 percent in 1966 (Figure IV and Table 4).

FIGURE IV

PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC PRODUCT BY CATEGORY, SOUTH VIETNAM, 1966



SOURCE: National Bank of Vietnam.

TABLE 4

UNADJUSTED GROSS DOMESTIC PRODUCT BY CATEGORY, SOUTH VIETNAM, 1960 TO 1966

Category	1960		1961		1962		1963		1964		1965		1966	
	VN $ (Million)	Percent	VN $ (Million)	Percent	VN $ (Million)	Percent	VN $ (Million)	Percent	VN $ (Million)	Percent	VN $ (Million)	Percent	VN $ (Million)	Percent
Agriculture	25,144	36.4	24,830	34.8	27,872	34.1	28,758	33.1	32,484	32.6	37,425	30.6	55,330	29.0
Mining Industries	281	0.4	276	0.4	375	0.5	316	0.4	255	0.3	299	0.2	448	0.2
Manufacturing	7,912	11.5	8,749	12.2	9,085	11.1	10,264	11.8	11,090	11.1	13,775	11.2	17,781	9.3
Construction	1,192	1.7	1,101	1.5	1,143	1.4	1,276	1.5	1,421	1.4	1,847	1.5	3,515	1.9
Electricity, Water and Gas	630	0.9	692	1.0	789	1.0	895	1.0	1,492	1.5	1,209	1.0	1,017	0.5
Transportation	3,588	5.2	4,026	5.6	4,127	5.0	4,034	4.7	4,462	4.5	6,092	5.0	8,251	4.3
Wholesale and Retail Trade	7,495	10.9	7,826	11.0	9,608	11.7	10,266	11.8	12,099	12.1	14,388	11.8	27,900	14.6
Banking and Insurance	838	1.2	816	1.1	871	1.1	1,034	1.2	1,174	1.2	1,586	1.3	3,601	1.9
Ownership of Dwellings	5,645	8.2	5,542	7.8	6,065	7.4	6,329	7.3	6,947	7.0	7,558	6.2	12,295	6.5
Public Administration and Defense	11,581	16.8	12,624	17.7	16,246	19.9	17,627	20.3	21,356	21.4	30,142	24.6	47,239	24.8
Services (Education, Medical and Health, Etc.)	4,727	6.8	4,955	6.9	5,540	6.8	6,004	6.9	6,849	6.9	8,020	6.6	13,417	7 0
TOTAL	69,033	100.0	71,437	100.0	81,721	100.0	86,803	100.0	99,629	100.0	122,341	100.0	190,794	100.0

SOURCE: 1960 to 1965, Vietnam Statistical Yearbook, National Institute of Statistics.
1966, National Bank of Vietnam.

Data are not available for the last two years; however, it would be safe to assume that the trend in expenditure for public administration and defense, at the present time, would place it at almost equal to or greater than the contribution of agriculture.

South Vietnam is a developing nation which has been burdened with war during much of its period of development. In spite of the hardships of war and the dislocation of many of the nation's productive workers, parts of the economy are growing at a rapid pace. The migration of labor to the large urban centers has made available a ready labor supply which, at the present time, is absorbed into the defense area of the economy. When hostilities cease, part of this labor supply will return to the rural areas; however, a large portion of this labor supply probably will remain in the cities and be used in the manufacture of productive durable goods.

Import-Export Balance

The present import-export balance is at a critical level and is an overpowering burden on the economy of the nation. During the last 12 years, the total deficit in international trade has been VN $170,159,400,000. The deficit in 1968 is five times that of 1957 but 10 percent less than for 1967 (Table 5).

Considerable emphasis has been placed on improving the productivity of the agricultural sector with the immediate objective being to improve the balance of payments of the nation as a whole. Special attention is being given to rice and a crash program has been initiated to introduce the improved varieties

TABLE 5

VALUE OF IMPORTS AND EXPORTS IN SOUTH VIETNAM, 1957 TO 1968

Year	Imports	Exports	Balance
		(VN $1,000,000)	
1957	10,104.1	2,819.2	- 7,284.9
1958	8,125.1	1,932.1	- 6,193.0
1959	7,861.4	2,627.3	- 5,234.1
1960	8,411.9	2,994.1	- 5,417.8
1961	8,928.4	2,477.7	- 6,450.7
1962	9,259.2	1,981.3	- 7,277.9
1963	10,016.2	2,683.5	- 7,332.7
1964	10,421.6	1,696.1	- 8,725.5
1965	12,506.5	1,242.2	- 11,264.3
1966	28,385.4	1,495.2	- 26,890.2
1967	43,043.7	1,312.8	- 41,730.9
1968	37,292.9	935.5	- 36,357.4
TOTAL	194,356.4	24,197.0	-170,159.4

SOURCE: Directorate General of Customs and National Institute of Statistics.

with their corresponding higher yields. Although agriculture can do much to improve the deficit trade balance, the entire burden is far too great for this sector of the economy to bear. It would require the export of more than three

million tons of rice at 1967/68 export prices to equal the export-import deficit in 1968. It would require over 160,000 tons of rice exports to pay for the importation of motorcycles and motor bicycles alone. Although the potential productive capacity of the agricultural sector is great, it cannot produce sufficient quantities of the major products at competitive world prices to offset all the deficit in the balance of payments.

The exports of other products such as rubber, coffee, tea, fish and the industrial products characteristic of South Vietnam (ceramics and basketware) also could be expanded to place the nation on a self-sufficient basis for consumer goods (Table 6). The production of rubber has long been an important part of the exports of the nation and after hostilities cease, the rubber production probably will resume its important place in the economy of South Vietnam.

Banking

The banking and finance of South Vietnam is directed through the National Bank of Vietnam. The National Bank has the exclusive right to direct all international credit and finance, issue bank notes and coins, and is generally charged with safeguarding the currency of South Vietnam. The domestic banking system is conducted by private licensed banks which operate under the new 1964 laws regulating the profession of banks and credit institutions. There is a total of 21 commercial banks in the nation at the present time. The commercial banks are required to maintain a deposit reserve with the National Bank of Vietnam.

In order to handle the agricultural credit needs which presently extend

TABLE 6

VALUE OF PRINCIPAL COMMODITY GROUPS OF EXPORTS
SOUTH VIETNAM, 1967 AND 1968

Commodity Group	1967	1968
	(VN $000)	
Live animals and meat	---	14
Fish, crustacea, molluscs	43,990	11,302
Other crude animal materials	55,375	30,936
Vegetables, roots, tubers for food	388	---
Edible fruit	426	---
Coffee, tea, spices	102,687	73,203
Cereals	---	52
Meal and flour of cereals, etc.	---	229
Oil seeds, oil nuts; plants, seeds used in perfumery, in pharmacy	882	1,357
Plaiting materials, other vegetable materials	6,120	3,190
Oils and fats, waxes	1,551	490
Preparations of meat, fish, crustacea, molluscs	10	128
Cereal preparations, preparations of flour	7,736	14,563
Preparations of vegetables and fruit	2,430	635
Miscellaneous food preparations	5,132	7,930
Food wastes	536	97
Salt, sulphur, stone, cement	1,332	---
Rubber and manufactures	1,061,482	778,724
Wood and manufactures	236	---
Basketwork and other articles of plaiting materials	6,683	3,970
Printed matter	144	368
Raw silk, silk yarn and fabrics	1,393	---
Other textile fibers	216	---
Footwear	104	208
Prepared feathers, artificial flowers, wigs and fans	---	63
Ceramics	2,271	6,087
Iron and steel	7,144	---
Works of art, etc.	2,814	830
TOTAL	1,311,082	934,376

SOURCE: 1967 - Directorate General of Customs, as published in Vietnam Statistical Yearbook, National Institute of Statistics.
1968 - Directorate General of Customs.

beyond the reaches of the regular commercial banking structure, the Agricultural Development Bank (ADB) was created in 1967. The purpose of the ADB was to extend short- and long-term credit to the agricultural sector of the economy. It is expected that this increased emphasis on production loans to farmers for seeds, fertilizer and other productive materials will greatly improve the productive capacity of the farmers. Loans also are made to establish farmer cooperatives for the purpose of purchasing their supplies and marketing their products.

CHAPTER III

POPULATION

Rural and Urban Population

Population Projections

Education

CHAPTER III

POPULATION

The problems of population are of considerable concern to most nations of the world. The rates of population growth, particularly in those developing nations where land area is rather limited, is a measure which is watched closely by government officials in planning expenditures in agriculture and its related areas.

In many countries of the world, population data are very sketchy and most growth estimates are based on poorly constructed demographic information. South Vietnam falls in this category and population data, at best, are nothing more than rough estimates or approximations. However, the population data prepared in 1960 for cities have been gathered more carefully and, as a result, are more accurate than data for the rural areas.

The local police in South Vietnam require that each head of a household must register himself and all those who live with him and keep this record up to date. These statistics aided in arriving at an estimate of the population in 1960 and for this reason, this information is regarded as the most accurate data on which to base a population analysis.

In spite of the sketchy information and the hazardous nature of making population projections, it is essential when determining the grain storage and handling needs of a nation that future population projections be made. The time lag in implementing a program of grain storage dictates that it be designed to serve the population of five to ten years in the future.

Population estimates for French Indo-China have been published in French publications for many years. These estimates included Laos, Cambodia, North Vietnam and South Vietnam. After the end of the French Indo-China War and the creation of the four separate nations, considerable migration occurred because of political, religious and family attachments to certain territories. The periods of war have caused artificial and temporary shifts of population, created refugee problems and caused considerable migration of people from the less secure rural areas to the more secure large cities. Many students who have studied the demographic structure of South Vietnam believe that this migration to the cities is temporary and after the hostilities cease, the migrants will return to the land. Others advocate that the migrants will develop roots in the cities and will be absorbed in the rapidly growing industrial complex of this new nation.

Rural and Urban Population

In spite of the difficulties encountered in obtaining head count, an arduous effort was made to compile accurate population data. The historical information contained in Table 7 represents the most popular provincial and city estimates of population for the nation. Although most of the population are considered rural (estimated at 80 percent), most of the rural people actually live in the 2,552 small villages and 13,850 hamlets throughout the nation. The farmers live in the villages and hamlets and each day go to their small farms which are located in the areas adjacent to the village or hamlet. There are only 21 cities in the nation with populations of over 50,000 and only 6 of these cities have populations of over 100,000 (Figure V).

TABLE 7

LAND AREA BY PROVINCE FOR 1967, POPULATION BY PROVINCE FOR 1960 AND 1965 TO 1968, NUMBER OF VILLAGES AND NUMBER OF HAMLETS BY PROVINCE FOR 1968, AND POPULATION OF PROVINCIAL CAPITALS FOR 1968, SOUTH VIETNAM

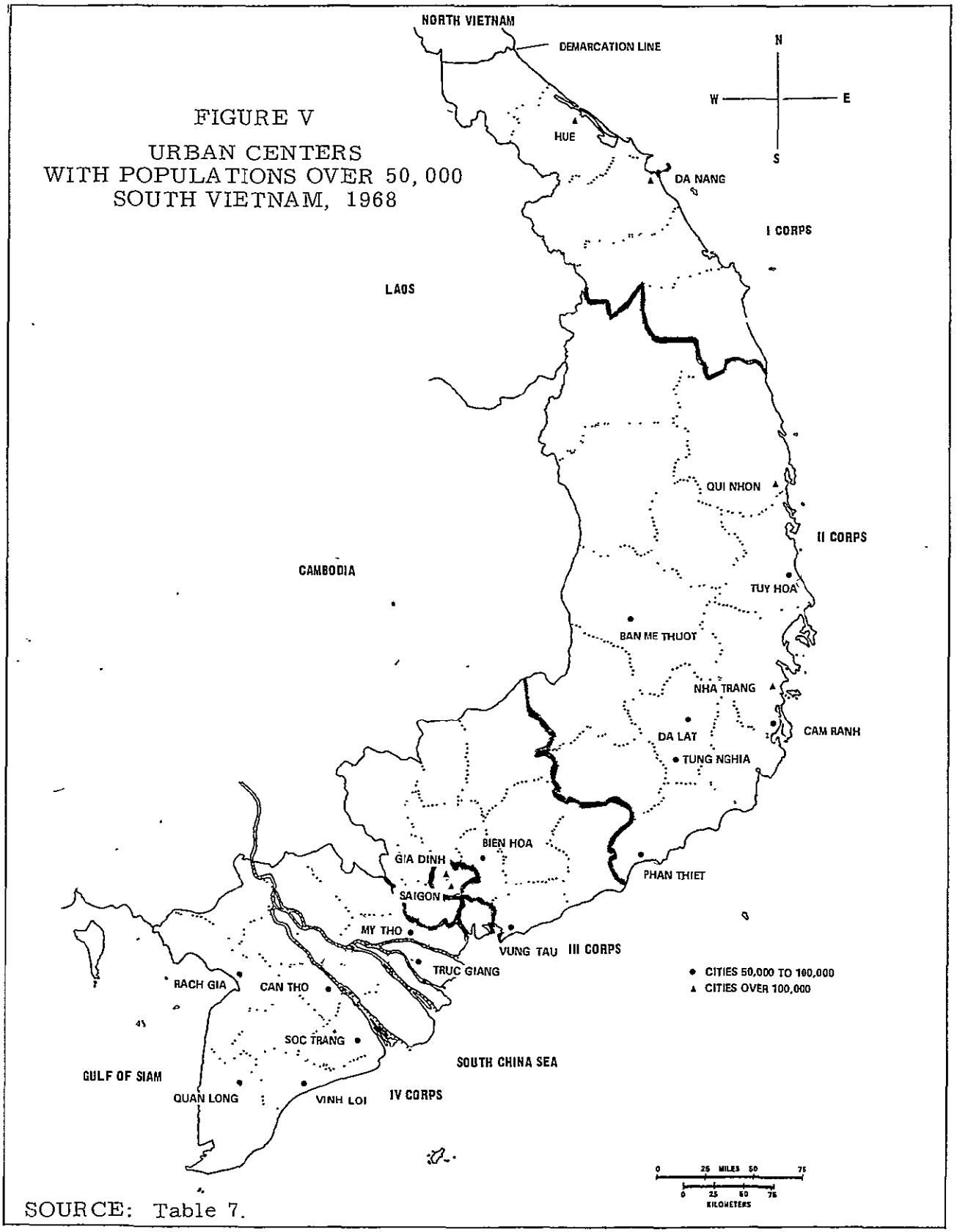
Province	Land Area	Population					Number of Villages a/	Number of Hamlets a/	Population of Provincial Capital a/	
		1960	1965	1966	1967	1968 a/			Capital	Population
	(Square Kilometers)									
1. Quang Tri	4,768	279,000	277,375	270,650	313,700	309,110	84	510	Quang Tri	15,581
2 Thua Thien	4,948	559,000	586,833	574,241	634,585	652,874	95	472	Hue	156,537
3 Quang Nam	6,599	1,047,000	843,915	818,700	921,711	980,016	141	553	Hoi An	36,663
4 Quang Tin	4,959	b/	361,007	340,207	409,823	419,553	86	407	Tam Ky	13,876
5 Quang Ngai	5,737	722,000	610,225	514,714	579,682	696,330	159	499	Quang Ngai	14,119
Total Region I	27,011	2,807,000	2,679,445	2,526,602	2,859,501	3,057,883	565	2,441		
6. Binh Dinh	9,218	790,000	772,581	875,547	931,915	859,437	168	1,094	Qui Nhon	116,821
7. Phu Yen	5,020	343,000	327,380	318,936	339,945	313,830	55	326	Tuy Hoa	62,487
8 Phu Bon	4,809	b/	46,905	49,381	53,973	67,777	36	135	Hau Bon	5,890
9. Khanh Hoa	0,200	272,000	361,377	360,540	424,553	438,594	69	280	Nha Trang	101,908
10 Quang Duc	6,063	31,000	25,355	29,695	30,353	28,188	18	61	Gia Nghia	5,181
11. Tuyen Duc	5,675	104,000	156,703	155,738 c/	177,618	177,618 d/	28	178	Tung Nghia	56,760
12. Ninh Thuan	3,431	137,000	138,255	150,485	150,630	155,295	27	120	Phan Rang	26,090
13. Binh Thuan	4,383	260,000	255,523	253,153	278,402	266,806	55	187	Phan Thiet	78,034
14. Lam Dong	5,106	58,000	66,780	65,232	66,760	66,760 d/	24	92	Bao Loc	10,678
15 Darlac	10,376	152,000	158,451	202,397	222,388	250,474	62	407	Ban Me Thuot	62,092
16 Pleiku	8,477	186,000	166,673	163,878	192,682	192,682 d/	101	486	Pleiku	23,720
17. Kontum	10,169	82,000	83,569	104,025	104,241	101,408	105	558	Kontum	18,678
Total Region II	78,927	2,415,000	2,550,552	2,729,007	2,982,460	2,918,869	748	3,924		
18. Binh Tuy	3,717	36,000	63,984	60,722	62,171	63,077	19	71	Ham Tan	18,825
19 Long Khanh	4,415	96,387	110,844	127,328	149,723	147,156	18	101	Xuan Loc	22,976
20 Phuoc Long	5,209	57,398	47,679	60,186	46,084	46,061	18	07	Phuoc Binh	18,960
21. Binh Long	2,405	65,000	79,971	79,660	71,013	73,430	29	163	An Loc	15,119
22. Binh Duong	1,938	317,246	237,077	236,839	235,404	231,867	52	254	Phu Cuong	30,651
23. Tay Ninh	4,236	290,000	275,004	257,881	307,186	285,107	46	147	Tay Ninh	21,683
24 Hau Nghia	1,282	b/	194,514	228,407	205,257	205,257 d/	24	199	Khiem Cuong	9,907
25. Long An	1,381	491,000	387,175	397,705	288,093	333,498	81	495	Tan An	36,092
26. Gia Dinh	1,620	2,034,000	2,410,723	2,498,522	2,815,444	2,777,374	73	343	Gia Dinh	151,113
27. Bien Hoa	1,705	263,969	337,354	324,832 c/	417,562	379,039	72	205	Bien Hoa	82,505
28 Phuoc Tuy	2,057	143,000	154,576	157,052 c/	180,604	177,179	20	110	Phuoc Le	16,419
Total Region III	30,055	3,794,000	4,298,800	4,430,134	4,778,631	4,719,051	461	2,195		
20. Kien Tuong	2,297	56,000	51,861	48,250	42,597	39,852	28	83	Moc Hoa	10,096
30. Dinh Tuong	1,557	669,000	514,146	518,593	548,421	548,421 d/	93	626	My Tho	62,656
31. Kien Hoa	2,155	542,000	547,819	569,878	535,432	530,513	115	865	Truc Giang	67,500
32 Go Cong	570	b/	167,120	174,718	174,114	173,005	32	300	Go Cong	33,191
33. Sa Dec	812	b/	b/	b/	268,560	261,965	36	129	Sa Dec	40,293
34. Vinh Long	1,088	541,000	578,007	573,240	401,401	480,667	65	285	Vinh Long	32,196
35 Binh Binh	2,879	536,000	503,621	517,694	404,118	404,118 d/	58	512	Phu Vinh	35,270
36. Kien Phong	2,615	271,000	297,842	306,838	320,880	324,358	45	215	Cao Lanh	16,686
37. Chau Doc	2,052	b/	450,516	447,653	484,515	484,099	57	268	Chau Phu	37,175
38. An Giang	1,903	806,000	478,280	440,377	496,581	496,624	40	254	Long Xuyen	47,401
39 Phong Dinh	1,632	479,000	416,095	401,900	424,500	426,090	44	286	Can Tho	87,675
40 Ba Xuyen	2,636	838,000	374,326	359,446	331,721	380,656	49	456	Soc Trang	52,004
41 Kien Giang	5,269	452,000	366,401	369,315	359,767	368,433	42	247	Rach Gia	60,195
42. Chuong Thien	2,291	b/	231,792	217,293	248,731	151,934	35	240	Vi Thanh	13,632
43. Bac Lieu	2,515	b/	261,247	251,832	259,801	281,350	20	230	Vinh Loi	53,308
44. An Xuyen	5,029	276,000	245,018	224,000	235,398	245,443	23	208	Quan Long	52,404
Total Region IV	37,290	5,266,000	5,485,001	5,420,737	5,635,817	6,503,528	778	5,300		
TOTAL SOUTH VIETNAM	173,283	14,081,000	15,023,788	15,112,480	16,256,415	16,259,334	2,552	13,850	Saigon	1,681,803

a/ Information through June 30, 1968.
b/ See notes, page v, regarding changes in provincial boundaries.
c/ 1966 data for Tuyen Duc province, 1965 data for Da Lat city
d/ Information effective May 1967
e/ 1966 data for Phuoc Tuy province and Con Son, 1965 data for Vung Tau

SOURCE Land area information and 1960 population data obtained from the National Institute of Statistics as published in Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service, all other population data and village and hamlet numbers obtained from the Ministry of Interior and published in Vietnam Statistical Yearbook, National Institute of Statistics

FIGURE V

URBAN CENTERS
WITH POPULATIONS OVER 50,000
SOUTH VIETNAM, 1968



SOURCE: Table 7.

The density of population is greater in the coastal area along the coast north of Saigon. The heaviest concentration of population, other than in the major cities, is in the Delta region where approximately one-third of the people live on slightly over one-fifth of the nation's land area (Figure VI).

The mountainous region of the Central Highlands is the most thinly populated area of the nation except for the jungle and swamp areas where little or no population exists. The average density of population in the entire nation is approximately 90 persons per square kilometer with the Delta region having the heaviest density of approximately 150 persons per square kilometer. With a total of 2,756,350 hectares of tillable land in South Vietnam, this means that in 1968 there were approximately 0.17 hectares of cultivated land per person. (For those readers who find it easier to compare population densities on an acreage basis, this means approximately 0.42 acres of cultivated land per person.) This small amount of cultivated land per person requires an intensive type of agriculture in order to provide an adequate food supply for the population. If this ratio of land to people continues to decrease, it will create major problems for the nation in providing an adequate food supply for the population. However, the ability of the nation to feed its population will be dependent not only upon its ability to increase food production but also upon the nation's willingness to control population within its ability to produce food. If this does not happen, the nation must look for a means of importing deficit foods to feed the population.

Population Projections

When making population projections, there are several factors to consider.

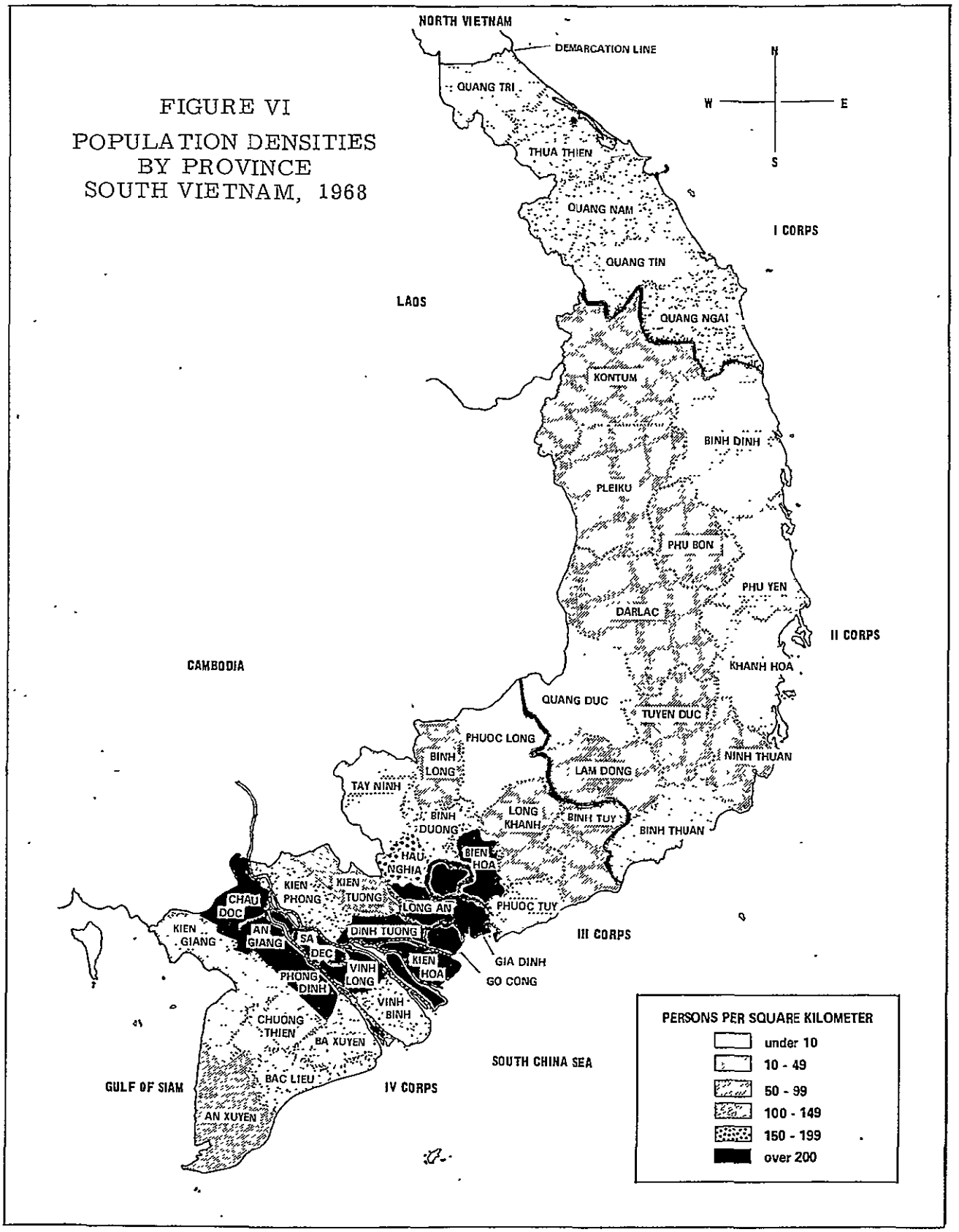


FIGURE VI
POPULATION DENSITIES
BY PROVINCE
SOUTH VIETNAM, 1968
NORTH VIETNAM
DEMARCATION LINE
N
W
E
S
QUANG TRI
THUA THIEN
QUANG NAM
I CORPS
QUANG TIN
LAOS
QUANG NGAI
KONTUM
BINH DINH
PLEIKU
PHU BON
PHU YEN
DARLAC
II CORPS
CAMBODIA
KHANH HOA
QUANG DUC
TUYEN DUC
PHUOC LONG
BINH LONG
NINH THUAN
LAM DONG
TAY NINH
LONG KHANH
BINH TUY
BINH DUONG
BINH THUAN
HAU NGHIA
BIEN HOA
KIEN PHONG
KIEN TUONG
CHAU DOC
LONG AN
PHUOC TUY
KIEN GIANG
AN GIANG
SA DEC
DINH TUONG
III CORPS
KIEN HOA
GIA DINH
GO CONG
VINH LONG
PHONG DINH
VINH BINH
CHUONG THIEN
BA XUYEN
SOUTH CHINA SEA
BAC LIEU
GULF OF SIAM
IV CORPS
AN XUYEN
PERSONS PER SQUARE KILOMETER
under 10
10 - 49
50 - 99
100 - 149
150 - 199
over 200

The nation, with its rapid economic growth and its expanded programs of health education, improved diets and medical services, can expect a decreasing mortality rate. At the same time, death rates should remain rather stable. Fertility rates, which are a flexible and controllable factor, will be determined by the extent of the efforts of the nation to do so. In the urban areas, a higher population growth rate could be expected than that for the rural areas.

In the absence of any recent studies on population in the nation of South Vietnam, the study team solicited the assistance of population specialists in the various ministries of the GVN and USAID to arrive at projection estimates. In addition, published reports of researchers who have included in their reports various types of analysis of the structure of the population of South Vietnam were used to support the estimated growth rates in this report.

Most specialists agree that if the migration factor is disregarded, the population growth rate in the cities is less than in the rural areas; however, this appears to be where the agreement stops. Estimates of annual growth rates for the nation have varied from 2.2 percent to 3.4 percent depending upon the source and the base upon which the analysis was founded. The migration from the rural areas to the urban areas has been great and this causes the net growth rate of the cities to be greater than that of the rural areas.

The base used to establish population projections was the revised provincial population data as shown in Table 7. Based on the estimated growth rate and the migration factor, an annual growth rate of 2.8 percent for the 21 cities with populations of over 50,000 in 1968 and 2.5 percent for the other areas was applied to the population estimates for 1968 to arrive at population estimates for 1975 and 1980 (Table 8).

TABLE 8

ADJUSTED 1968 POPULATION AND ESTIMATED POPULATION FOR 1975 AND 1980 BY PROVINCE, SOUTH VIETNAM

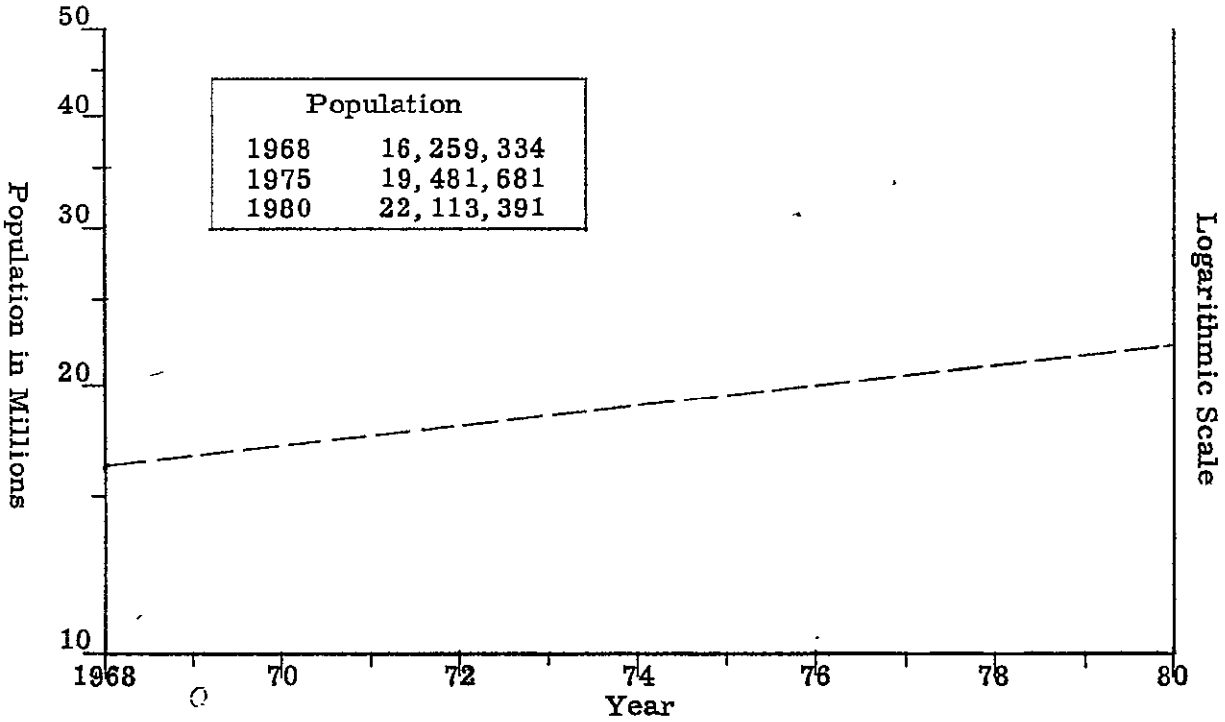
Province	1968	Estimated 1975	Estimated 1980
1. Quang Tri	309,110	367,435	415,720
2 Thua Thien	652,874	779,910	885,561
3. Quang Nam	996,161 a/	1,192,333	1,355,770
4. Quang Tin	419,553	498,717	564,253
5. Quang Ngai	696,330	827,717	936,486
Total Region I	3,074,028	3,666,112	4,157,790
6. Binh Dinh	859,437	1,024,471	1,161,455
7. Phu Yen	313,830	374,583	425,069
8. Phu Bon	67,777	80,565	91,151
9. Khanh Hoa	438,594	525,473	597,919
10. Quang Duc	28,188	33,506	37,910
11. Tuyen Duc	182,481 a/	220,470	252,366
12. Ninh Thuan	155,295	184,596	208,854
13. Binh Thuan	266,806	319,064	362,568
14. Lam Dong	68,429 a/	81,341	92,030
15. Darlac	250,474	299,261	339,841
16. Pleiku	197,499 a/	234,763	265,612
17. Kontum	101,408	120,542	136,382
Total Region II	2,930,218	3,498,635	3,971,157
18. Binh Tuy	63,077	74,979	84,831
19. Long Khanh	147,156	174,922	197,907
20. Phuoc Long	46,061	54,752	61,947
21 Binh Long	73,439	87,296	98,767
22. Binh Duong	231,867	275,616	311,834
23. Tay Ninh	285,107	338,904	383,439
24. Hau Nghia	210,388 a/	250,086	282,949
25. Long An	333,498	396,425	448,518
26. Gia Dinh	2,777,374	3,346,460	3,823,251
27. Bien Hoa	379,039	452,585	513,725
28 Phuoc Tuy	177,179	212,338	241,661
Total Region III	4,724,185	5,664,363	6,448,829
29 Kien Tuong	39,852	47,371	53,595
30. Dinh Tuong	562,319 a/	670,002	759,347
31. Kien Hoa	530,513	632,274	716,726
32. Go Cong	173,005	205,648	232,672
33. Sa Dec	261,965	311,395	352,315
34. Vinh Long	486,667	578,496	654,515
35. Vinh Binh	414,221 a/	492,379	557,081
36. Kien Phong	324,358	385,560	436,226
37. Chau Doc	484,090	575,432	651,048
38. An Giang	496,624	590,330	667,903
39. Phong Dinh	426,090	508,641	577,253
40. Ba Xuyen	360,656	429,985	487,548
41. Kien Giang	368,433	439,430	498,391
42. Chuong Thien	151,934	180,601	204,334
43. Bac Lieu	261,359	311,984	354,059
44. An Xuyen	245,443	293,043	332,610
Total Region IV	5,587,529	6,652,571	7,535,615
TOTAL SOUTH VIETNAM	16,315,960	19,481,681	22,113,391

a/ Adjusted to 1968 based on 1967 population figures.
SOURCE: 1968 population figures, Table 7

The composite of the provincial and city totals for a national population projection is shown in Figure VII. Based on other reports, these estimates are on the low side but until hostilities cease and families can reunite and the people can return to a normal living and working pattern, these projections appear to be realistic for the period for which they are intended.

FIGURE VII

ADJUSTED 1968 POPULATION AND ESTIMATED POPULATION FOR 1975 AND 1980, SOUTH VIETNAM



SOURCE: Table 8.

It was not the intent or purpose of this study to develop population estimates based on demographic features different from those used by the National Institute of Statistics or USAID since their estimate of the present situation

appears to be sound. The projections were based on the acceptance of the lower range of growth rates rather than the higher range of rates. It is important that the population estimates are as accurate as possible since these data are used in this study for estimating the rice requirements for each city and province throughout the nation.

The population of South Vietnam, as its economy, will remain predominately rural for several years to come. As the industrial complex of the nation develops, the agricultural economy will not only provide the food for the nation but will also provide a large portion of the new manpower requirements for new industries located in the urban centers. This probably will mean a decreasing percentage of the rural population.

These changes in the population balance and the total population increase will affect many spheres of activity in the economic development of the nation. In the short run, the most critical of these activities is supplying the basic foods for the nation and the very badly needed increased agricultural output will require additional labor. Hopefully, in the long run, this additional labor requirement can be supplemented by various forms of capital which will allow the migration of rural labor to the growing industrial centers without affecting food production.

Other changes in the rural areas will take place, such as specialization of production, combination of land holdings and partial commercialization of agricultural production. The number and rate of these changes can only be surmised but they will have a considerable effect on the marketing system for agricultural products. Marketing the surplus production of each farmer will become

a necessity since the urban and industrial centers will become completely dependent upon the marketing system to provide them with a reliable food supply at reasonable prices.

As the industrial complex grows and the rural-urban balance continues toward larger urban populations, increases in per capita income can be expected in both sectors of the economy. As this occurs, the consumptive patterns associated with the elasticity of demand for food will change.

Education

According to the National Institute of Statistics and based on information supplied by the Ministry of Culture, Education and Youth, in 1966/67 there were 32 kindergartens, 5,937 primary schools, 377 secondary junior schools and 267 secondary senior schools in South Vietnam (Table 9). Most of these schools are located in the urban centers. There were 2,264,479 students enrolled in these schools in 1966/67 out of an estimated population of 16,256,000--which is approximately 14 percent of the total population. It has been estimated that at present, approximately 40 percent of the population of South Vietnam is of school age. This would indicate that an estimated 65 percent of the school age children are not in school.

The GVN, assisted by USAID, is placing considerable emphasis on the development of the school system for the nation. Emphasis has been given to training teachers in order to improve the teacher-student ratio. New schools

TABLE 9

NUMBER OF SCHOOLS AND STUDENTS IN KINDERGARTEN, PRIMARY, SECONDARY JUNIOR LEVEL AND SECONDARY SENIOR LEVEL, BY PROVINCE, SOUTH VIETNAM, 1966/67 SCHOOL YEAR

Province	Kindergarten		Primary		Secondary Junior Level		Secondary Senior Level	
	Schools	Students	Schools	Students	Schools	Students	Schools	Students
1. Quang Tri	--	263	258	31,537	15	5,718	3	1,220
2. Thua Thien	--	384	313	66,558	31	17,650	13	5,276
3. Quang Nam	--	2,030	225	58,138	17	14,104	9	3,606
4. Quang Tin	--	--	81	21,909	7	3,537	3	790
5. Quang Ngai	--	--	173	40,281	10	6,378	5	1,700
Total Region I	--	2,677	1,050	218,423	80	47,387	33	12,592
6. Binh Dinh	1	186	263	46,168	10	7,782	10	2,120
7. Phu Yen	--	--	83	19,305	5	3,443	3	1,107
8. Phu Bon	--	--	--	--	1	133	--	--
9. Khanh Hoa	--	1,917	335	51,876	12	9,946	12	2,733
10. Quang Duc	--	292	39	3,875	1	152	--	--
11. Tuyen Duc	--	1,286	82	19,162	9	6,932	11	2,186
12. Ninh Thuan	1	212	118	18,848	3	2,900	4	711
13. Binh Thuan	--	952	130	24,565	7	4,177	4	1,089
14. Lam Dong	--	1,233	54	7,787	4	2,097	2	303
15. Darlac	--	1,217	101	19,052	4	3,247	3	452
16. Pleiku	--	1,095	49	10,149	--	625	1	186
17. Kontum	--	1,838	90	10,089	4	1,162	1	63
Total Region II	2	10,228	1,344	230,876	60	42,596	51	10,950
18. Binh Tuy	--	420	40	8,473	2	957	1	100
19. Long Khanh	--	819	74	21,022	3	2,935	3	409
20. Phuoc Long	--	354	19	3,904	--	271	1	21
21. Binh Long	--	24	65	9,924	3	1,035	1	162
22. Binh Duong	--	1,028	110	36,134	7	5,234	7	1,142
23. Tay Ninh	--	295	125	48,713	8	6,744	6	1,399
24. Hau Nghia	--	228	48	24,750	9	3,305	3	291
25. Long An	1	874	99	47,526	10	7,803	9	2,148
26. Gia Dinh	17	24,285	857	409,318	65	122,835	80	37,687
27. Bien Hoa	1	182	187	59,609	12	11,029	9	2,102
28. Phuoc Tuy	1	1,839	80	25,836	8	4,559	6	834
Total Region III	20	30,348	1,704	695,209	127	166,707	126	46,295
29. Kien Tuong	1	107	44	7,244	1	398	1	58
30. Dinh Tuong	--	319	104	74,158	17	12,513	9	3,266
31. Kien Hoa	--	924	115	63,577	9	8,476	4	1,653
32. Go Cong	--	115	89	24,694	4	3,120	3	784
33. Sa Dec	--	--	--	--	4	3,280	2	624
34. Vinh Long	2	708	219	89,809	3	7,893	7	2,060
35. Vinh Binh	--	558	251	58,748	9	5,191	2	960
36. Kien Phong	--	--	--	--	10	2,968	1	576
37. Chau Doc	1	294	166	54,154	8	5,595	3	969
38. An Giang	2	1,134	191	67,485	14	10,267	5	1,951
39. Phong Dinh	--	584	161	53,406	12	8,780	6	1,825
40. Ba Xuyen	--	462	196	48,231	4	5,534	5	1,097
41. Kien Giang	2	158	122	38,483	5	5,130	6	890
42. Chuong Thien	1	45	41	11,886	3	1,214	1	107
43. Bac Lieu	--	--	86	26,543	5	2,949	1	328
44. An Xuyen	1	349	54	22,915	2	2,301	1	344
Total Region IV	10	5,757	1,839	641,333	110	85,609	57	17,492
TOTAL SOUTH VIETNAM	32	49,010	5,937	1,785,841	377	342,299	267	87,329

SOURCE: Ministry of Culture, Education and Youth, as published in Vietnam Statistical Yearbook, National Institute of Statistics.

are being constructed in the rural areas and even though the progress has been very encouraging, much work needs to be done to improve the literacy rate of the population.

In addition to the primary and secondary schools, in 1966/67 over 32,000 students attended schools of higher education and almost 19,000 students attended technical, artistical and professional schools. 1/ The small enrollment in the schools of higher education is partially a result of the demands of the military for the services of the college age youths.

The development of the industrial complex of the nation and the modernization of its agricultural productive sector will be dependent upon the success of the nation's educational program. The agricultural marketing complex will require the services of educated young people who will mature with its development. These youths can only be a product of the school system of the nation. The success of a more complex, mechanized and more sophisticated marketing system will be dependent upon the ability of the institutions or agencies performing the marketing services to compete with other sectors of the economy for the services of the educated young people.

1/ Ministry of Culture, Education and Youth, as published in Vietnam Statistical Yearbook, National Institute of Statistics.

CHAPTER IV

THE AGRICULTURAL ECONOMY

Land Use

Production of Selected Agricultural Crops

Production of Fruits and Vegetables

Employment and Type of Farming

Environmental Factors

- Soils and Climate
- Water Management

Commercial Fertilizers

Governmental Services

- Ministry of Land Reform and Agriculture
- Ministry of Economy

CHAPTER IV

THE AGRICULTURAL ECONOMY

Land Use

Agriculture for years has been the most important segment of the economy of the entire French Indo-China area. When South Vietnam was established as a nation in 1954, agriculture accounted for over 90 percent of the economic activity of the new nation.

The land area of South Vietnam consists of 17,328,000 hectares; however, only 16 percent of the land area is cultivated (Table 10). The largest portion of the land area is in grassland and wasteland, which accounts for approximately 50 percent of the total land area. Forest area accounts for the remainder. The forest area has not been developed and it has been only recently that the vast resources of the forest area are being utilized. Security problems resulting from the warlike conditions have made the development of the lumber industry and the production of other forest products a high-risk industry. As security is improved in these areas, the lumber and paper industries are expected to develop rapidly.

Production of Selected Agricultural Crops

Rice accounts for the use of over 85 percent of the cultivated area of the nation and most of the rice is grown in the Delta region. Rubber for years has

TABLE 10

LAND USE, SOUTH VIETNAM, 1968

Description	Area	Percent
	(Hectares)	
Uncultivated Land		
Forest	5,949,000	34.33
Grassland) Wasteland) Other)	8,571,395	49.46
Cultivated Land		
Rice	2,393,800	13.81
Corn	28,780	0.17
Soybeans	7,840	0.05
Other food crops	197,605	1.14
Fiber crops	1,455	0.01
Rubber	105,730	0.61
Other industrial crops	71,060	0.41
Other crops	1,635	0.01
TOTAL LAND AREA	17,328,300	100.00

SOURCE: Agricultural Economics and Statistics Service, Ministry of Land Reform and Agriculture.

been one of the principal crops produced in South Vietnam and has accounted for a large share of the nation's exports. Although many of the other crops are grown on small land areas, the production of some of the minor crops is important to the economy of the nation and diets of the people (Table 11).

TABLE 11

ESTIMATED PRODUCTION OF SELECTED AGRICULTURAL CROPS
SOUTH VIETNAM, 1968

Crop	Metric Tons
Paddy	4,366,150
Corn	31,760
Sweet potatoes	234,685
Manioc	260,190
Peanuts	32,055
Soybeans	7,465
Mungo beans	13,360
Vegetables	193,055
Pineapple	34,110
Bananas	164,065
Fruits a/	221,880
Black pepper	410
Sesame	235
Yam beans	5,680
Watermelon b/	46,950
Other tubers	10,225
Potatoes	2,000
Rubber	34,000
Tea	4,770
Coffee	3,000
Coconuts c/	110,705
Tobacco	7,620
Sugarcane	426,070
Cacao	25
Mulberry	2,945
Areca nuts	665
Fiber crops	1,490

a/ Excluding bananas.
b/ Excluding 20 tons of seeds.
c/ Thousand nuts.
SOURCE: Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

Production of Fruits and Vegetables

The fruit and vegetable production in South Vietnam is an important part of the agricultural production of the limited productive land in the heavily populated areas of the Coastal Region from Saigon to the north. Although the volume of fruits and vegetables produced in the Southern Region accounts for approximately one-half of the total production of the nation, rice still competes heavily for the irrigated land which is needed for fruit and vegetable production.

The quality of the fruits and vegetables produced in the nation is excellent as evidenced by the attractive displays found in the many markets located throughout the nation. In spite of the excellent quality of the product, very little emphasis has been placed on commercializing the fruit and vegetable industry with the intent toward processing the various products for the expanding domestic and foreign markets.

Employment and Type of Farming

The agricultural sector of the economy provides gainful employment for over three-fourths of the working population of the nation. Of the more than five million gainfully employed people in the nation in 1966, over four million were employed in agriculture, forestry, fishing and mining (Table 12). The percentage of the population devoted to the production of agricultural products has been decreasing over the last few years since as late as 1960, more than 88 percent were employed in the agricultural sector.

TABLE 12

CIVILIAN EMPLOYMENT BY TYPE OF ACTIVITY
SOUTH VIETNAM, 1966

Activity	Number of People	Percent
	(000)	
Agriculture, Forestry, Fishing and Mining	4,043	78.8
Agriculture general	3,761	73.4
Plantations	26	0.5
Fishing	254	4.9
Mining and quarrying	2	---
Industrial and Commercial Establishments	623	12.1
Manufacturing and handicraft	120	2.3
Construction	131	2.6
Commerce, banks and insurance	103	2.0
Transport and communications	119	2.3
Electricity, gas, water and sanitary services	3	---
Services	147	2.9
Government Employees	210	4.1
U.S. Sector, Vietnamese Employees	142	2.8
Domestic Servants	115	2.2
TOTAL	5,133	100.0

SOURCE: Department of Labor, as published in Annual Statistical Bulletin. Office of Joint Economic Affairs, USAID/Vietnam, 1968.

Farming is a way of life in the nation of South Vietnam and the individual land holdings are very small in relation to those of most of the nations in the western hemisphere. Most of the agricultural production is a subsistence type

where the primary concern of the farmer is to produce enough rice for his family. The farmers live in the villages and hamlets and their land holdings usually are nearby. Although the primary aim of the farmer is to produce food for the family, his aim also is directed toward increasing yields and improving production methods so that there will be surplus rice or other products to sell in the market. This is difficult for the approximately 14 percent of the farm families in the Southern and Central Regions who farm less than 0.1 hectares (Table 13).

TABLE 13

NUMBER AND AREA OF FARMS ACCORDING TO SIZE a/
SOUTH VIETNAM, 1961

Size of Farm	Number of Farms		Area		Average Size of Farm
	Number	Percentage	Hectares	Percentage	
(Hectares)					(Hectares)
Less than 0.1	256,722	13.715	8,680	0.346	0.034
0.1 to under 0.5	435,409	23.261	114,299	4.550	0.262
0.5 to under 1.0	354,935	18.962	238.036	9.477	0.670
1.0 to under 2.0	411,417	21.980	537,305	21.391	1.306
2.0 to under 3.0	182,455	9.747	407,138	16.209	2.231
3.0 to under 5.0	143,249	7.653	497,667	19.813	3.474
5.0 to under 10.0	69,968	3.738	442,624	17.622	6.326
10.0 to under 50.0	17,326	0.926	236,512	9.416	13.650
50.0 to under 100.0	258	0.014	17,647	0.703	68.399
100.0 and over	71	0.004	11,875	0.473	167.253
TOTAL	1,871,810	100.000	2,511,783	100.000	1.342 b/

a/ Only 27 big rice-producing provinces are included in this survey (18 in the Southern Region and 9 in the Central Lowlands).
b/ Average.
SOURCE: Agricultural Economics and Statistics Service, Ministry of Land Reform and Agriculture.

In 1961, a survey was made by the Ministry of Agriculture to determine the size and number of land holdings in the nation. Twenty-seven of the more important rice-producing provinces (18 in the Southern Region and 9 in the Central Lowlands) were surveyed (Appendix Exhibit A-I). This information served as part of the basis to guide the land reform program of South Vietnam. The survey showed that more than 56 percent of these holdings in the 27 provinces were less than 1.0 hectare and accounted for slightly over 14 percent of the land area in farms. Most of the land area in these holdings is cultivated in rice and very little waste area was included (Figure VIII). This survey indicated that the average size of farm in the 27 provinces was 1.342 hectares, which must be considered small by any standards.

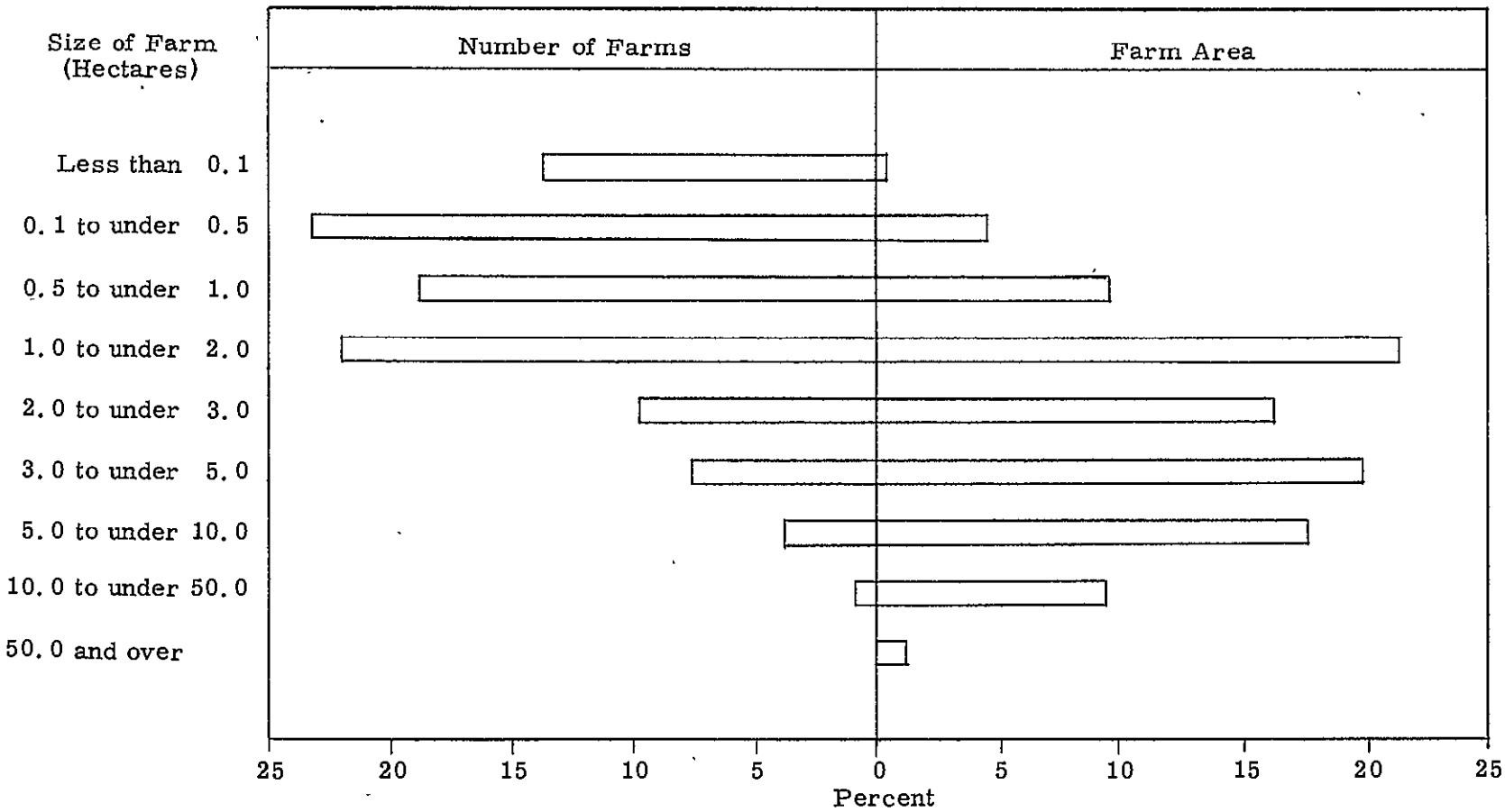
Environmental Factors

Soils and Climate

The soil characteristics and environmental conditions for growing crops in South Vietnam are well known and sufficient information is available in all areas of the nation to determine the productive potential of each province. There are excellent publications on the physical characteristics of the land throughout the nation and one of the better works is entitled Natural Environment and Land Use in South Vietnam, written by Thai-Cong-Tung of the Directorate of Agricultural Research, Ministry of Agriculture, and published in 1967. Another more general treatment of the agricultural productive unit of South Vietnam is entitled Agriculture, Vietnam, published by USAID in 1963.

FIGURE VIII

SIZE DISTRIBUTION OF RICE-PRODUCING FARMS AND FARM AREA, SOUTH VIETNAM, 1961



SOURCE: Table 13.

For the benefit of the reader, Figure IX is included in this report to show the types and locations of soils in the nation. Figure X also is included in order to show the growing seasons and the areas adapted to certain crops.

The soils and climate of South Vietnam are suitable for growing a wide variety of crops. In some areas, however, the soils are highly acid and it is presently not economically feasible to supply sufficient lime to bring them to a more favorable acidity balance.

Water Management

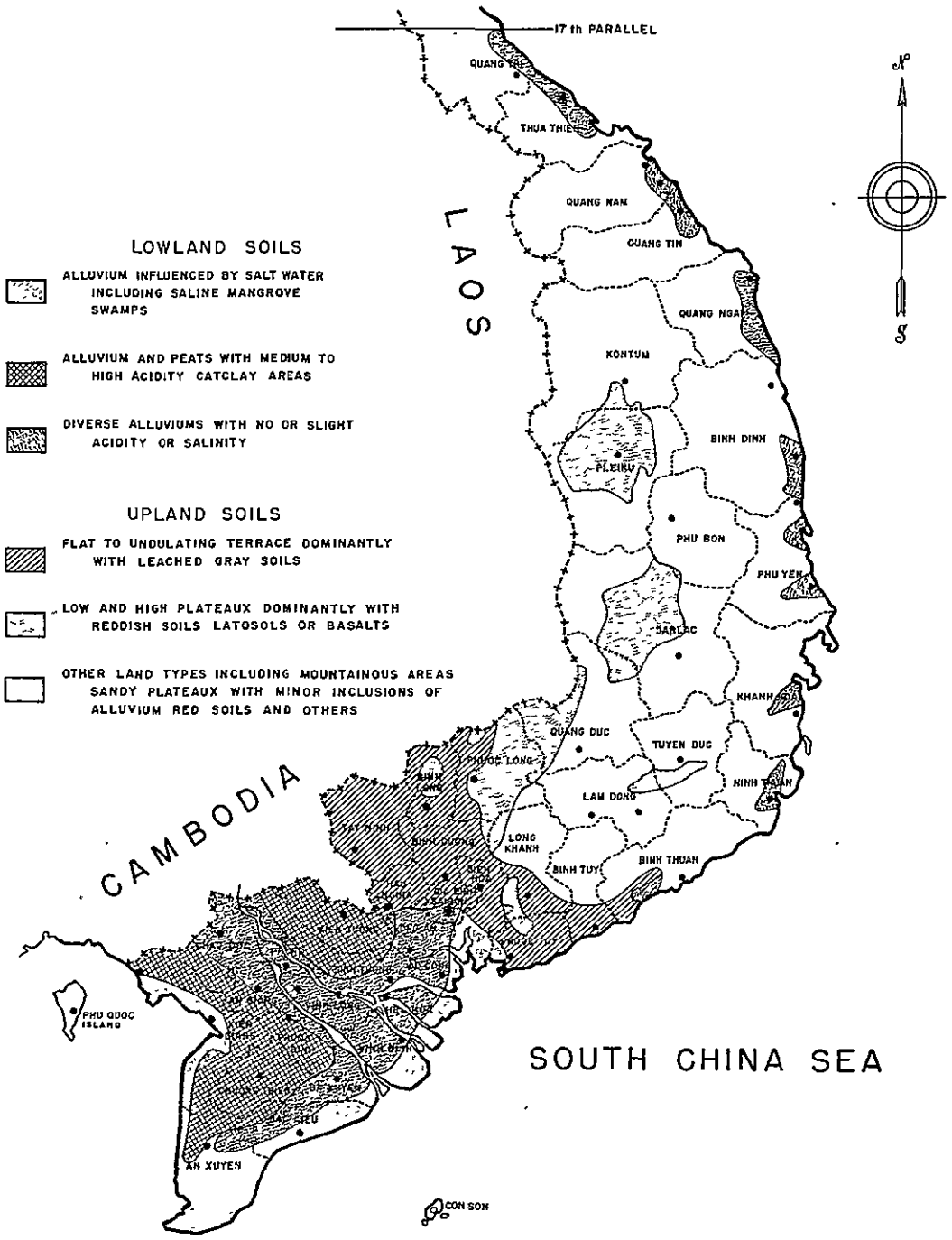
The coastal areas of the Delta have the problem of saltwater intrusion from the sea and this limits the area to the production of one crop of rice. Several years ago, the French government developed a system of saltwater controls which enabled the farmers to limit the extent of saltwater intrusion in the area; however, most of these facilities have been destroyed or have not been maintained in good repair. The productive capacity of the land in the Delta region canbe increased significantly with good water management and supplemental irrigation. In order to grow a second crop in this area, either rice or vegetables, the second crop must have supplemental irrigation.

Many studies have been made on the development of the water resources of the Delta with the aim of increasing the agricultural production in this rich area. 1/ Surveys have been made on the costs of harnessing the Mekong River

1/ One of the more elaborate studies was the one conducted by the Joint Development Group, which consists of the Postwar Planning Group of Saigon and the Development and Resources Corporation of New York. Volume Two of their series of reports deals with the agricultural potential of the Delta.

FIGURE IX

MAJOR SOIL REGIONS, SOUTH VIETNAM



SOURCE: Annual Statistical Bulletin. Office of Joint Economic Affairs, USAID/' South Vietnam, 1968.

FIGURE X

CROP GROWING SEASON MAP, SOUTH VIETNAM

LEGEND:

Class $\overline{IB}_T$ — Year-long tropical crop growing season - monthly average temperatures over 78 F., above optimum temperatures for nearly all crops. Best suited to heat-tolerant crops: sugar cane, watermelon, sweet potatoes, okra, eggplant, peppers, and tropical perennials.
Location: Mekong Delta (Most coastal regions within 10 degrees N/S of the Equator)

Class $\overline{IBB}_T$ — Year-long tropical crop growing season - summer monthly average temperatures over 78 F. (see above) winter monthly average temperatures 73 to 78 F., suitable for most tender crops, rice, corn, soybeans, tomatoes, cucumbers and squash plus heat tolerant hardy crops, onions, cabbage, and leaf lettuce for local market.
Location: Coastal plains, Phan Thiet to Binh Dinh. (Bombay, India)

Class $\overline{IBC}_T$ — Year-long tropical crop growing season - summer average monthly temperatures over 78 F. (see IB_T above), winter season monthly average temperatures 65 to 73 F., suitable for nearly all tender crops, also many hardy crops: small grains, Irish potatoes, beets, onions, cabbage, leaf lettuce, and cauliflower.
Location: Central South Vietnam coastal plains, Phu My to Da Nang (Key West, Fla., USA)

Class $\overline{IBC}$ — Year-long subtropical crop growing season climate - winter monthly average minimum temperatures below 65 F., otherwise same temperatures range as IBC_T, cooler nights, more desirable climate for hardy crops, less desirable for tropical perennials. (Note: Hot dry winds, northern S. Vietnam, add to unfavorable effect of high temperatures during the summer season)
Location: Foothills of central S.Vietnam, interior and western valleys (approx. 1000 ft. elevation) coastal plains Thua Thien and Quang Tri Provinces. (South Florida, USA)

Class $I\overline{BC}$ — Year-long subtropical crop growing season climate: Mid-summer monthly average temperatures above 78 F., best suited to heat tolerant crops (See IB_T); midwinter temperatures 60 to 65 F., satisfactory temperatures for nearly all hardy crops, and the more cold tolerant tender crops: rice, sweet corn, green beans, summer squash and tobacco.
Location: Foothills northern S. Vietnam, interior valleys, approx., 1500 ft. el. (Cent. Florida, USA)

Class $I\overline{BC}$ — Year-long moderate temperature growing season climate; summer monthly average temperatures 73 to 78F., suited to most tender crops, and heat resistant hardy crops (See IBB_T), winter monthly average temperatures 65 to 73F. suited to both tender and hardy crops (See IBC_T). A satisfactory temperature climate for the production of seed crops, canning and freezing crops, and all types of livestock.
Location, Western plateau-Central S Vietnam (Dan Ne Thuot-Pleiku) many small mountain valleys.

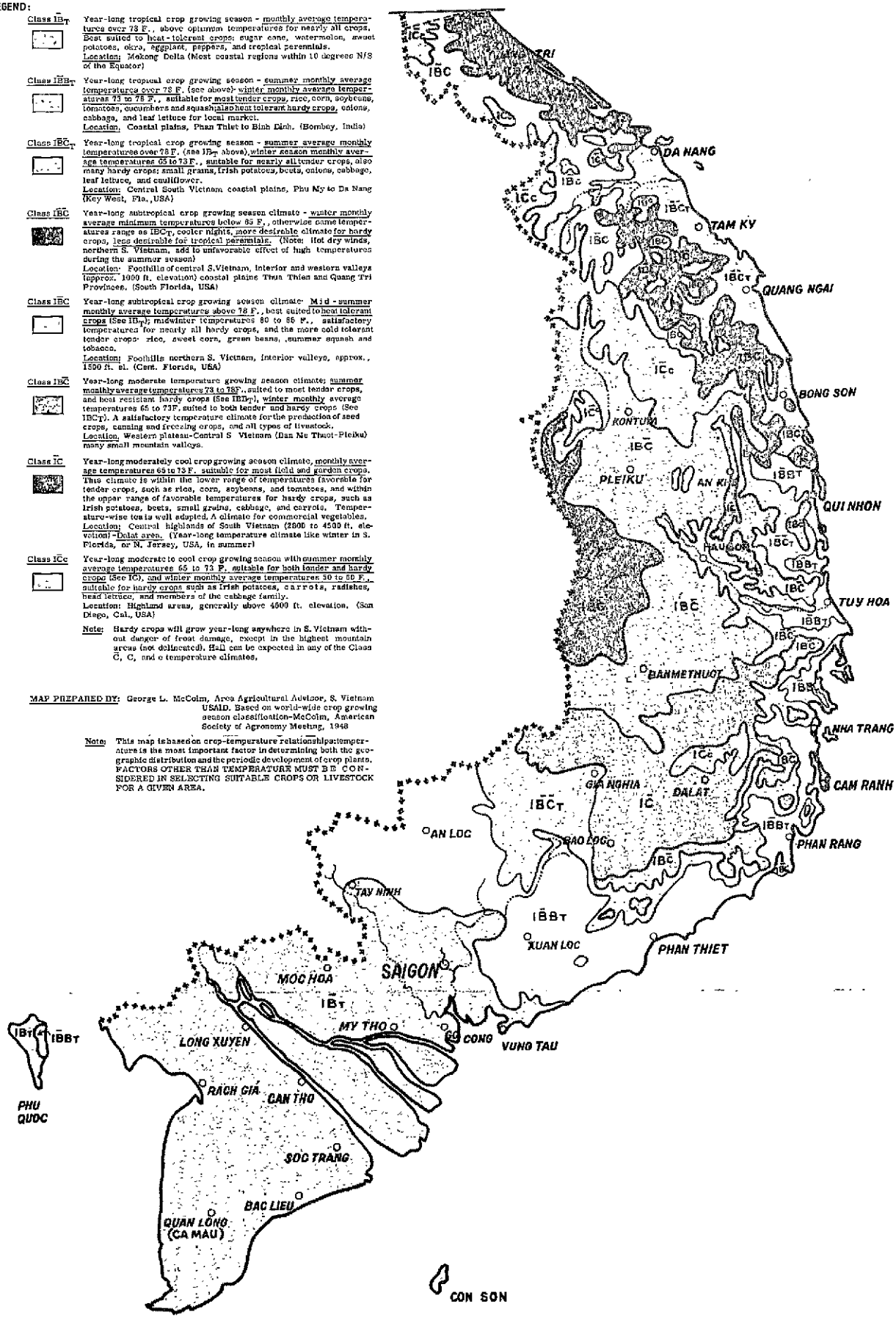
Class $\overline{IC}$ — Year-long moderately cool crop growing season climate, monthly average temperatures 65 to 73 F. suitable for most field and garden crops. This climate is within the lower range of temperatures favorable for tender crops, such as rice, corn, soybeans, and tomatoes, and within the upper range of favorable temperatures for hardy crops, such as Irish potatoes, beets, small grains, cabbage, and carrots. Temperature-wise tea is well adapted. A climate for commercial vegetables.
Location: Central highlands of South Vietnam (2500 to 4500 ft. elevation) -Dalat area. (Year-long temperature climate like winter in S. Florida, or N. Jersey, USA, in summer)

Class $I\overline{C}c$ — Year-long moderate to cool crop growing season with summer monthly average temperatures 65 to 73 F. suitable for both tender and hardy crops (See IC), and winter monthly average temperatures 50 to 60 F., suitable for hardy crops such as Irish potatoes, carrots, radishes, head lettuce, and members of the cabbage family.
Location: Highland areas, generally above 4500 ft. elevation. (San Diego, Cal., USA)

Note: Hardy crops will grow year-long anywhere in S. Vietnam without danger of frost damage, except in the highest mountain areas (not delineated). Hail can be expected in any of the Class $\overline{C}$, C, and c temperature climates.

MAP PREPARED BY: George L. McColm, Area Agricultural Advisor, S. Vietnam USAID. Based on world-wide crop growing season classification-McColm, American Society of Agronomy Meeting, 1948

Note: This map is based on crop-temperature relationships; temperature is the most important factor in determining both the geographic distribution and the periodic development of crop plants. FACTORS OTHER THAN TEMPERATURE MUST BE CONSIDERED IN SELECTING SUITABLE CROPS OR LIVESTOCK FOR A GIVEN AREA.



and more fully utilizing its tremendous capacity to supply water and power for the Delta area. In order to implement the recommendations of such studies, it will require vast amounts of capital and it is questionable in the minds of many experts whether the value of the reclaimed or more utilized land would justify such large amounts of capital expenditures.

The South Vietnamese farmer has relied on the small irrigation pump which is powered by a gasoline motor. The motor has become not only a means of pumping water but is used as a propellent for the family boat and for a multitude of other uses. Irrigation supplied by the small pump is limited to application on the land along the rivers and canals and is dependent upon the amount of water available for irrigation during the period of the year when supplemental water is needed. The flow of the Mekong and the canals and small rivers is low during the time when water is needed. Water cannot be taken from the rivers and canals when the quantity pumped onto the lands would be sufficient to affect water transportation--which is vital to the nation and, in many cases, the only means of transportation available.

Additional problems of property rights and access to supplemental water make it extremely difficult to introduce an effective short-run program of water control or irrigation. Most South Vietnamese experts are of the opinion that major water control programs are decades away and that the small motorized irrigation pump will be the principal method of intensifying agricultural production by multi-cropping. This is not to infer that there is no work presently being done on water control. During 1967, the GVN had 48 separate projects which would benefit 17,349 hectares of land. This was accomplished at an expenditure

of VN $72,507,404--or a cost of approximately VN $4,180 per hectare. 2/ it is not known to the study team whether this expenditure represents the total costs of the 48 completed projects or represents the expenditures on the 48 projects for the year 1967.

Commercial Fertilizers

The commercial fertilizer industry is in its infancy in South Vietnam with practically all the present requirements being met with imports from several sources throughout the world. The statistics on fertilizer imports vary considerably depending upon the source and upon what is included in the import statistics. The import of fertilizers covers many programs of import--some sponsored by the GVN and some from a multitude of other sources--which may be integrated into a variety of agricultural assistance programs for the nation. Chief among these is the USAID fertilizer import program.

The statistics furnished the study team by the Ministry of Land Reform and Agriculture and those furnished by USAID are in conflict during specific years but in total over the last decade may be reasonably close if allowances are made for inventory carryovers. The statistics furnished by the Ministry of Land Reform and Agriculture are shown in Table 14. These data show a lower volume than those furnished by USAID which are shown in Table 15. To further complicate the fertilizer situation, Figure XI shows the consumption of fertilizers in South Vietnam since 1953 with projections to 1971.

2/ At the present exchange rate of VN $118 equal to US $1.00, this means a little over US $35.00 per hectare.

TABLE 14

FERTILIZER IMPORTS BY TYPE, SOUTH VIETNAM, 1956 TO 1969

Year	Natural Fertilizers	Nitrogenous Fertilizers	Potassic Fertilizers	Phosphatic Fertilizers	Other Fertilizers	Total
			(Metric Tons)			
1956	70	28,270	2,637	47,537	200	78,714
1957	1,263	23,597	4,769	25,012	165	54,806
1958	192	41,064	5,305	34,351	21	80,933
1959	---	82,156	8,763	65,916	2,399	159,234
1960	---	55,427	7,789	65,794	1,740	130,750
1961	---	49,361	15,646	56,906	1,764	123,677
1962	379	54,362	7,719	52,593	500	115,553
1963	---	185,299	11,786	103,086	705	300,876
1964	---	76,835	7,329	83,016	1,874	169,054
1965	---	37,765	8,128	121,992	9,696	177,581
1966	---	81,393	1,055	59,148	38,902	180,498
1967	---	105,247	13,351	28,474	106,722	253,794
1968	---	83,920	2,300	27,500	47,000	160,720
1969 a/	---	217,100	5,800	50,200	---	273,100

a/ Estimate.
SOURCE: Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

TABLE 15

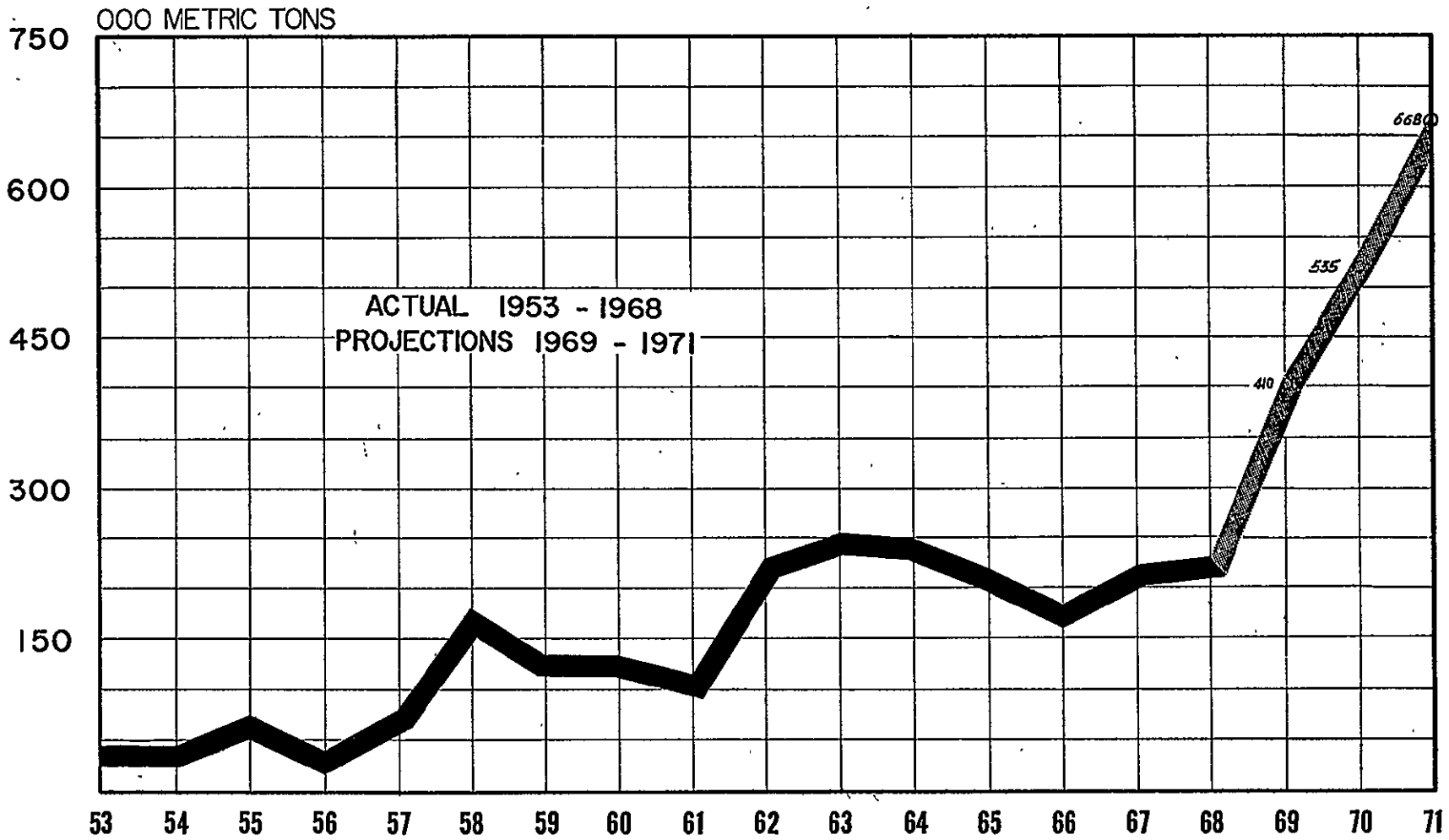
FERTILIZER IMPORT HISTORY, SOUTH VIETNAM, 1963 TO 1969 a/

Material	Analysis	1963	1964	1965	1966	1967	1968	1969
				(Metric Tons)				
Ammonium Sulfate	20.5-0-0	128,741	86,442	5,000	8,000	---	4,000	14,000
Urea	45-0-0	57,020	22,628	37,000	117,700	85,000	77,221	217,104
Tricalcium Phosphate (Later Rock Phosphate)	0-30-0	90,457	120,119	154,018	79,700	---	27,500	35,050
Diammonium Phosphate	18-46-0	14,250	1,850	1,860	5,970	---	1,500	13,700
Potash (KC_1)	0-0-60	11,835	8,372)	8,020	9,200	15,000	---	---
Potash (K_2SO_4) (Later Potassium Sulfate)	0-0-50	4,100	)	620	2,200	---	2,300	5,800
Mixed (Later Ammonium Phosphate)	20-20-15	16,200	22,000	40,000	44,000	105,000	19,500	85,879
Mixed	15-15-15	---	20	---	---	---	---	---
Ammonium Phosphate	16-16-8	---	---	---	---	---	---	105,000
Monophosphate	12-48-0	---	10	---	---	---	---	---
Dicalcium Phosphate	0-40-0	---	---	4,735	---	---	---	---
Triple Phosphate	0-45-0	---	---	---	---	---	---	1,500
TOTAL		322,603	261,441	251,253	266,770	205,000	132,021	478,033
Carryover into next year				108,000	182,000	150,000	40,000	

a/ 1963 to 1967 contracts awarded; 1968 to 1969 arrivals in CY.
SOURCE: USAID/ADDP/Agriculture Support Division, August 1969.

FIGURE XI

ACTUAL AND PROJECTED FERTILIZER CONSUMPTION
SOUTH VIETNAM, 1953 TO 1971



SOURCE: USAID/ADDP/Agriculture Support Division, Agri-Business Branch, April 1969.

These estimates were provided by USAID and are based on the planned active program covering the next two years. The improved varieties of rice are responsive to fertilizer treatment and fertilizer applications are a necessity in order to achieve the higher yields which are predicted for these varieties of rice. Fertilizers also are used in the production of other major crops. Table 16 shows the distribution of fertilizer use by crop for the years 1964 and 1965. This has changed with the use of fertilizer on the improved varieties of rice; however, it does show the importance of fertilizers to the production of other crops.

There are plans to produce various types of fertilizers in the nation and the most active of these plans is the one to construct a urea plant. Such efforts are aimed at reducing the foreign exchange requirements placed on the economy by the increased requirements for fertilizer. As is the case with many developing nations, one of the keys to a more intensified agriculture and its associated increased food supply in South Vietnam will be its ability to either produce or import the fertilizers necessary to achieve its agricultural goals.

Governmental Services

Ministry of Land Reform and Agriculture

The Ministry of Land Reform and Agriculture is the principal ministry of the GVN which serves the agricultural segment of the economy. The principal offices of the Ministry are in Saigon; however, there are provincial offices staffed by agricultural specialists with specialties in line with the needs of the

TABLE 16

ESTIMATED UTILIZATION OF CHEMICAL FERTILIZERS
SOUTH VIETNAM, 1964 AND 1965

Crop and Year	Nitrogen				Phosphate	
	Ammonium Phosphate	Ammonium Sulfate	Urea and Other	Potassium	Bicalcium Phosphate	Tricalcium Phosphate
	(Percent)					
Rubber						
1964	60	5	10	23	10	1
1965	30	3	5	40	8	1
Rice						
1964	-	60	60	5	10	85
1965	1	70	80	10	2	85
Tea and Coffee						
1964	5	5	5	10	15	1
1965	10	2	3	10	15	1
Sugarcane						
1964	5	10	10	7	10	8
1965	5	5	5	10	10	7
Vegetables						
1964	15	10	5	45	45	1
1965	30	15	2	20	55	2
Other						
1964	15	10	10	10	10	4
1965	24	5	5	10	10	4
TOTAL						
1964	100	100	100	100	100	100
1965	100	100	100	100	100	100

SOURCE: Societe Commerciale des Potasses l'Alsace, as published in Annual Statistical Bulletin. Office of Joint Economic Affairs, USAID/Vietnam, 1968.

particular area. The function of the Ministry of Land Reform and Agriculture has been one of providing education and policy guidelines rather than one of regulation. The Agriculture Extension Service functions as the direct contact with the farmers in the local areas. The Agricultural Economics and Statistics Service gathers and publishes the information on agricultural production, consumption, movement and other data pertinent to the agricultural economy.

The Ministry of Land Reform and Agriculture also conducts research programs in the production of the various crops and livestock important to the nation. The Ministry also is charged with the implementation of the much publicized land reform program and this program has been given a high priority in the economic development of South Vietnam. Figure XII shows the administrative structure of the Ministry of Land Reform and Agriculture and outlines the organizational responsibility.

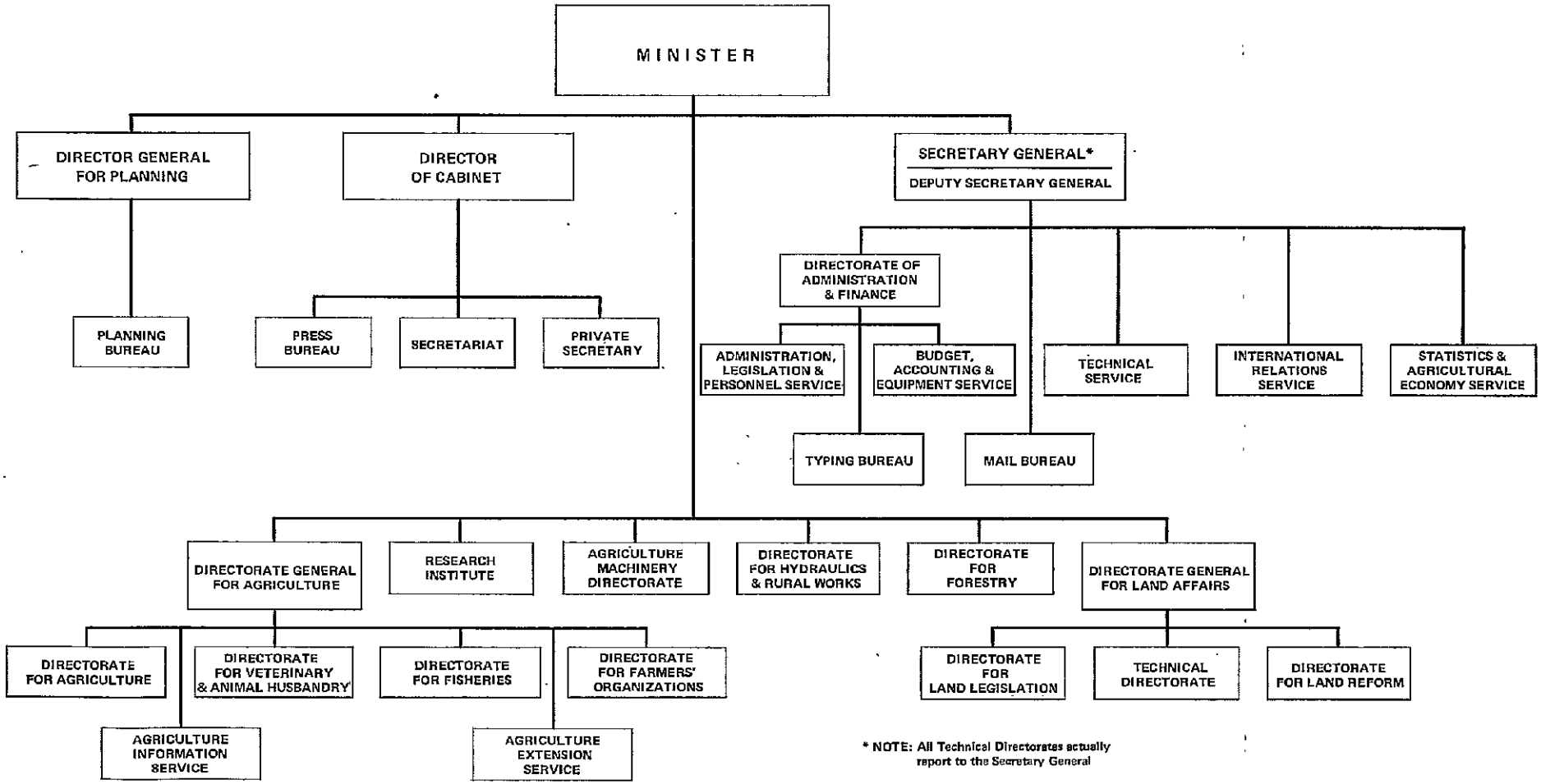
The lack of funds which plagues many Ministries of Agriculture throughout the world also limits the amount of service this Ministry can perform. With the considerable emphasis placed on the commercialization of agriculture, it would seem necessary that the Ministry give some attention to the marketing and utilization of agricultural products since, at present, the organizational structure does not provide for this badly needed service.

Ministry of Economy

The other ministry of the GVN concerned with the importation, distribution and pricing of agricultural products is the Ministry of Economy. This Ministry also has its principal offices in Saigon but has provincial offices throughout the nation similar to those of the Ministry of Land Reform and Agriculture.

FIGURE XII

ORGANIZATIONAL STRUCTURE OF THE MINISTRY OF LAND REFORM AND AGRICULTURE, SOUTH VIETNAM



SOURCE: Decree No. 65, SL/CCDD/CN, June 1968.

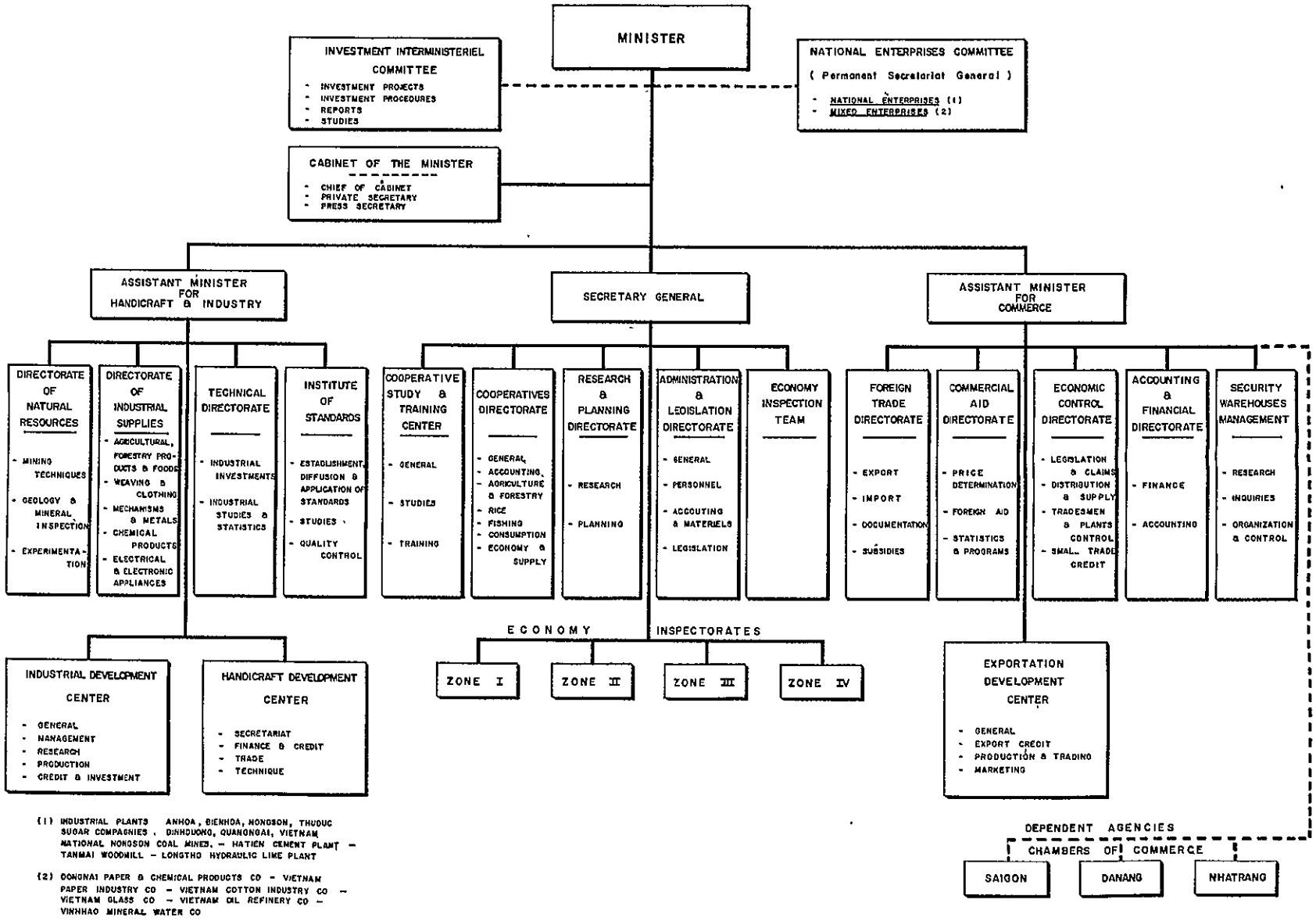
The problem of price supports, rationing, food distribution and programming of food imports has been the responsibility of the Ministry of Economy. The problem of inter-provincial movement of foods and the handling of GVN stocks of rice and other critical foods also has been the responsibility of the Ministry of Economy. Figure XIII shows the organizational structure of the Ministry of Economy.

The areas of activity of the Ministry of Economy cover a broad spectrum of products and services. Since the year 1964 when South Vietnam was forced to import large quantities of rice, the Ministry of Economy has had the responsibility of administering this important program.

As rice became more scarce and security problems made it more difficult to transport rice from the surplus areas to the deficit city areas, it became evident that the administrative structure of the Ministry of Economy and the Ministry of Land Reform and Agriculture could not solve the serious problem of freedom of movement of rice throughout the nation. Indiscriminate so-called "highway taxes" at the provincial level and other highway checkpoints, where the transporter must either pay or give up part of his cargo, create an impossible situation in the development of a commercialized agriculture--particularly with rice. Neither of the ministries have faced this critical problem and until this medieval custom is abolished through strict enforcement, the marketing cost for rice will be unrealistically high with market risks being the greatest cost factor. This responsibility would most logically fall to the Ministry of Economy since the organizational structure for implementing the program of enforcement already exists.

FIGURE XIII

ORGANIZATIONAL STRUCTURE OF THE MINISTRY OF ECONOMY, SOUTH VIETNAM



(1) INDUSTRIAL PLANTS ANHOA, BIENHOA, NONGSON, THUDUC SUGAR COMPAGNIES, DINHDUONG, QUANGNGAI, VIETNAM NATIONAL NONGSON COAL MINES, - HATIEN CEMENT PLANT - TANMAI WOODMILL - LONGTHO HYDRAULIC LIME PLANT

(2) DONGNAI PAPER & CHEMICAL PRODUCTS CO - VIETNAM PAPER INDUSTRY CO - VIETNAM COTTON INDUSTRY CO - VIETNAM GLASS CO - VIETNAM OIL REFINERY CO - VINHHAO MINERAL WATER CO

SOURCE: Decree No. 83, SL/KT, July 1968: USAID/ADPA, 1968.

CHAPTER V

TRANSPORTATION

Types of Transportation Available

Waterways
Highways
Railways

CHAPTER V

TRANSPORTATION

Transportation of grain is a major function to be performed in any grain distribution system and the ability of the transport system to efficiently and promptly perform this function will determine the efficiency of the total marketing system for grains. Transportation becomes necessary when the areas of production and consumption are not homogeneous.

The availability of the various modes of transport is of major consideration in selecting the most desirable location for grain storage and handling facilities. Grains are bulky and heavy in relation to their value; thus, it is essential when minimizing total transport costs to transport grain, when possible, in the lower cost larger transport units. When assembling grains in the producing areas, it is beneficial to assemble large quantities of grain at one point and at the same time minimize the distance of the "short haul" of grain which is generally done in the small and more expensive modes of transport. The reverse is true when distributing grains, or their manufactured products, to the smaller retail outlets.

From a theoretical point of view, grains would be stored in the areas of production provided the transport system operated perfectly. Since this is not the case in South Vietnam, various economic considerations such as cost of transport, time required to move the grain, uneven supply and demand conditions, weather, capital requirements for inventories and other factors dictate the need for holding inventories of rice or paddy at strategic points throughout the distribution system.

The goals of any storage and handling system must be clearly defined since cost minimization of storage alone most often is not the ultimate goal of a storage and handling system designed to serve a large area such as a nation. Due to limitations of the transport system of South Vietnam, it would not be possible to establish a theoretically low-cost, or even a minimal-cost, storage system of two large facilities such as one at Can Tho and one at Saigon.

When considering all the restrictions to movement of rice in the form of paddy in South Vietnam--particularly in the areas of assembly--and the problems of maintaining quality of the product and reducing losses in the marketing system, the question arises as to the adjustments that are necessary to develop as near as possible a minimal-cost storage and handling system. For example, it may be cheaper to add storage at a particular location than to purchase additional transport facilities to meet seasonal needs.

Transport rate structures may present obstacles to efficiency. Consideration should be given to the multiple use of transport equipment, to back hauls and to seasonal unused capacity of the transport system when determining the most efficient location of rice and paddy inventories in South Vietnam. Thus, a minimal-cost storage system for rice and paddy in South Vietnam, when considering the function of storage alone, may be quite different than a minimal-cost system taking storage as a functional part of the total distribution system for rice and paddy for the nation as a whole.

Rice is a basic food in South Vietnam and the stability of the nation depends, to a great degree, on the reliability of the supply of rice in all parts of the nation. Stocks of rice are necessary in the deficit areas and the stock

requirements will depend on the time required to replenish stocks from surplus areas. Normal interruptions in the transport service can create a rice crisis in a deficit area if adequate stocks are not maintained to protect the area against such occurrences. For these reasons, it is important to consider all aspects of the transport system for rice in South Vietnam before storage recommendations are made.

Types of Transportation Available

The Delta is the principal rice-producing area of the nation and this area depends largely on the network of waterways and canals for the major part of its transportation. The highway system of the nation is rather new and is being developed in all areas of the nation with particular emphasis in the areas from Saigon north to the 17th parallel. The railway system is small and, in most cases, inoperative at the present time.

The development of the nation's transportation system has been given considerable attention over the last five years. An excellent transportation study was made by Transportation Consultants, Inc. of Washington, D.C. and their report [1/], published in June 1966, describes in detail the existing system and sets forth a series of recommendations--many of which are being implemented at the present time. It is unnecessary to duplicate this excellent work; therefore, the study team leans heavily on the information contained in that fine

1/ Vietnam Transportation Study, prepared for the Government of Vietnam and the United States Agency for International Development by Transportation Consultants, Inc., Washington, D.C., 1966.

study and includes in this report only a brief description of the types of transportation available for rice and paddy.

Waterways

Water transportation is the principal method of moving people and goods throughout the entire Delta region. The Delta area is flat and has an extensive network of rivers and canals, making water transportation accessible to almost every city, village or hamlet in the southern part of the nation (Table 17). This network of rivers and canals in the Delta, estimated at 5,000 kilometers in length, relies principally on the water from the Mekong and Bassac Rivers, which flow through the heart of the Delta. Other smaller rivers in the Saigon area also provide access to water transportation to the rice-producing areas in the northern part of the Delta (Figure III, Chapter I).

Saigon, the major port of the nation, is located on the Saigon River, which is a branch of the Dong Nai River. The maximum draft at the port of Saigon is 8.5 meters, which allows the port to accommodate ocean vessels in the 10,000 to 25,000 ton class. The maximum draft at the shallow points of the Bassac River is 2.5 meters at low tide and limits the port cities along the river to accommodating the smaller ships.

The excellent network of waterways in the Delta, which links the important economic centers, also provides a barrier to the development of highways and railways. Distances are not great in the Delta area as compared with moving products in some of the more sparsely populated nations; thus, a large volume of merchandise is moved on these waterways by small, privately owned boats (Figure XIV).

TABLE 17

NAVIGABLE WATERWAYS OF SOUTH VIETNAM, 1954 TO 1967

Year	Great Rivers	Rivers, Rach and Arroyos	Canals				All Waterways
			Total	Main Way	Secondary Way	Tertiary Way	
	(Kilometers)						
1954	1,252	1,141	2,237	1,605	473	159	4,630
1955	1,252	1,141	2,237	1,605	473	159	4,630
1956	1,252	1,141	2,237	1,605	473	159	4,630
1957	1,252	1,141	2,216	1,584	473	159	4,609
1958	1,252	1,141	2,216	1,584	473	159	4,609
1959	1,252	1,141	2,208	1,576	473	159	4,601
1960	1,252	1,141	2,179	1,603	411	165	4,572
1961	1,252	1,141	2,369	1,594	612	163	4,762
1962	1,252	1,141	2,386	1,611	612	163	4,779
1963	1,252	1,141	2,364	1,682	442	240	4,757
1964	1,252	1,141	2,388	1,686	456	246	4,781
1965	1,252	1,141	2,388	1,686	456	246	4,781
1966	1,252	1,141	2,388	1,686	456	246	4,781
1967	1,252	1,141	2,388	1,686	456	246	4,781

SOURCE: Directorate of Navigation, as published in Vietnam Statistical Yearbook, National Institute of Statistics.

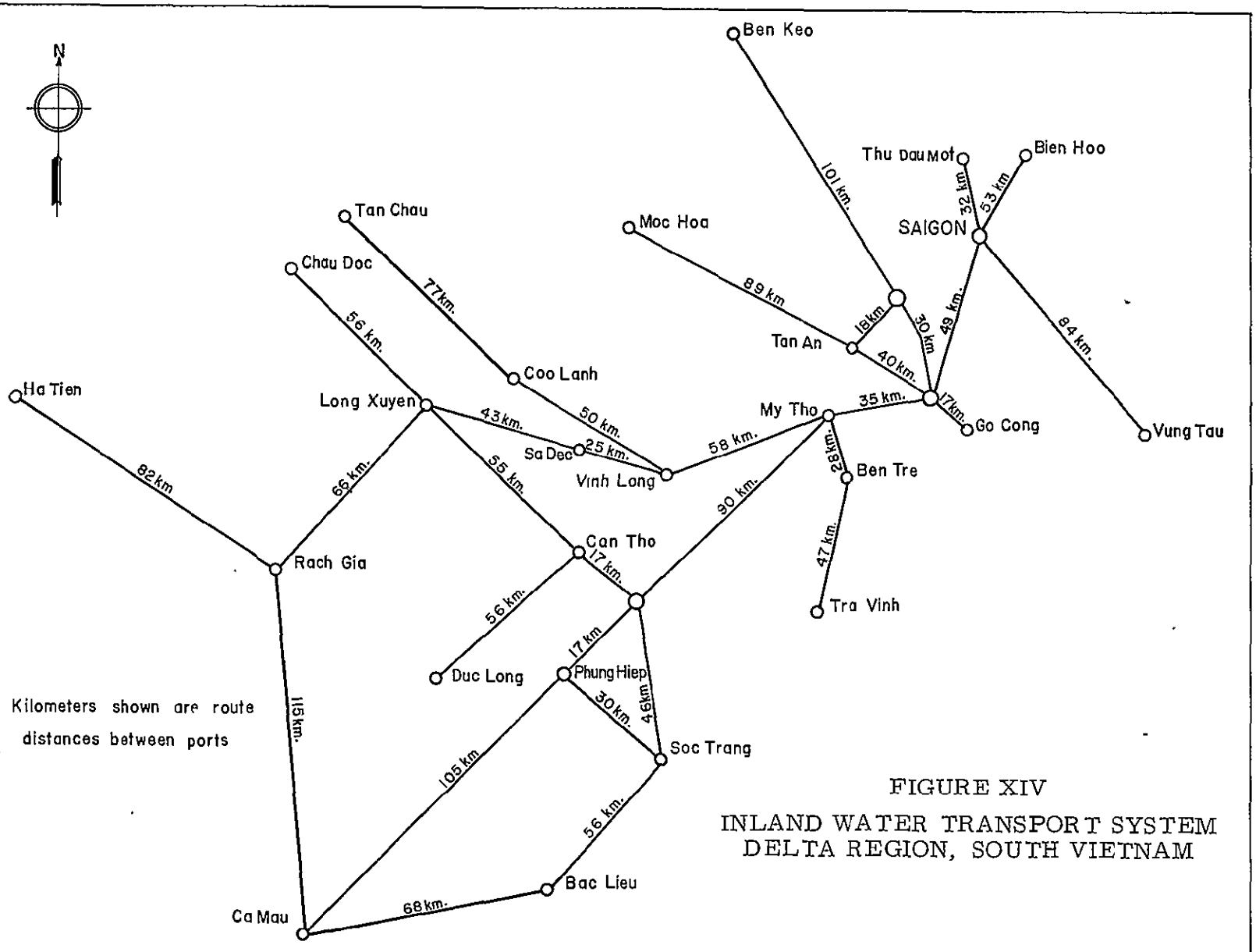


FIGURE XIV

INLAND WATER TRANSPORT SYSTEM
DELTA REGION, SOUTH VIETNAM

SOURCE: Transportation Consultants, Inc., Vietnam Transportation Study. Washington, D.C., 1966.

Keeping the waterways open to traffic during the period of conflict has been a major problem to the nation. The management of the water to achieve planned irrigation programs during the dry season may affect the water level and may limit the use of the river or canal to certain sized river boats; therefore, the use of the waters in the Delta touches on the economic activity of most all people who live in the area.

The effect of the tides on the waterways in the Delta extends inland for many kilometers causing a rise in the water level of up to 2.5 meters as far inland as Vinh Long and Sa Dec. The action of the tidal flow also aids in the cleaning of the riverbeds and the maintenance of navigable depths in the main channels.

The governmental agency which has the responsibility of controlling the waterways of the nation is the Directorate of Navigation. The Ports and Harbor Authority also exercises control of certain inland waterways, canals, ports and harbors. The Directorate of Navigation has a fleet of 14 dredges which are used to maintain the water depth in the areas where dredging is required.

The Directorate of Navigation also exercises some control over the fleet of commercial boats operating on the nation's waterways. All commercial vessels are required to register with the Directorate of Navigation, although it is estimated that only a small portion actually register. Thus, the actual number and size of boats operating throughout the nation is not known (Tables 18, 19 and 20).

Because of the long coastline and the higher population density in the

TABLE 18

STEAMSHIPS AND MOTOR-PROPELLED VESSELS
REGISTERED AND IN USE AT END OF YEAR 1968, SOUTH VIETNAM

Category of Vessel	Registered			In Use		
	Number	Horsepower	Total Tonnage (Metric Tons)	Number	Horsepower	Total Tonnage (Metric Tons)
Steam towing vessels	112	12,088	4,155	3	360	88
Pusher tugs and propelled towing vessels of every type	222	36,043	7,201	97	17,732	1,976
Motor-propelled junks and sampans, less than 50 metric tons	5,150	77,884	31,250	3,114	55,770	16,374
Motor-propelled fishing boats, more than 50 metric tons	167	17,487	29,851	167	17,487	29,851
Motor-propelled barges	78	15,345	16,513	56	10,743	11,411

Charges:

Powered barges	VN $2.20 per metric ton-kilometer
Non-powered barges	VN $1.53 per metric ton-kilometer
Tug boat	VN $0.50 per metric ton-kilometer

SOURCE: Directorate of Navigation.
Yen Chung Lou, General Engineer, USAID/Ports and Waterways.

TABLE 19

JUNKS AND BARGES, NON-PROPELLED, STILL REGISTERED AT SAIGON SUPERVISION OFFICE AND IN USE AT END OF YEAR 1968

Number and Tonnage	Non-Propelled Metallic Barges				
	More than 250 Metric Tons	151 to 250 Metric Tons	51 to 150 Metric Tons	16 to 50 Metric Tons	Total
Number still registered	158	161	165	72	556
Gross tonnage (metric tons)	55,562	29,218	18,199	2,014	104,993
Number in use at end of 1968	147	102	133	59	441
Gross tonnage (metric tons)	52,238	19,374	12,956	1,627	86,195

SOURCE: Directorate of Navigation.
Yen Chung Lou, General Engineer, USAID/Ports and Waterways.

coastal areas, coastal shipping is vital to the economy of the nation. This is particularly true with rice since it is necessary to supply the deficit areas in the north with rice produced in the Delta region. Water transportation offers the lowest cost method of transportation for moving rice these long distances.

In the Delta region, the small sampan is the primary mode of transportation in the outlying areas. Many sampans are equipped with an outboard motor which is also used as the source of power for pumping water for irrigation. The major inland canals can accommodate barges and river boats with capacities up to 300 metric tons and these units are used to move the major portion of the commerce between the large villages and the major cities. Most of the boats and barges are privately owned; however, some of the major industries of the nation operate fleets of these boats throughout the entire nation.

TABLE 20

LISTED VESSELS FOR COMMERCIAL TRAFFIC, SOUTH VIETNAM

Name of Vessel	Length (Meters)	Width (Meters)	Depth (Meters)	Cubic Meter Capacity	Metric Ton Capacity	Ship and Cargo Tonnage (Metric Tons)	Power
Phong Chau	53.65	8.60	3.09	499.12	252.00	700	500
Khanh Hoa	51.25	8.15	4.60	526.05	323.99	700	520
Nam Sanh	43.77	8.24	3.20	553.00	251.45	520	375
Dai Hai	54.96	8.96	3.76	607.00	280.00	650	630
Truong Son	54.96	8.96	3.76	607.00	280.00	650	630
Nhut Le	66.30	9.90	5.77	935.00	558.00	1,200	1,000
Thang Long	50.00	8.96	4.30	607.00	280.00	650	630
Tien Phong	50.00	8.96	4.30	607.00	280.00	650	630
Thong Nhut	50.00	8.96	4.30	607.00	280.00	650	630
Phu Quoc	50.00	8.96	4.30	607.00	280.00	650	630
Nam Mai 1	27.76	5.32	2.70	103.01	---	50	320
Nam Mai 2	27.76	5.32	2.70	103.05	---	50	320
Nam Viet	45.70	8.35	4.70	485.00	300.00	600	480

SOURCE: Yen Chung Lou, General Engineer, USAID/Ports and Waterways.

Some of the larger rice millers and merchants operate fleets of boats to transport paddy and milled rice to the various mills, warehouses and retail outlets. Generally speaking, the dock and wharf facilities for handling the larger commercial vessels are less than adequate. During the last few years, a diligent effort has been made to improve the various river port facilities. Completely new river ports are being developed, such as the one at Can Tho.

The cost of transporting bulk cargo by water in South Vietnam is by far the cheapest method of transportation. The rate per metric ton-kilometer was VN $2.20 as of March 31, 1969 (Table 21). This cost represents only the actual transport costs and not the unloading or loading charge, which varies between ports. Since the river ports are not mechanized, the rice or paddy usually is unloaded and loaded at a wharf adjoining or near the rice mill or warehouse. This unloading and loading is done by gang labor and a well-organized crew can unload 12 to 15 tons per hour. The cost of unloading or loading ranges from VN $460 per ton in the inland ports to VN $492 per ton at the larger ocean ports.

The coastal fleet consists primarily of ships in the 3,000 to 8,000 ton range which are both privately and government owned. These vessels are presently being used to transport the more strategic materials along the coast. As hostilities increased, the congestion at the ports became a serious problem. Delays in unloading occurred and the accompanying demurrage charges became prohibitive. The demurrage charges at Saigon, which range from US $800 to US $4,000 per day, became incorporated into the total transportation bill.

The practice of bringing all rice into Saigon for transshipment to the northern ports, such as Da Nang, contributed greatly to this congestion. As the

TABLE 21

TRANSPORTATION COSTS BY WATER FROM SAIGON
MARCH 31, 1969

Saigon to:	Distance	Piasters per Metric Ton: Rate per Metric Ton-Kilometer	Transport Cost	Loading and Unloading Cost	Total Cost
	(Kilometers)				
Can Tho	329	2.20	724	460	1,184
Long Xuyen	274	2.20	603	460	1,063
Vinh Long	166	2.20	365	460	825
Sa Dec	185	2.20	407	460	867
My Tho	111	2.20	244	460	704
Cam Ranh					
Rice	---	---	1,017	492	1,509
Corn	---	---	905	492	1,397
Nha Trang					
Rice	---	---	1,017	492	1,509
Corn	---	---	905	492	1,397
Qui Nhon					
Rice	---	---	1,128	492	1,620
Corn	---	---	1,005	492	1,497
Da Nang					
Rice	---	---	1,240	492	1,732
Corn	---	---	1,104	492	1,596

Loading and unloading cost basis:

VN $230 + VN $230 = VN $460 in Delta
VN $230 + VN $262 = VN $492 along coastal ports

SOURCE: USAID/Agriculture Support Division, Agri-Business Branch.

demand for moving military supplies and other strategic materials decreases, the port congestion is expected to decrease if improvements are made in port and wharf facilities for handling the increased commercial traffic. The developments at other ports, such as Da Nang, Cam Ranh, Nha Trang and Can Tho, will tend to take the pressure off the port of Saigon.

The quality of the river boats and coastal vessels vary depending on the age and use. Most of the small and medium-sized river boats are made of wood; however, there is an increasing number of metal barges and boats placed into service each year. At the present time, the river transportation system is operating at less than capacity. The general quality of the boats and coastal vessels is sufficient to transport bulk paddy anywhere it is needed. The problem would be to keep the paddy protected from the rain while in transit. An aggressive program of "cleaning the fleet" to protect the paddy against infestation and adulteration would be necessary to ready the system for transporting bulk paddy.

Highways

The major portion of the present hard-surfaced highway system of South Vietnam has been constructed since 1954. The entire highway system was severely damaged during the war period prior to 1954 with upwards to two-thirds of the highways and bridges made inoperative. A program of highway development was started in 1957 based on the recommendations of a United Nations Economic Survey Mission study which established priorities for highway development. In 1964, the Director of Highways issued a "Ten-Year Plan of Highway Improvement, 1965-1975." In addition, the Corps of U.S. Army Engineers

started work on improving the major highways throughout the length and breadth of the nation.

At the present time, there are hard-surfaced highways connecting most of the major cities. By the end of the year 1972, the development of the major military highways will be completed (Figure XV). These highways will be able to accommodate large trucks up to wheel loads of 5,500 kilograms. 2/

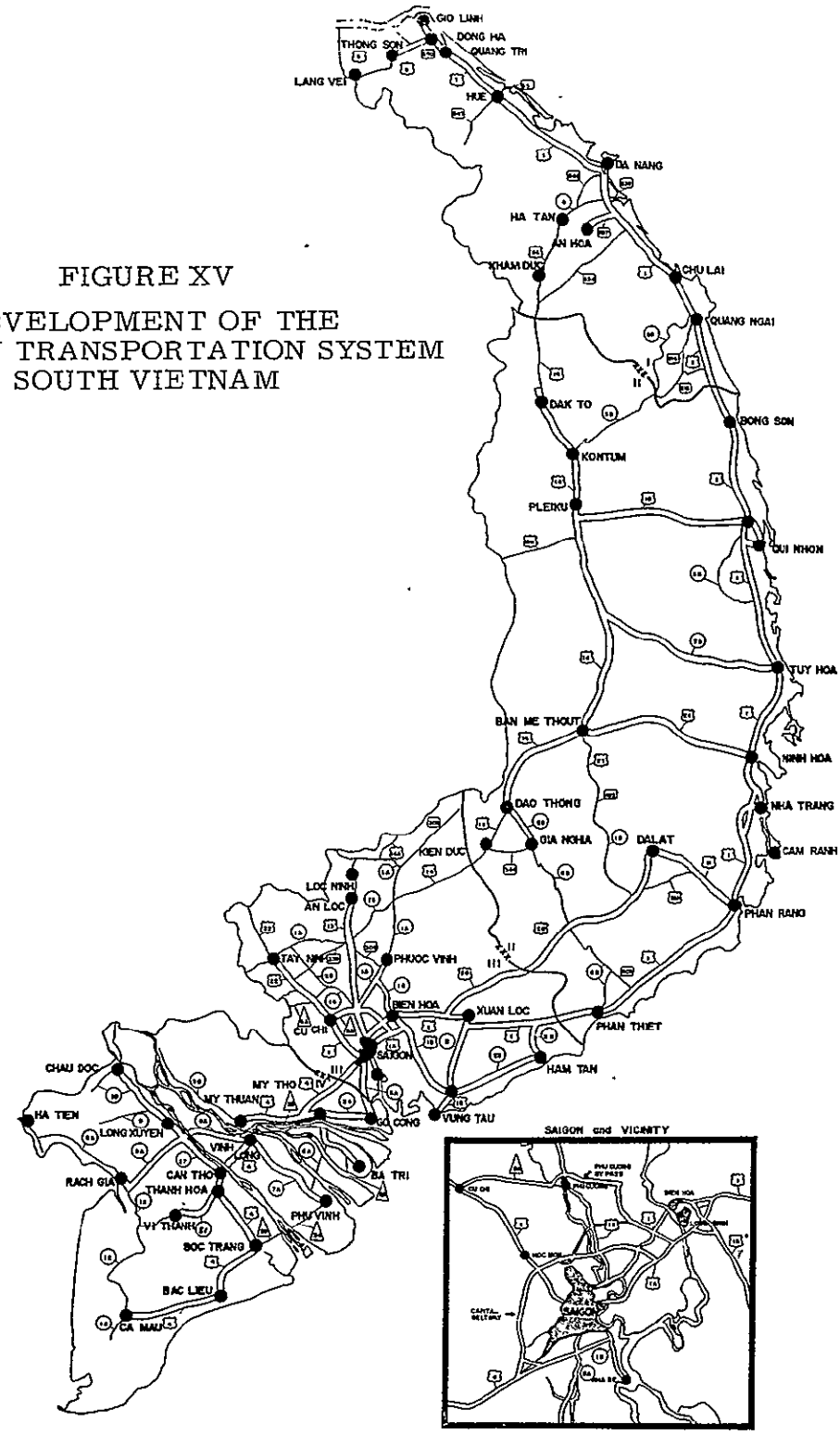
The regulation of the highways in South Vietnam is under the guidance of the Ministry of Public Works. For administrative purposes, highways are classed as national, inter-provincial, provincial, communal, city street, and miscellaneous roads and trails. The Ministry of Public Works controls the national and inter-provincial roads through the Directorate of Highways. The other classes of highways are controlled by the local governments. According to the United Nations Economic Survey Mission Report of 1957, the highway system consisted of almost 12,000 kilometers, with 23 percent being classed as asphalt surfaced, 42 percent classed as crushed stone or gravel, and 35 percent classed as earth or under construction.

The highway improvement program will produce a network of hard-surfaced roads that will connect all provinces with the major cities. As the improved highways are developed, maintenance becomes a problem and many officials feel that the present maintenance program is not keeping in step with major highway development. The absence of regulations or the overloading of trucks is causing a more rapid deterioration of the highways and as additional highways are developed, it adds to the maintenance problem.

2/ Average United States standards are 4,125 kilograms wheel load.

FIGURE XV

DEVELOPMENT OF THE HIGHWAY TRANSPORTATION SYSTEM SOUTH VIETNAM



SOURCE: Director of Construction, Lines of Communications Division, Military Assistance Command, Vietnam (MACV).

When developing a storage and marketing system for rice, truck transportation is essential. Although water transportation is cheaper for the long haul, the truck, in many cases, offers the only alternative for the short-haul assembly and distribution of rice and paddy. At the present time, the cost of truck transport varies considerably throughout the nation depending on availability of vehicles, type of roads, security, type of product, and the amount of estimated "taxes and assessments" charged the trucker through the maze of official and unofficial checkpoints along the route (Table 22). (See Appendix Exhibit A-II for measured distances between major centers.)

Truck traffic does not have free movement throughout the nation. Both the "official and unofficial" assessments at established and "temporary" points along the truck routes add tremendously to the cost of trucking goods throughout the nation. This is particularly true with inter-provincial shipments where provincial chiefs are given a free reign on assessing charges on merchandise moving through the province. Rice and paddy are the prime targets of highway assessors. The trucker usually is required to pay "in cash" or "in kind" a certain quantity of the truck cargo. On a long haul, where the route moves through several provinces, the assessments border on the stage of being ridiculous with charges being so excessive that it ultimately becomes financially prohibitive to move the product at all.

Unless these medieval mandarin system-type taxing powers on inter-provincial commerce are corrected, a modern rice storage and marketing system is an impossibility since its operational success or failure would be in the hands of the highway taxing officials and not in the hands of the management of the system itself.

TABLE 22

TRANSPORTATION COSTS BY HIGHWAY FROM SAIGON, MARCH 31, 1969

Saigon to:	Rate per Metric Ton-Kilometer	Distance	Hauling Costs per Metric Ton	Loading and Unloading Costs per Metric Ton	Total Cost per Metric Ton
	(Piasters)	(Kilometers)	(Piasters)	(Piasters)	(Piasters)
Bien Hoa	5.00	30	150.00	77.60	227.60
Binh Duong	5.00	30	150.00	77.60	227.60
Long Khanh	5.00	81	405.00	77.60	482.60
Phuoc Tuy	5.00	125	625.00	77.60	702.60
Vung Tau	5.00	131	655.00	77.60	732.60
Binh Tuy	5.00	172	860.00	77.60	937.60
Vo Dat (District)	5.00	225	1,125.00	77.60	1,202.60
Tanh Linh (District)	5.00	182	910.00	77.60	987.60
Binh Long	14.55	110	1,600.50	77.60	1,678.10
Phuoc Long	14.55	144	2,095.20	77.60	2,172.80
Quang Duc	5.00	240	1,200.00	77.60	1,277.60
Darlac	5.00	353	1,765.00	77.60	1,842.60
Lam Dong	5.00	186	930.00	77.60	1,007.60
Tuyen Duc	5.00	300	1,500.00	77.60	1,577.60
Binh Thuan	5.00	197	985.00	77.60	1,062.60
Ninh Thuan	5.00	346	1,730.00	77.60	1,807.60
Khanh Hoa	5.00	450	2,250.00	77.60	2,327.60
Tay Ninh	7.31	99	723.69	94.40	818.09
Hau Nghia	7.31	34	248.54	94.40	342.94
Long An	7.31	47	343.57	94.40	437.97
Dinh Tuong	7.31	71	519.01	94.40	613.41
Go Cong	7.31	58	423.98	94.40	518.38
Kien Hoa	7.31	86	628.66	94.40	723.06
Vinh Binh	7.31	203	1,483.93	94.40	1,578.33
Sa Dec	7.31	143	1,264.63	94.40	1,359.03
Vinh Long	7.31	136	994.16	94.40	1,088.56
Kien Phong	7.31	157	1,147.67	94.40	1,242.07
Phong Dinh	6.42	169	1,084.98	102.40	1,187.38
Chuong Thien	6.42	228	1,463.76	102.40	1,566.16
Bac Lieu	6.42	280	1,797.60	102.40	1,900.00
Ba Xuyen	6.42	231	1,483.02	102.40	1,585.42
An Xuyen	6.42	347	2,227.74	102.40	2,330.14
An Giang	6.42	190	1,219.80	102.40	1,322.20
Kien Giang	6.42	248	1,592.16	102.40	1,694.56
Chau Doc	6.42	245	1,572.90	102.40	1,675.30

SOURCE: USAID/Agriculture Support Division, Agri-Business Branch.

Because the waterways presently are relatively unsafe, particularly at night, the highway is the safest method of transport as far as security is concerned. According to the National Institute of Statistics, there were 16,310 heavy trucks in use in 1967. This number has been increasing over 10 percent each year with 1,732 heavy trucks added in 1968 and 803 added during the first four months of 1969. Many of the heavy trucks could be adapted to hauling bulk paddy and could be used to move large quantities of rice or paddy, particularly in the cities.

Railways

The national railway system of South Vietnam is almost inoperative due to its being the principal target of the subversive elements that have been active during the more than 20 years of conflict. The rights-of-way have long suffered from military action, flood damage and insufficient funds for maintaining the system (Figure XVI). In spite of these obstacles, the Vietnam Railway System still moves a large tonnage of freight in the urban and port areas of the nation. This system consists of 1,394 kilometers of one-meter gauge track which runs between Saigon and the 17th parallel with branches to some of the major economic areas along the primary route (Table 23).

The Vietnam Railway System is an autonomous governmental agency administered by a Director General who is responsible to a Board of Directors consisting of the following:

President:	Minister of Communications and Transportation
Member:	Minister of National Defense
Member:	Minister of Finance
Member:	Minister of National Economy

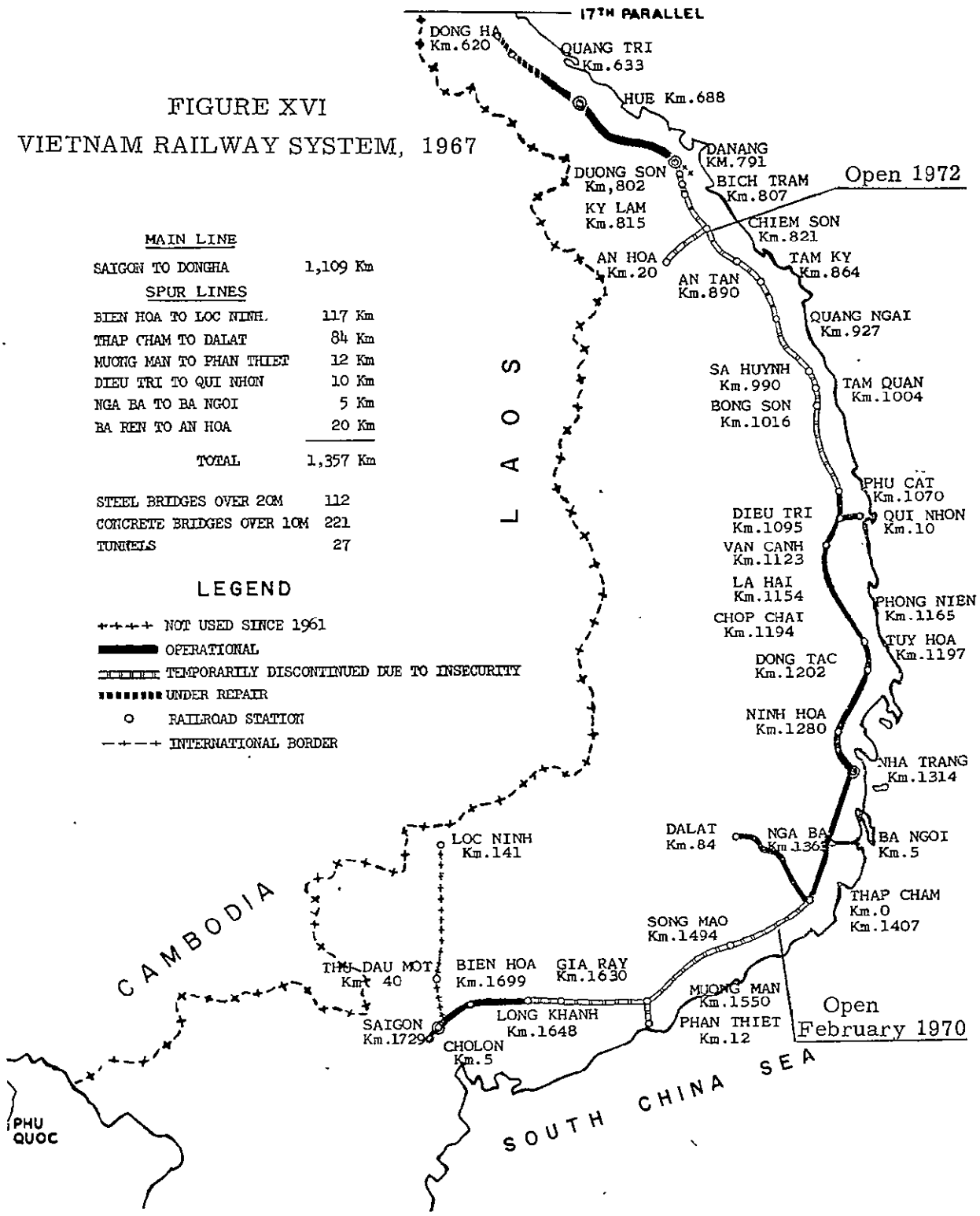


FIGURE XVI

VIETNAM RAILWAY SYSTEM, 1967

SOURCE: L.D. Marsden, Engineering Advisor, USAID/ADCCA/CAE.

TABLE 23

DIVISIONS OF THE VIETNAM RAILWAY SYSTEM

Division	From	To	Length		
			Main Line	Branches	Total
			(Kilometers)		
Saigon	Saigon	Muong Man	179.7	148.5	328.2
Nha Trang[a/]	Muong Man	Dieu Tri (Qui Nhon)	446.0	89.3	535.3
Da Nang	Dieu Tri	Dong Ha	483.6	47.1	530.7
TOTAL			1,109.3	284.9	1,394.2

a/ Includes branch to Da Lat, a portion of which is rack and cog.
SOURCE: Vietnam Railway System, 1965, as published in Vietnam Transportation Study, Transportation Consultants, Inc.

The service facilities for the Vietnam Railway System are in Saigon and Da Nang with all major work conducted at Saigon. Although much of the original equipment has been damaged or destroyed, the system still has a sufficient amount of modern equipment to perform a great service to the commerce of the nation (Table 24).

A large part of the equipment has a maximum load capacity of 40 tons but the roadway and its bridges limits the capacity of 30 tons over much of the right-of-way. The system has rail track scales of 50-ton capacity at Saigon, Thap Cham, Nha Trang and Da Nang. There are freight warehouses at each station for the storage of LCL (less than carload lot) shipments. The switching service allows for 24 hours of demurrage-free time to unload or load the cars. After the free time, demurrage rates are VN $350 per 24-hour period.

TABLE 24

NUMBER, TYPE AND CONDITION OF RAILWAY EQUIPMENT
VIETNAM RAILWAY SYSTEM

Number	Type	Condition and/or Capacity
	South Vietnam Equipment	
56	Diesel locomotives	8 Aesthom, 300 to 900 HP 48 General Electric, 900 HP
46	Steam locomotives	Operable, not in use
199	4-axel box cars	Old equipment but good condition
225	4-axel box cars (4-door)	New (5 years)
63	Gondola and hopper cars	Old equipment but good condition
90	Gondola and hopper cars	New (5 years)
151	Flat cars	Old equipment but good condition
23	Tank cars, 6,000 to 8,000 gallons	Old equipment but good condition
25	Tank cars, 6,000 to 8,000 gallons	New (5 years)
154	Passenger cars	100 persons each
10	Passenger cars	100 persons each, new (5 years)
20	Passenger cars	Not in use
4	Orton wrecking cranes	67-ton capacity
1	Applevage wrecking cranes	25-ton capacity
1	Bay City wrecking cranes	15-ton capacity
350	2-axel cars, 10 and 15 tons	Old equipment, still usable
	United States Military Equipment	
111	4-axel flat cars	
61	Flat bottom gondolas, open end	
25	Mechanical refrigerated cars	
10	Plymouth switch engines (yard work)	

SOURCE: L. D. Marsden, Engineering Advisor, USAID/ADCCA/CAE.

The freight rates are cheaper than truck rates and, in some instances, competitive with water rates over the longer hauls (Table 25). Since there has been little or no rice or paddy transported by rail during recent years, no rate

is listed for these products. Present equipment is not suitable for transporting bulk paddy; thus, it is doubtful that it would be economically feasible to develop a rice or paddy storage and distribution system based on the present railway system as an important mode of transportation. It may be feasible, however, to remodel some hopper-type cars for use in shuttling bulk paddy from the port facilities in Saigon to the rice mills in the area. Because of the limitations of the available equipment, this type of use may be farther in the future than the requirements of an immediate rice storage and handling system might dictate. It is mentioned here for the purpose of possible transport alternatives for consideration sometime in the future when the supply of rolling stock of the railway is increased to meet the growing needs of the anticipated peacetime economy.

TABLE 25

VIETNAM RAILROAD RATES FOR CARLOAD LOTS, 1969

Distance	Group Classification Rates				
	A	B	C	D	E
	(Piasters per Metric Ton/Kilometer)				
1 - 200 kilometers	3.00	3.30	3.60	3.80	4.00
200 - 400 kilometers	1.80	2.10	2.30	2.50	2.70
400 - 600 kilometers	1.50	1.80	2.00	2.10	2.20
Over 600 kilometers	1.20	1.30	1.50	1.60	1.80

Group Classification (partial list):

(A) Coal, fertilizer, gravel, crushed rock, wood (timber), fish, beer (manufactured locally), gas, etc.

(B) Manure, fertilizer, building materials, theater equipment, metal, minerals, farm products, fruit, vegetables, import beer and gas and beverages, bamboo, bark, logs, etc.

(C) Lumber (planks, boards and beams), hides, resins, paint, oil-bearing seeds, flour (local), etc.

(D) Cattle, fish, hardware, farm equipment, tools, leather, wood pulp, cotton, beads, furniture, import vehicles, etc.

(E) Parafin, vegetable oil, toys, firearms, commercial beverages, coffee, cigars, cigarettes, film, tires, etc.

NOTE: Multiply rates by 169 for current piaster rate.
SOURCE: L. D. Marsden, Engineering Advisor, USAID/ADCCA/CAE.

CHAPTER VI

THE LIVESTOCK AND POULTRY INDUSTRY

Buffalo and Cattle

Hogs

Ducks

Chickens

Feed Grain Storage Requirements

CHAPTER VI

THE LIVESTOCK AND POULTRY INDUSTRY

The production of livestock in South Vietnam has not received as much emphasis as the production of rice and fruit and vegetable crops. Traditionally, meats have not been an important part of the South Vietnamese diet. This is not to infer that the South Vietnamese consumer does not like meat; however, the low purchasing power of the average consumer dictates that money be spent for the more inexpensive foodgrains.

As the nation becomes more industrialized and consumer incomes rise, the demand for meats will increase. This, in fact, has been happening in South Vietnam at a startling rate since 1965 and 1966, particularly in the area of poultry production. Even though the livestock and poultry production has not been commercialized to a significant degree, there are significant numbers of the various types of livestock and poultry produced in the nation each year. The principal types of livestock and their numbers are shown in Table 26.

TABLE 26

LIVESTOCK POPULATION, SOUTH VIETNAM, 1968

Type	Number
Buffalo	646,600
Cattle	953,600
Pigs	3,552,600
Chickens	20,008,000
Ducks	14,089,000

SOURCE: Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

Buffalo and Cattle

The buffalo are basically draft animals, used by the farmers as a source of power to till the soil. A few of the younger buffalo are consumed for meat but this quantity is believed to be rather small. The cattle, on the other hand, are used for meat and for milk.

The cattle population is distributed throughout the nation much in the same manner as the people. Some specialization exists in parts of South Vietnam in the feeding of cattle on a cattle ranch type of operation where cattle are the major source of income of the farmers. Cattle markets have developed in many areas and the demand for the meat is increasing. The cattle produced for the market are generally grass fed; thus, cattle are not major consumers of feed grains.

Hogs

The production of pork is a major livestock enterprise of the nation and hogs are produced in every province (Table 27). Many of the hogs either live off the land or are fed off-grade rice or the by-products of the rice mill. The average hog in South Vietnam is white and it is fat. It is fat because there appears to be a sufficient amount of rice bran and broken rice that can be fed to hogs.

There are an increasing number of commercial hog enterprises scattered throughout the nation. New breeds are being introduced and programs of nutritional improvement in hog feeding are being emphasized.

TABLE 27

NUMBER OF HOGS BY PROVINCE, SOUTH VIETNAM, 1959 TO 1968

Province	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
1. Quang Tri	85,934	63,800	53,500	57,100	61,300	66,300	64,900	67,900	58,200	61,000
2. Thua Thien	91,808	115,800	117,000	123,400	135,500	126,000	93,100	93,100	03,100	90,000
3. Quang Nam	299,990	271,700	281,000	148,700	155,700	193,200	124,600	165,400	150,000	130,000
4. Quang Tin	a/	a/	a/	138,800	143,000	129,900	129,900	129,900	85,000	85,000
5. Quang Ngai	152,260	278,200	282,500	209,700	246,300	269,800	275,100	250,300	200,000	200,000
Total Region I	629,992	729,500	734,000	677,700	741,800	765,200	687,600	706,600	586,300	566,000
6. Binh Dinh	165,876	250,000	209,500	200,700	202,500	244,900	227,200	223,000	218,000	200,000
7 Phu Yen	118,225	106,600	103,400	80,300	75,100	101,100	95,000	95,000	103,000	97,000
8. Phu Bon	a/	a/	a/	a/	b/	b/	b/	b/	b/	b/
9. Khanh Hoa	34,023	58,700	52,700	46,100	47,200	47,300	38,400	37,400	36,500	31,500
10. Quang Duc	---	---	---	---	5,600	5,600	6,200	5,200	5,200	3,000
11. Tuyen Duc	8,971	11,600	11,900	11,900	16,000	16,000	16,000	22,100	22,100	17,000
12. Ninh Thuan	15,325	36,600	23,100	31,500	38,400	36,500	37,000	37,000	17,000	38,000
13. Binh Thuan	19,844	20,700	18,300	10,100	11,600	8,000	8,100	7,300	15,000	10,000
14. Lam Dong	11,782	16,200	12,200	12,200	16,000	16,000	12,800	14,900	13,400	16,300
15. Darlac	13,242	23,800	21,100	21,100	33,700	33,700	35,400	24,800	32,000	33,000
16. Pleiku	36,410	44,200	59,100	59,100	31,700	31,700	31,700	31,700	17,900	18,300
17. Kontum	8,785	17,500	9,700	9,700	14,500	14,500	14,500	15,300	16,600	19,500
Total Region II	432,483	585,900	521,000	491,700	492,300	555,300	522,300	513,700	496,700	483,600
18. Binh Tuy	7,150	10,300	6,900	6,900	11,500	11,500	11,500	22,200	26,200	27,000
19. Long Khanh	11,658	20,000	15,200	11,500	19,400	26,606	18,500	17,900	19,000	25,000
20. Phuoc Long	---	---	---	---	25,700	25,700	25,700	16,700	16,700	10,000
Phuoc Thanh	a/	15,500	12,600	12,600	12,600	12,600	a/	a/	a/	a/
21. Binh Long	8,039	6,400	9,600	9,600	15,900	15,900	15,900	3,200	3,300	7,000
22. Binh Duong	16,357	53,200	53,200	47,100	48,000	27,600	30,800	35,500	30,000	50,000
23. Tay Ninh	31,369	49,500	45,100	31,700	38,000	37,700	32,400	31,200	44,000	50,000
24 Hau Nghia	a/	a/	a/	a/	a/	145,600	145,600	144,600	103,000	110,000
25 Long An	76,734	132,600	135,200	158,500	164,300	155,500	119,000	112,100	119,000	128,000
26 Gia Dinh	36,914	84,600	76,700	68,200	81,200	94,800	84,600	111,700	72,600	96,000
27. Bien Hoa	29,243	33,600	38,200	57,500	31,800	42,400	39,200	28,500	34,800	87,000
28 Phuoc Tuy a/	5,954	21,900	23,300	8,800	14,300	16,800	7,800	7,000	9,500	18,000
Total Region III	223,418	429,800	416,000	412,400	482,700	612,700	531,000	530,600	478,100	608,000
29. Kien Tuong	13,395	11,200	7,900	6,900	9,000	11,900	10,600	9,800	10,100	10,000
30. Dinh Tuong	233,850	226,000	226,100	254,700	235,100	184,500	246,900	222,900	250,000	350,000
31 Kien Hoa	120,948	311,000	228,300	175,000	235,300	195,900	146,900	149,200	156,000	205,000
32. Go Cong	a/	a/	a/	a/	a/	65,500	97,000	56,000	64,000	112,000
33. Sa Dec	a/	a/	a/	a/	a/	a/	a/	46,700	55,000	78,000
34. Vinh Long	133,734	173,700	143,200	129,100	143,000	126,400	145,600	76,100	70,000	60,000
35. Vinh Binh	149,924	193,800	193,000	144,400	153,000	134,600	141,300	74,700	96,000	96,000
36. Kien Phong	40,320	66,200	57,300	28,700	53,700	64,300	62,200	82,000	85,000	90,000
37. Chau Doc	a/	a/	a/	a/	a/	94,800	102,100	79,600	75,800	100,000
38. An Giang	187,888	181,900	181,700	122,900	144,600	96,500	104,900	89,200	103,000	124,000
39. Phong Dinh	116,004	182,300	159,600	86,000	104,200	108,000	113,900	93,400	95,000	100,000
40 Ba Xuyen	176,254	180,500	239,900	113,300	130,900	104,100	95,100	100,200	104,200	136,000
41. Kien Giang	164,694	190,000	138,800	96,100	101,200	166,500	183,100	131,300	145,200	185,000
42. Chuong Thien	a/	a/	a/	113,100	129,800	151,200	57,600	72,500	75,000	70,000
43. Bac Lieu	a/	a/	a/	a/	a/	54,400	51,000	60,000	93,500	60,000
44. An Xuyen	101,673	158,000	103,900	100,900	174,600	143,200	183,900	159,400	145,700	119,000
Total Region IV	1,438,684	1,874,600	1,679,700	1,371,100	1,614,400	1,701,800	1,732,100	1,503,000	1,623,500	1,895,000
TOTAL SOUTH VIETNAM	2,724,577	3,619,800	3,350,700	2,952,900	3,331,200	3,655,000	3,473,000	3,253,900	3,184,600	3,552,600

a/ See notes, page v, regarding changes in provincial boundaries.
b/ Numbers for Phu Bon province included in Pleiku province
SOURCE: Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service

The production of hogs has been rather stable since 1960; however, many livestock specialists are of the opinion that hog numbers will increase significantly during the next decade. The study team requested the livestock specialists in USAID/Saigon and in the Ministry of Land Reform and Agriculture to make some projections of hog numbers and a composite of their estimates indicates hog numbers to be 4.7 million in 1970, 5.9 million in 1975 and 7.3 million by 1980.

If these production goals are achieved, this would mean a doubling of hog production over the next 10 years. The success of the efforts to increase hog production will depend to a degree on the ability of the feed manufacturers to formulate a good and low-cost protein supplemental feed for this growing industry. This need also will be accompanied by a growing demand for feed grains, such as sorghum, or for imported corn.

Ducks

Ducks are produced in every province of the nation; however, most of the ducks are produced in the Delta area where environmental conditions are ideal. Of the 14 million ducks in the nation, almost 11 million are produced in the 17 provinces of the Delta making up the western part of the Southern Region.

Ducks are used for meat, feathers and the production of duck eggs. Duck feathers have been a major export item and have furnished the principal wares of the famed "feather merchants" of the Far East. Live ducks, duck eggs and feather dusters can be found at all urban markets in South Vietnam. Duck eggs

are hatched commercially in some areas of the Delta; however, most of the production is produced by a family flock type of production. Basically, the ducks live "off the land" having rather free access to feed where they can find it. They live well, are fat and produce a good quantity of eggs.

The production of ducks has not been commercialized and there is no indication that commercialization of duck production will become a factor in the next decade. At the present time, commercial feed manufacturers are placing emphasis on producing feeds and concentrates for the growing poultry industry and not directing their efforts toward producing special duck feeds. This does not mean that ducks will not remain important in South Vietnam but that the production of ducks probably will remain in the status of farm flock production.

Chickens

Chicken is one of the major meats of the people of South Vietnam and chickens are produced in every province of the nation. The chicken population increased significantly from 1959 to 1962 but has remained rather stable since that time (Table 28).

Considerable effort has been placed on increasing broiler and layer production in South Vietnam and as a result, the numbers of poultry have increased faster than any other segment of the livestock industry. Commercialization of the broiler and layer production has been growing steadily as markets have developed and as production costs have decreased. The data in Table 28 does not truly reflect the numbers of poultry actually produced since it represents an

TABLE 28

NUMBER OF CHICKENS BY PROVINCE, SOUTH VIETNAM, 1959 TO 1968

Province	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
1. Quang Tri	275,080	177,800	236,000	203,000	197,000	237,000	216,000	19,000	120,000	150,000
2. Thua Thien	390,893	425,500	400,000	579,000	693,000	661,000	559,000	559,000	500,000	500,000
3 Quang Nam	872,865	1,349,100	1,099,000	900,000	956,000	1,259,000	550,000	495,000	400,000	400,000
4. Quang Tin	a/	a/	a/	668,000	748,000	737,000	600,000	600,000	500,000	520,000
5. Quang Ngai	325,940	1,278,300	1,182,000	1,225,000	1,396,000	1,432,000	1,455,000	1,434,000	1,100,000	1,000,000
Total Region I	1,864,788	3,230,700	2,917,000	3,575,000	3,990,000	4,326,000	3,380,000	3,107,000	2,820,000	2,570,000
6. Binh Dinh	596,878	875,800	769,000	1,003,000	1,211,000	1,196,000	972,000	729,000	700,000	600,000
7. Phu Yen	330,983	348,300	404,000	437,000	424,000	547,000	346,000	346,000	300,000	250,000
8 Phu Bon	a/	a/	a/	a/	b/	b/	b/	b/	b/	b/
9 Khanh Hoa	281,431	373,200	341,000	335,000	369,000	442,000	401,000	430,000	306,000	300,000
10. Quang Duc	---	---	---	---	17,000	17,000	25,000	25,000	25,000	25,000
11. Tuyen Duc	16,996	19,800	27,000	27,000	34,000	34,000	34,000	81,000	81,000	80,000
12. Ninh Thuan	40,000	83,100	100,000	115,000	124,000	105,000	115,000	115,000	75,000	100,000
13 Binh Thuan	85,878	80,900	81,000	112,000	82,000	64,000	65,000	105,000	136,000	135,000
14 Lam Dong	24,270	27,400	24,000	24,000	19,000	19,000	16,000	16,000	50,000	65,000
15. Darlac	58,001	50,000	50,000	50,000	59,000	59,000	61,000	70,000	110,000	150,000
16. Pleiku	171,231	61,000	63,000	63,000	18,000	18,000	18,000	18,000	27,000	30,000
17. Kontum	31,782	40,800	24,000	24,000	38,000	38,000	38,000	30,000	34,000	36,000
Total Region II	1,637,450	1,969,300	1,883,000	2,190,000	2,395,000	2,541,000	2,091,000	1,965,000	1,844,000	1,771,000
18 Binh Tuy	12,600	42,600	36,000	36,000	36,000	36,000	36,000	26,000	28,000	30,000
19. Long Khanh	46,827	97,200	117,000	115,000	95,000	115,000	105,000	79,000	84,000	80,000
20 Phuoc Long	---	---	---	---	84,000	84,000	84,000	145,000	145,000	145,000
Phuoc Thanh	a/	62,300	43,000	43,000	43,000	43,000	a/	a/	a/	a/
21. Binh Long	25,876	24,300	27,000	27,000	27,000	27,000	27,000	6,000	6,000	12,000
22 Binh Duong	193,742	309,800	461,000	379,000	419,000	144,000	158,000	189,000	200,000	250,000
23. Tay Ninh	148,052	309,200	400,000	363,000	362,000	321,000	306,000	338,000	402,000	425,000
24. Hau Nghia	a/	a/	a/	a/	a/	581,000	695,000	616,000	530,000	550,000
25. Long An	364,786	922,800	1,063,000	1,591,000	1,101,000	1,156,000	1,011,000	1,082,000	1,020,000	1,200,000
26. Gia Dinh	159,211	401,200	511,000	502,000	598,000	536,000	667,000	601,000	700,000	1,150,000
27 Bien Hoa	148,973	218,600	215,000	319,000	313,000	376,000	453,000	447,000	415,000	440,000
28. Phuoc Tuy a/	52,189	98,900	122,000	102,000	110,000	110,000	50,000	59,000	70,000	100,000
Total Region III	1,152,256	2,466,900	2,995,000	3,477,000	3,208,000	3,531 000	3,592,000	3,588,000	3,600,000	4,392,000
29. Kien Tuong	68,249	49,100	41,000	41,000	56,000	47,000	54,000	50,000	49,000	45,000
30. Dinh Tuong	694,674	1,390,000	1,761,000	2,140,000	2,413,000	1,563,000	1,560,000	1,802,000	1,320,000	1,350,000
31 Kien Hoa	675,245	1,376,300	1,614,000	1,277,000	1,622,000	1,736,000	1,476,000	1,057,000	1,050,000	1,050,000
32. Go Cong	a/	a/	a/	a/	a/	762,000	760,000	512,000	674,000	675,000
33. Sa Dec	a/	a/	a/	a/	a/	a/	a/	302,000	400,000	400,000
34 Vinh Long	548,845	1,076,900	1,209,000	1,258,000	1,299,000	861,000	1,342,000	755,000	1,020,000	950,000
35. Vinh Binh	426,090	856,000	857,000	1,119,000	1,344,000	1,304,000	1,360,000	645,000	750,000	750,000
36. Kien Phong	249,785	392,100	365,000	445,000	546,000	497,000	569,000	694,000	650,000	580,000
37. Chau Doc	a/	a/	a/	a/	a/	499,000	579,000	383,000	516,000	612,000
38. An Giang	391,053	988,900	1,049,000	1,245,000	1,441,000	806,000	1,028,000	890,000	1,072,000	950,000
39. Phong Dinh	492,642	901,900	787,000	658,000	897,000	885,000	1,092,000	864,000	827,000	800,000
40. Ba Xuyen	986,631	705,900	706,000	901,000	780,000	551,000	777,000	832,000	826,000	812,000
41. Kien Giang	337,004	800,600	761,000	648,000	770,000	867,000	1,177,000	1,049,000	1,052,000	1,000,000
42. Chuong Thien	a/	a/	a/	586,000	320,000	669,000	186,000	382,000	350,000	320,000
43. Bac Lieu	a/	a/	a/	a/	a/	225,000	313,000	305,000	304,000	278,000
44. An Xuyen	202,735	435,100	435,000	492,000	934,000	711,000	806,000	788,000	733,000	700,000
Total Region IV	5,072,953	8,972,600	9,585,000	10,810,000	12,422,000	12,003,000	13,179,000	11,320,000	11,593,000	11,272,000
TOTAL SOUTH VIETNAM	9,627,447	16,659,700	17,380,000	20,052,000	22,015,000	22,401,000	22,242,000	19,980,000	19,657,000	20,008,000

a/ See notes, page v, regarding changes in provincial boundaries

b/ Numbers for Phu Bon province included in Pleiku province

SOURCE: Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

inventory of poultry numbers as of the end of the year. Actually, during the year 1968, the commercial broiler production turnover (estimated at approximately four cycles per year) would result in the production of almost double the 20 million total poultry number indicated for that year. This would not be the case for total poultry numbers of the earlier years since the proportion of the poultry population made up of broilers in 1959 was lower than for 1968 due to the fact that commercial broiler production is rather new in the nation.

The study team solicited the assistance of Donald E. Knowlton, Poultry Advisor, ADDP/PD, in making projections of poultry production over the next decade. The study team is indebted to him for his contribution and feels fortunate to have access to his information. The projections based on Knowlton's analysis are shown in Table 29.

On the basis of the estimated broiler turnover cycle in 1968, the actual numbers produced in 1968 would be approximately 40 million birds. Using Knowlton's turnover ratio of 3.4 for 1975 and 1980 respectively would mean that total chicken numbers produced would be 107,253,000 in 1975 and 130,050,000 in 1980. If 80 percent of these numbers were broilers and a dressed broiler would weigh approximately 1.0 kilo, this production would give an estimated average per capita consumption of 4.4 kilos in 1975 and an estimated average per capita consumption of 4.7 kilos in 1980 based on the population estimates in Chapter III.

If this goal is reached (and most agricultural experts in South Vietnam feel that the goal is realistic), it will require a corresponding increase in the production of scientifically produced poultry feeds and concentrates by the feed manufacturing segment of the economy. The technology for achieving these

TABLE 29

PROJECTIONS OF POULTRY POPULATION BY PROVINCE
SOUTH VIETNAM, 1975 AND 1980

Province	1975	1980
1. Quang Tri	500,000	650,000
2. Thua Thien	900,000	1,250,000
3. Quang Nam	1,250,000	1,500,000
4. Quaug Tin	700,000	950,000
5. Quang Ngai	1,100,000	1,200,000
Total Region I	4,450,000	5,550,000
6. Binh Dinh	1,500,000	1,750,000
7. Phu Yen	500,000	650,000
8. Phu Bon	100,000	150,000
9. Khanh Hoa	1,000,000	1,250,000
10. Quang Duc	75,000	125,000
11. Tuyen Duc	200,000	300,000
12. Ninh Thuan	150,000	200,000
13. Binh Thuan	200,000	250,000
14. Lam Dong	100,000	135,000
15 Darlac	225,000	275,000
16. Pleiku	275,000	350,000
17. Kontum	200,000	250,000
Total Region II	4,525,000	5,685,000
18. Binh Tuy	100,000	125,000
19. Long Khanh	300,000	350,000
20. Phuoc Long	250,000	300,000
21. Binh Long	70,000	100,000
22. Binh Duong	500,000	700,000
23. Tay Ninh	600,000	750,000
24. Hau Nghia	650,000	750,000
25. Long An	1,350,000	1,500,000
26. Gia Dinh	3,500,000	4,700,000
27. Bien Hoa	1,000,000	1,300,000
28. Phuoc Tuy	250,000	350,000
Total Region III	8,570,000	10,925,000
29. Kien Tuong	100,000	140,000
30. Dinh Tuong	1,500,000	1,700,000
31. Kien Hoa	1,150,000	1,250,000
32. Go Cong	750,000	900,000
33. Sa Dec	500,000	650,000
34. Vinh Long	1,200,000	1,300,000
35. Vinh Binh	800,000	900,000
36. Kien Phong	750,000	900,000
37. Chau Doc	850,000	1,000,000
38. An Giang	1,250,000	1,400,000
39. Phong Dinh	1,200,000	1,400,000
40. Ba Xuyen	1,000,000	1,200,000
41. Kien Giang	1,200,000	1,300,000
42. Chuong Thien	500,000	600,000
43. Bac Lieu	500,000	600,000
44. An Xuyen	750,000	850,000
Total Region IV	14,000,000	16,090,000
TOTAL SOUTH VIETNAM	31,545,000	38,250,000

NOTE: For periods 1975 and 1980, it is assumed that 80 percent of the birds are broilers and go through four cycles per year. To determine total birds for the period, the listed figure should be multiplied by 3.4.
SOURCE: Donald E. Knowlton, Poultry Advisor, USAID/ADDP/PD.

goals already is known and the resources are available. Low consumer purchasing power may be the principal obstacle to this development; however, this can be partially offset by decreasing costs of production.

Chicken and pork presently are foods for the more affluent segment of the population in South Vietnam; thus, increases in per capita consumption will depend on two important factors. First, the ability of the working class to increase their purchasing power and second, a corresponding intensive effort on the part of the broiler and pork producers to decrease their costs of production. The retail prices of poultry and pork have been increasing in line with the inflationary trend in the nation (Table 30). The existing retail prices of both dressed poultry and pork places both meats out of the reach of the average consumer other than for special occasions.

Feed Grain Storage Requirements

The future feed grain requirements of the livestock and poultry industry will either be met by imports of corn, by the increased production of sorghum or by the by-products of the rice milling industry. If the projections for poultry and hog production are realized, the commercial segments of these enterprises will require at least 1.5 million tons of feed grains of some type. A large portion of this carbohydrate requirement can be supplied by the by-products of the rice milling industry (brokens); however, a large quantity of either sorghum or corn will be needed to supplement the rice contribution. Stocks of these grains will be needed to supply the feed manufacturers and commercial poultry producers. These stocks may originate from locally produced sorghum or from imported corn.

TABLE 30

AVERAGE MONTHLY RETAIL PRICES FOR LIVE POULTRY AND LEAN PORK
SAIGON, SOUTH VIETNAM, JULY 1967 TO AUGUST 1969

Year	Month	Piasters per Kilogram	
		Pork	Chicken
1967	July	292	195
	August	292	215
	September	320	205
	October	310	222
	November	336	243
	December	330	232
1967	Average	276	201
1968	January	330	265
	February	--	--
	March	355	322
	April	347	297
	May	450	350
	June	392	332
	July	425	357
	August	455	357
	September	500	362
	October	500	305
	November	500	287
	December	500	277
1968	Average	432	319
1969	January	500	252
	February	525	275
	March	500	300
	April	485	300
	May	467	312
	June	497	312
	July	497	300
	August	477	335
1969	Average a/	493	298

a/ Average retail prices for 1969 are for first eight months only.
SOURCE: Agricultural Economics and Statistics Service.

Regardless of the source, a grain storage system designed to meet the needs of the nation should provide storage space and grain handling equipment suitable to meet these needs. The analysis of grain storage, handling, drying and marketing used in this report will consider these needs and will provide facility services in the areas of the nation where needs have been projected, such as the proposed feed mill at Long Xuyen and the present feed mill at Cholon. It is expected that other areas soon will be developing similar facilities.

For the most part, facilities that can be used to service the needs of the bulk storage, handling, drying and transporting of paddy can function equally as well in performing similar functions for feed grains. For this reason, it is expected that any storage needs for feed grains can be handled in the same facilities that are used for paddy and provisions will be made in the development of new facilities to meet this need.

CHAPTER VII

RICE PRODUCTION

Production and Utilization Balances

Harvesting, Treshing and Drying

Introduction of New High-Yielding Varieties

CHAPTER VII

RICE PRODUCTION

Rice is the principal food crop in South Vietnam and is the major item in the diet of most of its people. It provides the economic livelihood for many thousand farm families as well as for countless others involved with the marketing and distribution of the product. In terms of land use, people and economic significance, rice production is the largest enterprise in the nation. More than 7.0 million people were actively engaged in producing and marketing rice in 1969. Of the approximately 3.0 million hectares of cultivated land, nearly 2.5 million hectares, or approximately 85 percent, were in rice production. 1/

Although rice is grown in varying degrees of importance in every province, the major commercial producing area is in the Mekong River Delta. In the provinces outside the Delta area, most of the rice is consumed on the farm where it is produced; however, in some small areas, especially in the Coastal Lowlands along the South China Sea, some rice moves in commercial channels to local markets. With a few exceptions, all provinces outside the Delta are deficit in rice production and must obtain rice from the Delta or from other sources to supply their needs.

The IV Corps, or Delta, area is characterized by broad expanses of fertile land and consists in the most part of alluvial soils. The elevation is practically sea level and the area is crisscrossed by an infinite number of natural

1/ Edmund H. Farstad, Chief, Economics Division, USAID/ADDP.

streams and canals. From the standpoint of rice culture, the Delta can be divided into three major subregions according to water conditions. These are the Coastal, Central and Western Subregions. 2/

The Coastal Subregion comprises all or parts of the provinces of Go Cong, Kien Hoa, Vinh Binh, An Xuyen, Ba Xuyen, Bac Lieu and Kien Giang. These provinces border on the sea and during the dry season when water flow in the rivers is lowest, saltwater flows inland through the network of waterways onto the lowlands leaving a high salt content in the soil (Figure XVII). Due to the high salinity of the soil during the dry season and the lack of adequate water control facilities, this subregion of approximately 760,000 hectares can produce only one crop of rice per year. At the beginning of the rainy season, farmers must delay transplanting rice to the field until the rainwater has washed the salt from the soil. Due to this limitation, irrigation during the dry or low water season presently is not feasible in these areas.

The Coastal Subregion includes the area of highest concentration of rice production in South Vietnam. All provinces, with the exception of Go Cong, have more than 100,000 hectares in rice production. In the 1968/69 crop year, five of the seven provinces produced more than 200,000 metric tons of paddy with Ba Xuyen province producing approximately 425,000 metric tons of paddy. 3/ The yields for all provinces in this subregion are low, averaging only 1.8 metric tons per hectare, and ranging from 1.5 to 2.3 metric tons per hectare.

2/ The material in this section draws heavily from: Thai-Cong-Tung, Natural Environment and Land Use in South Vietnam. Directorate of Agricultural Research, Ministry of Agriculture, South Vietnam, 1967.
3/ Paddy here refers to rough rice or unhulled rice.

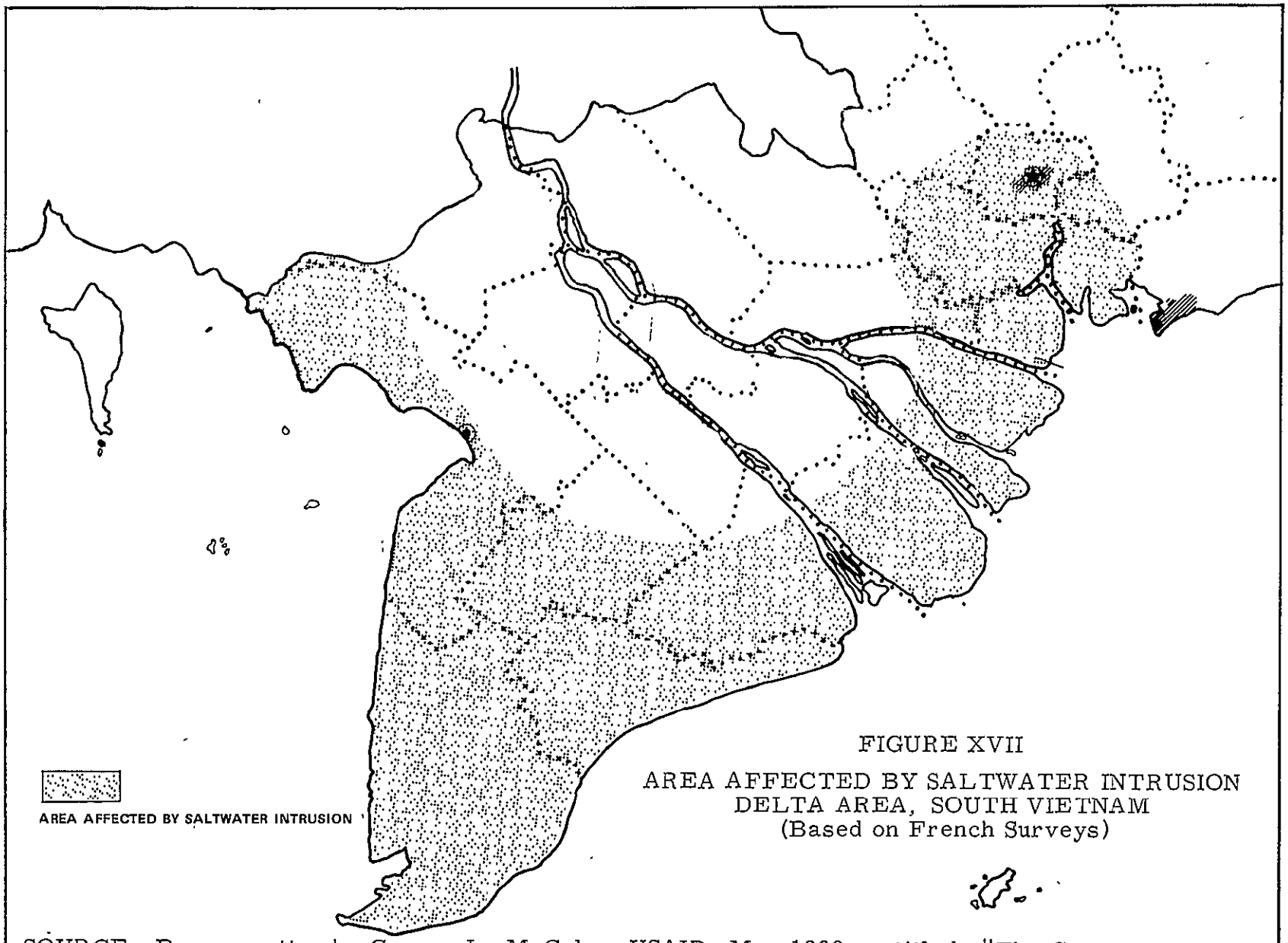


FIGURE XVII

AREA AFFECTED BY SALTWATER INTRUSION
DELTA AREA, SOUTH VIETNAM
(Based on French Surveys)

SOURCE: Paper written by George L. McColm, USAID, May 1969, entitled, "The Crop Growing Season Climates of South Vietnam."

The physical potentials for increasing rice production in the Coastal Subregion must be realized primarily from increased yields since multi-cropping (dry season rice production) is not practical without large capital outlays to develop an extensive system of dikes to prevent the intrusion of saltwater during the dry season. With the introduction of the new improved varieties of rice, the possibility of increasing production by increasing yields seems very promising. The area has sufficient natural drainage so that flooding of rice lands does not affect the production of these new short stem, high-yielding varieties of rice.

The Central Subregion is located in the heart of the Delta and includes the provinces of Chuong Thien, Phong Dinh, Vinh Long, Dinh Tuong and parts of Bac Lieu and Ba Xuyen. This area is very level and has few dikes or embankments but has many waterways and canals. During the end of the rainy season, the area is flooded and this process leaves the land rich in nitrogen and organic matter--making this subregion the best rice producing area in South Vietnam. The yields of the provinces in this area have averaged more than 2.0 metric tons per hectare. Phong Dinh province, which is in the middle of this rich area, had an average yield of 2.5 metric tons per hectare in 1968/69 compared to an average yield of 1.9 metric tons per hectare for the Delta as a whole.

The potential for increasing paddy production in this subregion is twofold: (1) by increasing the land area planted to dry season rice production and (2) by increasing yields. Since the water in the streams and canals in this area is not affected by salt intrusion, it can be used for irrigation and the land adjacent to the waterways can produce a crop of dry season rice in addition to the regular wet season crop. In addition, production can be increased by the planting of the new high-yielding, short stem varieties. If the farmers use good

cultural practices and are careful to plant at the proper time, they can harvest a crop of the early maturing varieties before the flooding begins. As dry season rice production increases, the demand for irrigation water will increase and if good water management and control practices are not followed, the total supply of water will become heavily taxed. Thus, multi-cropping in this area will depend upon the success of any water management program initiated by the nation.

The Western Subregion is composed primarily of the provinces of Kien Phong, Chau Doc, Sa Dec, An Giang and parts of Kien Giang. The Mekong and Bassac Rivers and their many tributaries flow through this subregion causing annual flooding of up to two to three meters in depth during this period of high water. The terrain is so flat that floodwaters from the rivers will often flow into the Gulf of Siam instead of into the South China Sea. In this area of an estimated one-half million hectares of rice land, expansion of paddy production must result primarily from increases in dry season paddy production. The production of short stem, high-yielding varieties during the rainy season is not practical without a major water control program. Present varieties of floating rice are low yielding and of poor quality and are used principally for feed purposes.

The III Corps area is the second most important paddy producing area in South Vietnam. Each year for the last 10 years, this area has planted between 250,000 and 300,000 hectares in rice. Production of paddy during this period has fluctuated from a low of 567,800 metric tons in the 1986/69 crop year to a high of 816,150 metric tons in the 1962/63 crop year. Average yield of paddy for the area was higher than the rest of the nation. The two provinces of Long An and Gia Dinh account for more than one-half the paddy produced in III Corps.

In the II Corps area, rice production has decreased from more than 600,000 metric tons in the 1959/60 crop year to less than 400,000 metric tons in the 1968/69 crop year. This decrease in production was due primarily to the decreasing number of hectares planted to rice. During the 1959/60 crop year, 362,230 hectares were devoted to rice production compared to only 229,200 hectares during the 1968/69 crop year. The three provinces that border the sea, Binh Dinh, Phu Yen and Khanh Hoa, produced the major portion of rice in the II Corps area.

Paddy production in the I Corps area has fluctuated from approximately 320,000 to 500,000 metric tons over the last 10 years but has decreased each year since 1963/64 reaching a low of 322,100 metric tons in 1968/69. Most of the fluctuation was due to variations in area planted to rice. Although yields were low in both I and II Corps, they have remained rather constant during the period.

The area planted to rice, the yields and the total production by provinces and military corps areas are shown in Tables 31, 32 and 33. Since 1963, production of rice in the nation has declined approximately one million metric tons. A substantial portion of the decrease in production can be attributed to the impact of hostilities. According to evaluations of specialists working in the field, these hostilities have had an adverse effect on nearly all the resources used in the production of rice. In insecure areas, many hectares of rice land have remained idle and many farmers in secure areas are cultivating fewer hectares of rice since the demand of military service has reduced available farm labor. Also, the supply of fertilizers, seeds, insecticides and herbicides has been limited because of the unsettled conditions and government priorities.

TABLE 31

RICE CULTIVATED AREA BY PROVINCE, SOUTH VIETNAM, 1959/60 TO 1968/69

Province	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69
					(Hectares)					
1. Quang Tri	60,800	22,464	25,300	25,690	23,920	25,600	25,000	23,800	21 000	21,000
2 Thua Thien	49,500	66,536	65,100	65,410	66,270	64,600	63,000	54,000	50,000	50,000
3. Quang Nam	122,900	107,391	97,600	54,670	53,540	56,100	40,000	32,200	30,100	33,000
4 Quang Tin	a/	a/	a/	66,800	50,750	70,100	69,500	65,000	60,500	55,000
5. Quang Ngai	84,800	75,395	74,700	79,080	91,490	84,000	84,000	71,200	74,000	77,000
Total Region I	318,000	271,786	262,700	291,650	294,970	300,400	281,500	246,200	235,600	236,000
6. Binh Dinh	157,200	110,317	101,600	98,610	109,910	126,300	117,000	86,000	90,000	95,000
7. Phu Yen	53,600	36,439	38,100	38,420	35,530	44,500	36,000	34,600	34,000	30,000
8. Phu Bon	a/	a/	a/	5,340	2,930	2,900	970	3,000	3,600	3,000
9. Khanh Hoa	30,200	35,760	29,300	37,010	35,210	30,000	29,000	27,000	27,000	27,000
10. Quang Duc	5,361	6,754	6,200	6,200	3,680	3,700	4,950	4,900	2,500	3,000
11. Tuyen Duc	1,000	1,300	1,500	1,500	2,050	2,500	3,000	4,100	4,100	4,200
12. Ninh Thuan	15,900	14,137	15,500	16,400	13,200	16,400	15,600	14,600	14,000	14,000
13. Binh Thuan	19,200	12,757	13,300	11,370	11,770	16,000	10,000	12,000	14,000	15,500
14. Lam Dong	9,250	7,618	7,000	7,650	6,400	6,700	5,560	4,800	3,000	2,500
15. Darlac	14,600	15,960	24,000	12,380	25,000	25,000	25,000	15,000	21,000	17,000
16. Pleiku	45,000	45,000	16,500	14,970	19,240	16,000	12,900	13,500	7,000	8,000
17. Kontum	10,919	10,919	12,500	12,500	12,420	12,700	10,500	10,500	8,000	10,000
Total Region II	362,230	296,961	267,500	262,350	277,340	302,700	270,480	229,800	228,200	229,200
18 Binh Tuy	6,000	8,050	8,200	8,520	9,410	9,400	3,120	3,400	4,400	4,500
18 Long Khanh	2,500	2,035	3,600	3,010	4,010	3,300	4,400	4,400	4,400	5,100
20. Phuoc Long	4,700	8,500	7,600	5,470	8,780	8,800	10,210	6,400	7,000	5,000
Phuoc Thanh	a/	8,237	8,200	8,200	6,390	6,400	a/	a/	a/	a/
21 Binh Long	1,460	1,923	1,500	2,600	4,000	4,000	4,500	4,500	2,300	2,000
22. Binh Duong	21,500	19,339	17,300	24,690	22,610	20,200	22,000	20,000	15,000	15,000
23. Tay Ninh	15,200	30,867	31,600	35,250	39,890	35,400	27,560	32,700	32,000	35,000
24 Hau Nghia	a/	a/	a/	a/	a/	40,600	40,000	34,600	30,000	30,000
25. Long An	144,400	111,283	124,800	143,080	133,570	98,300	91,050	89,000	88,000	90,000
26 Gia Dinh	20,100	48,945	48,200	52,610	51,510	53,500	46,170	46,000	44,000	44,000
27. Bien Hoa	28,900	23,653	21,900	21,930	23,660	21,600	33,160	30,000	34,900	34,000
28. Phuoc Tuy a/	3,970	10,108	12,500	9,620	7,830	12,100	10,560	8,080	8,400	8,000
Total Region III	248,730	270,940	285,400	314,980	311,660	313,600	292,730	279,080	270,400	272,600
29. Kien Tuong	13,700	14,184	19,200	13,670	11,240	16,400	15,040	17,700	16,000	15,000
30 Dinh Tuong	123,700	138,076	141,800	158,580	166,960	105,200	100,010	103,400	124,000	120,000
31. Kien Hoa	127,000	84,532	91,000	107,410	115,740	106,000	106,000	99,600	99,000	105,000
32. Go Cong	a/	a/	a/	a/	a/	47,500	51,620	45,800	48,000	46,000
33 Sa Dec	a/	a/	a/	a/	a/	a/	a/	41,900	48,000	51,000
34. Vinh Long	127,700	93,848	100,900	91,780	96,410	91,600	93,000	46,800	65,000	82,000
35 Vinh Binh	179,400	161,691	144,900	167,650	171,380	178,700	178,000	162,000	125,000	130,000
36 Kien Phong	38,200	75,745	78,800	77,950	87,400	72,500	76,900	82,800	80,000	90,000
37. Chau Doc	a/	a/	a/	a/	a/	104,700	98,540	98,800	97,000	110,000
38. An Giang	193,500	230,622	234,400	257,960	262,550	179,000	155,990	150,500	156,800	165,000
39. Phong Dinh	139,500	119,577	121,400	110,500	110,800	116,500	107,930	88,200	89,800	90,000
40. Ba Xuyen	204,000	292,777	310,400	259,890	266,270	175,200	167,140	170,100	173,000	197,000
41. Kien Giang	229,000	128,269	153,500	113,640	127,380	131,600	113,640	112,500	105,000	115,000
42. Chuong Thien	a/	a/	a/	118,270	124,930	119,600	123,000	111,000	105,000	110,000
43. Bac Lieu	a/	a/	a/	a/	a/	92,400	84,120	113,600	110,000	120,000
44. An Xuyen	198,800	139,032	141,400	132,580	112,490	103,200	103,000	95,000	100,000	110,000
Total Region IV	1,574,500	1,478,353	1,537,700	1,609,860	1,653,550	1,040,100	1,563,930	1,539,700	1,561,600	1,056,000
TOTAL SOUTH VIETNAM	2,503,460	2,316,040	2,353,300	2,476,880	2,537,520	2,556,800	2,428,640	2,294,780	2,295,800	2,393,800

a/ See notea, page v. regarding changes in provincial boundaries

SOURCE: Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

TABLE 32

RICE YIELD PER HECTARE BY PROVINCE, SOUTH VIETNAM, 1959/60 TO 1968/69

Province	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69
					(Metric Tons)					
1. Quang Tri	1.016	.883	1.186	1.144	1 242	1 662	1.600	1.765	1 200	1.000
2. Thua Thien	1.034	1 327	1 350	1.707	1.652	1.691	1.333	1 428	1.400	1.200
3. Quang Nam	1.616	820	1.735	1.394	1 981	1.970	1 875	2.034	1 800	1.700
4. Quang Tin	a/	a/	a/	1 360	1 591	945	.849	1.000	1.000	.909
5. Quang Ngai	2.318	1 575	1.237	1.706	2.022	1.673	1.631	1.788	2 500	1.750
Average Region I	1.596	1 159	1.445	1.519	1.781	1.561	1.403	1.531	1 676	1.365
6. Binh Dinh	1 692	1.468	1.731	1.767	1 661	1.791	1.795	1.953	1.600	1.700
7. Phu Yen	2.547	2.630	2.738	2.734	2.154	2.000	1.861	2.457	2 400	2.100
8. Phu Bon	a/	a/	a/	1.099	802	.896	.928	867	.472	.830
9. Khanh Hoa	1 493	2.123	2.113	2.096	1.943	1 848	2.310	2.307	2.100	1.815
10. Quang Duc	701	.637	.629	.629	.584	.649	.642	.857	1.560	1.000
11. Tuyen Duc	1 160	1.107	1.133	1.533	1.249	1 600	1.600	1.024	1.048	1.000
12. Ninh Thuan	1.635	2.419	2 516	1.904	2.036	1.899	1.923	1.637	1.785	2.070
13. Binh Thuan	1.656	1 894	2.241	1.952	1.940	2.490	2.200	2.350	1.800	2.000
14. Lam Dong	1 000	1 000	1.000	1.000	1.000	1.000	1.056	.826	.800	.800
15. Darlac	1 010	1.200	1.062	.904	.800	1.000	1.000	1.067	1.495	1.250
16. Pleiku	1.209	1.208	.908	838	.987	1.000	.750	1 000	1.000	.950
17. Kontum	1.050	1.049	.944	.944	.658	.968	.800	.800	.800	.800
Average Region II	1.657	1.856	1.785	1.775	1.579	1.687	1.681	1.828	1 707	1.667
18. Binh Tuy	1.200	1.144	1.122	1 366	1.423	1.436	1.503	1.500	1.340	1.733
19. Long Khanh	1.500	2.320	2.750	2.043	1.955	1.882	1.686	1.568	2.000	1.960
20. Phuoc Long	1.000	.923	1.013	1.208	1.058	1.023	.886	.859	.842	1.100
Phuoc Thanh	a/	905	.915	.915	1.380	1 406	a/	a/	a/	a/
21. Binh Long	.800	.800	1.000	1.050	1.135	1.125	1.222	1.311	.913	1.200
22. Binh Duong	2.335	2.493	2.815	2.258	2 328	2.304	2.045	2 150	1.800	2.000
23. Tay Ninh	1.704	2.013	1.930	2.386	2.111	2.133	2.406	2.443	2.200	1.700
24. Hau Nghia	a/	a/	a/	a/	a/	1.926	2.000	1.628	2.036	1.700
25. Long An	2.935	2.999	3.011	2.969	2.503	2.350	2.390	2.842	2 518	2.400
26. Gia Dinh	3 478	2.580	2.656	2.681	2.848	2.528	3.021	2.606	2 700	2.400
27. Bien Hoa	2.055	2 388	2.151	2.384	2 095	2.004	2.143	2.140	2.200	2.000
28. Phuoc Tuy a/	2 759	1.788	2.264	2.442	2.709	2.345	2.126	2.239	2 095	1.500
Average Region III	2 641	2.487	2.540	2.591	2 350	2.210	2.287	2.410	2.278	2.083
29. Kien Tuong	1.774	1.796	.010	1.744	1.320	1 657	1.759	.225	1.431	1.400
30. Dinh Tuong	2.710	3.202	2.278	2.270	2.484	2.220	2.110	2.234	2.356	2.000
31. Kien Hoa	3.343	1 970	1.868	1.882	1 854	1.754	1.698	1 942	2.500	2.050
32. Go Cong	a/	a/	a/	a/	a/	1.861	2.175	2.200	2.400	2.300
33. Sa Dec	a/	a/	a/	a/	a/	a/	a/	1.682	1.700	2.100
34. Vinh Long	2.580	2 517	2.667	2.362	2 305	1.679	2.208	1 685	2.004	2.000
35. Vinh Binh	1.842	2.558	2.640	2.159	2.097	1.630	1.635	1.697	1.700	1.550
36. Kien Phong	1.565	2.516	1.505	2.115	2.231	1.993	1.757	1.099	1.822	1 000
37. Chau Doc	a/	a/	a/	a/	a/	1.946	1.970	455	1.700	1.636
38. An Giang	1.744	2.052	1.254	2.233	2.007	2.347	1 851	1.063	1 799	1.600
39. Phong Dinh	3.001	3.231	2.316	2.560	2.624	2.397	2.393	2.199	2.200	2.500
40. Ba Xuyen	1.768	1.806	1.889	2.012	2.226	2.462	2.372	2.420	2.300	2.150
41. Kien Giang	2.274	2.550	1.917	2.325	2.213	2.362	1.964	1.964	2.000	1.600
42. Chuong Thien	a/	a/	a/	1.976	1.964	1.898	1.992	1.989	1 900	1.800
43. Bac Lieu	a/	a/	a/	a/	a/	2.836	2.873	2.948	2.750	1.800
44. An Xuyen	2.035	2.043	2.110	2.079	2.259	2.454	2.573	2.452	2.450	1 864
Average Region IV	2.252	2.350	1.967	2.162	2.196	2.142	2.085	1.862	2.105	1.868
AVERAGE SOUTH VIETNAM	2.122	2.138	1.958	2.100	2.099	2.024	1.985	1.889	2.042	1 824

a/ See notes, page v, regarding changes in provincial boundaries.

SOURCE: Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

TABLE 33

RICE PRODUCTION BY PROVINCE, SOUTH VIETNAM, 1959/60 TO 1968/69

Province	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69
					(Metric Tons)					
1. Quang Tri	61,800	19,837	30,000	29,390	29,700	42,550	40,000	42,000	25,200	21,000
2. Thua Thien	51,200	88,299	87,900	111,650	109,460	109,230	84,000	77,100	70,000	60,000
3. Quang Nam	198,600	88,109	169,300	76,240	106,060	110,530	75,000	65,500	54,200	56,100
4 Quang Tin	a/	a/	a/	90,820	95,060	66,220	59,000	65,000	60,500	50,000
5 Quang Ngai	196,600	118,807	92,400	134,930	185,000	140,520	137,000	127,300	185,000	135,000
Total Region I	508,200	315,052	379,600	443,030	525,280	469,050	395,000	376,900	394,900	322,100
6 Binh Dinh	266,000	161,907	175,900	174,230	182,600	226,270	210,000	168,000	144,000	161,500
7. Phu Yen	136,500	95,822	104,300	105,050	76,520	89,010	67,000	85,000	61,600	63,000
8 Phu Bon	a/	a/	a/	5,870	2,350	2,600	900	2,600	1,700	2,500
9 Khanh Hoa	45,100	75,912	61,900	77,580	68,420	55,450	67,000	62,300	56,700	49,000
10. Quang Duc	3,760	5,656	3,900	3,900	2,150	2,400	4,170	4,200	3,900	3,000
11 Tuyen Duc	1,160	1,440	1,700	2,300	2,560	4,000	4,800	4,200	4,300	4,200
12. Ninh Thuan	26,000	34,196	39,000	31,230	26,870	31,140	30,000	23,900	25,000	29,000
13. Binh Thuan	31,800	24,167	29,800	22,190	22,830	39,640	22,000	28,200	25,200	31,000
14 Lam Dong	9,250	7,618	7,000	7,650	6,400	6,700	5,870	3,800	2,400	2,000
15 Darlac	14,750	19,152	25,500	11,200	20,000	25,000	25,000	16,000	31,400	21,250
16. Pleiku	54,400	54,400	16,800	12,550	19,000	16,000	9,670	13,500	7,000	7,600
17 Kontum	11,460	11,457	11,800	11,800	8,170	12,300	8,400	8,400	6,400	8,000
Total Region II	600,180	491,727	477,600	465,550	437,870	510,710	454,810	420,100	389,600	382,050
18. Binh Tuy	7,200	9,210	9,200	11,640	13,390	13,500	4,690	5,100	5,900	7,800
19. Long Khanh	3,750	4,721	9,900	6,150	7,840	6,210	8,300	6,900	8,800	10,000
20. Phuoc Long	4,700	6,000	7,700	6,610	9,290	9,000	9,050	5,500	5,900	5,500
Phuoc Thanh	a/	7,458	7,500	7,500	8,830	9,000	a/	a/	a/	a/
21. Binh Long	1,168	1,530	1,500	2,730	4,540	4,600	5,500	5,900	2,100	2,400
22 Binh Duong	50,200	48,221	48,700	55,740	52,640	46,540	45,000	43,000	27,000	30,000
23. Tay Ninh	25,900	62,133	61,000	84,120	64,210	75,510	66,300	79,900	70,400	59,500
24. Hau Nghia	a/	a/	a/	a/	a/	78,200	80,000	71,000	61,100	51,000
25 Long An	423,800	333,767	375,800	424,830	334,300	230,980	217,570	253,000	221,600	216,000
26. Gia Dinh	69,900	126,271	128,100	141,050	146,700	147,890	139,490	119,900	118,800	105,600
27. Bien Hoa	59,400	56,442	47,100	62,300	49,560	43,290	71,060	64,200	76,800	68,000
28 Phuoc Tuy a/	10,952	18,071	28,300	23,490	21,210	28,370	22,450	18,090	17,600	12,000
Total Region III	656,970	673,832	724,800	816,150	732,510	692,990	669,410	672,490	616,000	567,800
29. Kien Tuong	24,300	25,472	200	23,640	14,840	27,170	28,460	4,000	22,900	21,000
30. Dinh Tuong	335,200	442,174	323,100	359,910	414,730	233,600	211,050	231,000	292,400	240,000
31. Kien Hoa	424,600	166,514	170,000	195,650	214,630	185,920	180,000	193,500	247,500	215,200
32 Go Cong	a/	a/	a/	a/	a/	88,380	112,290	100,800	115,200	105,800
33 Sa Dec	a/	a/	a/	a/	a/	a/	a/	70,500	81,600	107,100
34. Vinh Long	329,500	236,242	270,100	218,620	222,200	153,850	205,390	78,900	170,400	164,000
35. Vinh Binh	330,500	413,674	382,600	361,960	359,320	291,280	291,000	275,000	212,500	201,500
36 Kien Phong	59,800	190,583	124,900	164,870	195,030	144,490	135,090	91,000	145,800	144,000
37 Chau Doc	a/	a/	a/	a/	a/	203,750	194,170	45,000	164,900	180,000
38 An Giang	337,400	473,174	294,000	576,130	545,300	420,110	288,740	160,000	282,200	264,000
39 Phong Dinh	418,600	386,335	281,200	282,880	290,720	279,250	258,290	194,000	197,600	225,000
40 Ba Xuyen	360,700	528,935	586,300	522,900	592,820	431,340	396,390	413,500	397,900	423,600
41. Kien Giang	520,800	327,100	294,200	264,220	281,880	310,840	223,160	221,000	210,000	184,000
42. Chuong Thien	a/	a/	a/	233,700	245,380	227,000	245,000	220,800	199,500	198,000
43 Bac Lieu	a/	a/	a/	a/	a/	262,050	270,410	334,900	302,500	216,000
44. An Xuyen	404,500	284,062	298,300	275,630	254,170	253,250	265,000	233,000	245,000	205,000
Total Region IV	3,545,900	3,474,265	3,024,900	3,480,310	3,631,020	3,512,280	3,302,440	2,866,900	3,287,900	3,094,200
TOTAL SOUTH VIETNAM	5,311,250	4,954,876	4,606,900	5,205,040	5,326,680	5,185,030	4,821,660	4,336,390	4,688,400	4,366,150

a/ See notes, page v, regarding changes in provincial boundaries.

SOURCE: Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

Production and Utilization Balances

Production of paddy in South Vietnam during the 1968/69 crop year totaled 4,369,000 metric tons, Feed, seed, industrial uses, and milling and marketing losses accounted for 2,098,000 metric tons. Paddy equivalent of rice necessary to feed the 16,736,000 South Vietnamese an average per capita consumption of 421 grams per day would be 2,570,000 metric tons, or a deficit balance of 299,000 metric tons of paddy equivalent (Table 34).

All provinces in I, II and III Corps, with the exception of Long An, had negative net balances. As would be expected, Gia Dinh (the province in which the city of Saigon is located), had the largest deficit--317,000 metric tons of paddy equivalent. This negative balance was larger than the total deficits for either I or II Corps, which were 311,000 and 250,000 metric tons respectively. All provinces in the Delta, or IV Corps area, had positive balances with the one exception of Vinh Long which had a negative balance of 1,000 metric tons. The province of Ba Xuyen had the largest surplus balance of 159,000 metric tons, followed by the province of Chuong Thien with a surplus balance of 76,000 metric tons, the province of Bac Lieu with a surplus balance of 69,000 metric tons and the province of An Xuyen with a surplus balance of 67,000 metric tons.

The average rice farm in South Vietnam in 1961 was approximately 1.3 hectares (Table 13, Chapter IV). More than 56 percent of the farms were under 1.0 hectares in size. These farms accounted for only 14 percent of the land in rice cultivation. Rice farms in the Delta provinces are a little larger, averaging slightly over 2.0 hectares compared to 0.5 hectares for farms in the central provinces.

TABLE 34

AREA CULTIVATED, YIELD, PRODUCTION, CONSUMPTION AND SURPLUS (OR DEFICIT) FOR RICE BY PROVINCE, SOUTH VIETNAM, 1968/69

Province	Area Cultivated	Yield	Production	Hulls, Seed, Feed and Loss a/	Weighted Average Per Capita Consumption Rate b/	Total Human Consumption of Milled Rice	Milled Rice Surplus (or Deficit)	Population
	(Hectares)	(Metric Tons per Hectare)	(Metric Tons)	(Metric Tons)	(Grams per Day)	(Metric Tons)	(Metric Tons)	
1. Quang Tri	21,000	1.000	21,000	10,000	435	50,000	(39,000)	317,000
2. Thua Thien	50,000	1.200	60,000	29,000	407	99,000	(68,000)	670,000
3. Quang Nam	33,000	1.700	56,000	27,000	396	148,000	(119,000)	1,022,000
4. Quang Tin	55,000	.900	50,000	24,000	435	68,000	(42,000)	430,000
5. Quang Ngai	77,000	1.800	135,000	65,000	435	113,000	(43,000)	714,000
Total Region I	236,000	1.400	322,000	155,000	416	478,000	(311,000)	3,153,000
6. Binh Dinh	95,000	1.700	162,000	78,000	419	135,000	(51,000)	801,000
7. Phu Yen	30,000	2.100	63,000	30,000	412	48,000	(15,000)	322,000
8. Phu Bon	3,000	1.000	3,000	1,000	435	11,000	(9,000)	69,000
9. Khanh Hoa	27,000	1.800	49,000	24,000	390	64,000	(39,000)	450,000
10. Quang Duc	3,000	1.000	3,000	1,000	435	5,000	(3,000)	29,000
11. Tuyen Duc	4,000	1.000	4,000	2,000	342	23,000	(21,000)	167,000
12. Ninh Thuan	14,000	2.100	29,000	14,000	435	25,000	(10,000)	159,000
13. Binh Thuan	16,000	1.900	31,000	15,000	401	40,000	(24,000)	274,000
14. Lam Dong	3,000	.700	2,000	1,000	435	11,000	(10,000)	70,000
15. Darlac	17,000	1.200	21,000	10,000	406	38,000	(27,000)	257,000
16. Pleiku	8,000	1.000	8,000	4,000	435	32,000	(28,000)	202,000
17. Kontum	10,000	.800	8,000	4,000	435	17,000	(13,000)	104,000
Total Region II	230,000	1.700	383,000	184,000	410	449,000	(250,000)	3,004,000
18. Binh Tuy	5,000	1.600	8,000	4,000	435	10,000	(6,000)	65,000
19. Long Khanh	5,000	2.000	10,000	5,000	435	24,000	(19,000)	151,000
20. Phuoc Long	5,000	1.200	6,000	3,000	435	7,000	(4,000)	47,000
21. Binh Long	2,000	1.000	2,000	1,000	435	12,000	(11,000)	75,000
22. Binh Duong	15,000	2.000	30,000	14,000	435	38,000	(22,000)	238,000
23. Tay Ninh	35,000	1.700	60,000	29,000	435	48,000	(15,000)	292,000
24. Hau Nghia	30,000	1.700	51,000	24,000	435	34,000	(7,000)	216,000
25. Long An	90,000	2.400	216,000	104,000	435	54,000	58,000	342,000
26. Gia Dinh	44,000	2.400	106,000	51,000	358	372,000	(317,000)	2,852,000
27. Bien Hoa	34,000	2.000	68,000	33,000	409	56,000	(23,000)	389,000
28. Phuoc Tuy	8,000	1.500	12,000	6,000	388	26,000	(20,000)	182,000
Total Region III	273,000	2.100	569,000	274,000	386	681,000	(366,000)	4,049,000
29. Kien Tuong	15,000	1.400	21,000	10,000	472	7,000	4,000	41,000
30. Dinh Tuong	120,000	2.000	240,000	115,000	454	96,000	29,000	577,000
31. Kien Hoa	105,000	2.000	215,000	103,000	452	90,000	22,000	544,000
32. Go Cong	46,000	2.300	106,000	51,000	472	31,000	24,000	177,000
33. Sa Dec	51,000	2.100	107,000	51,000	472	46,000	10,000	269,000
34. Vinh Long	82,000	2.000	164,000	79,000	472	86,000	(1,000)	499,000
35. Vinh Binh	130,000	1.600	202,000	97,000	472	73,000	32,000	425,000
36. Kien Phong	90,000	1.600	144,000	69,000	472	57,000	18,000	332,000
37. Chau Doc	110,000	1.600	180,000	86,000	472	85,000	9,000	496,000
38. An Giang	165,000	1.600	264,000	127,000	472	88,000	49,000	509,000
39. Phong Dinh	90,000	2.500	225,000	108,000	440	70,000	47,000	437,000
40. Ba Xuyen	197,000	2.200	424,000	204,000	450	61,000	159,000	370,000
41. Kien Giang	115,000	1.600	184,000	88,000	447	62,000	34,000	378,000
42. Chuong Thien	110,000	1.800	198,000	95,000	472	27,000	76,000	156,000
43. Bac Lieu	120,000	1.800	216,000	104,000	441	43,000	60,000	268,000
44. An Xuyen	110,000	1.900	205,000	98,000	439	40,000	67,000	252,000
Total Region IV	1,656,000	1.900	3,095,000	1,485,000	460	962,000	648,000	5,730,000
TOTAL SOUTH VIETNAM	2,395,000	1.800	4,369,000	2,098,000	421	2,570,000	(299,000)	16,736,000

a/ Calculated at 48.0 percent of paddy weight.
b/ Consumption rates based on rates in Table 61.

The predominance of small holdings of less than 1.0 hectares in South Vietnam is not necessarily the result of population pressure, but rather the result of the adaptation of an intensive cropping system in which rotation or shifting of crops was not necessary. In certain areas, rice can be grown year after year, century after century, on the same land with no appreciable decline in fertility. This, plus moderate year-to-year yield fluctuation, makes it possible for a farmer to adjust with great accuracy the size of his farm to the food needs of his family. The high labor requirements under existing cultivating practices set an early limit to farm size. Thus, for the average farmer, there has been no need and, in most cases, no incentive to increase the size of his holding above a certain level.

In a country with so many small farms, the problems associated with attempts to increase production efficiency are many. One of the problems is the introduction of mechanical equipment to supplement scarce farm labor caused by the manpower needs of the military. At present, most farmers use tools and methods that have changed little for centuries. Another problem associated with small farms is the capital limitations of the small landholders--which limits their ability to finance purchases of such items as fertilizers and insecticides.

Traditionally, rice has been grown only during the rainy season. In South Vietnam, most rice is produced under conditions where the plant grows in standing water. Farmers utilize the rainfall during the monsoon for their water supply, building levees to trap and hold the rainfall. In some cases, however, rice is produced without levees as farmers rely on floodwaters from rivers to cover their land. In the upland areas, rice is produced on rolling to hilly land in much the same manner as other crops.

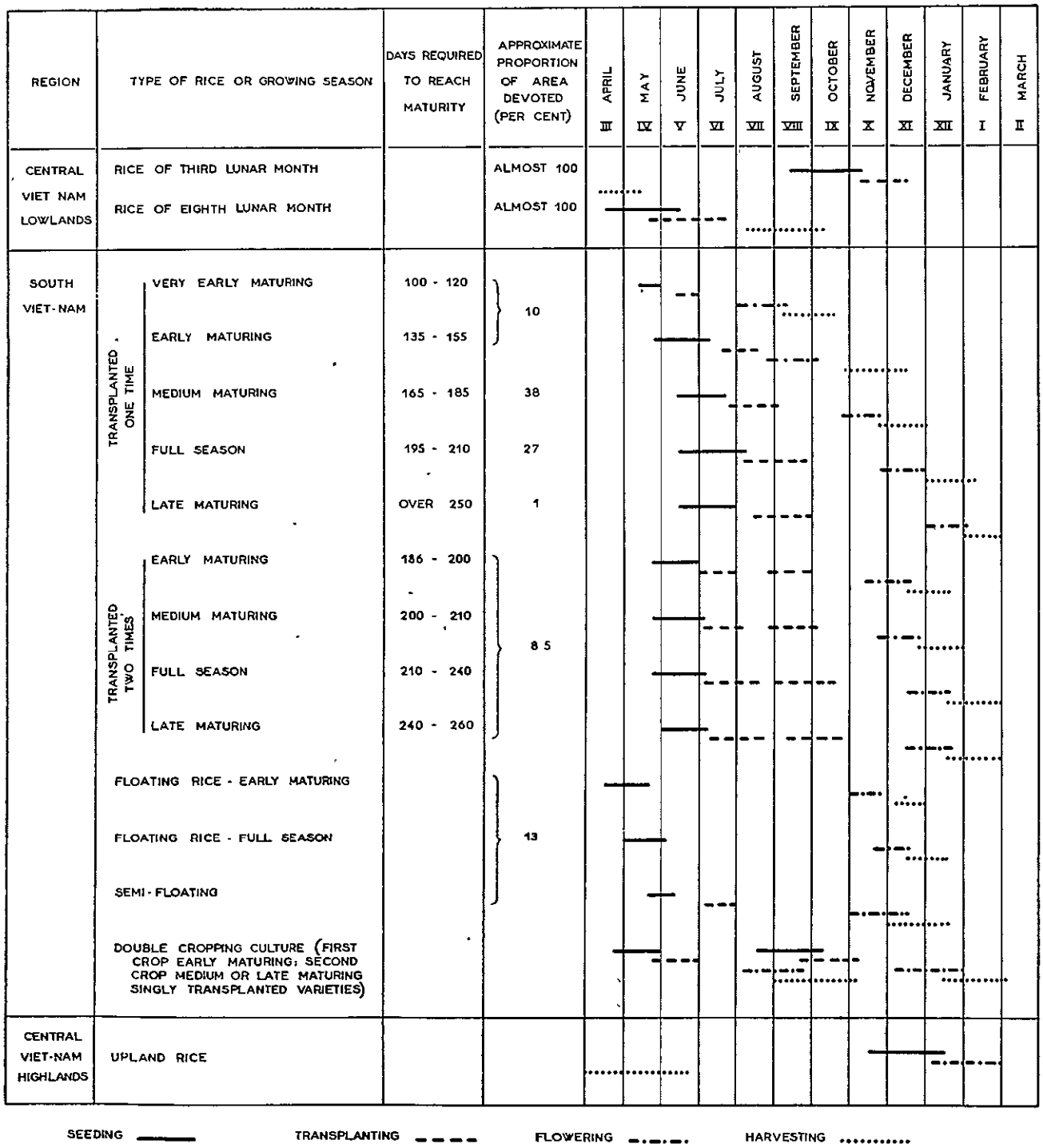
In South Vietnam, there are two seasons in rice culture--the wet season and the dry season. Plowing and seeding traditionally have been done in the rainy season and harvesting, threshing and drying have been done in the dry season. This has been the rule dictated by the weather since seeding and plowing need water, while during harvest the rice fields should be dry to enable the drying of paddy before storing. The months of June through November comprise the wet season in the southern half of the nation and the relatively dry season in the north, while the months of December through March comprise the dry season in the southern half of the nation and the wet season in the north.

In South Vietnam, there are many varieties of rice with different maturity dates, such as early, medium and late varieties. The farmer selects the variety that is best suited for his type of land, water and cultural practices. The early varieties generally are best suited for elevated rice fields which are most likely to be short of water or for saline rice fields which are easily soaked with saltwater. The saltwater may damage the rice plant when the rainy season is over due to the capillary action of the salts into the topsoil. Also, early maturing varieties are used when multi-cropping is practiced.

Medium maturing varieties usually are found in well-drained soils. These varieties mature in approximately six months which allows the harvesting, drying and storing of paddy to be done in the dry season. In areas of poorly drained rice fields, late varieties are planted. The late varieties, with their longer growth cycle, are adaptable to the areas where water is retained for a longer period of time. Figure XVIII illustrates the relationship of cultural practices to the different varieties of rice.

FIGURE XVIII

RICE CULTURAL CALENDAR, SOUTH VIETNAM



SOURCE: Annual Statistical Bulletin, Office of Joint Economic Affairs, USAID/ Vietnam, 1968.

The planting and cultivation practices which are followed in growing rice vary somewhat according to the water level, land topography, nature of the soils and available labor supply. In the Delta region, there are three planting practices: (1) the single transplant, (2) the double transplant and (3) the broadcasting method (Figure XIX).

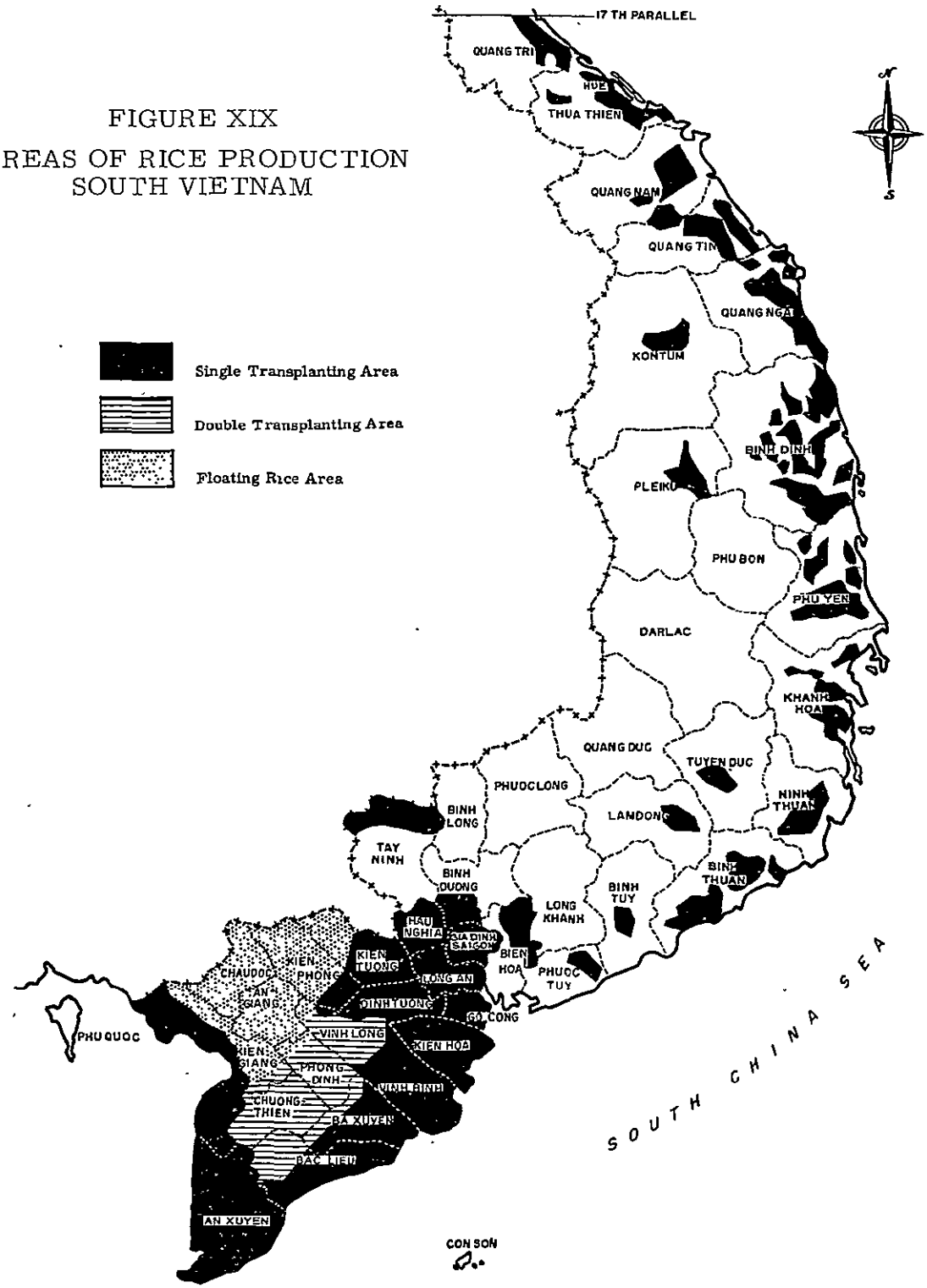
In the Western Subregion, which is subject to annual flooding, floating varieties of rice are grown. In this area the fields are flat and have no dikes and the floodwaters have free access to the land. Farmers plow their land any time from February to May depending on the time of the early rains. At the beginning of the rainy season, the rice is broadcast over the plowed fields.

The floating varieties of rice have very rapid growth characteristics that enable them to cope with water depth where ordinary varieties cannot survive. These low-yielding varieties generally have poor market quality. The low yeild may be due to the fact that farmers do not use fertilizer as well as due to varietal characteristics.

The single transplant method of cultivation generally is used in the Coastal Subregion where planting must be postponed until salts accumulated during the dry season are leached out of the soil by rainwater and where water is stagnant early in the growing season. When the first rains of the rainy season fall, farmers begin to prepare their fields and select a suitable site near a source of water for their seedling nursery. The seeds are sown in the seedbed and when the seedlings are strong enough, in 25 to 40 days, they are pulled and transplanted to the field. The transplanting operation is one of the major cost items in the farmer's production budget. Weeding and maintenance of water levels in rice fields are the most important operations between transplanting and harvesting.

FIGURE XIX

AREAS OF RICE PRODUCTION
SOUTH VIETNAM



SOURCE: Annual Statistical Bulletin, Office of Joint Economic Affairs, USAID/ Vietnam, 1968.

In the Central Subregion of the Delta, the fields are so rich in organic matter and nitrogen that farmers double transplant rice seedlings to reduce vegetative growth and to control weeds. Cultural operations are about the same as for single transplant except the nursery plot seedlings are transplanted to a larger nursery plot for a period of time before being transplanted to the field. After the seedlings have remained in the larger plots for about two months, and the water in the fields has reached a depth of approximately two and one-half to three feet, and the seedlings are stooling, they are pulled and transplanted to the field in small clusters.

On land along the river banks and canals where acidity and salinity are not a problem, multi-cropping offers great potential. After harvesting the first crop of rice, a crop of vegetables or another crop of early variety rice can be produced with the aid of supplemental irrigation. Most farmers produce only one crop of rice, leaving the land idle during the dry season. More and more farmers who live near rivers and canals are beginning to use motor-driven pumps for irrigation in order to produce a second crop. Also becoming more widely practiced is the application of fertilizers and the use of insecticides and herbicides.

In the eastern provinces of South Vietnam, both lowland and upland rice is grown in contrast to the Delta where only lowland rice is produced. The single transplant method of cultivation is used and cultural practices are similar to the Delta region.

Agriculture in Central Vietnam is more intensive than in the Delta. The density of population to cultivated area is very high and the fertility of soil is low. Although rice is still the principal crop, the methods of cultivation vary

considerably. In the lowland areas along the rivers and in the valleys where irrigation is practical, two crops of rice are grown. The principal crop, which is called the third lunar-month rice, is grown during the rainy season. It is generally transplanted in November and harvested in March and April. Farmers who can irrigate their fields then grow the eighth lunar-month rice crop, which is harvested in August.

On upland soils, farmers plant the tenth or twelfth lunar-month rice crops. The choice depends upon the drainage of land. Since the farmers rely on rainfall and not irrigation for their water, they plant the rice as early as possible to reduce the risk of drought damage. The soil is not puddled, thus the farmers broadcast these early varieties early in the planting season so the crop can be harvested in October. On low-lying land, where the damage results from floods in October and November, farmers sow the seeds early but use late varieties. Harvest is in December when the rainy season is over. Figure XX shows the agricultural calendar of the various varieties in Central Vietnam.

FIGURE XX

AGRICULTURAL CALENDAR OF
THIRD, EIGHTH, TENTH AND TWELFTH LUNAR-MONTH VARIETIES
OF RICE IN THE HIGHLAND AREA, SOUTH VIETNAM

Type of Rice	J	F	M	A	M	J	J	A	S	O	N	D
Third Lunar Month					H						S	T
Eighth Lunar Month						S	T		H			
Tenth Lunar Month						S					H	
Twelfth Lunar Month	H					S						

S - Sowing T - Transplanting H - Harvest

SOURCE: Thai-Cong-Tung, Natural Environment and Land Use in South Vietnam. Directorate of Agricultural Research, Ministry of Agriculture, South Vietnam, 1967.

Harvesting, Threshing and Drying

The harvesting of rice is still accomplished by hand in South Vietnam. Hand harvesting means cutting the stem far enough below the head so that enough of the stalk is left for the thresher to grasp and swing the bundle overhead and beat off the grain against a block of wood. The panicles are tied into small bundles and either placed in "small stacks" on the ground or in boats, depending on the condition of the field.

Rice should be harvested at the peak of maturity to insure good head yield. Rice grains generally reach maturity 25 to 35 days after heading. Harvesting should begin when the grains on the upper portion of the head are clear and firm and most of the grains at the base are in the hard dough stage. At this stage of maturity, the grains usually will contain 20 to 26 percent moisture.

The stage of maturity of the rice grains at the time of harvest is very critical to milling and head yields of milled rice. If the grains are immature, shrinkage of the grain will occur and this excessive shrinkage results in low milling yield. If the grains are overly mature when harvested, sun checking will occur and this will also result in low head yield.

Threshing of paddy is still typically done by hand in most areas of South Vietnam. One of the more popular threshing methods is beating the bundle of paddy on a bamboo ladder or against a wooden block. Another basic method is to have humans or water buffalo tramp the grain out of the straw. Farmers living along highways often pile their paddy on the hard surface of the roadbed where passing vehicles drive over and separate the grain. Most of the manual

threshers are of low capacity and cause threshing losses, especially if the straw is wet.

There are a few mechanical rice threshers in South Vietnam, mostly of the "washing machine" type consisting of a rotating vertical drum. The paddy is fed in at the top of the drum and the straw and grain come out at the bottom; the straw is then raked from the grain.

After the grain is threshed, hand winnowing is commonly used to remove the hulls and chaff. The practice of pouring threshed paddy from an elevation, thereby allowing the wind to carry away the empty hulls and chaff, is commonly used. Present cleaning practices of farmers frequently result in an excessive amount of empty hulls, chaff and dirt left with the paddy.

The increasing yield resulting from the improved varieties and production techniques, combined with the increasing area planted to the new early maturing, high-yielding varieties, is increasing the portion of the rice crop that is harvested during the rainy season. This freshly harvested paddy with a moisture content of 20 to 26 percent is highly perishable.

The present method of sun drying paddy on drying patios, bamboo mats and along the highway is wholly inadequate to meet these increasing needs during this period of limited sunshine. Farmers and agricultural technicians are showing considerable interest in different types of artificial dryers. For the small farmers, the most promising from the standpoint of drying the paddy to a safe storage level are the small shallow bed batch dryers which use a power-driven fan to force warm dry air through the paddy. To produce a high-quality

product, extreme care must be taken in this type of drying process. If the moisture content is lowered too rapidly and/or if the air temperature is too high, a low head yield will result. Thus, if the proper care is not taken in the harvesting, drying and storing of paddy, all the economic advantages of using the high-yielding varieties, proper tillage, fertilization, adequate plant protection and weed control are easily lost.

Introduction of New High-Yielding Varieties

The yield of paddy has been very low in South Vietnam in comparison with agriculturally developed countries. Average yields in 1968/69 were less than 2.0 metric tons per hectare, less than one-third of the average yield in Japan, Taiwan or the United States. This low yield has been due to many reasons, among these are low-yielding varieties, lack of water control, primitive cultural practices, and inadequate plant protection and weed control.

In 1967, the Ministry of Land Reform and Agriculture, in cooperation with USAID, introduced into South Vietnam the new improved varieties of rice developed by the International Rice Research Institute (IRRI) in the Philippines. These new varieties, called IR-8 and IR-5, are a result of a genetic breakthrough in rice breeding. The most outstanding characteristic of the new varieties is their yield potential. These varieties can easily double or triple the present average yield of less than 2.0 metric tons per hectare by native varieties in South Vietnam. Under very favorable conditions, yields of 10.0 and even 12.0 metric tons per hectare have been reported.

These new varieties require a short growing period of only 120 to 125 days from seeding to harvesting. Most native varieties take from 140 to 160 days and some varieties require 180 days. This increases the possibilities of double- or even triple-cropping on the same acreage. Other desirable characteristics which make these varieties superior to most native varieties are the lack of photosensitivity, allowing them to be planted any time of the year when water is available, and their stiff short stem which makes the plant more resistant to lodging. The IR-8 variety has a shorter stem than IR-5 which makes it more resistant to lodging but also more sensitive to high water levels.

These high-yielding varieties are moderately dormant at harvest time and will resist high humidity and wet conditions. They are classed as disease-resistant varieties but this characteristic may vary in relation to the local climate, soil fertility, cultural practices and fertilizer applications. These new high-yielding rice varieties are very responsive to nitrogen fertilization on all soils where they have been grown in South Vietnam. Local varieties, on the other hand, respond only moderately to similar amounts of nitrogen.

Some of the factors that may limit the adaptation of these two new improved varieties are: (1) low quality, poor market acceptance and undesirable cooking characteristics; (2) high capital investment on the part of farmers; (3) greater risk and susceptibility to economic hazards; and (4) the requirement of better cultural practices and water management. These limiting factors are only temporary as plant breeders are continually developing and testing new varieties of rice with the desired combination of characteristics. Two new varieties, IR-20 and IR-22, have been released by IRRI; these new varieties are far superior to IR-8 and IR-5 and are expected to replace them as soon as seed becomes available.

Shortly following the introduction of the new improved varieties into South Vietnam, the Ministry of Land Reform and Agriculture and USAID/Agriculture launched an intensive education and information program. A combination of technician training, farmer education, radio messages, demonstrations, and the distribution of mass printings of simplified, step-by-step educational materials were used in introducing the new varieties. It was emphasized that fertilizer was essential in order to fully realize these increased yields of the new improved rice varieties. Steps were taken to ensure that sufficient quantities of the proper analysis would be available to farmers throughout the country.

It was recognized also that the success of the program was dependent upon the willingness of farmers to risk growing the new varieties. Therefore, particular emphasis was given to two points in reference to the new rice--that it would at least double existing yields and that it had already done so in South Vietnam. The major factors limiting the adaptation of the new improved varieties and cultural practices in South Vietnam will be water control and the difficulty of farmers in adjusting their production schedules to seasonal weather patterns.

It seems feasible that farmers in the Coastal and Central Subregions will adjust their production schedules so they can grow a wet season crop of the improved varieties. It is very doubtful that a wet season crop of the short stem varieties can be produced in the Western Subregion without extensive water control. In the Central and Western Subregions, along river banks and canals where water is available for supplemental irrigation, a dry season crop of the new varieties can be produced in addition to the rainy season crop. In the Coastal Subregion, along the seacoast where salt intrusion is a problem, supplemental irrigation is presently impractical without a major water control program.

The new varieties represent a potential for increased production in South Vietnam. However, the initial expansion of production may create new problems which must be solved if sustained growth is to be achieved. The existing marketing structure may be adequate for a small increase in production. However, a large and rapid expansion will most certainly overtax the system, both from the point of view of delivering the necessary inputs and of processing the increased production.

Thus, in the opinion of the study team, the major factors influencing the rate and extent of acceptance of new varieties will be: (1) the extent of water control and irrigation; (2) the degree of plant protection from insects, rodents and disease; (3) the availability of complementary inputs including seeds, fertilizers, chemicals and production credit; (4) the relative advantage of new varieties over existing varieties, particularly in economic terms; (5) the consumer acceptability of the quality of the new rice; (6) the quality of farm management; (7) the farm institutional structure; (8) the availability of adequate marketing facilities including drying facilities, storage warehouses and milling facilities; and (9) the government institutional structure which may influence incentive and initiative.

CHAPTER VIII

THE PRODUCTION OF OTHER GRAINS

Corn Production

Soybean Production

Sorghum Production

CHAPTER VIII

THE PRODUCTION OF OTHER GRAINS

Although South Vietnam is basically a rice producing nation, there are many other grains produced or imported in small quantities throughout the nation. The consideration of these grains is important to the development of any grain storage, handling, drying and marketing system since their storage needs, although small, should be met. Such grains as soybeans, corn, sorghum and wheat can utilize the same type of storage facilities that would be designed for rice or paddy. The production of these grains is shown in Table 35.

TABLE 35

PRODUCTION OF CORN AND SOYBEANS, SOUTH VIETNAM, 1968 AND ESTIMATED PRODUCTION OF SORGHUM, SOUTH VIETNAM, 1969

Grain	Production
	(Metric Tons)
Corn	31,760
Soybeans	7,465
Sorghum a/	500

a/ Estimated by USAID/ADDP.
SOURCE: Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

Corn Production

Although corn production is the highest of the three, most of the corn is harvested in the immature stage, while the kernel is still "milky" or "doughy,"

and directly consumed. Very little of the corn production is used as livestock feed and, thus, would not be classed as a potential user of bulk grain storage.

Soybean Production

The production of soybeans has been limited to a type of table-edible soybean and these soybeans are not stored for processing into oil like soybeans grown in the United States. At the present level of technology, the production potential of soybeans is rather limited and their demand for bulk storage space in any storage system will be negligible.

Sorghum Production

The production of sorghum, however, has been given more attention. Demonstration programs have been initiated in most of the provinces throughout the nation. Yield responses have been good and most agronomy experts feel that sorghum has a great potential for fulfilling the feed grain needs of the nation.

The objective of these extensive efforts to increase the production of sorghum results from the increased demand for feed grains to support the growing poultry and pork industry. At the present time, corn is being imported to meet this demand. Agricultural officials view the increased production of sorghum as a means of reducing the import requirements for corn, thereby benefitting the nation's balance of payments.

Agronomists are recommending the use of sorghum in the rotation with rice during the dry seasons. It is still unknown as to whether the South Vietnamese farmer will change his production techniques and include sorghum in the rotation. Sorghum must compete with second-crop rice for its right to produce. The building of a market for sorghum is still in its infancy. The present poultry and hog industry could easily utilize 100,000 tons of sorghum annually and some livestock and poultry experts estimate that this demand could be increased two or even threefold.

Whatever the results of these production efforts may be, a storage and handling facility designed to handle paddy also can handle, store and dry sorghum in the bulk form. This unknown quantity of potential production and its possible production areas will be considered in the analysis of total grain storage, handling and drying needs of the nation. The present and planned needs of the newly developed feed processing and flour milling industries of the nation also will be considered with the view of developing the type of storage structures that will be able to serve the needs of both of these sectors of the food and feed grain economy.

CHAPTER IX

THE RICE ECONOMY

Exports and Imports

The Marketing System

Movement

Prices

Rice Consumption and Utilization

CHAPTER IX

THE RICE ECONOMY

The major industry of the nation of South Vietnam is the production of agricultural crops; most important among these is rice. The problems associated with the distribution of rice from the surplus areas of production to the deficit areas, primarily the cities, are many and the livelihood of the consumers of rice depends upon the efficiency with which this distribution process is performed. Every consumer in the nation is interested in the price of rice while the welfare of the majority of the farmers depends upon the price they can receive for their surplus rice.

Exports and Imports

Prior to the year 1964, South Vietnam was a major exporter of rice and prior to 1954 when South Vietnam was a part of French Indo-China, the Delta region was a big factor in the production of surplus supplies of rice moving into export. The port of Saigon was the principal point of origin for the rice exports originating out of the Mekong River basin.

The data on the volume of exports during the earlier years (1930 to 1954) does not indicate the type or quality of rice exported during that period (Table 36 and Figure XXI). Discussions with rice merchants who have been a part of the export trade in Saigon for many years indicate that a large portion of the more than one million tons of rice exported during the 1930's and early 1940's was a

TABLE 36

EXPORTS AND IMPORTS OF RICE, SOUTH VIETNAM, 1930 TO 1969

Year	Exports	Imports
	(Metric Tons)	
1930	1,122,000	---
1931	960,000	---
1932	1,214,000	---
1933	1,289,000	---
1934	1,513,000	---
1935	1,748,000	---
1936	1,763,000	---
1937	1,529,000	---
1938	1,054,000	---
1939	1,673,000	---
1940	1,586,000	---
1941	955,000	---
1942	974,000	---
1943	1,024,000	---
1944	499,800	---
1945	46,600	---
1946	109,000	---
1947	91,000	---
1948	240,000	---
1949	117,140	---
1950	110,767	---
1951	275,436	---
1952	153,752	---
1953	101,064	---
1954	176,821	---
1955	81,841	292
1956	4,747	27,683
1957	192,672	17,572
1958	117,409	1,936
1959	249,389	4,229
1960	346,209	14,308
1961	155,712	2,450
1962	86,372	41,520
1963	338,475	---
1964	48,653	---
1965	29	129,703
1966	---	434,194
1967	---	765,089
1968	---	677,925
1969 a/	---	350,000

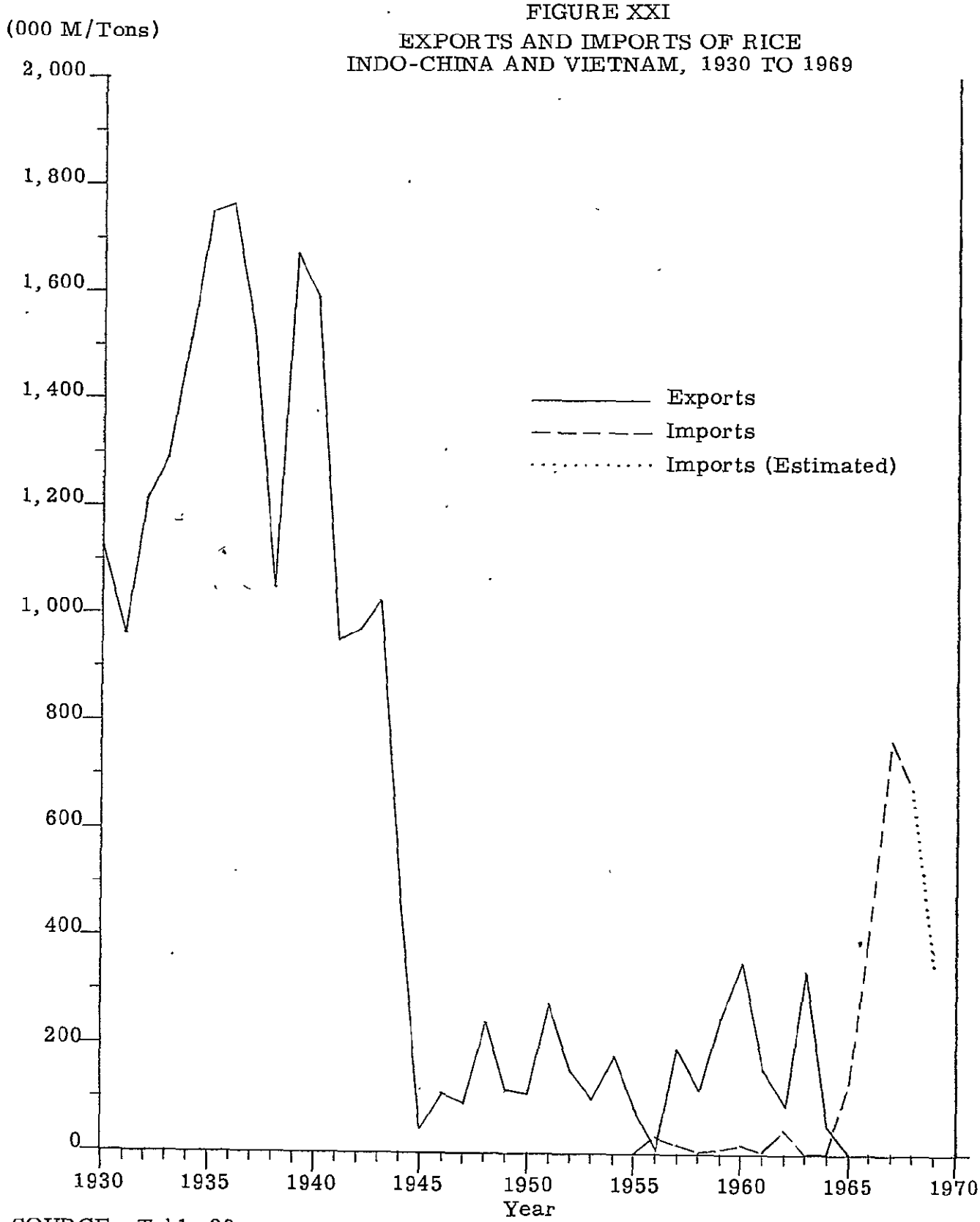
NOTE: Figures for 1930 to 1948 are for Indo-China as a whole but Vietnam was the principal surplus rice producing country. Figures for 1949 to 1953 are for all Vietnam while figures for 1954 to 1969 are for South Vietnam.

a/ Estimated.

SOURCE: 1930 to 1948 - Annuaire Statistique de l'Indochine.
1949 to 1953 - National Institute of Statistics.
1954 to 1969 - Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

FIGURE XXI

EXPORTS AND IMPORTS OF RICE
INDO-CHINA AND VIETNAM, 1930 TO 1969



SOURCE: Table 36.

low-quality rice which may have been used for animal feed. This would exclude the 350,000 to 400,000 tons of rice which were shipped annually to the port of Haiphong.

More realistic are the export data covering the period from 1957 to 1963 as representing the rice situation of South Vietnam prior to the increase in hostilities throughout the nation. Although the data are rather sketchy during the earlier years, checks can be made with the data that are available to more realistically clarify the situation as it existed during the earlier period. This is important since considerable emphasis is being placed on restoring South Vietnam's position as a major exporter and the figure most often used as a goal is the former 1.5 million ton level. Table 37 shows the historical production, exports, imports and the consumption of rice since 1940. The study team made an extensive effort to obtain this data for prior years but was unable to locate information which could be considered comparable with the data in Table 36.

When analyzing the data after 1954, it is evident that the amount of rice available for consumption on a per capita basis appears to be realistic and in line with estimated consumption rates of the nation. When examining the same measure for the years 1942/43 and 1944/45 based on available data, the per capita consumption rate is far below estimated consumption rates at that time. Two inconsistencies could occur: (1) the population estimate for all Vietnam (North and South) was too high, or (2) the amount available for consumption was too low. Since the population figure represents both North Vietnam and South Vietnam, it appears to be in line with estimates made in several world publications. The production statistics could be underestimated; however, they

TABLE 37

PRODUCTION, NET EXPORTS, NET IMPORTS AND CONSUMPTION OF RICE
FRENCH INDO-CHINA, 1940/41 TO 1944/45, AND SOUTH VIETNAM, 1945/46 TO 1968/69

Year	Production	Net Exports	Net Imports	Seed, Feed and Waste a/	Available Consumption b/	Population	Available Per Capita Consumption	Area Planted
			(Metric Tons)				(Grams per Day)	(Hectares)
1940/41	5,300,000	955,000	---	2,544,000	1,801,000	N.A.		4,300,000
1941/42	5,250,000	974,000	---	2,520,000	1,756,000	N.A.		4,400,000
1942/43	5,800,000	1,024,000	---	2,784,000	1,992,000	22,582,000	242	4,600,000
1943/44	N.A.	499,000	---	N.A.	N.A.	N.A.		N.A.
1944/45	4,250,000	47,000	---	2,040,000	2,163,000	N.A.		4,080,000
1945/46	1,700,000	109,000	---	836,000	755,000	22,614,000	91	1,380,000
1946/47	1,370,000	91,000	---	658,000	621,000	N.A.		1,250,000
1947/48	1,650,000	240,000	---	792,000	618,000	N.A.		1,400,000
1948/49	2,750,000	117,000	---	1,320,000	1,313,000	N.A.		2,300,000
1949/50	2,200,000	111,000	---	1,056,000	1,033,000	N.A.		1,800,000
1950/51	2,300,000	275,000	---	1,104,000	921,000	N.A.		1,820,000
1951/52	2,600,000	154,000	---	1,248,000	1,198,000	N.A.		1,820,000
1952/53	2,100,000	101,000	---	1,008,000	991,000	N.A.		1,600,000
1953/54	2,370,000	177,000	---	1,138,000	1,055,000	N.A.		1,750,000
1954/55	2,650,000	82,000	---	1,272,000	1,296,000	9,668,000	367	2,100,000
1955/56	2,839,000	5,000	28,000	1,363,000	1,499,000	N.A.		2,350,000
1956/57	3,412,000	192,000	18,000	1,638,000	1,600,000	12,366,000	354	2,540,000
1957/58	3,192,000	117,000	2,000	1,532,000	1,545,000	13,052,000	534	2,719,000
1958/59	4,235,000	249,000	4,000	2,033,000	1,957,000	12,935,000	415	2,291,000
1959/60	5,092,000	346,000	14,000	2,444,000	2,316,000	13,789,000	460	2,400,000
1960/61	4,955,000	156,000	2,000	2,378,000	2,423,000	14,081,000	471	2,318,000
1961/62	4,607,000	86,000	42,000	2,211,000	2,352,000	14,494,000	445	2,353,000
1962/63	5,205,000	338,000	---	2,498,000	2,369,000	14,275,000	455	2,479,000
1963/64	5,327,000	49,000	---	2,557,000	2,721,000	14,133,000	527	2,538,000
1964/65	5,185,000	---	130,000	2,489,000	2,826,000	14,359,000	539	2,567,000
1965/66	4,822,000	---	434,000	2,315,000	2,941,000	15,024,000	536	2,429,000
1966/67	4,336,000	---	765,000	2,081,000	3,020,000	15,112,000	548	2,295,000
1967/68	4,688,000	---	678,000	2,250,000	3,116,000	16,256,000	525	2,296,000
1968/69 c/	4,366,000	---	350,000	2,096,000	2,620,000	16,316,000	440	2,394,000

a/ Feed, seed and waste is equal to 48 percent of paddy weight.
b/ Includes rice for industrial use.
c/ Preliminary.
SOURCE: 1940 to 1953 - Le Production du Riz au Vietnam, Direction National de l'Agriculture, 1961.
1954 to 1969 - Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

correspond to the statistics compiled by the Government of France and these appear to be reliable. It would seem to the study team that the compilation of export data did not provide the necessary delineation to arrive at true exports to foreign countries. Instead, the data probably included all movement out of Saigon, whether these movements were destined for cities or ports within the nation or to countries outside the nation.

Since Saigon was the rice milling center of the nation, most of the paddy was brought to Saigon for milling and transshipping not only for export but to other consuming centers in the nation. If it were assumed that the entire French Indo-China area had a per capita consumption rate of 400 to 450 grams of rice per day, it would mean that the two nations of North and South Vietnam, as one, would be slightly better than self-sufficient with shipments to the North Vietnam area prior to the partition being somewhere near the surplus in South Vietnam during the period from 1957 to 1963.

The Marketing System

The city of Saigon has for years been the center of the rice marketing of the nation, even prior to the time when South Vietnam became an independent nation. It also was the rice milling center of the nation; however, in recent years, there has been a decentralization of the rice milling industry and Saigon no longer holds this position. The Chinese merchant was and still is a dominant factor in the rice marketing system of South Vietnam. Most of the commercial activities of these merchants are still centered in the city of Saigon.

The interests of the rice merchant extend into other facets of the economy, such as rice milling, transportation (water and highway), warehousing and, most important, agricultural credit. Some of the Chinese merchants have decentralized their operation and have moved much of their milling function to the Delta region where rice milling has increased significantly over the last few years.

From a marketing point of view, the rice merchants perform most of the marketing functions as far as rice is concerned. Since a rather small number of rice merchants control the rice economy, it is operated similar to other oligopolic enterprises throughout the world. The merchant controls or owns the rice mill and its connecting storage warehouse, controls the inter-market rice transport facilities, holds a large portion of the nation's supply of milled rice and, most important, has a direct claim on a large part of the farmers' surplus rice through an extensive operation of extending production credit to the farmer for seed, fertilizer and other productive items. The lack of competition in the rice economy draws much attention from economic planners and government officials who constantly are on the lookout for any type of price manipulation.

The large rice merchant or miller usually purchases his paddy from a roving rice merchant who may be an employee of the large merchant or an agent assembler in a village or hamlet. The roving rice merchant contacts the farmers directly and very often extends the farmer credit to purchase seed and other supplies; the farmer in turn promises to sell his rice to the merchant to pay his loan. In some cases, the local merchant may have a retail store where he sells farmers other supplies, such as gasoline for motors, clothing, hardware and basic food items. The merchant is acquainted with each farmer individually and

usually by the time the rice is harvested, the farmer is indebted to the merchant for part or even all his surplus rice. The roving merchant or the hamlet or village merchant often receives his capital from or is in the employ of the select group of rice merchants operating out of Saigon.

During the harvest period, the roving rice merchant will pick up the paddy by boat or truck and either deliver the paddy directly to the rice mill or to a small paddy warehouse in the village or hamlet. For some of the farmers who are not indebted to the roving rice merchant, the roving rice merchant still is the only market for his surplus paddy. The farmer will know in advance the pickup schedule of the roving merchant and will have his paddy ready for sale at a pickup point along the canal or river. In a few cases, the roving merchant operates a truck; however, the gathering procedure is the same.

In recent years some farmers, especially the larger ones, are transporting their paddy to the district or provincial capital for sale directly to the rice miller. In the Delta area, waterways still provide the principal means of transportation. The farmer owns a small boat and can only deliver small quantities of paddy to market. A few of the large rice millers do not purchase these small quantities, thus the farmer relies on the roving rice merchant who usually uses a larger river boat. The recent improvements of highways in the Delta and the commercialization of the highway transport system have offered a few farmers additional marketing opportunities by engaging a truck or by hiring a "lambretta" 1/ to haul their paddy to market.

1/ A type of small three-wheeled motorized vehicle used to transport people and cargo.

Most of the paddy moves to its point of first assembly at the time of harvest. The rice millers, merchants and warehousemen buy and store the paddy to the limit of their warehouse space and mill throughout the year depending upon market demand. Each farmer will store in a storage area in the home sufficient paddy for his own family use. Those farmers who are not indebted to the merchant for their surplus paddy also will store surplus paddy in the home storage unit. They will sell the surplus paddy as the family needs funds, thereby using the paddy reserve as a bank account.

Most of the paddy moves from the farm to the warehouse for storage in bulk, particularly the paddy transported in the small river boats. Some of the roving rice merchants will bag the paddy and maintain the identity of each lot that is purchased; however, the more common method for handling small lots is in bulk until it is bagged by the merchant or miller for storage. Some of the large rice mills are now storing paddy in bulk in a temporary cylindrical bin constructed by using bagged paddy as the outer walls of the bin. The increasing cost of the jute bag has made this method more popular.

In addition to the regular rice merchants, there are several farmer organizations (cooperatives) established throughout the nation. Some are operating paddy warehouses and a few are operating rice mills. A more detailed description of the operation of the cooperatives will be covered in Chapter X. The limitation of capital and membership of these associations restricts their influence on the market price of paddy and rice. Probably the greatest services that cooperatives are performing in the structure of the rice and paddy market in South Vietnam is providing storage for the farmers and acting as the farmers' agent in securing the highest price for the paddy at times other than the harvest period.

The marketing system for paddy and rice in South Vietnam is ancient in concept and is being operated by outdated, outmoded facilities which are badly in need of repair and modernization. In spite of the inefficiency of the marketing system as a whole, the job is being done--but not without the excessive marketing costs associated with such a system. High marketing margins are being maintained due primarily to two factors. One is the ability of the few rice merchants to hold their semi-monopolistic position in the rice economy and the other is the gross lack of reliable market information, particularly price information.

In most cases, the only price available to the farmer is the one he receives from the roving rice merchant. And in most cases, the farmer must accept this price as final since no other marketing alternative exists and the paddy must be sold to pay the debt to the merchant.

Movement

The Delta, which produces approximately 70 percent of the nation's rice, must move the surplus quantities of rice to the consuming centers of the nation. Prior to 1963, much of the movement of paddy and rice was made from the Delta to Saigon for milling and transshipment to the consuming centers. The amount of rice that is being transshipped from the Delta through Saigon has been decreasing since 1963 (Table 38). The decrease has been in the amount of paddy being shipped for milling in Saigon, which means that more direct shipments of milled rice are being made from the Delta.

TABLE 38

REPORTED ARRIVALS OF PADDY, RICE AND BROKEN RICE AT SAIGON, 1957 TO 1969

Year	Total Paddy Equivalent	Paddy	Rice	Broken Rice
		(Metric Tons)		
1957	630,160	204,913	249,051	34,447
1958	660,844	189,781	301,703	12,339
1959	891,534	284,718	382,824	21,720
1960	887,140	234,159	407,837	27,484
1961	848,393	183,634	425,821	17,352
1962	876,988	213,735	412,153	30,016
1963	1,116,042	249,417	540,510	37,240
1964	774,410	164,648	383,087	23,421
1965	684,004	100,548	378,696	10,275
1966	488,456	33,876	296,980	5,850
1967	448,147	13,592	283,021	6,128
1968	482,268	13,758	280,456	650
1969 a/	417,626	7,609	238,360	7,650

a/ Includes first eight months of 1969.
SOURCE: Directorate of Internal Trade, as published in Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

Part of this decrease results from the decrease in rice production since 1963 and from the difficulty in moving rice or paddy over the less secure waterways. The problem of security has forced the merchants to change to transporting milled rice by truck. The higher cost truck transport has been one of

the reasons for milling the paddy in the Delta since it saves the cost of transporting the hulls which have little or no economic value. Even when transporting paddy by truck, it was necessary to bag it and the higher volume paddy increased the bagging cost and limited the size of load on the trucks. The data on arrivals in Saigon since 1966 also reflect the direct shipments of imported rice to the deficit areas of the north, through the ports of Da Nang, Qui Nhon and Cam Ranh, which started in 1966.

The movements of rice to Saigon have some seasonal fluctuation with the months of January and March being the months of highest movement and with October being the month of lowest movement. Although these movements reflect to a degree the normal time lag after the harvest which is required to assemble, mill and transport the rice to Saigon, they do not vary greatly throughout the year (Table 39).

The origin of the shipments to Saigon are recorded at the provincial centers at the time of shipment. Although these data reflect the general pattern of movement of the surplus rice from each province to Saigon, the data may not represent all movements to Saigon or other inter-provincial movements. Table 40 shows those recorded movements to Saigon from the various provinces in the Delta. These data will not correspond to the data shown in Table 39 on arrivals in Saigon since all shipments are not reported.

Transshipments are still being made from Saigon to some of the deficit areas, although the present transshipments are not as large as in the years prior to 1960. Table 41 shows the volume of transshipments of rice from Saigon

TABLE 39

AVERAGE SEASONAL REPORTED ARRIVALS
OF PADDY, RICE AND BROKEN RICE AT SAIGON, 1965 TO 1968

Month	Paddy	Rice	Broken Rice	Total Paddy Equivalent
		(Metric Tons)		
January	3,982	28,307	443	51,898
February	8,906	16,779	660	37,971
March	11,971	26,837	885	58,174
April	5,374	27,720	569	52,522
May	2,237	25,370	480	45,320
June	3,164	23,736	325	43,266
July	432	26,893	426	45,964
August	919	26,201	396	45,247
September	2,574	24,090	306	43,234
October	708	20,235	548	35,346
November	779	27,151	390	46,681
December	788	27,941	298	47,853
YEARLY AVERAGE	41,834	301,260	5,726	553,476

SOURCE: Based on information from the Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

to the various provinces throughout the nation. A sharp decrease in the transshipment occurred in 1966 when imported supplies of United States PL 480 rice were shipped directly to I Corps and II Corps through the northern port cities.

TABLE 40

REPORTED DELIVERIES OF RICE TO SAIGON BY PROVINCE, 1965 TO 1969

Province	1965			1966			1967			1968			1969 a/		
	Paddy	Rice	Broken Rice	Paddy	Rice	Broken Rice	Paddy	Rice	Broken Rice	Paddy	Rice	Broken Rice	Paddy	Rice	Broken Rice
	(Metric Tons)														
An Giang	56,988	19,265	559	4,529	9,568	287	395	2,349	74	4,822	17,139	1,569	1,598	9,586	1,911
An Xuyen	3,335	4,279	281	1,995	2,383	116	408	2,197	66	190	2,372	3	---	3,212	49
Ba Xuyen	20,730	114,060	1,493	110	86,402	2,250	446	84,609	1,466	365	88,690	875	680	74,178	2,291
Bac Lieu	25,370	44,754	---	14,027	44,087	722	10,239	30,176	1,205	3,105	32,952	465	2,558	44,021	1,528
Sa Dec	---	---	---	---	---	---	6	2,771	---	4	7,799	---	9	7,928	---
Chau Doc	14,972	2,275	---	9,668	688	3	---	---	---	126	832	35	983	1,524	---
Chuong Thien	41	163	---	3	23	---	---	4,011	---	---	6	---	---	---	---
Dinh Tuong	2,652	41,182	3	146	28,871	---	338	37,795	---	3,173	34,547	187	---	19,831	6
Gia Dinh	---	---	---	---	21	---	---	8	---	4	21	---	---	---	---
Go Cong	534	4,914	---	101	2,954	33	---	5,501	47	---	8,312	486	---	4,078	20
Kien Giang	8,889	45,945	3,922	984	30,746	1,448	302	32,602	1,757	270	36,969	1,738	111	18,761	1,101
Kien Hoa	97	2,102	---	55	653	---	---	280	---	---	348	---	---	357	---
Kien Phong	2,950	140	8	844	43	---	---	4	---	31	14	---	487	---	---
Long An	1,017	33,749	29	275	28,793	96	1,328	37,399	75	588	35,923	57	36	22,567	3
Phong Dinh	5,607	38,065	3,328	287	24,874	437	101	16,741	238	882	14,256	653	1,163	15,269	306
Vinh Binh	335	5,333	652	177	11,280	359	9	9,788	1,200	---	5,808	134	4	6,304	226
Vinh Long	3,607	39,211	---	674	25,594	99	20	16,790	---	18	14,426	12	---	11,788	---
TOTAL	147,124	395,437	10,275	33,875	296,980	5,850	13,592	283,021	8,128	13,578	280,414	6,214	7,609	239,405	7,441

a/ Includes first eight months of 1969
SOURCE: Directorate of Internal Trade, as published in Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

TABLE 41

RESHIPMENTS OF PADDY, RICE AND BROKEN RICE FROM SAIGON TO OTHER REGIONS, 1963 TO 1968

Reshipment to:	1963	1964	1965	1966	1967	1968
			(Metric Tons)			
Central Highlands						
Paddy	---	---	---	---	---	---
Rice	57,265	54,091	48,217	6,907	1,238	349
Broken Rice	222	160	60	3	---	---
Total Paddy Equivalent	86,231	81,377	72,416	10,365	1,857	582
Central Lowlands						
Paddy	---	---	18	---	---	30
Rice	196,078	159,207	169,011	56,198	17,294	15,324
Broken Rice	3,694	3,872	5,386	8,849	2,959	8,166
Total Paddy Equivalent	299,658	244,619	261,614	97,570	30,378	39,180
Eastern Provinces of Southern Region						
Paddy	---	---	92	272	12	---
Rice	69,948	81,875	98,616	100,160	102,967	79,896
Broken Rice	92	1,125	607	1,489	1,370	3,139
Total Paddy Equivalent	105,060	124,500	148,927	152,746	156,516	138,392
TOTAL PADDY EQUIVALENT	490,949	450,496	482,957	260,681	188,751	178,154

SOURCE: Directorate of Internal Trade, as published in Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

The large proportion of the shipments were made to the more thickly populated provinces in the Central Lowlands and the eastern provinces in the Southern Region. A further check on the validity of the movement data is the reported arrivals of rice in each province (Table 42). These data do not necessarily correspond to the transshipment data out of Saigon since other inter-provincial movement occurs and may not be recorded.

The changing of the location of the rice milling industry did not affect the inter-provincial movement of rice; however, it did change the points of transshipment. Undoubtedly the problem of security on the various transport routes, since the increase in hostilities in 1963, has had more effect on the distribution patterns and procedures of moving rice than any other factor.

Saigon is presently the only port in the southern part of the nation which can accommodate the more commonly used ocean vessel. Inland river ports such as Can Tho, Long Xuyen and Vinh Long presently can accommodate only the smaller coastal vessel. This makes these inland ports ideal transfer points for shipments of exportable rice to Saigon for loading on the larger ocean-going vessel should South Vietnam regain its position as a rice exporting nation.

Prices

The price of rice is a constant concern to the farmer, merchant, miller, wholesaler, retailer and consumer. The prices of paddy and rice are watched closely by GVN officials who are concerned with price stabilization and rice distribution. Prior to the year 1964 when South Vietnam was a rice exporter,

TABLE 42

REPORTED ARRIVALS OF RICE IN PROVINCES, SOUTH VIETNAM, 1963 TO 1968

Province	1963	1964	1965	1966	1967	1968
			(Metric Tons)			
Eastern Part of Southern Region						
Con Son (Island)	---	---	915	50	465	494
Long Khanh	11,703	10,806	15,861	15,411	18,568	16,751
Phuoc Tuy	11,737	8,567	8,957	10,396	8,559	8,878
Binh Duong	9,071	11,543	16,372	17,917	17,733	13,928
Binh Long	7,576	6,871	6,181	4,970	4,542	4,814
Gia Dinh	9,629	8,551	15,731	18,024	19,911	14,167
Bien Hoa	12,465	10,391	15,638	13,786	17,946	10,986
Phuoc Long	3,051	2,412	1,014	539	93	---
Tay Ninh	---	---	9,168	8,460	4,998	3,460
Binh Tuy	2,443	2,056	1,767	2,204	2,605	2,730
Phuoc Thanh	1,145	1,138	904	859	---	---
Vung Tau (City)	---	---	6,786	6,978	6,041	6,077
Hau Nghia	---	---	---	3,840	2,907	692
Total	68,820	62,335	99,294	103,434	104,368	82,977
Central Lowlands						
Thua Thien	36,581	23,902	31,595	6,927	1,542	1,944
Da Nang (City)	34,710	24,758	32,081	10,075	4,181	4,791
Quang Nam	23,912	22,903	18,412	3,668	1,867	3,326
Khanh Hoa	25,974	17,065	28,315	12,840	385	430
Binh Dinh	20,353	4,094	25,572	12,654	275	1,409
Quang Tri	11,997	6,755	9,540	1,693	578	1,585
Quang Ngai	9,313	4,099	5,838	904	---	170
Phu Yen	3,620	4,168	3,914	850	97	---
Quang Tin	10,690	7,070	7,880	3,037	682	1,747
Ninh Thuan	4,226	2,840	4,331	294	35	---
Binh Thuan	14,960	16,785	12,772	14,469	10,334	8,116
Total	196,336	134,439	180,250	67,411	19,976	23,518
Central Highlands						
Darlac	11,431	9,286	9,689	2,193	N.A.	---
Da Lat (City)	8,594	9,744	7,601	304	20	---
Tuyen Duc	8,773	9,468	6,391	247	53	16
Lam Dong	8,245	9,324	6,045	112	80	16
Pleiku	7,093	7,189	10,642	3,649	920	251
Kontum	4,761	3,594	3,541	241	140	---
Quang Duc	2,215	1,210	1,228	---	25	66
Phu Bon	2,466	2,116	1,585	5	N.A.	---
Total	53,578	51,931	46,722	6,751	1,238	349
TOTAL	318,734	248,705	326,266	177,596	125,582	106,754

NOTE: From 1966, the Central Lowlands and the Central Highlands received imported rice direct from abroad without going through Saigon port, and these quantities are not recorded by the Directorate of Internal Trade.

SOURCE: 1963 to 1967 - Directorate of Internal Trade, as published in Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.
1968 - Agricultural Economics and Statistics Service.

the domestic price of rice was determined, to a great degree, by the world market price. After 1964, when the nation became an importer of rice, price stabilization has been a problem for the nation.

The GVN, through the Ministry of Economy, has attempted to control retail rice prices by establishing the retail price for all imported rice distributed through the GVN outlets. In spite of these efforts, the price of rice has more than doubled over the last three years and is now considerably higher than the world market price.

Prices of rice and paddy are collected regularly by the National Institute of Statistics, the Ministry of Land Reform and Agriculture and USAID. It is far more important to this study to analyze price relationship during the more recent periods than to review historical prices during the periods when the nation was a major exporter. Price spreads between markets and between paddy and milled rice can reveal the significant problems of distribution, storage and milling. Table 43 shows the wholesale prices of milled rice and ordinary paddy at some of the principal markets throughout the nation over the last three and one-half years. 2/

From January 1966 to September 1969, the wholesale price of No. 1 Milled Rice in Saigon increased from VN $710 to VN $3,400 per 100 kilograms,

2/ These prices were compiled by P. C. Can of the Agricultural Economics and Statistics Service of the Ministry of Land Reform and Agriculture and do not necessarily agree with those published by the National Institute of Statistics, which shows lower prices. These higher wholesale prices were selected since the study team was of the opinion that they more accurately reflected the price of most of the actual transactions in the free market place--these prices usually being higher than the GVN established prices for imported milled rice.

TABLE 43

AVERAGE MONTHLY WHOLESALE PRICES OF NO. 1 MILLED RICE AND ORDINARY PADDY AT SELECTED MARKETS, SOUTH VIETNAM, JANUARY 1966 TO SEPTEMBER 1969

Year	Month	Saigon	Quang Ngai		Phan Thiet		My Tho		Soc Trang		Can Tho		Rach Gia	
		No. 1 Milled	No 1 Milled	Ordinary Paddy	No 1 Milled	Ordinary Paddy	No 1 Milled	Ordinary Paddy	No 1 Milled	Ordinary Paddy	No 1 Milled	Ordinary Paddy	No 1 Milled	Ordinary Paddy
		(VN $ per 100 Kilograms)												
1966	January	710	1,840	960	936	---	845	450	705	450	697	463	685	403
	February	755	1,450	1,025	930	---	815	465	705	445	705	462	725	432
	March	800	---	750	---	---	925	605	700	457	715	487	870	480
	April	---	1,025	600	1,293	---	935	645	740	475	757	550	880	507
	May	900	1,100	875	1,293	1,250	1,000	650	775	510	810	600	900	565
	June	---	1,852	1,050	---	1,330	1,150	725	942	628	892	650	1,060	735
	July	1,240	2,239	1,325	---	1,316	1,350	905	1,150	747	1,165	857	1,275	835
	August	1,170	2,375	1,462	---	1,316	1,400	950	1,275	844	1,175	920	1,400	911
	September	1,070	1,900	1,250	---	1,333	1,200	750	1,100	705	1,100	857	1,250	710
	October	1,280	1,872	1,050	1,575	1,250	1,400	925	1,175	785	1,150	842	1,250	795
	November	1,200	1,860	1,050	1,850	1,250	1,525	975	1,310	870	1,200	900	1,400	901
	December	1,375	1,625	985	1,750	1,333	1,300	850	1,300	730	1,340	970	1,400	782
1967	January	1,500	1,850	972	1,750	1,374	1,500	850	1,500	839	1,375	970	1,625	895
	February	---	2,050	995	2,400	---	1,850	---	1,875	1,070	2,300	1,100	1,850	1,280
	March	2,492	2,175	1,050	2,950	2,000	2,500	1,500	2,500	1,476	2,000	1,077	2,600	1,397
	April	2,116	2,040	1,025	2,950	2,000	2,400	1,500	2,300	1,345	2,225	1,325	2,600	1,397
	May	2,093	2,000	1,000	---	2,000	2,300	1,450	2,200	1,325	2,075	1,412	2,200	1,250
	June	1,964	2,050	1,000	---	2,000	2,300	1,500	2,300	1,393	2,100	1,425	2,225	1,320
	July	2,001	2,339	1,200	---	2,000	2,300	1,450	2,275	1,415	2,150	1,400	2,300	1,343
	August	1,975	2,307	1,250	---	2,000	2,250	1,350	2,200	1,435	2,200	1,450	2,350	1,450
	September	2,038	2,265	1,150	2,600	2,100	2,000	1,200	2,300	1,435	2,225	1,512	2,350	1,450
	October	2,031	2,150	1,100	2,750	2,200	---	1,300	2,125	1,310	2,225	1,475	2,300	1,450
	November	2,044	2,200	1,250	2,750	2,000	---	1,300	2,100	1,200	2,200	1,425	2,250	1,325
	December	2,075	2,230	1,275	2,725	1,700	---	1,250	2,100	1,225	2,100	1,400	2,300	1,372
1968	January	---	2,490	1,475	2,700	2,000	---	1,350	2,200	1,300	2,175	1,385	2,125	1,279
	February	---	---	---	2,870	2,500	---	---	2,225	1,100	2,200	1,350	2,200	1,295
	March	---	3,150	1,600	3,000	2,600	---	---	2,300	1,100	1,900	975	---	---
	April	2,120	2,975	1,525	---	2,600	2,200	1,375	2,150	---	2,100	1,150	2,000	1,200
	May	2,120	---	1,500	---	2,600	2,500	1,300	2,000	1,220	2,150	1,250	---	1,210
	June	2,010	3,200	1,550	---	2,300	2,585	1,375	1,750	1,005	2,125	1,350	---	1,150
	July	1,962	3,350	1,850	---	2,000	2,150	1,175	1,650	1,000	2,050	1,250	2,150	1,250
	August	2,000	3,300	2,000	---	2,000	2,200	1,300	1,725	1,087	2,000	1,225	2,350	1,300
	September	2,016	3,000	1,950	---	2,000	2,325	1,375	1,900	1,130	2,075	1,275	2,350	1,300
	October	2,063	---	1,800	---	2,000	2,325	1,350	1,950	1,114	2,050	1,225	2,350	1,350
	November	2,100	3,150	1,950	---	2,000	2,325	1,400	2,050	1,178	2,075	1,250	---	---
	December	2,265	---	2,200	2,800	2,000	2,450	1,475	2,150	1,286	2,300	1,400	---	---
1969	January	2,206	3,900	2,200	---	2,000	2,600	1,600	2,275	1,290	2,350	1,450	2,375	1,375
	February	2,292	3,800	2,300	---	2,000	2,450	1,400	2,250	1,285	2,250	1,325	2,425	1,450
	March	2,355	3,775	2,300	---	1,500	2,550	1,600	2,275	1,325	2,200	1,325	2,350	1,400
	April	2,429	3,600	2,200	---	---	2,550	1,500	2,200	1,465	2,350	1,625	2,350	1,435
	May	2,644	3,500	2,000	---	---	2,950	1,950	2,400	1,600	2,500	2,000	2,600	1,450
	June	2,692	3,400	2,100	---	1,900	3,100	2,050	---	1,880	2,650	2,100	---	1,845
	July	3,265	3,750	2,350	3,400	---	3,400	2,400	---	1,910	2,700	2,100	---	1,800
	August	3,806	3,750	2,450	3,650	2,415	3,600	2,400	---	2,213	3,250	2,500	---	2,200
	September	3,400	3,750	2,300	4,000	2,650	3,800	2,600	---	2,506	3,700	2,750	---	2,250

NOTES: (1) The wholesale prices of No. 1 Milled Rice in Saigon are collected by the National Institute of Statistics.

(2) The wholesale prices of No. 1 Milled Rice in Quang Ngai, Phan Thiet, My Tho, Soc Trang, Can Tho and Rach Gia are free market wholesale prices at rice mills near the provincial headquarters, collected biweekly by agents from the Agricultural Economics and Statistics Service.

(3) The wholesale prices of Ordinary Paddy in Quang Ngai, Phan Thiet, My Tho, Soc Trang, Can Tho and Rach Gia are free market wholesale prices at rice mills near the provincial headquarters, collected biweekly by agents from the Agricultural Economics and Statistics Service and are among those published in the Agricultural Statistics Yearbook

SOURCE: P. C Can, Agricultural Economics and Statistics Service.

or an increase of almost five times. Ordinary Paddy prices at Can Tho, a market center in the Delta, increased from VN $463 to VN $2,750 per 100 kilograms. The spread on wholesale prices of No. 1 Milled Rice between Saigon and Can Tho was VN $710 and VN $697 per 100 kilograms in January 1966, or a spread of VN $13 per 100 kilograms. This is a markup of approximately 2.0 percent over the Can Tho price. The prices in September 1969 were VN $3,400 at Saigon and VN $3,700 at Can Tho, creating a reverse relationship which was probably caused by the lower base price on imported rice. It is interesting to note that the wholesale price of Milled Rice in Saigon in September 1969 was lower than in most of the cities where imported rice did not constitute a major part of the supply. This partially reflects the success of the GVN price ceiling policy on rice imports.

Price spread between Ordinary Paddy and Milled Rice in Can Tho in January 1966 was VN $234 per 100 kilograms. This reflects such costs as milling yield, milling costs, a certain amount of storage costs, other marketing costs and profit. In September 1969, this spread had increased to VN $950. The average spread for the first nine months was more than VN $752 per 100 kilograms. Similar relationships can be observed when comparing similar prices at other market centers.

Imported rice contributes more to total rice consumption in the northern provinces and in the Saigon area. For this reason, the GVN can exercise a greater control over wholesale rice prices in these areas than at market points in the Delta. Most South Vietnamese consumers express a preference for locally produced rice, especially the more aromatic varieties. Price differences of Delta-produced rice fluctuate from month to month and even day

to day, reflecting the market supply of the more preferred varieties of locally produced rice. Retail prices of up to VN $55 to VN $60 per kilogram were observed by the study team in Saigon and in the northern cities, such as Da Nang and Hue, for some grades of domestic rice.

The GVN first fixed the price of imported rice in 1966 when the price was established at the "landed price" plus a fixed fee of VN$500 per metric ton. In late 1966, the GVN sold imported rice for VN $900 per 100 kilograms. Successive increases have occurred until the present price is VN $2,750 per 100 kilograms. Although the retail price for domestic rice is averaging higher than the GVN price, it is believed that as surpluses of rice develop in the domestic market resulting from the expected production increases, these prices will fall more nearly into balance.

The consumers of rice are more interested in the retail price of rice and the average consumer places more importance on the price of rice than on the price of any other consumption item in the family budget. The retail price data collected by the National Institute of Statistics reflects a median of prices in Saigon. Table 44 shows the retail prices for Ve Vang and Soc Nau which are the varieties consumed by the middle income and lower income families. The price of Nang Huong, the more aromatic type generally consumed by the higher income families because of its higher price, is not shown since it is difficult to obtain an accurate price for this type. Nang Huong generally sells for approximately eight percent more than the price of the Ve Vang type.

Retail prices of rice have tripled since 1966 and this rapid increase places the domestic price for rice in Saigon higher than the world market price.

TABLE 44

AVERAGE MONTHLY RETAIL PRICES FOR RICE IN SAIGON, 1965 TO 1968

Month	Ve Vang Rice				Soc Nau Rice			
	1965	1966	1967	1968	1965	1966	1967	1968
	(VN $ per 100 Kilograms)							
January	914	1,229	2,262	3,225	821	1,021	2,049	2,767
February	916	1,263	2,630	4,160	804	971	2,296	3,518
March	890	1,317	3,550	3,267	793	1,064	3,271	3,119
April	899	1,427	3,221	3,100	805	1,113	2,906	2,956
May	924	1,483	3,170	3,138	823	1,153	2,680	2,868
June	1,145	1,594	3,196	3,400	931	1,265	2,711	2,775
July	1,225	1,734	3,174	3,250	989	1,490	2,734	2,729
August	1,182	1,839	3,274	3,200	938	1,538	2,803	2,723
September	1,151	1,711	3,282	3,200	933	1,484	2,760	2,714
October	1,142	1,708	3,050	3,200	908	1,509	2,797	2,715
November	1,126	1,953	3,100	N.A.	872	1,687	2,805	2,745
December	1,170	1,946	3,242	3,363	927	1,750	2,766	2,908
AVERAGE	1,057	1,600	3,096	3,318	879	1,337	2,732	2,878

SOURCE: National Institute of Statistics, as published in Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

Retail margins do not appear to be excessive, which undoubtedly reflects the GVN policy of controlling the spread between retail and wholesale prices of imported rice (Figure XXII).

Since the retail price of rice is so important to all the consumers of South Vietnam, the success of any government program in the area of agriculture and its related food supplies is evaluated on its success in keeping the price of rice in balance. On the other hand, prices to farmers are equally important since a large proportion of the rural population depends upon the sale of surplus rice to support their families and educate their children.

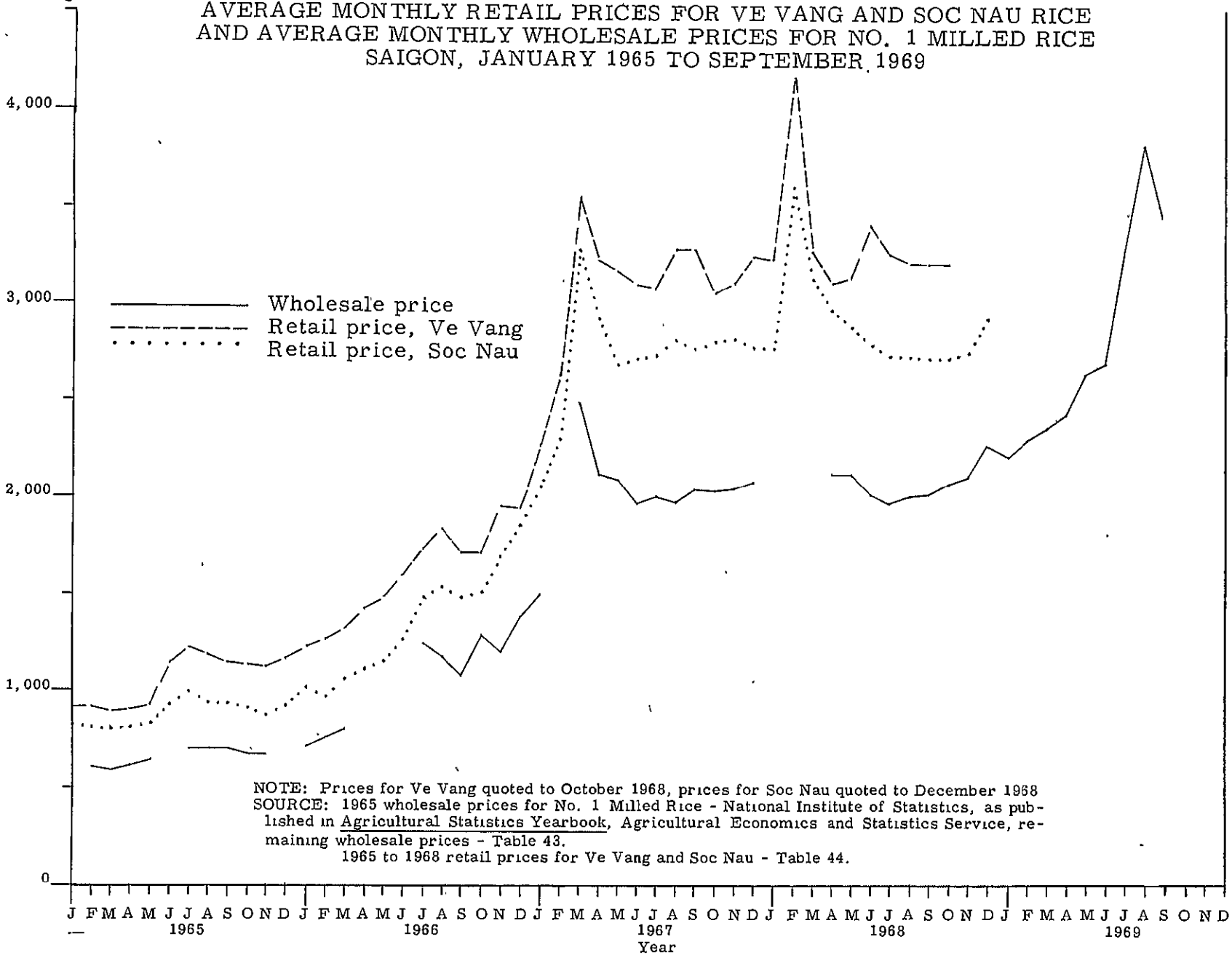
Rice Consumption and Utilization

Rice is the only major cereal grain that is consumed without being processed in some form. The kernel is consumed in the whole form. Rice grows with a protective husk which has little economic value. The brown outer layer of the kernel is the bran and, like the husk, most be removed before the highly polished white kernels are ready for consumption. The bran is used for livestock feed and has considerable economic value. During the milling process, which is an abrasive process, some kernels are damaged or broken and when the amount of broken kernels becomes excessive, it lowers the value of the milled product.

Part of the broken kernels are consumed as animal feed, part are for human consumption and part are used for industrial purposes. In addition, there

FIGURE XXII

AVERAGE MONTHLY RETAIL PRICES FOR VE VANG AND SOC NAU RICE AND AVERAGE MONTHLY WHOLESALE PRICES FOR NO. 1 MILLED RICE SAIGON, JANUARY 1965 TO SEPTEMBER 1969



NOTE: Prices for Ve Vang quoted to October 1968, prices for Soc Nau quoted to December 1968
SOURCE: 1965 wholesale prices for No. 1 Milled Rice - National Institute of Statistics, as published in Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service, remaining wholesale prices - Table 43.
1965 to 1968 retail prices for Ve Vang and Soc Nau - Table 44.

are wastes and losses resulting from storing and transporting the rice at various levels of the distribution system. At the present time, it is estimated that out of 100 kilograms of paddy produced, only 49.0 kilograms of milled rice reaches the consumer for consumption (Table 45). These estimates are based on materials furnished and published by the Food and Agriculture Organization of the United Nations (FAO), USAID, the Ministry of Land Reform and Agriculture and on the inspections and evaluations made by the members of the study team. Seed accounts for approximately 2.0 percent of the paddy production; wastes and losses, which will be discussed in Chapter XI, presently account for approximately 12.0 percent of the rice crop.

TABLE 45

AVERAGE UTILIZATION OF HARVESTED PADDY PRODUCTION
SOUTH VIETNAM, 1969

Utilization	Percent
Hulls	20.0
Feed (Includes bran and broken rice and paddy used for feed)	16.0
Seed	2.0
Waste	
Storage loss (insects and rodents)	4.0
Transit loss (paddy and milled rice)	4.0
Loss of stored milled rice (insects and pilferage)	2.0
Industrial use (Includes broken rice, flour and other processed foods)	3.0
Milled rice for human consumption (Includes broken rice for low-income consumption)	49.0
TOTAL	100.0

The rice consumption habits of the South Vietnamese people vary considerably depending upon family income and geographic location; however, since very little research has been done on diets and consumption habits of the population, the exact differences can only be estimated. The National Institute of Statistics conducted a survey in 1962 in seven cities to determine the family consumption of rice (Table 46).

TABLE 46

DAILY RICE CONSUMPTION AT SEVEN SELECTED CITIES
SOUTH VIETNAM, 1962

Locality	Number of Households Surveyed	Total Number of Persons Involved	Average Number of Persons per Household	Daily Rice Consumption
				(Grams)
Saigon	3,105	20,854	6.7	318
Gia Dinh	624	3,406	5.5	395
Phong Dinh	391	2,170	5.6	472
Phuoc Tuy	396	2,209	5.6	485
Khanh Hoa	395	2,432	6.2	485
Quang Nam	264	1,562	5.9	374
Da Lat	252	1,809	7.2	465
TOTAL	5,427	34,442	6.3	428

SOURCE: National Institute of Statistics, 1962 Survey.

This survey showed that rice consumption in Saigon was lower than the other cities with the per capita consumption averaging 318 grams of rice per

day. Other cities in the National Institute survey showed a consumption rate of more than 50 percent greater than that for Saigon. The average for all families in the sample was 428 grams per day. In the absence of more refined data, it is estimated that the data obtained from this survey is reasonable and is representative of the actual rice consumptive habits of the nation. It has been widely accepted that the rural population consumes far more rice than do the people in the larger industrial cities. It also is an accepted fact that the people in the Delta consume more rice than the people in the northern provinces.

In the rural areas, where the farmers grow the rice they consume, the population is primarily self-sufficient in rice which is the major portion of their diet. As income increases, the family will consume a lesser proportion of rice and a greater proportion of proteins. There have been no studies on the income elasticity of rice in South Vietnam, thus very little information is available to guide the researcher along these lines of investigation. In 1959, the Interdepartmental Committee on Nutrition for National Defense conducted a survey to determine the importance of rice in the family expenditures (Table 47).

TABLE 47

DAILY EXPENDITURES ON RICE IN RELATION TO TOTAL FOOD EXPENDITURES AND TOTAL FAMILY EXPENDITURES SOUTH VIETNAM, 1959

Income Class	Rice Expenditure as a Percent of Total Food Expenditure	Rice Expenditure as a Percent of Total Family Expenditure
Upper income	19.91	11.85
Middle income	34.85	26.10
Lower income	40.30	35.17

SOURCE: Interdepartmental Committee on Nutrition for National Defense, 1959.

In the lower income group, rice accounted for over one-third of the total family expenditures while for the upper income group, it represented approximately 12 percent of family expenditures. Even in the upper income group, rice accounted for almost 20 percent of total food expenditures, thereby establishing this important foodgrain as the basic component of the South Vietnamese diet.

CHAPTER X

PRESENT STORAGE, MARKETING AND MILLING SYSTEMS AND INSTITUTIONS

Rice Mills

Taxes on Rice Mills

Storage Facilities

Types and Capacities

The Ramassuer, or Roving Rice Merchant

Rice Cooperatives

Stocks of Paddy and Rice in Warehouses

Rice Dryers

Grades and Standards

Flour Mills

Feed Mills

CHAPTER X

PRESENT STORAGE, MARKETING AND MILLING SYSTEMS AND INSTITUTIONS

Rice Mills

The typical rice milling operation in South Vietnam is a small inefficient private business. It produces: (1) a type of edible rice which is a product containing 20 to 40 percent or more of broken grains, (2) a grade of brokens, and (3) a type of by-product feed called rice bran. Under the type of milling process used in South Vietnam, a higher percentage of total mill yield is obtained but the quality of the milled product is inferior to that produced under more controlled milling conditions.

The rice mill in South Vietnam is generally one of two types, either a small "kiskisan" type which dehulls, mills and polishes the grains in one operation or a larger mill of the "cono" type that dehulls, mills and polishes the grains at different stages and with different machines throughout the milling operation. The "cono" mill is more desirable since different units, such as cleaners, separators and graders, can be added individually, thus allowing the miller to improve the quality of the product if the market demands the higher quality.

The larger mills are used primarily for that portion of the crop sold to "Saigon merchants" and to government agencies. Most of the paddy used for home consumption and local trade is milled by the small mills. The small mills are more conveniently located in the villages since the paddy which is used for local consumption is milled in small quantities and at frequent intervals.

Most of the larger rice mills have limited warehouse storage space available in the mill house but only for a fraction of their annual milling volume. The common practice is to fill the warehouses at harvest and purchase additional paddy throughout the year. As a rule, rice millers and merchants maintain only a working stock of milled rice. There are several reasons why the millers prefer to hold inventory in paddy rather than milled rice: (1) there is less insect and rodent loss; (2) there is less care needed to maintain quality; (3) paddy can be stored in the bulk form, thereby eliminating the cost of bags; and (4) paddy is less susceptible to human pilferage.

The owner of the large mills is either a rice merchant and miller, a custom miller, or a combination of the two. The merchant-miller buys paddy from farmers, roving "ramassuers" 1/ and others. He will then mill the paddy and sell milled rice to provincial and/or Saigon merchants. The custom operator will mill rice for others and it is a common practice for the custom miller to handle all the milling business of three, four or more merchants, depending upon the size of the operation. The merchants' allegiance to a particular miller depends upon the services the miller provides, which may include free storage for paddy inventories and, at times, credit. The custom milling charge was VN $100 for 100 kilograms of milled rice and was rather constant throughout the Delta in 1969. In the third category, the combinations varied from millers who purchased a small amount of paddy to millers with only a limited custom business.

The small "kiskisan" type mill is primarily a custom operation which

1/ Roving rice merchants.

mills small quantities of paddy for farm families and for local consumption. The usual custom milling charge was VN $16 per gia[2/] of paddy or the miller would keep the brokens and rice bran for his fee. Although it was impossible to obtain a recent estimate of the number, size, capacity and condition of rice mills in South Vietnam, it appeared to the study team that there was adequate milling capacity to care for current production as most mills were operating at much less than capacity.

The study team was unable to obtain a complete inventory of rice mills during the time spent in South Vietnam. The National Institute of Statistics publishes a listing of the rice mills in operation as of December 31 of each year. This is not a complete inventory but lists only those mills licensed by the GVN. According to the National Institute of Statistics data in 1966, there were 997 business firms operating 1,022 rice mills (Table 48). According to this information, these mills operated 965,020 hours during the year for an average of less than 120 eight-hour days per mill. The potential milling capacity of the mills, using an eight-hour day and operating 300 days per year at 80 percent operating efficiency, would be 1,962,240 hours. Based on this measure, the mills were operating at less than 50 percent of their estimated potential capacity.

These mills produced 432,426 metric tons of milled rice. Using a 60 percent milling yield, it would take approximately 720,710 metric tons of paddy to produce this quantity of milled rice. This was less than 20 percent of the 4,336,390 metric tons of paddy produced during the 1966/67 crop year.

2/ A volume unit of measure consisting of approximately 20 liters and weighing approximately 20 kilograms, which also is approximately one bushel of paddy.

TABLE 48

RICE MILLS OPERATING BY PROVINCE, SOUTH VIETNAM, DECEMBER 31, 1966

Province	Number of Establishments	Number of Rice Mills	Installed Capacity	Maximum Capacity	Total Hours Operated in 1966	Production of Rice in 1966	Number of Workers
			(Horsepower)	(Metric Tons of Paddy per Twenty-Four Hours)		(Metric Tons)	
1. Quang Tri	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
2. Thua Thien	52	52	813	45 6	35,626	9,397	95
3. Quang Nam a/	--	--	--	--	--	--	--
4. Quang Tin	16	16	288	20.4	14,738	917	27
5. Quang Ngai	--	--	--	--	--	--	--
Total Region I	68	68	1,101	66.0	50,364	10,314	122
6. Binh Dinh	66	66	1,041	132.8	62,926	10,296	85
7. Phu Yen	27	27	437	109.0	15,210	14,710	403
8. Phu Bon	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
9. Khanh Hoa	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
10. Quang Duc	1	1	N.A.	N.A.	N.A.	N.A.	N.A.
11. Tuyen Duc	3	4	86	5.2	3,095	340	2
12. Ninh Thuan b/	1	1	16	1.0	3,492	143	1
13. Binh Thuan	34	35	753	140.0	46,720	7,078	74
14. Lam Dong	--	--	--	--	--	--	--
15. Darlac	9	9	170	23.0	4,800	370	27
16. Pleiku	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
17. Kontum	--	--	--	--	--	--	--
Total Region II	141	143	2,503	411.0	136,243	32,937	592
18. Binh Tuy	12	12	194	N.A.	N.A.	N.A.	N.A.
19 Long Khanh	12	12	323	30.2	15,480	1,586	27
20. Phuoc Long	1	1	26	0.4	538	32	5
21. Binh Long	3	3	69	8.0	7,200	381	10
22. Binh Duong	28	28	364	40.5	17,720	3,209	25
23. Tay Ninh	33	33	887	174.6	79,722	15,570	140
24. Hau Nghia	42	42	1,157	N.A.	N.A.	7,502	30
25. Long An	62	64	1,989	483.9	67,999	36,008	275
26. Gia Dinh	67	85	2,893	1,207.8	56,302	35,708	533
27. Bien Hoa	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
28. Phuoc Tuy	2	2	38	2.6	3,629	611	5
Total Region III	262	282	7,940	1,948.0	248,590	100,607	1,050
29. Kien Tuong	8	8	171	30.4	19,460	1,118	20
30. Dinh Tuong	83	83	2,702	120.5	13,674	6,503	N.A.
31. Kien Hoa	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
32. Go Cong	36	37	1,171	426.0	50;758	25,643	126
33. Sa Dec	c/	c/	c/	c/	c/	c/	c/
34. Vinh Long	76	77	2,175	482.5	70,369	31,700	341
35. Vinh Binh	69	69	N.A.	N.A.	N.A.	13,120	N.A.
36. Kien Phong	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
37. Chau Doc	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
38. An Giang	58	58	1,739	346.7	40,595	41,279	264
39. Phong Dinh	56	57	2,075	636.0	84,878	44,178	229
40. Ba Xuyen	77	77	2,766	1,010.5	134,810	70,497	569
41. Kien Giang	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
42. Chuong Thien	18	18	733	101.1	25,890	9,716	97
43. Bac Lieu	45	45	1,687	361.2	89,389	44,814	293
44. An Xuyen	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Total Region IV	526	529	15,219	3,514.9	529,823	228,568	1,939
TOTAL SOUTH VIETNAM	997	1,022	26,763	5,939.6	965,020	432,426	3,703

a/ Information not available for Da Nang.

b/ Information not available for Ninh Thuan province, information shown is for Cam Ranh only.

c/ Sa Dec province included as part of Vinh Long province until September 1966.

SOURCE: National Institute of Statistics, as published in Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

The Consultative Sub-Committee on the Economic Aspects of Rice, of the Food and Agriculture Organization of the United Nations, made a survey of rice mills in South Vietnam during 1964. The survey included data on the number, age, production capacity, utilization, location, ownership and management of rice mills by province in 1963 (Table 49).

South Vietnam has been under a wartime economy since the survey was made; therefore, it would seem reasonable to assume that the data is still a reasonably accurate description of conditions in 1969. The study team was also informed that the Australian Government had provided the GVN with 75 rice mills of the "kiskisan" type but only a very few, if any, were in operation in 1969.

According to the FAO study, there were 2,018 rice mills in operation during 1963. The large majority of these mills was owned by small operators and were located in villages or near rice fields. Only 17 percent of the mills were located in principal towns and market centers. The majority of the mills (64 percent) had been in operation from 5 to 15 years. Thirty-two percent had been operating less than 5 years, while four percent had been in operation more than 15 years. In making comparisons of these data using 1969 as a base, the three time intervals would be less than 11 years, 11 to 21 years, and more than 21 years.

When examining the processing capacity of the mills in relation to the time when they were established, the category of less than 5 years had the highest average milling capacity of 0.4 metric tons per hour; the category of 5 to 15 years had the next highest milling capacity of 0.3 metric tons per hour, which

was the average for all mills. The group of mills that had been in operation the longest had the lowest average milling capacity of 0.2 metric tons per hour. Thus, approximately seven out of every ten rice mills in South Vietnam in 1969 were very small mills with a processing capacity of approximately two and one-half metric tons for an eight-hour day and have been operating for 11 years or more. Some of these have a milling capacity of approximately one and one-half metric tons per eight-hour day and have operated for more than 21 years.

The potential average hourly milling capacity of mills in the three groups was 261.6 metric tons, 390.0 metric tons and 12.8 metric tons respectively for the less than 5 year group, the 5 to 15 year group and the more than 15 year group. Using a milling year of 300 eight-hour days and 80 percent operating efficiency, the potential yearly output for the three groups of mills would be 502,272 metric tons for the first group, 748,800 metric tons for the middle group and 24,576 metric tons for the third group, or a yearly potential of approximately 1.3 million metric tons for all mills. As the mills operating averaged only 150 days in 1963, the quantity of milled rice processed was 637,824 metric tons (Table 50).

The paddy equivalent of this rice, assuming a milling yield of 60 percent, would be 1,063,060 metric tons. This is approximately 20 percent of the 5,326,680 metric tons of paddy produced in the 1963/64 crop year. If the rice mills operated two six-hour shifts per day, which was a common practice in the Delta, the paddy equivalent would increase to approximately 1,594,590 metric tons. Thus, a considerable quantity of the paddy produced in 1963/64 was not accounted for in this survey.

TABLE 49

NUMBER, AGE, PRODUCTION CAPACITY, UTILIZATION, LOCATION, OWNERSHIP AND MANAGEMENT OF RICE MILLS BY PROVINCE, SOUTH VIETNAM, 1963

Province	Total Number of Rice Mills	Mills Established in			Production Capacity			Annual Number Operating Months			Location of Rice Mills					Rice Mills Owned by			Rice Mills Managed by		
		Less than 5 Years	From 5 to 15 Years	Over 15 Years	Less than 5 Years	From 5 to 15 Years	Over 15 Years	Less than 5 Years	From 5 to 15 Years	Over 15 Years	Near Rice Field	At the Village	At the Chief Town	Near the Pier	Other	GVN	Cooperative	Private	GVN	Cooperative	Private
					(Metric Tons per Hour)																
Tay Ninh	35	10	22	3	1.00	0.70	0.50	9	3	7	10	10	2	7	6			35			35
Bien Hoa	35	19	15	1	1.50	0.90	0.54	3	3	3		33	2					35			35
Binh Duong	11	1	10		3.50	3.00		6	6		10	1						11			11
Vinh Binh	76	36	40		0.40	0.20		6	6			70	3	3				76			76
An Giang	80	14	61	5	From 0.20 to 0.80			6	6	6		65	9		6			80			80
Pleiku	18	18			0.20			5				7			11			18			18
Binh Thuan	51	22	29		0.34	0.34		7	7		9	40	2					51			51
Phu Yen	120	40	80		0.40	0.20		4	4		60	50	10					120			120
Tuyen Duc	3	3			0.40			4				3						3			3
Hau Nghia	46	11	34	1	0.60	0.45	0.40	10	10	10	15	22	2		7			46			46
Dinh Tuong	95	18	70	7	0.32	0.32	0.20	12	8	4	3	86	6				1	94		1	94
Kien Hoa	79	12	67		0.40	0.40		10	10			78	1				1	78		1	78
Kien Phong	28	4	20	2	0.80	0.40	0.40	5	5	5	26							28			26
Kien Giang	52	16	34	2	0.50	13.50	1.20	8	8	8	14	26	12					52			52
Long An	132																				
Ba Xuyen	117																				
Vinh Long	81																				
Phong Dinh	53	7	45	1	0.30	40.40	2.40	6.5	6.5	8		53					1	52		1	52
An Xuyen	35																				
Chuong Thien	38																				
Kien Tuong	7		2	5		0.90	2.00		7	12		7						7			7
Saigon	27																				
S.F.D.I.C.	2		2		90.0				3						2			2			2
Gia Dinh	76																				
Binh Tuy	21																				
Phuoc Thanh	9																				
Phuoc Tuy	6	1	4	1	0.50	0.45	0.40	4	10	11		5			1			6			6
Long Khanh	10																				
Binh Long	2	1	1		0.30	0.30		10	7		2							2			2
Phuoc Long	4																				
Binh Dinh	184																				
Quang Ngai	162																				
Quang Nam	95																				
Khanh Hoa	33																				
Ninh Thuan	40																				
Quang Tin	29	29			1.30			3				28	1					29			29
Quang Tri	5																				
Thua Thien	47																				
Kontum	16																				
Darlac	10																				
TOTAL	2,018																				

SOURCE: Survey conducted by the Consultative Sub-Committee on the Economic Aspects of Rice, Food and Agriculture Organization of the United Nations, 1964.

TABLE 50

MILLING CAPACITY OF RICE MILLS, SOUTH VIETNAM, 1963

Potential of Rice Mills	Number of Mills	Average Hourly Capacity	Output for 150 Days	Output for 300 Days
		(Metric Tons per Hour)	(Metric Tons per Year)	(Metric Tons per Year)
Within 5 years	654	0.4	251,136	502,272
From 5 to 15 years	1,[illegible]00	0.3	374,400	748,800
Over 15 years	[illegible]64	0.2	12,288	24,576
TOTAL	2,018	xxx	637,824	1,275,648

Output is estimated on an eight-hour day and 80 percent operating efficiency.

In 1964, the GVN planned to construct 24 new rice mills, each with a capacity of 0.4 to 0.8 metric tons per hour and to modernize 15 existing mills so as to increase their average capacity from the existing 0.3 to 0.4 metric tons per hour. Most of these mills were to be constructed in villages under private ownership and management. 3/

The study team observed that the rice mills in South Vietnam produced a low-quality milled rice with a very high percentage of broken grains. Millers paid little attention to producing a good quality 4/ product since the market did not discriminate against rice with 20 to 25 percent brokens. There did not appear to be any grading standards at the mill level. As a result, millers were able to sell rice with a high percentage of brokens without suffering a financial

3/ Food and Agriculture Organization, FAO, Rice Report, 1965. Rome, Italy.
4/ Good quality means the higher range of world export grades.

loss. However, if a surplus develops, the price of rice with a high percentage of broken kernels will fall and smaller quantities of this lower quality product will move to market as the consumers' relative purchasing power increases. Quality also becomes of prime importance when surpluses develop to the extent that rice is available for international trade. Of the many samples of milled rice that the study team inspected, not a single sample was sufficiently high in quality to be acceptable in normal world export markets.

C. T. Brackney, while looking into the problems of rice milling, wrote as follows:

> "Many factors are concerned with a successful milling operation. The condition and type of equipment in use is highly important. However, just as important is the mill operator; he must understand and put into effect sound principles of mill operation, know the characteristics of the rice grain and their relationship to the milling process, and be dedicated to the production of a high quality product. Even the most modern mill cannot be completely successful if the philosophy of milling is limited to 'two days under the sun and 10 minutes in the mill'. He must know what he is doing, know his equipment and use it to its maximum. With a trained, qualified operator, even a poor mill can increase both total and head rice yields.
>
> "Milling efficiency also depends upon year-round operation. Thus, all mills should have good rice storage available to them in combination with good drying facilities, both of sufficient capacity to handle paddy brought into the mill at peak receiving periods of the season. Drying, the maintenance of stored rice at the proper moisture content, the adjustment of this moisture content to proper milling levels before milling are very important problems faced by the miller." 5/

The improvement of quality does not mean simply the purchase of new

5/ Brackney, C. T., "Rice Milling," a paper prepared as a Rice Production Training and Research Trainee at the International Rice Research Institute, Manila, Philippines.

milling equipment. There must be an improvement in the whole method of handling rice from the farm throughout the marketing system. This is not a task that is likely to be accomplished overnight.

Taxes on Rice Mills

Rice mills in South Vietnam pay, in addition to income taxes, an annual franchise tax and a production tax. The franchise tax is a conglomerate of the following: (1) a national tax, which varies by size, location and type of mills; (2) a provincial tax, which is equal to the national tax; (3) a village tax, which also is equal to the national tax; (4) a chamber of commerce tax, which is equal to 3.5 percent of the national tax; and (5) a reconstruction tax, a temporary tax which is equal to 20.0 percent of the national tax. The production tax is VN $3.00 per 100 kilograms of milled rice. (See Appendix Exhibit A-III for a description of taxes on rice mills in South Vietnam.)

Storage Facilities

Paddy is harvested and marketed throughout the year in South Vietnam. In the commercial producing area in the Delta, the major portion is harvested during a four-month period from November through February. The introduction of the new non-photosensitive varieties and continuing increases in dry season production will tend to reduce this seasonal peak in harvesting and marketing. Therefore, if the storage and marketing systems react to these changes, less storage, processing and marketing facilities will be needed to handle a given volume; however, the quality of storage will need to be improved.

In travelling throughout the country, the study team paid special attention to the type and structural condition of existing warehousing--private, cooperative and government owned. The majority of the facilities were old and lacked adequate sanitation controls while at several locations, new facilities constructed of local materials were observed and were judged to be excellent rice or paddy warehousing facilities.

Types and Capacities

The majority of existing warehouses were constructed of brick and plaster walls, wood or steel roof framing with corrugated metal, and asbestos or clay tile roofs. Warehouse floors normally were dirt--sometimes covered with rice hulls or wood pallets. Most of these facilities were old and badly in need of repair before the units could be used as suitable storage facilities since only a few of the facilities had adequate ventilation and offered suitable protection from rain, insects and rodents. The sanitation program could be improved since dust, dirt, cobwebs, weevil excrement and dirty bags were found in most all the warehouses. Many of the floors were of concrete but some were badly in need of repair. The crumbling and cracked areas in these warehouses made insect and rodent control almost impossible. Another type of floor found in some warehouses was bamboo matting which would be reused year after year, thereby creating continuous insect contamination conditions.

In an attempt to obtain complete information on the warehouses for the storage of rice and paddy in the nation, a questionnaire was sent to provincial agricultural chiefs and the USAID representatives of each province (Appendix Exhibit A-IV). The information obtained from this questionnaire and all

other data the study team could find on storage facilities provided the basis for estimating the amount of storage available in the nation. A sampling of these facilities was inspected by the members of the study team to determine the condition of the storage units.

Table 51 shows the warehouse capacity used primarily for milled rice or paddy for the various locations throughout the nation. The study team realizes that this list is only a partial enumeration of the number of warehouses which could be used for milled rice or paddy storage; however, it does represent most of the warehouses presently used for this purpose. The locations checked (√) are estimated capacities obtained from a multitude of sources, including inspection trips and questionnaires, while the capacities shown for the remaining locations are from the information quoted on the questionnaires. Most of the warehouses were used for items other than milled rice or paddy and are listed as mixed warehouses. Many of the warehouses were structures which were converted to milled rice or paddy use when the demand for such storage developed.

A high percentage of the rice is grown on small farms and the production per farm is small; thus, farmers have only a few gia of paddy to sell since most of the crop is needed for family consumption. The farmer usually stores his surplus production in the form of paddy. When rice is needed for family consumption, a few days' requirement of paddy is taken to the local mill to be custom milled. When extra money is needed or when money is needed to pay accumulated debts, especially at harvest time, the farmer either will sell paddy to the local mill or will sell to a "roving ramassuer."

TABLE 51

WAREHOUSE CAPACITY USED PRIMARILY FOR RICE STORAGE
SOUTH VIETNAM, 1969

	Location	Size	Function and Condition
		(Metric Tons)	
√	Quang Nam	10,830	Mixed warehousing (Da Nang area included)
	Kien Tuong	60	Poor condition
	Tuyen Duc	---	
	Khanh Hoa	30,500	Good to fair condition (Nha Trang area included)
	Quang Duc	---	
	Ninh Thuan	4,280	Fair to poor condition
	Binh Dinh	20,000	Good to fair condition (Qui Nhon area included)
√	Lam Dong	750	Mixed warehousing
	Binh Thuan	4,500	Good condition
	Kien Phong	1,650	Good condition
	Vinh Binh	9,500	Fair to poor condition
	Kontum	1,900	Fair to poor condition
	Phu Yen	6,350	Good to fair condition
√	Darlac	200	Mixed warehousing
	Pleiku	---	
√	Quang Tri	500	Mixed warehousing
√	Thua Thien	13,800	Fair condition, mixed warehousing
√	Quang Tin	300	Mixed warehousing
√	Quang Ngai	1,000	Mixed warehousing
√	Bien Hoa	7,330	Mixed warehousing
√	Binh Duong	600	Mixed warehousing
√	Gia Dinh	240,750	Mixed warehousing (Saigon/Cholon area included)
√	Hau Nghia	775	Mixed warehousing
√	Long An	755	Mixed warehousing
√	Dinh Tuong	1,000	Mixed warehousing
√	Go Cong	2,600	Mixed warehousing
√	An Giang	9,075	Mixed warehousing
√	An Xuyen	3,060	Good condition
√	Cam Ranh	6,000	Good condition
√	Chau Doc	3,000	Good condition, mixed warehousing
√	Ba Xuyen	1,000	Good condition, mixed warehousing
√	Bac Lieu	700	Good condition, mixed warehousing
√	Chuong Thien	300	Good condition, mixed warehousing
√	Kien Giang	500	Good condition, mixed warehousing
√	Phong Dinh	1,100	Good condition, mixed warehousing
√	Vinh Long	500	
√	Sa Dec	450	
√	Kien Hoa	1,050	Mixed warehousing
√	Phuoc Long	300	Good condition
√	Phuoc Tuy	500	Good condition
√	Tay Ninh	1,275	Good condition

The Ramassuer, or Roving Rice Merchant

The ramassuers, or roving rice merchants, generally are financed by the large rice merchants who agree to pay the ramassuer a specified price for the paddy delivered to the merchant's warehouse or rice mill. The ramassuer's profit (margin) results from the difference between the price paid the farmer and the negotiated price received from the merchant or miller.

The price the ramassuer pays the farmer for paddy depends upon the information available to the farmer concerning present market conditions; the bargaining position of each; and the type, quality, condition and moisture content of the paddy. In rural areas, paddy is not traded on any standard set of quality or grade factors. The determination of the value of each unit of sale is based on personal inspection of the entire lot. The factors which are used in determining the quality of a given lot of paddy are difficult to identify, as the true market value is determined primarily by the buyer's estimation of the percentage of whole grains of milled rice that can be obtained from each lot. Paddy may be dry and comparatively free of visible defects yet can produce a relatively low milling quality depending upon the condition which prevailed during the harvesting and drying period.

The ramassuer will generally pay cash for the paddy at the farm with a high percentage of the paddy sold on an advanced sale basis. The rice merchants, through their ramassuers, will advance money to the farmers during the growing season in order for the farmers to meet production and household expenses and this loan is repaid in the form of paddy at harvest time. Generally, the amount of paddy to be repaid is determined at the time the loan is

made--when the farmer's bargaining strength is weakest and when paddy prices are the lowest. Most farmers could receive higher prices for the paddy if their credit structure would allow them to hold the paddy for longer periods of time. In September 1969, paddy prices were more than 100 percent above the January 1969 prices in many Delta provinces.

The marketing of paddy by landlords usually is less related to the production credit structure; therefore, most of the paddy produced by this group is marketed in a more orderly manner. Landlords often store paddy and market it later in the year when prices have increased. The small country rice merchants and mill owners who purchase paddy from farmers usually sell milled rice to local retailers, to large rice merchants and in provincial market centers. The large rice merchants in the Delta generally maintain constant contact with large wholesale rice merchants in Saigon and Cholon, where a large part of the rice is sold.

Rice Cooperatives

At the present time, farmer-owned cooperative associations are not influential in paddy marketing. In 1967, there were 42 paddy and rice associations with a membership in excess of 40,000. 6/ These are primarily the supply type which sell farmers production inputs, such as fertilizer, seed and other items. Some of the associations also stored and/or marketed paddy for members. These cooperatives would provide warehouse storage for paddy at a cost

6/ Directorate of Cooperatives, as published in Agricultural Statistics Yearbook, Agricultural Economics and Statistics Service.

of VN $2.00 per gia per month and would advance to a member up to 65 percent of the value of the paddy placed in storage. Under this arrangement, the association maintains control of the paddy as security for loans which often extend for periods of seven months. The interest rate for such loans normally is 12 percent per year. The member who stores rice at the cooperative warehouse can sell his rice either through the association or to a private individual. Some of the cooperative leaders in South Vietnam are becoming interested in extending operations in the areas of drying, storing and marketing of paddy for their members. Probably the two greatest limiting factors to their increased activity in this area are the lack of capital and the lack of qualified management.

Stocks of Paddy and Rice in Warehouses

A survey of paddy and rice stocks on April 30, 1969, in 24 provinces was made by the Agricultural Economics and Statistics Service of the Ministry of Land Reform and Agriculture. The 24 provinces included in the survey produced 86.7 percent of the total rice crop. Fifteen of the provinces were located in the commercial rice producing area in the Delta and these provinces alone accounted for 70 percent of the 4,366,150 metric tons produced in the 1968/69 crop year. A close analysis of these data reveal some significant characteristics of storage and marketing patterns in South Vietnam.

On April 30, 1969, there were 2,639,543 metric tons of paddy in storage in South Vietnam with the major portion, 90.2 percent, stored on farms, 6.3 percent stored at rice mills and 3.5 percent stored in warehouses (Table 52). It was estimated that farmers would keep 1,586,209 metric tons for farm

TABLE 52

QUANTITY OF PADDY STORED AT FARMS, WAREHOUSES AND RICE MILLS
SOUTH VIETNAM, APRIL 30, 1969

Province	1968/69 Production	Quantity of Paddy Stored at: Farms	Warehouses	Rice Mills	Total Paddy Stored	Amount Intended for Farm and Home Use by Rice Producers
		(Metric Tons)				
An Giang	264,000	180,735	12,936	6,970	200,641	90,012
An Xuyen	205,000	161,505	2,978	168	164,651	93,591
Ba Xuyen	423,000	258,798	19,236	53,138	331,172	119,944
Bac Lieu	216,000	82,166	409	17,564	100,139	72,495
Chau Doc	180,000	64,715	1,805	628	67,148	55,733
Dinh Tuong	240,000	170,253	1,920	8,876	181,049	99,186
Go Cong	105,800	66,651	---	5,028	71,679	50,214
Kien Giang	184,000	84,753	23,057	24,818	132,628	56,934
Kien Hoa	215,200	166,300	1,661	1,024	168,985	93,066
Kien Phong	144,000	89,522	2,334	N.A.	91,856	44,909
Long An	216,000	93,335	2,364	20,510	116,209	61,975
Phong Dinh	225,000	161,955	11,045	17,853	190,853	124,396
Vinh Binh	201,500	165,500	5,702	2,135	173,337	101,795
Vinh Long	164,000	115,174	345	N.A.	115,519	100,097
Sa Dec	107,100	82,820	2,431	2,471	87,722	59,916
Total	3,090,600	1,944,182	88,223	161,183	2,193,588	1,224,263
Bien Hoa	68,000	47,180	---	182	47,362	36,569
Binh Duong	30,000	14,596	915	12	15,523	13,700
Gia Dinh	105,600	49,806	2,641	2,004	54,451	40,486
Phuoc Tuy	12,000	7,227	---	244	7,471	5,895
Tay Ninh	59,500	28,690	400	1,393	30,483	27,481
Total	275,100	147,499	3,956	3,835	155,290	124,131
Binh Dinh	161,500	159,886	---	14	159,900	134,601
Phu Yen	63,000	40,685	285	35	41,005	32,956
Quang Ngai	135,000	57,712	---	3	57,715	43,200
Thua Thien	60,000	32,013	---	32	32,045	27,058
Total	419,500	290,296	285	84	290,665	237,815
TOTAL	3,785,200	2,381,977	92,464	165,102	2,639,543	1,586,209

SOURCE: *Agricultural Economics and Statistics Service.*

and home use and sell 795,768 metric tons later in the marketing year. Thus, on April 30, more than 20 percent of the total production in the nation was still stored on the farm. There were only 82,975 metric tons of milled rice in storage on April 30, 1969, and of this amount, 71,349 metric tons was stored on farms, 7,902 metric tons was stored at rice mills and only 3,724 metric tons was stored in warehouses. Practically all the milled rice stored on farms was intended for farm and home use (Table 53).

It was estimated that farmers in the Delta provinces would sell 36.0 percent of the paddy stored on farms on April 30, 1969, while farmers in the other provinces would sell only 17.0 percent of the stored paddy. Delta farmers were expected to sell only 4.0 percent of the milled rice stored on farms as compared to 10.0 percent for non-Delta farmers.

The quality of paddy, indicated by rather broad undefined terms, for the three levels of storage are shown in Tables 54, 55 and 56. More than one-half the farm-stored paddy was classified as "ordinary," about one-third was classified as "high quality," with lesser amounts classified as "low quality," "red grain" and "Than Nong" (IR-8). More than one-half the paddy stored at rice mills was categorized as "high quality" and about two-fifths was classified as "ordinary" with small amounts in the other categories. Paddy in warehouses was about equally divided among the classifications of "high," "ordinary" and the lesser three classifications of "low," "red grain" and "Than Nong."

In the 24 provinces, it is estimated that 261,932 metric tons of paddy storage is available at rice mills. As of April 30, 1969, the mills had an inventory of 165,103 metric tons of paddy storage, which is a utilization of 62.5

TABLE 53

QUANTITY OF RICE STORED AT FARMS, WAREHOUSES AND RICE MILLS
SOUTH VIETNAM, APRIL 30, 1969

Province	Quantity of Rice Stored at: Farms	Warehouses	Rice Mills	Total Rice Stored	Amount Intended for Farm and Home Use by Rice Producers
			(Metric Tons)		
An Giang	3,243	46	267	3,556	2,252
An Xuyen	2,536	49	71	2,656	2,536
Ba Xuyen	10,660	63	748	11,471	10,535
Bac Lieu	4,240	4	1,063	5,307	4,240
Chau Doc	2,944	31	154	3,129	2,944
Dinh Tuong	3,345	45	393	3,783	2,989
Go Cong	2,089	---	652	2,741	2,089
Kien Giang	2,471	14	1,909	4,394	2,471
Kien Hoa	3,055	587	72	3,714	2,954
Kien Phong	1,459	---	---	1,459	1,459
Long An	3,035	31	525	3,591	3,003
Phong Dinh	4,949	397	849	6,195	4,811
Vinh Binh	3,576	39	213	3,828	3,576
Vinh Long	4,003	50	---	4,053	3,977
Sa Dec	2,101	5	586	2,692	1,626
Total	53,706	1,361	7,502	62,569	51,462
Bien Hoa	1,477	---	40	1,517	1,477
Binh Duong	412	347	1	760	412
Gia Dinh	1,037	905	293	2,235	1,037
Phuoc Tuy	318	1,093	34	1,445	318
Tay Ninh	671	4	17	692	671
Total	3,915	2,349	385	6,649	3,915
Binh Dinh	5,966	---	4	5,970	5,332
Phu Yen	746	14	3	763	729
Quang Ngai	367	---	---	367	367
Thua Thien	6,649	---	8	6,657	5,512
Total	13,728	14	15	13,757	11,940
TOTAL	71,349	3,724	7,902	82,975	67,317

SOURCE: Agricultural Economics and Statistics Service.

TABLE 54

QUALITY OF PADDY STORED AT FARMS
SOUTH VIETNAM, APRIL 30, 1969

Province	Total Paddy in Storage	Quality and/or Type				
		High	Ordinary	Low	Red Grain	Than Nong
		(Metric Tons)				
An Giang	180,735	74,539	65,842	37,996	1,688	---
An Xuyen	161,505	52,525	107,810	1,170	---	---
Ba Xuyen	258,798	116,791	138,505	3,502	---	---
Bac Lieu	82,166	33,053	16,837	2,276	---	---
Chau Doc	64,715	8,447	39,623	15,695	950	---
Dinh Tuong	170,253	66,430	74,699	201	258	---
Go Cong	66,651	29,436	36,532	683	---	---
Kien Giang	84,753	44,591	40,162	---	---	---
Kien Hoa	166,300	34,844	119,517	---	---	---
Kien Phong	89,522	---	54,693	---	34,829	---
Long An	93,335	48,413	38,021	410	1,733	---
Phong Dinh	161,955	82,755	73,054	500	2,527	---
Vinh Binh	165,500	94,055	67,430	2,117	---	---
Vinh Long	115,174	32,781	78,077	571	---	---
Sa Dec	82,820	21,811	54,151	2,839	3,160	---
Total	1,944,182	740,471	1,034,953	67,960	45,145	55,653
Bien Hoa	47,180	16,039	29,489	1,401	---	251
Binh Duong	14,596	906	13,194	496	---	---
Gia Dinh	49,806	19,794	29,772	---	240	---
Phuoc Tuy	7,227	386	6,752	89	---	---
Tay Ninh	28,690	14,184	13,978	---	528	---
Total	147,499	51,309	93,185	1,986	768	251
Binh Dinh	159,886	68,726	76,262	13,281	---	1,617
Phu Yen	40,685	16,438	20,577	1,965	---	1,705
Quang Ngai	57,712	35,021	18,454	2,305	---	1,932
Thua Thien	32,013	9,880	21,605	404	---	124
Total	290,296	130,065	136,898	17,955	---	5,378
TOTAL	2,381,977	921,845	1,265,036	87,901	45,913	61,282

SOURCE: Agricultural Economics and Statistics Service.

TABLE 55

QUALITY OF PADDY STORED AT RICE MILLS
SOUTH VIETNAM, APRIL 30, 1969

Province	Storage Capacity	Total Paddy in Storage	Quality and/or Type					Amount Shipped out during Past Seven Days
			High	Ordinary	Low	Red Grain	Than Nong	
			(Metric Tons)					
An Giang	20,890	6,970	776	1,883	4,250	---	61	4
An Xuyen	13,688	169	27	137	5	---	---	---
Ba Xuyen	89,110	53,138	42,278	8,160	2,700	---	---	---
Bac Lieu	19,301	17,564	2,239	15,325	---	---	---	233
Chau Doc	7,762	628	74	176	378	---	---	11
Dinh Tuong	9,877	8,876	2,357	5,519	679	204	117	54
Go Cong	9,400	5,028	1,626	3,200	202	---	---	71
Kien Giang	N.A.	24,818	17,963	5,063	---	1,792	---	---
Kien Hoa	6,683	1,024	313	336	31	330	14	11
Kien Phong	N.A.	---	---	---	---	---	---	---
Long An	37,163	20,510	13,913	6,178	---	15	404	---
Phong Dinh	21,676	17,853	3,619	13,364	757	113	---	730
Vinh Binh	11,382	2,134	674	1,455	3	2	---	227
Vinh Long	N. A.	---	---	---	---	---	---	---
Sa Dec	7,338	2,471	391	1,557	40	483	---	---
Total	254,270	161,183	86,250	62,353	9,045	2,939	596	1,341
Bien Hoa	518	182	25	139	18	---	---	10
Binh Duong	41	12	1	11	---	---	---	---
Gia Dinh	4,422	2,004	332	1,648	16	8	---	5
Phuoc Tuy	540	244	135	94	15	---	---	---
Tay Ninh	1,903	1,394	6	1,068	---	320	---	1
Total	7,424	3,836	499	2,960	49	328	---	16
Binh Dinh	77	14	---	14	---	---	---	---
Phu Yen	N.A.	35	30	3	1	1	---	---
Quang Ngai	(nt)	3	---	3	---	---	---	4
Thua Thien	161	32	18	13	1	---	---	9
Total	238	84	48	33	2	1	---	13
TOTAL	261,932	165,103	86,797	65,346	9,096	3,268	596	1,370

SOURCE: Agricultural Economics and Statistics Service.

TABLE 56

QUALITY OF PADDY STORED AT WAREHOUSES
SOUTH VIETNAM, APRIL 30, 1969

Province	Storage Capacity	Total Paddy in Storage	Quality and/or Type					Amount Shipped out during Past Seven Days
			High	Ordinary	Low	Red Grain	Than Nong	
			(Metric Tons)					
An Giang	33,203	12,936	4,375	5,069	3,267	205	20	37
An Xuyen	11,116	2,978	991	1,987	---	---	---	1,868
Ba Xuyen	25,088	19,236	6,504	12,716	16	---	---	1,220
Bac Lieu	746	409	---	409	---	---	---	---
Chau Doc	3,947	1,805	557	849	399	---	---	---
Dinh Tuong	3,084	1,920	1,381	539	---	---	---	---
Go Cong	---	---	---	---	---	---	---	---
Kien Giang	52,075	23,057	4,853	940	---	17,264	---	75
Kien Hoa	3,907	1,661	1,513	137	9	2	---	90
Kien Phong	N.A.	2,334	---	1,125	---	1,209	---	---
Long An	3,258	2,364	864	1,031	55	218	196	300
Phong Dinh	17,708	11,045	9,204	1,718	12	111	---	4,028
Vinh Binh	6,289	5,702	3,215	2,403	84	---	---	---
Vinh Long	749	345	52	293	---	---	---	528
Sa Dec	N.A.	2,431	470	1,693	157	83	28	---
Total	161,170	88,223	33,979	30,909	3,999	19,092	244	8,146
Bien Hoa	---	---	---	---	---	---	---	---
Binh Duong	1,925	915	25	768	---	---	122	46
Gia Dinh	7,504	2,641	42	2,578	21	---	---	---
Phuoc Tuy	2,130	---	---	---	---	---	---	---
Tay Ninh	N.A.	400	400	---	---	---	---	---
Total	11,559	3,956	467	3,346	21	---	122	46
Binh Dinh	---	---	---	---	---	---	---	---
Phu Yen	582	285	102	109	36	9	29	---
Quang Ngai	---	---	---	---	---	---	---	---
Thua Thien	---	---	---	---	---	---	---	---
Total	582	285	102	109	36	9	29	---
TOTAL	173,311	92,464	34,548	34,364	4,056	19,101	395	8,192

SOURCE: Agricultural Economics and Statistics Service.

percent of the space. Other warehouses in the provinces have a storage capacity of 173,311 metric tons and on April 30, 1969, had an inventory of 92,464 metric tons of paddy in storage, which is a utilization of only 53.4 percent of the space.

Several interesting marketing traits can be surmised from the above data. Rice stocks are primarily held by the producer on the farm in the form of paddy. Although a large part of the paddy stored on farms is consumed by the farm family, a sizable portion later moves into trade channels. The rice miller, on the average, maintains only a small inventory of paddy, relying on the market to supply the paddy requirements to keep the mill operating the remainder of the year. The miller's inventory of milled rice is generally very small since the miller will mill paddy as orders are received or as sales are made.

The existing storage and warehouse system may be able to handle a small increase in production in the same manner as is presently practiced; however, a large and rapid expansion in marketings resulting from increased production and decreased imports would greatly overtax the system. Therefore, the improvement of the rice storage, processing and distribution system in South Vietnam is presently almost as important a problem as was the problem of increasing production a short time ago. The encouragement of private investment to develop facilities for storing, processing and distributing rice should be given high priority. The GVN should provide the proper atmosphere and encouragement for private enterprises to stimulate changes in the marketing and processing economy for rice and to develop the facilities which could contribute to the efficiency and stability of the rice economy.

Rice Dryers

All paddy produced in South Vietnam is dried on sun drying floors which range from small tramped earth floors to community concrete patios. Many of the rice mills use drying floors to dry the paddy which is purchased at harvest. There are no mechanical dryers in operation in South Vietnam except for a few batch dryers used for demonstrational purposes. These demonstration dryers ranged from the small home-constructed individual units, having a fan powered by a boat motor and the air heated by burning rice straw, to large self-contained units designed for commercial or community drying. At these demonstration centers, attention was being directed to merely "getting the job done" and little attention was being given to air temperature, length of drying period or airflow, which must be properly controlled in order to produce a good quality of paddy.

Dr. J. Norman Efferson and Mr. Klaus Sengelmann stated in An Appraisal of Rice Drying, Storage, Processing, and Marketing in the Philippines, that:

> "The type of rice dryer that is generally accepted as best for drying rice is the so-called LSU mixing-type dryer. This type provides for a continual mixing of the palay as it moves downward through hot air, and gives uniform heat to all grains. ... The mixing-type columnar drier with baffles and the conventional straight columnar flow dryer are also used to dry rice and when properly managed do a creditable job. Under certain conditions, the batch dryer in which heated air is blown up through the rice or out into the rice from a central chamber also does an efficient job. Batch driers have the disadvantage, however, that the process is slower than the columnar drier approach and if the process is intensified to reduce time, the non-moving grains nearest the heat are over-heated while those most distant are not properly dried. Also, heat to this extent greatly reduces the germination. Thus such rice is not satisfactory as seed. Batch dryers are used by some farmers in the United States and in Latin

America where they harvest only one crop a year and have one to two months time to dry their rice. They use only slightly heated air, and under low-humidity conditions no heat to gradually dry the rice in place and then leave it in the same tanks which serve as both dryers and bodegas. For rapid drying of large volumes of palay in a short period of time, batch dryers are not likely to be successful in the Philippines." 7/

This evaluation of Efferson and Sengelmann also applies to the conditions that exist in South Vietnam. For this reason, it is the conclusion of the members of the study team that the emphasis on artificial drying should be placed at the large marketing facility where sufficient volume of paddy can be accumulated to support the installation of a continuous-flow dryer which can produce a quality product which will give higher milling yield.

Grades and Standards

In a rice marketing system, ownerships of both paddy and milled rice are transferred among individuals, business firms and government agencies, thereby creating a necessity for two sets of grades and standards--one set for paddy and the other set for milled rice. Although the market value of paddy is determined largely by the market value of the milled rice processed from it, different factors and tolerances are necessary to determine its value.

In South Vietnam, no grades and standards have been established for

7/ Efferson, J. Norman, and Klaus Sengelmann, An Appraisal of Rice Drying, Storage, Processing, and Marketing in the Philippines. Manila, Philippines: The Ford Foundation, 1969.

paddy. In the trade, certain terms such as "high quality," "ordinary quality" and "low quality" are used to indicate the value of different lots. When a rice merchant or miller was asked how he distinguishes between classifications, his answer was always, "experience." Therefore, these classifications become very limited in determining the factors affecting quality.

Thus, the value of paddy is based on a rather indefinite grading system which has incorporated into the price structure an estimate of the moisture content of the paddy. When the paddy is dried and ready for sale, the moisture content is determined by feel or by the "snap" or "crack" of the paddy when pressure is exerted on the paddy kernel. The buyer will crack the kernel close to the ear and by sound, will estimate the moisture content. The paddy with excessive moisture is discounted in price according to the estimated moisture content.

Since the process is a gross estimation at best, a significant hedge factor is incorporated into the price to the farmer so the merchant is protected. These moisture discounts are sufficiently high to cause farm drying of paddy to be a primary problem of farmers and a concern of the Ministry of Land Reform and Agriculture. 8/ Commercial drying of paddy is almost non-existent in South Vietnam. The rice mills, like all rice marketing organizations, try to purchase dry storable paddy (14 percent or lower moisture average); however, most rice

8/ USAID has placed emphasis on finding an economical solution to the problem of farm drying of paddy. Several specialists have worked on the problem and are continuing their efforts in the hopes of finding a solution. The problem has been magnified with the advent of the shorter seasoned improved varieties which mature during the rainy season.

mills maintain a platform drying area in case paddy is purchased with a moisture content too high for safe storage.

The grading system for rice in South Vietnam was developed for the export trade during the period when rice exports were important to the nation (Appendix Exhibit A-V). These grade standards were developed for milled rice and as a result, cannot be applied to paddy. This lack of emphasis on paddy standards results in a lack of interest on the part of the farmers to select the most desirable harvesting period or to be concerned as to the methods of drying. Since the farmer is not rewarded for producing paddy with high milling yields, he cares less about controlling these factors. The lack of control of these two factors probably causes more loss in milling yield and reduction of milling quality (number of broken kernels) than any other factors in the nation's production and marketing process for rice.

The GVN has no official grades and standards for milled rice sold in the domestic market, only for the rice moving in international trade. The terms "high quality," "ordinary" and "low quality" are used in the milled rice trade, also without standards to define the classifications. The GVN, when purchasing milled rice, has certain standards pertaining to the amount of brokens--these being No. 1, 15 percent brokens; No. 2, 20 percent brokens; and No. 3, 25 percent brokens.

Factors affecting the market value of milled rice vary among markets. In most industrial nations, consumers discriminate against broken kernels. The South Vietnamese consumers have developed a high tolerance for brokens; however, each buyer personally inspects each purchase of rice and uses his own set of quality standards.

Flour Mills

Two flour mills were under construction in South Vietnam during the time the study was being made. The study team visited with the owners, contractors and equipment manufacturers in order to incorporate into the overall storage needs for grains their needs for grain receiving, handling and storage facilities.

The two mills are located in Cholon and will have milling capacities of 6,000 metric tons per month at each facility. Each mill has plans for present storage capacity of 40,000 metric tons in sacks and plans to start construction of approximately 20,000 metric tons of bulk silo storage in 1970. Present unloading facilities require that the grain be sacked on the ship and moved to the mill sites by barge. Each mill plans to have in operation by late 1970 portable equipment for discharging grain in bulk from the ship to the barge and from the barge to the mill.

Feed Mills

There is a small formula feed mixing plant located in Cholon. The mill owner imported shelled corn and protein concentrates and mixed these with some domestic rice bran to produce a complete line of hog and poultry feeds. All ingredients were received in bags and all mill feeds moved from the mill in bags.

The miller manufactured three protein concentrate feeds, one a broiler concentrate containing 43.5 percent protein, another a pig concentrate containing

39.0 percent protein and the third a layer concentrate containing 32.0 percent protein. Four pig feeds also were produced, a prestarter with 22.0 percent protein, a starter feed containing 16.0 percent protein, a grower feed and a breeder feed each with 14.0 percent protein, and a pig finisher with a protein content of 11.5 percent. In addition to these, the miller manufactured two broiler feeds, a starter with 22.0 percent protein and a finisher with 18.0 percent protein; and three poultry feeds, a poultry starter containing 20.0 percent protein, a layer feed and a grower feed, both containing 16.0 percent protein. The inventories of corn and other ingredients were stored in bags in the warehouse adjoining the mill and inventory requirements of corn were met through imports from the United States.

The feed requirements of the commercial broiler and layer operations were being met by small feed blending units located at each of the poultry operations and, as yet, the commercial feed industry had not been developed to service this rapidly growing industry.

CHAPTER XI

PROJECTIONS OF RICE PRODUCTION AND UTILIZATION

Production

- Assumptions for Provincial Production Projections
- Production Projections

Utilization

- Losses
- Human Consumption

Estimated Savings

CHAPTER XI

PROJECTIONS OF RICE PRODUCTION AND UTILIZATION

The construction of meaningful projections of all the major inputs affecting the rice economy of a nation like South Vietnam is a difficult endeavor and requires the work of many people. It was not possible for the study team to become proficient and completely knowledgeable on the characteristics of rice production and marketing in South Vietnam within the time period of the study. Instead, the team attempted to incorporate the ideas and opinions of those people knowledgeable of the South Vietnamese rice economy into the experiences and expertise gained in working with the rice economies of other countries.

Production

The study team reviewed all studies and reports on the problems of rice production and evaluated projections made by various individuals, organizations and agencies that worked in the area. Most reports which included projections of rice production were made on a national basis or, at best, a delineation was made for the Delta alone. One of the first reactions of the study team toward this type of analysis was to note the lack of consideration for the geographic variation in the factors of production of rice from province to province. This lack of homogeneity of the production factors throughout the nation, or even throughout the Delta, became evident after personal interviews with the agricultural specialists located at the provincial and district capitals and with other tenured specialists in the Ministry of Land Reform and Agriculture and in USAID.

Based on this knowledge, the study team was of the opinion that due to the extreme variation in population density, land topography, water problems, climatic conditions, soil types and production capabilities found in South Vietnam, meaningful projections for a storage, processing and marketing study should be made on a provincial basis. For this reason, the study team believed that the national projections of rice production found in many of the more recently published secondary sources could not be used as a basis for this study.

The production projections for rice which are shown in this report are based on individually derived provincial estimates based on firsthand information obtained by the study team. This information was obtained by personal interview with the South Vietnamese provincial agricultural chiefs, rice production specialists, agronomists, irrigation specialists and other competent South Vietnamese employees; USAID agronomists, rice production specialists and community development specialists; United States military personnel; and local rice millers, rice merchants and farmers.

The information was obtained on the area in crop production, in paddy production, in dry season production and under irrigation; the amount of crop land not in production; the amount of land abandoned due to security reasons; and the quality of new land that can be brought under paddy cultivation. Information also was obtained on the potential area which can produce the new improved short stem varieties without a major water control program, the estimated yields, and an estimate of the rate at which farmers will adopt the new improved varieties and cultural practices.

A questionnaire was designed to obtain part of this data and this questionnaire was mailed to each provincial agricultural chief and to each provincial

USAID agricultural advisor (Appendix Exhibit A-VI). This data was received from each province and, in addition, at least one member of the study team visited most of the major rice producing provinces--especially in the Delta.

Information on the environmental factors affecting paddy production by subregion was obtained by personal interview with soil scientists, water management experts, plant breeders, plant protection specialists and agronomists from the Ministry of Land Reform and Agriculture, the College of Agriculture at the University of Saigon, and USAID. Thus, the provincial rice production projections included in this report were based on information obtained on each province by questionnaires and by personal visits supplemented by the information obtained on the general conditions in the various subregions. Projections were not made on a national or military corps basis; these values were obtained by the summation of provincial projections.

Assumptions for Provincial Production Projections

After the study team assembled and evaluated the information from all sources, a set of assumptions was developed. These assumptions were used as controlling factors in establishing realistic projections of the rice production for each province:

1. All rice land in the single and double transplanting areas is capable of producing at least one crop per year of the new improved varieties.

2. The present new varieties cannot be successfully grown in the floating rice area without a major water control program.

3. Fifteen percent of the rice land in the floating rice area, twenty percent of the double transplant area and zero percent of the single transplant area can be irrigated without the assistance of a major river water control program such as the one planned for the entire Mekong River.

4. Sixty percent of the irrigatable rice land will be planted in new improved varieties by 1974/75 and ninety percent of the irrigatable rice land will be planted in new improved varieties by 1979/80.

5. The reclaimable rice land, abandoned due to security reasons, will be returned to rice production at the following rate: 60 percent returned to rice production by 1974/75 and 90 percent returned to rice production by 1979/80.

6. All irrigation requiring the mechanical pumping of water will be accomplished by the use of small gasoline motor-powered pumps.

7. Thirty percent of the rice land adaptable to new varieties will be planted to improved varieties by 1974/75 and sixty percent of the rice land adaptable to new varieties will be planted to improved varieties by 1979/80.

8. No new varieties will be grown in the high altitudes of the northern and central areas.

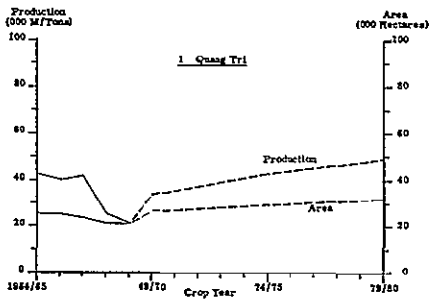
9. Irrigated land in rice areas of I, II and III Corps will be shared with fruit and vegetable crops.

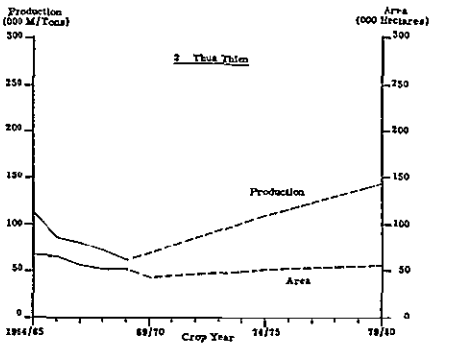
Production Projections

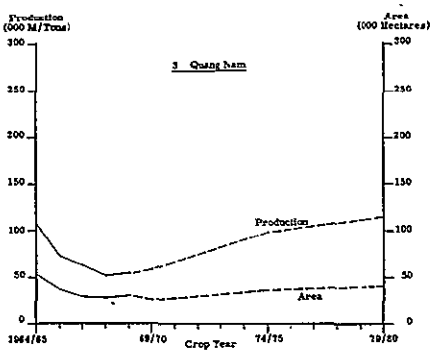
The projections show an increasing quantity of paddy produced in each province for each time period (Figure XXIII). This increase results from an expected increase in the area planted to rice and/or from anticipated increases in yield. In the upland provinces where the new high-yielding varieties are not as adaptable to local conditions, increases in production were expected to be small--resulting primarily from additional plantings on reclaimable abandoned land. In the Central Lowland provinces, where most of the tillable land is already in production, production increases are expected to result primarily from

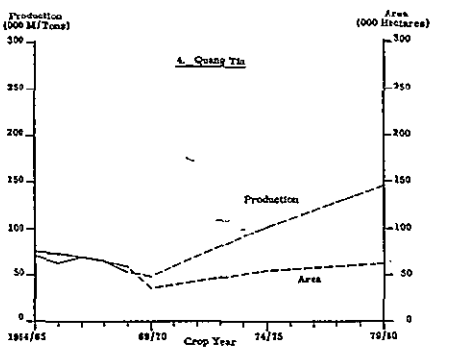
FIGURE XXIII

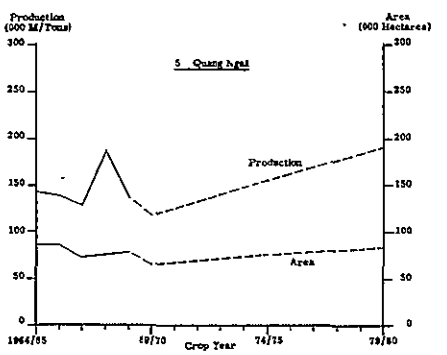
RICE PRODUCTION AND AREA CULTIVATED BY PROVINCE
SOUTH VIETNAM, 1964/65 TO 1968/69 WITH PROJECTIONS TO 1979/80

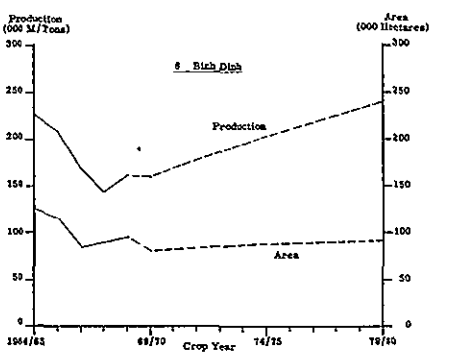


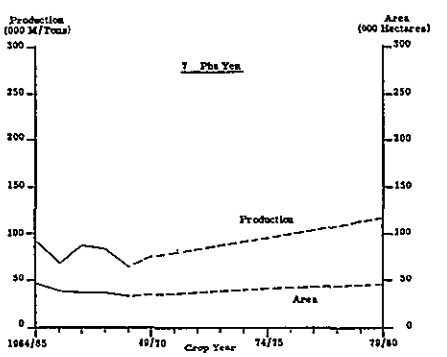












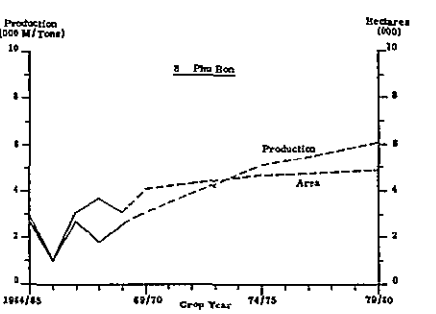
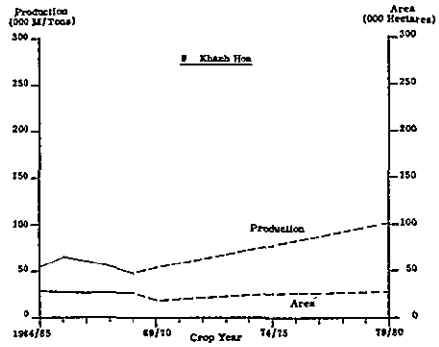
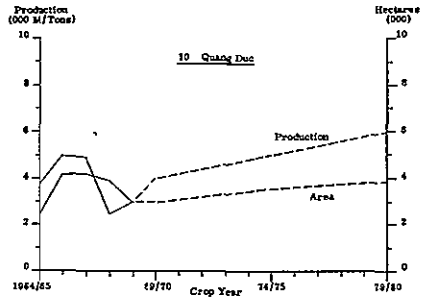
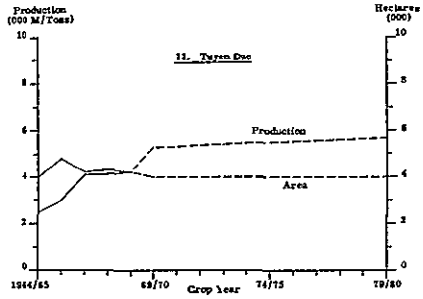


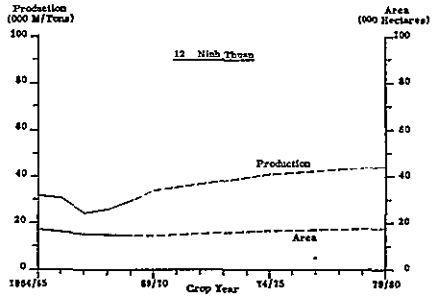
FIGURE XXIII, continued

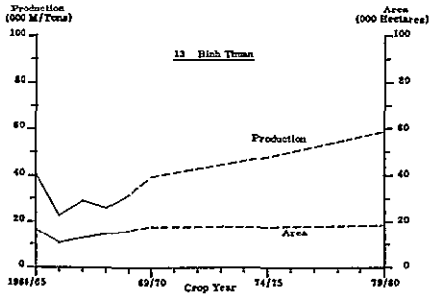
RICE PRODUCTION AND AREA CULTIVATED BY PROVINCE
SOUTH VIETNAM, 1964/65 TO 1968/69 WITH PROJECTIONS TO 1979/80

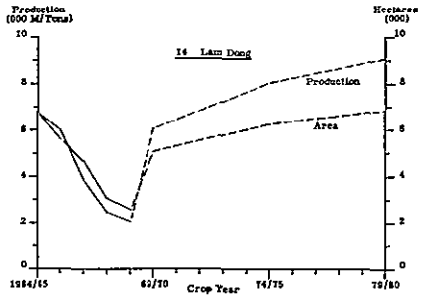


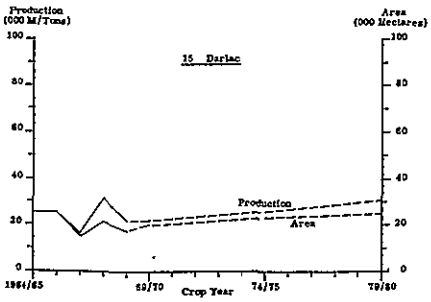












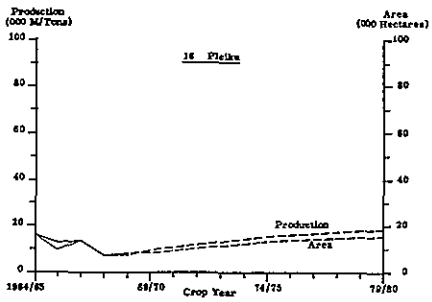
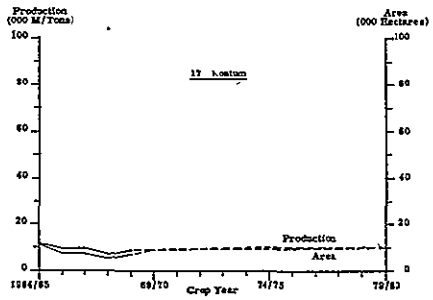
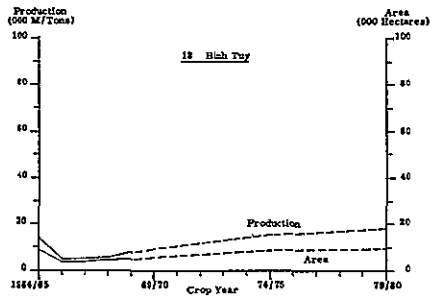
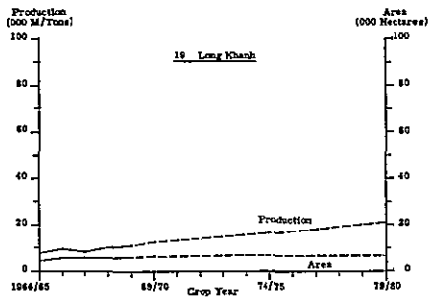


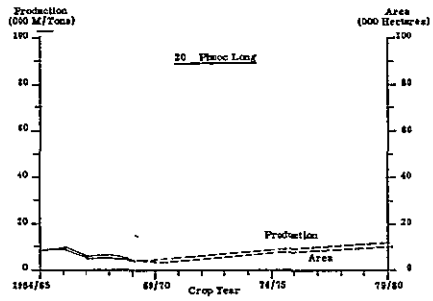
FIGURE XXIII, continued

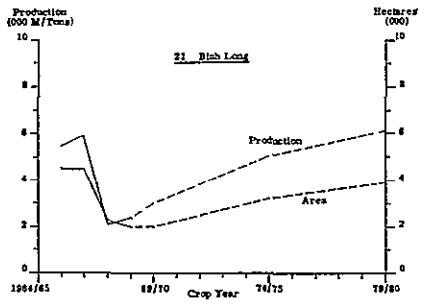
RICE PRODUCTION AND AREA CULTIVATED BY PROVINCE
SOUTH VIETNAM, 1964/65 TO 1968/69 WITH PROJECTIONS TO 1979/80

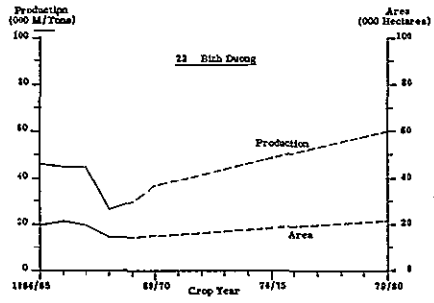


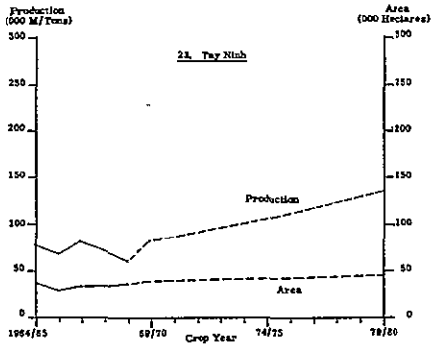












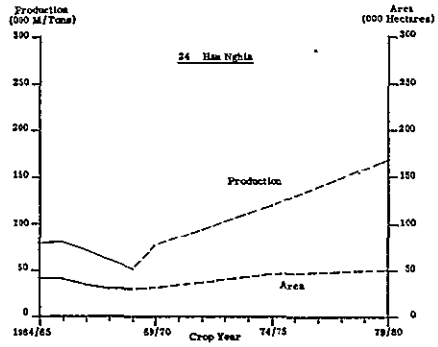
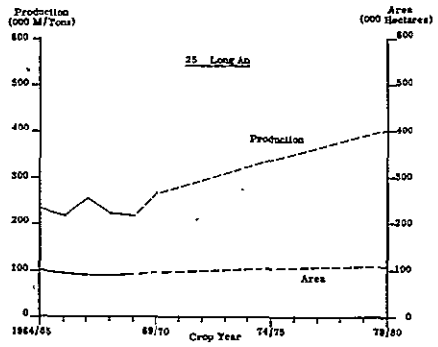
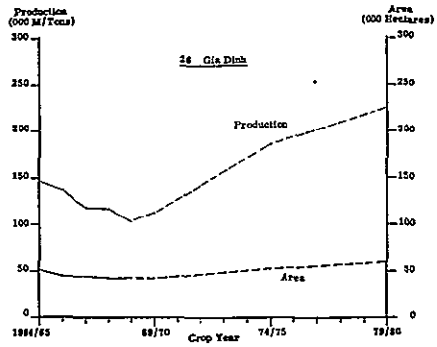
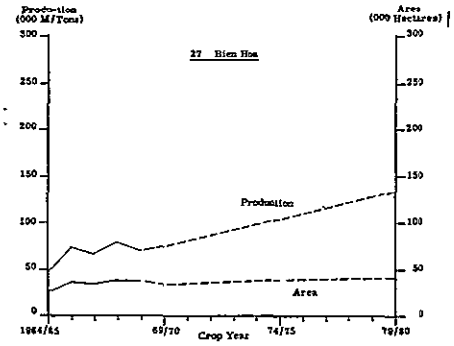


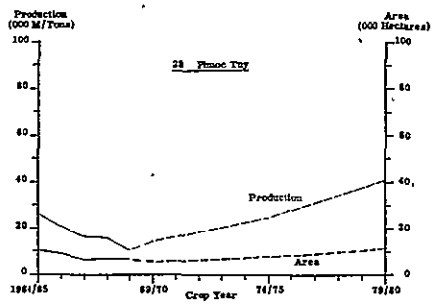
FIGURE XXIII, continued

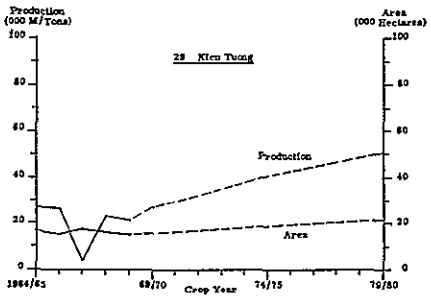
RICE PRODUCTION AND AREA CULTIVATED BY PROVINCE
SOUTH VIETNAM, 1964/65 TO 1968/69 WITH PROJECTIONS TO 1979/80

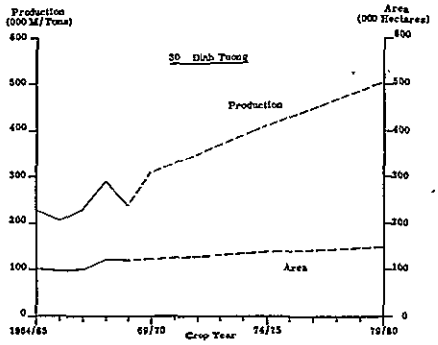


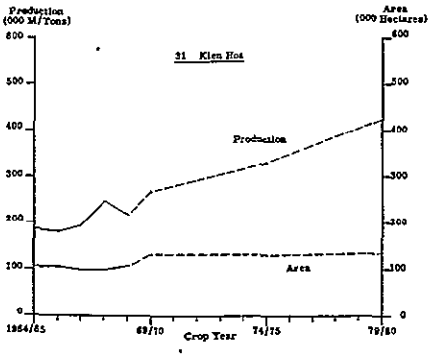












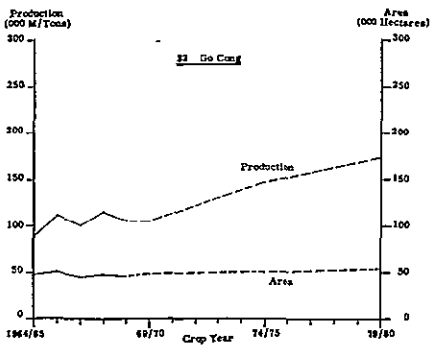
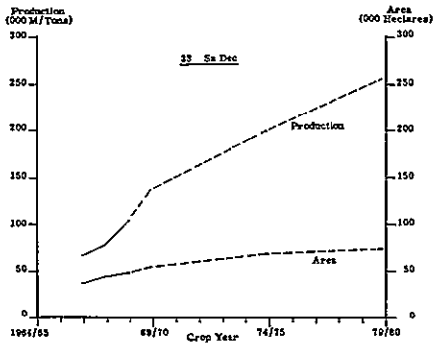
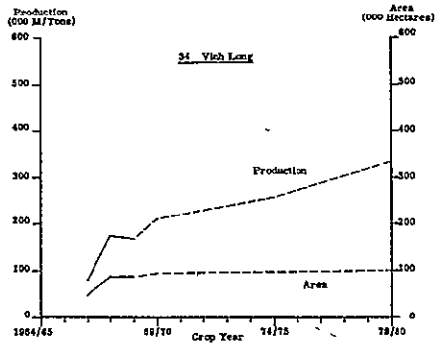
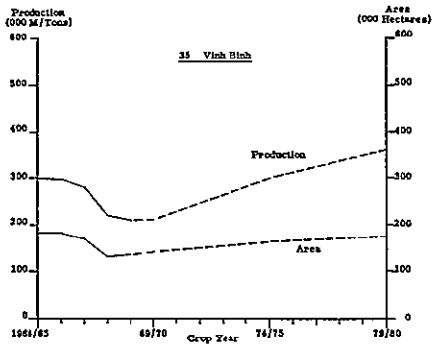


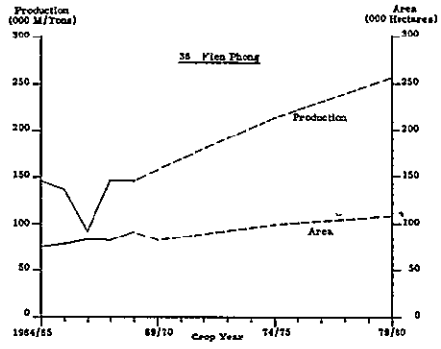
FIGURE XXIII, continued

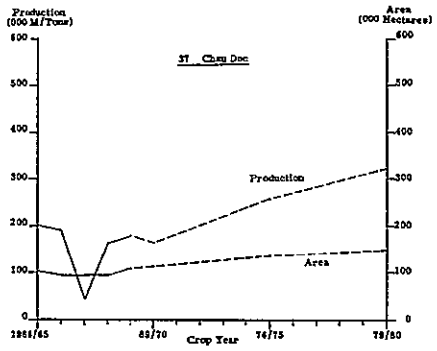
RICE PRODUCTION AND AREA CULTIVATED BY PROVINCE
SOUTH VIETNAM, 1964/65 TO 1968/69 WITH PROJECTIONS TO 1979/80

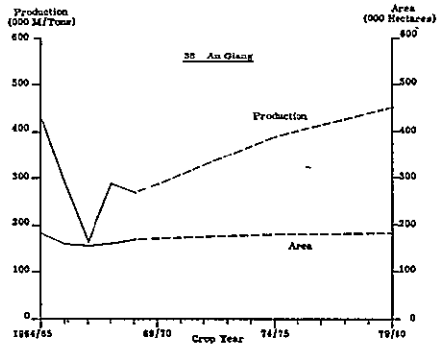


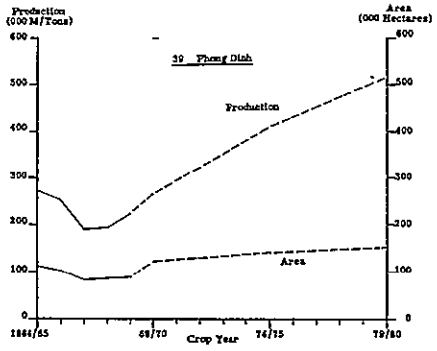












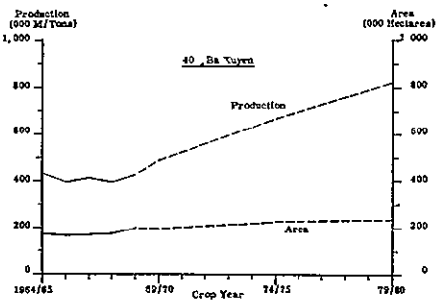
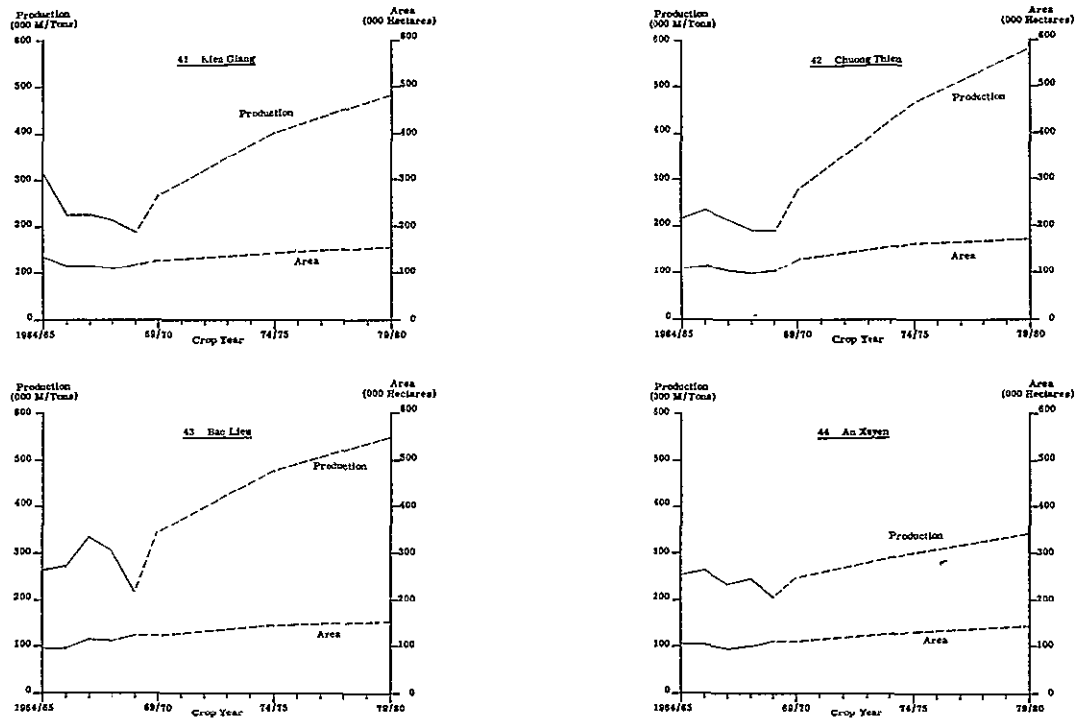


FIGURE XXIII, continued

RICE PRODUCTION AND AREA CULTIVATED BY PROVINCE
SOUTH VIETNAM, 1964/65 TO 1968/69 WITH PROJECTIONS TO 1979/80



planting new varieties and improved cultural practices. In most of the Deltaxxx provinces, production increases are expected to result from a combination ofxii increases in the area planted and in the planting of new varieties.

When deriving the projections for paddy, several basic limiting factorsii must be considered. In the Coastal Subregion of the Delta, where dry seasonxii production of paddy is very limited due to the salinity problem, increases inxxii area planted to rice will derive from plantings in reclaimable and/or new lands. Increases in yields in this subregion will depend upon the rate at which farmers will shift to the new varieties and their associated new cultural practices. Since

one crop of rice is now being produced in this area and the land is suitable for producing the new varieties, it is expected that 30 percent of the land will be planted to the new varieties by 1974/75 and that 60 percent of the land will be planted to the new varieties by 1979/80.

In the Western Subregion, where annual flooding prohibits the production of short stem varieties during the wet season, increases in production are expected to result from improving the productivity of the dry season crop through the use of the new varieties and from producing a second crop on part of the land. The volume of water and its accessibility to the rice land is one of the major limiting factors to producing the second crop. After considering the needs of water for transportation and other uses and its location in relation to the rice fields, it is estimated that 15 percent of cultivated rice land can be irrigated during the dry season by using the small gasoline-motor pump. In addition, some production increases will result from planting abandoned and reclaimable lands.

In the Central Subregion, paddy production can be increased by increasing the land area planted to dry season paddy. Again, the demand on water and its availability to the rice fields limits the amount of cultivated land that can be irrigated. After considering these factors, it is estimated that 20 percent of the rice land in this area can be economically irrigated. Increases in production due to expanded plantings of the new varieties depends on the rate at which farmers will adapt the improved varieties to their production schedules. It is estimated that 30 percent of the rice land in this area will be planted to new varieties by 1974/75 and 60 percent of the rice land in this area will be planted to new varieties by 1979/80.

It is assumed that all irrigated land planted to rice will be planted to the new high-yielding varieties. The higher yields of the new varieties will most certainly dictate their use since irrigation increases the cost of production and yield becomes increasingly important to the farmer.

The provinces in IV Corps (the Delta) are expected to have the largest increases in both area planted [1/] and quantity produced. It is estimated that the area planted to rice in the Delta will increase from approximately 1.8 million hectares in 1969/70 to approximately 2.0 million hectares in 1979/80. Total production in the Delta is expected to increase by more than 2.5 million metric tons--from 3.8 million metric tons in 1969/70 to 6.3 million metric tons by 1979/80 (Figure XXIV).

Projections for III Corps show an increase in area planted to rice of less than 100,000 hectares and an increase in quantity of paddy produced of approximately 500,000 metric tons (Figure XXV). Estimated increases in areas planted to rice and in quantities of paddy produced were small in both II Corps and I Corps (Figure XXVI and Figure XXVII).

The projections for South Vietnam as a whole show the area planted to rice increasing from approximately 2.5 million hectares in 1969/70 to approximately 2.8 million hectares by 1974/75 and to more than 3.0 million hectares in 1979/80. Production was estimated to increase from 5.2 million metric tons in 1969/70 to approximately 7.3 million metric tons in 1974/75 and to approximately 8.9 million metric tons by 1979/80 (Figure XXVIII).

1/ Includes hectares in both wet season and dry season cropping.

FIGURE XXIV

RICE PRODUCTION AND AREA CULTIVATED, REGION IV
SOUTH VIETNAM, 1959/60 TO 1968/69 WITH PROJECTIONS TO 1979/80

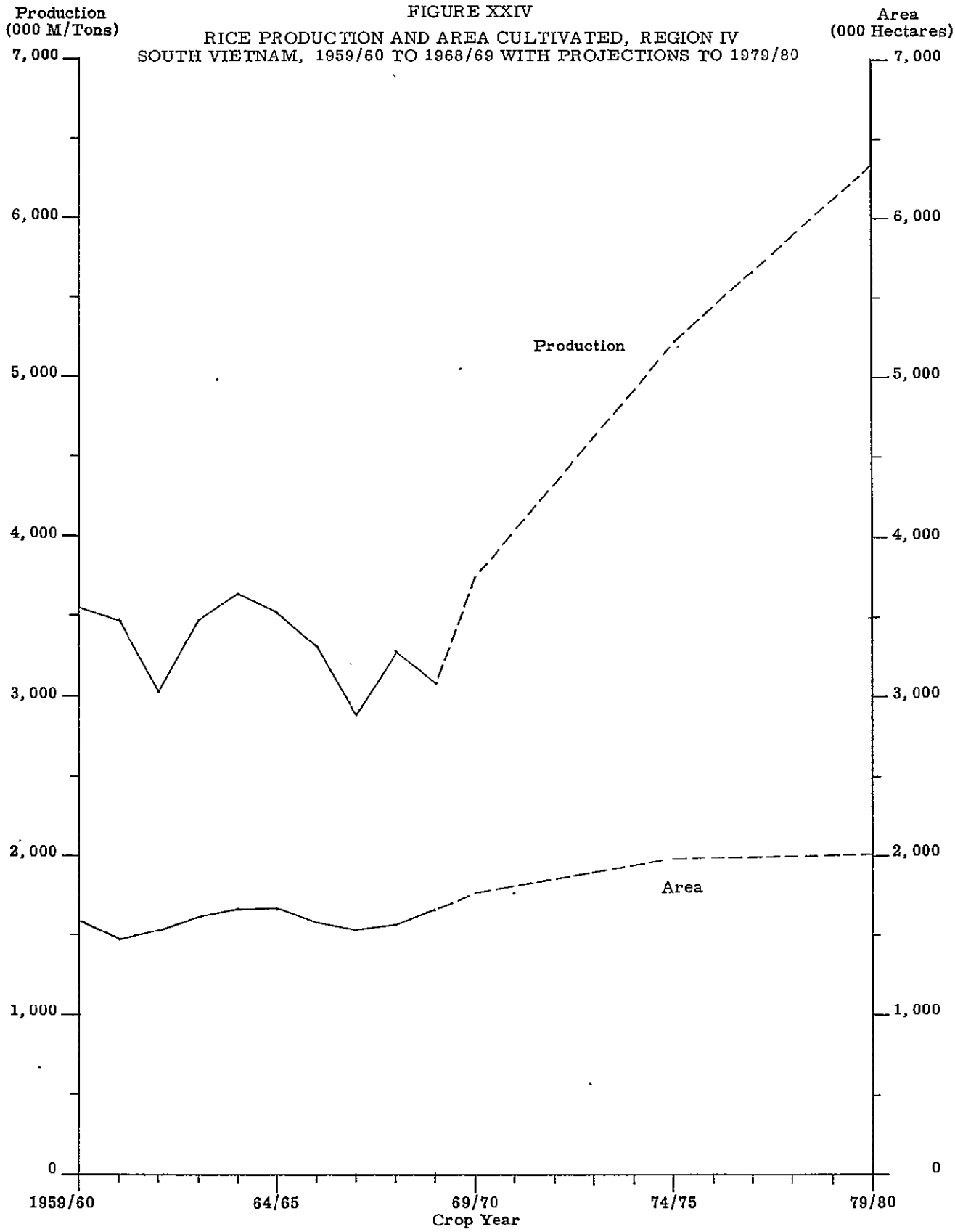


FIGURE XXV

RICE PRODUCTION AND AREA CULTIVATED, REGION III
SOUTH VIETNAM, 1959/60 TO 1968/69 WITH PROJECTIONS TO 1979/80

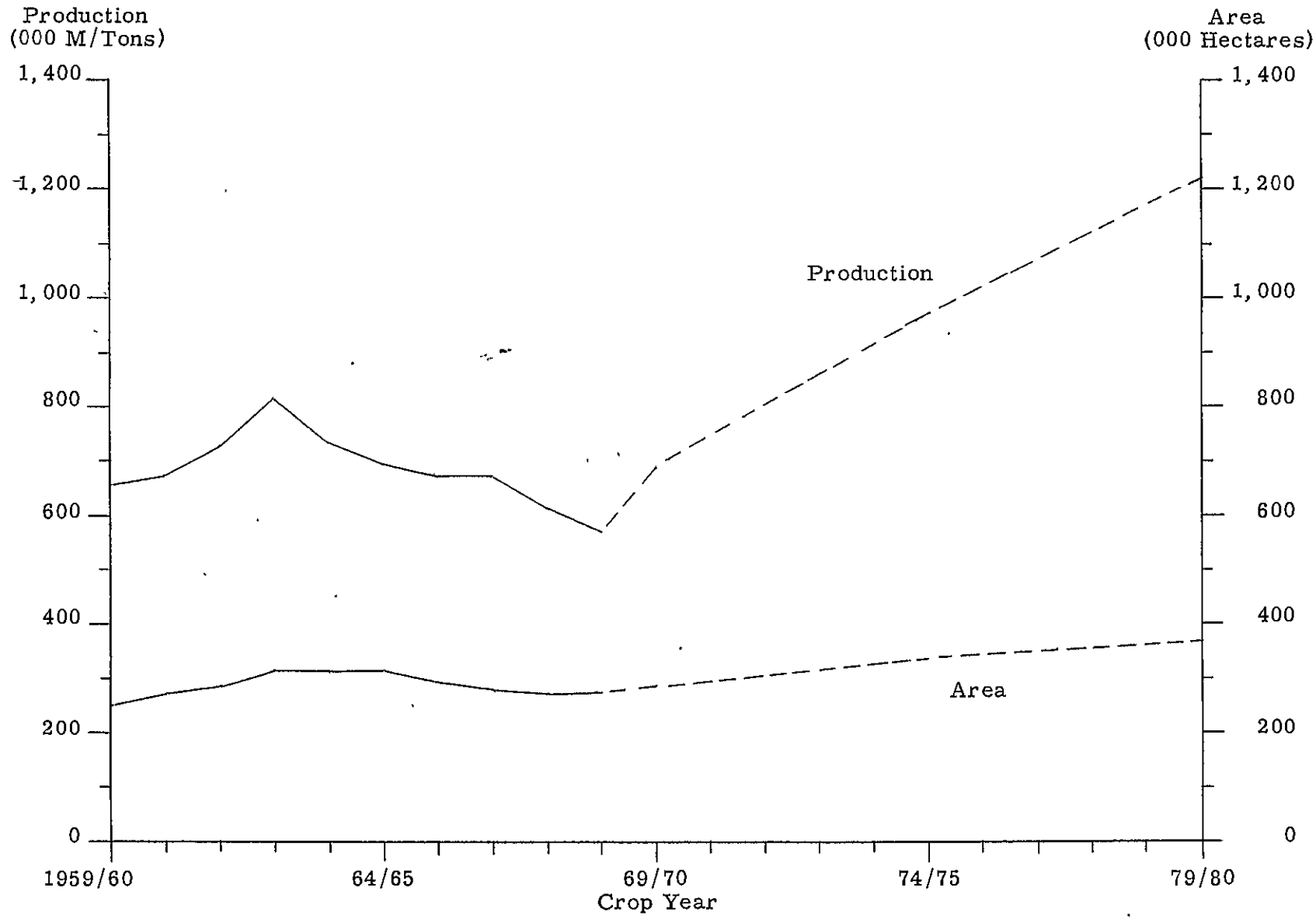


FIGURE XXVI

RICE PRODUCTION AND AREA CULTIVATED, REGION II
SOUTH VIETNAM, 1959/60 TO 1968/69 WITH PROJECTIONS TO 1979/80

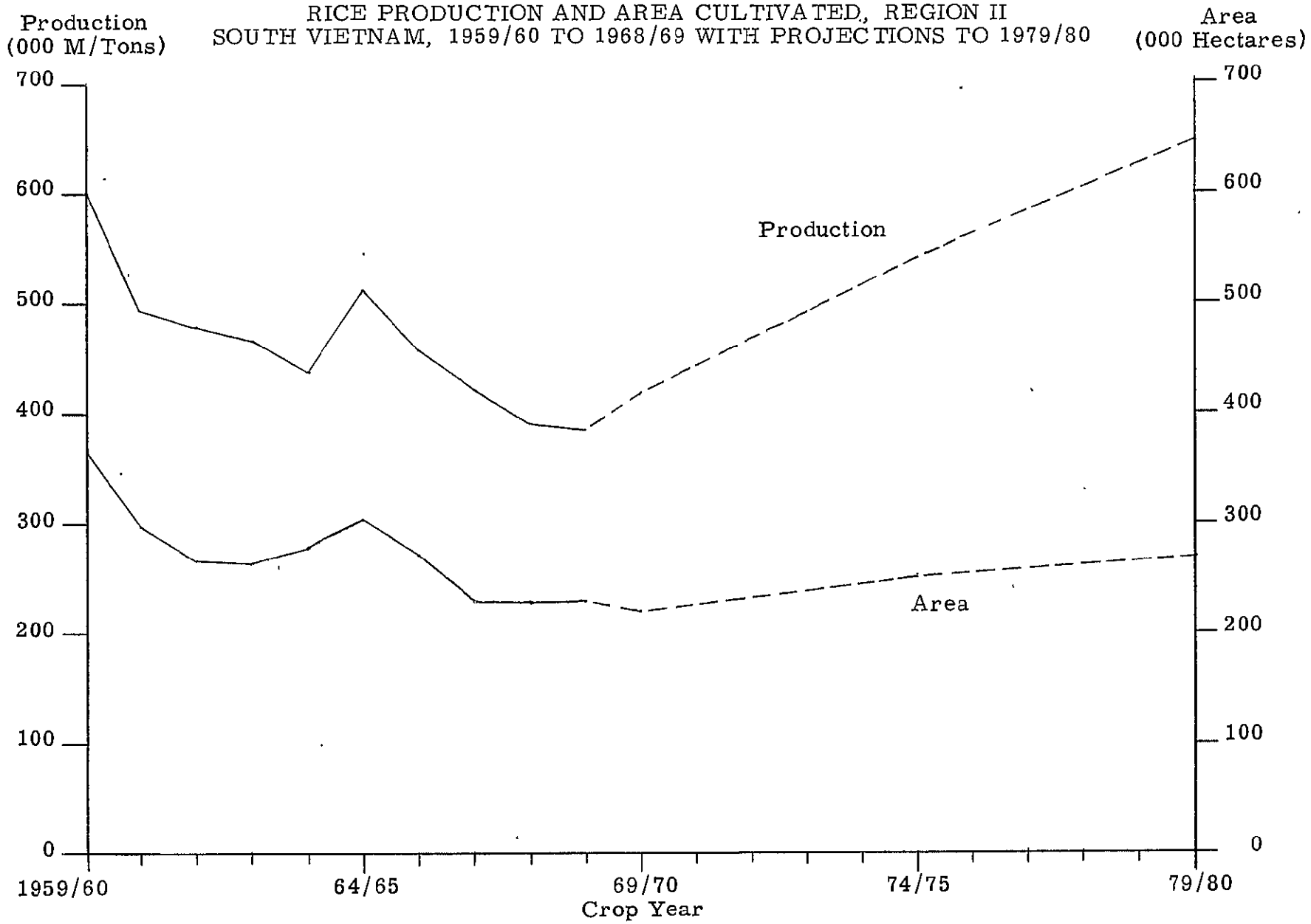


FIGURE XXVII

RICE PRODUCTION AND AREA CULTIVATED, REGION I
SOUTH VIETNAM, 1959/60 TO 1968/69 WITH PROJECTIONS TO 1979/80

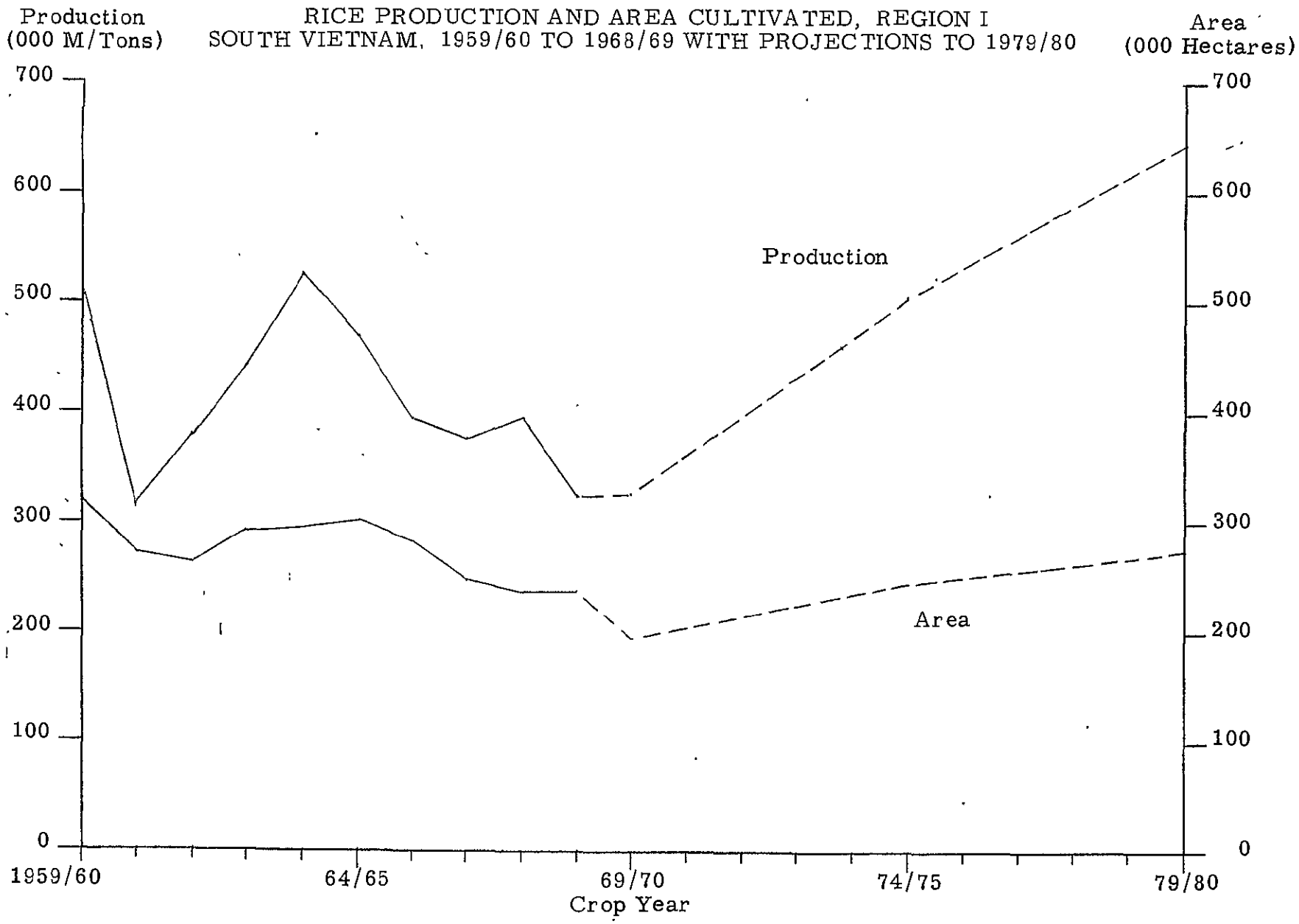
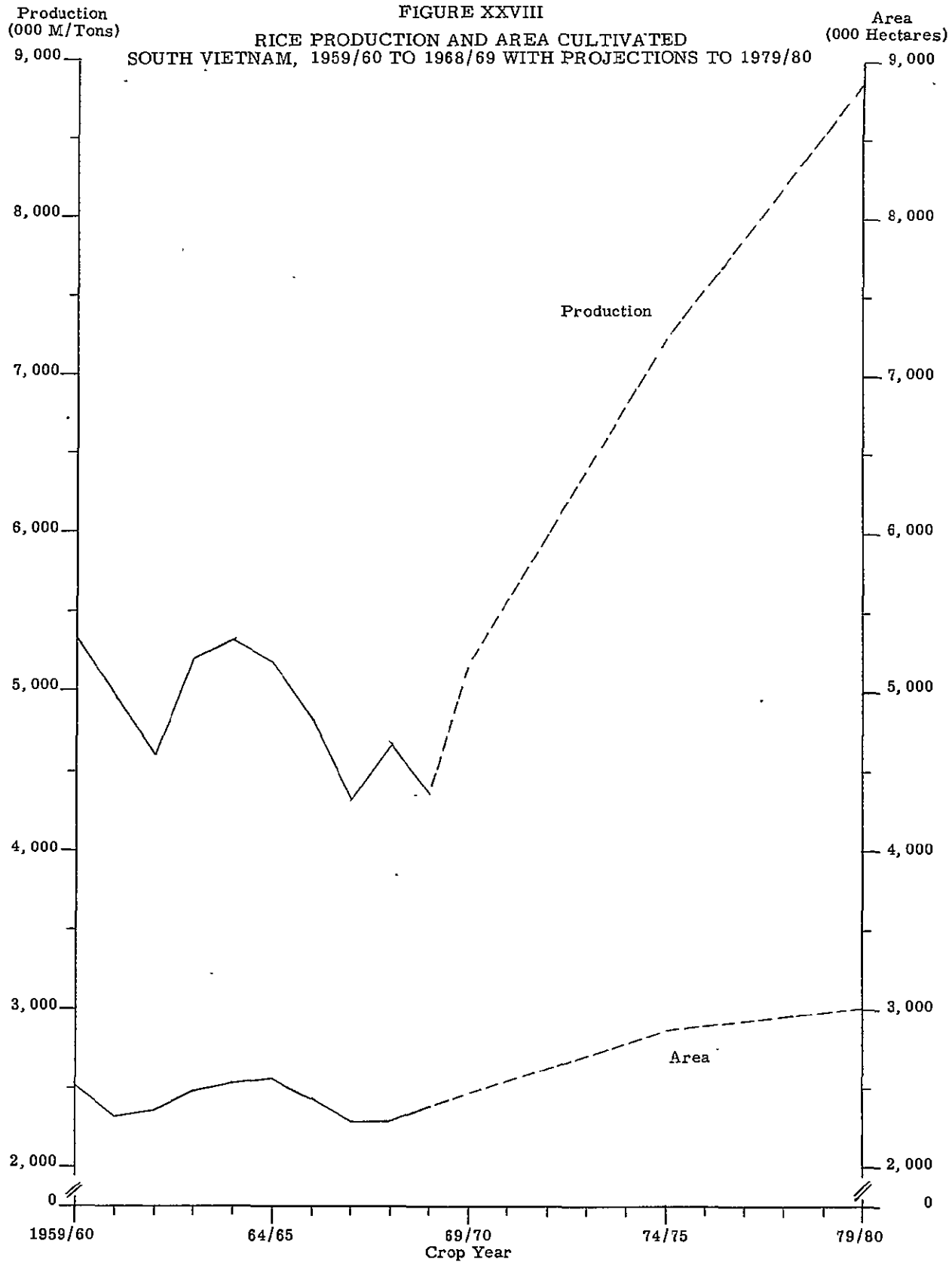


FIGURE XXVIII

RICE PRODUCTION AND AREA CULTIVATED
SOUTH VIETNAM, 1959/60 TO 1968/69 WITH PROJECTIONS TO 1979/80



Projections of areas planted to rice, yields per hectare and quantity produced for 1969/70, 1974/75 and 1979/80 for each province, each military region and for South Vietnam are shown in Tables 57, 58 and 59. All provinces, with the exception of Kien Hoa in IV Corps and Kontum in II Corps, are expected to increase in the area planted to rice by 1979/80. Kien Hoa, an important fruit and vegetable producing area, had an estimated 130,000 hectares in rice production in 1969/70 but was expected to decrease to 126,000 hectares in 1974/75 and expected to increase to only 129,000 hectares in 1979/80. Kontum, a highland province, was estimated to have 10,000 hectares in rice cultivation for each of the three periods.

Average provincial yields 2/ ranged from a low of 0.8 metric tons per hectare in Phu Bon province in 1969/70 to a high of 3.9 metric tons per hectare in Bac Lieu province in 1979/80. For the nation, average yields are estimated to increase by approximately three-quarters of a metric ton per hectare by the 1979/80 crop year, increasing from 2.1 metric tons in 1969/70 to 2.9 metric tons in 1979/80. III Corps is expected to have the largest percentage increase in total production and the highest estimated yields per hectare with an increase in yield of 0.9 metric tons per hectare from an expected yield of 2.4 metric tons per hectare in 1969/70 to a yield of 3.3 metric tons per hectare in 1979/80.

2/ Average yields were obtained for each province for the three time periods. These were calculated by multiplying the last five-year average for native varieties by the estimated number of hectares planted to native varieties. The yield factors used for the improved varieties for the Delta provinces were 4.0 metric tons per hectare for the wet season crop and 5.0 metric tons per hectare for the dry season crop. The estimated number of hectares planted to each crop was multiplied by its yield factor. A weighted average yield was calculated from these totals. For upland provinces, the yield factors for improved varieties were 3.0 metric tons per hectare for wet season paddy and 4.0 metric tons per hectare for dry season paddy.

TABLE 57

PROJECTED AREA HARVESTED, YIELD, PRODUCTION, CONSUMPTION AND SURPLUS (OR DEFICIT) FOR RICE BY PROVINCE, SOUTH VIETNAM, 1969/70

Province	Area Harvested	Yield	Production	Hulls, Seed, Feed and Loss a/	Weighted Average Per Capita Consumption Rate b/	Total Human Consumption of Milled Rice	Milled Rice Surplus (or Deficit)	Paddy Equivalent	Population
	(Hectares)	(Metric Tons per Hectare)	(Metric Tons)	(Metric Tons)	(Grams per Day)	(Metric Tons)	(Metric Tons)	(Metric Tons)	
1. Quang Tri	26,500	1.300	34,000	16,000	435	52,000	(34,000)	(57,000)	325,000
2. Thua Thien	42,000	1.600	67,000	32,000	407	102,000	(67,000)	(112,000)	687,000
3. Quang Nam	28,000	2.200	61,000	29,000	396	151,000	(119,000)	(198,000)	1,049,000
4. Quang Tin	33,000	1.400	45,000	22,000	435	70,000	(47,000)	(78,000)	441,000
5 Quang Ngai	64,000	1.800	117,000	56,000	436	116,000	(55,000)	(93,000)	732,000
Total Region I	193,500	1.700	324,000	155,000	416	401,000	(322,000)	(537,000)	3,234,000
6. Binh Dinh	81,000	2.000	160,000	77,000	419	138,000	(55,000)	(92,000)	904,000
7. Phu Yen	33,000	2.200	73,000	35,000	412	50,000	(12,000)	(20,000)	330,000
8. Phu Bon	4,000	800	3,000	1,000	435	11,000	(9,000)	(15,000)	71,000
9. Khanh Hoa	20,000	2.800	55,000	26,000	390	66,000	(37,000)	(62,000)	462,000
10. Quang Duc	3,000	1 300	4,000	2,000	435	5,000	(3,000)	(5,000)	30,000
11. Tuyen Duc	4,000	1.300	5,000	2,000	342	24,000	(21,000)	(35,000)	193,000
12. Ninh Thuan	14,000	2.400	33,000	16,000	435	26,000	(9,000)	(15,000)	183,000
13. Binh Thuan	17,600	2.200	39,000	19,000	401	41,000	(21,000)	(35,000)	281,000
14 Lam Dong	5,000	1.200	6,000	3,000	435	11,000	(0,000)	(13,000)	72,000
15 Darlac	20,000	1 100	22,000	11,000	406	39,000	(28,000)	(47,000)	264,000
16. Pleiku	8,000	1.100	9,000	4,000	435	33,000	(28,000)	(47,000)	207,000
17. Kontum	10,000	1.000	10,000	5,000	435	17,000	(12,000)	(20,000)	107,000
Total Region II	219,600	1.900	419,000	201,000	410	461,000	(243,000)	(406,000)	3,084,000
18. Binh Tuy	5,800	1.600	9,000	4,000	435	11,000	(6,000)	(10,000)	66,000
19. Long Khanh	5,700	2.100	12,000	6,000	435	25,000	(19,000)	(32,000)	155,000
20 Phuoc Long	4,000	1.300	5,000	2,000	435	6,000	(5,000)	(8,000)	48,000
21. Binh Long	2,000	1.500	3,000	1,000	435	12,000	(10,000)	(17,000)	77,000
22. Binh Duong	15,900	2.300	37,000	18,000	435	39,000	(20,000)	(33,000)	244,000
23. Tay Ninh	38,000	2.100	81,000	39,000	435	48,000	(6,000)	(10,000)	300,000
24. Hau Nghia	36,400	2.100	76,000	36,000	435	35,000	5,000	8,000	221,000
25 Long An	95,000	2.800	265,000	127,000	435	56,000	62,000	137,000	350,000
26 Gia Dinh	43,000	2.700	114,000	55,000	358	382,000	(323,000)	(538,000)	2,929,000
27. Bien Hoa	30,400	2.400	72,000	35,000	409	60,000	(23,000)	(38,000)	399,000
28. Phuoc Tuy	7,000	2.300	16,000	8,000	386	26,000	(18,000)	(30,000)	187,000
Total Region III	283,200	2.400	690,000	331,000	386	702,000	(343,000)	(571,000)	4,976,000
29. Kien Tuong	15,900	1.800	27,000	13,000	472	7,000	7,000	12,000	42,000
30. Dinh Tuong	122,000	2.500	310,000	149,000	454	98,000	63,000	105,000	591,000
31. Kien Hoa	130,000	2.000	266,000	129,000	452	92,000	45,000	75,000	558,000
32. Go Cong	46,000	2.200	105,000	50,000	472	31,000	24,000	40,000	162,000
33. Sa Dec	58,000	2.400	140,000	67,000	472	47,000	26,000	43,000	275,000
34. Vinh Long	91,000	2.300	207,000	99,000	472	88,000	20,000	33,000	511,000
35. Vinh Binh	136,000	1.500	205,000	98,000	472	75,000	32,000	53,000	435,000
36. Kien Phong	81,000	1.900	156,000	75,000	472	59,000	22,000	37,000	341,000
37. Chau Doc	111,000	1 500	164,000	79,000	472	86,000	(3,000)	(5,000)	509,000
38. An Giang	168,000	1 700	281,000	135,000	472	90,000	56,000	93,000	522,000
39. Phong Dinh	122,000	2.200	268,000	129,000	440	72,000	57,000	112,000	448,000
40. Ba Xuyen	197,500	2.500	485,000	233,000	450	82,000	190,000	317,000	379,000
41. Kien Giang	123,000	2.100	261,000	125,000	447	63,000	73,000	122,000	387,000
42. Chuong Thien	135,000	2.100	283,000	136,000	472	28,000	119,000	198,000	160,000
43. Bac Lieu	120,000	2.900	342,000	164,000	440	44,000	134,000	223,000	275,000
44. An Xuyen	110,000	2.200	246,000	116,000	439	41,000	87,000	145,000	258,000
Total Region IV	1,768,400	2.100	3,746,000	1,799,000	460	985,000	962,000	1,603,000	5,873,000
TOTAL SOUTH VIETNAM	2,464,700	2.100	5,179,000	2,486,000	421	2,639,000	54,000	89,000	17,167,000

a/ Calculated on 48.0 percent of paddy weight.
b/ Consumption rates based on rates in Table 61.

TABLE 50

PROJECTED AREA HARVESTED, YIELD, PRODUCTION, CONSUMPTION AND SURPLUS (OR DEFICIT) FOR RICE BY PROVINCE, SOUTH VIETNAM, 1974/75

Province	Area Harvested	Yield	Production	Hulls, Seed, Feed and Loss a/	Weighted Average Per Capita Consumption Rate b/	Total Human Consumption of Milled Rice	Milled Rice Surplus (or Deficit)	Paddy Equivalent	Population c/
	(Hectares)	(Metric Tons per Hectare)	(Metric Tons)	(Metric Tons)	(Grams per Day)	(Metric Tons)	(Metric Tons)	(Metric Tons)	
1. Quang Tri	29,500	1.500	43,000	18,000	428	57,000	(32,000)	(53,000)	367,000
2. Thua Thien	51,000	2.200	110,000	46,000	400	114,000	(50,000)	(83,000)	780,000
3. Quang Nam	37,000	2.700	99,000	41,000	309	169,000	(111,000)	(185,000)	1,192,000
4. Quang Tin	51,000	1.900	90,000	41,000	428	78,000	(21,000)	(35,000)	499,000
5. Quang Ngai	75,000	2.100	155,000	64,000	428	129,000	(30,000)	(63,000)	828,000
Total Region I	243,500	2.100	505,000	210,000	409	547,000	(252,000)	(417,000)	3,666,000
6. Binh Dinh	87,000	2.300	203,000	84,000	412	154,000	(35,000)	(58,000)	1,024,000
7 Phu Yen	39,000	2.400	93,000	39,000	405	55,000	(1,000)	(2,000)	375,000
8. Phu Bon	4,600	1.100	5,000	2,000	428	13,000	(10,000)	(17,000)	81,000
9. Khanh Hoa	27,000	3.000	80,000	33,000	384	74,000	(27,000)	(45,000)	525,000
10. Quang Duc	3,600	1.400	5,000	2,000	428	5,000	(2,000)	(3,000)	34,000
11. Tuyen Duc	4,000	1 500	8,000	2,000	337	27,000	(23,000)	(38,000)	220,000
12. Ninh Thuan	16,000	2.500	40,000	17,000	428	29,000	(6,000)	(10,000)	185,000
13. Binh Thuan	18,000	2.700	48,000	20,000	394	46,000	(18,000)	(30,000)	319,000
14. Lam Dong	6,200	1 300	8,000	3,000	428	13,000	(8,000)	(13,000)	81,000
15 Darlac	23,000	1.100	26,000	11,000	399	44,000	(29,000)	(40,000)	299,000
16. Pleiku	13,000	1 200	15,000	6,000	428	37,000	(28,000)	(47,000)	235,000
17. Kontum	10,000	1 100	11,000	5,000	428	19,000	(13,000)	(22,000)	121,000
Total Region II	251,400	2 100	540,000	224,000	403	516,000	(200,000)	(333,000)	3,499,000
10. Binh Tuy	8,400	1.000	15,000	6,000	428	12,000	(3,000)	(5,000)	75,000
19. Long Khanh	6,100	2.600	16,000	7,000	428	27,000	(18,000)	(30,000)	175,000
20. Phuoc Long	8,000	1.100	9,000	4,000	428	9,000	(4,000)	(7,000)	55,000
21. Binh Long	3,200	1 600	5,000	2,000	428	14,000	(11,000)	(18,000)	87,000
22. Binh Duong	19,000	2.600	40,000	20,000	428	43,000	(14,000)	(23,000)	276,000
23. Tay Ninh	41,000	2.600	105,000	44,000	428	53,000	8,000	13,000	339,000
24. Hau Nghia	46,000	2.600	120,000	50,000	428	39,000	31,000	52,000	250,000
25. Long An	107,000	3.200	340,000	141,000	428	62,000	137,000	228,000	396,000
26. Gia Dinh	54,000	3.500	187,000	78,000	352	430,000	(321,000)	(535,000)	3,346,000
27. Bien Hoa	36,000	2.600	101,000	42,000	403	67,000	(8,000)	(13,000)	453,000
28. Phuoc Tuy	9,000	2.900	26,000	11,000	382	30,000	(15,000)	(25,000)	212,000
Total Region III	337,700	2.900	973,000	405,000	380	786,000	(218,000)	(363,000)	5,664,000
29 Kien Tuong	19,000	2.200	41,000	17,000	465	8,000	16,000	27,000	47,000
30. Dinh Tuong	134,000	3.300	408,000	169,000	447	109,000	130,000	217,000	670,000
31 Kien Hoa	126,000	2.600	325,000	135,000	445	103,000	87,000	145,000	632,000
32 Go Cong	50,000	2.900	146,000	61,000	465	35,000	50,000	83,000	200,000
33. Sa Dec	70,000	2 900	201,000	83,000	465	53,000	65,000	108,000	311,000
34. Vinh Long	94,000	2.700	255,000	106,000	465	98,000	51,000	85,000	578,000
35. Vinh Binh	158,000	1.800	292,000	121,000	465	84,000	87,000	145,000	492,000
36. Kien Phong	99,000	2.200	214,000	89,000	465	65,000	60,000	100,000	386,000
37. Chau Doc	132,000	1.900	256,000	106,000	465	98,000	52,000	87,000	575,000
38. An Giang	176,000	2.200	382,000	159,000	465	100,000	123,000	205,000	590,000
39 Phong Dinh	139,000	2 900	403,000	167,000	433	80,000	156,000	260,000	509,000
40. Ba Xuyen	224,000	3.000	671,000	278,000	443	70,000	323,000	538,000	430,000
41. Kien Giang	138,000	2 900	395,000	164,000	440	71,000	160,000	267,000	439,000
42. Chuong Thien	162,000	2.000	466,000	193,000	428	31,000	242,000	403,000	181,000
43. Bac Lieu	141,000	3.400	475,000	197,000	434	49,000	229,000	382,000	312,000
44. An Xuyen	128,000	2.300	298,000	124,000	432	48,000	126,000	213,000	293,000
Total Region IV	1,990,000	2.600	5,228,000	2,169,000	453	1,100,000	1,959,000	3,265,000	6,651,000
TOTAL SOUTH VIETNAM	2,822,600	2.800	7,246,000	3,006,000	414	2,949,000	1,289,000	2,150,000	19,480,000

a/ Calculated on 41.5 percent of paddy weight.
b/ Consumption rates based on rates in Table 61
c/ Table 8.

TABLE 58

PROJECTED AREA HARVESTED, YIELD, PRODUCTION, CONSUMPTION AND SURPLUS (OR DEFICIT) FOR RICE BY PROVINCE, SOUTH VIETNAM, 1979/80

Province	Area Harvested	Yield	Production	Hulls, Seed, Feed and Loss a/	Weighted Average Per Capita Consumption Rate b/	Total Human Consumption of Milled Rice	Milled Rice Surplus (or Deficit)	Paddy Equivalent	Population c/
	(Hectares)	(Metric Tons per Hectare)	(Metric Tons)	(Metric Tons)	(Grams per Day)	(Metric Tons)	(Metric Tons)	(Metric Tons)	
1 Quang Tri	32,000	1.500	49,000	20,000	421	64,000	(35,000)	(53,000)	416,000
2. Thua Thien	56,000	2.600	145,000	59,000	394	127,000	(41,000)	(68,000)	886,000
3. Quang Nam	40,000	2.900	115,000	47,000	383	189,000	(121,000)	(202,000)	1,356,000
4. Quang Tin	60,000	2 400	144,000	59,000	421	87,000	(2,000)	(3,000)	564,000
5. Quang Ngai	84,000	2.300	191,000	78,000	421	144,000	(31,000)	(52,000)	936,000
Total Region I	272,000	2.400	844,000	263,000	403	611,000	(230,000)	(383,000)	4,158,000
6. Binh Dinh	90,000	2.700	239,000	98,000	405	172,000	(31,000)	(52,000)	1,161,000
7 Phu Yen	44,000	2.600	115,000	47,000	398	62,000	6,000	10,000	425,000
8. Phu Bon	4,800	1.300	6,000	2,000	421	14,000	(10,000)	(17,000)	91,000
9. Khanh Hoa	30,000	3.500	104,000	43,000	378	82,000	(21,000)	(35,000)	598,000
10 Quang Duc	3,900	1.500	6,000	2,000	421	6,000	(2,000)	(3,000)	38,000
11 Tuyen Duc	4,000	1 500	6,000	2,000	388	31,000	(27,000)	(45,000)	252,000
12. Ninh Thuan	17,000	2.500	43,000	18,000	421	32,000	(7,000)	(12,000)	309,000
13. Binh Thuan	19,000	3.100	59,000	24,000	388	51,000	(16,000)	(27,000)	363,000
14. Lam Dong	6,800	1.300	9,000	4,000	421	14,000	(9,000)	(15,000)	92,000
15. Darlac	25,000	1.200	31,000	13,000	393	49,000	(31,000)	(52,000)	340,000
16. Pleiku	15,000	1.200	10,000	7,000	421	41,000	(30,000)	(50,000)	266,000
17. Kontum	10,000	1 100	11,000	5,000	421	21,000	(15,000)	(25,000)	136,000
Total Region II	269,500	2.400	647,000	265,000	396	575,000	(193,000)	(323,000)	3,071,000
18. Binh Tuy	9,600	1 900	18,000	7,000	421	13,000	(2,000)	(3,000)	85,000
19 Long Khanh	6,400	3.300	21,000	9,000	421	30,000	(18,000)	(30,000)	190,000
20 Phuoc Long	10,000	1.200	12,000	5,000	421	10,000	(3,000)	(5,000)	62,000
21 Binh Long	3,800	1.600	6,000	2,000	421	15,000	(11,000)	(18,000)	99,000
22. Binh Duong	22,000	2.700	60,000	25,000	421	48,000	(13,000)	(22,000)	312,000
23 Tay Ninh	45,000	3 000	135,000	55,000	421	59,000	21,000	35,000	383,000
24. Hau Nghia	50,000	3.400	169,000	69,000	421	43,000	57,000	95,000	203,000
25. Long An	113,000	3.600	408,000	167,000	421	69,000	172,000	287,000	449,000
26. Gia Dinh	60,000	3.800	226,000	93,000	347	464,000	(351,000)	(585,000)	3,823,000
27 Bien Hoa	39,000	3 400	132,000	54,000	396	74,000	4,000	7,000	514,000
28. Phuoc Tuy	12,000	3.400	41,000	17,000	376	33,000	(9,000)	(15,000)	242,000
Total Region III	370,300	3.300	1,228,000	503,000	373	878,000	(153,000)	(254,000)	6,450,000
29. Kien Tuong	22,000	2.300	51,000	21,000	458	9,000	21,000	35,000	54,000
30 Dinh Tuong	140,000	3.600	497,000	204,000	441	122,000	171,000	285,000	759,000
31. Kien Hoa	129,000	3 200	415,000	170,000	439	115,000	130,000	217,000	717,000
32. Go Cong	53,000	3.300	173,000	71,000	458	39,000	63,000	105,000	233,000
33. Sa Dec	74,000	3 500	256,000	105,000	458	59,000	92,000	153,000	352,000
34. Vinh Long	99,000	3.300	331,000	136,000	458	109,000	86,000	143,000	655,000
35. Vinh Binh	169,000	2 100	353,000	145,000	458	93,000	115,000	192,000	557,000
36. Kien Phong	109,000	2 400	258,000	106,000	458	73,000	79,000	132,000	436,000
37 Chau Doc	144,000	2.200	317,000	130,000	458	109,000	78,000	130,000	651,000
38 An Giang	178,000	2.500	446,000	183,000	458	112,000	151,000	252,000	668,000
39. Phong Dinh	147,000	3.400	505,000	207,000	427	60,000	200,000	347,000	577,000
40 Ba Xuyen	238,000	3.500	822,000	337,000	436	78,000	407,000	678,000	408,000
41. Kien Giang	143,000	3.300	470,000	193,000	433	79,000	198,000	330,000	498,000
42. Chuong Thien	168,000	3.400	575,000	236,000	458	34,000	305,000	508,000	204,000
43. Bac Lieu	148,000	3.900	546,000	224,000	427	55,000	267,000	445,000	354,000
44 An Xuyen	137,000	2.400	334,000	137,000	426	52,000	145,000	242,000	333,000
Total Region IV	2,099,000	3.000	6,349,000	2,605,000	446	1,228,000	2,516,000	4,194,000	7,536,000
TOTAL SOUTH VIETNAM	3,011,300	2.900	8,868,000	3,636,000	408	3,292,000	1,940,000	3,234,000	22,115,000

a/ Calculated on 41.0 percent of paddy weight
b/ Consumption rates based on rates in Table 61.
c/ Table 8.

Utilization

When determining grain storage needs, it is necessary to balance the values derived for projected paddy production of the provinces against the consumption patterns throughout the nation to determine the amount, type and location of grain storage facilities. The consumption of milled rice is the principal form in which rice is consumed and the achievement of the highest yield of good quality milled rice from the crop of paddy is the primary objective of any rice economy.

Losses

In addition to milled rice, the utilization of paddy is made up of other factors, some of which are undesirable utilization. The proportion of the paddy which is lost to rice hulls and seed is unavoidable; however, the amount of the crop which is wasted due to storage and transit losses and losses due to insects, rodents and the environmental elements can be controlled. The amount used for animal feed and industrial use will depend to a degree on the rice price situation and the quality of the milling function.

Estimates were made of the present utilization of the rice crop based on observations, interviews and reviews of research from organizations such as FAO, USAID and the Ministry of Land Reform and Agriculture (Table 45, Chapter IX). Projections were made on the utilization of the 1974/75 and 1979/80 rice crops based on the assumption that the rice economy would adopt the recommendations contained in this report (Table 60). Even though the present losses

TABLE 60

UTILIZATION OF HARVESTED PADDY FOR 1969/70 WITH PROJECTIONS TO 1974/75 AND 1979/80, SOUTH VIETNAM a/

Utilization	1969/70	1974/75	1979/80
		(Percent)	
Hulls	20.0	20.0	20.0
Feed (Includes bran and broken rice and paddy used for feed)	16.0	16.0	16.0
Seed	2.0	2.0	2.0
Waste			
Storage loss (insects and rodents)	4.0	1.0	1.0
Transit loss (paddy and milled rice)	4.0	1.5	1.0
Loss of stored milled rice (insects and pilferage)	2.0	1.0	1.0
Industrial Use (Includes broken rice, four and other processed foods)	3.0	3.0	3.0
Milled Rice for human consumption (Includes brokens for low-income consumption)	49.0	55.5	56.0
TOTAL	100.0	100.0	100.0

a/ Projections for 1974/75 and 1979/80 assume the adoption of the facilities and marketing improvements recommended in this report.

from insects, rodents, transit losses and pilferage are not considered unreasonably high as compared with other rice producing countries, these losses are high when it becomes economically feasible to reduce this costly waste.

By constructing the modern facilities as recommended in this report and by implementing a sound program of inventory control throughout the marketing

system, considerable reduction can be achieved in the amount of rice or paddy that is wasted or lost as a result of insects, rodents, transit losses and pilferage. Based on numerous experiences in other parts of the world, it is estimated that these losses can be reduced to a level enjoyed by grain economies operating similar programs in other parts of the world.

With good facilities and controlled conditions, these losses generally can be cut to less than 3.0 percent. An estimated savings of 7.0 percent of the rice crop through the improvement of marketing facilities and changes in the marketing structure is equivalent to increasing production by an equal amount since 7.0 percent more of already produced rice is available for consumption. When equating the tremendous cost of increasing a nation's production of rice by 7.0 percent against the cost of improving facilities to save 7.0 percent of a crop that is already produced, then the decision becomes an obvious one.

Human Consumption

The primary source of consumption of paddy is in the form of milled rice and human consumption accounts for almost one-half of the utilization of the paddy crop in South Vietnam. Consumption rates affect the distribution of the crop and the concentration and location of the population will determine the location of the deficit and surplus areas of the nation. In South Vietnam, consumption rates vary between sections of the country and between rural and urban sectors. The projected consumption rates shown in Table 61 are derived from estimates made by the FAO, USAID and the Ministry of Land Reform and Agriculture.

TABLE 61

PROJECTED PER CAPITA CONSUMPTION RATES OF MILLED RICE
1970, 1975 AND 1980, SOUTH VIETNAM

Area	1970	1975	1980
	(Grams per person per day)		
	Rural Sector		
I Corps	435	428	421
II Corps	435	428	421
III Corps	435	428	421
IV Corps	472	465	458
	Urban Sector		
I Corps	318	314	310
II Corps	318	314	310
III Corps	318	314	310
IV Corps	318	314	310

Most authorities estimate a decreasing trend in per capita rice consumption in the rural and urban areas over the next decade. Most agree that the consumption rates in the Delta are much higher than in other areas and that rural consumption is higher than urban consumption. The consumption rates, as shown in Table 61, are those which were applied to the rice production and utilization projections for the 1969/70, 1974/75 and 1979/80 crop years to determine the surplus or deficit position of each province (Tables 57, 58 and 59).

The data is calculated for each province and the consumption rate for each province represents a weighted average consumption rate based on the percentage of rural and urban population in each province. Population classified as urban included the people living in cities of 50,000 and over. The net production/consumption balances for each province, giving the surplus and deficit position for each province, are shown in Table 62.

TABLE 62

PROJECTED PRODUCTION, CONSUMPTION AND SURPLUS (OR DEFICIT) OF RICE BY PROVINCE, SOUTH VIETNAM, 1970, 1975 AND 1980

Province	Paddy Production			Milled Rice Consumption			Milled Rice Surplus (or Deficit)		
	1970	1975	1980	1970	1975	1980	1970	1975	1980
	(Metric Tons)			(Metric Tons)			(Metric Tons)		
1. Quang Tri	34,000	43,000	49,000	52,000	57,000	64,000	(34,000)	(32,000)	(35,000)
2. Thua Thien	67,000	110,000	145,000	102,000	114,000	127,000	(67,000)	(50,000)	(41,000)
3. Quang Nam	61,000	99,000	115,000	151,000	169,000	189,000	(119,000)	(111,000)	(121,000)
4. Quang Tin	45,000	98,000	144,000	70,000	78,000	87,000	(47,000)	(21,000)	(2,000)
5. Quang Ngai	117,000	155,000	191,000	116,000	129,000	144,000	(55,000)	(36,000)	(31,000)
Total Region I	324,000	505,000	644,000	491,000	547,000	611,000	(322,000)	(252,000)	(230,000)
6 Binh Dinh	160,000	203,000	239,000	138,000	154,000	172,000	(55,000)	(35,000)	(31,000)
7. Phu Yen	73,000	93,000	115,000	50,000	55,000	62,000	(12,000)	(1,000)	6,000
8. Phu Bon	3,000	5,000	6,000	11,000	13,000	14,000	(9,000)	(10,000)	(10,000)
9. Khanh Hoa	55,000	80,000	104,000	66,000	74,000	82,000	(37,000)	(27,000)	(21,000)
10. Quang Duc	4,000	5,000	6,000	5,000	5,000	6,000	(3,000)	(2,000)	(2,000)
11. Tuyen Duc	5,000	6,000	6,000	24,000	27,000	31,000	(21,000)	(23,000)	(27,000)
12 Ninh Thuan	33,000	40,000	43,000	26,000	29,000	32,000	(9,000)	(6,000)	(7,000)
13. Binh Thuan	39,000	48,000	59,000	41,000	46,000	51,000	(21,000)	(18,000)	(16,000)
14 Lam Dong	6,000	8,000	9,000	11,000	13,000	14,000	(8,000)	(8,000)	(9,000)
15. Darlac	22,000	26,000	31,000	39,000	44,000	49,000	(28,000)	(29,000)	(31,000)
16 Pleiku	9,000	15,000	16,000	33,000	37,000	41,000	(28,000)	(28,000)	(30,000)
17. Kontum	10,000	11,000	11,000	17,000	19,000	21,000	(12,000)	(13,000)	(15,000)
Total Region II	419,000	540,000	647,000	461,000	516,000	575,000	(243,000)	(200,000)	(193,000)
18 Binh Tuy	9,000	15,000	18,000	11,000	12,000	13,000	(6,000)	(3,000)	(2,000)
19. Long Khanh	12,000	16,000	21,000	25,000	27,000	30,000	(19,000)	(18,000)	(16,000)
20. Phuoc Long	5,000	9,000	12,000	8,000	9,000	10,000	(5,000)	(4,000)	(3,000)
21. Binh Long	3,000	5,000	6,000	12,000	14,000	15,000	(10,000)	(11,000)	(11,000)
22. Binh Duong	37,000	49,000	60,000	39,000	43,000	48,000	(20,000)	(14,000)	(13,000)
23. Tay Ninh	81,000	105,000	135,000	48,000	53,000	59,000	(6,000)	8,000	21,000
24. Hau Nghia	76,000	120,000	169,000	35,000	39,000	43,000	5,000	31,000	57,000
25. Long An	265,000	340,000	403,000	56,000	62,000	69,000	82,000	137,000	172,000
26 Gia Dinh	114,000	187,000	226,000	362,000	430,000	484,000	(323,000)	(321,000)	(351,000)
27 Bien Hoa	72,000	101,000	132,000	60,000	67,000	74,000	(23,000)	(8,000)	4,000
28. Phuoc Tuy	16,000	26,000	41,000	26,000	30,000	33,000	(18,000)	(15,000)	(9,000)
Total Region III	690,000	973,000	1,228,000	702,000	786,000	878,000	(343,000)	(218,000)	(153,000)
29. Kien Tuong	27,000	41,000	51,000	7,000	8,000	9,000	7,000	16,000	21,000
30. Dinh Tuong	310,000	408,000	497,000	98,000	109,000	122,000	63,000	130,000	171,000
31. Kien Hoa	286,000	325,000	415,000	92,000	103,000	115,000	45,000	87,000	130,000
32. Go Cong	105,000	146,000	173,000	31,000	35,000	39,000	24,000	50,000	63,000
33. Sa Dec	140,000	201,000	256,000	47,000	53,000	59,000	26,000	65,000	92,000
34 Vinh Long	207,000	255,000	331,000	88,000	98,000	109,000	20,000	51,000	86,000
35. Vinh Binh	205,000	292,000	353,000	75,000	84,000	93,000	32,000	87,000	115,000
36. Kien Phong	156,000	214,000	258,000	59,000	65,000	73,000	22,000	60,000	79,000
37. Chau Doc	164,000	256,000	317,000	88,000	98,000	109,000	(3,000)	52,000	78,000
38 An Giang	281,000	382,000	446,000	90,000	100,000	112,000	56,000	123,000	151,000
39 Phong Dinh	268,000	403,000	505,000	72,000	80,000	90,000	67,000	156,000	208,000
40. Ba Xuyen	485,000	671,000	822,000	62,000	70,000	76,000	190,000	323,000	407,000
41. Kien Giang	261,000	395,000	470,000	63,000	71,000	79,000	73,000	160,000	198,000
42. Chuong Thien	283,000	466,000	575,000	28,000	31,000	34,000	119,000	242,000	305,000
43. Bac Lieu	342,000	475,000	546,000	44,000	49,000	55,000	134,000	229,000	267,000
44. An Xuyen	246,000	298,000	334,000	41,000	46,000	52,000	87,000	128,000	145,000
Total Region IV	3,746,000	5,226,000	6,349,000	985,000	1,100,000	1,228,000	962,000	1,959,000	2,516,000
TOTAL SOUTH VIETNAM	5,179,000	7,246,000	8,868,000	2,639,000	2,949,000	3,292,000	54,000	1,289,000	1,940,000

The net balances, expressed in terms of milled rice, show all the provinces in I, II and III Corps to be deficit producing areas for all three periods with the exceptions of Hau Nghia and Long An provinces for all three periods, Tay Ninh province for 1974/75 and 1979/80, and Phu Yen province for 1979/80. All provinces in IV Corps are surplus rice producing areas with the exception of Chau Doc province which is expected to have a small deficit in 1969/70.

A surplus of rice is projected for all three periods with the 1969/70 crop year being almost in balance with a surplus of 54,000 metric tons of rice projected for the entire nation for this period. This surplus represents the miraculous results of an intensified effort on the part of the rice farmers of South Vietnam to increase the nation's production through the adoption of the new varieties and improved cultural practices. Projections for 1974/75 and 1979/80 show a national surplus of 1,289,000 and 1,940,000 metric tons respectively. These estimates are based on the assumption that South Vietnam can enter the world market and that production efforts will restore the nation's comparative advantage in world rice production.

The magnitude of the projected surplus is not as important in developing a grain storage and handling system as the lack of homogeneity between production and consumption throughout the nation. I, II and III Corps are heavily deficit areas and this deficit position for these areas is expected to continue. The task of storing and moving the projected 1974/75 deficit of 670,000 metric tons of milled rice (1,115,000 metric tons of paddy) from the surplus IV Corps area to the northern deficit areas is a tremendous one and will require significant improvements in the present marketing system to efficiently accomplish this task. The facilities and other marketing structure recommendations of this

report are the revisions and additions which the study team feels are necessary to efficiently and effectively perform the various functions on a timely basis.

Estimated Savings

The justification for implementing a modernized grain storage system in South Vietnam is demonstrated in the potential savings these changes can realize for the entire rice economy. Small savings in the marketing of the large quantities of rice and paddy which move in the commercial channels of South Vietnam become large when expressed in total monetary terms. The potential savings based on the projected utilization as shown in Table 60 are applied to the volumes which are estimated to move through the recommended facilities and these values are shown in Table 63.

This represents only the saving which can be realized on the 60 percent of the commercial movement of paddy that is projected for the recommended facilities and does not represent the potential savings that could be realized if all commercial movements of paddy were made through these or similar facilities. Based on these realistic estimates and the present wholesale value of paddy in South Vietnam, the annual savings are estimated at VN $4,995,288,000 or US $42,332,949.

Additional savings can be realized by converting the commercial handling of paddy from bags to bulk. If the recommended system makes it possible to eliminate the need for 80 percent of the bags, the annual savings for bags alone would be VN $512,340,000 or US $4,341,864 (Table 64). It is assumed that bags can be used an average of four trips and the cost of a new jute bag, with a capacity of approximately 67 kilos of paddy, is VN $80 per bag.

TABLE 63

ANNUAL ESTIMATED SAVINGS IN THE REDUCTION OF LOSSES
BY ADOPTION OF THE RECOMMENDED FACILITIES EXPRESSED IN 1974/75 VOLUMES
OF PADDY AND RICE MOVING THROUGH THE RECOMMENDED SYSTEM

Loss Item	Estimated Losses under Present System			Estimated Losses under Recommended System			Total Savings	
	Percent	Tonnage	Value a/	Percent	Tonnage	Value a/	VN Piasters	US Dollars b/
Insects	2.0	42,695	1,537,020,000	1.0	21,348	768,528,000	768,492,000	6,512,644
Rodents	3.0	64,043	2,305,548,000	0.5	10,674	384,264,000	1,921,284,000	16,282,068
Moisture	1.0	21,348	768,528,000	0.5	10,674	384,264,000	384,264,000	3,256,474
Pilferage	2.0	42,695	1,537,020,000	0.5	10,674	384,264,000	1,152,756,000	9,769,119
Transit	2.0	42,695	1,537,020,000	1.0	21,348	768,528,000	768,492,000	6,512,644
TOTAL	10.0	213,476	7,685,136,000	3.5	74,718	2,689,848,000	4,995,288,000	42,332,949

a/ Value based on an average wholesale price for Ordinary Paddy at Can Tho of VN $1,800 per 100 kilograms.
b/ Based on an exchange rate of VN $118 equal to US $1.00.

TABLE 64

ANNUAL ESTIMATED SAVING IN JUTE BAGS
BY THE ADOPTION OF THE RECOMMENDED FACILITIES
EXPRESSED IN TERMS OF 1974/75 VOLUMES OF PADDY

Total volume of paddy through systems (metric tons)	2,134,750
Number of trips per bag	4
Original cost of unused bag	VN $80
Bag cost per trip	VN $20
Bags needed per metric ton of paddy	15
Net bag cost per metric ton	VN $300
Percent of paddy bags eliminated by system	80
Bag savings value per metric ton	VN $240
Total bag savings	
Expressed in South Vietnam currency	VN $512,340,000
Expressed in United States currency a/	US $4,341,864

a/ Value based on an exchange rate of VN $118 equal to US $1.00.

The total annual savings from reduced losses and from the reduction in the use of bags is estimated to be VN$5,507,628,000 or US$46,674,813. Added to these savings are the savings resulting from: (1) the reduction in the cost of operation of grain storage and handling facilities, (2) the improvement in the general efficiency of the rice economy, (3) the improvement in the efficiency of the transport system, and (4) the improvement in the methods of grain distribution. These are the savings that should be considered when justifying the allocations of finances in developing such a program and in establishing the priorities of this program as compared to other worthwhile programs planned for other sectors of the economy of South Vietnam.

CHAPTER XII

RECOMMENDATIONS FOR FACILITIES

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- Major Assembly Facilities
- Port and Transfer Facilities

CHAPTER XII

RECOMMENDATIONS FOR FACILITIES

In the preceding chapters, the magnitude of the grain storage, handling and marketing operation in South Vietnam was described in detail. The major problem areas were outlined and the various means for meeting the nation's foodgrain needs were analyzed. When evaluating the effect of the more significant technological factors on the future production potential for rice for the nation, the analysis indicates an increase in the total rice production beyond that needed for self-sufficiency.

The net gains in the production of rice are expected to increase the volume of marketings manyfold and the present storage and handling systems cannot be expected to handle this significant increase in volume; nor can it possibly protect these precious food stocks from the losses of the elements or of the insects and rodents. New facilities are recommended to meet these urgent needs and to supplement the present system of warehousing and milling facilities. The recommendations are made in the hopes that the private sector of the rice economy which can measure up to acceptable standards will be given the opportunity to implement the facility portion of the recommendations of this report.

Objectives of the Storage System

Any storage and handling system for grains should meet certain basic needs of the economy of the nation. These needs or objectives may vary from

nation to nation or even may vary from area to area within a nation and will depend to a great degree upon the characteristics of the supply and demand for grains in the nation. The objectives of the storage and handling system should be to solve the problems created by the peculiarities of the factors affecting supply and demand. The principal objectives of the recommended storage and handling system for South Vietnam are as follows:

1. To provide additional facilities for the storage, handling and drying of the expected increases in rice production and marketings.

2. To reduce and minimize the losses of rice and other grains from insects, rodents, moisture, heat, pilferage and contamination.

3. To provide the rice economy of the nation with an efficient, reliable and dependable storage and handling system for grain.

4. To provide facilities which can move paddy by the lower cost bulk method.

5. To provide storage inventories of paddy and other grains so that the existing rice mills, feed mills and flour mills can operate more efficiently.

6. To speed the loading and unloading of grains in the congested port areas in order to reduce costs resulting from demurrage and assessments.

7. To provide reliable storage for rice producers and others to assist in their credit requirements.

8. To maintain a reserve supply of rice for the nation.

9. To reduce the marketing costs of rice and other grains.

10. To improve the quality of rice and to provide the facilities to improve the method of standardizing the product.

11. To integrate the recommended facilities with the existing facilities.

12. To provide facilities for exporting rice when production increases result in annual surpluses.

13. To provide facilities to handle imports of other food or feed grains as deemed necessary.

14. To provide a system of accurately controlling and accounting for grain inventories.

15. To provide a basis for the orderly growth of the storage, handling and marketing system.

It should be understood that all the above objectives may not be met with equal ease or success; however, it is important to keep the overall objectives of the system in proper perspective.

Methodology

When developing the recommendations for facilities for storing, handling, drying and marketing grains for South Vietnam, many factors were considered. The present facilities are old, inefficient and, in most instances, poorly located. The result has been a costly storage and distribution system for rice. Costs of performing the various marketing services were of prime consideration in developing the facilities that could most economically perform the service required to meet the increasing needs of the rice economy and at the same time be adaptable to the planned production programs of sorghum and feed grains. The use of port facilities for handling and storing the imports of wheat and corn, as well as the potential exports of rice, received important consideration.

It is impossible now to properly quantify the magnitude of the function to be performed and to place the importance of storage in the grain production and [illegible] plies are deemed necessary. In other words, the amount of storage of grains

in particular, is dictated to a degree by a set of exogenous factors which may be outside the marketing complex; and these should not be ignored. It is important to differentiate between the objectives of fulfilling the function as a whole from the objectives of each individual firm or agency which may be attempting to perform its share of the function, at a profit or preferably at the lowest cost.

The methods of determining total storage needs in any nation, province, state or locality will depend upon the characteristics of the production, marketing and movement functions in the area involved. This should not be confused with the normal operational criteria of the individual firm or agency performing a particular service in the marketing system, which may or may not include the performance of the entire storage function.

It is at this point where methodology is vitally important. Rules of thumb, such as operating ratios and operational models, have no place in determining the magnitude of the storage function to be performed. Familiarity with the marketing and productive habits of the area is essential in analyzing total storage needs. Since grains are bulky and heavy in relation to their value and since transport costs are a major portion of marketing costs, it is important to evaluate the efficiency of the transport system. Harvesting techniques, marketing patterns and processing requirements all affect the length of the storage period which, in turn, controls to a degree the amount and location of storage.

The storage determinates must be clearly defined and economically justified so that storage objectives can be achieved. If this is not adequately done, an investor in storage has every right to question the results of a storage analysis. In evaluating the criteria used in the methodology of determining overall

storage requirements, it is essential that the assumptions originate in the activity complex associated with the determinates of storage and not be based on industry standards of another nation or on a set of standard industry performance goals (such as turnover ratios or break-even analyses). Storage systems based on such operational goals usually produce too much storage since the development of each facility is based on the ideal and realism for the system as a whole is lost.

If the transportation function is ignored in a storage analysis and the analysis is based on operation criteria, the results usually produce a storage system with far greater overall transport costs than a minimal cost system developed on a total marketing functional basis.

For these reasons, the study team has developed the methodology for this storage analysis based on a set of assumptions which also encompass those exogenous factors which affect storage requirements for the nation of South Vietnam. Since these assumptions are characteristic of South Vietnam and may not coincide with those of another rice producing nation of the world, it is impossible to implant a storage system of another nation into the production and marketing climate of South Vietnam and have it work with any degree of efficiency. It also is important that each recommended facility is specially designed to serve the specific needs of each location in South Vietnam and that it is not a standard prototype of a facility which may have been designed for a somewhat similar function in another area of the world.

After diligent study of the production, transportation, marketing, credit and consumption functions of the grain economy of the nation of South Vietnam,

the study team established a set of assumptions which were used to quantify the storage function and to establish the basis for developing the recommended storage, handling and drying system. These assumptions are:

1. The South Vietnamese rice merchant, miller or warehouseman is far more efficient and effective in storing paddy than milled rice; thus, a system designed to store and move rice in the paddy form is more desirable. 1/

2. Paddy can be moved or transported in bulk with slight modifications of the present water and highway transport system.

3. The rice milling capacity of the nation is not sufficient to meet future needs in terms of either quality or quantity.

1/ The study team weighed very carefully the advantages and disadvantages of storing inventories in the form of paddy, brown rice (with the hulls removed) or milled rice. Maintaining inventories in either the brown or milled rice would reduce substantially the amount of transportation and storage facilities needed, as the hulls account for approximately 40 percent by volume. But both brown and milled rice are perishable and should not remain in storage for long periods of time. This is especially true of brown rice, which becomes rancid due to the high oil content in the bran.

In a recent report, An Appraisal of Rice Drying, Storage, Processing, and Marketing in the Philippines, Dr. J. Norman Efferson, recognized authority on rice marketing, stated:

> "Brown rice and milled rice are more perishable and should be moved to the consumer as soon as possible after milling in order to prevent losses. Although rice is frequently stored as brown rice in Japan, Taiwan, and South Korea, the temperature conditions and relative humidity in the Philippines are such that this is dangerous, and if practiced is likely to result in substantial losses."

After carefully considering the above factors, it was decided to recommend that rice inventories be stored in the paddy form and that adequate space be provided at each facility for installing hullers if technology improves so that it becomes feasible to store brown rice.

The study team also gave serious consideration to storing rice inventories in bags in flat warehouses. There were too many advantages to bulk storage, such as reduction in handling costs, elimination of sack costs, more effective insect control and the elimination of losses from rodents; thus, the decision was made to recommend a storage system for South Vietnam that would provide storage, handling and drying facilities for paddy.

4. All grains would immediately become free-moving commodities throughout the nation and would be exempt from all taxes and assessments in the intro- and inter-provincial movement.

5. The grain merchants, millers and warehousemen of South Vietnam are qualified and have the necessary expertise to operate a modern grain storage and handling system after short training of some key employees.

6. South Vietnam will become a surplus rice producing nation before 1974/75.

7. The new facilities recommended for the Delta or for the surplus rice producing areas will handle 60 percent of the surplus paddy in 1974/75 and will handle 75 percent of the surplus paddy by 1979/80.

8. Sixty percent of the paddy that is marketed by the farmer will move to its point of first assembly at the time of harvest.

9. The remaining 40 percent of the paddy that is marketed will move to its point of first assembly according to the following monthly percentages:

October	20 percent	April	7 percent
November	25 percent	May	7 percent
December	15 percent	June	2 percent
January	8 percent	July	2 percent
February	2 percent	August	4 percent
March	3 percent	September	5 percent

10. Harvesting schedules for each province should be determined individually as determined by the rice production schedule and calendar of that province.

11. Present transport equipment is suitable to allow for the movement and location of inventories so that the recommended system could minimize the total amount of storage needed to serve the grain economy.

12. Present warehouse space in Saigon and Cholon would be available for the storage of paddy for short periods of time during the heavy demands on the system.

13. Present warehouse space in the provincial capitals and other major cities was sufficient to store bagged milled rice for local consumption.

14. Deficit areas would consume locally produced rice in rural areas with imports from the Delta used to supply the cities or provincial capitals.

15. All rice consumed on the farm will be stored on the farm.

The above assumptions were based on extensive study and observation by the study team while in South Vietnam and are used as the basis for the recommendations contained in this chapter.

The Recommended System

The recommended system consists of several distinct parts, some of which are conditional upon the other. The conditional recommendations are as follows:

1. Decree that all grains moving on all waterways, highways or railways, or being transported in any form, have free movement throughout the entire nation and not be subject to any tax or assessment whatever based on the movement of the grain by national, provincial, district or local governments; the military; or any of the appointed and elected representatives of these governments. The strict enforcement of this decree is a condition to the implementation of the rest of the recommendations.

2. Establish a Directorate of Foods and Marketing in the Ministry of Land Reform and Agriculture to be charged with the enforcement of the regulations for marketing foods.

The other recommendations are as follows:

1. Construct a system of 16 storage and handling facilities at the following locations: Can Tho, Saigon, Long Xuyen, Phung Hiep, Duc Long, Chau Phu, Soc Trang, Rach Gia, Vinh Loi, Quan Long, Da Nang, Qui Nhon, Cam Ranh, Vinh Long, My Tho and Phu Vinh. This system of storage and handling facilities is strategically located for efficient assembly and distribution of paddy and the maintenance of inventories of paddy for prompt milling and distribution of rice.

2. Integrate the operation of local warehouses in the hamlets and villages of the surplus producing areas to serve as local assembly points for paddy for transfer to the major facilities.

3. Establish, where needed, new local assembly facilities to serve as associated local buying centers for bulk paddy if present facilities are inadequate.

4. Encourage the use of and the adaption of present warehouse space in Saigon and Cholon for short-term storage of paddy during the heavy movement periods.

5. Develop a system for inventory control of the new system so that strict accountability and responsibility can be placed on grain inventories throughout the marketing system.

6. Develop a training program for key personnel in operational management.

7. Establish a warehouse receipt program whereby grain stored in the recommended facilities can be supported by a warehouse receipt which can be used as collateral for a loan for farmers and others. This system should become a part of the activities of the Agricultural Development Bank.

8. Within a newly formed Directorate of Foods and Marketing in the Ministry of Land Reform and Agriculture, establish the machinery and provide the personnel to administer programs in the establishment of:

   (a) Grades and standards.
   (b) Market information.
   (c) Warehouse licensing and control.
   (d) Product movement, storage and quality control.
   (e) Training programs.

9. Implement an experimental program on the development of low-cost farm storage and drying facilities for paddy.

10. Improve and modernize the present storage and rice milling facilities.

Recommendations are made based on the facilities being developed and in use by the 1974/75 crop year. Modifications for these facility recommendations are made to take care of the needs for the 1979/80 period.

Storage Needs for Paddy

Rice is harvested during almost every month of the year in South Vietnam

with the major portion of the harvest occurring in the Delta from November through February. With the introduction of the improved varieties, the production and harvesting patterns are expected to change. The new varieties mature sooner, which will make the principal harvest from September through December and increase the second crop harvest, which will occur during the months of March, April and May. The consumption, however, is rather uniform throughout the year making storage of paddy or rice necessary in order to guarantee the rice millers and consumers a constant supply of the product (Table 65).

In South Vietnam, rice is produced in each of the 44 provinces; however, approximately 70 percent of the rice production is in the Delta region with the cities to the north being in the deficit areas of production. This disparity between the areas of production and consumption also contributes greatly to the storage problem.

The rice millers are interested in a constant supply of paddy and most millers provide some storage facilities for the paddy that is purchased at harvest time. In the hot and humid climate of the nation, the millers and warehousemen have had best results when storing paddy as opposed to storing milled rice. The storage facilities at the rice mills are far from adequate to meet the present needs and with rapid increases in production in the Delta area, the storage problem for paddy is expected to reach the critical stage.

Adequate storage will prevent excessive seasonal price fluctuations--which are beneficial only to the speculators and produce financial chaos for the farmers. If managed properly, good storage will minimize losses of all types. Well-located storage will provide the nation with established market centers and

TABLE 65

PROJECTED SEASONAL PRODUCTION, CONSUMPTION AND SURPLUS (OR DEFICIT) OF PADDY SOUTH VIETNAM, 1975 AND 1980

Month	Production		Consumption a/		Surplus (or Deficit)	
	1975	1980	1975	1980	1975	1980
	(Metric Tons)					
June	191,970	218,130	424,666	469,500	(232,696)	(251,370)
July	---	---	424,666	469,500	(424,666)	(469,500)
August	199,310	390,750	424,666	469,500	(225,356)	(78,750)
September	968,790	1,974,710	424,666	469,500	544,124	1,505,210
October	816,240	1,599,840	424,667	469,500	391,573	1,130,340
November	416,300	316,700	424,667	469,500	(8,367)	(152,800)
December	1,332,820	1,173,390	424,667	469,500	908,153	703,890
January	1,412,980	1,248,170	424,667	469,500	988,313	778,670
February	506,850	353,540	424,667	469,500	82,183	(115,960)
March	545,920	589,770	424,667	469,500	121,253	120,270
April	657,880	756,470	424,667	469,500	233,213	286,970
May	196,940	246,530	424,667	469,500	(227,727)	(222,970)
TOTAL SOUTH VIETNAM	7,246,000	8,868,000	5,096,000	5,634,000	2,150,000	3,234,000

a/ Including losses.

will allow the rice economy to hold inventories and distribute paddy and rice at the most beneficial time and to use the most economical means of transporting the product to the proper consuming centers. Adequate storage of paddy will allow the rice millers to develop mills which can operate at almost 100 percent of capacity. Properly organized storage will assist in standardizing the rice product of the nation, a factor which can significantly decrease marketing costs.

The nation of South Vietnam presently has a subsistence type of rice economy where deficits are served by imports and the bulk of the production is basically consumed in the area where it is produced. As the rice production increases, and the rice economy is again restored to its commercial level, storage will become a more important function. The success of a commercialized rice economy is dependent to a considerable degree upon the marketing system's ability to perform this most important function of storage in an efficient manner. Additional and improved storage for paddy in South Vietnam is essential if the nation expects to support itself in self-sufficiency in rice or to move to the next stage of restoring itself as a major exporter of rice in the future.

Storage Needs for Other Grains

The production of other grains such as corn, sorghum and soybeans has not been significant in the nation of South Vietnam. It has been only recently that emphasis has been given to increasing the production of feed grains in order to support the growing livestock economy. The same is true with the development of flour mills to process imported wheat.

The demands for storage of these grains are not great and, at present,

are limited to the Saigon area. Because the storage facilities for rice or paddy are also located in the production and consumption areas of the minor grains, the storage function for these grains can be performed in the same facilities. The demand for import facilities and inventory storage space for import wheat and import corn can be met in the major rice storage facilities at Saigon; however, the development of any storage system should include these minor grains in the inventory plans.

Facility Recommendations for 1974/75

The facilities recommended for 1974/75 consist of 16 silo type storage and handling units at 16 locations throughout the nation. The system is designed to handle and store paddy in the bulk and is located so that the movement of rice can be in the paddy form as far as it is practical before it is milled and consumed. This philosophy takes advantage of the natural protection of the rice kernel offered by its tough and durable hull. Paddy is less subject to abuse, contamination, infestation, adulteration or pilferage than milled rice. Milled rice is a table-ready product and must be treated like any other consumable food which needs no other processing other than cooking (see footnote, page 216).

The silo facilities are to be constructed of reinforced concrete since concrete offers the most economical non-importable material for constructing the storage units. Concrete minimizes the foreign exchange requirements and also provides the most desirable type of construction for the hot and humid local conditions.

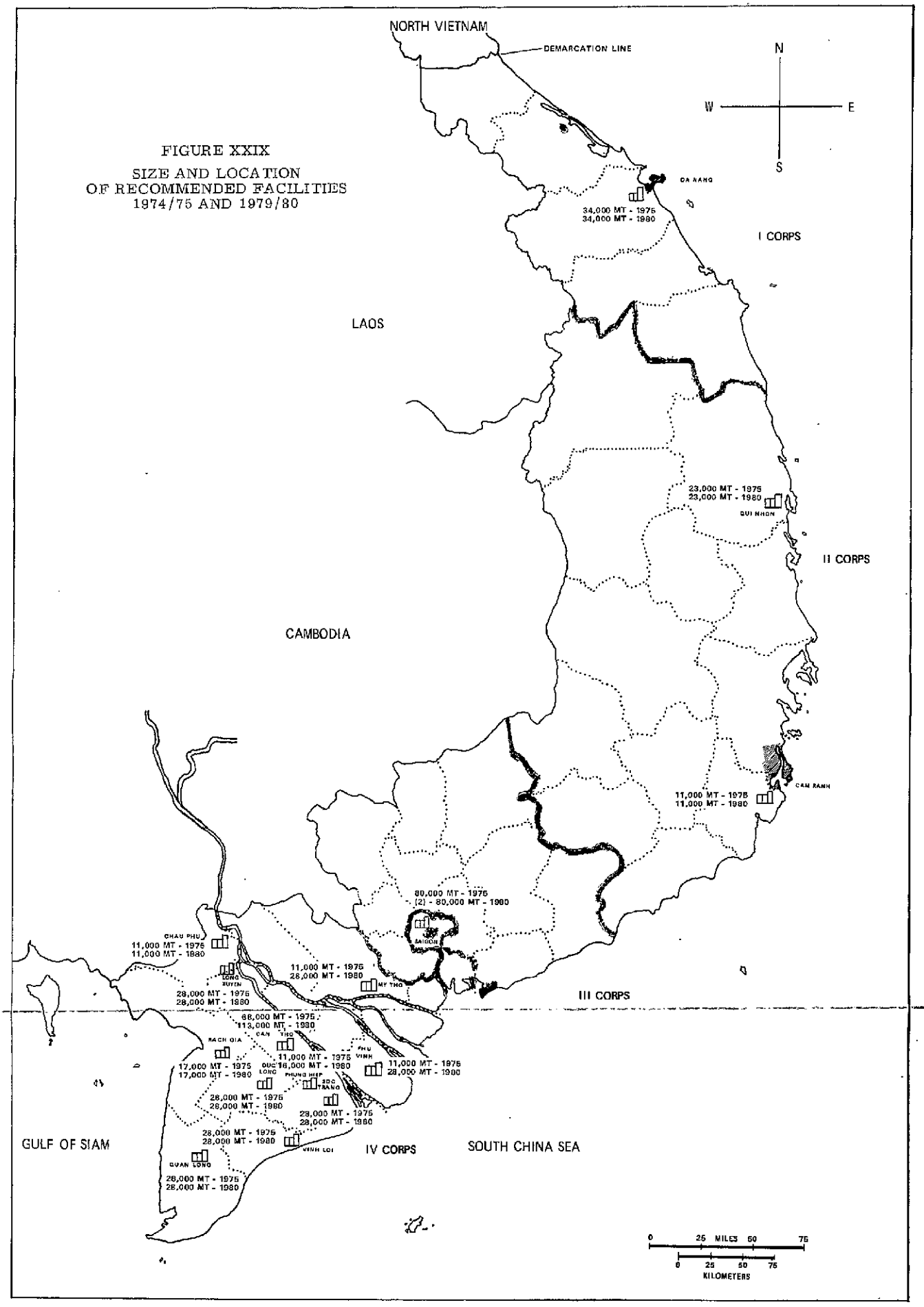
The silo facilities are of two types: (1) assembly facilities for assembling paddy in the surplus producing areas of the Delta for storage and transfer to the deficit areas in the north, and (2) port transfer facilities in the strategic major ports in the deficit areas for storage and transfer of paddy to rice mills located in the port or surrounding areas. The assembly facilities, consisting of a total capacity of 280,000 metric tons are located at Can Tho, Long Xuyen, Phung Hiep, Duc Long, Chau Phu, Soc Trang, Rach Gia, Vinh Loi, Quan Long, Vinh Long, My Tho and Phu Vinh. The transfer facilities, consisting of a total capacity of 148,000 metric tons, are located at Saigon, Da Nang, Qui Nhon and Cam Ranh.

This series of 16 silos totaling 428,000 metric tons of capacity represents the major facilities of the recommended silo system (Figure XXIX). Additional paddy assembly facilities constructed of local materials (either brick, concrete block or wood) are recommended at locations where present assembly warehouses are inadequate, non-esixtent or will need to be replaced at a later date. Although the recommended silo system can operate without the addition of this type of facility, a prototype is presented and recommended for use in case the farmer organizations choose to expand their efforts in the rice marketing and purchasing area. Private rice merchants also may want to develop such a facility to provide the local assembly and transshipment functions of paddy to one of the recommended silo facilities.

The assembly system of silos, with the exception of Vinh Long, My Tho and Phu Vinh, are designed to operate in conjunction with the principal transfer silo at Can Tho. The Can Tho location was selected as the most desirable location for a large storage and transfer facility because its port facilities could

FIGURE XXIX

SIZE AND LOCATION
OF RECOMMENDED FACILITIES
1974/75 AND 1979/80



accommodate the larger coastal vessels and also because Can Tho is located in the center of the surplus rice producing area. The other facilities will assemble rice from farmers and merchants for transfer to Can Tho in the large river and canal boats (the 50- to 300-ton class). The coastal vessels and barges of 1,000- to 5,000-ton capacity will be loaded for direct shipment of paddy to Da Nang, Qui Nhon, Cam Ranh and Saigon. The assembly facilities at Vinh Long, My Tho and Phu Vinh will transfer paddy directly to Saigon.

The Saigon facility is designed to handle either imports or exports of paddy, milled or brown rice, wheat, sorghum or corn in the bulk form. The other port facilities are also designed to receive the various grains in bulk; however, they are not designed as two-way facilities since exports from those areas are not anticipated in the foreseeable future.

The assembly facilities in the Delta and at the Saigon port facility will be equipped with continuous-flow grain dryers to service the anticipated volume of high moisture paddy which will result from the changing production cycle. The storage and handling system is designed to operate at 100 percent of capacity during the five or six heavy movement months with an average annual occupancy of 68.1 percent for the system as a whole.

The port facilities at Da Nang, Qui Nhon and Cam Ranh are designed to maintain approximately a two- or three-week supply of paddy for the deficit areas each of these facilities will serve. The storage and handling facilities are designed to handle peak seasonal needs of loading and unloading paddy and are designed to accommodate the type of transport that is most commonly used

in the area. No new transport equipment will be needed to service the recommended system although it may prove profitable for transport agencies and firms to design special equipment or to modify the existing equipment to better serve the needs of the system.

Certain facilities and equipment are considered to be indispensable in planning the facilities for the storage system for rice. First, since water transportation is so vital to the rice economy of South Vietnam, the design and location of each facility must be such that all water transportation vehicles can be serviced and at the same time have access to good highway transportation. Second, each facility must be equipped with effective fumigation of grains. Third, temperature indicating systems are deemed necessary for the safekeeping of inventories. Fourth, drying facilities at the silo assembly facilities and at the port of Saigon are necessary to condition grain for safe storage. Fifth, each facility should have adequate weighing and testing equipment to facilitate a fair and equitable means of arriving at the value of each lot of grain when the responsibility for the care of the grain is transferred.

The recommended storage and handling system is expected to handle 2,134,760 metric tons of paddy in the 1974/75 crop year--much of which will be handled two or more times. The annual flow of paddy through the recommended facilities is shown in Figure XXX. This volume represents approximately 30 percent of the projected production of 7,246,000 metric tons of paddy during that crop year. A discussion of the recommended facilities to meet the projected needs of the 1974/75 crop year follows:

Major Assembly Facilities

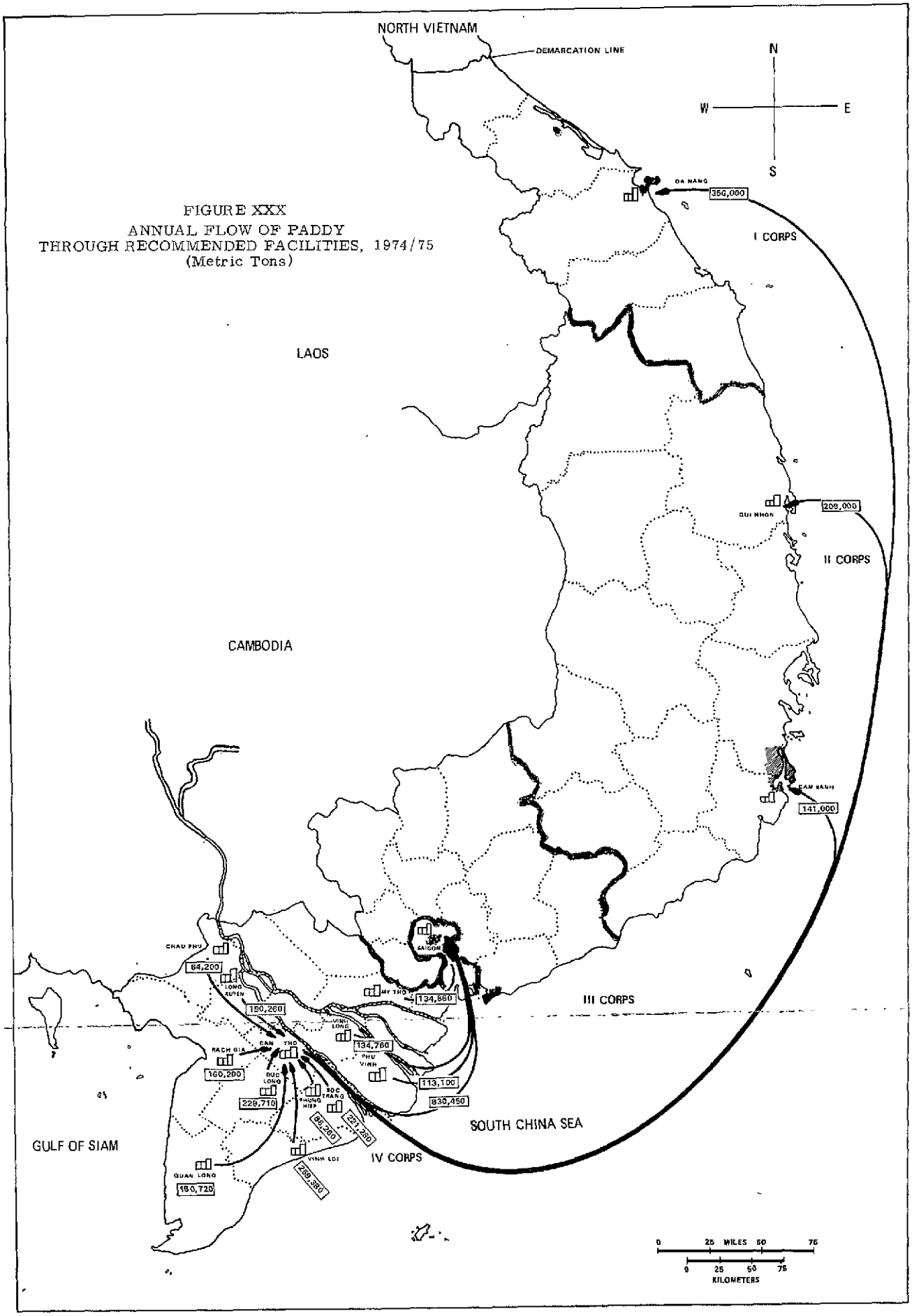


FIGURE XXX
ANNUAL FLOW OF PADDY
THROUGH RECOMMENDED FACILITIES, 1974/75
(Metric Tons)

Can Tho

A concrete silo with a capacity of 68,000 metric tons of paddy is recommended for the Can Tho area. The facility should be located on the Bassac River where it can receive paddy from small sampans, canal and river boats, trucks or other means of land transport and should be able to load out paddy to the 1,000- to 5,000-ton coastal vessel class. It is necessary that the facilities are designed so that the receiving and loading out functions can be performed simultaneously when necessary. The facility should be equipped to weigh, grade, dry, fumigate and clean paddy in the quantities which are expected to be received. The projected annual volume through the Can Tho facility in 1974/75 is 1,536,450 metric tons of paddy. The seasonal flow of paddy by origin and destination is shown in Table 66.

The maximum intake from farmers and agents is expected to be approximately 29,000 metric tons per month with approximately 80 percent received by water and 20 percent received by truck or other type of land transport. Transfers from other facilities are expected to be approximately 184,000 metric tons in the peak month and all will be received in canal and river boats. The facility should be able to handle the peak volume load out of approximately 210,000 metric tons of paddy per month.

Soc Trang

A concrete silo facility with a capacity of 28,000 metric tons of paddy is recommended for the Soc Trang area. The facility should be located on a major canal and have access to the major highway so that paddy can be received from

TABLE 66

PADDY FLOW THROUGH THE CAN THO FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake													Offtake					Month End Inventory
	Phong Dinh Province	Vinh Long Province	Sa Dec Province	Total Intake Direct from Provinces	Transfer from Phung Hiep Facility	Transfer from Duc Long Facility	Transfer from Chau Phu Facility	Transfer from Soc Trang Facility	Transfer from Quan Long Facility	Transfer from Vinh Loi Facility	Transfer from Rach Gia Facility	Transfer from Long Xuyen Facility	Total Intake	Saigon Facility	Cam Ranh Facility	Qui Nhon Facility	Da Nang Facility	Total Offtake	
	(Metric Tons)																		
June	1,061	163	156	1,380	4,706	10,837	5,514	10,770	10,205	11,076	9,282	13,522	77,292	49,842	13,050	11,900	18,500	93,292	31,000
July	1,061	163	155	1,379	4,706	10,837	5,514	10,770	10,205	11,076	9,282	13,523	77,292	45,842	11,050	12,900	23,500	93,292	15,000
August	2,121	2,407	1,944	6,472	3,413	9,676	4,266	0,540	9,412	10,150	10,253	15,327	78,509	33,759	10,550	14,000	34,300	93,509	0
September	16,973	3,346	2,721	23,040	10,435	22,025	4,222	25,737	9,953	29,257	16,622	14,289	155,580	56,330	9,950	16,000	48,300	130,500	25,000
October	25,724	1,632	1,555	28,911	11,260	22,195	5,136	28,341	14,135	29,376	20,234	15,221	174,799	65,749	11,450	19,300	48,300	144,799	55,000
November	13,260	2,040	1,944	17,244	10,113	22,971	8,583	28,128	15,072	29,938	20,632	26,180	178,861	74,111	10,950	35,500	48,300	168,861	65,000
December	15,912	2,326	1,983	20,221	10,486	23,808	8,698	28,559	25,815	29,086	20,030	27,209	194,812	140,262	10,550	18,500	23,500	192,812	67,000
January	16,973	3,101	2,605	22,679	10,740	30,781	9,900	29,428	25,098	20,919	19,544	27,535	206,524	155,474	11,350	18,200	21,500	206,524	67,000
February	13,790	2,611	2,139	18,540	6,797	25,268	514	13,012	13,511	25,045	6,088	4,827	113,602	40,552	13,750	26,000	33,300	113,602	67,000
March	10,343	857	1,516	12,716	5,540	17,918	771	12,225	5,322	10,682	8,651	4,422	86,247	63,097	12,650	12,000	18,500	106,247	47,000
April	11,669	1,183	2,061	14,913	6,593	22,971	4,807	14,574	5,871	23,614	11,213	13,892	118,448	54,398	12,650	11,900	19,500	98,448	67,000
May	3,713	571	661	4,945	3,471	10,433	0,275	10,196	5,221	11,261	8,369	14,313	74,484	51,034	13,050	11,900	18,500	94,484	47,000
TOTAL	132,600	20,400	19,440	172,440	88,260	229,710	64,200	221,280	150,720	259,380	150,200	190,260	1,536,450	630,450	141,000	209,000	356,000	1,536,450	46,083 a/

a/ Average

farmers and agents by water in small sampans and other canal and river boats and by truck or other means of land transport. The facility should be able to load out to larger river and canal boats and to trucks for the transfer of paddy to rice mills in the area and principally to the Can Tho facility. The facility should be designed so that the receiving and loading out functions can be performed simultaneously. The facility should be equipped to weigh, grade, dry, fumigate and clean paddy in the quantities which are expected to be received. The projected annual volume through the Soc Trang facility in 1974/75 is 221,280 metric tons of paddy. The seasonal flow of paddy, listing the provincial origin and facility destinations, is shown in Table 67.

The maximum intake from farmers and agents is expected to be approximately 40,000 metric tons per month with approximately 75 percent received by water and 25 percent received by truck or other type of land transport. The maximum monthly load out is expected to be approximately 30,000 metric tons per month with most of the paddy moving out to Can Tho by water transport.

Quan Long

A concrete silo facility with a capacity of 28,000 metric tons of paddy is recommended for the Quan Long area. The facility should be located on a major canal and have access to the major highway so that paddy can be received from farmers and agents by water in small sampans and other canal and river boats and by truck or other means of land transport. The facility should be able to load out to larger river and canal boats and to trucks for the transfer of paddy to rice mills in the area and principally to the Can Tho facility. The facility

TABLE 67

PADDY FLOW THROUGH THE SOC TRANG FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake			Offtake to Can Tho Facility	Month End Inventory
	Bac Lieu Province	Ba Xuyen Province	Total Intake		
	(Metric Tons)				
June	92	1,678	1,770	10,770	15,000
July	92	1,678	1,770	10,770	6,000
August	183	3,357	3,540	9,540	0
September	1,398	24,339	25,737	25,737	0
October	2,154	38,187	40,341	28,341	12,000
November	1,146	20,982	22,128	28,128	6,000
December	1,238	45,321	46,559	28,559	24,000
January	1,535	31,893	33,428	29,428	28,000
February	1,261	11,751	13,012	13,012	28,000
March	894	11,331	12,225	12,225	28,000
April	1,146	13,428	14,574	14,574	28,000
May	321	5,875	6,196	10,196	24,000
TOTAL	11,460	209,820	221,280	221,280	16,583 a/

a/ Average.

should be designed so that the receiving and loading out functions can be performed simultaneously. The facility should be equipped to weigh, grade, dry, fumigate and clean paddy in the quantities which are expected to be received. The projected annual volume through the Quan Long facility in 1974/75 is 150,720 metric tons of paddy. The seasonal flow of paddy, listing the provincial origin and facility destinations, is shown in Table 68.

The maximum intake from farmers and agents is expected to be approximately 41,000 metric tons per month with approximately 80 percent received by water and 20 percent received by truck and other type of land transport. The maximum monthly load out is expected to be approximately 26,000 metric tons per month with most of the paddy moving out to Can Tho by water transport.

Duc Long

A concrete silo facility with a capacity of 28,000 metric tons of paddy is recommended for the Duc Long area. The facility should be located on a major canal and have access to the major highway so that paddy can be received from farmers and agents by water in small sampans and other canal and river boats and by truck or other means of land transport. The facility should be able to load out to larger river and canal boats and to trucks for the transfer of paddy to rice mills in the area and principally to the Can Tho facility. The facility should be designed so that the receiving and loading out functions can be performed simultaneously. The facility should be equipped to weigh, grade, dry, fumigate and clean paddy in the quantities which are expected to be received. The projected annual volume through the Duc Long facility in 1974/75 is 229,710 metric tons of paddy. The seasonal flow of paddy, listing the provincial origin and facility destinations, is shown in Table 69.

TABLE 68

PADDY FLOW THROUGH THE QUAN LONG FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake			Offtake to Can Tho Facility	Month End Inventory
	An Xuyen Province	Bac Lieu Province	Total Intake		
			(Metric Tons)		
June	1,022	183	1,205	10,205	16,000
July	1,022	183	1,205	10,205	7,000
August	2,045	367	2,412	9,412	0
September	7,157	2,796	9,953	9,953	0
October	14,825	4,310	19,135	14,135	5,000
November	12,780	2,292	15,072	15,072	5,000
December	38,340	2,475	40,815	25,815	20,000
January	30,927	3,071	33,998	25,998	28,000
February	10,990	2,521	13,511	13,511	28,000
March	1,534	1,788	3,322	5,322	26,000
April	3,579	2,292	5,871	5,871	26,000
May	3,579	642	4,221	5,221	25,000
TOTAL	127,800	22,920	150,720	150,720	15,500 a/

a/ Average.

TABLE 69

PADDY FLOW THROUGH THE DUC LONG FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake from Chuong Thien Province	Offtake to Can Tho Facility	Month End Inventory
		(Metric Tons)	
June	1,837	10,837	15,000
July	1,837	10,837	6,000
August	3,676	9,676	0
September	28,025	22,025	6,000
October	43,185	22,185	27,000
November	22,971	22,971	27,000
December	24,808	23,808	28,000
January	30,781	30,781	28,000
February	25,268	25,268	28,000
March	17,918	17,918	28,000
April	22,971	22,971	28,000
May	6,433	10,433	24,000
TOTAL	229,710	229,710	20,417 a/

a/ Average.

The maximum intake from farmers and agents is expected to be approximately 44,000 metric tons per month with approximately 75 percent received by water and 25 percent received by truck and other type of land transport. The maximum monthly load out is expected to be approximately 31,000 metric tons per month with most of the paddy moving out to Can Tho by water transport.

Long Xuyen

A concrete silo facility with a capacity of 28,000 metric tons of paddy is recommended for the Long Xuyen area. The facility should be located on the river and have access to the major highway so that paddy can be received from farmers and agents by water in small sampans and other canal and river boats and by truck or other means of land transport. The facility should be able to load out to larger river and canal boats and to trucks for the transfer of paddy to rice mills in the area and principally to the Can Tho facility. The facility should be designed so that the receiving and loading out functions can be performed simultaneously. The facility should be equipped to weigh, grade, dry, fumigate and clean paddy in the quantities which are expected to be received. The projected annual volume through the Long Xuyen facility in 1974/75 is 190,260 metric tons of paddy. The seasonal flow of paddy, listing the provincial origin and facility destinations, is shown in Table 70.

The maximum intake from farmers and agents is expected to be approximately 40,000 metric tons per month with approximately 75 percent received by water and 25 percent received by truck and other type of land transport. The maximum monthly load out is expected to be approximately 28,000 metric tons per month with most of the paddy moving out to Can Tho by water transport.

TABLE 70

PADDY FLOW THROUGH THE LONG XUYEN FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake					Offtake to Can Tho Facility	Month End Inventory
	Kien Tuong Province	An Giang Province	Sa Dec Province	Kien Phong Province	Total Intake		
	(Metric Tons)						
June	39	984	259	240	1,522	13,522	16,000
July	39	984	260	240	1,523	13,523	4,000
August	311	6,396	3,240	1,380	11,327	15,327	0
September	447	7,626	4,536	1,680	14,289	14,289	0
October	389	9,840	2,592	2,400	15,221	15,221	0
November	952	24,108	3,240	5,880	34,180	26,180	8,000
December	1,021	28,044	3,304	6,840	39,209	27,209	20,000
January	593	24,600	4,342	6,000	35,535	27,535	28,000
February	39	984	3,564	240	4,827	4,827	28,000
March	58	1,476	2,528	360	4,422	4,422	28,000
April	486	7,872	3,434	2,100	13,892	13,892	28,000
May	486	10,086	1,101	2,640	14,313	14,313	28,000
TOTAL	4,860	123,000	32,400	30,000	190,260	190,260	15,667 a/

a/ Average.

Vinh Loi

A concrete silo facility with a capacity of 28,000 metric tons of paddy is recommended for the Vinh Loi area. The facility should be located on a major canal and have access to the major highway so that paddy can be received from farmers and agents by water in small sampans and other canal and river boats and by truck or other means of land transport. The facility should be able to load out to larger river and canal boats and to trucks for the transfer of paddy to rice mills in the area and principally to the Can Tho facility. The facility should be designed so that the receiving and loading out functions can be performed simultaneously. The facility should be equipped to weigh, grade, dry, fumigate and clean paddy in the quantities which are expected to be received. The projected annual volume through the Vinh Loi facility in 1974/75 is 259,380 metric tons of paddy. The seasonal flow of paddy, listing the provincial origins and facility destinations, is shown in Table 71.

The maximum intake from farmers and agents is expected to be approximately 48,000 metric tons per month with approximately 84 percent received by water and 16 percent received by truck and other type of land transport. The maximum monthly load out is expected to be approximately 30,000 metric tons per month with most of the paddy moving out to Can Tho by water transport.

Rach Gia

A concrete silo facility with a capacity of 17,000 metric tons of paddy is recommended for the Rach Gia area. The facility should be located on a major

TABLE 71

PADDY FLOW THROUGH THE VINH LOI FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake			Offtake to Can Tho Facility	Month End Inventory
	Bac Lieu Province	Ba Xuyen Province	Total Intake		
	(Metric Tons)				
June	1,559	517	2,076	11,076	15,000
July	1,559	517	2,076	11,076	6,000
August	3,117	1,033	4,150	10,150	0
September	23,768	7,489	31,257	29,257	2,000
October	36,626	11,750	48,376	29,376	21,000
November	19,482	6,456	25,938	29,938	17,000
December	21,041	13,945	34,986	29,986	22,000
January	26,106	9,813	35,919	29,919	28,000
February	21,430	3,615	25,045	25,045	28,000
March	15,196	3,486	18,682	18,682	28,000
April	19,482	4,132	23,614	23,614	28,000
May	5,454	1,807	7,261	11,261	24,000
TOTAL	194,820	64,560	259,380	259,380	18,250 a/

a/ Average.

canal or river and have access to the major highway so that paddy can be received from farmers and agents by water in small sampans and other canal and river boats and by truck or other means of land transport. The facility should be able to load out to larger river and canal boats and to trucks for the transfer of paddy to rice mills in the area and principally to the Can Tho facility. The facility should be designed so that the receiving and loading out functions can be performed simultaneously. The facility should be equipped to weigh, grade, dry, fumigate and clean paddy in the quantities which are expected to be received. The projected annual volume through the Rach Gia facility in 1974/75 is 160,200 metric tons of paddy. The seasonal flow of paddy, listing the provincial origins and facility destinations, is shown in Table 72.

The maximum intake from farmers and agents is expected to be approximately 28,000 metric tons per month with approximately 65 percent received by water and 35 percent received by truck and other type of land transport. The maximum monthly load out is expected to be approximately 21,000 metric tons per month with most of the paddy moving out to Can Tho by water transport.

Phung Hiep

A concrete silo facility with a capacity of 11,000 metric tons of paddy is recommended for the Phung Hiep area. The facility should be located on a major canal and have access to the major highway so that paddy can be received from farmers and agents by water in small sampans and other canal and river boats and by truck or other means of land transport. The facility should be able to load out to larger river and canal boats and to trucks for the transfer of paddy to rice mills in the area and principally to the Can Tho facility. The facility

TABLE 72

PADDY FLOW THROUGH THE RACH GIA FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake from Kien Giang Province	Offtake to Can Tho Facility	Month End Inventory
		(Metric Tons)	
June	1,282	9,282	8,000
July	1,282	9,282	0
August	10,253	10,253	0
September	17,622	16,622	1,000
October	27,234	20,234	8,000
November	25,632	20,632	13,000
December	24,030	20,030	17,000
January	19,544	19,544	17,000
February	6,088	6,088	17,000
March	8,651	8,651	17,000
April	11,213	11,213	17,000
May	7,369	8,369	16,000
TOTAL	160,200	160,200	17,000 a/

a/ Average.

should be designed so that the receiving and loading out functions can be performed simultaneously. The facility should be equipped to weigh, grade, dry, fumigate and clean paddy in the quantities which are expected to be received. The projected annual volume through the Phung Hiep facility in 1974/75 is 88,260 metric tons of paddy. The seasonal flow of paddy, listing the provincial origins and facility destinations, is shown in Table 73.

The maximum intake from farmers and agents is expected to be approximately 16,000 metric tons per month with approximately 75 percent received by water and 25 percent received by truck and other type of land transport. The maximum monthly load out is expected to be approximately 12,000 metric tons per month with most of the paddy moving out to Can Tho by water transport.

Chau Phu

A concrete silo facility with a capacity of 11,000 metric tons of paddy is recommended for the Chau Phu area. The facility should be located on a major canal or river and have access to the major highway so that paddy can be received from farmers and agents by water in small sampans and other canal and river boats and by truck or other means of land transport. The facility should be able to load out to larger river and canal boats and to trucks for the transfer of paddy to rice mills in the area and principally to the Can Tho facility. The facility should be designed so that the receiving and loading out functions can be performed simultaneously. The facility should be equipped to weigh, grade, dry, fumigate and clean paddy in the quantities which are expected to be received. The projected annual volume through the Chau Phu facility in 1974/75 is 64,200 metric tons of paddy. The seasonal flow of paddy, listing the provincial origins and facility destinations, is shown in Table 74.

TABLE 73

PADDY FLOW THROUGH THE PHUNG HIEP FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake					Offtake to Can Tho Facility	Month End Inventory
	Chuong Thien Province	Phong Dinh Province	Ba Xuyen Province	Vinh Binh Province	Total Intake		
	(Metric Tons)						
June	97	187	387	35	706	4,706	6,000
July	97	187	387	35	706	4,706	2,000
August	193	375	775	70	1,413	3,413	0
September	1,475	2,995	5,617	348	10,435	10,435	0
October	2,273	4,540	8,812	635	16,260	11,260	5,000
November	1,209	2,340	4,842	722	9,113	10,113	4,000
December	1,306	2,808	10,459	913	15,486	10,486	9,000
January	1,620	2,995	7,360	765	12,740	10,740	11,000
February	1,330	2,434	2,711	322	6,797	6,797	11,000
March	943	1,825	2,615	157	5,540	5,540	11,000
April	1,209	2,059	3,099	226	6,593	6,593	11,000
May	338	655	1,356	122	2,471	3,471	10,000
TOTAL	12,090	23,400	48,420	4,350	88,260	88,260	6,667 a/

a/ Average.

TABLE 74

PADDY FLOW THROUGH THE CHAU PHU FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake			Offtake to Can Tho Facility	Month End Inventory
	Chau Doc Province	Kien Phong Province	Total Intake		
	(Metric Tons)				
June	418	96	514	5,514	6,000
July	418	96	514	5,514	1,000
August	2,714	552	3,266	4,266	0
September	3,550	672	4,222	4,222	0
October	4,176	960	5,136	5,136	0
November	10,231	2,352	12,583	8,583	4,000
December	10,962	2,736	13,698	8,698	9,000
January	9,500	2,400	11,900	9,900	11,000
February	418	96	514	514	11,000
March	627	144	771	771	11,000
April	3,967	840	4,807	4,807	11,000
May	5,219	1,056	6,275	6,275	11,000
TOTAL	52,200	12,000	64,200	64,200	6,250 a/

a/ Average.

The maximum intake from farmers and agents is expected to be approximately 14,000 metric tons per month with approximately 75 percent received by water and 25 percent received by truck and other type of land transport. The maximum monthly load out is expected to be approximately 10,000 metric tons per month with most of the paddy moving out to Can Tho by water transport.

Phu Vinh

A concrete silo facility with a capacity of 11,000 metric tons of paddy is recommended for the Phu Vinh area. The facility should be located on a major canal and have access to the major highway so that paddy can be received from farmers and agents by water in small sampans and other canal and river boats and by truck or other means of land transport. The facility should be able to load out to larger river and canal boats and to trucks for the transfer of paddy to rice mills in the area and principally to the Saigon facility. The facility should be designed so that the receiving and loading out functions can be performed simultaneously. The facility should be equipped to weigh, grade, dry, fumigate and clean paddy in the quantities which are expected to be received. The projected annual volume through the Phu Vinh facility in 1974/75 is 113,100 metric tons of paddy. The seasonal flow of paddy, listing the provincial origins and facility destinations, is shown in Table 75.

The maximum intake from farmers and agents is expected to be approximately 23,000 metric tons per month with approximately 55 percent received by water and 45 percent received by truck and other type of land transport. The maximum monthly load out is expected to be approximately 18,000 metric tons per month with most of the paddy moving out to Saigon by river boat.

TABLE 75

PADDY FLOW THROUGH THE PHU VINH FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake			Offtake to Saigon Facility	Month End Inventory
	Vinh Binh Province	Kien Hoa Province	Total Intake		
	(Metric Tons)				
June	661	244	905	3,905	6,000
July	661	244	905	3,905	3,000
August	1,322	487	1,809	4,809	0
September	6,612	4,628	11,240	11,240	0
October	12,067	6,455	18,522	16,522	2,000
November	13,720	3,593	17,313	16,313	3,000
December	17,357	5,481	22,838	16,838	9,000
January	14,547	4,628	19,175	17,175	11,000
February	6,116	792	6,908	6,908	11,000
March	2,975	1,279	4,254	4,254	11,000
April	4,298	1,766	6,064	6,064	11,000
May	2,314	853	3,167	5,167	9,000
TOTAL	82,650	30,450	113,100	113,100	6,333 a/

a/ Average.

Vinh Long

A concrete silo facility with a capacity of 11,000 metric tons of paddy is recommended for the Vinh Long area. The facility should be located on the river and have access to the major highway so that paddy can be received from farmers and agents by water in small sampans and other canal and river boats and by truck or other means of land transport. The facility should be able to load out to larger river and canal boats and to trucks for the transfer of paddy to rice mills in the area and principally to the Saigon facility. The facility should be designed so that the receiving and loading out functions can be performed simultaneously. The facility should be equipped to weigh, grade, dry, fumigate and clean paddy in the quantities which are expected to be received. The projected annual volume through the Vinh Long facility in 1974/75 is 134,760 metric tons of paddy. The seasonal flow of paddy, listing the provincial origins and facility destinations, is shown in Table 76.

The maximum intake from farmers and agents is expected to be approximately 20,000 metric tons per month with approximately 75 percent received by water and 25 percent received by truck and other type of land transport. The maximum monthly load out is expected to be approximately 16,000 metric tons per month with most of the paddy moving out to Saigon by river boat.

My Tho

A concrete silo facility with a capacity of 11,000 metric tons of paddy is recommended for the My Tho area. The facility should be located on the river and have access to the major highway so that paddy can be received from farmers and agents by water in small sampans and other canal and river boats and

TABLE 76

PADDY FLOW THROUGH THE VINH LONG FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake						Offtake to Saigon Facility	Month End Inventory
	Vinh Long Province	Dinh Tuong Province	Kien Tuong Province	Kien Phong Province	Sa Dec Province	Total Intake		
	(Metric Tons)							
June	245	521	65	144	104	1,079	6,079	6,000
July	245	521	65	144	103	1,078	6,078	1,000
August	3,611	1,041	518	828	1,296	7,294	8,294	0
September	5,018	7,161	746	1,008	1,815	15,748	15,748	0
October	2,448	11,458	648	1,440	1,037	17,031	15,031	2,000
November	3,060	9,635	1,588	3,528	1,296	19,107	15,107	6,000
December	3,488	7,031	1,701	4,104	1,322	17,646	15,646	8,000
January	4,651	7,161	989	3,600	1,737	18,138	15,138	11,000
February	3,917	5,208	65	144	1,425	10,759	10,759	11,000
March	1,285	5,469	97	216	1,011	8,078	8,078	11,000
April	1,775	7,291	809	1,260	1,373	12,508	12,508	11,000
May	857	2,603	809	1,584	441	6,294	6,294	11,000
TOTAL	30,600	65,100	8,100	18,000	12,960	134,760	134,760	6,500 a/

a/ Average.

by truck or other means of land transport. The facility should be able to load out to larger river and canal boats and to trucks for the transfer of paddy to rice mills in the area and principally to the Saigon facility. The facility should be designed so that the receiving and loading out functions can be performed simultaneously. The facility should be equipped to weigh, grade, dry, fumigate and clean paddy in the quantities which are expected to be received. The projected annual volume through the My Tho facility in 1974/75 is 134,850 metric tons of paddy. The seasonal flow of paddy, listing the provincial origins and facility destinations, is shown in Table 77.

The maximum intake from farmers and agents is expected to be approximately 26,000 metric tons per month with approximately 80 percent received by water and 20 percent received by truck and other type of land transport. The maximum monthly load out is expected to be approximately 18,000 metric tons per month with most of the paddy moving out to Saigon by river boat.

Port and Transfer Facilities

Saigon

A concrete port silo with a capacity of 80,000 metric tons of paddy is recommended for the port of Saigon. The facility should be located in or adjacent to the port area of Saigon and have dock water draft sufficient in depth to accommodate the type of bulk cargo vessels that can enter the port area. The facility should have excellent access to major highways to accommodate the heavy truck traffic that is necessary to move the volumes of grain which are projected to arrive at this facility. The facility should also provide for access to the railway facilities.

TABLE 77

PADDY FLOW THROUGH THE MY THO FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake					Offtake to Saigon Facility	Month End Inventory
	Kien Hoa Province	Dinh Tuong Province	Go Cong Province	Kien Tuong Province	Total Intake		
	(Metric Tons)						
June	452	521	80	26	1,079	5,079	6,000
July	452	521	80	26	1,079	5,079	2,000
August	905	1,042	159	208	2,314	4,314	0
September	8,596	7,161	1,514	298	17,569	17,569	0
October	11,989	11,457	2,111	259	25,816	17,816	8,000
November	6,673	9,635	1,295	635	18,238	17,238	9,000
December	10,179	7,031	1,853	680	19,743	17,743	11,000
January	8,596	7,161	1,574	395	17,726	17,726	11,000
February	1,470	5,208	438	26	7,142	7,142	11,000
March	2,375	5,468	179	39	8,061	8,061	11,000
April	3,280	7,291	398	324	11,293	11,293	11,000
May	1,583	2,604	279	324	4,790	5,790	10,000
TOTAL	56,550	65,100	9,960	3,240	134,850	134,850	7,500 a/

a/ Average.

The facility should be equipped to receive paddy on transfer from other facilities by large river boats and barges. It is not anticipated that small river boats of under 50 tons will serve this facility. The facility should be able to receive paddy by truck. It is necessary that the facility be designed so that the receiving and loading out functions can be performed simultaneously when necessary. The facility should also be able to receive wheat, sorghum or corn in the bulk form at the same time it is receiving paddy. The same is true with the loading out facilities. The facility should be equipped to weigh, grade, dry, fumigate and clean paddy, wheat, sorghum or corn in the quantities which are expected to be received. The site area selected for the facility should be sufficient in size to include a large rice mill located in such a manner that normal conveying equipment can be used to transfer paddy directly to the rice mill without the need of using truck or other transport facilities.

The projected annual volume of all grain in 1974/75 is 1,668,800 metric tons, of which 1,428,000 metric tons is paddy, 120,000 metric tons is wheat and 120,000 metric tons is corn. The seasonal flow of paddy and other grains, listing the origins of destinations, is shown in Table 78. The maximum monthly intake of paddy from agents in small river boats and trucks is expected to be 40,000 metric tons per month, 75 percent of which will arrive by boat and 25 percent of which will arrive by truck. Maximum monthly transfers from other facilities are expected to reach 206,000 metric tons and all this volume will arrive in boats from the 300- to 5,000-ton size.

The maximum offtake is expected to total 251,000 metric tons, most of which will be transferred by truck to the rice mills and present auxiliary storage in the area. If the large rice mill is constructed in the adjoining area, some

TABLE 78

GRAIN FLOW THROUGH THE SAIGON FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake												
	Long An Province	Go Cong Province	Tay Ninh Province	Hau Nghia Province	Total Intake Direct from Provinces	Transfer from Vinh Long Facility	Transfer from Phu Vinh Facility	Transfer from My Tho Facility	Transfer from Can Tho Facility	Total Intake Paddy	Intake of Import Wheat	Intake of Import Corn	Total Intake All Grains
	(Metric Tons)												
June	1,094	319	62	250	1,725	6,079	3,905	5,079	49,842	66,630	10,000	10,000	86,630
July	1,094	318	62	250	1,724	6,078	3,905	5,079	45,842	62,628	10,000	10,000	82,628
August	2,189	638	453	4,243	7,523	8,294	4,809	4,314	33,759	58,699	10,000	10,000	78,699
September	16,600	6,055	671	4,555	27,971	15,748	11,240	17,569	56,330	128,858	10,000	10,000	148,858
October	25,718	8,446	1,045	5,117	40,326	15,031	16,522	17,816	65,749	155,444	10,000	10,000	175,444
November	33,530	5,179	1,903	5,741	36,353	15,107	16,313	17,238	74,111	169,122	10,000	10,000	179,122
December	18,058	7,410	1,825	4,493	31,786	15,646	16,838	17,743	140,262	222,275	10,000	10,000	242,275
January	24,897	8,295	530	998	32,720	15,138	17,175	17,726	155,474	238,233	10,000	10,000	258,233
February	1,094	1,753	62	2,122	5,031	10,759	6,908	7,142	40,552	70,302	10,000	10,000	90,392
March	1,642	718	94	1,685	4,139	8,078	4,254	8,061	63,097	87,629	10,000	10,000	107,629
April	10,397	1,594	593	873	13,457	12,508	6,064	11,293	54,398	97,720	10,000	10,000	117,720
May	10,397	1,115	500	873	12,885	6,294	5,167	5,790	51,034	81,170	10,000	10,000	101,170
TOTAL	136,800	39,840	7,800	31,200	215,640	134,760	113,100	134,850	830,450	1,428,800	120,000	120,000	1,668,800

Month	Offtake																
	Gia Dinh Province	Bien Hoa Province	Binh Duong Province	Binh Long Province	Phuoc Long Province	Long Khanh Province	Phuoc Tuy Province	Binh Tuy Province	Binh Thuan Province	Lam Dong Province	Quang Duc Province	Total Offtake to Provinces	Offtake Paddy to Mills and Auxiliary Storage a/	Offtake Wheat to Flour Mills	Offtake Corn to Feed Mills	Total Offtake All Grains	Month End Inventory
	(Metric Tons)																
June	50,750	1,600	6,000	2,000	1,500	4,000	3,500	500	4,500	1,600	500	85,450	---	10,000	10,000	105,450	48,473
July	59,750	1,900	6,000	2,000	1,000	4,000	3,500	1,500	3,500	1,600	500	85,250	---	10,000	10,000	105,250	25,851
August	60,750	9,500	2,500	700	1,000	---	3,500	1,000	3,500	1,600	500	84,550	---	10,000	10,000	104,550	0
September	30,830	---	---	---	---	---	1,500	1,000	1,500	1,600	500	36,930	91,928	10,000	10,000	148,858	0
October	29,830	---	---	---	---	3,500	1,500	1,000	1,500	1,600	500	39,430	86,014	10,000	10,000	145,444	30,000
November	31,700	---	---	1,300	---	1,500	1,500	---	1,500	1,600	500	39,600	89,522	10,000	10,000	149,122	60,000
December	31,700	---	---	2,000	---	2,500	1,500	---	1,500	900	---	40,100	182,175	10,000	10,000	242,275	80,000
January	14,000	---	---	2,000	---	1,500	1,500	---	1,500	900	---	21,400	209,540	10,000	10,000	250,940	67,203
February	59,750	---	---	2,000	---	2,500	1,500	---	2,500	1,600	---	69,850	542	10,000	10,000	90,392	67,293
March	50,750	---	---	2,000	1,000	2,500	1,500	---	3,500	---	---	70,250	17,379	10,000	10,000	107,629	67,293
April	48,530	---	2,500	2,000	1,000	4,000	1,500	---	2,500	---	---	62,030	35,690	10,000	10,000	117,720	67,293
May	48,660	---	6,000	2,000	1,500	4,000	2,500	---	2,500	---	---	67,160	14,010	10,000	10,000	101,170	67,293
TOTAL	535,000	13,000	23,000	18,000	7,000	30,000	25,000	5,000	30,000	13,000	3,000	702,000	726,800	120,000	120,000	1,668,800	46,732 b/

a/ Offtake paddy to mills and auxiliary storage for export milling
b/ Average.

paddy will be moved by direct transfer. If rail facilities are developed, special hopper cars can be used to transfer bulk paddy to the rice mills and auxiliary storage in the area. The 251,000 metric ton maximum monthly offtake includes 231,000 metric tons of paddy, 10,000 metric tons of wheat to flour mills in the area and 10,000 metric tons of corn or sorghum to feed mills in the area. A small inventory of paddy, wheat, corn or sorghum is planned for the Saigon facility; however, its major function is unloading and transferring the grain to the various destinations and the facility is not designed for long-term storage for these grains. It is expected that this Saigon port facility will coordinate its storage operation with the existing rice and paddy warehouses in the Saigon and Cholon areas.

Da Nang

A concrete port silo with a capacity of 34,000 metric tons of paddy is recommended for the Da Nang port area. This facility should be located in the port area of Da Nang where it can accommodate the deeper draft ocean vessels. The facility should have access to the major highways to accommodate the trucks that will move the largest proportion of paddy to the rice mills in the area. The facility should also have access to the railway system.

The facility should be equipped to receive paddy in bulk form from the 1,000- to 5,000-ton coastal vessels which are expected to transport the paddy from the Can Tho facility. The facility should be equipped to load out paddy in bulk to either truck or rail facilities. It is necessary that the facility is designed to receive grain and load out grain simultaneously when necessary. The equipment in the facility should be able to handle wheat, corn and sorghum in

case volumes of these grains would arrive in Da Nang should a new flour mill or feed mill create such a demand. The facility should be equipped to weigh, grade, fumigate and clean grain in the quantities which are expected to be received. The site area selected for the facility should be sufficient to include a large rice mill located in such a manner that normal conveying equipment can be used to transfer paddy directly to the rice mill without the need of using truck or other transport facilities.

The projected annual volume of all paddy in 1974/75 is 356,000 metric tons. The seasonal flow of paddy, listing the origin and provincial destinations, is shown in Table 79. The maximum monthly intake of 49,000 metric tons of paddy is designed to equal the identical volume of the offtake for the same month. Inventory levels are expected to maintain an average monthly supply of paddy inventory and this was one of the factors in determining the size of this facility.

Qui Nhon

A concrete port silo with a capacity of 23,000 metric tons of paddy is recommended for the Qui Nhon port area. This facility should be located in the port area of Qui Nhon where it can accommodate the deeper draft ocean vessels. The facility should have access to the major highways to accommodate the trucks that will move most of the paddy to the rice mills in the area. The facility should also have access to the railway system.

The facility should be equipped to receive paddy in bulk form from the 1,000- to 5,000-ton coastal vessels which are expected to transport the paddy

TABLE 79

PADDY FLOW THROUGH THE DA NANG FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake from Can Tho Facility	Offtake					Month End Inventory
		Quang Tri Province	Thua Thien Province	Quang Nam Province	Quang Tin Province	Total Offtake	
	(Metric Tons)						
June	18,500	1,000	4,000	11,500	2,000	18,500	34,000
July	23,500	1,000	9,000	11,500	2,000	23,500	34,000
August	34,300	6,800	11,000	12,500	4,000	34,300	34,000
September	48,300	7,800	11,000	24,500	5,000	48,300	34,000
October	48,300	7,800	11,000	24,500	5,000	48,300	34,000
November	48,300	7,800	11,000	24,500	5,000	48,300	34,000
December	23,500	5,000	4,000	12,500	2,000	23,500	34,000
January	21,500	5,000	4,000	10,500	2,000	21,500	34,000
February	33,300	7,800	5,000	18,500	2,000	33,300	34,000
March	18,500	1,000	4,000	11,500	2,000	18,500	34,000
April	19,500	1,000	5,000	11,500	2,000	19,500	34,000
May	18,500	1,000	4,000	11,500	2,000	18,500	34,000
TOTAL	356,000	53,000	83,000	185,000	35,000	356,000	34,000 a/

a/ Average.

from the Can Tho facility. The facility should be equipped to load out paddy in bulk to either truck or rail facilities. It is necessary that the facility is designed to receive grain and load out grain simultaneously when necessary. The equipment in the facility should be able to handle wheat, corn and sorghum in case volumes of these grains would arrive at Qui Nhon should a new flour mill or feed mill create such a demand. The facility should be equipped to weigh, grade, fumigate and clean grain in the quantities which are expected to be received. The site area selected for the facility should be sufficient to include a large rice mill located in such a manner that normal conveying equipment can be used to transfer paddy directly to the rice mill without the need of using truck or other transport facilities.

The projected annual volume of all paddy in 1974/75 is 209,000 metric tons. The seasonal flow of paddy, listing the origin and provincial destinations, is shown in Table 80. The maximum monthly intake of 36,000 metric tons of paddy is designed to equal the identical volume of the offtake for the same month. Inventory levels are expected to maintain an average monthly supply of paddy inventory and this was one of the factors in determining the size of this facility.

Cam Ranh

A concrete port silo with a capacity of 11,000 metric tons of paddy is recommended for the Cam Ranh port area. This facility should be located in the port area of Cam Ranh where it can accommodate the deeper draft ocean vessels. The facility should have access to the major highways to accommodate the trucks that will move the largest proportion of paddy to the rice mills in the area. The facility should also have access to the railway system.

TABLE 80

PADDY FLOW THROUGH THE QUI NHON FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake from Can Tho Facility	Offtake							Month End Inventory
		Quang Ngai Province	Binh Dinh Province	Kontum Province	Pleiku Province	Phu Bon Province	Phu Yen Province	Total Offtake	
	(Metric Tons)								
June	11,900	1,000	2,500	2,000	5,000	1,300	100	11,900	23,000
July	12,900	2,000	2,500	2,000	5,000	1,300	100	12,900	23,000
August	14,900	2,000	5,500	2,000	4,000	1,300	100	14,900	23,000
September	16,000	3,000	5,500	2,000	4,000	1,300	200	16,000	23,000
October	19,300	4,000	10,500	2,000	1,000	1,500	300	19,300	23,000
November	35,500	15,000	16,500	1,000	1,000	1,700	300	35,500	23,000
December	18,500	9,000	2,500	1,000	4,000	1,700	300	18,500	23,000
January	18,200	8,000	2,500	2,000	4,000	1,500	200	18,200	23,000
February	26,000	16,000	2,500	2,000	4,000	1,400	100	26,000	23,000
March	12,000	1,000	2,500	2,000	5,000	1,400	100	12,000	23,000
April	11,900	1,000	2,500	2,000	5,000	1,300	100	11,900	23,000
May	11,900	1,000	2,500	2,000	5,000	1,300	100	11,900	23,000
TOTAL	209,000	63,000	58,000	22,000	47,000	17,000	2,000	209,000	23,000 a/

a/ Average.

The facility should be equipped to receive paddy in bulk form from the 1,000- to 5,000-ton coastal vessels which are expected to transport the paddy from the Can Tho facility. The facility should be equipped to load out paddy in bulk to either truck or rail facilities. It is necessary that the facility be designed to receive grain and load out grain simultaneously when necessary. The equipment in the facility should be able to handle wheat, corn and sorghum in case volumes of these grains would arrive in Cam Ranh should a new flour mill or feed mill create such a demand. The facility should be equipped to weigh, grade, fumigate and clean grain in the quantities which are expected to be received. The site area selected for the facility should be sufficient to include a large rice mill located in such a manner that normal conveying equipment can be used to transfer paddy directly to the rice mill without the need of using truck or other transport facilities.

The projected annual volume of all paddy in 1974/75 is 141,000 metric tons. The seasonal flow of paddy, listing the origin and provincial destinations, is shown in Table 81. The maximum monthly intake of 14,000 metric tons of paddy is designed to equal the identical volume of the offtake for the same month. Inventory levels are expected to maintain an average monthly supply of paddy inventory and this was one of the factors in determining the size of this facility.

Rural Grain Collection Warehouse

Although the 16 recommended silo facilities constitute the principal facility recommendations of this report, consideration should be given to the further development of the first assembly facilities for grain in South Vietnam.

TABLE 81

PADDY FLOW THROUGH THE CAM RANH FACILITY, SOUTH VIETNAM, 1974/75

Month	Intake from Can Tho Facility	Offtake					Month End Inventory
		Khanh Hoa Province	Darlac Province	Ninh Thuan Province	Tuyen Duc Province	Total Offtake	
	(Metric Tons)						
June	13,050	3,100	6,250	500	3,200	13,050	11,000
July	11,050	3,100	4,250	500	3,200	11,050	11,000
August	10,550	3,100	3,250	1,000	3,200	10,550	11,000
September	9,950	4,300	1,250	1,000	3,400	9,950	11,000
October	11,450	5,300	1,250	1,500	3,400	11,450	11,000
November	10,950	5,300	1,250	1,000	3,400	10,950	11,000
December	10,550	4,300	2,250	1,000	3,000	10,550	11,000
January	11,350	4,100	3,250	1,000	3,000	11,350	11,000
February	13,750	3,100	6,250	1,000	3,400	13,750	11,000
March	12,650	3,100	6,250	500	2,800	12,650	11,000
April	12,650	3,100	6,250	500	2,800	12,650	11,000
May	13,050	3,100	6,250	500	3,200	13,050	11,000
TOTAL	141,000	45,000	48,000	10,000	38,000	141,000	11,000 a/

a/ Average.

At the present time, almost every village or hamlet has some type of paddy warehouse or paddy buying station. As stated earlier in the report, it is anticipated that the small units will act as feeder stations to the silo system and will provide a back-up inventory of paddy which will enable the marketing system to maintain a smoother flow of paddy throughout the year. The study team noted considerable interest on the part of farmer cooperatives and local merchants in modernizing this segment of the paddy storage and handling system.

The transportation of paddy from some of the more remote areas sometimes is limited to the small family boat. In many cases, this type of farmer will not have access to one of the 16 silos and would prefer to have some direct contact with the benefits which the larger silo storage units could provide. A rural warehouse, especially equipped to handle these small quantities, could provide a reliable market for paddy in areas where the distance from the silo is greater than 15 to 20 kilometers.

The number of these new warehouses which would be needed will depend upon the conditions and usability of present facilities in these areas and upon the activity of farmer cooperatives in the structure of the rice marketing system in South Vietnam. In any event, the development of the rural grain collection warehouse should be on the basis of an auxiliary facility to the silo system and should not be developed for the purpose of competing with the silos for the farmers' paddy.

The services performed could be somewhat similar in nature to those of the silo locations, however, on a much lesser and slower scale. The facilities should not be considered as long-term storage but more as handling facilities.

The function of these facilities would be to assemble, dry, weigh, clean and price paddy or other grains so that the product could be loaded out to the larger, lower cost transport facilities which could transfer the grain to the silo facilities or to a local rice mill.

It would be a major benefit to the rice economy if these facilities could be standardized, particularly as far as equipment is concerned. This would make it possible to realize the savings which can be enjoyed through quantity purchases, uniform maintenance procedures and reduced inventories of repair parts.

The Use of Existing Facilities

Although the present facilities would not be sufficient to meet the storage and handling needs of the increased production and marketings of the future, these facilities have served the nation well during the period when production has been low. These warehouses are an essential part of the recommended system and are intended for continued use as milled rice and paddy storage.

The milled rice warehouses in the various provincial and district capitals are expected to continue to serve as inventory centers for milled rice for the areas they serve. The large warehouses in the Cholon and Saigon areas are to be used as auxiliary short-term paddy storage and also serve as inventory space for the local rice mills in the area.

The new silo facilities in the Delta area are intended to handle only 60

percent of the paddy that will be marketed by 1974/75, leaving 40 percent of the paddy to be handled by the present facilities. With the projected 1,959,000 metric tons of surplus paddy in the Delta area for the year 1974/75, 40 percent of this volume would be approximately 784,000 metric tons of surplus paddy to be handled by the existing facilities during that year. These facilities also will be expected to handle the local paddy consumption increase in the urban areas of the Delta, estimated at approximately 150,000 metric tons. This makes a total volume for these existing facilities of approximately 934,000 metric tons of paddy, which is in excess of the amount of paddy these facilities are handling during the 1968/69 crop year.

It is the opinion of the study team that the expertise of the present rice miller and merchant ranks with the best in the world. The small amounts of insect and moisture damage found during the team's inspection and observation in the field testify to this fact. In order that these abilities can continue to serve the rice economy of the nation, it is necessary to not only develop new facilities but to modernize and improve the old facilities so these facilities can continue to be useful and effective. Some of the warehouses can be modified and made suitable for storing bulk paddy. Other warehouses can be improved and partially mechanized so that operating costs can be reduced. Some warehouses are poorly located and can be used to a better advantage for storing other products.

Assistance should be provided to the operators and owners of present suitable rice or paddy warehouse and milling facilities in improving these facilities. Emphasis should be given to:

1. Improving ventilation.

2. Method of fumigating.
3. Reduction of labor costs through mechanization.
4. Converting storages to bulk paddy.
5. Rodent proofing.
6. Implementing modern inventory control procedures.
7. Reduction of broken kernels in milling process.
8. Standardization and blending procedures on milled rice.

Inventory Control

Effective inventory control is a managerial technique that makes it possible to place accountability and responsibility for inventories of grains and volumes of grains in transit. It protects the owner or operator of a facility or a network of facilities against controlled losses, assists in a program of quality maintenance, and assists in the maximum utilization of the facilities under the organization's control.

The development of an effective inventory control system is most often a basic requirement of financing agencies that lend capital for the development and operation of modern grain storage and handling facilities. The control of product flows is as important as the control of capital flow.

Inventory control encompasses the activities which assist in the control of the quantity, quality, location and transfer of inventories of grain throughout a system of storages or with an individual storage and handling unit. It provides a type of continuing or moving balance sheet on the entire operation. It also provides the machinery for allowing a storage and handling system to provide adequate supplies of grains at the most strategic locations at the minimum cost.

An improved system of facilities will contribute to the efficiency of the overall rice economy of South Vietnam only if the improvements can be properly integrated into the present marketing system. Since the functional operation of new and improved facilities will be decidedly different from the operation of the present facilities, the efficiency with which the new facilities are integrated into the rice marketing economy will depend to a great degree upon such facilitating functions as inventory control.

The operation of the recommended facilities is based on the storage philosophy of having moving inventories throughout the entire storage and handling complex. This in itself requires the management of facilities in such a system to initiate good inventory control procedures. The recommended system will undoubtedly handle some stocks of government owned rice or paddy at some time and most governments require good inventory accounting procedures. Lending institutions that finance the credit program for farmers and others, where warehouse receipts represent a claim on stocks of grain, require that the holder of these stocks maintain adequate records and follow good inventory control practices.

Since the operational success of the new facilities which are recommended in this report extends further than the quality and design of the buildings and equipment, it is recommended that prior to the construction and initial operation of any of the facilities a system of inventory control be developed so that it is ready to implement when the first paddy starts moving through the facilities.

Training Program

The level of performance of the personnel who manage any storage or handling system is the principal determinant of its level of success. The performance of each facility depends upon the quality of the personnel who make up the organizational structure of the operation. The successful performance of the management function will depend to a great degree upon the level of competence of the key employees who operate and control the facility or system of facilities as well as upon the competence of management itself.

Because of the "newness" of the facility recommendations to the rice economy of the nation, it is recommended that a training program be developed to train key personnel who will be needed to operate the new facilities and their associated marketing functions. These key personnel should be trained prior to the completion of the first facility. The training program should be timed so that the final training of certain key operative personnel can be coordinated with the installation of equipment in the new facilities. A complete training program should be developed for each job classification needing training, outlining the type, method and depth of training. In some cases, special training will need to be developed in South Vietnam for those employees who need "on-the-job" training. Some foreign training undoubtedly will be needed for certain selected personnel in the higher management classifications.

Since training personnel for the entire rice and paddy marketing economy of the nation may be in the best interest of the nation as a whole, it is recommended that the training program be self-perpetuating and be implemented in the Ministry of Land Reform and Agriculture.

Rice and Paddy Grades and Standards

Establishing an effective program of grades and standards is a necessary facilitating function in the marketing of most agricultural products. Grades and standards are a means of establishing a useful yardstick of quality and salability of a product. For many products, grades and standards afford the buyer and seller the opportunity to exchange the title of the product without the necessity of each party inspecting each individual lot. If the people involved have confidence in the grades and standards for a product and in the independent parties establishing the grade values on the product, it can greatly improve the efficiency of the marketing system.

The grades and standards for rice and paddy in South Vietnam need not be as strict as those used in international trade. Broken kernels, an important grade factor in international trade in rice, do not appear to be an important consideration with the rice consumers in South Vietnam.

The recommended storage and handling system will handle paddy and there are presently no grade standards for paddy in South Vietnam. Most paddy is purchased and valued on its expected yield of milled rice and the grade of milled rice it will produce. Even though the recommended facilities will handle paddy, it will be necessary to establish the grade value of each lot of paddy that is purchased, sold or moved. It will be necessary to establish some sort of grade classification for paddy--even if it is on moisture alone. The problem arises as to who establishes these standards.

It is the recommendation of the study team that a simplified functional

set of grade standards be established for paddy and rice and that these standards be administered by the Ministry of Land Reform and Agriculture. It is recommended that an impartial rice and paddy grader, an employee of the Ministry of Land Reform and Agriculture, be located at each of the recommended facilities and that all paddy moving through these facilities be graded under the supervision of this Ministry of Land Reform and Agriculture employee.

The grading locations also should service the entire industry by establishing grades on samples of paddy and rice which are brought to these impartial government graders for grading by farmers, agents, millers and others. The Ministry of Land Reform and Agriculture should have the responsibility of hiring, licensing and training these grading specialists. This grading function at each of the recommended facilities is considered as a minimum necessity to the successful integration of these facilities with the overall rice marketing system of the nation.

Financing Warehouse Stocks of Rice under the Recommended System

The function of storage of any product requires the storer or owner of the product to invest capital to finance the product while it is being stored. In most areas of the world, grain crops are produced seasonally and are consumed rather uniformly throughout the year; thus, these crops must be stored for certain periods of time so that populations can be assured of a reliable supply of these basic commodities throughout the year. In addition to the problem of seasonal production, the grains usually are not produced in the areas of heavy consumption; thus, expensive transportation is necessary to move the product to its

point of final consumption. Rice, which is a basic food in South Vietnam, is produced seasonally and much of it is not produced where it is consumed; thus, storage and transportation are necessities to assure the urban population a dependable supply of this basic food throughout the year.

If a nation possesses an efficient or an almost perfectly operated transport system, it can minimize the need for large quantities of storage of grains at points other than the areas of production; however, it does not eliminate the need for financing the inventories of grain in storage where ever it may be stored. In South Vietnam, the present transport system is far from perfect and is generally inadequate and undependable; thus, the marketing system will need to provide storage at various levels of the marketing and processing system for rice in the urban areas so that dependable supplies can be available at all times. These supplies or inventories will need to be sufficiently large to offset imperfections in the transport system or unscheduled interruptions in the operation of the transportation network.

The farmers in South Vietnam have small land holdings and, in most cases, cannot afford to construct insect- and rodent-free storage on the farm for all the paddy they produce. At the present time, farmers are forced to relinquish title of a large portion of the marketable rice at the time of harvest to merchants who are professional warehousemen and merchants.

Historically, some of the warehousemen in South Vietnam are also rice millers. These millers fill their warehouses at harvest when the price for paddy to the farmer is lowest. Seasonal price increases of rice have been significant and it has proven extremely profitable for these millers to obtain large

inventories of paddy at harvest. The farmers, on the other hand, neither had the resources nor the facilities to take advantage of this seasonal price increase. In effect, the warehouseman or rice miller in South Vietnam has had a virtual monopoly on the storage function for rice and this, in turn, has had its impact on retail rice prices in South Vietnam for many years.

In many countries of the world, this type of warehousing monopoly has been broken by changes in the structure of the firms and agencies operating in the warehousing field. Technological developments in the storage of grains have made it possible to provide lower cost storage facilities which are efficient and adaptable to various types of locations and various kinds of grains. These developments encourage specialization in the performance of the storage function and increased its interdependency with other marketing functions, such as financing.

Decentralization of the storage function away from major processing centers made it possible to increase the competition in the storage of grains throughout the world. As the amount of storage increased and the amount of windfall profits decreased, warehousemen were willing to hire out storage space. This was especially true when windfall profits from excessive seasonal price increases were less than or equal to the revenues from storage. Although this development brought about a change in the type of ownership of the grains in storage units, it did not relieve the owner of grain the burden of financing his inventories. Thus, the availability of capital became the governing factor on who owned the inventories.

Farmers throughout the world are taking advantage of the opportunity to

receive the benefits of gains resulting from the seasonal price increase of their product by storing for later sale in the hopes that the price increase of their product would be greater than the cost of storage.

In most cases when the farmers started this practice, their storage was on the farm; however, more recently, farmers have stored their products at commercial warehouses that charged for this service. In order to reduce the violent seasonal fluctuations in paddy prices, it is vital and necessary to the marketing system for rice in South Vietnam that farmers can rent storage for their paddy at a fair and reasonable rate. Unless this policy is followed in the strictest sense, construction of new storage facilities would do little to reduce the marketing costs of rice if the facilities were allowed to operate under the existing conditions.

In making paddy storage space available to farmers in South Vietnam, a licensed warehouse system is a necessity. The owners or operators of any new storage or handling facilities for paddy should be licensed and bonded by the GVN, thereby making the warehouse owners financially responsible for the paddy stored in their warehouse. The owners or operators should be required to give the farmer first priority on a large portion of the storage space at each location.

If paddy is delivered to the warehouse for storage by a farmer, land owner or merchant, the warehouseman should be required to issue the owner of the paddy a warehouse receipt stipulating the amount, grade, price differentials for quality and storage charges for the grain. When the owner of the warehouse receipt later presents this receipt to the warehouseman, the warehouseman

should be required by law to deliver to the owner of the warehouse receipt the quantity and grade of the product in store or its value equivalent in money. The warehouse receipt should be negotiable. In order to obtain financing and still hold title to the paddy, the farmer could present his warehouse receipt to the local Agricultural Development Bank or other authorized local bank as collateral for a loan on his paddy which is in storage.

Since the warehouseman is bonded to deliver the stipulated quality and quantity of paddy upon demand, the banks have a guaranteed collateral and generally should lend the farmer up to 70 to 75 percent of the present market value of the paddy. The bank would then hold the warehouse receipt as collateral until the farmer paid the loan either by selling the paddy or from other funds. Interest rates for the loan should be in line with other types of agricultural loans.

The object of this type of inventory financing program is to make it possible for the farmer to obtain the capital which is badly needed at harvest time and still hold title to the paddy. In this way, the farmer can benefit by the seasonal price increases which, in the past, have been far greater than the cost of storage. In addition, this procedure would assure the farmers, land owners, small merchants and rice buyers the full use of the new facilities and would establish each facility as a market center of the area it serves.

It is therefore recommended that prior to the construction of any of the facilities recommended in this report, and as a condition to financing these facilities, a complete system of warehouse inventory financing along these lines be developed in advance of the construction of any facility so that it could be

implemented at the time of the first delivery of rice to the facilities. It is recommended that this warehouse licensing program be administered by the Ministry of Land Reform and Agriculture.

Improving the Marketing Information for Rice

The efficiency with which a marketing system performs its various functions depends to a great degree upon the amount and quality of information available to those persons operating in a market. By definition, a completely free competitive market assumes that all people operating in the market are equally informed. In practice, a trader in a given market often is able to possess certain information which will place him at an advantage over the person with whom he is dealing. Generally, these advantages are short run and the length of time a trader can maintain this advantage depends upon the efficiency and effectiveness of the market information system.

Prices of a basic commodity traded on a national basis are usually determined at the place where the most title transfers are made and as a result, these markets usually have the best information network. In South Vietnam, the principal market place for rice has traditionally been the city of Saigon. However efficient the market information system has been for the people operating in the Saigon market, its efficiency has suffered greatly as the distance from Saigon increased.

Lines of communication between the roving rice merchant in the Delta and the market of Saigon often are restricted and available only to a selected

group of rice merchants. The result has created a buyers market for rice in the major producing area with all the information advantage on the side of the buyer. In most cases in South Vietnam, the only source of market information available to the farmer is the information he receives from the roving rice merchant or the rice miller if one is located in his area. Price spreads are unknown to the farmer and because of his limited market information, his market alternatives are few.

Some efforts have been made to disseminate central market information to various lesser market centers. The Ministry of Land Reform and Agriculture and USAID have cooperated in providing prices, production and stock reports of certain agricultural products at principal markets for distribution to GVN and USAID personnel throughout the nation. As yet, this information reaches only government workers while farmers, in general, have limited access to this data.

In developing the recommendations of this report, one of the important criteria in locating facilities was the location's adaptability as a market center which, as such, could serve as an excellent source of price information for rice farmers and traders. It is important to the development of confidence in the market information originating from a given market that the collecting and reporting of the information in each market be developed by an unbiased agency which has no financial interest in the active market. The information must be timely, accurate and immediately available to those interested in the market. As far as the rice economy of South Vietnam is concerned, the rice farmer is the most important person in the marketing system and it is important for the farmer to have available accurate and timely market information compiled by an independent and unbiased market service.

In South Vietnam, most farm families own a radio or have access to one in their village or hamlet. As a public service, the radio stations could report on a regularly scheduled basis daily rice and paddy prices at local market centers. The same is true for daily newspapers where, as a public service, daily rice and paddy prices could be printed. This information would assist the farmer in choosing his best market alternative and in determining whether to sell or store his rice. It is the recommendation of this report that this market information service be established in the Ministry of Land Reform and Agriculture.

Although the above recommendation is not absolutely essential to the implementation of the facilities recommended in this report, the development of such a market information system is badly needed in South Vietnam. Such a system of market reports would improve the efficiency of the rice marketing system and would help build confidence in the farmer to choose his best market alternative.

Uniform Operating Procedures

When developing a new system of facilities or implementing a new type of marketing structure, the problem arises as to costs of services that are provided by the firms or agencies operating the facilities. If granted the right to construct and operate a rice handling facility at a major port in South Vietnam, there must accompany this right an obligation on the part of the person, firm or organization to offer similar services to all persons who can use the facilities. For example, storage rates should be based on costs and the same rates charged all people. The same is true for handling, drying, transportation and other service charges for rice or paddy.

A certain number of ground rules for the operation of the rice marketing system in South Vietnam is a necessity to assure that the social and economic objectives of the agricultural sector of the economy are achieved. A licensing system for all persons, firms or agencies dealing in paddy (in particular) and extending to milled rice should be initiated whereby each person, firm or agency would be required under license to publish charges and prices for the services performed and would be required by law to treat all customers alike who asked for these services.

Specific charges for such services as storage, drying, transporting, loading, unloading and bagging should be published for each facility. Although it is recommended that the Ministry of Land Reform and Agriculture administer this program, it is not intended that the GVN set the price schedules for the various services. In case of price disputes, the Ministry of Land Reform and Agriculture could conduct hearings and after hearing all evidence, approve or disapprove all service charges. The intent of this regulating agency is to prevent discriminatory or excessive service charges resulting from a monopolistic position enjoyed by a person, firm, organization or agency in any particular area.

In addition to the rates for services, it should be the obligation of the Ministry of Land Reform and Agriculture to prevent the establishment of any local or provincial tax or assessment on the free movement of rice or paddy in intra-provincial or inter-provincial commerce. The implementation of this program of policing the marketing system should be developed with specific plans for implementation prior to the approval for financing of any facilities recommended in this report.

Implementing and Administering the Facilitating Functions

In order to implement and administer the facilitating marketing functions, such as grades and standards, market information, warehouse licensing, product movement and service control, and perpetuating training programs, it is necessary to have the programs associated with these functions administered by a public-minded agency of the government that can be impartial in making these judgment decisions.

The recommendations made in this report depend heavily on the participation of the private sector of the rice economy to invest capital and talent in the system. However, in doing so, there is a public responsibility on the part of each and every firm or agency operating the facilities to perform the functions in a competitive but somewhat benevolent manner. In other words, some control will be necessary to assure that all parties are treated fairly and that the system does not perpetuate any monopolistic tendencies in the rice economy.

Since the Ministry of Land Reform and Agriculture has had a continuing interest in rice marketing, has successfully administered the program of increasing rice production, has some personnel with agricultural backgrounds and with academic training in marketing, and has a close working relationship with the rice milling sector, it is recommended that this regulatory program be administered by this Ministry.

The Ministry of Land Reform and Agriculture is not at present structured to administer such a program; thus, it is recommended that a Directorate of Foods and Marketing be established for the purpose of directing these

expanded activities. It is recommended that the Directorate of Foods and Marketing be structured along the lines shown in Figure XXXI. It also is recommended that this change in the Ministry of Land Reform and Agriculture be made a condition to the financing of any new facilities recommended in this report and that the personnel be trained and the program be in operation prior to the opening of any new facilities. In this way, the operational framework of the improved marketing system will be clearly outlined before other undesirable characteristics become institutionalized and thoroughly implanted in the operational activity of the system.

Facility Recommendations for 1979/80

Since it is expected that rice production in South Vietnam will continue to show marked increases over the next 10 to 15 years, any facility recommendations should provide for a possible growth--both in capacity and in functions performed. An analysis was made based on the production and consumption projections for rice for the 1979/80 crop year. The analysis indicated that although the volume handled was expected to increase significantly, the system would not benefit greatly by the addition of new facility locations over the 16 locations recommended for 1974/75. The capacities of some of the facilities would need to be increased and volumes moving through all facilities would show significant increases. The annual flow of paddy through the recommended facilities for 1979/80 is shown in Figure XXXII.

It was assumed that only 60 percent of the paddy that moved through the marketing system would move through the recommended facilities in 1974/75.

FIGURE XXXI

SUGGESTED ORGANIZATIONAL STRUCTURE FOR RECOMMENDED DIRECTORATE OF FOODS AND MARKETING IN THE MINISTRY OF LAND REFORM AND AGRICULTURE

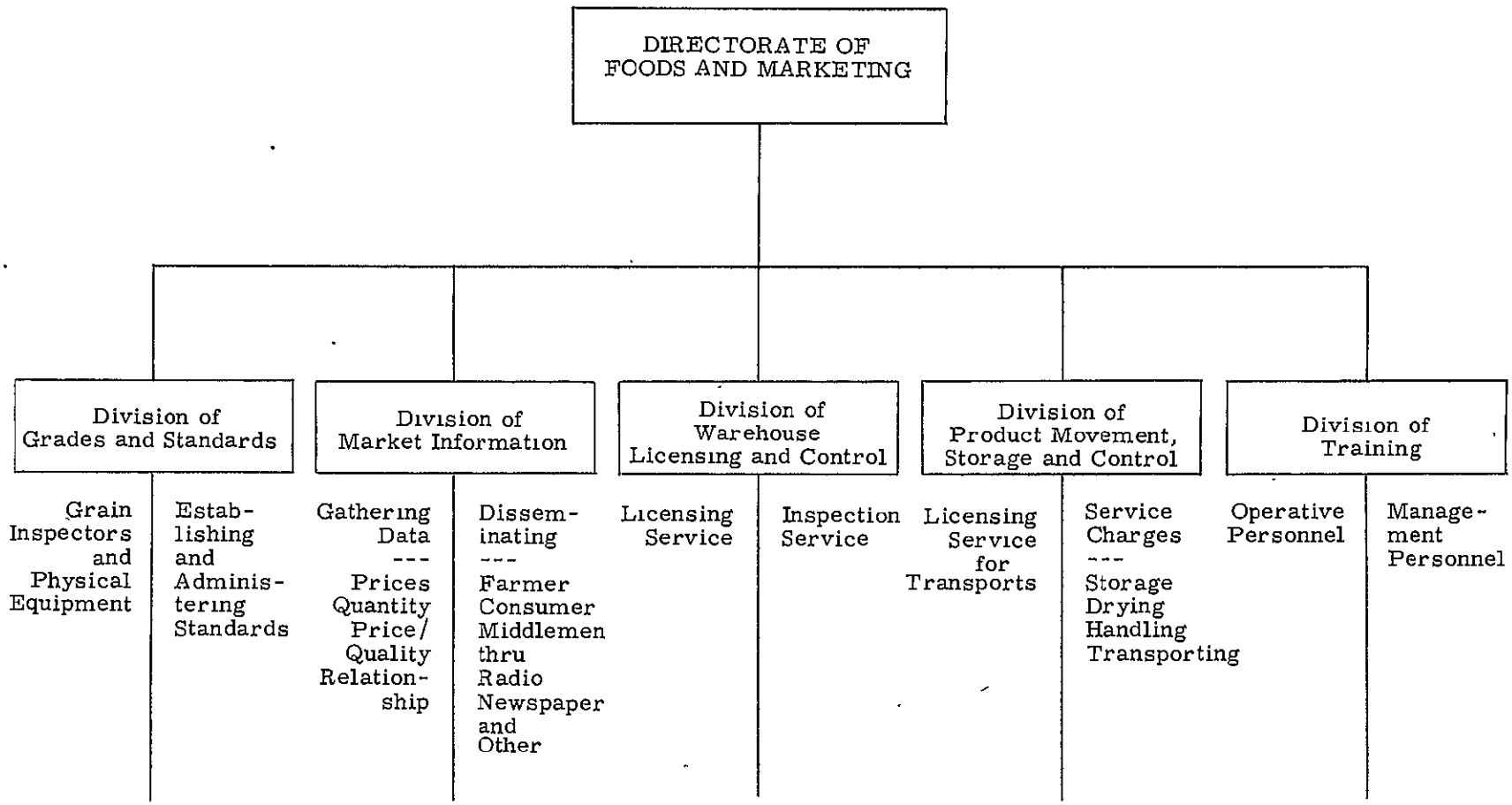
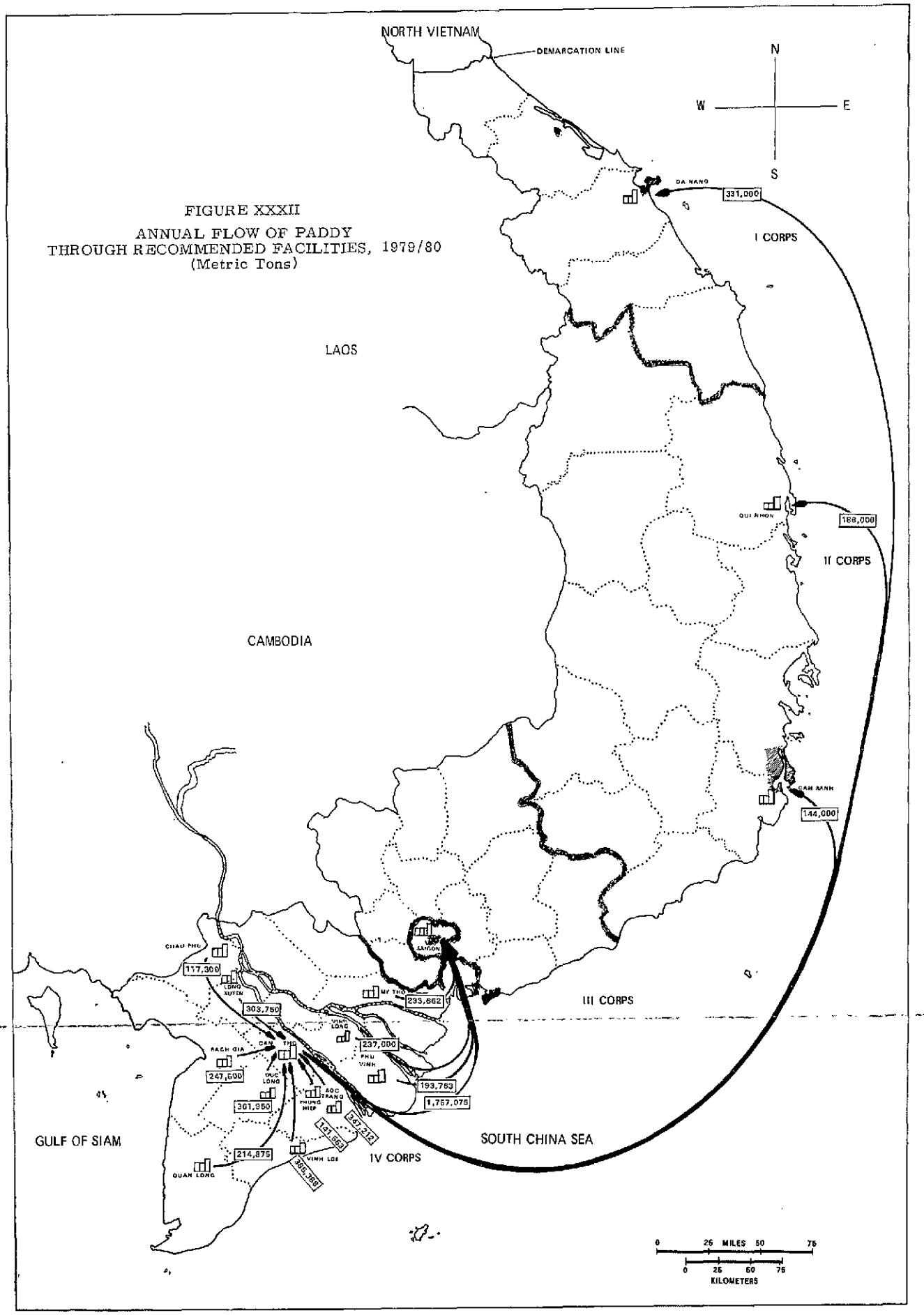


FIGURE XXXII

ANNUAL FLOW OF PADDY
THROUGH RECOMMENDED FACILITIES, 1979/80
(Metric Tons)



After five years of operation, it is expected that the new facilities will have greater acceptance by the farmers and agents and as a result, it is projected that 75 percent of the paddy that moves through the marketing system in 1979/80 will be marketed through the recommended facilities. It is recommended that a total of 181,000 metric tons of additional storage be added, bringing the total capacity of the recommended system to 609,000 metric tons.

The recommended changes and additions to the storage and handling system to meet the needs of the 1979/80 crop year are as follows:

Major Assembly Facilities

Can Tho

The facility at Can Tho should be increased in size from its capacity of 68,000 metric tons to a total capacity of 113,000 metric tons of paddy. The services performed will remain the same and the existing equipment can meet the needs of the additional volume. The projected seasonal flow of paddy, listing the origins and destinations, is shown in Table 82.

Soc Trang

The size of the facility and the functions performed at Soc Trang will remain the same as for 1974/75. The volume of paddy handled will increase and the utilization is expected to improve. The seasonal flow of paddy, listing the origins and destinations, is shown in Table 83.

TABLE 82

PADDY FLOW THROUGH THE CAN THO FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake: Phong Dinh Province	Vinh Long Province	Su Doc Province	Total Intake Direct from Provinces	Transfer from Phung Hiep Facility	Transfer from Duc Long Facility	Transfer from Chau Phu Facility	Transfer from Soc Trang Facility	Transfer from Quan Long Facility	Transfer from Vinh Loi Facility	Transfer from Rach Gia Facility	Transfer from Long Xuyen Facility	Total Intake	Offtake: Saigon Facility	Cam Ranh Facility	Qui Nhon Facility	Da Nang Facility	Total Offtake	Month End Inventory
	(Metric Tons)																		
June	1,770	343	275	2,388	6,132	12,896	5,938	12,777	10,719	13,084	9,080	16,430	90,344	95,344	11,500	11,500	12,000	130,344	40,000
July	1,770	343	275	2,388	6,132	12,896	5,938	12,777	10,719	13,084	9,980	16,430	90,344	84,344	15,500	12,500	18,000	130,344	0
August	3,539	7,894	5,508	16,941	5,266	12,791	8,677	11,555	10,438	13,166	18,810	27,311	124,955	65,955	11,500	9,500	38,000	124,955	0
September	44,242	10,124	7,298	61,664	20,722	60,218	9,258	62,577	20,484	75,559	37,105	25,628	373,215	289,715	11,000	7,500	40,000	348,215	25,000
October	58,842	3,432	2,754	65,028	26,021	76,107	9,384	63,392	23,377	75,293	37,470	24,300	400,372	214,372	13,500	31,500	53,000	312,372	113,000
November	22,121	4,290	3,442	29,853	14,503	36,195	15,038	34,721	21,487	38,530	32,175	29,560	252,971	149,471	15,000	38,500	50,000	252,971	113,000
December	18,582	3,604	2,892	25,078	16,701	30,404	16,708	48,216	44,568	58,280	28,215	56,416	324,595	293,095	6,000	9,500	16,000	324,595	113,000
January	17,697	3,690	2,754	24,141	12,758	28,956	18,424	31,943	41,549	35,456	21,285	48,958	263,470	225,970	8,000	13,500	16,000	263,470	113,000
February	12,388	2,660	1,028	16,976	6,554	20,269	1,930	13,194	12,521	14,645	6,435	5,184	97,716	47,716	12,500	15,500	22,000	97,716	113,000
March	15,927	2,316	2,892	21,135	9,061	26,060	1,408	20,333	6,179	14,612	14,850	7,775	121,413	79,413	16,500	11,500	14,000	121,413	113,000
April	18,140	3,003	3,442	24,595	10,740	34,023	10,085	24,005	6,817	21,871	18,810	22,525	173,470	129,470	11,500	12,500	21,000	173,470	113,000
May	6,194	1,201	965	8,360	6,964	11,135	13,004	11,722	6,017	11,790	12,385	23,233	105,210	63,210	11,500	12,500	31,000	138,210	80,000
TOTAL	221,212	42,900	34,425	298,537	141,563	361,950	117,300	347,212	214,875	385,388	247,500	303,750	2,418,075	1,757,075	144,000	186,000	331,000	2,418,075	70,000 a/

a/ Average.

TABLE 83

PADDY FLOW THROUGH THE SOC TRANG FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake			Offtake to Can Tho Facility	Month End Inventory
	Bac Lieu Province	Ba Xuyen Province	Total Intake		
	(Metric Tons)				
June	133	2,644	2,777	12,777	16,000
July	133	2,644	2,777	12,777	6,000
August	267	5,288	5,555	11,555	0
September	3,438	62,139	65,577	62,577	3,000
October	4,439	83,953	88,392	63,392	28,000
November	1,669	33,052	34,721	34,721	28,000
December	2,603	45,613	48,216	48,216	28,000
January	1,535	30,408	31,943	31,943	28,000
February	634	12,560	13,194	13,194	28,000
March	501	19,832	20,333	20,333	28,000
April	868	23,137	24,005	24,005	28,000
May	467	9,255	9,722	11,722	26,000
TOTAL	16,687	330,525	347,212	347,212	20,583 a/

a/ Average.

Quan Long

The size of the facility and the functions performed at Quan Long will remain the same as for 1974/75. The volume of paddy handled will increase and the utilization is expected to improve. The seasonal flow of paddy, listing the origins and destinations, is shown in Table 84.

Duc Long

The size of the facility and the functions performed at Duc Long will remain the same as for 1974/75. The volume of paddy handled will increase and the utilization is expected to improve. The seasonal flow of paddy, listing the origins and destinations, is shown in Table 85.

Long Xuyen

The size of the facility and the functions performed at Long Xuyen will remain the same as for 1974/75. The volume of paddy handled will increase and the utilization is expected to improve. The seasonal flow of paddy, listing the origins and destinations, is shown in Table 86.

Vinh Loi

The size of the facility and the functions performed at Vinh Loi will remain the same as for 1974/75. The volume of paddy handled will increase and the utilization is expected to improve. The seasonal flow of paddy, listing the origins and destinations, is shown in Table 87.

TABLE 84

PADDY FLOW THROUGH THE QUAN LONG FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake			Offtake to Can Tho Facility	Month End Inventory
	An Xuyen Province	Bac Lieu Province	Total Intake		
	(Metric Tons)				
June	1,452	267	1,719	10,719	16,000
July	1,452	267	1,719	10,719	7,000
August	2,904	534	3,438	10,438	0
September	15,609	6,875	22,484	20,484	2,000
October	26,499	8,878	35,377	23,377	14,000
November	18,150	3,337	21,487	21,487	14,000
December	53,361	5,207	58,568	44,568	28,000
January	38,478	3,071	41,549	41,549	28,000
February	11,253	1,268	12,521	12,521	28,000
March	2,178	1,001	3,179	6,179	25,000
April	5,082	1,735	6,817	6,817	25,000
May	5,082	935	6,017	6,017	25,000
TOTAL	181,500	33,375	214,875	214,875	17,666 a/

a/ Average.

TABLE 85

PADDY FLOW THROUGH THE DUC LONG FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake from Chuong Thien Province	Offtake to Can Tho Facility	Month End Inventory
		(Metric Tons)	
June	2,896	12,896	17,000
July	2,896	12,896	7,000
August	5,791	12,791	0
September	70,218	60,218	10,000
October	94,107	76,107	28,000
November	36,195	36,195	28,000
December	30,404	30,404	28,000
January	28,956	28,956	28,000
February	20,269	20,269	28,000
March	26,060	26,060	28,000
April	34,023	34,023	28,000
May	10,135	11,135	27,000
TOTAL	361,950	361,950	21,417 a/

a/ Average.

TABLE 86

PADDY FLOW THROUGH THE LONG XUYEN FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake					Offtake to Can Tho Facility	Month End Inventory
	Kien Tuong Province	An Giang Province	Sa Dec Province	Kien Phong Province	Total Intake		
	(Metric Tons)						
June	63	1,512	459	396	2,430	16,430	14,000
July	63	1,512	459	396	2,430	16,430	0
August	599	14,364	9,180	3,168	27,311	27,311	0
September	819	17,388	12,164	4,257	34,628	25,628	9,000
October	630	15,120	4,590	3,960	24,300	24,300	9,000
November	1,260	33,642	5,738	7,920	48,560	29,560	28,000
December	1,512	39,690	4,819	10,395	56,416	56,416	28,000
January	961	34,398	4,590	9,009	48,958	48,958	28,000
February	63	1,512	3,213	396	5,184	5,184	28,000
March	94	2,268	4,819	594	7,775	7,775	28,000
April	929	12,096	5,738	3,762	22,525	22,525	28,000
May	882	15,498	1,606	5,247	23,233	23,233	28,000
TOTAL	7,875	189,000	57,375	49,500	303,750	303,750	19,000 a/

a/ Average.

TABLE 87

PADDY FLOW THROUGH THE VINH LOI FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake			Offtake to Can Tho Facility	Month End Inventory
	Bac Lieu Province	Ba Xuyen Province	Total Intake		
	(Metric Tons)				
June	2,270	814	3,084	13,084	17,000
July	2,270	814	3,084	13,084	7,000
August	4,539	1,627	6,166	13,166	0
September	58,440	19,119	77,559	75,559	2,000
October	75,461	25,832	101,293	75,293	28,000
November	28,369	10,170	38,539	38,539	28,000
December	44,255	14,034	58,289	58,289	28,000
January	26,099	9,357	35,456	35,456	28,000
February	10,780	3,865	14,645	14,645	28,000
March	8,510	6,102	14,612	14,612	28,000
April	14,752	7,119	21,871	21,871	28,000
May	7,943	2,847	10,790	11,790	27,000
TOTAL	283,688	101,700	385,388	385,388	20,750 a/

a/ Average.

Rach Gia

The size of the facility and the functions performed at Rach Gia will remain the same as for 1974/75. The volume of paddy handled will increase and the utilization is expected to improve. The seasonal flow of paddy, listing the origins and destinations, is shown in Table 88.

Phung Hiep

The facility at Phung Hiep should be increased in size from its capacity of 11,000 metric tons to a total capacity of 16,000 metric tons of paddy in 1979/80. The services performed will remain the same and the existing equipment can meet the needs of the additional volume. The projected seasonal flow of paddy, listing origins and destinations, is shown in Table 89.

Chau Phu

The size of the facility and the functions performed at Chau Phu will remain the same as for 1974/75. The volume of paddy handled will increase and the utilization is expected to improve. The seasonal flow of paddy, listing the origins and destinations, is shown in Table 90.

Phu Vinh

The facility at Phu Vinh should be increased in size from its capacity of 11,000 metric tons to a total capacity of 28,000 metric tons of paddy in 1979/80.

TABLE 88

PADDY FLOW THROUGH THE RACH GIA FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake from Kien Giang Province	Offtake to Can Tho Facility	Month End Inventory
		(Metric Tons)	
June	1,980	9,980	8,000
July	1,980	9,980	0
August	18,810	18,810	0
September	39,105	37,105	2,000
October	52,470	37,470	17,000
November	32,175	32,175	17,000
December	28,215	28,215	17,000
January	21,285	21,285	17,000
February	6,435	6,435	17,000
March	14,850	14,850	17,000
April	18,810	18,810	17,000
May	11,385	12,385	16,000
TOTAL	247,500	247,500	12,083 a/

a/ Average.

TABLE 89

PADDY FLOW THROUGH THE PHUNG HIEP FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake					Offtake to Can Tho Facility	Month End Inventory
	Chuong Thien Province	Phong Dinh Province	Ba Xuyen Province	Vinh Binh Province	Total Intake		
	(Metric Tons)						
June	152	312	610	58	1,132	6,132	8,000
July	152	312	610	58	1,132	6,132	3,000
August	305	625	1,221	115	2,266	5,266	0
September	3,696	7,808	14,340	878	26,722	20,722	6,000
October	4,953	10,384	19,374	1,310	36,021	26,021	16,000
November	1,905	3,904	7,628	1,066	14,503	14,503	16,000
December	1,600	3,279	10,526	1,296	16,701	16,701	16,000
January	1,524	3,123	7,017	1,094	12,758	12,758	16,000
February	1,067	2,186	2,898	403	6,554	6,554	16,000
March	1,372	2,811	4,576	302	9,061	9,061	16,000
April	1,791	3,201	5,339	418	10,749	10,749	16,000
May	533	1,093	2,136	202	3,964	6,964	13,000
TOTAL	19,050	39,038	76,275	7,200	141,563	141,563	11,833 a/

a/ Average.

TABLE 90

PADDY FLOW THROUGH THE CHAU PHU FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake			Offtake to Can Tho Facility	Month End Inventory
	Chau Doc Province	Kien Phong Province	Total Intake		
	(Metric Tons)				
June	780	158	938	5,938	5,000
July	780	158	938	5,938	0
August	7,410	1,267	8,677	8,677	0
September	9,555	1,703	11,258	9,258	2,000
October	7,800	1,584	9,384	9,384	2,000
November	16,770	3,168	19,938	15,938	6,000
December	17,550	4,158	21,708	16,708	11,000
January	14,820	3,604	18,424	18,424	11,000
February	780	158	938	1,938	10,000
March	1,170	238	1,408	1,408	10,000
April	8,580	1,505	10,085	10,085	10,000
May	11,505	2,099	13,604	13,604	10,000
TOTAL	97,500	19,800	117,300	117,300	6,417 a/

a/ Average.

The services performed will remain the same and the existing equipment can meet the needs of the additional volume. The projected seasonal flow of paddy, listing origins and destinations, is shown in Table 91.

Vinh Long

The facility at Vinh Long should be increased in size from its capacity of 11,000 metric tons to a total capacity of 28,000 metric tons of paddy in 1979/80. The services performed will remain the same and the existing equipment can meet the needs of the additional volume. The projected seasonal flow of paddy, listing origins and destinations, is shown in Table 92.

My Tho

The facility at My Tho should be increased in size from its capacity of 11,000 metric tons to a total capacity of 28,000 metric tons of paddy in 1979/80. The services performed will remain the same and the existing equipment can meet the needs of the additional volume. The projected seasonal flow of paddy, listing origins and destinations, is shown in Table 93.

Port Transfer Facilities

Saigon

The facility recommended for Saigon for 1974/75 is expected to be operated at capacity and the capacity could not be increased by merely adding more storage. The volume of truck, rail and boat traffic that is necessary to

TABLE 91

PADDY FLOW THROUGH THE PHU VINH FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake			Offtake to Saigon Facility	Month End Inventory
	Vinh Binh Province	Kien Hoa Province	Total Intake		
	(Metric Tons)				
June	1,094	456	1,550	10,550	15,000
July	1,094	456	1,550	10,550	6,000
August	2,189	911	3,100	9,100	0
September	16,690	13,101	29,791	20,791	9,000
October	24,898	16,519	41,417	22,417	28,000
November	20,246	6,722	26,968	26,968	28,000
December	24,624	5,810	30,434	30,434	28,000
January	20,794	4,557	25,351	25,351	28,000
February	7,661	1,481	9,142	9,142	28,000
March	5,746	2,051	7,797	7,797	28,000
April	7,934	3,304	11,238	11,238	28,000
May	3,830	1,595	5,425	9,425	24,000
TOTAL	136,800	56,963	193,763	193,763	20,833 a/

a/ Average.

TABLE 92

PADDY FLOW THROUGH THE VINH LONG FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake						Offtake to Saigon Facility	Month End Inventory
	Vinh Long Province	Dinh Tuong Province	Kien Tuong Province	Kien Phong Province	Sa Dec Province	Total Intake		
	(Metric Tons)							
June	515	855	105	238	184	1,897	13,897	12,000
July	515	855	105	238	184	1,897	13,897	0
August	11,840	1,710	997	1,901	3,672	20,120	20,120	0
September	15,187	19,452	1,365	2,554	4,865	43,423	28,423	15,000
October	5,148	26,505	1,050	2,376	1,836	36,915	26,915	25,000
November	6,435	12,612	2,100	4,752	2,295	28,194	25,194	28,000
December	5,405	8,336	2,520	6,237	1,928	24,426	24,426	28,000
January	5,534	7,909	1,601	5,405	1,836	22,285	22,285	28,000
February	3,990	5,343	105	238	1,285	10,961	10,961	28,000
March	3,475	8,977	158	356	1,928	14,894	14,894	28,000
April	4,504	11,329	1,549	2,257	2,295	21,934	21,934	28,000
May	1,802	2,992	1,470	3,148	642	10,054	14,054	24,000
TOTAL	64,350	106,875	13,125	29,700	22,950	237,000	237,000	20,333 a/

a/ Average.

TABLE 93

PADDY FLOW THROUGH THE MY THO FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake					Offtake to Saigon Facility	Month End Inventory
	Kien Hoa Province	Dinh Tuong Province	Go Cong Province	Kien Tuong Province	Total Intake		
	(Metric Tons)						
June	846	855	126	42	1,869	10,869	15,000
July	846	855	126	42	1,869	10,869	6,000
August	1,693	1,710	252	399	4,054	10,054	0
September	24,331	19,451	3,339	546	47,667	42,667	5,000
October	30,678	26,505	4,378	420	61,981	38,981	28,000
November	12,483	12,611	1,953	840	27,887	27,887	28,000
December	10,791	8,337	1,890	1,008	22,026	22,026	28,000
January	8,463	7,908	1,543	640	18,554	18,554	28,000
February	2,751	5,344	504	42	8,641	8,641	28,000
March	3,808	8,978	473	63	13,322	13,322	28,000
April	6,135	11,328	725	620	18,808	18,808	28,000
May	2,962	2,993	441	588	6,984	10,984	24,000
TOTAL	105,787	106,875	15,750	5,250	233,662	233,662	20,500 a/

a/ Average.

handle the discharges of the projected 1974/75 volumes of grain from the facility will almost saturate the accesses to this facility. Since the volume of paddy, wheat and corn moving through the Saigon facility is expected to almost double between 1974/75 and 1979/80, it is recommended that a second separate facility similar in design and size be constructed at another location in the Saigon harbor area. The projected seasonal flow of paddy, wheat and corn, listing origins and destinations, is shown in Table 94.

Da Nang

The size of the facility and the functions performed at Da Nang will remain the same as for 1974/75. The volume of paddy handled will increase and the utilization is expected to improve. The seasonal flow of paddy, listing the origins and destinations, is shown in Table 95.

Qui Nhon

The size of the facility and the functions performed at Qui Nhon will remain the same as for 1974/75. The volume of paddy handled will increase and the utilization is expected to improve. The seasonal flow of paddy, listing the origins and destinations, is shown in Table 96.

Cam Ranh

The size of the facility and the functions performed at Cam Ranh will remain the same as for 1974/75. The volume of paddy handled will increase and the utilization is expected to improve. The seasonal flow of paddy, listing the origins and destinations, is shown in Table 97.

TABLE 94

GRAIN FLOW THROUGH THE SAIGON FACILITY, SOUTH VIETNAM, 1970/80

Month	Intake													
	Long An Province	Go Cong Province	Tay Ninh Province	Hau Nghia Province	Bien Hoa Province	Total Intake Direct from Provinces	Transfer from Vinh Long Facility	Transfer from Phu Vinh Facility	Transfer from My Tho Facility	Transfer from Can Tho Facility	Total Intake Paddy	Intake of Import Wheat	Intake of Import Corn	Total Intake All Grains
	(Metric Tons)													
June	1,722	504	210	570	42	3,048	13,897	10,550	10,869	95,344	133,708	12,000	10,000	155,708
July	1,722	504	210	570	42	3,048	13,897	10,550	10,869	84,344	122,708	12,000	10,000	144,708
August	3,444	1,008	1,838	15,675	84	22,049	20,120	9,100	10,054	65,955	127,278	12,000	10,000	149,278
September	43,050	13,356	3,675	15,532	1,113	76,726	28,423	20,791	42,667	289,715	458,322	12,000	10,000	480,322
October	55,965	17,514	4,462	8,265	1,428	87,634	26,915	22,417	38,981	214,372	390,319	12,000	10,000	412,319
November	29,274	7,812	4,515	0,690	683	51,974	25,194	26,968	27,887	140,471	281,494	12,000	10,000	303,494
December	20,664	7,560	4,410	6,840	473	39,947	24,426	30,434	22,026	293,095	409,928	12,000	10,000	431,028
January	19,802	6,174	1,943	2,280	514	30,713	22,285	25,351	18,554	225,970	322,873	12,000	10,000	344,873
February	1,722	2,016	210	4,845	42	8,835	10,961	9,142	8,641	47,716	85,295	12,000	10,000	107,295
March	2,583	1,890	315	2,093	63	7,844	14,894	7,797	13,322	70,413	123,270	12,000	10,000	145,270
April	17,651	2,898	2,467	1,995	399	25,410	21,934	11,238	18,808	128,470	305,860	12,000	10,000	227,860
May	17,651	1,764	1,995	1,995	367	23,772	14,054	9,425	10,984	83,210	141,445	12,000	10,000	163,445
TOTAL	215,250	63,000	26,250	71,250	5,250	381,000	237,000	193,763	233,662	1,757,075	2,802,500	144,000	120,000	3,066,500

Month	Offtake															
	Gia Dinh Province	Binh Duong Province	Binh Long Province	Phuoc Long Province	Long Khanh Province	Phuoc Tuy Province	Binh Tuy Province	Binh Thuan Province	Lam Dong Province	Quang Duc Province	Total Offtake to Provinces	Offtake Paddy to Mills and Auxiliary Storage a/	Offtake Wheat to Flour Mills	Offtake Corn to Feed Mills	Total Offtake All Grains	Month End Inventory
	(Metric Tons)															
June	68,000	6,000	2,000	1,500	4,000	2,000	---	1,500	2,000	500	87,500	66,208	12,000	10,000	175,708	40,000
July	68,000	7,000	2,000	1,500	4,000	2,000	1,500	5,500	2,000	500	94,000	58,708	12,000	10,000	174,708	10,000
August	67,000	7,000	1,000	---	---	2,000	500	6,500	2,000	500	86,500	50,778	12,000	10,000	159,278	0
September	40,000	---	---	---	---	1,000	500	1,500	2,000	500	45,500	342,822	12,000	10,000	410,322	70,000
October	40,000	---	---	---	---	1,000	500	1,500	2,000	500	45,500	294,819	12,000	10,000	362,310	120,000
November	40,000	---	1,000	---	2,000	1,000	---	1,500	2,000	500	48,000	233,494	12,000	10,000	303,494	120,000
December	40,000	---	2,000	---	3,000	1,000	---	1,500	1,000	---	48,500	331,428	12,000	10,000	401,928	150,000
January	40,000	---	2,000	---	3,000	1,000	---	1,500	1,000	---	48,500	274,373	12,000	10,000	344,873	150,000
February	40,000	1,000	2,000	---	3,000	1,000	---	1,500	1,000	---	49,500	95,705	12,000	10,000	157,295	100,000
March	40,000	---	2,000	---	3,000	1,000	---	1,500	---	---	47,500	95,770	12,000	10,000	165,270	80,000
April	52,000	---	2,000	1,000	4,000	1,000	---	1,500	---	---	61,500	144,360	12,000	10,000	227,860	80,000
May	50,000	1,000	2,000	1,000	4,000	1,000	---	1,500	---	---	60,500	100,945	12,000	10,000	183,445	60,000
TOTAL	585,000	22,000	18,000	5,000	30,000	15,000	3,000	27,000	15,000	3,000	723,000	2,070,500	144,000	120,000	3,066,500	81,666 b/

a/ Offtake paddy to mills and auxiliary storage for export milling.
b/ Average.

TABLE 95

PADDY FLOW THROUGH THE DA NANG FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake from Can Tho Facility	Offtake					Month End Inventory
		Quang Tri Province	Thua Thien Province	Quang Nam Province	Quang Tin Province	Total Offtake	
	(Metric Tons)						
June	12,000	1,000	3,500	7,500	---	12,000	34,000
July	18,000	1,000	3,500	13,500	---	18,000	34,000
August	38,000	9,000	3,500	25,500	---	38,000	34,000
September	40,000	9,000	5,500	25,500	---	40,000	34,000
October	53,000	9,000	17,500	25,500	1,000	53,000	34,000
November	50,000	9,000	13,500	25,500	2,000	50,000	34,000
December	16,000	5,000	3,500	7,500	---	16,000	34,000
January	16,000	5,000	3,500	7,500	---	16,000	34,000
February	22,000	7,000	3,500	11,500	---	22,000	34,000
March	14,000	1,000	3,500	9,500	---	14,000	34,000
April	21,000	1,000	3,500	16,500	---	21,000	34,000
May	31,000	1,000	3,500	26,500	---	31,000	34,000
TOTAL	331,000	58,000	68,000	202,000	3,000	331,000	34,000 a/

a/ Average.

TABLE 96

PADDY FLOW THROUGH THE QUI NHON FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake from Can Tho Facility	Offtake						Month End Inventory
		Quang Ngai Province	Binh Dinh Province	Kontum Province	Pleiku Province	Phu Bon Province	Total Offtake	
	(Metric Tons)							
June	11,500	---	2,500	3,000	5,000	1,000	11,500	23,000
July	12,500	---	2,500	3,000	6,000	1,000	12,500	23,000
August	9,500	---	2,500	3,000	4,000	---	9,500	23,000
September	7,500	---	2,500	2,000	3,000	---	7,500	23,000
October	31,500	20,000	8,500	3,000	---	---	31,500	23,000
November	38,500	20,000	18,500	---	---	---	38,500	23,000
December	9,500	4,000	2,500	---	3,000	---	9,500	23,000
January	13,500	4,000	2,500	---	6,000	1,000	13,500	23,000
February	15,500	4,000	2,500	2,000	6,000	1,000	15,500	23,000
March	11,500	---	2,500	3,000	5,000	1,000	11,500	23,000
April	12,500	---	2,500	3,000	6,000	1,000	12,500	23,000
May	12,500	---	2,500	3,000	6,000	1,000	12,500	23,000
TOTAL	186,000	52,000	52,000	25,000	50,000	7,000	186,000	23,000 a/

a/ Average.

TABLE 97

PADDY FLOW THROUGH THE CAM RANH FACILITY, SOUTH VIETNAM, 1979/80

Month	Intake from Can Tho Facility	Offtake					Month End Inventory
		Khanh Hoa Province	Darlac Province	Ninh Thuan Province	Tuyên Duc Province	Total Offtake	
	(Metric Tons)						
June	11,500	1,000	6,500	---	4,000	11,500	11,000
July	15,500	5,000	6,500	---	4,000	15,500	11,000
August	11,500	5,000	2,500	---	4,000	11,500	11,000
September	11,000	5,000	1,500	---	4,500	11,000	11,000
October	13,500	5,000	1,500	3,000	4,000	13,500	11,000
November	15,000	5,000	1,500	4,000	4,500	15,000	11,000
December	6,000	1,000	1,500	---	3,500	6,000	11,000
January	8,000	1,000	3,500	---	3,500	8,000	11,000
February	12,500	2,000	6,500	1,000	3,000	12,500	11,000
March	16,500	3,000	6,500	4,000	3,000	16,500	11,000
April	11,500	1,000	7,500	---	3,000	11,500	11,000
May	11,500	1,000	6,500	---	4,000	11,500	11,000
TOTAL	144,000	35,000	52,000	12,000	45,000	144,000	11,000 a/

a/ Average.

CHAPTER XIII

DESCRIPTION AND COST OF THE RECOMMENDED FACILITIES

Recommendations for 1974/75

- General Description
- Civil Work
- Mechanical Work
- Auxiliary Work
- General Facility Layout Conditions
- Saigon
- Can Tho
- Da Nang
- Qui Nhon and Cam Ranh
- My Tho, Vinh Long, Phu Vinh, Phung Hiep and Chau Phu
- Soc Trang, Long Xuyen, Vinh Loi, Duc Long and Quan Long
- Rach Gia
- Suggested Rural Grain Warehouse

Personnel Requirements

Cost of the Recommended Facilities

- Facilities for 1974/75
- Cost of Facility Additions in 1979/80

Cost of Operation of the Recommended Facilities

Program Development and Construction Schedule

- Priorities
- Construction Schedule

CHAPTER XIII

DESCRIPTION AND COST OF THE RECOMMENDED FACILITIES

Recommendations for 1974/75

General Description

The grain storage and handling system recommended for South Vietnam is designed to handle bulk grain. All 16 storage and handling units are to be constructed of concrete since concrete structures have proven to be the best type of structure to protect grains in hot and humid climates; concrete also enables the system to utilize the maximum amount of local currencies in constructing the various units.

Five concrete silo prototypes were designed for the 16 locations since some locations can utilize almost identical facilities. Drawings showing the site plan, elevation, flow design and other details of these five prototypes are shown in the sets of Drawings 1 through 5. These drawings are made in sufficient detail to illustrate operational procedures and provide adequate information to formulate accurate cost estimates. Whenever possible, facilities and machinery were duplicated at the various locations so the owners of the facilities can simplify the problems of maintenance, inventory of spare parts, and the training and utilization of employees.

All the facilities are designed to receive bulk grain from the various types of equipment used to transport grain by water or land in South Vietnam.

As the grain is received at each facility, magnetic equipment is provided to remove all ferrous metallic objects from the grain. Each facility is equipped with scales to weigh grain as it is received and loaded out. The types of scales designed for each facility will allow the operation to accurately measure all receipts and shipments and to check inventories as the grain is transferred within the facility. Equipment is provided to clean and condition the grain. Special bins are provided for fumigation. A specially designed low-temperature, continuous-flow, oil-fired grain dryer for paddy is provided at all the facilities with the exception of those at the ports of Da Nang, Cam Ranh and Qui Nhon. All bins are designed for self-cleaning and each storage bin is equipped with electric temperature indicating equipment.

The machinery and equipment is designed to provide maximum flexibility in the use of all the storage bins and the cleaning, drying and weighing equipment is arranged so that a continuous flow of grain can be maintained until the clean dry grain reaches its respective storage bin. Facilities are provided to collect the dust and screenings from the grain so that these products can be utilized in animal feeds.

The grain which arrives at the facility by boat is unloaded by pneumatic equipment with sampling, testing and weighing equipment provided at dockside so that a fast and orderly transfer of title can be made at each facility. The same is true for the grain received by truck; however, the trucks are unloaded at special truck dump pits where pneumatic equipment is not required.

As the grain is loaded out to boats, barges or trucks from the storage bin, it can be weighed, blended with grain from other bins and graded. Trucks

can be loaded out directly from some of the bins while grain is being received. Bagging facilities are provided at those locations where shipments of bagged grain are required. The capacity of the receiving and loading out equipment is well within the limits of the volume flows as shown in Chapter XII.

Separate office and auxiliary buildings are provided at each location and auxiliary power units are provided at those locations where local power supplies are not available or are not dependable.

Civil Work

Since specific site selections were not made for the facilities, it may be necessary to modify the general layout of each facility to fit a chosen site; however, the designs were made to fit sites that the study team observed and found to be available for the location for each facility. The requirements for piling and dockside improvements may be different from those shown in the drawings since the drawings also are based on the observation and information obtained for those available sites which the study team believed to be suitable for the facility.

The storage bins and headhouses will be constructed of reinforced concrete using the sliding or slip form type of construction. The bins will be designed with hoppered bottoms so that each bin will be self-cleaning. The auxiliary buildings, such as bagging warehouses, offices, scalehouses and maintenance shops, will be constructed of local materials with concrete columns and brick plastered walls. The sheds for the truck dumping driveway will be constructed of locally fabricated structural steel framing and corrugated asbestos

sheeting. Each facility will be provided with a water supply and a sanitary sewage system. Where dependable electric power is not available, diesel generating power plants will be provided. The site, including the accesses to roadways, railways and waterways, will be lighted for night operation and for security.

Mechanical Work

The recommended machinery and equipment and the methods of handling the grain are those that have proven to be the most practical, efficient, economical and best suited for facilities operating under the types of conditions found in South Vietnam. Because of the fundamental problems of dust, maintenance and cost, the grain will be moved horizontally by chain conveyors. Chain conveyors were chosen over belt conveyors in order to eliminate the need for an elaborate dust collecting system and its associated costly maintenance. Chain conveyors also will virtually eliminate the hazard of dust explosions.

The vertical elevator legs are the standard type used in grain handling facilities throughout the world. The cleaners, scales, distribution system, valves, magnets, fumigation systems, aeration systems, dryers, pneumatic equipment and temperature control systems are typical of the type used in grain facilities having similar functions. Power for the machinery will be provided by electric motors which will be designed to minimize the risks of fire or dust explosions.

Auxiliary Work

Each site will have auxiliary buildings, such as administrative offices,

testing laboratories, and maintenance and repair shops. The administrative offices will be of sufficient size to conduct the normal business, house the necessary records and provide pleasant working facilities for the administrative personnel. The testing laboratory will be sufficient in size to house the grain testing equipment which is necessary to determine grade.

Each facility will be provided with safe drinking water and sanitary facilities. An interplant telephone communication system also will be provided. The maintenance building will be sufficient to house the necessary equipment for minor repairs and will also house a small inventory of parts.

General Facility Layout Conditions

The requirements and functions of the system of silo facilities were the governing factors in developing individual layout details, in the selection of machinery types and capacities, and in the organization of the related auxiliary facilities at each location.

The elevation at potential sites which were observed in the Delta area and along the northern coastline was very close to local water levels, a condition which creates a continuous problem in developing foundations for the structures involved. The high water table makes it expensive and undesirable to design a facility which has much of its equipment below ground level; thus, it is necessary to design conveying equipment which can operate under these restrictive conditions. The potential sites in South Vietnam which are suitable for constructing a silo facility are undeveloped and will require large investments in

waterfront sheeting and other improvements so that the waterfronts will be durable enough to meet the test of time since these locations will become the hub of considerable river traffic.

The scarcity of the required material, personnel and equipment in South Vietnam for constructing "typical" silo facilities creates a problem of design since it is in the best interest of the nation to use as many locally produced and locally fabricated materials as possible. For this reason, special layouts were designed capitalizing on the experience gained by observing the results of various types of facilities constructed in South Vietnam under similar conditions.

The size of the storage bins was selected to serve the function of the facility and still be economical to construct. Efforts were made to standardize the bins so that contractors could reuse the high-priced forming materials. The unstable soil conditions in South Vietnam cause foundation problems for a large facility since unequal loading in a facility with a large foundation area causes abnormal pressures on the piling--often causing cracking in the structure. Consequently, a reasonable storage unit to serve its functional purpose and still be structurally sound was chosen. Storage bins of a height greater than 105 feet are often used elsewhere but the foundation pressures of this additional weight would prove excessive for practical piling requirements. This condition was confirmed in discussions with foundation piling firms active in the construction of large heavy facilities in South Vietnam.

The maintenance, operation and original installation cost was considered in the choice of the types of machinery for each facility. Types of machinery

and equipment shown are the most generally used and accepted for the functions for which this system was designed.

In the normal operation of a waterfront facility, large ships or barges of 1,000 to 15,000 metric tons are the rule, but involved in South Vietnam are the small sampans and river barges of from 1 to 300 metric tons. These small boats account for a large percentage of the total intake volume of paddy during the harvest season. To service all sizes of boats requires special mechanical facilities so that the small and large vessels can be serviced simultaneously.

Special features are required to enable the operators of the facilities to separate the many qualities and varieties of paddy that are normally received in the marketing system of South Vietnam. These conditions affected the bin design and layout of each facility. Thus, an attempt was made to design silo facilities which were adaptable to local conditions and at the same time were versatile enough to meet the needs of the flexible storage and handling system recommended for South Vietnam.

Additional descriptions of the characteristics of each facility are given in more detail in the following:

Saigon

The recommended facility at Saigon has an estimated capacity of 78,960 metric tons of paddy with an additional 610 metric tons of space in the headhouse work bins. This is equivalent to 107,583 metric tons and 825 metric tons respectively of wheat storage. The estimated cost of this facility is US $15,862,290

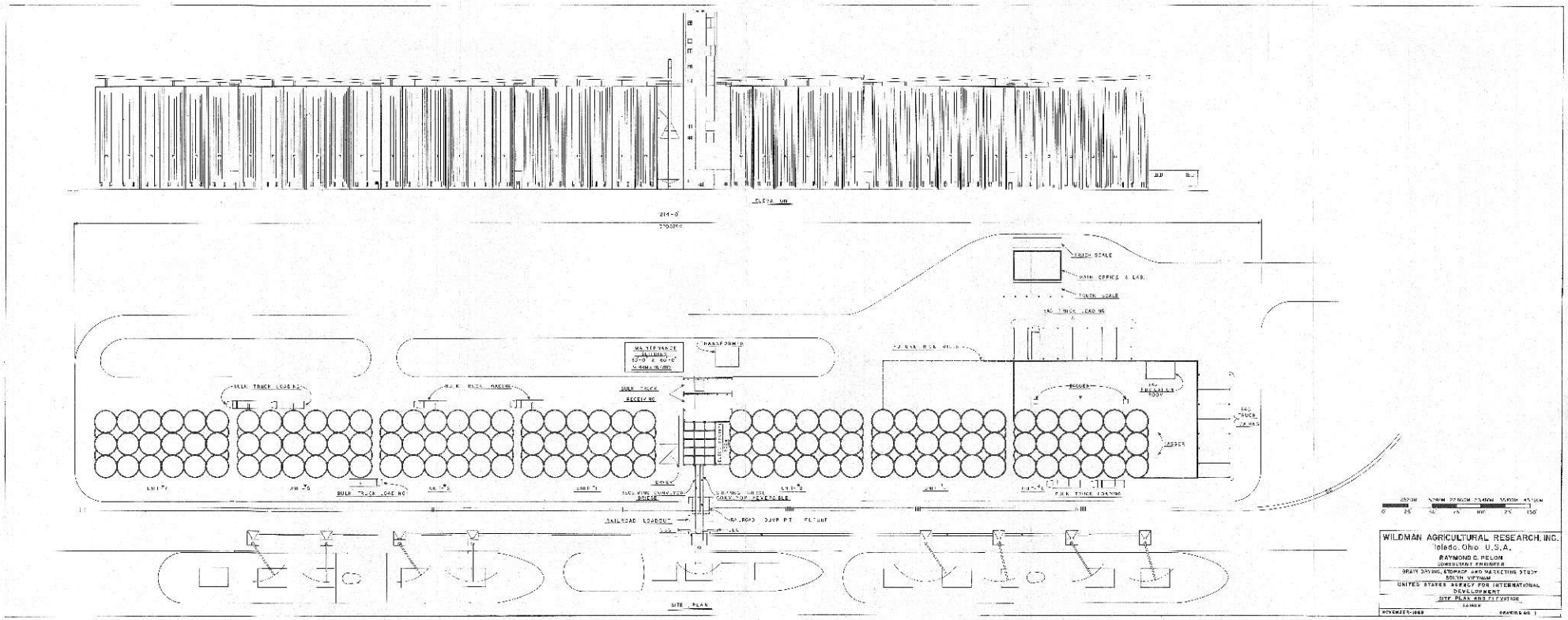
and VN $539,541,096. The details of this facility are shown in Drawings 1, 1A and 1B. Waterfront dock facilities sufficient to accommodate the largest vessel to service the port of Saigon and stable enough to support the bulk unloading and loading equipment will be provided at this facility.

The grain which is received by water will be unloaded by pneumatic conveying units having an unloading capacity of 800 metric tons per hour and a reversible loadout capacity to water transportation at the rate of 400 metric tons per hour. Intake by truck will be at the rate of 200 metric tons per hour. Trucks can be loaded directly from the storage bins by side bin valves, thereby eliminating the necessity of elevating the grain through the headhouse conveying equipment. Trucks loaded in this manner will be weighed on two truck scales, each with a capacity of 25 metric tons.

The bagging warehouse has a capacity of 1,500 metric tons with five bagging machines rated at 20 metric tons per hour each with sewing machines for closing the bag. Covered truck loading docks and rail accesses are provided at the bagging warehouse.

The outgo of grain from this facility can be by either bulk or by bag to all methods of transportation available in Saigon. International trade will be transacted at this facility; thus, the scales and related equipment provided at this facility are recognized and accepted in the world grain trade.

The types of equipment with rated capacities for weighing, conveying, elevating, distributing, cleaning, drying, fumigating and aerating are listed on the flow diagram (Drawing 1B) and this plan illustrates the entire processing flow of grain through all the functions of the Saigon port facility.


ELEVATION
TRUCK SCALE
MAIN OFFICE & LAB.
TRUCK SCALE
BAG TRUCK LOADING
BULK TRUCK LOADING
BULK TRUCK RECEIVING
RECEIVING CONVEYOR
DRYER
LOADER
BULK TRUCK LOADING
RAILROAD LOADOUT
SITE PLAN
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RAYMOND C. PELON
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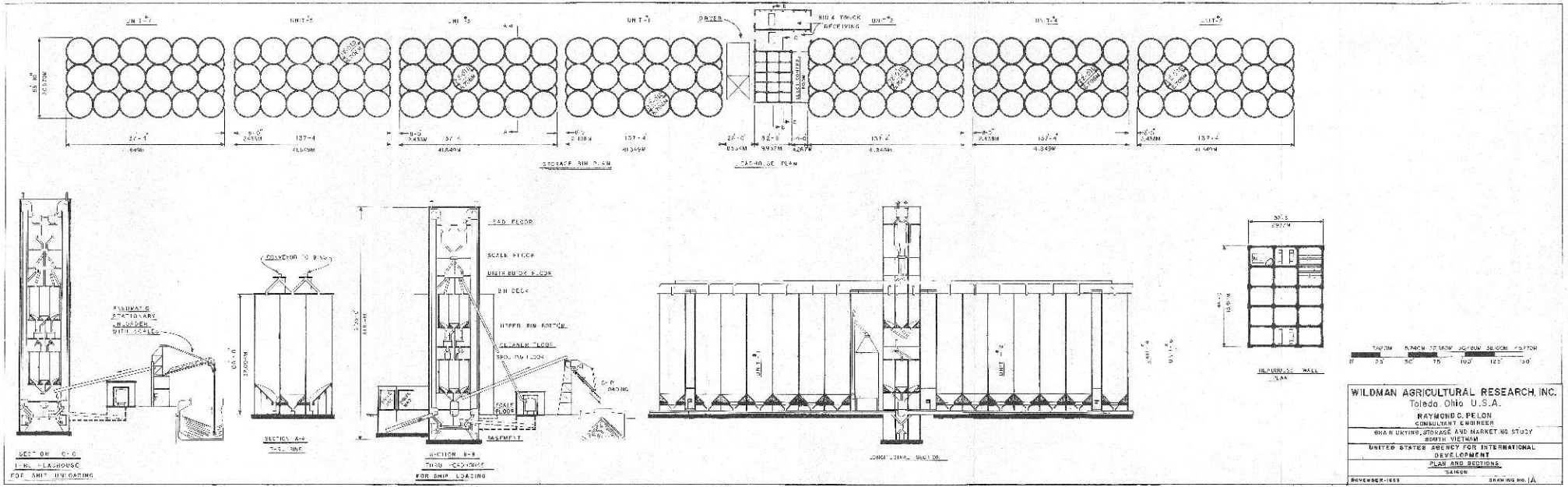
SOUTH VIETNAM
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
SITE PLAN AND ELEVATION
SAIGON
NOVEMBER 1969
DRAWING NO. 1


UNIT 1
UNIT 2
UNIT 3
UNIT 4
UNIT 5
DRYER
BIN & TRUCK RECEIVING
STORAGE BIN PLAN
WAREHOUSE PLAN
PNEUMATIC STATIONARY BLOWER WITH SCALES
SECTION C-C
TYPICAL WAREHOUSE
FOR BAGS UNLOADING
CONVEYOR TO BINS
SECTION A-A
TYPICAL BIN
LEAD FLOOR
SCALE FLOOR
DISTRIBUTOR FLOOR
BIN DECK
UPPER BIN BOTTOM
CLEANER FLOOR
SPOUTING FLOOR
SCALE FLOOR
BASEMENT
SECTION B-B
TYPICAL WAREHOUSE
FOR BAGS LOADING
LONGITUDINAL SECTION
WAREHOUSE WALL PLAN
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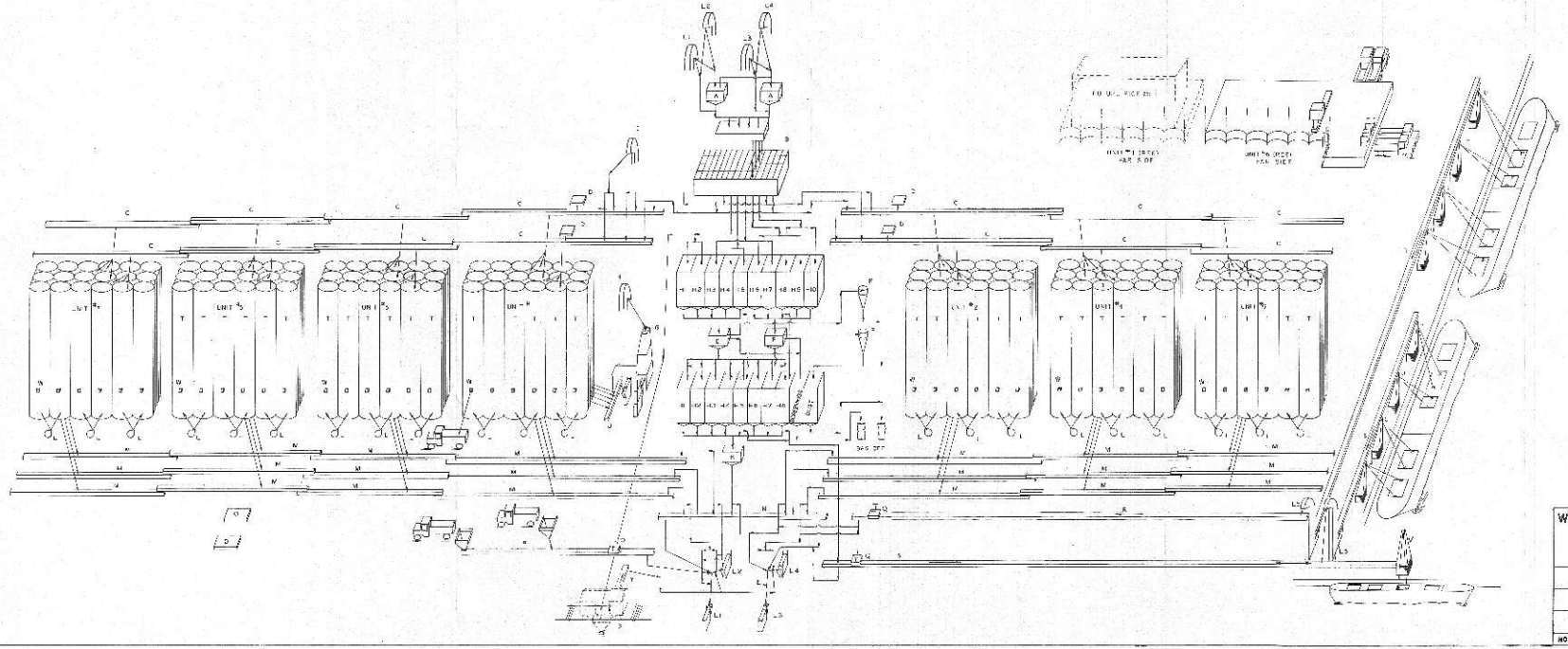
SOUTH VIETNAM
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
PLAN AND SECTIONS
SAIGON
NOVEMBER-1959
DRAWING NO. A



CAPACITY RATED IN METRIC TONS/HR

LEGEND

L ELEVATOR LEG	200MT
L2 ELEVATOR LEG	200MT
L3 ELEVATOR LEG	400MT
L4 ELEVATOR LEG	400MT
A AUTOMATIC SCALE	200MT
B DISTRIBUTION SYSTEM-REMOTE CONTROLS	
C CHAIN CONVEYOR	400MT
D FUMIGATION BELOW STORAGE	
E GRAIN CLEANER	
F CLEANER FAN COLLECTOR	10 DUST BAGS
G GRAIN DRYER AND CONVEYOR	30MT
H ELEVATOR LEG WET	30MT
I ELEVATOR LEG DRY	30MT
J CHAIN CONVEYOR	30MT
K AUTOMATIC SCALE	30CWT
L AERATION AND FUMIGATION FAN	ALL BINS
M CHAIN CONVEYOR	200MT
N CHAIN CONVEYOR	400MT
O TRUCK SCALE	25MT
P CHAIN CONVEYOR	200MT
Q SUSPENDED WEIGHT	
R CHAIN CONVEYOR	400MT
S CHAIN CONVEYOR	400MT
T TUNNEL TRAVEL CONTROL CABLES	ALL BINS
U STATIONARY PNEUMATIC UNLOADERS WITH SCALES	400MT EACH
V STATIONARY CLOSOUT STATIONS	400MT
W TRUCK LOADING SPOUTS	
X BAG DUMP	
Y SCREW CONVEYOR	
H HOPPER FUMIGATION FAN	
HP HOPPER FUMIGATION BINS	
LS ELEVATOR LEG	400MT

BIN CAPACITIES	CAPACITY IN TONS METRIC	
	PADDY RICE	OR WHEAT
42 ROUND BINS	23,775	21,375
84 SQUARE BINS	43,965	81,210
70 FLAT BINS	10,010	15,5[illegible]
98 FLAT BINS	[illegible]	[illegible]
SUB TOTAL	78,965	[illegible]
2 UPPER BINS EACH 0.5	350	680
8 LOWER BINS EACH 0.5	2,70	1,305
TOTAL	79,670	103,408

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SOUTH VIETNAM

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

FLOW DIAGRAM

SAIGON

NOVEMBER-1969 DRAWING NO. 1B

Can Tho

The recommended silo facility at Can Tho has an estimated capacity of 67,680 metric tons of paddy with an additional 610 metric tons of space in the headhouse work bins. This is equivalent to 92,214 metric tons and 825 metric tons respectively of wheat storage. The estimated cost of this facility is US $14,871,387 and VN $460,142,858. The details of this facility are shown in Drawings 2, 2A and 2B.

Waterfront dock facilities necessary to accommodate the largest river vessels and stable enough to support the bulk unloading and loading equipment for the bulk grain will be provided at this facility. The grain receipts arriving at this facility by water transport will be unloaded by pneumatic conveying units with an intake capacity of 600 metric tons per hour and a capacity to load out to water transportation at the rate of 600 metric tons per hour.

The equipment to receive bulk grain by truck will have a rated capacity of 300 metric tons per hour. Trucks will be loaded out direct from storage bins by side bin valves, thereby bypassing the headhouse conveying equipment. These trucks of bulk grain will be weighed on a truck scale with a capacity of 25 metric tons and which can accommodate both incoming and outgoing trucks.

The types of equipment with their rated capacities for weighing, conveying, elevating, distributing, cleaning, drying, fumigating and aerating are listed on the flow diagram (Drawing 2B) which also shows the flow of grain through the entire facility from the time it is received by truck or boat until it

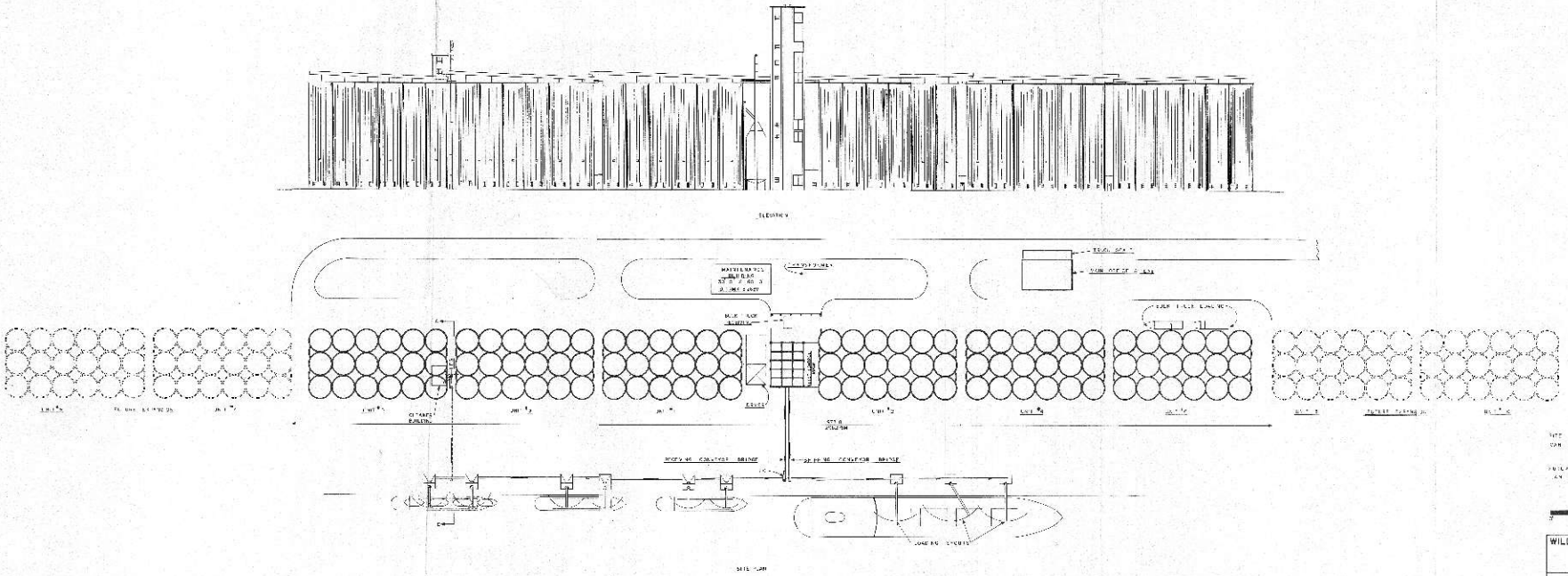
is discharged into the barges or coastal vessels. The equipment is designed to accommodate present river boats and coastal vessels and will also be able to accommodate the larger coastal or oceangoing vessels in case the Bassac River is dredged to a depth to allow the larger ships to service the port of Can Tho.

Da Nang

The recommended silo facility at Da Nang has an estimated capacity of 33,840 metric tons of paddy with an additional 375 metric tons of headhouse work bins. This is equivalent to 46,107 metric tons and 520 metric tons respectively of wheat storage. The estimated cost of this facility is US$6,408,433 and VN $229,990,349. The details of this facility are shown in Drawings 3, 3A and 3B.

Waterfront dock facilities sufficient to accommodate the large coastal vessels and smaller oceangoing vessels and stable enough to support the bulk unloading equipment will be provided at this facility. The grain receipts arriving at this facility by water from coastal vessels or oceangoing vessels will be unloaded by pneumatic conveying units with an intake capacity of 200 metric tons per hour.

The equipment to receive bulk grain by truck will have a rated intake capacity of 150 metric tons per hour. Trucks will be loaded out directly from the storage bins by side bin valves, thereby bypassing the headhouse conveying equipment. These trucks will be weighed on a truck scale with a capacity of 25 metric tons and which will accommodate both incoming and outgoing trucks.



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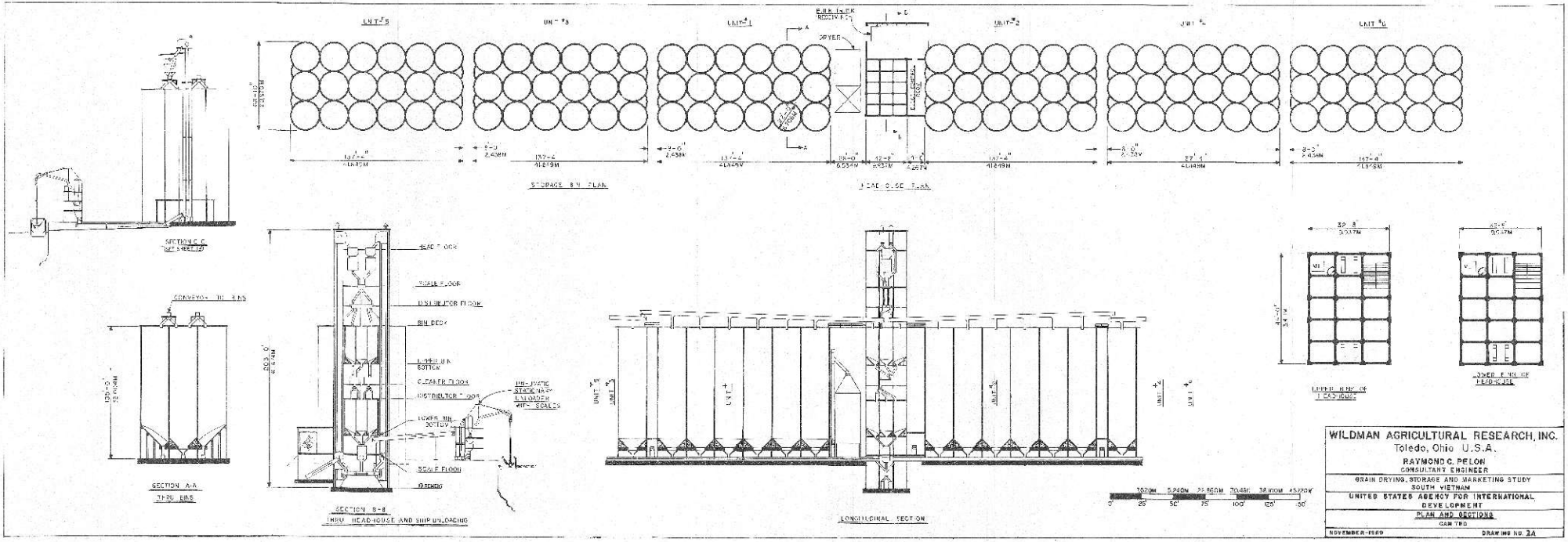
SITE PLAN AND ELEVATION	
GAW 7/62	
NOVEMBER 1969	DRAWING NO. 2


UNIT #5
UNIT #3
UNIT #1
UNIT #2
UNIT #4
UNIT #6
DRYER
STORAGE BIN PLAN
HEADHOUSE PLAN
SECTION C-C
SECTION A-A
THRU BINS
HEAD FLOOR
SCALE FLOOR
DISTRIBUTOR FLOOR
BIN DECK
LOWER BIN BOTTOM
CLEANER FLOOR
DISTRIBUTOR FLOOR
LOWER BIN BOTTOM
SCALE FLOOR
BASEMENT
SECTION B-B
THRU HEADHOUSE AND SHIP UNLOADING
LONGITUDINAL SECTION
UPPER BIN OF HEADHOUSE
LOWER BIN OF HEADHOUSE
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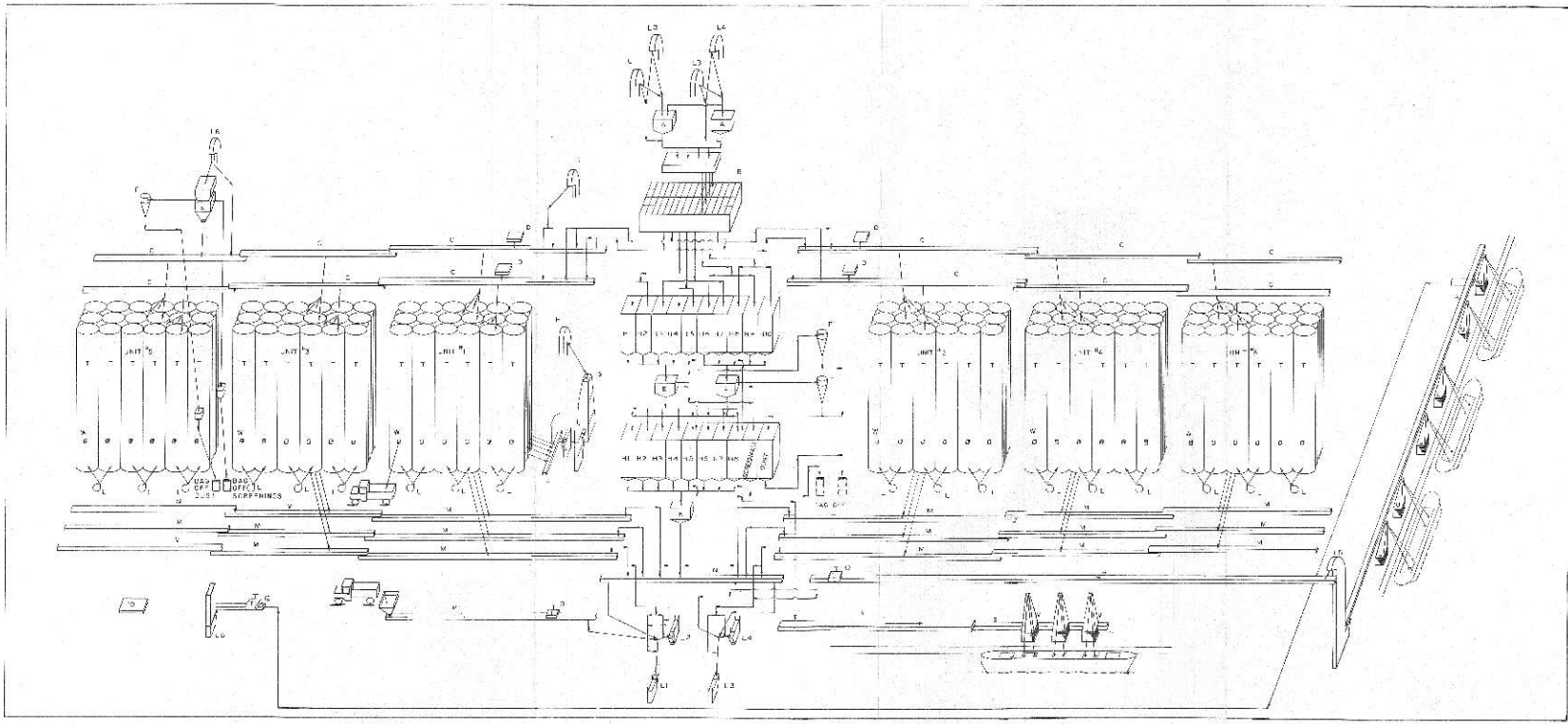
SOUTH VIETNAM
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
PLAN AND SECTIONS
CAM THO
NOVEMBER-1969
DRAWING NO. 2A



CAPACITY RATED IN METRIC TONS/HR

LEGEND

L1 ELEVATOR SA	300MT
L2 ELEVATOR FC	300MT
L3 ELEVATOR FC	300MT
L4 ELEVATOR LCU	300MT
A AUTOMATIC SCALE	250MT
B DISTRIBUTOR SYSTEM-REMOTE CONTROLS	
C CHAIN CONVEYOR	600MT
D FUMIGATION MINOR STORAGE	
E GRAIN CLEANER	100MT/LOAD
F CLEANER DAM COLLECTOR	10 DUST BINS
G GREEN DRYER AND CONVEYOR	10MT
H ELEVATOR LEG-WET	30MT
I ELEVATOR LEG DRY	30MT
J CHAIN CONVEYOR	30MT
K AUTOMATIC SCALE	250MT
L METAL CY AND FUMIGATION FAN	ALL BINS
M CHAIN CONVEYOR	500MT
N CHAIN CONVEYOR	300MT
O CHAIN CONVEYOR	250MT
P CHAIN CONVEYOR	300MT
Q SUSPENDED MAGNET	
R CHAIN CONVEYOR	600MT
S CHAIN CONVEYOR	600MT
T TEMPERATURE CONTROL CABLES	IN ALL BINS
U STATIONARY PNEUMATIC UNLOADERS KIT	SCALES CONTRACT
V STATIONARY LOADOUT STATIONS	CONTRACT
W TRUCK LOADING BELTS	

H. PEEK FUMIGATION BINS	
HOPPER FUMIGATION BINS	
RECEIVING LEG	60CMT
RECEIVING LEG	100CMT

BIN CAPACITY	COMMODITY IN METRIC TONS	
	PADDY RICE IN SHELL	
36 ROUND BINS	19,880	27,080
22 ROUND BINS	18,300	32,370
60 RECTANGULAR	8,500	11,620
24 END BINS	840	1,164
8 D BINS	17,480	22,214
10 UPPER DISTRIBUTOR-DUST BIN		450
8 LOWER DISTRIBUTOR DUST BIN		163
TOTAL	65,220	93,033

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GRAIN DRYING, STORAGE AND MARKETING STUDY
SOUTH VIETNAM

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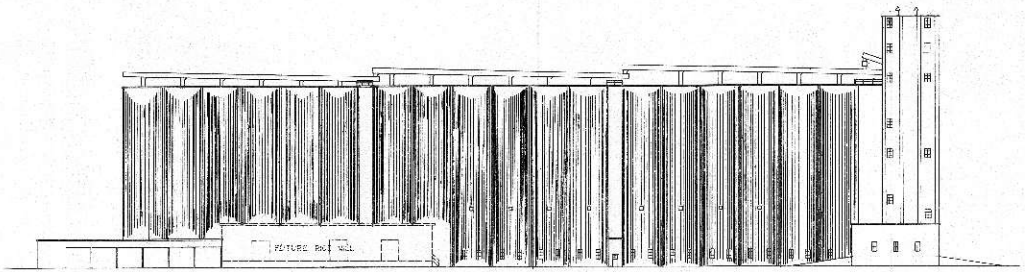
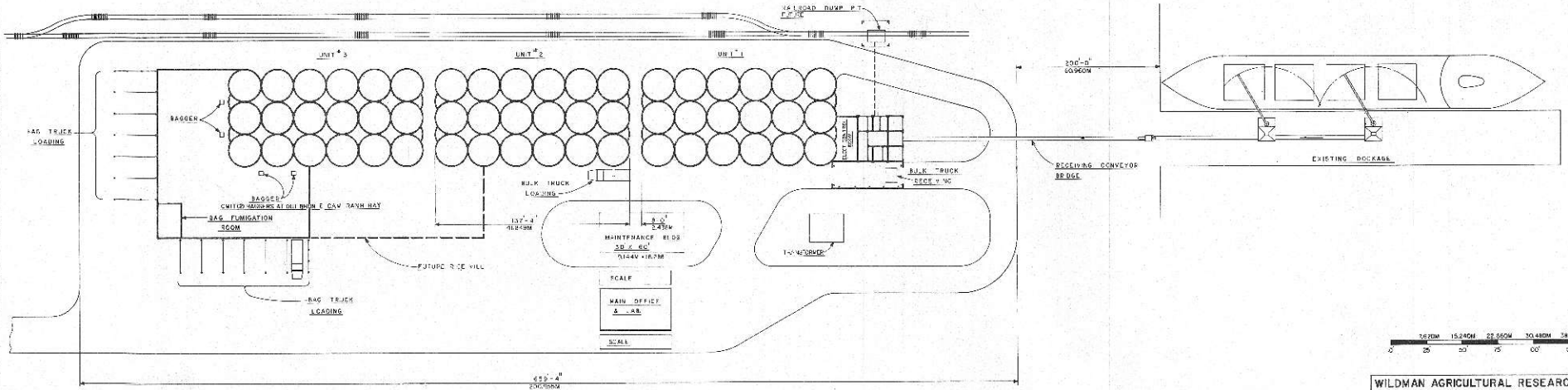
FLOW DIAGRAM

CAN THO

NOVEMBER-1969 DRAWING NO. 28



ELEVATION



SITE PLAN

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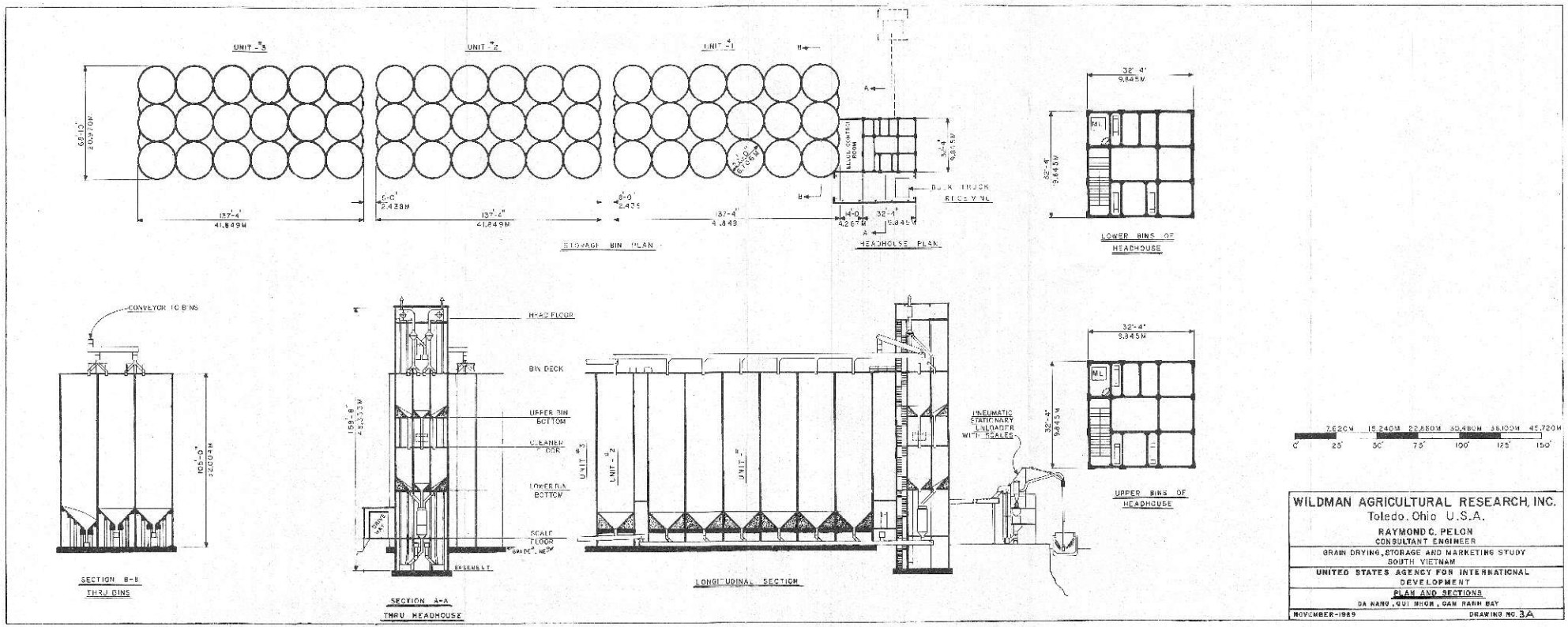
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
SITE PLAN AND ELEVATION DA NANG, QUI NHON, CAM RANH BAY
NOVEMBER-1959 DRAWING NO. 3


UNIT #3
UNIT #2
UNIT #1
68'-10"
20.970M
137'-4"
41.849M
6'-0"
1.828M
137'-4"
41.849M
6'-0"
1.828M
137'-4"
41.849M
STORAGE BIN PLAN
BUCK TRUCK
RECEIVING
4'-0"
1.219M
32'-4"
9.845M
HEADHOUSE PLAN
32'-4"
9.845M
32'-4"
9.845M
LOWER BINS OF HEADHOUSE
CONVEYOR TO BINS
102'-0"
31.090M
SECTION B-B
THRU BINS
H-A2 FLOOR
BIN DECK
UPPER BIN BOTTOM
CLEANER DOR
LOWER BIN BOTTOM
SCALE FLOOR
BASEMENT
SECTION A-A
THRU HEADHOUSE
UNIT #3
UNIT #2
UNIT #1
PNEUMATIC STATIONARY UNLOADER WITH SCALES
LONGITUDINAL SECTION
32'-4"
9.845M
32'-4"
9.845M
UPPER BINS OF HEADHOUSE
7.620M 15.240M 22.860M 30.480M 38.100M 45.720M
0' 25' 50' 75' 100' 125' 150'
WILDMAN AGRICULTURAL RESEARCH, INC.
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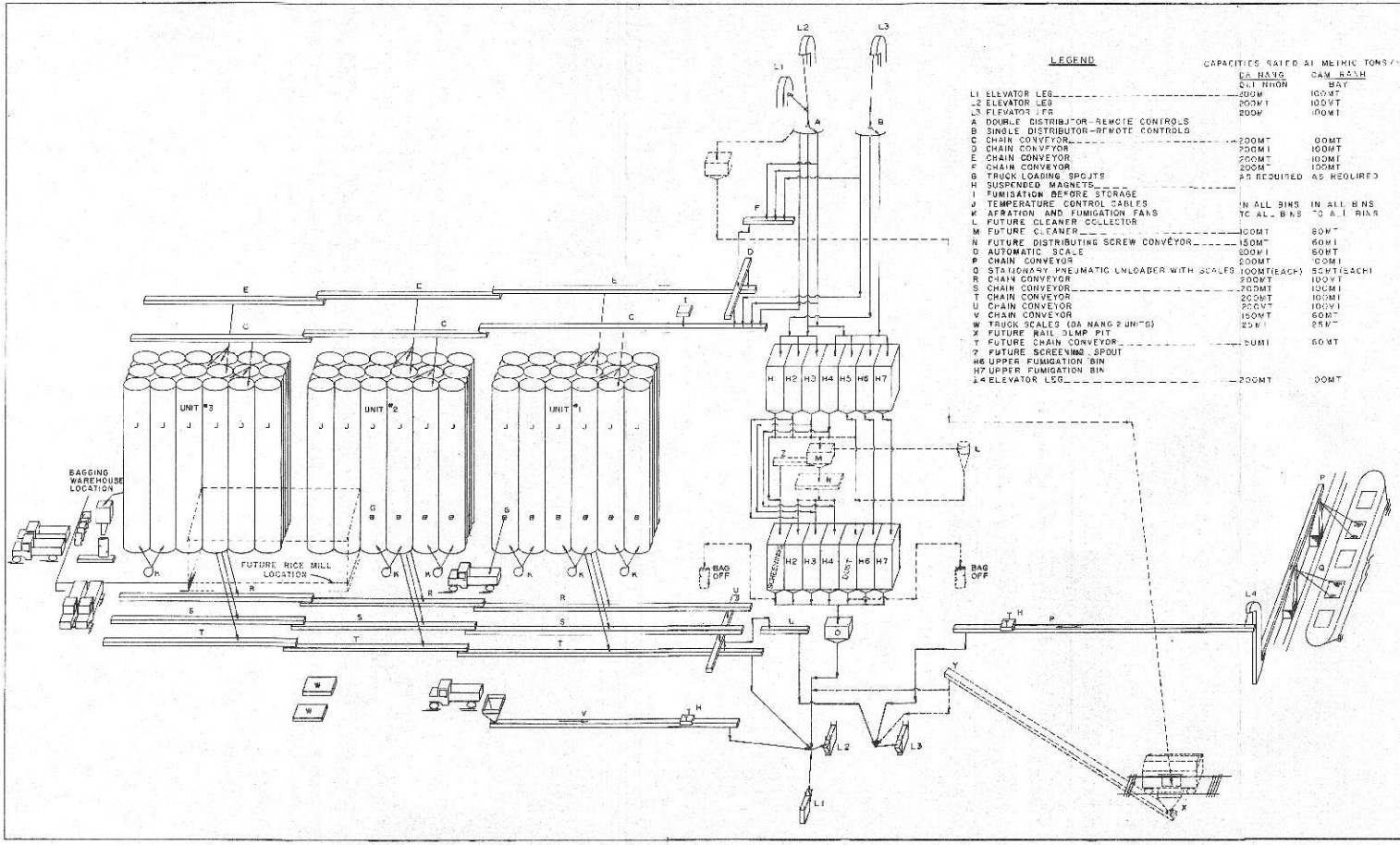
SOUTH VIETNAM
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
PLAN AND SECTIONS
DA NANG, QUI NHON, CAM RANH BAY
NOVEMBER-1969
DRAWING NO. 3A



LEGEND

		CAPACITIES RATED AT METRIC TONS/HR: DA NANG QUI NHON	CAM RANH BAY
L1	ELEVATOR LEG	200MT	100MT
L2	ELEVATOR LEG	200MT	100MT
L3	ELEVATOR LEG	200MT	100MT
A	DOUBLE DISTRIBUTOR-REMOTE CONTROLS		
B	SINGLE DISTRIBUTOR-REMOTE CONTROLS		
C	CHAIN CONVEYOR	200MT	100MT
D	CHAIN CONVEYOR	200MT	100MT
E	CHAIN CONVEYOR	200MT	100MT
F	CHAIN CONVEYOR	200MT	100MT
G	TRUCK LOADING SPOUTS	AS REQUIRED	AS REQUIRED
H	SUSPENDED MAGNETS		
I	FUMIGATION BEFORE STORAGE		
J	TEMPERATURE CONTROL CABLES	IN ALL BINS	IN ALL BINS
K	AERATION AND FUMIGATION FANS	TO ALL BINS	TO ALL BINS
L	FUTURE CLEANER COLLECTOR		
M	FUTURE CLEANER	100MT	50MT
N	FUTURE DISTRIBUTING SCREW CONVEYOR	150MT	60MT
O	AUTOMATIC SCALE	200MT	50MT
P	CHAIN CONVEYOR	200MT	100MT
Q	STATIONARY PNEUMATIC UNLOADER WITH SCALES	100MT(EACH)	50MT(EACH)
R	CHAIN CONVEYOR	200MT	100MT
S	CHAIN CONVEYOR	200MT	100MT
T	CHAIN CONVEYOR	200MT	100MT
U	CHAIN CONVEYOR	200MT	100MT
V	CHAIN CONVEYOR	150MT	50MT
W	TRUCK SCALES (DA NANG 2 UNITS)	25MT	25MT
X	FUTURE RAIL DUMP PIT		
Y	FUTURE CHAIN CONVEYOR	50MT	50MT
Z	FUTURE SCREENING SPOUT		
H6	UPPER FUMIGATION BIN		
H7	UPPER FUMIGATION BIN		
L4	ELEVATOR LEG	200MT	100MT

DA NANG

BIN CAPACITY	COMMODITY IN METRIC TONS: PADDY RICE	OR WHEAT
18 ROUND BINS	9,900	13,590
36 ROUND BINS	19,200	26,160
30 INTERSTICE BINS	4,290	5,835
12 END BINS	420	582
SUB TOTAL	33,840	46,167
6 UPPER BINS	215	296
4 LOWER BINS	160	224
TOTAL	34,215	46,687

QUI NHON

BIN CAPACITY	COMMODITY IN METRIC TONS: PADDY RICE	OR WHEAT
12 ROUND BINS	6,620	9,020
24 ROUND BINS	12,800	17,440
20 INTERSTICE BINS	2,900	3,950
8 END BINS	280	388
SUB TOTAL	22,560	30,738
6 UPPER BINS	215	296
4 LOWER BINS	160	224
TOTAL	22,935	31,258

CAM RANH BAY

BIN CAPACITY	COMMODITY IN METRIC TONS: PADDY RICE	OR WHEAT
8 ROUND BINS	3,200	4,360
12 ROUND BINS	6,400	8,720
8 INTERSTICE BINS	1,430	1,950
4 END BINS	140	194
SUB TOTAL	11,260	15,339
6 UPPER BINS (HEADHOUSE)	215	296
4 LOWER BINS (HEADHOUSE)	160	224
TOTAL	11,655	15,859

DA NANG	23,840MT	USE	UNITS 1,2 & 3
QUI NHON	22,560MT	USE	UNITS 1 & 2
CAM RANH BAY	11,260MT	USE	UNIT 1

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SOUTH VIETNAM

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

FLOW DIAGRAM
DA NANG, QUI NHON, CAM RANH BAY

NOVEMBER-1969 DRAWING NO. 38

A bagging warehouse with a capacity of 1,000 metric tons housing four bagging machines rated at 20 metric tons per hour each with sewing machines will be constructed adjacent to the silo facility. This bagging warehouse will have covered truck and rail docks so that both modes of transportation also can be loaded during inclement weather. The facilities are designed to handle either paddy, corn, wheat or sorghum.

The types of equipment with rated capacities for weighing, conveying, elevating, distributing, cleaning, fumigating and aerating are listed on the flow diagram (Drawing 3B) and this plan illustrates the entire processing flow of grain through all the functions of the Da Nang port facility.

Qui Nhon and Cam Ranh

The recommended silo facility at Qui Nhon has an estimated capacity of 22,560 metric tons of paddy with an additional 375 metric tons in the headhouse work bins. This is equivalent to 30,738 metric tons and 520 metric tons respectively of wheat storage. The estimated cost of this facility is US $5,792,741 and VN $183,794,140. The recommended silo facility at Cam Ranh is basically the same as that recommended for Qui Nhon except that the silo itself has an estimated capacity of 11,280 metric tons of paddy with an additional 375 metric tons in the headhouse work bins. This is equivalent to 15,369 metric tons and 520 metric tons respectively of wheat storage. The estimated cost of this facility is US $4,236,247 and VN $118,878,958. The details of these facilities are shown in Drawings 3, 3A and 3B.

Waterfront dock facilities sufficient to accommodate the large coastal

vessels and smaller oceangoing vessels and stable enough to support the bulk unloading equipment will be provided at each of these facilities. The grain receipts arriving at these facilities by water from coastal vessels or oceangoing vessels will be unloaded by pneumatic conveying units with an intake capacity of 200 metric tons per hour at Qui Nhon and 100 metric tons per hour at Cam Ranh.

The equipment to receive bulk grain by truck will have a rated intake capacity of 150 metric tons per hour at Qui Nhon and 60 metric tons per hour at Cam Ranh. Trucks will be loaded out directly from the storage bins by side bin valves, thereby bypassing the headhouse conveying equipment. These trucks will be weighed on a truck scale with a capacity of 25 metric tons and which will accommodate both incoming and outgoing trucks.

A bagging warehouse with a capacity of 1,000 metric tons housing two bagging machines rated at 20 metric tons per hour each with sewing machines will be constructed adjacent to each silo facility. This bagging warehouse will have covered truck and rail docks so that both modes of transportation also can be loaded during inclement weather. The facilities are designed to handle either paddy, corn, wheat or sorghum.

The types of equipment with rated capacities for weighing, conveying, elevating, distributing, cleaning, fumigating and aerating are listed on the flow diagram (Drawing 3B) and this plan illustrates the entire processing flow of grain through all the functions of the Qui Nhon and Cam Ranh facilities.

My Tho, Vinh Long, Phu Vinh, Phung Hiep and Chau Phu

The recommended silo facilities at My Tho, Vinh Long, Phu Vinh, Phung Hiep and Chau Phu each have an estimated capacity of 11,100 metric tons of paddy with an additional 375 metric tons of headhouse work bins. This is equivalent to 15,110 metric tons and 520 metric tons respectively of wheat storage. The estimated cost of the My Tho and Vinh Long facilities is US $4,042,608 and VN $114,873,325 each; the estimated cost of the Phung Hiep, Chau Phu and Phu Vinh facilities is US $4,005,333 and VN $114,760,405 each. The details of these facilities are shown on Drawings 4, 4A and 4B.

Waterfront dock facilities necessary to support the bulk unloading and loading equipment for bulk grain will be similar to those shown on the drawings but will be modified to fit each particular site. The grain receipts arriving at this facility by water transportation will be unloaded by pneumatic conveying units with an intake capacity of 60 or 100 metric tons per hour and a capacity to load out to water transportation at the rate of 60 or 100 metric tons per hour.

The equipment to receive grain by truck will have a rated capacity of 60 or 100 metric tons per hour. Trucks will be loaded out direct from storage bins by side bin valves, thereby bypassing the headhouse conveying equipment. These trucks of bulk grain will be weighed on a truck scale with a capacity of 25 metric tons and which can accommodate both incoming and outgoing trucks.

The type of equipment with rated capacities for weighing, conveying, elevating, distributing, cleaning, drying, fumigating and aerating are listed in the flow diagram (Drawing 4B) which also shows the flow of grain through the entire facility.

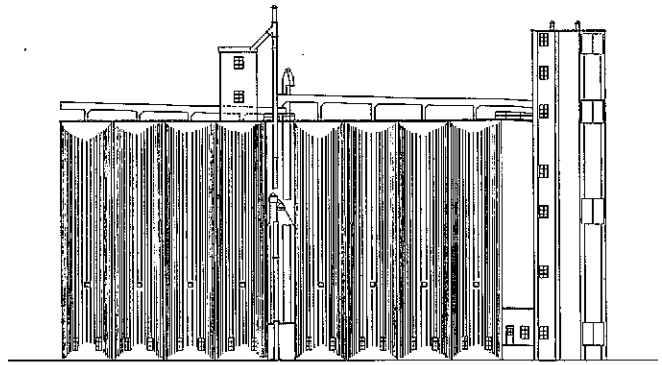
Soc Trang, Long Xuyen, Vinh Loi, Duc Long and Quan Long

The recommended silo facilities at Soc Trang, Long Xuyen, Vinh Loi, Duc Long and Quan Long each have an estimated capacity of 27,750 metric tons of paddy with an additional 375 metric tons of headhouse work bins. This is equivalent to 37,775 metric tons and 520 metric tons respectively of wheat storage. The estimated cost of the Soc Trang, Vinh Loi, Duc Long and Quan Long facilities is US $7,173,547 and VN $214,297,778 each; the estimated cost of the LongXuyen facility is US $6,698,397 and VN $210,783,683. The details of these facilities are shown in Drawings 5, 5A and 5B.

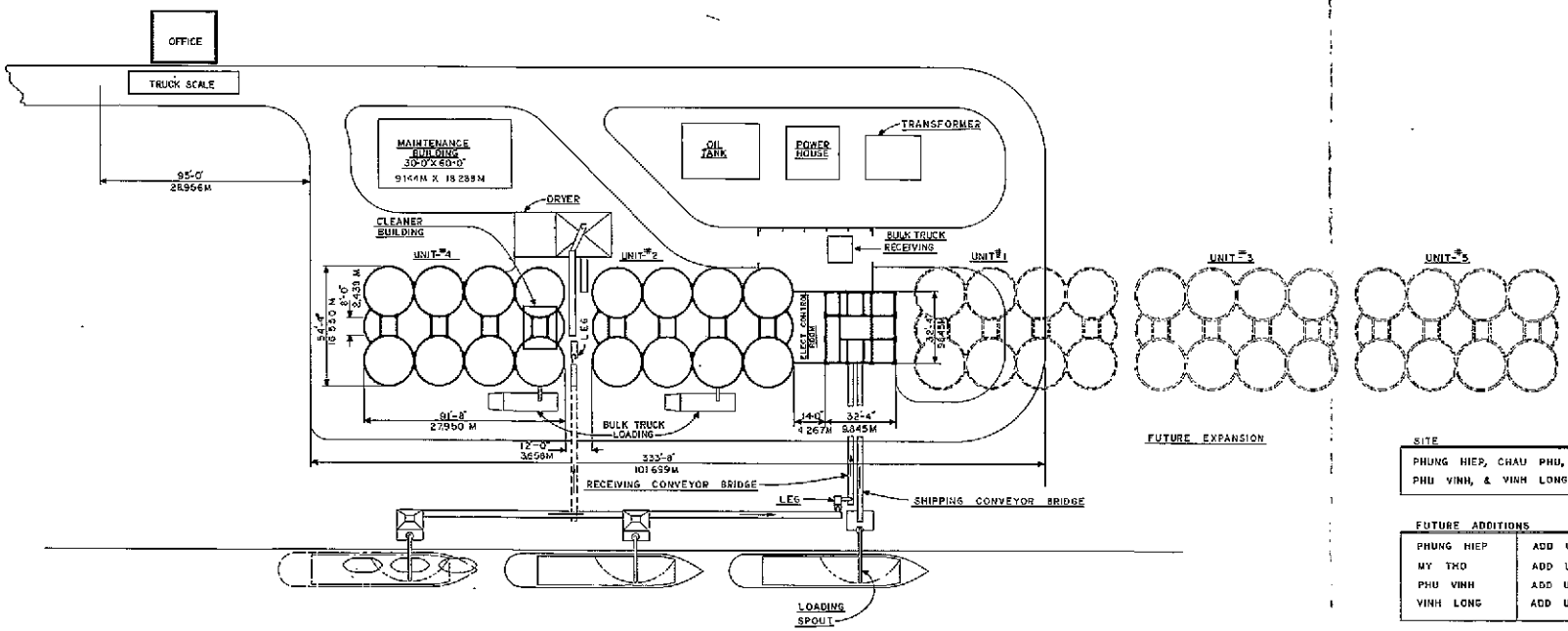
Waterfront dock facilities necessary to support the bulk unloading and loading equipment for bulk grain will be similar to those shown on the drawings but will be modified to fit each particular site. The grain receipts arriving at these facilities by water transportation will be unloaded by pneumatic conveying units with an intake capacity of 150 metric tons per hour and a capacity to load out to water transportation at the rate of 150 metric tons per hour.

The equipment to receive grain by truck will have a rated capacity of 150 metric tons per hour. Trucks will be loaded out direct from storage bins by sidebin valves, thereby bypassing the headhouse conveying equipment. These trucks will be weighed on a truck scale with a capacity of 25 metric tons and which can accommodate both incoming and outgoing trucks.

The types of equipment with rated capacities for weighing, conveying, elevating, distributing, cleaning drying, fumigating and aerating are listed in the flow diagram (Drawing 5B) which also shows the flow of grain through the entire facility.



ELEVATION



SITE PLAN

SITE	CAPACITY
PHUNG HIEP, CHAU PHU, MY THO, PHU VINH, & VINH LONG	11,100 M.T.

FUTURE ADDITIONS		
PHUNG HIEP	ADD UNIT # 1	5,550 M.T.
MY THO	ADD UNIT # 1, 3, & 5	16,650 M.T.
PHU VINH	ADD UNIT # 1, 3, & 5	16,650 M.T.
VINH LONG	ADD UNIT # 1, 3, & 5	16,650 M.T.

7620M 15.240M 22.860M 30.480M 38.100M 45.720M
0' 25' 50 75' 100' 125' 150

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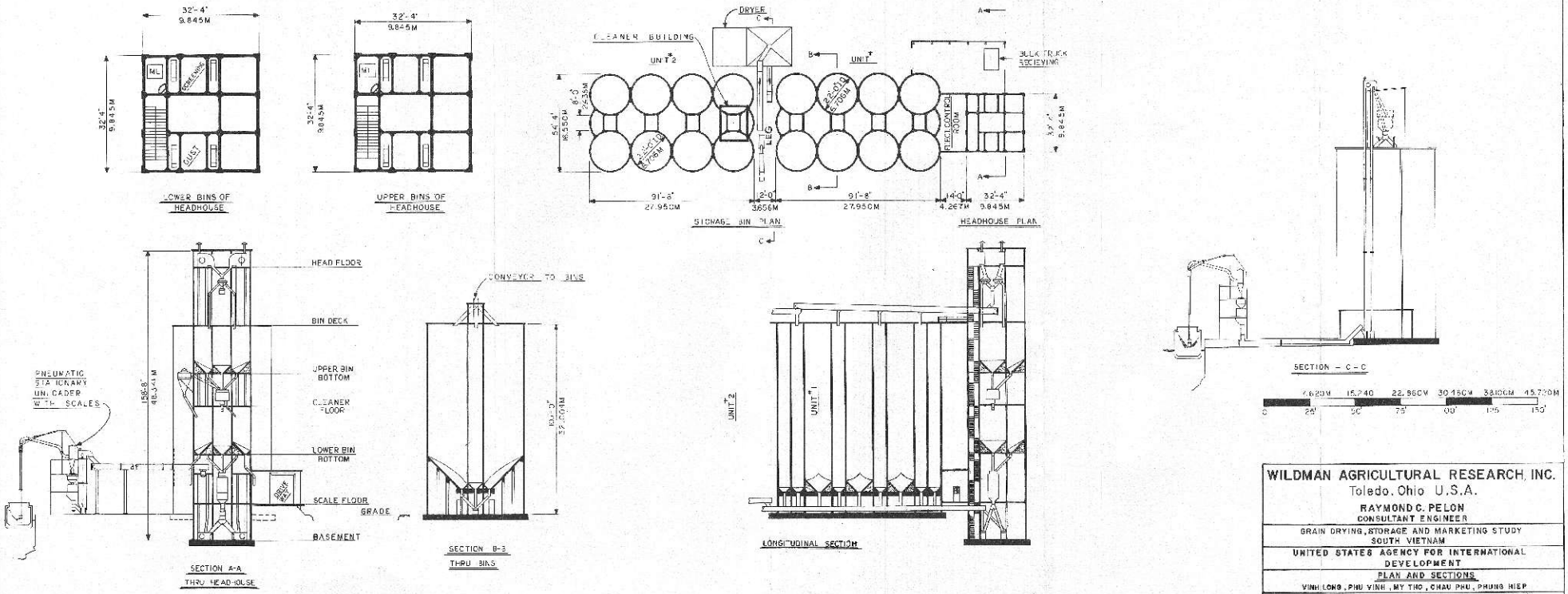
SOUTH VIETNAM

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

SITE PLAN AND ELEVATION
VINH LONG, PHU VINH, MY THO, CHAU PHU, PHUNG HIEP

NOVEMBER-1969 DRAWING NO. 4


32'-4"
9.845M
ML
SCALE VIEW
DUST
LOWER BINS OF HEADHOUSE
UPPER BINS OF HEADHOUSE
DRYER
CLEANER BUILDING
UNIT 2
UNIT 1
BULK TRUCK RECEIVING
LEG
ELECT. CONTROL ROOM
91'-8"
27.950M
2'-0"
3.656M
4'-0"
4.267M
SIGNAGE BIN PLAN
HEADHOUSE PLAN
HEAD FLOOR
BIN DECK
UPPER BIN BOTTOM
CLEANER FLOOR
LOWER BIN BOTTOM
SCALE FLOOR
GRADE
BASEMENT
PNEUMATIC STATIONARY UNLOADER WITH SCALES
DRIVE
158-8
48.341M
SECTION A-A THRU HEADHOUSE
CONVEYOR TO BINS
SECTION B-B THRU BINS
LONGITUDINAL SECTION
SECTION - C - C
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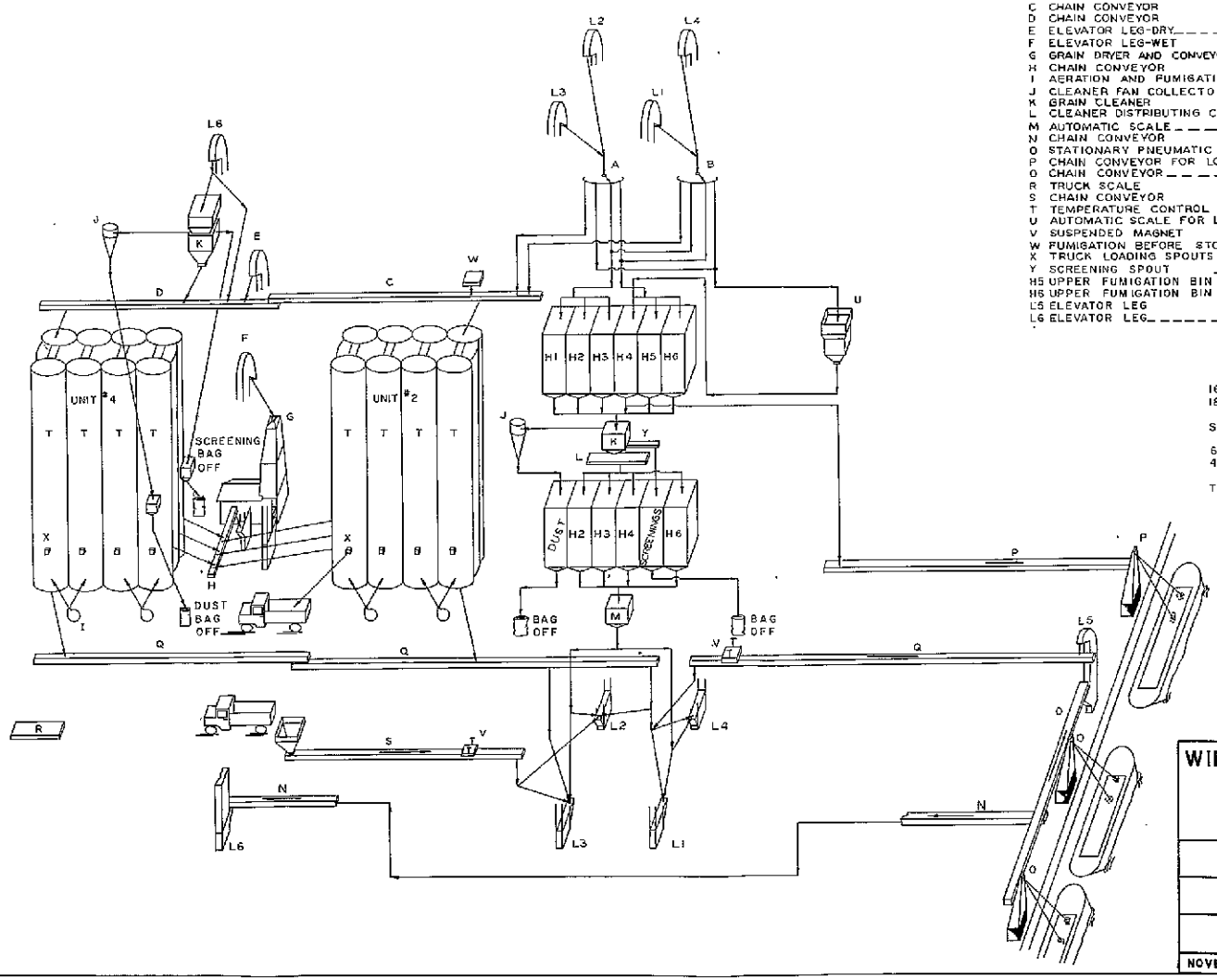
SOUTH VIETNAM
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
PLAN AND SECTIONS
VINH LONG, PHU VINH, MY THO, CHAU PHU, PHUNG HIEP
NOVEMBER-1959
DRAWING NO. 4A



LEGEND

		CAPACITIES RATED AT METRIC TONS/HR: PHUNG HIEP CHAU PHU PHU VINH	MY THO VINH LONG
L1	ELEVATOR LEG	60 MT	100 MT
L2	ELEVATOR LEG	60 MT	100 MT
L3	ELEVATOR LEG	60 MT	100 MT
L4	ELEVATOR LEG	60 MT	100 MT
A	DOUBLE DISTRIBUTOR-REMOTE CONTROL		
B	DOUBLE DISTRIBUTOR-REMOTE CONTROL		
C	CHAIN CONVEYOR	60MT	100 MT
D	CHAIN CONVEYOR	60MT	100 MT
E	ELEVATOR LEG-DRY	30MT	30 MT
F	ELEVATOR LEG-WET	30MT	30 MT
G	GRAIN DRYER AND CONVEYOR	30MT	30 MT
H	CHAIN CONVEYOR	30MT	30 MT
I	AERATION AND FUMIGATION FANS	TO ALL BINS	TO ALL BINS
J	CLEANER FAN COLLECTOR	TO DUST BINS	TO DUST BINS
K	GRAIN CLEANER	75MT	100 MT
L	CLEANER DISTRIBUTING CONVEYOR	75MT	100 MT
M	AUTOMATIC SCALE	60MT	100 MT
N	CHAIN CONVEYOR	60MT	100 MT
O	STATIONARY PNEUMATIC UNLOADER WITH SCALES	30MT EACH	50 MT EACH
P	CHAIN CONVEYOR FOR LOADOUT STATION	60MT	100 MT
Q	CHAIN CONVEYOR	60MT	100 MT
R	TRUCK SCALE	25MT	25 MT
S	CHAIN CONVEYOR	60MT	100 MT
T	TEMPERATURE CONTROL CABLE	IN ALL BINS	IN ALL BINS
U	AUTOMATIC SCALE FOR LOADOUT	60MT	100 MT
V	SUSPENDED MAGNET		
W	FUMIGATION BEFORE STORAGE		
X	TRUCK LOADING SPOUTS	AS REQUIRED	AS REQUIRED
Y	SCREENING SPOUT		
H5	UPPER FUMIGATION BIN		
H6	UPPER FUMIGATION BIN		
L5	ELEVATOR LEG	60MT	100MT
L6	ELEVATOR LEG	60MT	100MT

BIN CAPACITY	COMMODITY IN METRIC TONS: PADDY RICE	OR WHEAT
16 ROUND BINS	8,240	11,230
18 CENTER BINS	2,860	3,880
SUB TOTAL	11,100	15,110
6 UPPER BINS (HEADHOUSE)	215	296
4 LOWER BINS (HEADHOUSE)	160	224
TOTAL	11,475	15,630

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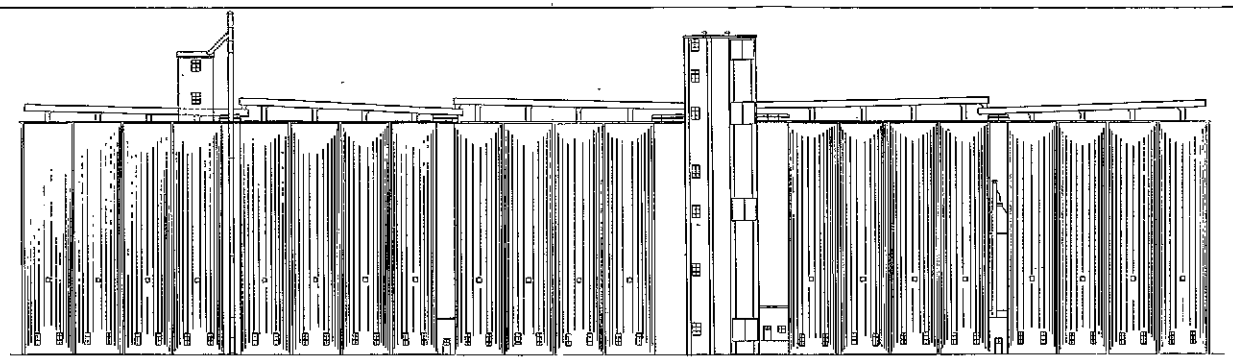
SOUTH VIETNAM

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

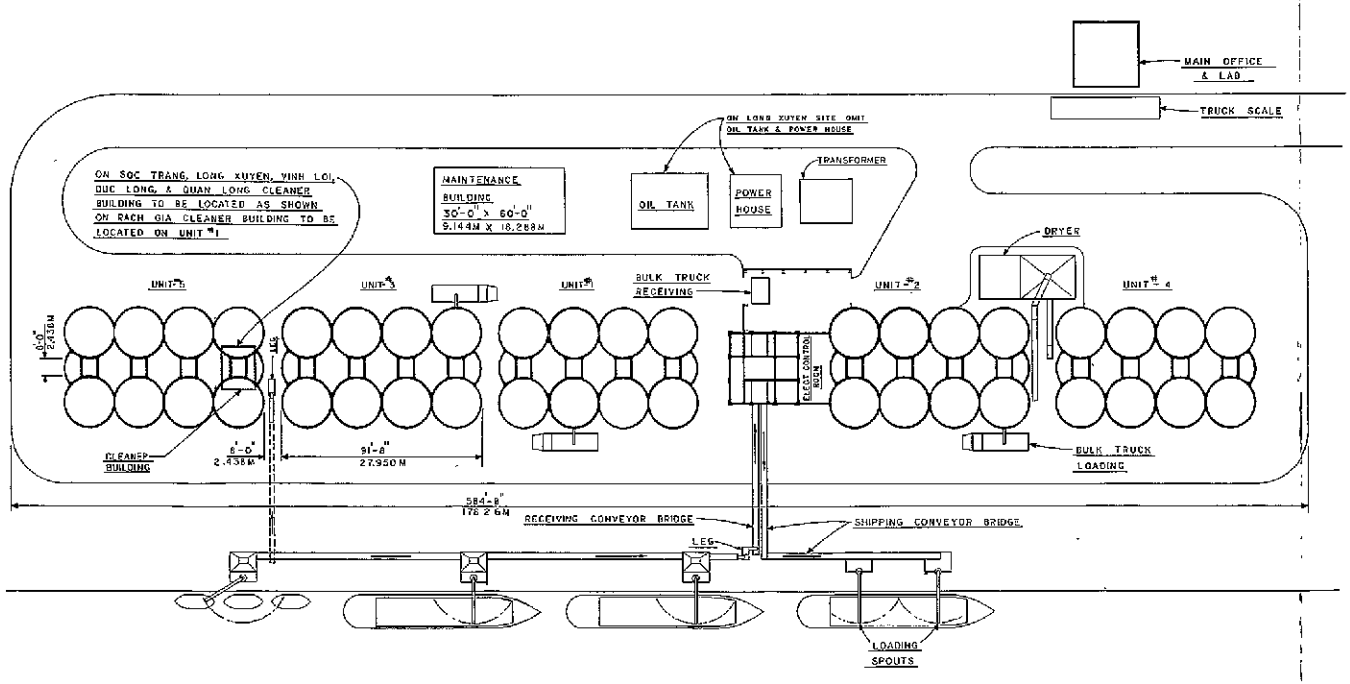
FLOW DIAGRAM

VINH LONG, PHU VINH, MY THO, CHAU PHU, PHUNG HIEP

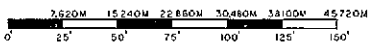
NOVEMBER-1969 DRAWING NO. 4B



ELEVATION



SITE PLAN



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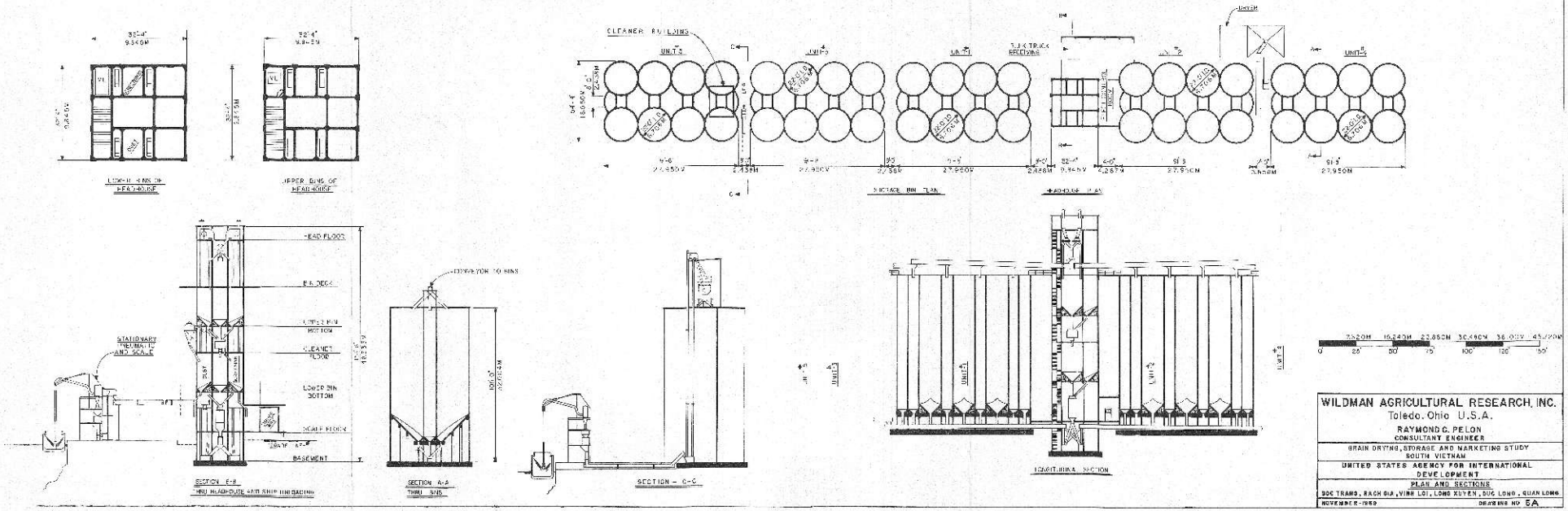
GRAIN DRYING, STORAGE AND MARKETING STUDY SOUTH VIETNAM
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
SITE PLAN AND ELEVATION
SOC TRANG, RACH GIA, VINH LOI, LONG XUYEN, DUC LONG, QUAN LONG
NOVEMBER-1969 DRAWING NO. 5


LOWER BINS OF HEAD HOUSE
UPPER BINS OF HEAD HOUSE
CLEANER BUILDING
UNIT 1
UNIT 2
UNIT 3
UNIT 4
UNIT 5
T.I.K. TRUCK SECTIONS
DRYER
SILO BIN PLAN
HEAD HOUSE PLAN
HEAD FLOOR
BIN DECK
UPPER BIN BOTTOM
CLEANER FLOOR
LOWER BIN BOTTOM
SCALE FLOOR
BASEMENT
STATIONARY PNEUMATIC AND SCALE
SECTION E-E
THRU HEAD-HOUSE AND SHIP UNLOADING
CONVEYOR TO BINS
SECTION A-A
THRU BINS
SECTION - C-C
LONGITUDINAL SECTION
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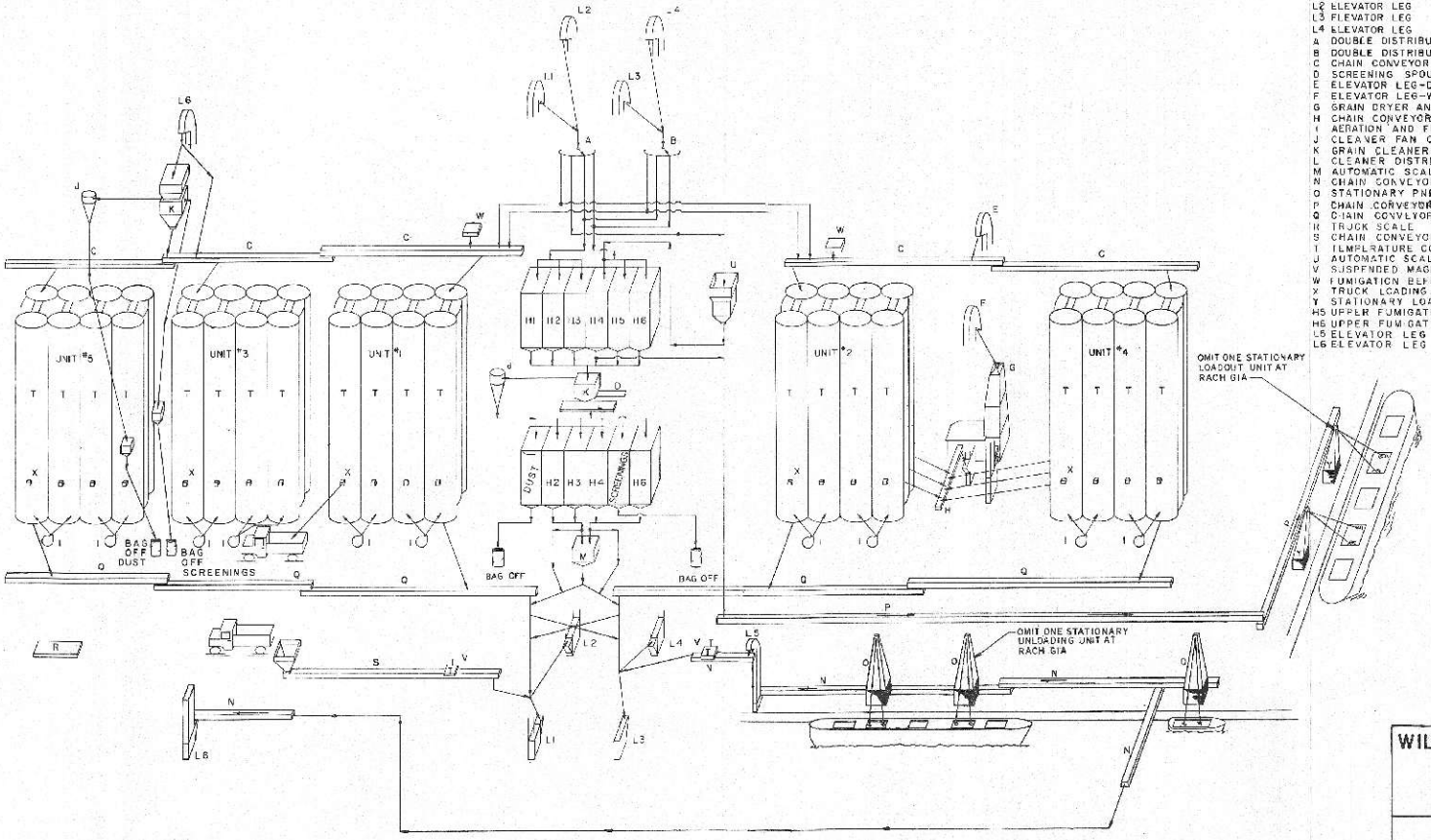
SOUTH VIETNAM
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
PLAN AND SECTIONS
DOC TRANG, BACH DIA, VINH LOI, LONG XUYEN, DUC LONG, QUAN LONG
NOVEMBER-1969
DRAWING NO 5A



CAPACITIES RATED AT METRIC TONS / HR

LEGEND	SOC TRANG, LONG XUYEN DUC LONG QUAN LONG VINH LOI	RACH GIA
L1 ELEVATOR LEG	150MT	150MT
L2 ELEVATOR LEG	150MT	150MT
L3 ELEVATOR LEG	150MT	150MT
L4 ELEVATOR LEG	150MT	150MT
A DOUBLE DISTRIBUTOR-REMOTE CONTROL		
B DOUBLE DISTRIBUTOR-REMOTE CONTROL		
C CHAIN CONVEYOR	150MT	150MT
D SCREENING SPOUT		
E ELEVATOR LEG-DRY	30MT	30MT
F ELEVATOR LEG-WET	30MT	30MT
G GRAIN DRYER AND CONVEYOR	30MT	30MT
H CHAIN CONVEYOR	30MT	30MT
I AERATION AND FUMIGATION FANS	TO ALL BINS	TO ALL BINS
J CLEANER FAN COLLECTOR	TO DUST BINS	TO DUST BINS
K GRAIN CLEANER	100MT	100MT
L CLEANER DISTRIBUTING CONVEYOR	100MT	100MT
M AUTOMATIC SCALE	100MT	100MT
N CHAIN CONVEYOR	150MT	100MT
O STATIONARY PNEUMATIC UNLOADER WITH SCALES	50MT (EACH)	50MT (EACH)
P CHAIN CONVEYOR FOR LOADOUT	150MT	100MT
Q CHAIN CONVEYOR	150MT	150MT
R TRUCK SCALE	25MT	25MT
S CHAIN CONVEYOR	150MT	150MT
T TEMPERATURE CONTROL CABLE	IN ALL BINS	IN ALL BINS
U AUTOMATIC SCALE FOR LOADOUT	150MT	100MT
V SUSPENDED MAGNET		
W FUMIGATION BEFORE STORAGE		
X TRUCK LOADING SPOUTS	AS REQUIRED	AS REQUIRED
Y STATIONARY LOADOUT STATIONS	75MT (EACH)	100MT
H5 UPPER FUMIGATION BINS		
H6 UPPER FUMIGATION BINS		
L5 ELEVATOR LEG	150MT	100MT
L6 ELEVATOR LEG	150MT	100MT

RACH GIA

BIN CAPACITY	COMMODITY IN METRIC TONS: PADDY RICE	OR WHEAT
24 ROUND BINS	12,360	16,845
27 CENTER BINS	4,290	5,820
SUB TOTAL	16,650	22,665
6 UPPER BINS (HEADHOUSE)	215	296
4 LOWER BINS (HEADHOUSE)	160	224
TOTAL	17,025	23,185

SOC TRANG, LONG XUYEN, VINH LOI
DUC LONG, QUAN LONG

BIN CAPACITY	COMMODITY IN METRIC TONS: PADDY RICE	OR WHEAT
40 ROUND BINS	20,600	28,075
45 CENTER BINS	7,150	9,700
SUB TOTAL	27,750	37,775
6 UPPER BINS (HEADHOUSE)	215	296
4 LOWER BINS (HEADHOUSE)	160	224
TOTAL	28,125	38,295

SOC TRANG, LONG XUYEN, VINH LOI, DUC LONG QUAN LONG 27,750MT USE UNITS 1,2,3,4 & 5

RACH GIA 16,650MT USE UNITS 1,2 & 4

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GRAIN DRYING, STORAGE AND MARKETING STUDY
SOUTH VIETNAM

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

FLOW DIAGRAM

SOC TRANG, RACH GIA, VINH LOI, LONG XUYEN, DUC LONG, QUAN LONG

NOVEMBER-1969 DRAWING NO. 5B

Rach Gia

The recommended silo facility at Rach Gia has an estimated capacity of 16,650 metric tons of paddy with an additional 375 metric tons of headhouse work bins. This is equivalent to 22,665 metric tons and 520 metric tons respectively of wheat storage. The estimated cost of this facility is US $5,179,466 and VN $145,692,606. The details of this facility are shown in Drawings 5, 5A and 5B.

Waterfront dock facilities necessary to support the bulk unloading and loading equipment for bulk grain will be similar to those shown in the drawings but will be modified to fit the particular site. The grain receipts arriving at this facility by water transportation will be unloaded by pneumatic conveying units with an intake capacity of 100 metric tons per hour and a capacity to load out to water transportation at the rate of 100 metric tons per hour.

The equipment to receive grain by truck will have a rated capacity of 150 metric tons per hour. Trucks will be loaded out direct from storage bins by sidebin valves, thereby bypassing the headhouse conveying equipment. These trucks will be weighed on a truck scale with a capacity of 25 metric tons and which can accommodate both incoming and outgoing trucks.

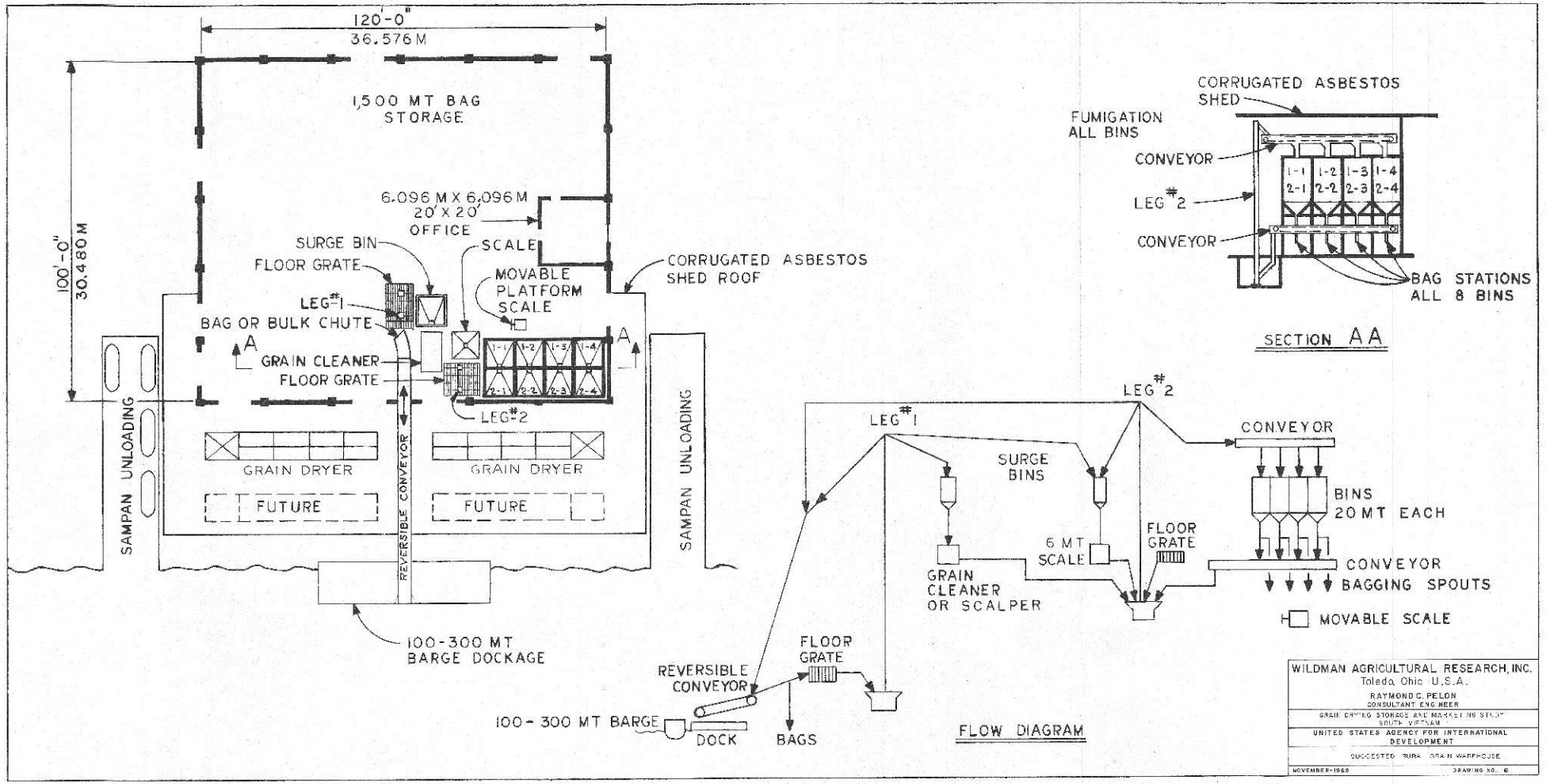
The types of equipment with rated capacities for weighing, conveying, elevating, distributing, cleaning, drying, fumigating and aerating are listed in the flow diagram (Drawing 5B) which also shows the flow of grain through the entire facility.

Suggested Rural Grain Warehouse

The recommended rural grain warehouse facility is designed to meet the grain assembly needs at the village or hamlet level. An attempt was made to design a facility that would serve as a blueprint for organizations and agencies (such as farmer cooperatives) or for firms that wanted to replace present buying station facilities or to construct new facilities which could serve as feeder facilities to the larger silo units.

The details of this recommended facility, which is equipped to handle either bagged grain or bulk grain, are shown in Drawing 6. This facility could be located either on a highway or waterway or could have access to both types of transport. The warehouse would be constructed primarily of local materials. The floor would be concrete and the walls would be of brick and plaster with intermittently spaced concrete columns while the roof would be constructed of a steel truss system covered with corrugated asbestos. This bird-proof and rodent-proof building would have a storage capacity of approximately 1,500 metric tons of bagged or bulk paddy.

The warehouse will be equipped to receive or load out bagged or bulk grain from or to either trucks or boats. Equipment will be provided to clean, weigh, bag, fumigate and dry the grain. The size of the warehouse can vary according to the storage needs. Drawing 6 also illustrates the flow of grain through the facility and lists the kind and capacity of the various types of equipment recommended for this facility. The estimated cost of this facility is US $230,000.


120'-0"
36.576 M
100'-0"
30.480 M
1,500 MT BAG STORAGE
6.096 M X 6.096 M
20' X 20'
OFFICE
SURGE BIN
FLOOR GRATE
SCALE
MOVABLE PLATFORM SCALE
CORRUGATED ASBESTOS SHED ROOF
LEG #1
BAG OR BULK CHUTE
A
A
GRAIN CLEANER
FLOOR GRATE
LEG #2
1-1 1-2 1-3 1-4
2-1 2-2 2-3 2-4
GRAIN DRYER
GRAIN DRYER
FUTURE
FUTURE
REVERSIBLE CONVEYOR
SAMPAN UNLOADING
SAMPAN UNLOADING
100-300 MT BARGE DOCKAGE
CORRUGATED ASBESTOS SHED
FUMIGATION ALL BINS
CONVEYOR
LEG #2
CONVEYOR
BAG STATIONS ALL 8 BINS
SECTION AA
LEG #1
LEG #2
CONVEYOR
SURGE BINS
BINS 20 MT EACH
6 MT SCALE
FLOOR GRATE
GRAIN CLEANER OR SCALPER
CONVEYOR BAGGING SPOUTS
MOVABLE SCALE
FLOOR GRATE
REVERSIBLE CONVEYOR
100-300 MT BARGE
DOCK
BAGS
FLOW DIAGRAM
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SOUTH VIETNAM
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
SUGGESTED RURAL GRAIN WAREHOUSE
NOVEMBER-1969
DRAWING NO. 6

Personnel Requirements

The construction of the various silos as recommended in this report should provide each market area with the physical facilities necessary to perform the functions demanded in the area. However, the physical plant alone cannot do the job. Trained people are required to operate each facility and the success attained at each location will depend almost entirely upon the quality of management and operative personnel required at each location.

As a guide to the personnel needs at each facility, an attempt was made to develop the personnel requirements for the operative and lower management personnel to assist in the planning for an advanced personnel training program. Table 98 shows the recommended list of personnel with their titles and functions. The requirements for operative labor will be governed somewhat by union organization requirements. No present union structure exists which would apply to the conditions and functions of this type of operation and it is not known what the unions will do in classifying the labor requirements of a silo operation.

Cost of the Recommended Facilities

Facilities for 1974/75

The estimated costs of the facilities recommended for 1974/75 are listed in Table 99. The various cost components for each facility are divided into two parts. First, the requirements for foreign currency (expressed in United States

TABLE 98

ESTIMATED MANAGEMENT AND OPERATING PERSONNEL REQUIRED FOR SILO FACILITIES FOR 1974/75 a/

Classification and Title	Saigon	Can Tho	Da Nang	Cam Ranh	Qui Nhon	Phung Hiep	Chau Phu	My Tho	Phu Vinh	Vinh Long	Soc Trang	Vinh Loi	Long Xuyen	Duc Long	Quan Long	Rach Gia	Total
Office and Records:																	
Manager of Facility	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Assistant Manager	2	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-	7
General Manager of Records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Assistant for Receiving and Shipping Records	2	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-	7
Accountants	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18
Office Clerks	12	12	6	3	3	3	3	3	3	3	4	4	4	4	4	3	74
Security Personnel	8	8	6	6	6	6	6	6	6	6	6	6	6	6	6	6	100
Receiving:																	
Waterfront Foreman	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Pneumatic Unloader Operators	8	6	2	2	2	2	2	2	2	2	3	3	3	3	3	2	47
Unloader Scale Weighman	8	6	2	2	2	2	2	2	2	2	3	3	3	3	3	2	47
Pneumatic Unloader Tenders	16	12	4	4	4	4	4	4	4	4	6	6	6	6	6	4	94
Stevedore Forman	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Stevedores	32	24	8	8	8	8	8	8	8	8	12	12	12	12	12	8	188
Truck and Rail Unloading Foreman	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Laborers	16	12	4	4	4	2	2	2	4	2	4	4	4	4	4	4	76
Shipping:																	
Barge Loading Foreman	1	1	-	-	-	1	1	1	1	1	1	1	1	1	1	1	13
Truck and Rail Loading Foreman	1	1	1	1	1	-	-	1	-	1	-	-	-	-	-	-	7
Weighmaster	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Bagging Facilities Foreman	1	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	4
Bagging Machine Operators	5	-	4	2	2	-	-	-	-	-	-	-	-	-	-	-	13
Laborers	28	18	15	9	9	4	4	6	4	6	4	4	4	4	4	4	127
Sampling and Grading.																	
Grain Sampling Foreman	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Grain Samplers	12	9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	35
Laboratory Technician	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Laboratory Assistants (Trainees)	1	1	1	1	1	-	-	-	-	-	1	1	1	1	1	-	10
Storage:																	
Chief Weighmaster	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Scale Operators (Headhouse)	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	29
Conveyor Tenders	12	12	4	4	4	4	4	4	4	4	8	8	8	8	8	6	102
Truck Scale Operators	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17
Laborers	10	10	8	6	8	6	6	6	6	6	8	8	8	8	8	6	118
Grain Processing.																	
Process Foreman	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Assistant as Cleaner Operator	2	2	-	-	-	1	1	1	1	1	1	1	1	1	1	1	15
Assistant as Dryer Operator	1	1	-	-	-	1	1	1	1	1	1	1	1	1	1	1	13
Assistant as Fumigant Operator	2	2	-	-	-	1	1	1	1	1	1	1	1	1	1	1	15
Assistant as Temperature and Aeration Systems Operator	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Laborers	5	5	2	2	2	4	4	4	4	4	4	4	4	4	4	4	60
Sanitary and Quality Control:																	
General Controller of Products	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	5
Assistant as Sanitary Conditions Engineer	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Assistant as Quality Control Engineer	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Laboratory Technician	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Plant Engineering and Maintenance:																	
Plant Engineer	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Assistant Engineer	1	1	1	-	1	-	-	-	-	-	1	1	1	1	1	-	9
Chief Millwright	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Millwrights	3	3	2	2	2	1	1	1	1	1	2	2	2	2	2	1	28
Stock Controller of Supplies	1	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	4
Diesel Generator Operator	-	-	-	-	-	1	1	1	1	1	1	1	-	1	1	1	10
Laborers	6	6	5	5	5	3	3	3	3	3	5	5	5	5	5	3	70
TOTAL	219	179	97	82	86	72	72	75	74	75	94	94	93	94	94	76	1,576

a/ Takes into account operating more than one shift during months of heavy movement and anticipated labor union requirements for various job classifications

TABLE 99

ESTIMATED COST BREAKDOWN OF RECOMMENDED SILO FACILITIES FOR 1974/75

Site	Storage Capacity of Paddy a/	Drying Capacity	Civil Work (Structures)		Machinery and Electrical b/		Contractor's Overhead and Equipment Rental		Contractor's Profit	Site Preparation and Work Allowance c/		Construction Bonds d/	Engineering	Contingencies e/		Total Currency Requirements f/	
			Foreign Currency	Local Currency	Foreign Currency	Local Currency	Foreign Currency	Local Currency		Foreign Currency	Local Currency			Foreign Currency	Local Currency	Foreign Currency	Local Currency
	(Metric Tons)	(Metric Tons per Hour)	(US Dollars)	(VN Piasters)	(US Dollars)	(VN Piasters)	(US Dollars)	(VN Piasters)	(US Dollars)	(US Dollars)	(VN Piasters)	(US Dollars)	(US Dollars)	(US Dollars)	(VN Piasters)	(US Dollars)	(VN Piasters)
Saigon	78,960	30	1,895,930	233,984,496	5,429,640	57,599,790	2,087,440	96,222,480	981,340	3,260,700	122,577,000	205,360	1,259,320	732,560	29,158,330	15,862,290	539,541,096
Can Tho	67,680	30	1,781,467	207,475,978	4,645,070	54,497,895	2,120,760	86,451,315	920,380	3,415,500	85,520,500	188,305	1,159,250	642,655	26,197,370	14,871,337	460,142,858
Da Nang	33,840	g/	967,033	103,509,954	2,127,430	25,632,565	1,083,060	45,199,880	467,580	848,700	42,733,700	91,840	513,340	309,450	12,914,350	6,408,433	229,990,349
Cam Ranh	11,280	g/	388,437	47,358,238	1,663,665	12,818,840	718,240	21,096,910	255,610	629,100	31,477,480	55,285	320,700	205,210	6,027,690	4,236,247	118,878,958
Qui Nhon	22,560	g/	677,101	75,132,960	2,024,260	23,579,170	945,475	34,546,095	372,970	972,800	40,874,600	77,235	452,665	270,135	9,870,315	5,792,741	183,794,140
Phung Hiep	11,100	30	371,453	47,192,920	1,339,680	13,867,355	598,900	21,406,100	229,900	937,800	26,078,000	48,595	307,890	171,115	6,116,030	4,005,333	114,760,405
Chau Phu	11,100	30	371,453	47,192,920	1,339,680	13,867,355	598,900	21,406,100	229,900	937,800	26,078,000	48,595	307,890	171,115	6,116,030	4,005,333	114,760,405
My Tho	11,100	30	371,453	47,192,920	1,362,195	14,045,235	606,775	21,433,355	231,720	937,800	26,078,000	49,100	310,200	173,365	6,123,815	4,042,608	114,873,325
Phu Vinh	11,100	30	371,453	47,192,920	1,339,680	13,867,355	598,900	21,406,100	229,900	937,800	26,078,000	48,595	307,890	171,115	6,116,030	4,005,333	114,760,405
Vinh Long	11,100	30	371,453	47,192,920	1,362,195	14,045,235	606,775	21,433,355	231,720	937,800	26,078,000	49,100	310,200	173,365	6,123,815	4,042,608	114,873,325
Soc Trang	27,750	30	802,172	96,615,568	2,084,615	21,488,830	1,010,375	41,336,540	425,795	1,919,700	43,046,400	85,110	557,100	288,680	11,810,440	7,173,547	214,297,778
Vinh Loi	27,750	30	802,172	96,615,568	2,084,615	21,488,830	1,010,375	41,336,540	425,795	1,919,700	43,046,400	85,110	557,100	288,680	11,810,440	7,173,547	214,297,778
Long Xuyen	27,750	30	802,172	96,615,568	1,797,800	19,065,310	909,990	40,488,315	403,670	1,919,700	43,046,400	78,555	526,510	260,000	11,568,090	6,698,397	210,783,683
Duc Long	27,750	30	802,172	96,615,568	2,084,615	21,488,830	1,010,375	41,336,540	425,795	1,919,700	43,046,400	85,110	557,100	288,680	11,810,440	7,173,547	214,297,778
Quan Long	27,750	30	802,172	96,615,568	2,084,615	21,488,830	1,010,375	41,336,540	425,795	1,919,700	43,046,400	85,110	557,100	288,680	11,810,440	7,173,547	214,297,778
Rach Gia	16,650	30	515,026	63,667,136	1,748,530	17,295,765	792,260	28,337,015	307,290	1,129,500	28,296,400	64,340	396,110	226,360	8,096,280	5,170,466	145,692,606

NOTE: Estimated costs are based on October 1969 local prices; site acquisition costs are not included in total development cost.

a/ Storage capacity is based on paddy weight of 45 pounds per bushel or 49 bushels per metric ton (2,205 pounds).

b/ Machinery and electrical costs represent installed prices, including mechanical contractor's profit but excluding all fees, taxes and duties.

c/ Site work, demolition, grading, foundation piling, waterfront sheet piling, and roadway and railway works allowance, including contractor's profit but excluding all fees, taxes and duties.

d/ Excluding amounts for fees, taxes and import duties.

e/ Based on 10 percent of civil and mechanical costs.

f/ Currency exchange is based on October 1969 official rate of VN $118 equal to US $1.00.

g/ No dryer at this location.

dollars) and second, the requirements for local currency (expressed in Vietnamese piasters). Conversion to equivalents in Vietnamese piasters and United States dollars is based on the official exchange rate of 118 Vietnamese piasters equal to one United States dollar.

The cost for each facility was compiled by using detailed quantity take-offs based on prices that prevailed during the period September 1969 through October 1969. Costs for site preparation, with regard to grading and fill, roadways, on-site railway siding installation, building support piling and waterfront sheet piling were based on local costs quoted by firms which were presently engaged in work in South Vietnam or which were familiar with South Vietnamese construction conditions. The machinery cost was estimated from detailed itemized take-off lists of the entire machinery requirements as represented on the drawings for each type of facility. The most recent cost of each piece of machinery was obtained from the major suppliers of the machinery and represents their quotations as of October 1969. Inasmuch as these cost estimates were made from the typical plans, as presented on the drawings, and since it may be necessary to adjust these specifications to specific sites, a contingency of 10 percent was added to cover any unforeseen items.

It should be pointed out that these cost estimates represent the wide variation in material costs throughout South Vietnam since the more secure areas have lower material costs than the less secure areas. These relationships could change as hostilities decrease; however, no attempt was made to predict the direction prices will take in any locality.

It should be made clear that these estimates are for budget purposes only

since specific sites have not been selected; however, since a contingency allowance and estimated site improvement costs were included, the estimate represents an accurate appraisal of the individual cost categories for each silo site. The following assumptions and conditions were made in arriving at final cost estimates:

1. It was more desirable to use as much local currency as possible for building materials, specialized labor, fabricated machinery and equipment, and the costs of these items are expressed in the piaster portion.

2. All items that could not be purchased or supplied locally were assumed to require foreign currency.

3. All imported items or construction equipment are assumed to be exempt from all import duties, taxes, governmental fees or other assessments contingent to their import or distribution to the appropriate site.

4. The actual cost of the site itself is not included in the estimate but estimates of the cost of site preparation, grading, dirt fill, foundation piling, waterfront sheet piling, site roadways and railways, and other necessary improvements were included.

5. The costs were based on the construction of the silos as shown in the respective drawings.

6. Although site railway tracks were included in the estimates for those sites where a railway was necessary, the estimate does not include the cost of any railway equipment, such as switch engines or special car moving equipment.

Costs for Facility Additions in 1979/80

Additional storage is recommended for six of the silo locations for the period 1979/80. These future additions are shown as dotted additions in the respective drawings. The port of Saigon is the only exception and due to the physical limitations of traffic, accesses around the original facility and the tremendous volume of paddy which is projected for 1979/80, the construction of a near

duplicate facility as shown in Drawings 1, 1A and 1B at another location in the Saigon port area will be necessary. Although it is recommended that the facility be identical, changes are expected since benefits could be realized from the experience gained in the operation of the first facility.

The addition of four storage tank units at the facility in Can Tho would increase the capacity of that facility to 113,410 metric tons. It would merely mean an extension of the machinery to connect the new addition. No changes in the receiving, loading out, drying, cleaning and weighing equipment will be needed.

The addition of one storage tank unit at the Phung Hiep facility would increase the capacity of that facility to 17,025 metric tons. This unit would connect to the original facility and would require no changes in other equipment.

The addition of three storage tank units at the Vinh Long, My Tho and Phu Vinh facilities would increase the capacity of each of these facilities to 28,125 metric tons. These units would connect to the original facilities and would require no changes in the other equipment.

The estimated costs of these facility additions were derived in the same manner as those for the original facilities and are based on prices as they existed in September and October 1969 (Table 100).

Costs of Operation of the Recommended Facilities

A breakdown of the basic costs of operation of the recommended facilities

TABLE 100

ESTIMATED COST OF FUTURE SILO ADDITIONS FOR 1979/80

Site	Capacity of Paddy	Foreign Currency a/	Local Currency a/
	(Metric Tons)	(US Dollars)	(VN Piasters)
Saigon	78,960	15,862,290	539,541,096
Can Tho	45,120	5,200,180	198,895,820
Phung Hiep	5,550	649,565	26,129,200
Vinh Long	16,650	1,948,840	78,387,620
My Tho	16,650	1,948,840	78,387,620
Phu Vinh	16,650	1,948,840	78,387,620

a/ Costs are based upon prices as of October 1969 and are to be revised and adjusted at time of future construction. Based on exchange rate of VN $118 equal to US $1.00.

is shown in Table 101. The costs are based on the list of employees shown in Table 98, the amount of grain shown in the respective grain flow tables and the level of prices that existed in October 1969. The costs include only the administrative costs at each facility and do not assume the costs of a central office if one is needed. Profits are not included since there has not been established a schedule of charges for the services performed at each location.

If charges were levied similar to those in existence in the trade today, the estimated minimum net return on investment would be approximately 18 percent annually--or the entire system would pay for itself in a little over five years. This does not take into account those savings of product and bag savings as listed in Tables 63 and 64 in Chapter XI.

TABLE 101

ESTIMATED ANNUAL COST OF OPERATION OF THE RECOMMENDED SILO FACILITIES FOR 1974/75

Site	Total Nominal Capacity	Grain Handled per Year	Annual Depreciation: Machinery 10 Percent	Annual Depreciation: Buildings 4 Percent	Annual Maintenance and Repair 1 Percent	Annual Payroll a/: Administrative	Annual Payroll a/: Operative	Annual Electrical Energy Costs	Annual Fuel Cost for Dryer b/	Annual Fumigation Cost	Annual Insurance 1 Percent c/	Annual Interest 7 Percent	Total Operating Cost per Year	Operating Cost per Metric Ton per Year
	(Metric Tons)		(VN Piasters)											
Saigon	80,000	1,668,800	69,829,631	18,308,169	6,982,963	2,112,000	17,472,000	10,030,512	1,693,498	5,117,595	19,036,517	168,790,392	320,173,277	191.86
Can Tho	68,000	1,536,450	60,261,596	16,707,563	6,026,160	2,112,000	13,851,000	9,971,561	1,559,189	4,686,173	17,264,170	155,047,657	287,487,069	187 11
Da Nang	34,000	356,000	27,666,931	8,704,794	2,766,693	1,752,000	7,128,000	2,310,440	d/	3,257,400	8,423,051	69,032,981	131,042,290	368.09
Cam Ranh	11,000	141,000	20,923,111	3,727,752	2,092,311	1,752,000	6,294,000	915,090	d/	1,200,150	5,130,448	43,312,927	85,437,709	605.94
Qui Nhon	23,000	209,000	26,243,285	6,201,235	2,624,329	1,752,000	6,555,000	1,356,410	d/	1,912,350	7,118,608	60,713,630	114,476,847	547.74
Phung Hiep	11,000	88,260	17,204,960	3,640,975	1,720,496	1,532,000	5,589,000	572,807	448,339	807,579	4,506,513	41,117,279	77,139,948	074.01
Chau Phu	11,000	64,200	17,204,960	3,640,975	1,720,496	1,532,000	5,589,000	416,658	325,751	587,430	4,506,513	41,117,279	76,641,062	1,193 79
My Tho	11,000	134,850	17,478,425	3,640,975	1,747,843	1,532,000	5,850,000	875,177	684,229	1,233,878	4,551,627	41,433,075	79,027,220	586.04
Phu Vinh	11,000	113,100	17,204,960	3,640,975	1,720,498	1,532,000	5,745,000	734,019	573,869	1,034,865	4,506,513	41,117,279	77,809,976	687.98
Vinh Long	11,000	134,760	17,478,425	3,640,975	1,747,843	1,532,000	5,580,000	874,502	683,772	1,233,054	4,551,627	41,433,075	78,764,363	584 48
Soc Trang	28,000	221,280	26,747,340	7,650,875	2,674,734	1,628,000	7,419,000	1,436,107	1,122,775	2,024,712	7,912,053	74,254,343	132,869,930	600 46
Vinh Loi	28,000	259,380	26,747,340	7,650,875	2,674,734	1,628,000	7,419,000	1,683,376	1,316,094	2,373,327	7,912,053	74,254,343	133,659,142	515 30
Long Xuyen	28,000	190,260	23,120,571	7,650,875	2,312,057	1,628,000	7,314,000	1,234,787	965,887	1,740,879	7,316,235	70,083,617	123,366,998	648 41
Duc Long	28,000	220,710	26,747,340	7,650,875	2,874,734	1,628,000	7,419,000	1,490,018	1,185,549	2,101,847	7,912,053	74,254,343	133,044,559	579 18
Quan Long	28,000	150,720	26,747,340	7,650,875	2,674,734	1,628,000	7,419,000	978,173	784,753	1,370,989	7,912,053	74,254,343	131,400,359	871.87
Rach Gia	17,000	160,300	23,862,831	4,077,608	2,236,282	1,532,000	5,955,000	1,039,608	812,855	1,465,030	5,952,922	52,080,872	99,315,888	619 95

a/ Includes labor in training, which in the initial stages of operation will be approximately one-third of the personnel. After two years of operation, both administrative and operative labor costs are expected to decrease by approximately 25 percent.
b/ Drying 50 percent of annual volume at each location except Saigon and Can Tho which are 10 percent
c/ Does not include insurance on piling and site improvements.
d/ No dryer at this location.

Program Development and Construction Schedule

Priorities

The development of a grain storage and handling system of this magnitude will require considerable planning. There are also many other important projects which may be equally important to the agricultural economy of the nation. Thus, it may be important to planners and others to establish a set of priorities of the recommendations contained in this report.

Even though the 16 silo facilities recommended in this report are basic to the development of an integrated grain storage and handling system, the limitation of capital may require the establishment of priorities so the program can be developed in stages. The grain flows are developed to illustrate the product flows assuming all 16 facilities would be completed and in operation by the 1974/75 crop year.

In planning the facility development, it is recommended that the following priorities be established. These priorities are based on the contribution and importance of each facility to the system:

Priority I

Saigon facility complex
Can Tho facility complex
Da Nang facility complex

Priority II

Long Xuyen facility complex
Soc Trang facility complex

Duc Long facility complex
Vinh Loi facility complex
My Tho facility complex.

Priority III

Vinh Long facility complex
Quan Long facility complex
Qui Nhon facility complex
Chau Phu facility complex
Rach Gia facility complex
Phung Hiep facility complex
Cam Ranh facility complex
Phu Vinh facility complex

Priority IV

Rural grain collection warehouses

The nucleus of the system is the major assembly silo at Can Tho and the transfer facilities at Saigon and Da Nang. The Priority II group is the minimum number of support facilities which are necessary for the ultimate success of the three units in Priority I. The group in Priority III, although contributing greatly to the success of the Priority I group, have a basic function of alleviating the present problems of the rice producers and merchants in the areas they serve.

Construction Schedule

When implementing a construction program such as is recommended in this report, it is important to develop a schedule for performing the necessary functions in making the program operative. If it is assumed that financing is available for the construction of all or part of the recommended program, then the following steps are recommended:

Site Selection and Acquisition

Since specific sites were not selected, it will be necessary to make this selection. It is advised that this selection be made with the assistance of a design engineer who is familiar with this type of project. Begin April 1970.

Civil Engineering Site Surveys

After the exact site is selected, a civil engineering survey should be made to stake out the location of the facility on each site and develop the general layout plan of accesses and other related functions. This also should be done with the assistance of a design engineer familiar with this type of project. Begin June 1970.

Soil Test for Foundation Requirements

Since each silo structure is large and heavy, it will require numerous soil borings at each site to determine the type and amount of piling and other foundation materials. This work also should be done under the supervision of an engineer. Begin June 1970.

Determine the Necessary Site Improvements

While the soil conditions are being determined, the engineer should investigate and determine the local conditions which would affect the cost of the project. The cost and degree of grading, filling, dredging and site clearance

should be determined in addition to the cost of connecting to highways and railways and to water, sewage and electrical supplies. Since these factors are important in arriving at the final cost, this work should be under the supervision of the engineer responsible for the design work on the project. Begin July 1970.

Preparation of Preliminary Plans with Complete Cost Estimates

The preparation of preliminary plans with complete cost estimates based on the above information will modify the cost estimates that are included in this report in line with the specific costs and design adjustments which must be made to adapt each recommended facility to the actual site selected. To be completed by October 1970.

Preparation of Final Detailed Construction Drawings

The design engineer should prepare final construction drawings, specifications and contractual and bidding documents. These documents should be complete in every detail and should provide all engineering information necessary to select bids for construction. October 1970 to December 1971.

Contract Bidding and Awarding of Contracts

With the assistance of the design engineer, the contract bids should be analyzed and the design engineer should make the final recommendations as to the acceptance or rejection of any bids submitted. January 1972 to April 1972.

Construction Begins under the Supervision of the Design Engineer

It is important at this stage of development that the design engineer have full knowledge of all engineering aspects of the project. For effective construction engineering, a resident staff is a necessity. It is the responsibility of the supervising engineer to inspect and approve all phases of construction and to certify all payments of the contractors based on the successful completion of the construction as per design specifications. The construction engineer's supervision responsibility will continue through all test runs of each facility and the determination as to whether all aspects of the construction contracts have been met. April 1972 to December 1974.

APPENDIX

APPENDIX EXHIBIT A-1

NUMBER OF HOLDINGS BY SIZE OF HOLDINGS AND PROVINCE, SOUTH VIETNAM, 1961

Province	Total Number of All Holdings	Number of Holdings without Agricultural Land	Number of Holdings with Agricultural Land										
			Total	Under 0.1 Hectares	0.1 Hectares to under 0.5 Hectares	0.5 Hectares to under 1.0 Hectares	1.0 Hectares to under 2.0 Hectares	2.0 Hectares to under 3.0 Hectares	3.0 Hectares to under 5.0 Hectares	5.0 Hectares to under 10.0 Hectares	10.0 Hectares to under 50.0 Hectares	50.0 Hectares to under 100.0 Hectares	100.0 Hectares and over
Southern Region													
Dinh Tuong	121,282	---	121,282	13,147	20,933	23,298	37,791	14,348	8,811	2,899	255	---	---
Kien Hoa	120,163	---	120,163	27,830	12,076	16,739	27,157	18,253	15,597	2,511	---	---	---
An Giang	108,461	9,924	98,537	15,195	15,260	8,861	17,332	9,968	15,597	11,952	4,328	44	---
Vinh Long	99,632	---	99,632	6,825	17,007	22,646	31,045	12,982	6,805	1,933	409	---	---
Phong Dinh	97,215	1,371	95,844	6,105	9,537	18,101	35,192	15,311	8,370	2,829	399	---	---
Ba Xuyen	96,656	---	96,656	21,052	8,089	4,214	12,005	13,686	15,504	15,378	5,625	155	48
Vinh Binh	96,645	309	96,336	10,679	6,070	10,022	30,685	18,044	12,709	5,615	512	---	---
Long An	81,388	---	81,388	8,562	7,211	14,479	26,947	12,387	8,367	3,085	350	---	---
Kien Giang	76,283	16	76,267	7,049	7,132	8,765	23,808	12,182	12,182	3,944	1,182	---	23
Gia Dinh	58,054	1,846	56,208	12,922	10,873	10,781	13,097	4,250	2,920	1,219	186	---	---
An Xuyen	48,841	132	48,709	3,194	1,748	2,178	9,674	10,931	13,026	7,302	1,656	---	---
Binh Duong	44,870	---	44,870	7,224	13,564	10,437	10,145	2,472	812	135	81	---	---
Kien Phong	42,145	---	42,145	6,967	7,329	4,493	7,873	5,399	5,175	4,193	657	59	---
Tay Ninh	40,401	4,016	36,385	7,587	6,682	4,497	7,494	4,662	4,283	824	356	---	---
Bien Hoa	29,254	12	29,242	6,778	8,829	3,742	4,800	2,267	1,357	1,413	56	---	---
Phuoc Tuy	15,283	09	15,184	5,312	3,448	1,111	2,351	1,082	1,140	541	169	---	---
Long Khanh	9,609	81	9,519	2,202	1,769	1,625	2,424	916	424	144	15	---	---
Kien Tuong	7,534	72	7,462	215	716	344	1,211	1,418	1,361	1,446	751	---	---
Total	1,103,707	17,878	1,175,829	168,805	161,173	166,333	300,031	160,538	134,240	67,363	17,017	258	71
Central Lowlands													
Quang Nam	186,151	---	186,151	14,557	86,225	57,632	23,325	3,295	1,024	93	---	---	---
Binh Dinh	145,322	189	145,133	13,936	66,294	40,676	25,678	3,720	654	160	15	---	---
Quang Ngai	132,598	119	132,479	7,213	57,340	41,821	21,123	4,177	782	14	---	---	---
Thua Thien	87,334	155	87,179	6,875	21,068	18,887	14,834	3,885	1,205	464	81	---	---
Phu Yen	60,610	200	60,410	22,644	14,686	10,286	9,643	2,012	1,139	---	---	---	---
Quang Tri	40,521	316	40,205	4,113	19,555	10,406	6,013	847	271	---	---	---	---
Khanh Hoa	35,486	---	35,486	8,566	9,812	5,302	6,792	2,569	1,658	738	39	---	---
Ninh Thuan	16,436	21	16,415	6,300	3,466	2,649	1,954	728	976	814	137	---	---
Binh Thuan	14,624	2,101	12,523	3,713	2,841	1,552	2,024	684	1,290	392	37	---	---
Total	699,082	3,101	695,981	87,917	274,236	188,602	111,386	21,917	9,009	2,605	309	---	---
TOTAL	1,892,789	20,979	1,871,810	256,722	435,409	354,935	411,417	182,455	143,249	69,968	17,326	258	71

SOURCE: Ministry of Agriculture

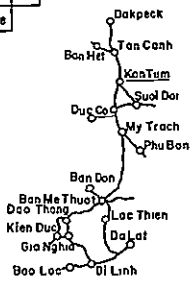
APPENDIX EXHIBIT A-II

HIGHWAY DISTANCES BETWEEN MAJOR CENTERS, SOUTH VIETNAM

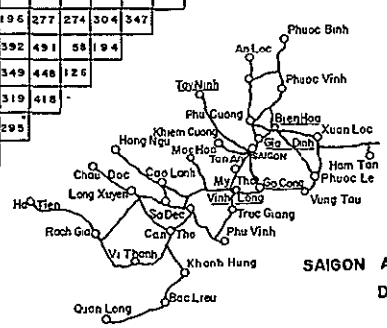
DISTANCES BETWEEN PROVINCE AND DISTRICT CAPITALS IN CENTRAL HIGHLANDS AREA PROVINCE CAPITALS ARE UNDERLINED.

	TAN CANH	SUOI DOI	PLEIKU	LAC THIEN	KONTUM	KIEN DUC	HAU BON	GIA NGHIA	DI LINH	DUC CO	DAO THONG	DA LAT	DAKPECK	BAO LOC	BAN HET	BAN DON
BANMETHUOT	280	222	188	53	237	137	209	125	224	243	77	217	349	258	323	42
BAN DON	322	264	230	95	279	179	251	187	266	285	119	259	397	300	355	
BAN HET	43	149	135	376	86	460	232	400	547	213	400	540	118	581		
BAO LOC	538	480	446	218	495	157	467	134	34	501	182	112	678			
DAKPECK	69	174	161	402	116	486	256	474	573	239	426	566				
DA LAT	497	439	405	164	456	199	426	176	78	460	224					
DAO THONG	357	299	265	130	314	60	285	49	147	320						
DUC CO	200	112	78	296	127	380	149	368	467							
DI LINH	504	446	412	184	461	121	533	98								
GIA NGHIA	405	347	313	178	362	23	334									
HAU BON	187	129	95	262	144	344										
KIEN DUC	417	359	325	190	374											
KONTUM	43	63	49	290												
LAC THIEN	327	275	241													
PLEIKU	92	34														
SUOI DOI	106															
TAN CANH																

BAN ME THUOT DISTRICT



	XUAN LOC	VUNG TAU	VI THANH	VINH LONG	TRUC GIANG	TAY NINH	TAN AN	SA DEC	RACH GIA	QUAN LONG	PHUOC VINH	PHUOC LE	PHUOC BINH	PHU VINH	PHU CUONG	MY THO	MOC HOA	LONG XUYEN	KHIEM CUONG	KHANH HUNG	HAM TAN	HA TIEN	GO CONG	GIA DINH	CHAU DOC	CAN THO	CAO LANH	BIEN HOA	BAC LIEU	AN LOC
SAIGON	81	125	228	136	86	99	47	143	248	347	71	101	144	203	30	71	138	190	34	231	172	338	58	3	248	169	157	30	280	110
AN LOC	191	235	338	246	196	209	157	253	358	457	100	206	105	313	80	181	248	300	144	341	244	448	168	107	355	279	267	102	390	
BAC LIEU	361	405	68	146	234	379	233	169	193	67	351	381	424	204	310	219	240	173	304	50	452	283	252	283	232	111	196	310		
BIEN HOA	51	95	258	166	116	129	77	173	278	377	55	72	137	233	23	101	168	220	64	261	142	368	88	27	278	199	187			
CAO LANH	238	282	142	52	111	256	110	28	133	265	228	258	301	121	187	96	113	76	187	147	329	223	132	160	130	66				
CAN THO	250	294	58	34	123	268	122	58	115	178	240	270	313	102	199	108	127	62	199	62	341	205	141	172	116					
CHAU DOC	326	370	174	127	199	344	198	110	130	296	316	346	389	193	275	184	205	55	275	178	417	219	219	248						
GIA DINH	78	122	231	139	89	102	50	146	251	350	58	98	141	206	27	74	141	193	37	234	169	341	63							
GO CONG	139	183	201	110	51	157	60	117	222	320	129	159	202	104	88	35	113	164	88	202	230	310								
HA TIEN	419	464	151	220	283	362	291	195	90	350	409	439	482	280	368	277	298	165	368	234	510									
HAM TAN	91	170	400	308	258	271	219	315	420	519	249	146	279	374	165	243	310	362	206	403										
KHANH HUNG	312	356	68	97	185	330	184	120	144	117	302	332	375	155	261	171	187	124	265											
KHIEM CUONG	115	159	261	170	120	133	77	173	278	377	105	135	178	233	64	101	168	220												
LONG XUYEN	271	315	120	75	144	289	143	48	75	240	261	291	334	141	220	130	146													
MOC HOA	219	263	184	94	95	237	91	103	208	303	209	239	282	160	168	75														
MY THO	152	196	167	75	15	170	24	82	187	286	142	172	215	69	101															
PHU CUONG	74	118	258	166	116	129	77	173	278	377	41	104	114	233																
PHU VINH	284	328	157	66	55	302	156	91	196	277	274	304	347																	
PHUOC BINH	188	232	372	280	230	243	191	287	392	491	58	194																		
PHUOC LE	55	24	329	237	187	200	148	244	349	448	126																			
PHUOC VINH	103	147	299	207	157	170	118	214	319	418																				
QUAN LONG	428	472	193	213	276	446	300	240	295																					
RACH GIA	329	373	59	130	193	347	201	105																						
SA DEC	224	268	106	25	97	242	96																							
TAN AN	128	172	181	90	39	146																								
TAY NINH	180	224	327	235	185																									
TRUC GIANG	167	211	182	90																										
VINH LONG	217	261	92																											
VI THANH	309	353																												
VUNG TAU	79																													
XUAN LOC																														



SAIGON AND CAN THO DISTRICTS

FROM SAIGON TO:

NATIONAL HY20		NATIONAL HY 1	
		BIEN HOA	30
DONH QUAN	111	XUAN LOC	81
BAO LOC	186	PHAN THIET	197
DI LINH	223	PHAN RI	260
LIEN KHANG	271	PHAN RANG	348
FIMNOM	277	BA NGOI	393
DA LAT	300	NHA TRANG	450
NATIONAL HY14		NINH HOA	485
		TUY HOA	572
		SONG CAU	625
KIEN DUC	216	QUI NHON	677
DAO THONG	276	BINH DINH	693
GIA NGHIA	240	BONG SON	759
BAN ME THUOT	353	DUC PHO	809
MY TRACH	503	MO DUC	827
HAU BON	561	QUANG NGAI	844
PLEIKU	542	TAM KY	907
KONTUM	590	QUANG NAM	951
TAN CANH	633	DA NANG	970
DAKTO	637	HUE	1077
DAKSUT	679	QUANG TRI	1131
DAKPECK	702	DONG HA	1144
DAKROTAH	716	BEN HAI River	1162

DISTANCES BETWEEN PROVINCE AND DISTRICT CAPITALS IN DELTA AREA PROVINCE CAPITALS ARE UNDERLINED

NOTE DISTANCES IN KILOMETERS

APPENDIX EXHIBIT A-II, continued

HIGHWAY DISTANCES BETWEEN MAJOR CENTERS, SOUTH VIETNAM

DISTANCES BETWEEN PROVINCE AND DISTRICT CAPITALS IN THE SOUTH OF THE CENTRAL LOWLANDS PROVINCE CAPITALS ARE UNDERLINED

	VINH HAO	VAN GIA	TUY HOA	SONG CAU	QUI NHON	PHAN THIET	PHAN RI	PHAN RANG	NINH HOA	CUNG SON	BINH DINH	BONG SON	BA NGOI	AN KHE
NHATRANG	153	61	122	175	237	250	160	103	35	169	236	309	56	298
AN KHE	451	237	176	123	79	548	459	401	263	225	64	133	355	
BA NGOI	100	121	182	235	297	196	125	49	94	229	294	369		
BONG SON	462	248	187	134	86	559	489	413	275	234	69			
BINH DINH	387	173	112	60	18	484	414	338	200	159				
CUNG SON	321	108	47	100	163	419	349	273	135					
NINH HOA	187	27	88	140	204	265	215	138						
PHAN RANG	50	165	226	278	341	147	77							
PHAN RI	33	241	302	354	418	75								
PHAN THIET	106	311	372	425	488									
QUI NHON	391	177	116	64										
SONG CAU	327	113	53											
TUY HOA	275	61												
VAN GIA	214													
VINH HAO														

NHA TRANG DISTRICT

DISTANCES BETWEEN PROVINCE AND DISTRICT CAPITALS IN THE NORTH OF THE CENTRAL LOWLANDS PROVINCE CAPITALS ARE UNDERLINED

	TRUNG LUONG	THUONG TRO	THANG BINH	TAM KY	QUANG TRI	QUANG NGAI	MO DUC	LAO BAO	KHAM DUC	HA TAN	HOI AN	DIEN BAN	DONG HA	DA NANG
HUE	69	52	147	171	57	234	255	153	250	163	136	126	70	107
DA NANG	196	107	40	64	164	127	148	260	143	56	29	19	177	
DONG HA	20	121	217	241	13	304	325	84	319	229	210	195		
DIEN BAN	215	125	22	46	182	107	130	279	125	38	10			
HOI AN	225	135	32	56	192	117	140	289	135	48				
HA TAN	252	162	59	83	219	144	167	316	87					
KHAM DUC	339	249	86	110	306	175	195	403						
LAO BAO	103	205	300	324	97	387	408							
MO DUC	344	255	108	84	312	21								
QUANG NGAI	323	234	87	63	291									
QUANG TRI	32	109	204	228										
TAM KY	260	170	24											
THANG BINH	236	147												
THUONG TRO	141													
TRUNG LUONG														

HUE DISTRICT

NOTE: DISTANCES IN KILOMETERS

SOURCE: Directorate of Highways, as published in Vietnam Transportation Study, Transportation Consultants, Inc. Washington, D.C. 1966.

APPENDIX EXHIBIT A-III

TAXES PAID BY RICE MILLERS, SOUTH VIETNAM

I. Franchise Tax

Depending on the size of the mill (engine and building) and on the location, the mill will be classified by type and grade as a basis for computing the five components of the franchise tax.

National tax
Provincial tax
Village tax
Chamber of commerce tax
Reconstruction tax

A. National tax is an annual tax and is based on the following:

Type I	Grade 1 mill pays VN	$100,000 +	10 percent of annual rent value
	Grade 2 mill pays VN	$ 75,000 +	10 percent of annual rent value
	Grade 3 mill pays VN	$ 60,000 +	10 percent of annual rent value
	Grade 4 mill pays VN	$ 50,000 +	10 percent of annual rent value
	Grade 5 mill pays VN	$ 45,000 +	10 percent of annual rent value
	Grade 6 mill pays VN	$ 40,000 +	10 percent of annual rent value
	Grade 7 mill pays VN	$ 35,000 +	10 percent of annual rent value
	Grade 8 mill pays VN	$ 30,000 +	10 percent of annual rent value
	Grade 9 mill pays VN	$ 25,000 +	10 percent of annual rent value
Type II	Grade 1 mill pays VN	$ 20,000 +	8 percent of annual rent value
	Grade 2 mill pays VN	$ 18,000 +	8 percent of annual rent value
	Grade 3 mill pays VN	$ 16,000 +	8 percent of annual rent value
	Grade 4 mill pays VN	$ 14,000 +	8 percent of annual rent value
	Grade 5 mill pays VN	$ 12,000 +	8 percent of annual rent value
	Grade 6 mill pays VN	$ 11,000 +	8 percent of annual rent value
	Grade 7 mill pays VN	$ 10,000 +	8 percent of annual rent value
	Grade 8 mill pays VN	$ 9,000 +	8 percent of annual rent value
	Grade 9 mill pays VN	$ 8,000 +	8 percent of annual rent value
Type III	Grade 1 mill pays VN	$ 7,000 +	6 percent of annual rent value
	Grade 2 mill pays VN	$ 6,000 +	6 percent of annual rent value
	Grade 3 mill pays VN	$ 5,000 +	6 percent of annual rent value
	Grade 4 mill pays VN	$ 4,500 +	6 percent of annual rent value
	Grade 5 mill pays VN	$ 4,000 +	6 percent of annual rent value
	Grade 6 mill pays VN	$ 3,500 +	6 percent of annual rent value
	Grade 7 mill pays VN	$ 3,000 +	6 percent of annual rent value
	Grade 8 mill pays VN	$ 2,500 +	6 percent of annual rent value
	Grade 9 mill pays VN	$ 2,000 +	6 percent of annual rent value

APPENDIX EXHIBIT A-III, continued

TAXES PAID BY RICE MILLERS, SOUTH VIETNAM

Type IV	Grade 1 mill pays VN $	1,800 +	5 percent of annual rent value
	Grade 2 mill pays VN $	1,600 +	5 percent of annual rent value
	Grade 3 mill pays VN $	1,400 +	5 percent of annual rent value
	Grade 4 mill pays VN $	1,200 +	5 percent of annual rent value
	Grade 5 mill pays VN $	1,000 +	5 percent of annual rent value
	Grade 6 mill pays VN $	900 +	5 percent of annual rent value
	Grade 7 mill pays VN $	800 +	5 percent of annual rent value
	Grade 8 mill pays VN $	700 +	5 percent of annual rent value
	Grade 9 mill pays VN $	600 +	5 percent of annual rent value
Type V	Grade 1 mill pays VN $	500 +	4 percent of annual rent value
	Grade 2 mill pays VN $	450 +	4 percent of annual rent value
	Grade 3 mill pays VN $	400 +	4 percent of annual rent value
	Grade 4 mill pays VN $	350 +	4 percent of annual rent value
	Grade 5 mill pays VN $	300 +	4 percent of annual rent value
	Grade 6 mill pays VN $	250 +	4 percent of annual rent value
	Grade 7 mill pays VN $	220 +	4 percent of annual rent value
	Grade 8 mill pays VN $	200 +	4 percent of annual rent value
	Grade 9 mill pays VN $	180 +	4 percent of annual rent value

B. Provincial tax is equal to the national tax.

C. Village tax is also equal to the national tax.

D. Chamber of commerce tax is equal to 3.5 percent of the national tax.

E. Reconstruction tax is equal to 20 percent of the national tax. This is temporary and was applied only recently.

II. Production Tax

This is 6 percent of the gross income or VN $3 per 100 kilograms of paddy milled. The production tax is supposed to be paid by the month.

III. Income Tax

For companies and corporations, the income tax is 24 percent of the net income plus a percentage on the total net income. For individuals, the income tax is 16 percent of the net income plus a percentage on the total net income. Progressive percentage on total net income is as follows:

APPENDIX EXHIBIT A-III, continued

TAXES PAID BY RICE MILLERS, SOUTH VIETNAM

From VN $ 1,000 to VN $ 10,000	1 percent
From VN $ 11,000 to VN $ 20,000	2 percent
From VN $ 21,000 to VN $ 30,000	3 percent
From VN $ 31,000 to VN $ 40,000	4 percent
From VN $ 41,000 to VN $ 50,000	5 percent
From VN $ 51,000 to VN $ 60,000	6 percent
From VN $ 61,000 to VN $ 70,000	7 percent
From VN $ 71,000 to VN $ 80,000	8 percent
From VN $ 81,000 to VN $ 90,000	9 percent
From VN $ 91,000 to VN $100,000	10 percent
From VN $101,000 to VN $200,000	15 percent
From VN $201,000 to VN $300,000	20 percent
From VN $301,000 to VN $400,000	25 percent
From VN $401,000 to VN $500,000	30 percent
From VN $501,000 to VN $600,000	35 percent
From VN $601,000 to VN $700,000	40 percent
From VN $701,000 to VN $800,000	45 percent

Over VN $800,000 of net income per year, apply the formula:

$$\frac{\text{Total net income}}{2} - \text{VN \$184,500 (this is fixed)}$$

Amount due under this formula should be greater than 45 percent of VN $800,000.

SOURCE: Supplied by Vietnam Finance & Investment Consultants, Inc., Saigon.

APPENDIX EXHIBIT A-IV

RICE AND PADDY WAREHOUSE QUESTIONNAIRE

PROVINCE: _____ DATE: _____ NAME OF PERSON SUPPLYING INFORMATION: _____

WILDMAN AGRICULTURAL RESEARCH, INC.
EXISTING WAREHOUSES USED FOR PADDY STORAGE

Location	Age (Years)	Operated by	Area (Square Feet) Length and Width in Feet	Sidewall Height (Feet)	Type of Construction (Metal, Brick, Frame, Etc.)	Type of Floor	Electric Service (Yes or No)	Storage Capacity (Tons)	Comments on General Condition and Adequacy for Fumigation

APPENDIX EXHIBIT A-V

RICE GRADES OF SOUTH VIETNAM

Vietnam rice, by virtue of its constantly selected and improved quality, is highly prized by the importing countries. Hence does the government of Vietnam strive to increase rice export every year.

To assure the high quality of export rice, a nationwide control system has been instituted by presidential decree of March 3, 1954, fixing standards for different grades of rice currently on sale in the world market.

The characteristics of these rice grades are described below:

1. Selected rice, pure long grain - Special quality 10 percent brokens.

- Milling the most careful.
- Less than 10 percent of rounded grains deducted from entire grains.
- Homogeneous aspect.
- Sound grain and not attacked by insects.
- Less than 5 percent of broken grains bigger than the half of entire grain.
- Less than 4 percent of chalky grains.
- Less than 0.5 percent of yellow grains.
- Less than 1 percent of extraneous matter.

2. Special rice long 15 percent of brokens.

- Milling more elaborated than common rice long and rounded grains.
- 80 percent at least of long or rounded grains deducted from entire grains.
- Homogeneous aspect.
- Sound grains and not attacked by insects.
- Less than 4 percent of chalky grains.
- Less than 0.5 percent of yellow grains.
- Less than 1 percent of extraneous matter.

3. Selected White rice, pure rounded grain - 10 percent of brokens.

- Excellent milling.
- Less than 10 percent of long grains deducted from entire grains.

- Homogeneous aspect.
- Sound grain and not attacked by insects.
- Less than 5 percent of broken grain bigger than the half of entire grain.
- Less than 4 percent of chalky grains.
- Less than 0.50 percent of yellow grains.
- Less than 1 percent of extraneous matter.

4. Special parboiled rice No. 1, 5 percent to 10 percent brokens.

- Good looking rice milled from parboiled paddy having at least 60 percent long grains. It may contain 5 to 10 percent brokens at most and 2 to 10 percent of grains bearing traces of red stripes.

5. Common long White rice No. 1, 15 percent of brokens.

- Milling less elaborated than selected rice.
- 60 percent at least of long grains deducted from entire grains.
- Aspect distinctly less homogeneous than selected rice.

6. Common White rice No. 1, 10 percent of brokens.

- Milling slightly less elaborated than common rice, long and rounded grains.
- May be composed of grains with all shape.

7. Common White rice No. 1, 20 percent of brokens.

- Milling slightly less elaborated than common rice, long and rounded grains.
- May be composed of grains of all shape.

8. Common White rice No. 1, 35 percent of brokens.

- Milling slightly less elaborated than common rice, long or rounded grains.
- May be composed of grains of all shape.

APPENDIX EXHIBIT A-V, continued
RICE GRADES OF SOUTH VIETNAM

9. Reunion White - rice No. 2, 40 percent of brokens.

- Milling less elaborated than common rice No. 1.
- Unlimited percentage of yellow or colored grains.
- May be composed of grains of all shape.

10. Japan White - rice No. 2, 40 percent of brokens.

- Distinctly less polished than common rice No. 1.
- Milling less elaborated than Reunion rice.
- May be composed of grains of all shape.
- May contain till 5 percent of red-stripe grains.

11. Java White - rice No. 2, 50 percent of brokens.

- Milling less elaborated than Japan rice.
- May be composed of grains of all shape.
- May contain till 20 percent of red-stripe grains.

12. Rice of Plantation (Red rice).

- Usually milled in one cone.
- Contain from 25 to 35 percent of brokens maximum.
- May contain a percentage of red-stripe grains badly milled.
- May be composed of all shape of grains but should be at least obtained by milling of paddy of 3rd quality similar to paddy for Java rice.
- 10 percent maximum of yellow rice.

13. Selected glutinous rice with 10 to 15 percent of brokens.

- This rice must present the same degree of whiteness as special rice.
- It should contain at least 80 percent of glutinous grains.
- The percentage of brokens could be admitted according to contracting party.

APPENDIX EXHIBIT A-V, continued

RICE GRADES OF SOUTH VIETNAM

14. Mixed brokens rice No. 1 and No. 2.

- Do not contain straw and dust and chaff.
- Do not pass through sieves No. 16 and exceed 10 percent of fine brokens.
- 2 percent of entire grains maximum.

15. Mixed brokens rice No. 3 and No. 4.

- Coming from milling of all kinds of white rice except Java rice.
- 2 percent of entire grains maximum.
- 30 percent maximum of fine brokens which pass through sieves No. 18.
- 5 percent maximum of extraneous matter.
- 35 percent of brokens No. 2 (rejected from sieves No. 16).

16. Brokens No. 2 of Java rice.

- Must be obtained from milling of Java rice.
- Do not contain straw and chaff and dust.
- Do not pass through sieves No. 16 and exceed 20 percent of fine brokens.
- 2 percent of entire grains maximum.

17. Flour stuff (fine bran).

- Obtained from rice milling by mixing (materials) coming out from 1st and eventually 3rd cones.
- 20 percent maximum of rejected matter from sieve No. 25.
- Very little chaff percentage.

18. Paddy for consumption.

- Susceptible to cattle feeding.
- 2 percent maximum of extraneous matter.
- Minimum weight 580 grams per litre.

SOURCE: Supplied by P. C. Can, Agricultural Economics and Statistics Service.

APPENDIX EXHIBIT A-VI

RICE PRODUCTION QUESTIONNAIRE

WILDMAN AGRICULTURAL RESEARCH, INC.

RICE PRODUCING AREA, June 1, 1968 - May 31, 1969

PROVINCE: _____

Total area active in rice production during the 1968/69 crop year	_____	ha.
Total area capable of producing at least one crop of the new varieties	_____	ha.
Area upon which at least one crop of the new varieties was planted	_____	ha.
Area capable of producing a second rice crop	_____	ha.
Area capable of producing a second crop of the new varieties	_____	ha.
Area upon which a second crop of the new varieties was planted	_____	ha.
Area which was planted to floating varieties	_____	ha.
Area of undeveloped land adapted to rice production	_____	ha.
Area of reclaimable abandoned land adapted to rice production	_____	ha.
Area of irrigated rice land	_____	ha.

PREPARED BY:

_____

_____

(Title)

DATE: _____

APPENDIX EXHIBIT A-VI, continued

RICE PRODUCTION QUESTIONNAIRE

WILDMAN AGRICULTURAL RESEARCH, INC.

PROJECTIONS OF RICE PRODUCTION FOR 1969/70, 1974/75 AND 1979/80

PROVINCE: _____

	Crop Year 1969/70	1974/75	1979/80	
NEW VARIETIES:				
First Crop				
(1) Area	_____	_____	_____	ha.
(2) Yield	_____	_____	_____	MT/ha.
(3) Production	_____	_____	_____	MT
Second Crop				
(4) Area	_____	_____	_____	ha.
(5) Yield	_____	_____	_____	MT/ha.
(6) Production	_____	_____	_____	MT
OLD VARIETIES:				
First Crop				
(7) Area	_____	_____	_____	ha.
(8) Yield	_____	_____	_____	MT/ha.
(9) Production	_____	_____	_____	MT
Second Crop				
(10) Area	_____	_____	_____	ha.
(11) Yield	_____	_____	_____	MT/ha.
(12) Production	_____	_____	_____	MT
(13) TOTAL AREA	_____	_____	_____	ha.
(14) TOTAL PRODUCTION	_____	_____	_____	MT

PREPARED BY: _____

DATE: _____ _____
(Title)