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ECONOMIC AND ENGINEERING FEASIBILITY STUDY

STORAGE, HANDLING AND MARKETING OF SELECTED CROPS IN

THE REPUBLIC OF THE PHILIPPINES

CO-OPERATING AGENCY
THE RICE AND CORN ADMINISTRATION

PRODUCED UNDER CONTRACT WITH
THE UNITED STATES AGENCY
FOR INTERNATIONAL DEVELOPMENT

JUNE 1968
(Data Collected November 1967 - February 1968)

WEITZ-HETTELSATER ENGINEERS
A DIVISION OF THE WEITZ COMPANY, INC
427 WEST 12th STREET
KANSAS CITY, MISSOURI, U S A

PREFACE

In August 1967, the United Stated Agency for International Development, acting pursuant to a request made by the Government of the Republic of the Philippines, retained Weitz-Hettelsater Engineers to make a study of grain marketing and storage practices with respect to rice, corn, sorghum, and soybeans in the Philippines. The objective, as set forth in the contract with the Consultant is stated as follows:

> "The objective of this project is to produce a report which gives a complete picture of the current, past, and future production and consumption of rice, corn, sorghum, and soybeans in the Philippines, with emphasis on the handling, storage, transportation, processing and marketing aspects, offering recommendations and plans, with schematic and illustrative drawings of facilities, for the most practical, improved, efficient and economical national, regional, village and farm systems and installations for taking care of grains during the next ten years in the Philippines."

In undertaking this assignment, the Consultant followed its customary system approach. After careful research of present practices and available statistical data, an attempt is made to map a marketing system for the products involved. In this method the system is designed to take into consideration everything that happens to the commodity from the time it is harvested until it reaches the consumer. After the source and destination is clearly visible, the facilities necessary to make the system viable all fall into the category of infrastructure. Included in this infrastructure are such items as transport, marketing credits, storage (including

protecting from spoilage), milling and related undertakings.

An adjunct value of the report contained herein is the inclusion of considerable background and historical information concerning production and marketing practices in the Philippines. This includes data that will render this report useful as a source of information as well as a guide to future developments.

The problems of providing adequate handling and storage facilities for rice and corn have been a concern of the Rice and Corn Administration of the Philippines for a number of years. Grain losses due to insects, rodents and spoilage have been exceedingly large in the present storage and distribution system. Furthermore, the lack of adequate storage facilities in some regions of the Philippines has led to lower farm prices and higher distribution costs. The success of the Philippine government's program to increase rice production has added emphasis to these problems and has created a need for substantial amounts of new grain storage and drying facilities.

The need for an evaluation of the grain storage and handling system in the Philippines has been recognized by several government agencies. The Rice and Corn Board completed a Survey of Rice and Corn Mills in the Philippines in 1966. The Warehouse Survey Report of a committee from the Philippine National Bank, the Development Bank of the Philippines, the Agricultural Credit Association, and the Rice and Corn Administration was published in 1967. A Warehousing Plan for 1968-1970 was prepared by the Rice and Corn Administration in early 1968. In addition to these reports, there have been a number of other studies made by members of the Presidential Economic Staff, the Rice and Corn Productivity Coordination Council and the Department of Agricultural Economics at the University of the Philippines College of Agriculture.

This report is based on the findings of a field research team composed of two economists and a grain storage and processing engineer from the Weitz-Hettelsater Engineer's staff. Their efforts were supported by a substantial group resident in the Consultant's Kansas City headquarters. Together with staff members and consultants of the management studies divison of Sycip, Gorres, Velayo & Company, Manila, members of the team traveled extensively in the Philippines interviewing government officials, rice and corn mill operators, farmers and businessmen. Most of the basic data contained in the report was obtained in the Philippines during a three-month period from November 1967 to February 1968.

Acknowledgment is made and deep appreciation is expressed to the officials of the USAID/Manila and officials of the Rice and Corn Administration; members of the Department of Agriculture at the University of the Philippines; the staff at the International Rice Research Institute, and the many individuals in private firms and government agencies who gave so freely of their time to provide much of the information used in this report. Appreciation is also expressed to the staff members of Sycip, Gorres, Velayo & Company, who devoted much time to the arranging of interviews, gathering information and providing detailed reports related to this study.

* * *

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NO. iv

SUMMARY OF MAJOR RECOMMENDATIONS

1. Construct 1,500 metric ton Up-Country Bulk Type Satellite facilities, as collecting stations, for cleaning, drying, and storage, as follows:

Region	By 1970	By 1972	By 1975
Ilocos	4 Units	--	--
Cagayan Valley	4 Units	--	4 Units
Central Luzon	4 Units	--	12 Units
Southern Tagalog	8 Units	--	8 Units
Bicol	8 Units	--	6 Units
Western Visayas	4 Units	--	2 Units
Eastern Visayas	6 Units	--	4 Units
S. & W. Mindanao	6 Units	--	18 Units
N. & E. Mindanao	6 Units	--	4 Units
TOTAL UNITS	50 Units	--	58 Units
TOTAL CAPACITY	75,000 M.T.	--	87,000

The RCA is presently sponsoring a number of similar facilities. These should be integrated into the overall recommended program. See Tables 85, 86, and 87 (Chapter XV) for location of the facilities by province and estimated costs of construction. The 1,500 ton facilities for 1970 should be considered as the highest priority of construction scheduling.

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2. Construct the larger bulk silo facilities as follows (Refer to Tables 85, 86, and 87 (Chapter XV) for location of the facilities by provinces, estimated costs of construction, and priorities of construction in case funds for financing the entire program are not available):

Region	By 1970	By 1972	By 1975
	(by number and capacity in metric tons)		
Manila, North Harbor	--	1 - 25,000	--
Cagayan Valley	2 - 5,000	1 - 5,000	1 - 5,000
Cagayan Valley	--	--	2 - 10,000
Cagayan Valley	--	--	1 - 15,000
Central Luzon	--	1 - 25,000	1 - 25,000
Central Luzon	--	1 - 10,000	2 - 10,000
Southern Tagalog	1 - 3,000	--	--
Bicol	1 - 3,000	1 - 3,000	--
Bicol	1 - 5,000	1 - 5,000	--
Western Visayas	--	1 - 5,000	--
Eastern Visayas	--	2 - 5,000	--
S. & W. Mindanao	1 - 10,000	1 - 10,000	2 - 5,000
S. & W. Mindanao	1 - 5,000	--	--
N. & E. Mindanao	1 - 5,000	--	--
TOTAL UNITS	8 Units	10 Units	9 Units
CAPACITY	41,000 M.T.	98,000 M.T.	95,000 M.T.

It is urged that the improvement of the Manila North Harbor be expedited in order that the recommended export bulk silo in Manila may be constructed not later than 1972.

3. Construct the following standard Sack Warehouses during the same period as the 1,500 ton Bulk Silos are constructed (see Tables 85, 86, and 87, (Chapter XV) for location of the facilities, by provinces, and the estimated costs of construction):

Region	By 1970	By 1972	By 1975
	(by number and capacity in metric tons)		
Manila	--	5 - 5,000	--
Ilocos	2 - 1,000	--	3 - 1,000
Ilocos	2 - 2,000	--	--
Cagayan Valley	2 - 1,000	--	3 - 1,000
Cagayan Valley	1 - 2,000	--	--
Central Luzon	1 - 1,000	--	2 - 1,000
Central Luzon	3 - 2,000	--	6 - 2,000
Southern Tagalog	3 - 1,000	--	2 - 1,000
Southern Tagalog	9 - 2,000	--	7 - 2,000
Bicol	1 - 1,000	--	--
Bicol	7 - 2,000	--	5 - 2,000
Western Visayas	1 - 1,000	--	3 - 1,000
Western Visayas	4 - 2,000	--	2 - 2,000
Eastern Visayas	4 - 2,000	--	2 - 2,000
S. & W. Mindanao	1 - 1,000	--	--
S. & W. Mindanao	7 - 2,000	--	4 - 2,000
N. & E. Mindanao	--	--	1 - 1,000
N. & E. Mindanao	1 - 2,000	--	3 - 2,000
TOTAL UNITS	49 Units	5 Units	43 Units
CAPACITY	87,000 M.T.	25,000 M.T.	72,000 M.T.

4. Initiate bulk handling and storage to reduce cost of sacks and to minimize loss and wastage by being able to practice better control of moisture and fumigation in the bulk.

5. In advance of construction, a training program with emphasis on operation, proper drying procedures, and bulk handling should be conducted under the sponsorship of the RCA to provide the facilities with properly trained people when construction is completed. The RCA should continue its program during construction to promote improved methods of grain handling and to promote the use of mechanical grain drying.

6. Rehabilitate the existing bulk silos in San Jose, Solano, and Digos. Monies have already been allocated to rehabilitate San Jose and Solano; but funds have been requested, but not granted for Digos. These later funds should be granted at once.

7. Rehabilitate the several existing column grain driers for effective operation. The experiments should be concluded and results distributed to prospective operators on the effectiveness and use of the Japanese bed-type driers, the locally manufactured shaker-screen driers, and in-bin drying.

8. Initiate and encourage the improvement of highways and feeder roads to provide access to areas of production.

9. Convert existing railroad box cars to bulk handling. This work should be undertaken by the railroad companies.

10. The present system of licensing grain storage facilities (public and private) should be continued and modified in order to permit the producer to obtain a negotiable warehouse receipt if he so desires. Grain producers should be encouraged to use the storage facilities as a depository if they do not wish to sell grain in the harvest

season. This would give them the privilege of withdrawing a comparable amount of grain in kind and quality by simply paying the costs of cleaning, drying, storing, fumigating, and other services.

11. Establish a system of offical grades for milled rice that will be sold on the world market.

12. Establish and enforce a uniform grading system for domestic marketing, within the Philippines, of the raw grains and the finished products

13. Regulations should be established restricting the storage of farm chemicals, insecticides and other poisonous materials in areas used for the storage of food grains. Supplement these regulations with an extension program on the proper storage of such materials.

14. The need for a rigorous program of "good-housekeeping", fumigating, and cleaniness should be emphasized in the existing sack warehouses, in order to minimize the great losses caused by improper methods of storing and handling.

15. The physical condition of the majority of the existing warehouses show a lack of adequate maintenance which makes it difficult to conduct the program recommended in item 14 above. Immediate steps should be taken to make necessary repairs, where needed, to the floors, walls, roofs, doors, windows, ventilators, etc. Particular precautions should be taken to keep out of the warehouses, rain, birds, vermin, and other pests.

16. The RCA should continue to buy and sell between 10 and 15 percent of the rice and corn marketed in the Philippines.

Domestic rice price should be adjusted to the world price.

17. Continue a limited research program to develop sorghum and soybean varieties suitable for growing in the Philippines and establish an extension program to acquaint farmers with the possibilities of planting these grains in rotation with rice and corn.

18. The government should review the existing import policies and reduce the tariffs on soybeans, soybean meal, and sorghums used in livestock feed until more feed grains are produced domestically.

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CHAPTER I

GENERAL DESCRIPTION OF THE PHILIPPINES

Governmental Divisions

Physical

Climate
Rainfall
Temperature
Humidity
Typhoons

CHAPTER I

GENERAL DESCRIPTION OF THE PHILIPPINES [1/]

The Republic of the Philippines is an archipelago of 7,100 islands, bounded by the Pacific Ocean on the east and by the South China Sea on the west. Lying off the Southeast Coast of the Asiatic mainland, the Philippines neighbors Japan, Korea and Taiwan (Formosa) to the north, Vietnam and Thailand to the west, and Borneo and Indonesia to the south.

The islands stretch over 1,000 miles just above the equator between latitude 4 degrees 23' north and 21 degrees 25' north, and approximately 750 miles from longitude 116 degrees 21' east to 126 degrees 40' east.

Luzon (in the extreme north) is the largest of the islands in the archipelago. Mindanao (in the far south) is next in size and with Luzon makes up two-thirds of the 114,830 square mile land area. These two islands, plus Samar, Negros, Palawan, Panay, Mindoro, Cebu, Bohol, Masbate and Leyte constitute 96 percent of the total Philippine land area. Approximately one-third of the land area is considered to be arable.

The Philippine coastline of 10,850 miles, measures twice that of the United States and contains 61 natural harbors and 20 land-lock straits. Manila Bay is one of the largest in the world having an area of 770 square miles and a circumference of 120 miles.

1/ Much of these data adapted from The Philippine Economic Atlas, Office of the President Program Implementation Agency, 1962.

Governmental Divisions

The Philippines is politically divided into 4 main subdivisions comprised of 56 provinces (Table 1). The provinces are geographically arranged to form ten regions and the provincial composition of the regions varies between governmental agencies (Figure I). The president of the Philippines, with the authorization of Congress, has the power to fix boundaries and create new political subdivisions.

The national capital of the Philippines is Quezon City, a suburb of the City of Manila. Manila is the major commercial and port city of the Philippines.

Cebu City is the second largest city in the Philippines and is a prime trading center located in the southern part of the archipelago. Other major inter-regional trade centers are Iloilo, Davao, and Zamboanga.

Physical

The Philippine archipelago has a diversified terrain. Mountains, varying greatly in height and ruggedness from island to island, occupy the greater part of the land area. But coastal plains, valleys, rolling uplands, and plateaus are also to be found on almost all of the principal islands. Nowhere are the mountains too high for plant life, but the higher elevations and some of the upland areas are very rough and limit cultivation. 2/

2/ Ross, James E. and Keith R. Vice. Republic of the Philippines--Its Agricultural Economy, FAS-M-68, Far East Analysis Branch, Foreign Agricultural Service, United States Department of Agriculture, November 1959.

Although the mountainous regions are the source of valuable hardwood timber, the mountainous nature of the Philippines makes the construction of first class roads in many parts of the country a very expensive task. This, in turn, hampers the development of an efficient grain marketing system. Much of the grain that moves between regions must go by boat or barge. Some of the major rivers expedite commerce. The extra handling involved in this form of shipment further increases the cost of moving grain from surplus regions to the final consumers.

Climate

In considering the crop production and storage potentials of the country and major areas thereof, knowledge of the climate is essential. Essential climatological variables are rainfall, temperature, air movement, and humidity. Variations and ranges as well as duration and sequences of climatological occurrences, are important factors in evaluating storage, processing, transporting and handling crop production and in constructing needed installations for providing these facilities.

These climatological factors are taken into consideration in the design and in the construction scheduling of the recommended facilities which are discussed in later chapters of this report.

The Philippines has two pronounced seasons, wet and dry. Temperature differences in the archipelago are very slight and rainfall differences, on the contrary, are important and decidedly variant due to the combined influence of topography and air stream direction. The Weather Bureau classifies the Philippine climate by the types of rainfall. The following are the four general classification descriptions (see Figure II):

1st Type: Two pronounced seasons; one dry from November

TABLE 1

CLASSIFICATION OF PROVINCES, BY GEOGRAPHICAL REGIONS, PHILIPPINES, 1962

I City of Manila

II Ilocos
1 Abra
2 Ilocos Norte
3 Ilocos Sur
4 La Union
5 Mountain Province

III Cagayan Valley
6 Batanes
7 Cagayan
8 Isabela
9 Nueva Vizcaya

IV Central Luzon
10 Bataan
11 Bulacan
12 Nueva Ecija
13 Pampanga
14 Pangasinan
15 Tarlac
16 Zambales

V Southern Tagalog
17 Batangas
18 Cavite
19 Laguna
20 Marinduque
21 Mindoro Occidental
22 Mindoro Oriental
23 Palawan
24 Quezon
25 Rizal

VI Bicol
26 Albay
27 Camarines Norte
28 Camarines Sur
29 Catanduanes
30 Masbate
31 Sorsogon

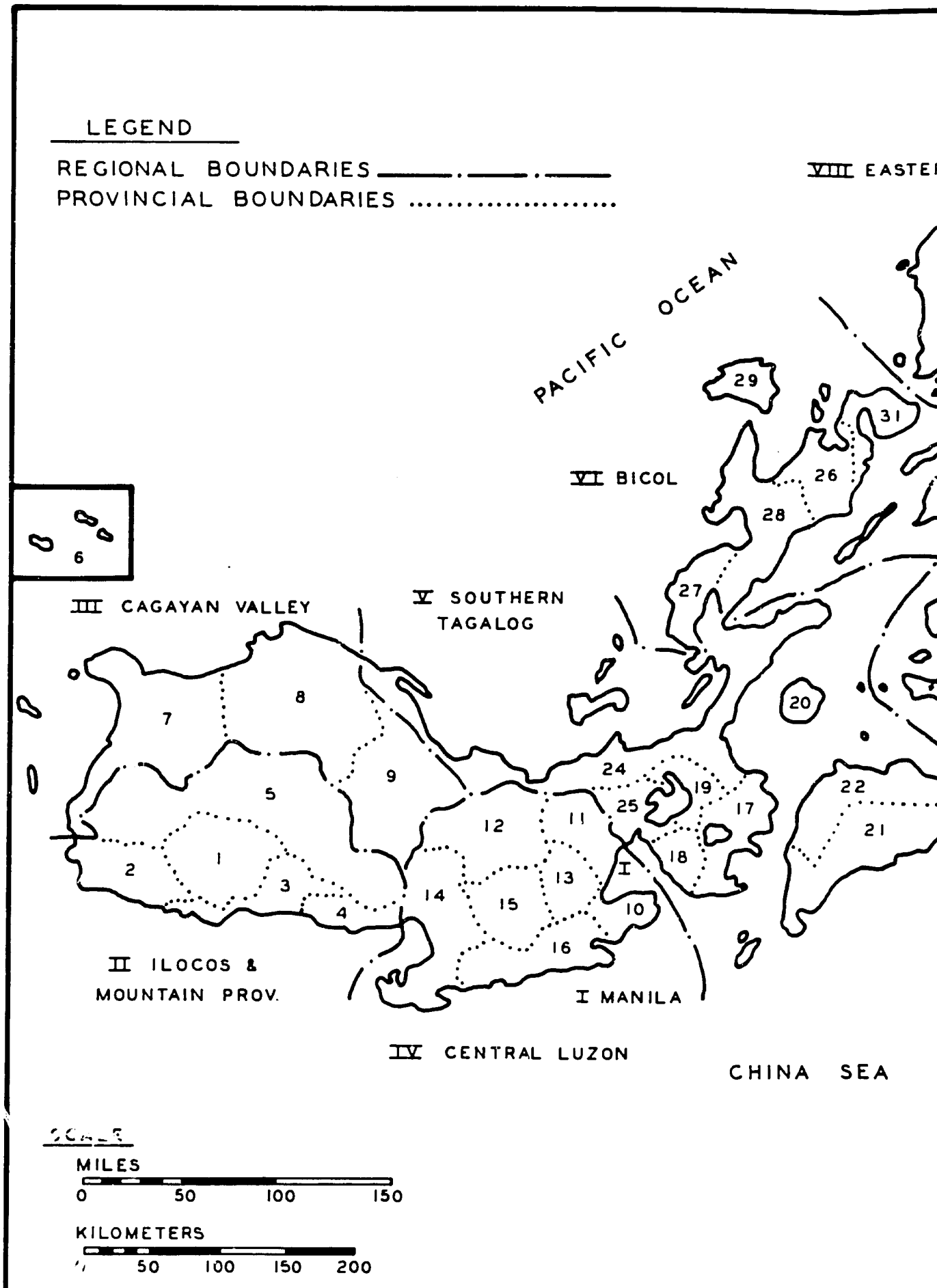
VII Western Visayas
32 Aklan
33 Antique
34 Iloilo
35 Capiz
36 Negros Occidental
37 Negros Oriental
38 Romblon

VIII Eastern Visayas
39 Bohol
40 Cebu
41 Northern Leyte
42 Southern Leyte
43 Samar

IX Southern and Western Mindanao
44 Cotabato
45 Davao
46 Zamboanga del Norte
47 Zamboanga del Sur
48 Sulu

X Northern and Eastern Mindanao
49 Agusan
50 Bukidnon
51 Lanao del Norte
52 Lanao del Sur
53 Misamis Occidental
54 Misamis Oriental
55 Surigao del Norte
56 Surigao del Sur

Source: The Philippine Economic Atlas, Program Implementation Agency, Republic of the Philippines, Bureau of Printing, Manila (1962).



NOTE:

SEE TABLE I FOR CORRESPONDING PROVINCIAL TITLE TO NUMBERS INDICATED

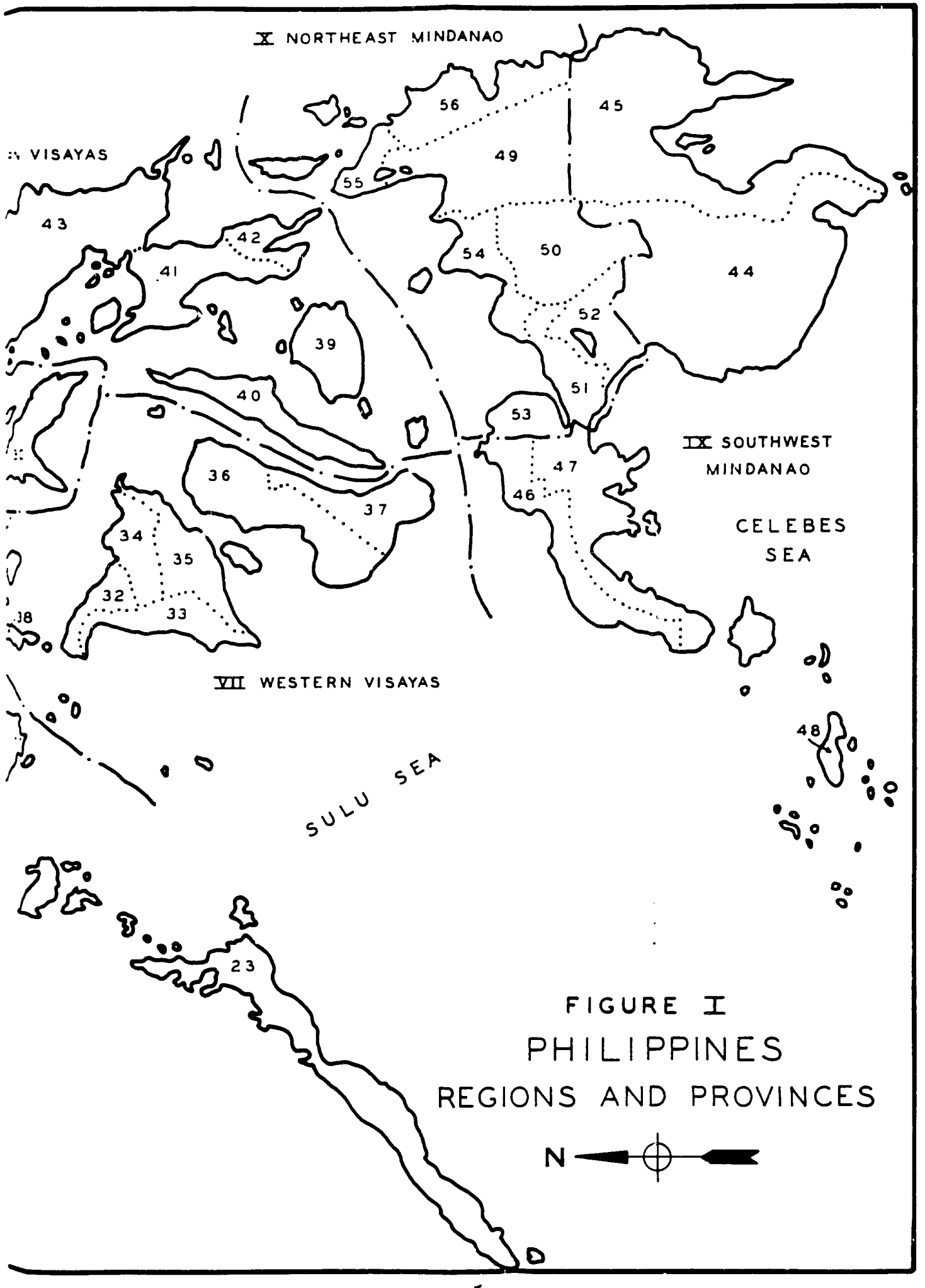


FIGURE I
PHILIPPINES
REGIONS AND PROVINCES

to April, the other wet during the rest of the year.

All of the regions on the western part of the islands of Luzon, Mindoro, Negros and Palawan are of this type. The controlling factor is topography. These localities are shielded from the Northeast Monsoons by mountain ranges, but are open to the Southwest Monsoons.

The average annual rainfall in these areas is 100 inches.

2nd Type: No dry season, with a very pronounced maximum rain period from November to January.

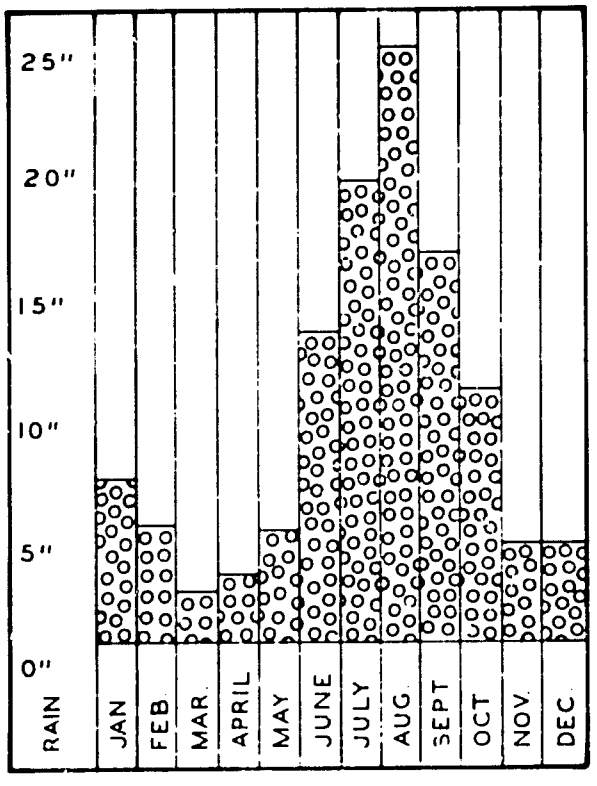
Regions with this type of climate are: Catanduanes, Sorsogon, the eastern part of Albay, the eastern and northern part of Camarines Norte and Camarines Sur, a large portion of the eastern part of Quezon, Samar, the eastern part of Leyte and a large portion of eastern Mindanao. These regions are along the eastern side of the Philippines and are not sheltered from the Northeast Monsoon or the trade wind.

The average annual rainfall is 129 inches in these areas.

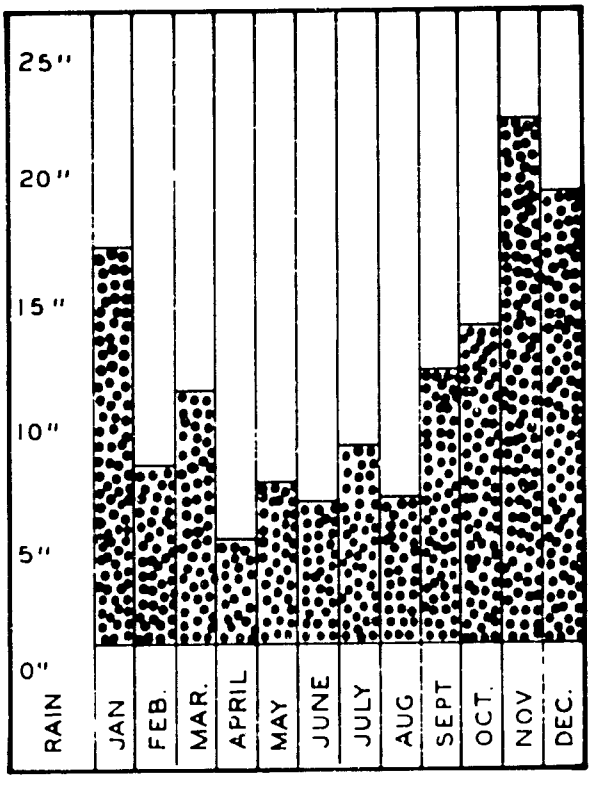
3rd Type: Seasons not very pronounced, relatively dry from November to April and wet during the rest of the year. The maximum rain periods are not very pronounced, with the short dry season lasting only from one to three months.

Regions with this type of climate are the western part of Cagayan (Luzon), Isabela, Nueva Viscaya, the eastern portion of the Mountain Province, southern Quezon, Masbate, Romblon, northeast Panay, eastern Negros, central and southern Cebu, part of northern Mindanao and most of eastern Palawan.

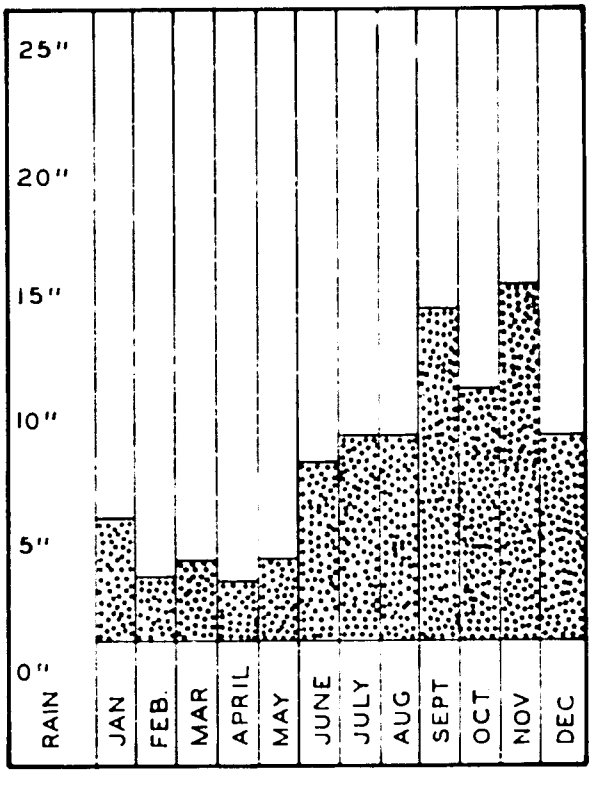
FIGURE II
WEATHER TYPES



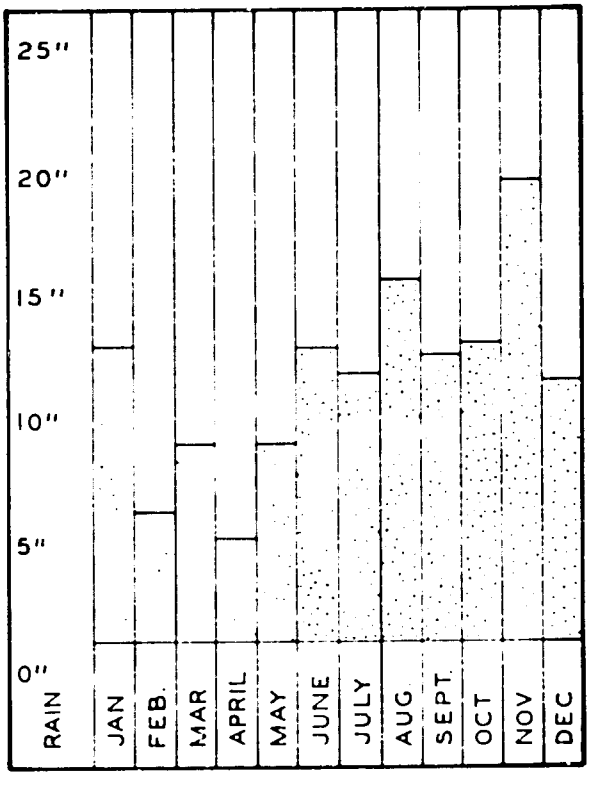
1ST TYPE - TWO PRONOUNCED SEASONS; DRY FROM NOVEMBER TO APRIL, WET DURING THE REST OF THE YEAR.



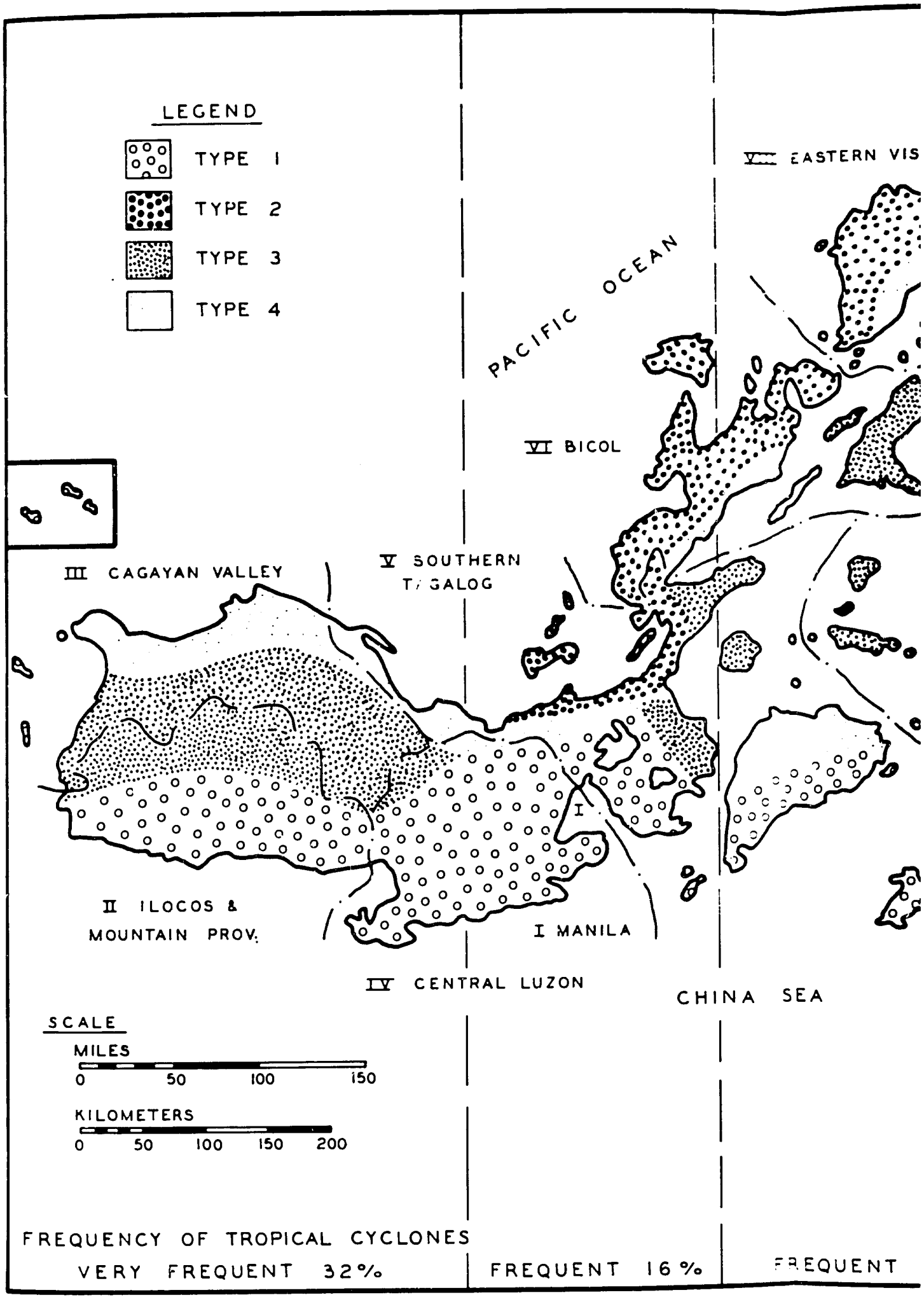
2ND TYPE - NO DRY SEASON WITH A VERY PRONOUNCED MAXIMUM RAINFALL NOVEMBER TO JANUARY.



3RD TYPE - SEASONS NOT VERY PRONOUNCED, RELATIVELY DRY FROM NOVEMBER TO APRIL AND WET DURING THE REST OF THE YEAR.



4TH TYPE - RAINFALL MORE OR LESS EVENLY DISTRIBUTED THROUGHOUT THE YEAR.


LEGEND
TYPE 1
TYPE 2
TYPE 3
TYPE 4
PACIFIC OCEAN
VIII EASTERN VIS
VI BICOL
III CAGAYAN VALLEY
V SOUTHERN
TAGALOG
II ILOCOS &
MOUNTAIN PROV.
I MANILA
IV CENTRAL LUZON
CHINA SEA
SCALE
MILES
0 50 100 150
KILOMETERS
0 50 100 150 200
FREQUENCY OF TROPICAL CYCLONES
VERY FREQUENT 32%
FREQUENT 16%
FREQUENT

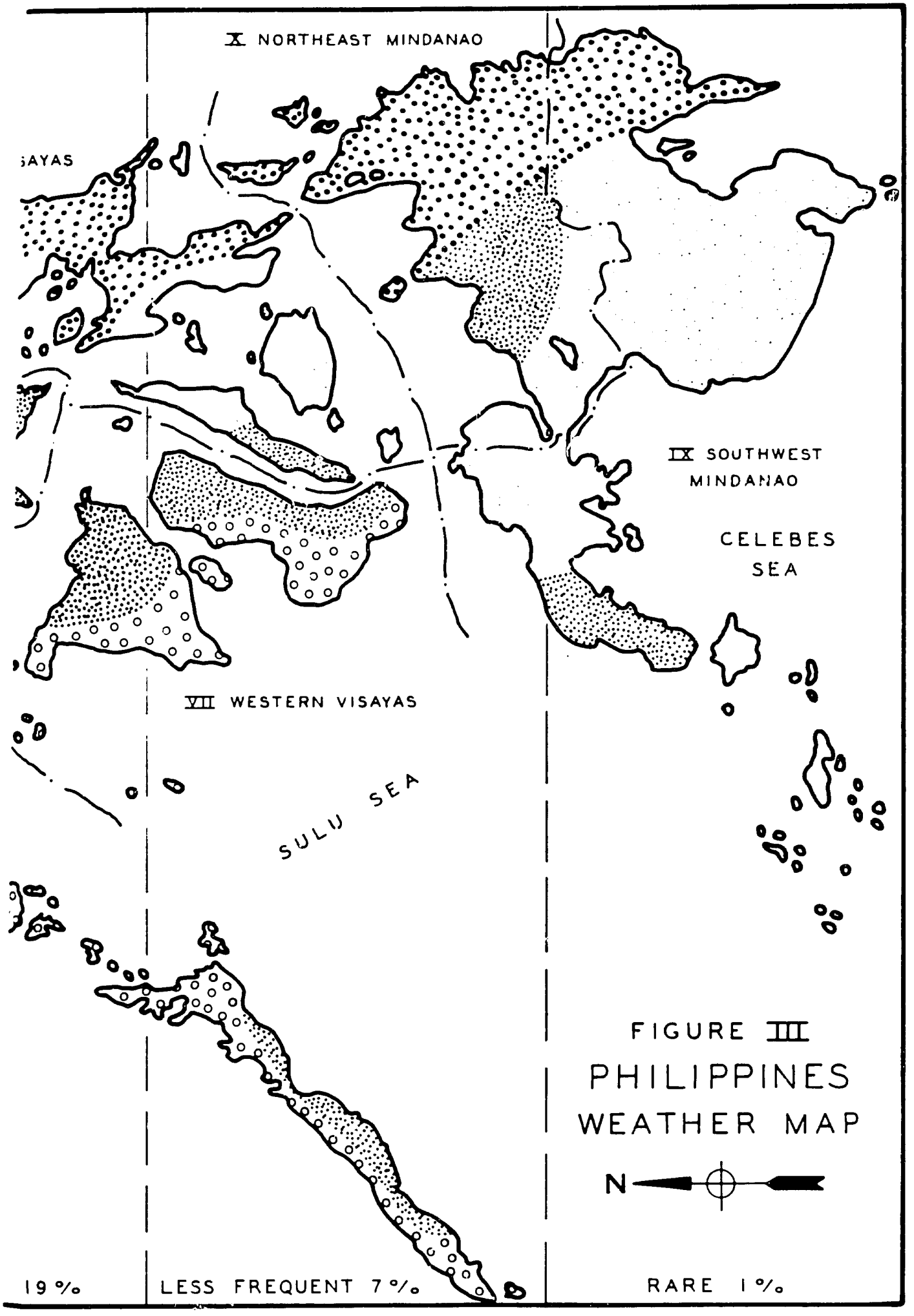


FIGURE III
PHILIPPINES WEATHER MAP

The average annual rainfall is 77 inches in these areas.

4th Type: Rainfall more or less evenly distributed throughout the year.

The regions affected by this type of climate are Bantanes Province, northeastern Luzon, the southwestern part of Camarines Norte, the western part of Camarines Sur and Albay, Bondoc Peninsula, eastern Mindoro, Marinduque, western Leyte, northern Cebu, Bohol and most of central, eastern and southern Mindanao.

The average annual rainfall in these areas is 102 inches.

Figure III geographically shows the four climate classification patterns of the islands.

Rainfall

The average annual rainfall in the Philippines is about 100 inches. The average at Manila for 90 recording years as of 1960 was 81.4 inches, with a low for the month of February of 0.43 and a high for the month of August of 17.20. The highest annual average in 26 recording years was at Culasi in Western Visayas at 167.5 inches, and the lowest recorded over 52 years was at Cebu City in Eastern Visayas at 63.76 inches (Appendix Table A-1).

The reliability of yearly abundant rainfall is of considerable importance to many agricultural sectors in the Philippines and is an important economic asset. The number of rainy days per month for each region as reported by regional weather stations is given in Appendix Table A-2. As shown in this table, the number of rainy days varied by stations from 109 to 226 days annually, and averaged 176 rainy days for the entire country for the year.

Temperature

Lying just north of the equator, the Philippines has a tropical climate. Average temperature varies only a few degrees either side of 27 degrees Centigrade monthly and regionally (Appendix Table A-3). Even though considerable temperature variations exist at the higher elevations, overall, temperature variations are relatively insignificant throughout the islands.

Humidity

The relative humidity fluctuates, with few exceptions, between 70 percent and 85 percent throughout the year. Nearer the equator the relative humidity increases towards 80 percent and shows less fluctuation. The percent of monthly average relative humidity is shown for the ten regions in Appendix Table A-4.

Typhoons

All the regions of the four types of climate are exposed to typhoons. The southern part of the archipelago, up to 8 degrees N Latitude, is nearly free from typhoons, an asset to the agricultural lands. From 8 to 11 degrees N, or over a zone of 180 miles wide, the typhoons are a little more frequent, but leaves relatively undisturbed the sugar lands of Negros and southern Panay. From 11 to 13 degrees N, which includes the City of Manila, typhoons are quite frequent and often destructive. Typhoons are most frequent in the northern part of the archipelago. The typhoon frequency for the Philippines is shown in Figure III. [3/]

* * *

[3/] The Climate of the Philippines, Climatological Division, Weather Bureau, Manila (pamphlet).

CHAPTER II

POPULATION

The Demographic Situation

Population Density

Literacy and Employment Status

Population Projections

CHAPTER II

POPULATION

The Demographic Situation

The census of 1960 enumerated 27,087,685 Filipinos; an increase of more than 7 million over the 1948 census. This increment represents an average annual growth rate of 3.06 percent which ranks the Philippines as one of the fast growing countries in the world. [1/] Except for the war years, 1941-1945, the average annual population growth rate has increased since the beginning of the twentieth century (Table 2).

The reporting of births and deaths is incomplete in the Philippines. Hence, estimate of vital statistics can only be arrived at indirectly. [2/] International migration has played an insignificant role in the growth of the Philippine population. The tremendous increase in numbers has therefore been due primarily to the high birth rate coupled with a rapidly declining death rate (Table 3).

The Philippine population is a relatively young population having 45.7 percent of the total population under 15 years of age (Table 4). Details on the age and sex distribution of the Philippine population by regions is presented in Appendix Table A-5. The median age of the population has fallen steadily from 20.2 years in 1903 to 17.1 years in

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1/ "The Population and Other Demographic Facts of the Philippines," National Economic Council, Office of Statistical Coordination and Standards, Republic of the Philippines, Manila, 1968, p. 1. (mimeographed)

2/ Ibid., pp. 13-16.

TABLE 2

GROWTH OF POPULATION,

BY CENSUS YEARS, 1903 to 1960

Census Date	Population	Average Annual Rate Of Increase
		(percent)
March 2, 1903	7,635,426	--
December 31, 1918	10,314,310	1.90
January 1, 1939	16,000,303	2.22
October 1, 1948	19,234,182	1.91 a/
February 15, 1960	27,087,685	3.06

a/ The war years, 1941-1945 probably caused this growth rate to be out of line with the rising trend.

Source: Census of the Philippines: 1960-Agriculture, Vol. II, Summary Report, Bureau of the Census and Statistics, Republic of the Philippines, Manila.

1960 (Table 5). The median age of the population is expected to decline somewhat during the 1970's but such a decline is not expected to significantly affect the per capita consumption of rice and corn.

Population Density

With an area of approximately 300,000 square kilometers the Philippines had a 1960 population density of about 90 persons per square kilometer (Appendix Table A-6). The population densities ranged from a low of 38.6 persons per square kilometer in the Cagayan Valley to a high of 156.2 persons in Central Luzon. The population density of the City of Manila in 1960 was 28,465 persons per square kilometer. A population density map is presented in Figure IV.

The low population density in the Cagayan Valley and Southern and Western Mindanao regions is coupled with fairly

TABLE 3

ESTIMATED BIRTH RATES, DEATH RATES, PHILIPPINES
CENSUS YEARS 1903 - 1960

Census Year	Intrinsic[a] Birth Rate	Sex-Age[b] Adjusted Birth Rate	Intrinsic[c] Death Rate	Model Life[d] Table Death Rate
1903	46.7	-	37.3	-
1918	50.2	53.3	30.7	31.1
1939	49.0	52.2	26.8	25.9
1948	56.2	56.4	33.8	33.7
1960	51.1	53.9	20.2	17.7

a/ These were calculated from a quasi-stable population derived from census data and represent the long-run average if the population remains subject to constant conditions of fertility and mortality.

b/ The method of reverse-survival was applied to age distributions obtained from the different censuses to obtain sex-age adjusted birth rates using model life tables with expectation of life at birth of 30 years for the 1948 census data and one with expectation of life at birth of 37.5 years for data of the censuses of 1939 and 1918. For 1960 the model life table with expectation of life at birth equal to 50.0 years was utilized

c/ Calculated as per birth rates.

d/ Estimates were made by comparing the observed age distribution of deaths to that of a stable population in conformity with the set of model life tables derived by the United Nations: gross reproduction rate used =3.

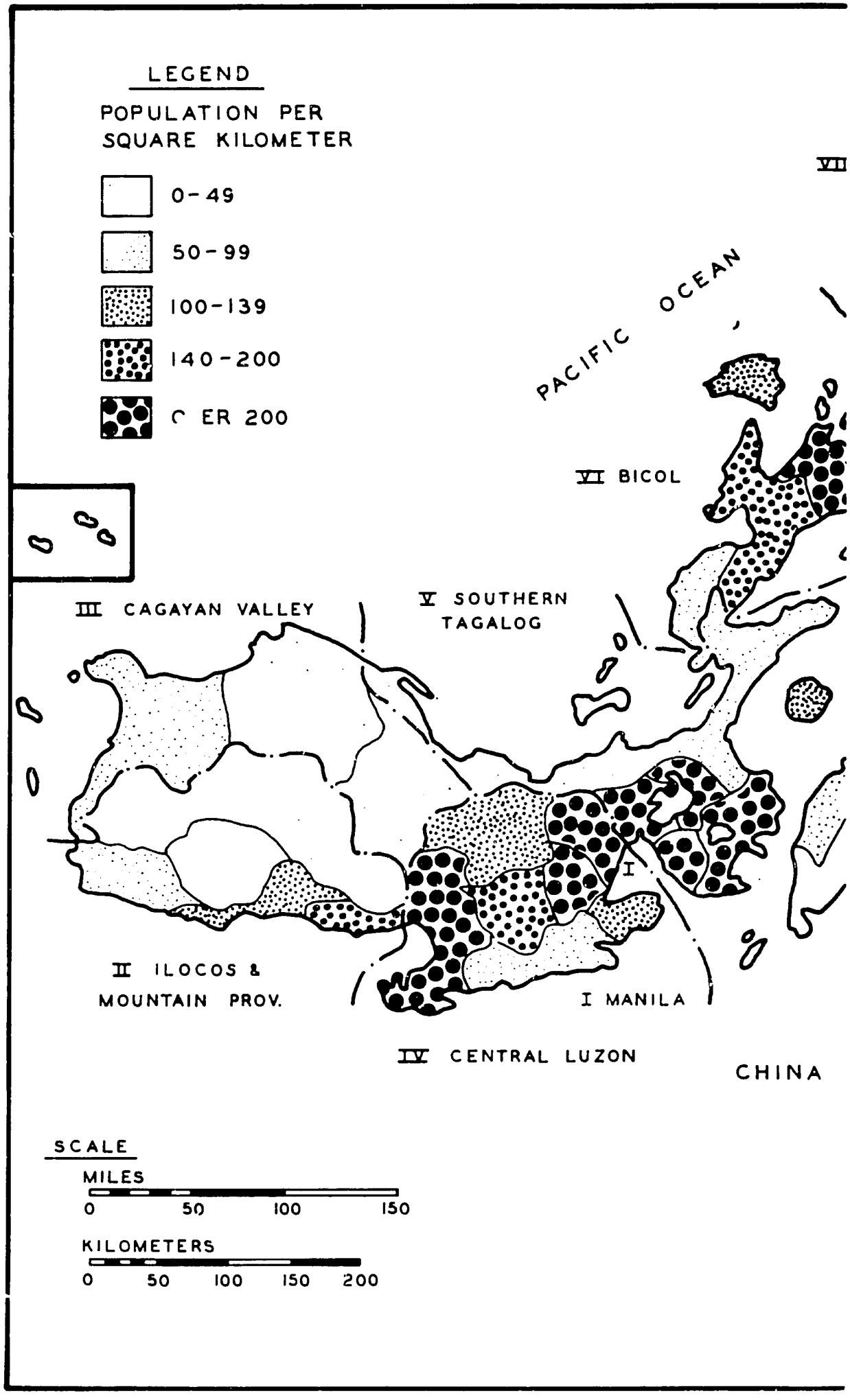
Source: The Population and Other Demographic Facts of the Philippines, National Economic Council, Manila, September 1963, pp. 13-15 (mimeographed).

TABLE 4

POPULATION BY AGE GROUPS, PHILIPPINES, 1960

Age Groups	Total Population	Percent of Total Population	Cumulative
	(millions)	(percent)	
Under 4 Years	4573.5	16.9	16.9
5 to 9 Years	4369.5	16.1	33.0
10 to 14 Years	3036.8	12.7	45.7
15 to 19 Years	2314.1	10.4	56.1
20 to 24 Years	2458.7	9.1	65.2
25 to 29 Years	1953.4	7.2	72.4
30 to 34 Years	1566.5	5.7	78.1
35 to 39 Years	1428.6	5.3	83.4
40 to 44 Years	1099.0	4.1	87.5
45 to 49 Years	1032.5	3.8	91.3
50 to 54 Years	710.2	2.6	93.9
55 to 59 Years	437.8	1.8	95.7
60 to 64 Years	431.0	1.6	97.3
65 Years and Over	738.8	2.7	100.0
TOTAL	27087.9	100.0	--

Source: Appendix Table A-2.


LEGEND
POPULATION PER SQUARE KILOMETER
0-49
50-99
100-139
140-200
OVER 200
PACIFIC OCEAN
VII
VI BICOL
III CAGAYAN VALLEY
V SOUTHERN TAGALOG
I
II ILOCOS & MOUNTAIN PROV.
I MANILA
IV CENTRAL LUZON
CHINA
SCALE
MILES
0 50 100 150
KILOMETERS
0 50 100 150 200

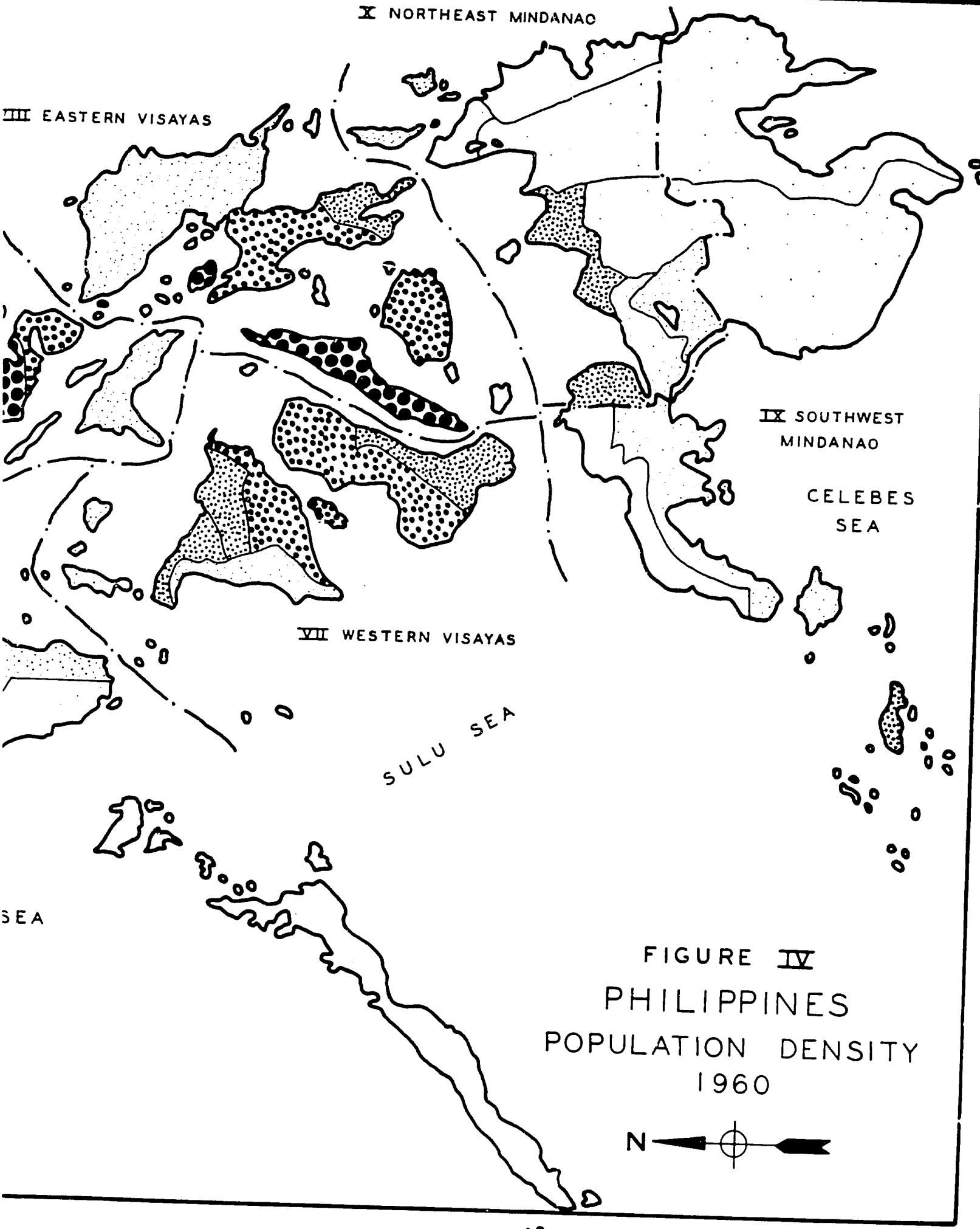


FIGURE IV
PHILIPPINES
POPULATION DENSITY
1960

substantial amounts of fertile land. As a result, both of these regions have surpluses of rice and corn.

TABLE 5

MEDIAN AGE OF THE POPULATION IN THE CENSUS YEARS, 1903 to 1960

Census Year	Median Age
1903	20.2
1918	18.5
1939	18.3
1948	17.7
1960	17.1

Source: Bureau of Census and Statistics, Census of the Philippines, 1960, Population and Housing, Vol. II, Summary Report, Manila, 1963, p. xiii.

In contrast with the negligible international migration into or out of the Philippines, the migration within the Philippines has been such that there was a substantial redistribution of the population between 1948 and 1960. Economic betterment seems to have been the underlying motive behind all of these movements. 3/

Estimates of life-time migration show that 15.8 percent of the population in 1960 were living in a province other than the one they were born in. On the basis of the 1948-1960 intercensal change in province of residence, 11.9 percent of those enumerated in the 1960 census were living in a different province than in 1948. The movements within the country were towards areas where mining and logging

3/ Pascual, Elvira. Population Redistribution in the Philippines, Population Institute, University of the Philippines, 1966, pp. 17-42. (mimeographed)

were important or where new farm lands were being opened. Another prominent migration stream originates from the provinces and terminates in the Metropolitan Manila area which is the industrial center of the Philippines.

The percentage of the population living in urban areas has increased slowly since 1948. The urban population was about 26.5 percent of the total population in 1948 and 29.9 percent in 1960. In absolute terms, however, the urban areas have grown rather rapidly. There were 32 cities with an aggregate population of almost 4 million in 1960. The number of cities with a population of over 100,000 increased from 2 in 1939 to 11 in 1960. [4/]

The percentage of total rice and corn production marketed has increased substantially during the past 20 years as the population in the urban areas has increased. These trends are expected to continue during the 1970's.

Literacy and Employment Status

The proportion of the population that can read and write has increased from 48.8 percent of the total population 10 years and over in 1939 to 72.0 percent in 1960. The proportion of the population classified as literate varies considerably from region to region, however. Over 90 percent of the population over 10 years of age living in Manila can read and write while less than 55 percent of the population over 10 years of age in Southern and Western Mindanao are classified as literate. A regional breakdown of literacy levels of persons 10 years and over by age and sex as of

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[4/] Ibid., pp. 13-16, 53-61. See also Statistical Handbook of the Philippines, Bureau of the Census and Statistics, Bureau of Printing, Republic of the Philippines, Manila, 1965, pp. 16-17.

1960 is presented in Appendix Table A-7. The 1960 census also indicated that approximately two-thirds of the population finished elementary school.

Nearly half of the Filipinos above 10 years of age are employed. The results of the labor force survey conducted by the Bureau of the Census and Statistics in 1960 show that 47.8 percent of the population 10 years and over were in the labor force. Of these, 93.1 percent were employed and the remaining 6.9 percent classified as unemployed. The employment status of the population 10 years and over is presented in Appendix Table A-8.

A high percentage of the population is engaged in farming. The occupational distribution of those classified as employed in 1960 is shown in Table 6. Over 65 percent of those employed were classified as farmers, fishermen, loggers or kindred workers. Only 11 percent were classified as production workers or craftsmen.

Population Projections

The Philippine population is expected to pass the 50 million mark by 1980. Projected population for the ten regions of the Philippines for the years 1970, 1975 and 1980 are given in Table 7.

An analysis of the future course of the Philippine population up to the year 2000 under three sets of assumptions (high, medium and low) has been prepared by Dr. Frank W. Lorimer of the Population Institute of the University of the Philippines. [5/] Based upon Dr. Lorimer's national

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[5/] Lorimer, Frank W. "Analysis and Projections of the Population of the Philippines," in First Conference on Population, 1965, Population Institute, University of the Philippines Press, 1966, pp. 287-309.

TABLE 6

EMPLOYED PERSONS TEN YEARS OLD AND OVER
BY OCCUPATION GROUP, PHILIPPINES, 1960

Occupation Group	Male	Female	Total	Percent of Total
Professional and Technical	114,140	119,250	233,390	2.9
Administrative	41,600	7,030	48,630	0.6
Clerical	138,070	41,200	179,270	2.3
Sales	239,760	246,320	486,080	6.1
Farmers, Fisherman and Loggers	4,444,500	769,660	5,214,160	65.6
Mining	16,270	340	16,610	0.2
Transportation and Communications	174,060	3,500	177,560	2.2
Production Workers and Craftsmen	435,320	434,450	869,770	11.0
Services	164,460	321,180	485,640	6.1
Stevedores and Freight Handlers	173,890	7,640	181,530	2.3
Unclassified	48,060	3,750	51,810	0.7
TOTAL	5,990,130	1,954,320	7,944,450	100.0

Source: Bureau of the Census and Statistics.

TABLE 7

POPULATION PROJECTIONS TO 1970, 1975, AND 1980
BY REGIONS, PHILIPPINES

	Region	1970	1975	1980
			(thousands)	
I	Metropolitan Manila [a]	3,109	3,730	4,452
II	Ilocos	1,917	2,197	2,523
III	Cagayan Valley	1,517	1,819	2,171
IV	Central Luzon	4,894	5,649	6,528
V	Southern Tagalog	4,683	5,581	6,627
VI	Bicol	3,276	3,849	4,517
VII	Western Visayas	4,761	5,359	6,055
VIII	Eastern Visayas	4,656	5,088	5,592
IX	Southwestern Mindanao	5,513	6,918	8,555
X	Northeastern Mindanao	3,076	3,682	4,387
	TOTAL [b]	37,402	43,872	51,407

[a] Includes the City of Manila, Quezon City, Pasay City, Caloocan City, San Juan, Mandaluyong, Makati, Paranaque.

[b] Hypothesis B as shown on Appendix Table A-9.

population estimates, and using each region's percentage share of the 1948-1960 intercensal increase of the total population, projections for the ten regions of the Philippines were developed, and are presented in Appendix Table A-9. The three sets of assumptions shown in this table are identified as Hypothesis A, Hypothesis B, and Hypothesis C.

A moderate decline in the mortality rate during the 1970's is assumed in all three sets of projections; however, differences between the population projections are due to different assumptions about the birth rate:

Hypothesis A (low estimate) is based on the assumption that there will be a progressive fall in the birth rate beginning in 1965 with an accelerated downward trend during the period 1975-1980, and would result in a population of 48,978,000 in 1980;

Hypothesis B (medium estimate) assumes the fertility rate as being an arithmetic mean between the fertility rates operative in the high and low estimates; and

Hypothesis C (high estimate) is based on the assumption that the fertility rate during the 1970's will be the same as that during the 1960 to 1965 period and would result in a population of 53,415,000 in 1980.

For the purposes of this study, Hypothesis B (the medium estimate) presented in Table 7 is used as a basis for estimating human consumption of rice and corn in the Philippines for the years 1970, 1975 and 1980.

According to the medium projections, the population of the Philippines will increase from 27,088,000 in 1960 to 37,402,000 persons in 1970, and to 51,407,000 persons in 1980. In general, a slightly larger percentage of the population will live in urban areas. The percentage of the

total population living in the Manila metropolitan area is expected to increase from 7.8 percent in 1960 to 8.6 percent in 1980. The percentage of the total population living in the Ilocos region, Central Luzon, Eastern and Western Visayas is expected to decrease during the 1970's. According to these projections, Southern and Western Mindanao will be the fastest growing region in the Philippines.

The projections indicate that 14.7 percent of the total population will be located in Southern and Western Mindanao in 1970 compared to 12 percent in 1960. This percentage is expected to increase to 16.5 by 1980. The rapid growth in this region is partly due to the immigration from other parts of the Philippines. As will be seen later, the Southern and Western Mindanao region will be the nation's most important corn producing area and second most important rice producing area in 1980. This development together with the general trend in population shifts to urban areas will call for substantial development in the nation's rice and corn marketing system. Storage, processing, and distribution facilities will need to be improved in order to assure the urban sector of adequate rice and corn supplies.

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CHAPTER III

THE GENERAL ECONOMY

Introduction

Gross National Product and National Income

Inflation

- Food Prices

Foreign Trade

- Exports
- Imports
- Foreign Trade Projections

CHAPTER III

THE GENERAL ECONOMY

Introduction

The Philippine economy is basically an agricultural one. Although the expansion of nonagricultural industries has provided new employment opportunities for the growing labor force, an estimated 57 percent of the labor force was still employed in agriculture and related industries in 1965. [1/] In 1966, the value of agriculture, fishery and forestry products accounted for 27 percent of the Gross National Product (GNP) and 77 percent of the total of Philippine exports. The rapidly expanding population and, until recently, the slow growth in food production has led to an 8 percent yearly average increase in food prices. Both the overall price level and real GNP have averaged a moderate 5 percent yearly increase over the last ten years. The rapidity of the development and diversification of the Philippine economy depends in no small way upon the ability of the Filipino farmer to feed himself and the increasing number of people who move out of agriculture.

Real output in the commerce sector has nearly trebled since 1956. The expansion in commerce and in the service industries has provided employment opportunities for women who now represent a third of the labor force. Mining and quarrying, construction, transportation, communication,

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[1/] "Labor Force Including Educational and Attainment Data," Bureau of the Census and Statistics, The BCS Survey of Households Bulletin (formerly the Philippines Statistical Survey of Households Bulletin), Series 19, October 1965, p. 3.

storage, and utilities comprise 9 percent of GNP and have nearly doubled their output since 1956.

Gross National Product and National Income

The Philippine Gross National Product in 1967, in current pesos, was estimated to be about ₱24,242 million. In real terms (in 1955 pesos), this is ₱15,839 million and represents a 5.6 percent increase in real GNP over the 1966 level. The average rate of growth of real GNP during the past decade was 5 percent annually (Table 8). Real per capita income increased by 10 percent from ₱360 in 1960 to ₱398 in 1965, an average of 2 percent per year. 2/

It is estimated that 27 percent of the 1967 real GNP originated in the agriculture, forestry, and fishing industries. Although it remains the largest contribution to GNP, this sector has shown a steady decline in proportion from 35 percent of GNP in 1956 to the present 27 percent estimate. Between 1960 and 1965 the number of people employed in agriculture, forestry, and mining increased by half a million workers; however, the percentage of the labor force thus employed declined from 65 percent in 1960 to 57 percent in 1965. 3/ This means that 57 percent of the labor force was engaged in industry that produced only 27 percent of the GNP. The average income per worker in agriculture, forestry and mining amounted to only ₱686 in 1965. The real value of the output of this sector has increased about 3.5 percent per year, but should increase more rapidly in the future due to

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2/ These data were computed from figures obtained from "Facts and Figures About the Philippines," Bureau of Census and Statistics, Department of Commerce and Industry, 1963, p. 5; and "Labor Force Including Educational and Attainment Data," p. 3.

3/ Ibid.

TABLE 8

GROSS NATIONAL PRODUCT, BY SECTOR, PHILIPPINES 1956-1967

Sector / Year:	1956	1957	1958	1959	1960	1961[a]	1962	1963	1964	1965	1966	1967[b]
	(in million 1955 Pesos)											
Agriculture, Fishery, & Forestry	3190	3186	2936	3235	3342	3443	3521	3794	3712	3930	4063	4270
Mining & Quarrying	134	150	148	160	153	168	169	172	178	195	213	233
Manufacturing	1158	1251	1347	1459	1503	1604	1827	2047	2192	2271	2385	2516
Construction	281	303	275	287	260	310	345	421	456	506	476	527
Transportation, Communication Storage and Utilities	278	307	325	337	345	370	516	542	568	593	622	652
Commerce (Trade)	593	1045	1001	1028	1081	1140	1551	1530	1553	1647	1721	1786
Services	2279	2308	2784	2932	3045	3151	2672	2856	2977	3147	3305	3482
Net Domestic Product at Factor Cost	8293	8550	8816	9438	9729	10186	10601	11362	11636	12389	12785	13469
Indirect taxes less subsidies plus Capital Consumption Allowance	839	982	1113	1076	1207	1420	1725	1899	1958	2108	2217	2370
Gross National Product	9132	9532	9929	10514	10936	11606	12326	13261	13594	14397	15002	15839
Growth rate of real GNP (%)		4.38	4.16	5.89	4.01	6.13	6.20	7.59	2.51	6.00	4.20	5.58

a/ Preliminary.
b/ Estimated.

Source: Office of Statistical Coordination and Standards, NEC.

the present emphasis on increasing grain and livestock production.

The service industry is the second largest sector in the Philippine economy both in terms of the numbers employed and the GNP originating in this sector. Output in the service sector has increased by 53 percent since 1956 and it now amounts to 22 percent of the GNP. In 1965, 14 percent of the labor force was employed in the service sector. The manufacturing sector accounted for 16 percent of the real GNP in 1967 and is one of the fastest growing components of the Philippine economy. The real value of manufacturing output has more than doubled since 1956 and the number of laborers engaged in manufacturing increased by 30 percent between 1960 and 1965. Commerce is another rapidly growing sector. Twelve percent of GNP originated in the commerce sector in 1967 compared to only 6.5 percent in 1956.

The rapid expansion of nonagricultural employment, the decline of agricultural output as a percentage of GNP, and the moderate increases in agricultural output can be expected to continue as the Philippine economy industrializes and implements its agricultural development policies.

Inflation

Prices in the Philippines have increased by nearly 52 percent over the last ten years. The price fluctuations during the 1957-1967 period for selected categories are shown in Table 9 for this time period. The largest price increases have been in clothing and food. Food prices jumped about 80 percent and clothing prices increased by about 56 percent over the decade. The cost of housing as indicated by "rent and repairs" has risen only 1 percent per year while utilities prices increased by 2.5 percent per year.

TABLE 9

CONSUMER PRICE INDEX FOR THE PHILIPPINES, 1957-1967
(1957=100)

Period	All Items	Food	Clothing	Rent & Repairs	Fuel, Light & Water	Miscel-laneous
1957	100.0	100.0	100.0	100.0	100.0	100.0
1958	102.5	104.3	102.6	100.3	101.9	100.2
1959	100.6	98.6	106.9	100.6	103.2	101.7
1960	105.6	100.0	112.8	101.4	103.7	104.0
1961	110.3	113.8	114.5	102.2	106.0	105.8
1962	113.6	116.6	121.4	103.2	108.8	109.4
1963	122.6	132.5	124.3	104.8	111.2	111.6
1964	133.5	151.2	129.6	105.7	116.9	114.5
1965	137.6	156.3	136.1	107.1	121.7	117.0
1966	144.5	167.0	142.1	109.0	123.0	120.0
1967[a/]	151.8	178.8	149.1	110.7	124.0	122.3

a/ January to March Average

Source: Statistical Bulletin, Volume 19, No. 1, March, 1967, published by the Department of Economic Research of the Central Bank of the Philippines, Table 119, p. 290.

Prices of consumer items are slightly different in Manila and in other regions, but the principal difference noted during the past decade is that "rent and repairs" increased by about 25 percent in Manila and remained about the same in other areas.

Food Prices

Food prices have increased steadily since 1957. The Manila Retail Price Index for Foodstuffs (Table 10) shows prices of all major categories of food up considerably from 1957-1966 as follows:

Cereals	- up 66 percent
Fish	- up 74 percent
Meat	- up 84 percent
Vegetables	- up 50 percent
Fruits	- up 59 percent
Eggs and Milk	- up 84 percent
Fat and Oils	- up 50 percent

Although vegetable prices have increased the least over the time period, they have been the most erratic. Vegetable prices jumped 38 percent between 1963 and 1964 then declined 7 percent in 1965, increased 16 percent in 1966 and showed a decline of 5 percent in the first quarter of 1967. A similar but much less erratic trend was followed by fats and oils which also experienced a slight price decrease in the first quarter of 1967. Fruit prices leveled off during the last two years but showed a small price increase in the first quarter of 1967. The moderate 3 percent yearly increase in egg and milk prices between 1964 and 1966 became a 4.7 percent increase in early 1967. Cereal prices have increased by about 38 percent during the last two years to bring the prices to a level 80 percent higher than the 1957 prices. Fish prices more than doubled

TABLE 10

RETAIL PRICE INDEX OF FOODSTUFFS[a] IN MANILA, 1957-1967

(1957 - 100)

Year	All Items	Cereals	Fish	Meat	Vegetables	Fruits	Eggs & Milk	Fats & Oils
1957	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1958	106.2	111.8	104.2	103.1	105.3	110.7	105.1	98.5
1959	101 8	95.2	103.5	106.6	97.9	108.9	113.3	115.6
1960	108.6	104.6	107.8	109.2	127.4	107.6	110.3	114.1
1961	111.3	112.8	114.9	114.2	97.6	120.8	114.0	111.1
1962	119.8	108.3	134.7	127.8	103.9	127.4	151.6	118.0
1963	131.5	121.7	145.8	147.0	102.7	140.0	172.3	124.8
1964	148.3	145.4	149.7	164.4	140.3	150.5	178.9	130.1
1965	151.0	142.5	165.9	168.8	133.7	159.1	181.0	146.8
1966	165.2	165.8	173.8	183.6	150.2	159.2	184.0	150.3
1967[b]	176.8	180.1	210.3	188.4	144.9	161.0	188.7	149.3

a Food component of the consumer price index.
b January to March average.
Source: Statistical Bulletin, Department of Economic Research of the Central Bank of the Philippines, Vol. 19, No. 1, March, 1967, Table 109, p. 279.

over the period and by 1967 were 110 percent higher than the 1957 prices. The substitution of meat for fish placed greater demands on the slowly developing livestock industry and contributed to an 88 percent increase in prices here.

The large population increase and the migration of people into Manila promise to place even greater stress on food prices unless supplies of food products increase substantially in the near future.

An average price increase of 5 percent per year is not excessive for a developing economy. The much higher inflation of food prices is an indication of the pressures that are brought to bear on an economy with a rapidly expanding population. The extent to which these pressures are alleviated depends upon the ability of the Filipino farmer to increase output through the adoption of new high yielding varieties and improved farming methods now available.

Foreign Trade

Exports

Philippine exports were valued at over US$800 million in 1966 of which over half came from forestry and coconut products. The top ten exports accounted for 87 percent of all export revenues in 1966 (Table 11). Approximately 77 percent of the total value of Philippine exports was comprised of exports of raw or semi-processed agricultural products The Philippines is heavily dependent upon the lumber and coconut products industries as sources of revenue in international trade. The value of exports from these two industries totals 58 percent of the country's export revenues. The Philippines derives another 24 percent of their total export revenue from shipments of copper concentrates and sugar.

TABLE 11

TEN PRINCIPAL EXPORTS, PHILIPPINES, 1966

Export Product	Quantity[a]	Value	Percent of Total Value of All Exports[b]	Value of Amount Exported to the U. S.	Percent Exported to the U. S.	Other Major Recipients	Value of Amount Exported	Percent of Total of this Export
				(value in U.S. $1000)				
Logs and Lumber[c]	3,677,451	208,389	25	5,602	3	Japan	164,567	79
Copra	1,014,680	169,626	20	46,788	28	Netherlands	54,843	32
Sugar (Centrifugal)	854,765	115,863	14	115,863	100	--	--	--
Copper Concentrates	362,969	83,081	10	--	--	Japan	5,731	79
Coconut Oil	313,804	75,468	9	58,772	78	--	--	--
Abaca (Unmanufactured)	78,869	18,689	2	7,455	40	Japan	4,006	21
Plywood	356,584	18,151	2	17,625	97	--	--	--
Dessicated Coconut	67,161	17,713	2	12,744	72	--	--	--
Copra Meal or Cake	239,093	17,231	2	--	--	Germany	8,164	47
Pineapples, Canned	45,173	8,910	1	3,010	34	--	--	--
Total Value of Top Ten Exports	--	733,121	87	--	37[d]	--	--	--
Value of All Exports	xxx	838,000	100	xxx	32[d]	xxx	xxx	xx

a. Quantity in 1000 kilograms.
b. Calculated from source data table 70.
c. Quantity in thousand board feet.
d. Excludes "copper concentrates" and "copra meal or cake" for which no data was available.
Source: Statistical Bulletin, Department of Economic Research of the Central Bank of the Philippines, Volume 19, No. 1, June, 1967, Table 70, pp. 186-195.

The United States and Japan are the major importers of Philippine products. The United States is the largest purchaser for seven of the top ten export commodities. The revenue received from the sale of these products to the United States amounts to 37 percent of the total revenue derived from the export market. All centrifugal sugar exports and 97 percent (by value) of the plywood exports are destined for the United States.

Japan provides 32 percent of the total revenue derived from exporting Philippine products. Japan is the largest purchaser of Philippine lumber and copper concentrates, accounting for 79 percent of the export revenues obtained from these industries, and is the second largest purchaser of unmanufactured abaca.

Imports

The Philippines imported US$852,800,000 worth of foreign products in 1966. The top ten import categories accounted for 75 percent of this total (Table 12). Purchases of machinery and complementary products amounted to 45 percent of the total value of Philippine imports. Other important imports included base metals at 10 percent, food imports 9 percent and textile products 8 percent of the total value of imports.

The United States and Japan occupy somewhat less important positions in the import market. About one-fourth of the imported products come from the United States. Purchases from Japan account for another 22 percent of Philippine import expenditures. Japan is the major or second largest supplier of goods to the Philippines in seven of the ten import categories. Other imports come from Indonesia, Thailand, and the Netherlands.

TABLE 12

TEN PRINCIPAL IMPORTS[a] PHILIPPINES, 1966

Principal Imports	Value	Percent of Total Imports	Value of Imports from U.S.	Percent of Amount Imported from U.S.	Other Countries	Value of Imports	Percent of Total
	(f.o.b. value in 1000 US dollars)						
Machinery other than electric	151,337	18	59,882	40	Japan	54,921	36
Transport equipment	109,908	12	38,084	35	Japan	42,740	39
Mineral fuels, lubricants, and related materials	84,095	10	7,607	9	Indonesia	21,592	26
Base metals	83,988	10	7,113	8	Japan	51,657	62
Cereals and Cereal preparations	52,768	6	26,112	49	Thailand	6,696	13
Electric machinery, apparatus, and appliances	35,952	4	15,436	43	Japan	7,704	21
Textile fibers not manufactured into thread and yarns	34,909	4	15,702	45	Japan	8,036	23
Explosives and miscellaneous chemical materials and products	30,670	4	12,992	42	Japan	8,100	26
Textile yarns and made-up articles	30,622	4	11,404	37	Japan	16,289	53
Dairy products, eggs, and honey	28,634	3	7,367	26	Netherlands	7,768	27
Total Value of Top Ten Imports	642,883	75	31[a]				
Value of All Imports	852,800	100	24[a]	xx	xxx	xxx	xx

a This figure is for the top ten imports total only. Other imports are not considered.
Source: Statistical Bulletin, Department of Economic Research of the Central Bank of the Philippines, Volume 19, No 1, June 1967, Table 72, pp. 202-209.

Foreign Trade Projections

It seems unlikely that the capital intensiveness of imports and the predominance of agricultural products in exports will change in the near future. The development of the Philippine's mineral resources will increase raw material exports. However, the copra, lumber, and sugar industries will probably continue to provide the largest portion of Philippine exports during the 1970's. The major short run change is projected for the food products in which the Philippines is expected to become a rice exporter by 1970.

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CHAPTER IV

THE FOOD AND AGRICULTURAL ECONOMY

Food Expenditures

Food Requirements

- Rice and Corn Requirements

Land Use

Farm Size

Land Tenure

Agricultural Production and Use

- Rice
- Corn

Fertilizer and Pesticide Use

- Fertilizers
- Pesticides

Imports of Foodgrains

- Wheat and Flour Imports
- Soybean Imports
- Oats Imports
- Grain Sorghum Imports
- Corn Imports
- Rice Imports
- Beans and Peas Imports

Exports of Foodgrains

CHAPTER IV

THE FOOD AND AGRICULTURAL ECONOMY

Food Expenditures

The average family in the Philippines spends ₱1,793 each year, of which, ₱965 or nearly 54 percent is spent on food. This compares to less than 20 percent spent for food in the United States. Cereals and sea foods are the most important items in the food budget accounting for 37.6 percent and 19.5 percent respectively of total expenditures on food consumed at home. The distribution of the family food expenditure and its relation to total family expenditures is presented in Table 13.

TABLE 13

DISTRIBUTION OF AVERAGE FAMILY FOOD EXPENDITURES, PHILIPPINES, 1961

Expenditure Group	Pesos	Percent
Food Consumed Outside the Home	41	4.2
Food Consumed at Home	924	95.8
Cereal & cereal products	362	37.6
Fish & other sea foods	188	19.5
Meat & eggs	108	11.2
Milk & other dairy products	33	3.4
Roots, vegetables & fruits	110	11.4
Miscellaneous	123	12.7
TOTAL	965	xxx

Source: The Philippine Statistical Survey of Households Bulletin, Bureau of Census and Statistics, Series 14, Manila.

Food Requirements

Nutrition surveys of the Food and Nutrition Research Center indicate that, except for cereals and some fruits and vegetables, the consumption of most types of food is below recommended levels of consumption. The Philippine diet includes about two-thirds of the meat, fish and poultry, one-third of the eggs, one-seventh of milk, and one-fourth of the leafy and yellow vegetables needed to meet recommended dietary allowances. [1/] At the present time, caloric intake is about 75 percent of recommended allowances while total protein intake is around 85 percent of the recommended level. A summary of the results of the Food and Nutrition Research Center's nutrition surveys is presented in Table 14.

Rice and Corn Requirements

The rice supply will be about 12 percent short of requirements in 1970 while corn production will exceed total requirements by about 20 percent, according to the Food and Nutrition Research Center's estimates. Corn may tend to be substituted for rice in the Philippine diet as corn becomes relatively more available (see note below). Total production

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1/ Intengan, Carmen. "The Food Needs of the Philippines", a paper presented to the Second Conference on Population, November 27-29, 1967, Manila, p.4.

NOTE: The reader should keep in mind that "total requirements" of rice and corn as estimated by the Food and Nutrition Research Center are not projections of actual consumption of rice and corn. The "total requirements" figures are based on a set of assumptions about what people in different age groups should consume in order to have an adequate diet. The "total requirement" estimates for milled rice and milled corn in 1970 and 1980 are somewhat higher than the projections of milled rice and corn consumption figures shown in later chapters of this report. This difference is partly explained by the fact that projected population figures of the research team are below those used by the Food and Nutrition Research Center. The analysis of storage facility requirements presented later is based on

TABLE 14

QUANTITY AND NUTRITIVE VALUE OF FOODS COMSUMED PER CAPITA PER DAY IN THE PHILIPPINES COMPARED TO RECOMMENDED ALLOWANCES

Item		Per Capita Food Intake[a]	Recommended Allowances	Percent Sufficiency
Foodstuffs:		(Grams)	(Grams)	(Percent)
Cereal		334	318	105.0
Starchy Roots		55	70	78.6
Sugar		19	33	57.6
Pulses and Nuts		8	20	40.0
Leafy and Yellow Vegetables		17	68	25.0
Vitamin C-Rich Foods		26	87	29.9
Other Fruits and Vegetables		93	94	98.9
Meat, Fish and Poultry		75	108	69.4
Eggs		5	14	35.7
Milk and Milk Products		26	168	15.5
Fats and Oils		7	29	24.1
Nutrients:				
Calories		1672	2193	76.2
Total Protein		47	54	85.7
Fats		21	--	--
Calcium	(mg.)	350	1000	35.0
Iron	(mg.)	10	8	125.0
Vitamin A Value	(I.U.)	1900	3772	50.4
Thiamine	(mg.)	0.8	1.2	67.2
Riboflavin	(mg.)	0.5	1.4	38.2
Niacin	(mg.)	14	12	116.7
Ascorbic Acid	(mg.)	70	70	100.0

a/ Based on nutrition survey reports for 6 regions in the Philippines and represents consumption levels of 58 percent of the population.

Source: Intengan, Carmen, "The Food Needs in the Philippines", a paper presented to the Second Conference on Population, Food and Nutrition Research Center, Manila, November 27-29, 1967.

TABLE 15

PROJECTED TOTAL GROSS FOOD REQUIREMENT IN 1970 AND 1980 AS COMPARED WITH PRODUCTION PROJECTION[a/]

Food	1970			1980		
	Total Requirement	Total Production[a/]	Production as Percent of Requirement	Total Requirement	Total Production[a/]	Production as Percent of Requirement
	(1000 Metric Tons)		(Percent)	(1000 Metric Tons)		(Percent)
Rice (Milled)	4,325	3,798	88	5,919	6,333	107
Corn (Milled)	1,358	1,631	120	1,652	2,174	131
Wheat (Flour)	456	--	--	648	--	--
Starchy Roots	1,223	1,633	134	1,732	1,885	109
Sugars	275	773	281	429	1,205	281
Pulses and Nuts	317	113	36	514	182	36
Fruits and Vegetables	5,454	1,898	35	10,427	2,750	26
Meat and Poultry	523	397	76	866	630	73
Fish	1,647	1,341	81	2,838	2,043	72
Eggs	144	98	68	205	109	53
Milk	550	13	2	780	22	3
Fats	287	113	39	489	160	33

a/ Production projections from DANR, OSCAS, NEC.
Source: Intengan, Carmen, "The Food Needs in the Philippines", a paper presented to the Second Conference on Population, (Table 8) Food and Nutrition Research Center, Manila, November 27-29, 1967.

of both rice and corn is expected to exceed required consumption levels by 1980. This would allow the Philippines to export both rice and corn while at the same time satisfying recommended dietary allowances of these grains. Except for starchy roots and sugars, the production of most other types of foods is expected to continue below the levels required to meet recommended nutrition needs. The projected total gross food requirements as compared with production projections for 1970 and 1980 are presented in Table 15.

Land Use

The mountainous terrain of the Philippines considerably restricts the land area available for farming. In 1965, approximately 8,252,000 hectares or 28 percent of the 29,741,000 hectares of Philippine land area was crop land.[2/] Most of this crop land (about 47 percent) lies in the basins of the Agno, Pampanga, Cagayan, Bicol, Cotabato, Agusan and Ilog-Hilabangan rivers. Nationally, about 7.25 percent of the crop land, or 600,000 hectares, were under irrigation in 1965. [3/] Reports of the U.S. Bureau of Reclamation on the seven basin areas indicate that 3,090,000 hectares of the land in these valleys are potentially irrigable [4/] (Table 16). For the nation as a whole, approximately 6.5 to 7.5 million hectares are potentially irrigable.

[2/] BAE, DANR Table 1 "Summary: Agricultural Land Utilization by Kind of Crops, Philippines, 1940 and 1954-1966."

[3/] Golay, Frank H. and Marvin E. Goodstein. Rice and People in 1990, Manila, 1967, p. 76.

[4/] Ibid., p. 79.

NOTE continued: projections of actual consumption rather than estimates of consumption "requirements" and the research team felt that the actual per capita consumption of rice and corn during the 1970's will be very close to "recommended" consumption levels.

TABLE 16

POTENTIALLY IRRIGABLE RIVER BASIN SOILS

Soil Type	Description	Area	Percent of Total Basin Land Area
		(hectares)	
I	Best suited for irrigation; poor internal drainage; gradient under 3 percent.	1,325,000	16
II	Less suitable for irrigation; porous external drainage; gradient to 3 percent.	411,000	5
III	Physical properties of Class I soils; gradients to 25 percent.	1,354,000	16
	TOTAL	3,090,000	37

Source: Golay, Frank H. and Marvin E. Goodstein. Rice and People in 1990, Manila, 1967, p. 78-79.

Total land under cultivation increased by 35 percent between the mid-1950's and the mid-1960's. The total land in food crops increased by 32 percent during the same period. The proportion of total farm land used for raising food crops expanded from 75 percent in 1954 to 79 percent in 1960 and then declined to 73 percent in 1966 (Table 17).

About 83 percent of the total land devoted to food crops is planted to rice or corn. The relative importance of corn has increased since 1954. Corn accounted for only 24 percent of the total food crop land in 1954 and nearly 35 percent in 1966. Rice, on the other hand, accounted for nearly 58 percent of the food crop land in 1954 and only 51 percent in 1966. The increasing importance of corn is primarily due to the rapid expansion of corn production in

TABLE 17

LAND UTILIZATION[a] BY KIND OF CROPS, PHILIPPINES, 1954-66[b]

Crops	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
						(in thousand hectares)							
Food Crops													
Palay (rough rice)	2,645.4	2,655.5	2,742.5	2,768.1	3,124.1	3,329.4	3,306.5	3,197.8	3,179.2	3,161.3	3,087.4	3,199.7	3,109.2
Corn	1,120.0	1,388.4	1,674.8	1,786.8	1,380.6	2,107.0	1,845.5	2,045.5	2,016.3	1,949.5	1,897.6	1,922.8	2,106.1
Fruits and nuts, except citrus	316.8	332.3	332.4	344.9	365.8	349.0	319.6	358.5	366.5	366.0	364.6	372.0	353.0
Citrus	18.8	19.7	20.5	21.4	22.1	22.0	22.9	27.8	28.6	29.1	28.4	28.6	28.5
Root Crops	267.9	272.7	279.9	291.7	299.7	300.3	289.1	282.6	261.3	264.4	287.9	273.6	262.8
Vegetables, except onions and potatoes	89.5	91.3	91.8	93.6	95.7	91.7	72.1	53.8	55.4	47.7	46.5	45.8	47.0
Onions	3.9	4.0	3.6	3.5	3.7	5.2	6.5	5.5	6.0	4.8	4.2	4.8	5.2
Irish Potatoes	1.8	2.6	3.0	3.2	3.6	2.4	2.1	2.2	2.2	2.5	2.6	2.5	2.5
Beans and Peas	66.1	67.7	70.0	75.4	81.1	81.6	78.2	63.1	67.2	68.9	61.1	56.0	54.9
Coffee	17.4	19.2	19.8	21.5	23.4	25.6	30.5	39.0	50.4	42.0	42.0	44.3	45.7
Cacao	6.8	6.5	6.4	6.7	7.1	6.9	6.6	9.5	9.1	9.7	9.2	9.6	9.4
Peanuts	28.2	28.4	28.8	29.3	30.5	26.6	24.3	21.8	19.6	19.4	25.2	24.1	25.8
All other food crops	2.1	2.2	2.3	2.4	2.7	3.5	4.0	11.2	11.1	11.6	11.8	11.4	11.7
Total	4,584.7	4,890.5	5,275.8	5,448.5	5,470.1	6,351.2	6,007.9	6,118.3	6,072.9	5,976.9	5,868.5	5,995.2	6,061.8

a/ Crop area harvested.
b/ Crop year is July 1 to June 30. Example: Column 1961 means Crop Year ending June 30, 1961
Source: Department of Agriculture and Natural Resources, Bureau of Agricultural Economics, Diliman, Quezon City.

the Southern and Western Mindanao region. The expansion in land area in commercial crops has largely been dominated by coconut products.

In 1962, the peso was devalued and the export crops of the Philippines became available at relatively lower international prices. As a result of the increased demand for these export crops, the amount of land used for food crops declined during the next two years, but by 1966 they had increased again to the 1961-62 levels. Nearly all of the reduction in land area in food crops during this period was due to a reduction in land planted to rice and corn. Much of the area that went out of the production of rice and corn appears to have gone into the production of coconuts.

The agricultural nature of the export commodities, the desire for self-sufficiency in food production, the relatively slow growth of the Philippine industrial sector, and the rapid expansion of the Philippine population would indicate continued crop land expansion and more intensive use of existing lands through irrigation and increased technological skill.

Farm Size

The average farm size in the Philippines in 1960 was 3.6 hectares. There are substantial differences in farm sizes, however, depending upon the type of farm. Most of the large farms were sugar cane farms and averaged 13.9 hectares in size. The sugar cane farms larger than 200 hectares account for 43 percent of the total area in farms. Abaca and coconut farms are about a third of the size of sugar cane farms on the average. Forty-nine percent and 38 percent respectively of these farms exceed 10 hectares, but few are over 200 hectares. Rice and corn farms average

3 and 2.5 hectares respectively. Tobacco farms are the smallest on the average at 1.7 hectares and account for only 0.5 percent of the crop land area (Table 18).

Land Tenure

Full farm ownership characterizes about 45 percent of the Philippine farms. This represents 53 percent of the crop land area (Table 19). Another 14 percent of the farms are operated by farmers who partly own the land they work. Various types of tenancy prevail on 40 percent of the farms and over a quarter of the crop land. The bulk of this land (85 percent by number of farms and area) is farmed under a share-of-the-produce agreement. One-tenth of one percent of the farms and 5 percent of the farmed area are operated under the manager system. The number of farms by type of tenancy is shown in Table 20.

The highest percentage of tenancy is in Central Luzon where 85 percent of the farmers in Pampanga, 76 percent of the Nueva Ecija, and 69 percent of the Bulacan farmers are tenants. The lowest percentage of tenancy is in Batanes (3.1 percent), Mountain Province (5.8 percent) and Lanao del Sur in Mindanao (4.9 percent).

The ownership and tenancy status of palay and corn farms are quite similar for the two types of farms (Tables 21 and 22). A slightly larger proportion of corn farmers own all or part of their land than is true for palay farmers. Corn and palay farms fall more heavily in the tenant category than the national average. Nationally, 40 percent of the farms by number and 25 percent of the land area is farmed by tenants. For rice farms, 46 percent are farmed by tenants which represents 35 percent of the farm area. For corn, 51 percent of the farms are tenant operated, accounting for 32 percent of the farm area.

TABLE 18

AVERAGE FARM AREA FOR MAJOR PHILIPPINE CROPS

Crop	Farms	Area	Average Size of Farm	Percent of Total Area in: Farms of 10 Hectares and Over	Percent of Total Area in: Farms Larger Than 200 Hectares
	(number)	(hectares)	(hectares)	(percent)	
All Farms	2,166,200	7,772,500	3.6	33	8
Sugar Cane	17,800	249,400	13.9	80	43
Abaca	36,000	209,000	5.8	49	8
Coconut	440,300	1,938,600	4.4	38	3
Palay	1,041,900	3,112,100	3.0	20	2
Corn	378,800	949,300	2.5	20	1
Tobacco	22,900	38,400	1.7	8	0

Source: Golay, Frank H. and Goodstein, Marvin E., Rice and People in 1990, Manila, 1967, Table 7, p. 14.

The small farm high tenancy status is a major cause of the poverty status of rice and corn farmers. No significant changes in the tenure of Philippine farm land occurred between 1948 and 1960. [5] Governmental attempts to change the tenure pattern by buying and distributing private land and opening up public lands have not been very effective to date. Laws designed to limit the amount of rent charged to tenants have not been enforced and indeed may be so vague as to be unenforceable. [6]

Agricultural Production and Use

The production of food is a continuing problem in the Philippines. Historically, production has fallen short of consumption requirements and for many food items considerably below recommended nutritional levels. The problem is sharpened by the increasing demand for food as the result of a rapidly increasing population (up 50 percent during the past decade) and the increasing proportion of the people living in cities.

Rice

During the past 10 years rice production increased about 25 percent to about 4 million metric tons. About half of this increase was due to more land planted to rice and the other half due to better yields. Obviously, the increased production still falls short of needed domestic supplies. Additional lands are available for the production of irrigated rice, but irrigation projects must be finalized in order to make this extra land highly productive. The use of recommended varieties and improved production methods including fertilizer and pesticides hold promise

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[5] 1960 Census of Agriculture, Vol. II, Summary, p. xv.

[6] Golay, Frank H. The Philippines: Public Policy and National Economic Development, Ithaca, N.Y., 1961, Chapter XII, pp. 266-293.

TABLE 19

NUMBER AND AREA OF FARMS, BY TYPE OF LAND TENURE, PHILIPPINES, 1960

Tenure	Type of Land Tenure		Land Area	
	Number of Farms	Percent of Total	Area in Hectares	Percent of Total
Full Owner	967,725	44.67	4,133,276	53.17
Part Owner	310,944	14.36	1,139,956	14.67
Tenant	864,538	39.91	2,000,201	25.73
Manager	2,487	0.11	365,309	4.70
Other Forms of Tenure	20,522	0.95	133,742	1.73
PHILIPPINES TOTAL	2,166,216	100.00	7,772,484	100.00

Source: Census of the Philippines: 1960 - Agriculture, Vol II, Summary Report, pp. 8-9, Bureau of the Census and Statistics, Republic of the Philippines, Manila.

TABLE 20

NUMBER AND AREA OF FARMS, BY TYPE OF TENANCY, PHILIPPINES, 1960

Type of Tenant	Type of Land Tenure		Land Area	
	Number of Farms	Percent of Total	Area in Hectares	Percent of Total
Cash	13,506	1.56	47,008	2.35
Fixed Amount of Produce	34,145	3.95	88,911	4.45
Share of Produce	745,426	86.22	1,677,857	83.88
Cash & Fixed Amount of Produce	693	0.08	3,676	0.18
Cash & Share of Produce	10,847	1.25	34,083	1.70
Rent Free	29,816	3.46	55,918	2.80
Others	30,105	3.48	92,748	4.64
TOTAL	864,538	100.00	2,000,201	100.00

Source: Census of the Philippines: 1960 - Agriculture, Vol. II, Summary Report, pp. 8-9, Bureau of the Census and Statistics, Republic of the Philippines, Manila.

TABLE 21

NUMBER AND AREA OF PALAY AND CORN FARMS, BY TYPE OF LAND TENURE, PHILIPPINES, 1960

Tenure of Farm Operator	Palay				Corn			
	Type of Tenure		Land Area		Type of Tenure		Land Area	
	Number of Farms	Percent of Total	Area in Hectares	Percent of Total	Number of Farms	Percent of Total	Area in Hectares	Percent of Total
Full Owner	385,170	36.97	1,399,590	[illegible].97	136,626	36.07	481,697	50.74
Part Owner	164,557	15.79	528,215	16.98	47,835	12.63	144,611	15.23
Tenant (all types)	479,143	46.00	1,089,274	35.00	191,733	50.62	303,133	31.93
Manager	781	0.07	49,615	1.59	170	0.04	7,454	0.80
Other Forms of Tenure	12,231	1.17	45,437	1.46	2,439	0.64	12,371	1.30
Philippines	1,041,882	100.00	3,112,131	100.00	378,803	100.00	949,266	100.00

Source: Census of the Philippines: 1960 - Agriculture, Vol. II, Summary Report, Bureau of Census and Statistics, Republic of the Philippines, Manila, pp. 13.

TABLE 22

NUMBER AND AREA OF PALAY AND CORN FARMS, BY TYPE OF TENANCY, PHILIPPINES, 1960

Tenancy Type	Palay				Corn			
	Type of Tenure		Land Area		Type of Tenure		Land Area	
	Number of Farms	Percent of Total	Area in Hectares	Percent of Total	Number of Farms	Percent of Total	Area in Hectares	Percent of Total
Cash	5,058	1.06	13,543	1.24	856	0.45	2,136	0.70
Fixed Amount of Produce	25,728	5.37	60,011	5.51	1,911	1.00	4,025	1.32
Share of Produces	417,741	87.18	940,589	86.35	173,476	90.48	270,472	89.25
Cash and Fixed Amount of Produce	225	0.05	932	0.09	48	0.03	165	0.05
Cash and Share of Produce	4,205	0.87	11,990	1.10	1,523	0.79	3,502	1.15
Rent Free	12,115	2.53	23,656	2.17	8,214	4.27	11,835	3.90
Other Tenants	14,071	2.94	38,553	3.54	5,705	2.98	10,998	3.63
Philippines	479,143	100.00	1,089,274	100.00	191,733	100.00	303,133	100.00

Source: Census of the Philippines: 1960 - Agriculture, Vol. II, Summary Report, Bureau of Census and Statistics, Republic of the Philippines, Manila, pp. 13.

for substantial increases in rice production to the point of permitting rice exports.

A more detailed discussion of the historical and projected agricultural analysis of rice with respect to storage, handling and marketing will be presented in later chapters of this report.

Corn

Corn production during the past 10 years has increased by approximately 50 percent to 1.4 million metric tons. Additional land planted to corn and better yields have contributed about equally to this increase in corn production. Although the increase in corn has been about the same as the increase in population during the last 10 years, total domestic availability of corn is still below current needs. Imports of corn are restricted but limited quantities are imported, mostly from the United States. As with the prospects for increased rice production, considerable corn production potential exists through the use of recommended varieties and improved production methods, especially by the application of fertilizers. Potential exports of corn could be substantial.

As increased amounts of inputs are applied in the production of rice and corn, improvements in credit availability and arrangements will be necessary. A natural consequence of improved technology in agriculture and the resultant increase in the production of rice and corn is the prospective need for considerable increases and improvements in grain handling, processing, and distribution facilities.

A more detailed discussion of the historical and projected agricultural analysis of corn with respect to storage, handling and marketing will be presented in later chapters of this report.

Fertilizer and Pesticide Use

Fertilizers

Filipino farmers are presently applying fertilizers at rates much below recommended levels. Over one-half reportedly do not use fertilizers at all. A recent study on the effective and potential demand for fertilizers in the Philippines indicated that, by 1970, the effective demand for fertilizers will be on about 7 percent of the potential demand (Table 23).

TABLE 23

EFFECTIVE AND POTENTIAL DEMANDS FOR FERTILIZERS IN THE PHILIPPINES, 1966-1970

Year	Effective Demand	Potential Demand [a]
1966	355.34	5,664.30
1967	375.12	5,782.40
1968	394.00	5,900.40
1969	414.68	6,018.50
1970	434.46	6,136,60

Source: Economic Monitor, April 10, 1967.

[a] The potential demand for fertilizer is based on the "ideal" rate of application to a hectare of crop land.

To substantially increase the total effective demand for fertilizers would require a large scale educational campaign involving both the government's extension service and private fertilizer manufacturers. The Philippines was dependent upon imported fertilizers up to 1957. The importation of fertilizers remained high even after local firms started manufacturing fertilizers in 1958. The availability of commercial fertilizers has increased during the past decade, reaching an estimated 355,000 metric tons in 1966

(Table 24). The five Philippine fertilizer manufacturing firms produced 40 to 45 percent of the fertilizer available for use.

The new high yielding rice varieties respond very well to fertilizer and do not lodge easily. Rice farmers with irrigated land are therefore expected to increase their use of fertilizers substantially in the future.

Pesticides

Agricultural chemicals are marketed under trade names, and data on imports, production and consumption are very limited. The basic ingredients are nearly all imported. Approximately thirty firms are involved in the importation, formulation, repacking and distribution of agricultural chemicals. The distribution of the products is handled either by traveling sales representatives or local dealers of farm inputs. Approximately 2,204 metric tons of agricultural chemicals were imported in 1961. Imports increased to over 3,327 metric tons in 1967 (Table 25).

Adequate protection against insects, diseases, and weeds must be provided if the yield potentials of the new rice varieties are to be realized. Rice farmers will undoubtedly use substantial larger amounts of agricultural chemicals in the future.

Imports of Foodgrains

Nearly all of the wheat, sorghum, soybeans, rye, oats and barley consumed in the Philippines comes from imports. See Appendix Table A-10 for detailed breakdown of major foodgrain imports by country of origin.

Wheat and Flour Imports

Experimental wheat plantings in the Philippines are insignificant and there is little prospect that commercial

TABLE 24

FERTILIZER PRODUCTION AND IMPORTATION

PHILIPPINES, 1952 TO 1964

Year	Total Available Supply	Quantity Imported	Locally Produced	Percent Imported
		(metric tons)		
1957	158,215	158,215	None	100.00
1958	183,377	106,677	76,700	58.17
1959	282,865	199,465	83,400	70.51
1960	193,577	139,477	54,100	72.05
1961	247,514	179,814	67,700	72.64
1962	388,439	294,539	93,900	75.82
1963	170,355	72,655	97,700	42.64
1964	343,754	233,954	109,800	68.05
1965	350,000 a/			
1966	355,000 a/			

Source: The Economic Monitor, Vol. II (12), April 10, 1967.

a/ Estimated.

TABLE 25

PHILIPPINE INSECTICIDE IMPORTATION, 1961-1966

Type	1961	1962	1963	1964	1965	1966
			(kilograms)			
Agricultural Insecticides and Formulations	777,540	485,512	1,189,320	1,088,166	1,204,920	1,216,548
Fungicides Other Than Medicinal	143,037	88,881	171,267	174,988	152,460	148,021
Insecticides, Rodenticides and Others	1,145,725	919,385	853,380	754,550	1,181,295	1,690,598
Fumigants; Soil and Grain	27,650	290,189	682,059	62,241	73,224	1,950
Herbicides and Other Similar Preparations	110,494	82,319	149,310	247,156	240,840	224,910
TOTAL	2,204,446	1,866,286	3,045,336	2,327,101	2,852,739	3,327,027

Source: Department of Economic Research, Central Bank of the Philippines.

wheat production will become important in the Philippines. Available wheat flour in 1966 was made up of approximately 84 percent locally milled flour and 16 percent imported flour. Nearly all of the imported wheat comes from the United States or Canada. The source of wheat flour varies considerably from year to year. Australia, Canada, and the United States have usually been important suppliers of wheat. Substantial amounts of wheat flour were supplied by France, Italy and Japan in 1966, however.

Wheat flour consumption has increased steadily in the Philippines and further increases are expected in the future. Both the Philippine Flour Millers Association and Wheat Associates, U.S.A. have been active in campaigns to increase the consumption of bread in the Philippines.

Soybean Imports

Most of the soybeans imported by the Philippines are from the United States. Soybean imports from the United States amounted to 16,747 metric tons in 1966.

Oats Imports

Philippine imports of unmilled oats amounted to 2,028 metric tons in 1966. Five percent of the oats imported were supplied by the United States and ninety-five percent by Australia.

Grain Sorghum Imports

There were 1,462 metric tons of grain sorghum imported in 1966. Ninety-nine percent of the sorghum imports were from the United States and one percent from Australia.

Corn Imports

Corn imports have been fairly small during the 1960's.

The United States has traditionally been the main source of imported corn. Imports of corn would undoubtedly be higher than they have been were it not for the fact that corn imports are strictly controlled by the Philippine government.

Rice Imports

On the average, rice imports have been equal to about 10 percent of national production in recent years. Most of the rice imported in 1967 was from Thailand and Egypt.

Beans and Peas Imports

Dry beans and peas in the Philippines are almost entirely used for human consumption. Total supply in 1966-67 is estimated at 24,000 metric tons, of which about 3,000 metric tons were imports. In calendar year 1966, total imports of dry beans were 1,821 metric tons, consisting of 738 metric tons from the United States, 654 metric tons from Hongkong, 395 metric tons from Thailand and 34 metric tons from other countries. Imports of chick peas, lentils and other legumes totaled 1,023 metric tons of which 553 tons came from the United States. 7/

Exports of Foodgrains

The only foodgrains exported by the Philippines in any significant amounts are rice and corn, and even these exports are sporadic and the volume is not great.

Largest exports of rice in recent years was in 1960 when 1,500 metric tons were shipped to Hongkong (Appendix Table A-11).

7/ Grain and Feed Report, U. S. Agricultural Attache, U.S. Embassy, Manila, August 10, 1967.

Corn exports have been made to Japan and the United Kingdom, the largest being shipments totalling 58,000 metric tons to Japan in 1959. No corn has been exported since 1960. Corn germs shipments of 203 metric tons were sent to Japan in 1965.

* * *

CHAPTER V

TRANSPORTATION

Introduction

- Inter-island Traffic
- Rail Traffic
- Road Development

Philippine Inter-island Water Transportation and Rates

- Inter-island Shipment of Grain
- Domestic Freight Rates

Philippine Railroad System and Rates

- Philippine National Railways (PNR)
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Philippine Road System

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CHAPTER V

TRANSPORTATION

Introduction

The capacity and availability of the transport system are major factors in determining the proper location and capacity of facilities for the most satisfactory storage and handling system in the Philippines. It is necessary to locate storages in such a manner as to insure that lack of transport will not prevent the operation of the system under any foreseeable set of circumstances.

Consideration must be given to the length of time needed to replenish supplies through the use of whatever transportation is available to facilities in order to efficiently determine the effectiveness and value of present storage locations and to determine needed requirements for future recommendations.

Transportation cost minimization is achieved by choosing the most economical form of transportation available and by strategically locating facilities so as to place grain in the proper position for transshipment, if necessary.

Water and overland transportation play equally important roles in the Philippine transportation system. Throughout the 7,100 islands there are 64 national, 200 municipal, and thousands of small ports. A port can be an efficient distribution and export center only if it has an adequate system of feeder roads. Without a well-developed system of roads in the Philippines each port is forced to service a small isolated area, and as a result, there has been a prolification of small ports. This requires those engaged

in inter-island shipping to make numerous stops to pick up small cargoes. The larger ports, located at points of access to the interior of an island are also collection centers for the smaller ports nearby.

Inter-island Traffic

The domestic inter-island fleet consists of 181 vessels over 100 tons capacity and is complemented by hundreds of smaller ships that make hauls between small ports or pick up the small port shipments and bring them to the larger ports. On the whole, the ports are congested; the facilities outside of those kept up by private industrial concerns are in a state of disrepair; and the inevitable silting problem is often ignored.

Rail Traffic

Rail lines connect the major ports on Panay and Luzon. The bulk of the commodities carried by the Panay Railway come from the sugar industry. The rail line on Luzon serves as the main line of transportation to the Manila area from the Bicol and Southern Tagalog regions. The road system from Manila north parallels the rail line and is such that truckers are able to compete successfully with the railroad. Both railroads are in a general state of disrepair. The Panay railroad is in particularly poor condition with rotting ties, rusty tracks, and long outdated rolling stock. The railroad in Luzon has recently rehabilitated its tracks to Cabanatuan, Nueva Ecija. Several other lines have been abandoned, however, and much of the rolling stock is down for lack of spare parts.

Road Development

The mountainous terrain and the tropical climate have hindered the development of an adequate system of roads.

When completed, the Pan Philippine Highway will enable goods to flow along a route from northern Luzon to the southern coast of Mindanao. The present road system is plagued by monsoon washouts, and the asphalt surfaces crumble due to the heat of the tropical sun. As could be expected, the best road system is on Luzon and extends through the valleys north and south from Manila. The main road on Luzon extends north from Manila through the Cagayan Valley to the northern coast and along the western coast of Luzon. Except for small stretches of asphalt and concrete, this road from San Jose in Nueva Ecija province consists of crushed rock on a clay base. Travel is slow and difficult particularly on the narrow, twisting road over the mountains, but the commodities continue to flow to and from Manila.

The road system throughout the Philippines is much like that described for Luzon. The vast Mindanao area has relatively few roads and almost no easily passable ones. A trip of 180 kilometers from Dadiangas to Cotabato takes 8 to 10 hours. Despite the general adverse conditions the commodities continue to arrive for export. Increased crop production will place even greater demands on the transportation system. In the detailed description of transportation that follows, particular attention has been paid to the present system for transporting grains.

Philippine Inter-island Water Transportation and Rates

The archipelago nature of the Philippines necessitates extensive water transportation of commodities. There are 64 national ports of entry open to overseas shipping and approximately 200 municipal ports open to domestic traffic.[1/]

1/ An Economic Analysis of Philippine Domestic Transportation, Vol. III, "Domestic Water Transportation and Ports," Stanford Research Institute, June 1956, pp. 171-178.

Because of inadequate facilities not all the ports are actively engaged in handling large amounts of freight. The most active ports are shown in the rate tables that follow.

In 1963, the Philippine overseas merchant marine consisting of 48 vessels with a gross tonnage of 48,814 tons carried roughly 7 percent of the nation's exports and 9 percent of her imports. [2/] Philippine domestic carriers with a gross tonnage of over 100 tons number 181 vessels with a total gross tonnage of 111,613 tons. The port of registry, number, gross and net tonnage are tabled below:[3/]

Port	Number of Vessels	Gross Tons	Net Tons
Manila	83	71,679	37,030
Cebu	89	36,054	20,229
Iloilo	9	3,880	1,810
Total	181	111,613	59,069

Inter-island Shipment of Grain

The primary rice flow in inter-island commerce is southward from the Luzon surplus region through Manila to the deficit Visayan and Northern and Eastern Mindanao regions. A smaller flow from Southern and Western Mindanao goes to these same deficit regions by water. The main flow of corn is in the opposite direction. Corn is shipped from the surplus Mindanao regions to the Visayas particularly to the port of Cebu City where it is milled and distributed.

2/ Philippine Shipping Directory, 1963, Philippine Shipowners Association, p. 63.

3/ Ibid., p. 58.

Incoming corn shipments to the Luzon area more than doubled between 1965 and 1966 despite the efforts to increase corn production in the Cagayan Valley (Table 26).

Virtually all grain is shipped by sack. Shipments are often partial loads shipped in combination with other cargoes. The average shipment is between 300 and 500 metric tons and is carried by a variety of ships. [4/]

Domestic Freight Rates

Domestic shipping rates between major ports are set by the Public Service Commission and adopted by the Conference of Interisland Shipowners and Operators (CISO) (Appendix Table A-12). Shipping insurance is not included in these rates. The rates for services complementary to domestic and international shipments of grain are established on an "ad hoc" basis. Type of sack, grain, destination, labor situation, and weather factors play important parts in determining the cost of delivery from warehouse to warehouse. The rates charged for each service on international grain imports at the port of Manila are shown below. [5/]

	Rate per 1000 kilos
Stevedoring	₱ 1.67
Lighterage and/or trucking	7.27
Arrastre	5.50
Handling from truck to scale to warehouse piling	2.20

[4/] Information obtained in interviews with the Secretary and Vice-President of the Conference of Interisland Shipowners and Operators.

[5/] These rates are for Rice and Corn Administration grain shipments as given by the Chief of Transportation for RCA.

TABLE 26

INTER-ISLAND SHIPMENT OF RICE AND CORN, BY REGIONS, PHILIPPINES, JULY 1964/JUNE 1965 AND JULY 1965/JUNE 1966

	Region	Rice				Corn			
		July 1964/June 1965		July 1965/June 1966		July 1964/June 1965		July 1965/June 1966	
		Net Incoming	Net Outgoing	Net Incoming	Net Outgoing	Net Incoming	Net Outgoing	Net Incoming	Net Outgoing
		(metric tons)							
	Luzon[a/]	--	16,680	--	23,740	16,880	--	37,706	--
VII	Western Visayas	3,985	--	4,218	--	6,098	--	39,396	--
VIII	Eastern Visayas	12,593	--	14,469	--	106,412	--	154,162	--
IX	Southern and Western Mindanao	--	3,546	--	261	--	116,746	207,669	--
X	Northern and Eastern Mindanao	3,648	--	5,314	--	--	12,645	--	23,595

a/ Luzon comprises regions II, III, IV, V and VI.
Source: Unpublished papers of Leon Mears, School of Economics, University of the Philippines, Diliman, Quezon City; source of basic data: Bureau of Census and Statistics, Republic of the Philippines, Manila.

Philippine Railroad System and Rates

Philippine National Railways (PNR)

The Philippine National Railways (PNR) on the island of Luzon is one of two railroad companies serving the Philippines. It has in use about 1,026 kilometers of track and is operated by the Philippine government. As shown in Figure V the main line runs from Sumarang, La Union (17 km north of San Fernando, La Union) 266 kilometers southeast to Manila and from Manila, 473 kilometers southeast to the port of Legaspi in Albay province. Six main branches extend to Rosales, Pangasinan; San Jose, Nueva Ecija; Penaranda, Nueva Ecija; Carmen, Pangasinan; Sta. Cruz, Laguna, and Lipa, Batangas. An abandoned line runs 24 kilometers between Lipa and the port of Batangas. A 21-kilometer line between Penaranda and Cabanatuan City in Nueva Ecija is being rehabilitated.

Proposed Extensions

Two extensions of the system have been undertaken but are not yet completed. Republic Act 1867 authorized the extension of the PNR system from San Jose, Nueva Ecija, northwest through the provinces of Nueva Vizcaya and Isabela to Tuguegarao, Cagayan, a distance of 334 kilometers. Construction was scheduled for seven years with a total appropriation of thirty million pesos and twenty-four million dollars worth of reparation goods from Japan. Only ₱6.5 million was actually released, however, and work was discontinued in April, 1964. Moreover, only US$5.2 million in reparations equipment was actually received.

Another extension from Daraga, Albay, 153 kilometers southward to Matnog, Sorsogon was authorized by Republic Act 2638. This project had an appropriation of ₱15 million and US$7 million worth of reparations equipment from Japan.

When the ₱10 million released for the project work was exhausted, work was discontinued in January 1966.

These two extensions were discussed by the President and Prime Minister of Japan in September 1966. As a result of this meeting, the railroad extensions were relegated to second priority in favor of the Pan Philippine Highway.

Rolling Stock

The present rolling stock of the Philippine National Railways is tabulated below:

	Total	In Operation	Under Repair
Diesel Locomotive	79	40	39
Steam Locomotive	7	3	4
Motor Car	19	9	10
Passenger Cars	165	108	57
Freight Cars	1,247	1,106	141
(a) Box Cars	345	313	32

Freight is being carried in 20-ton, 25-ton, and 30-ton cars. An actual count of each size cannot be made because some of the 20 and 25-ton cars are 30-ton cars whose capacities were lowered as their condition deteriorated. An estimated breakdown of the original equipment as built is 5 percent: 20-ton, 5 percent: 25-ton, and 90 percent: 30-ton cars. [6/]

Operating Losses

The high percentage of inoperable equipment is a result of the poor financial position of the company.

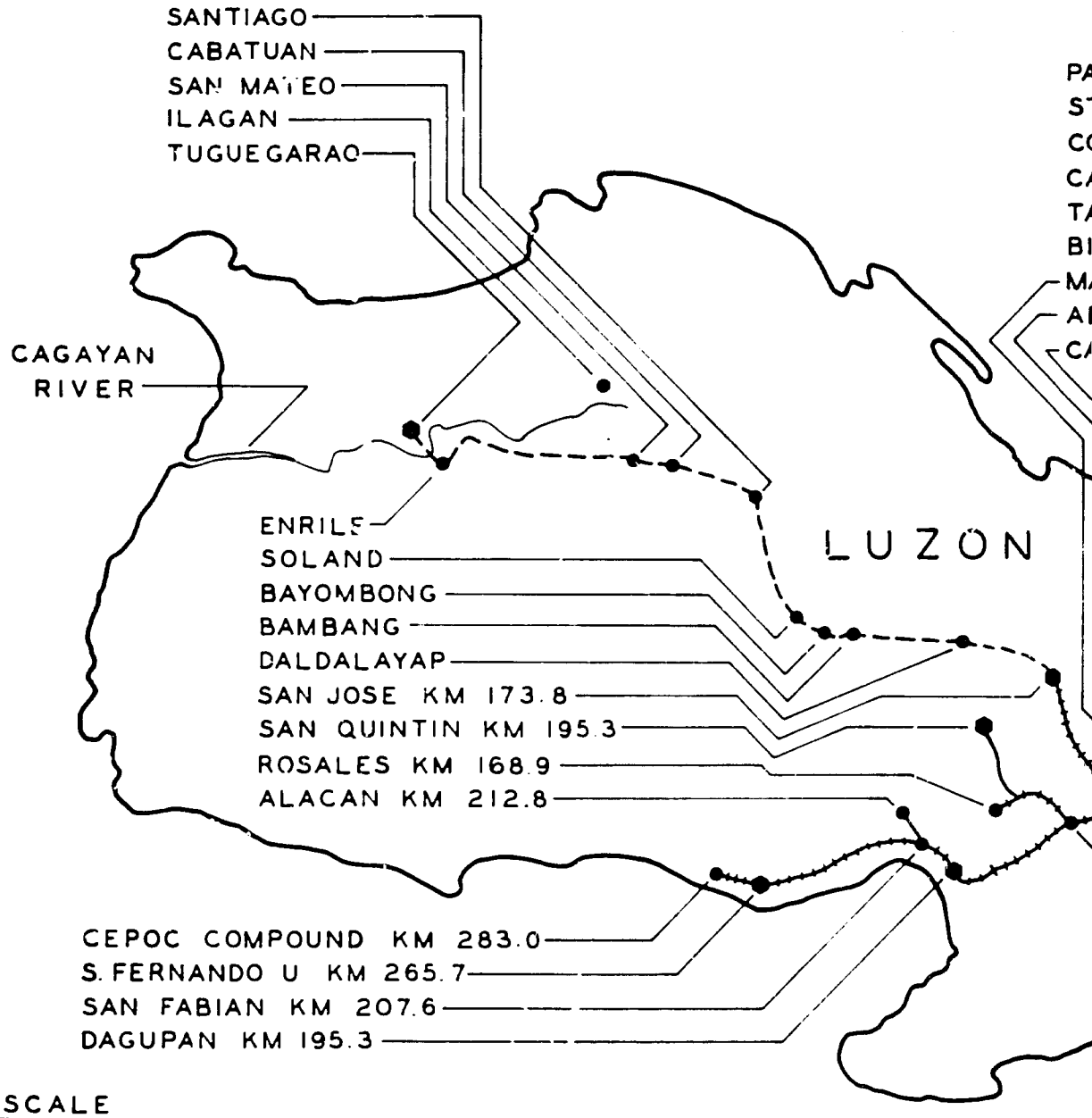
[6/] Data obtained in an interview with the Chief Engineer of the PNR on December 11, 1967.

LEGEND

RAILROAD LINES IN OPERATION AS OF APRIL, 1961.

EXISTING RAILROADS NOT IN OPERATION.

PROPOSED RAILROADS.



SCALE

KILOMETERS

0 50 100

MILES

0 30 60

PANIQUI KM 139.5

TARLAC KM 119.4

DAU KM 82.8

STOTSENBERG KM 89.4

CARMEN KM 90.1

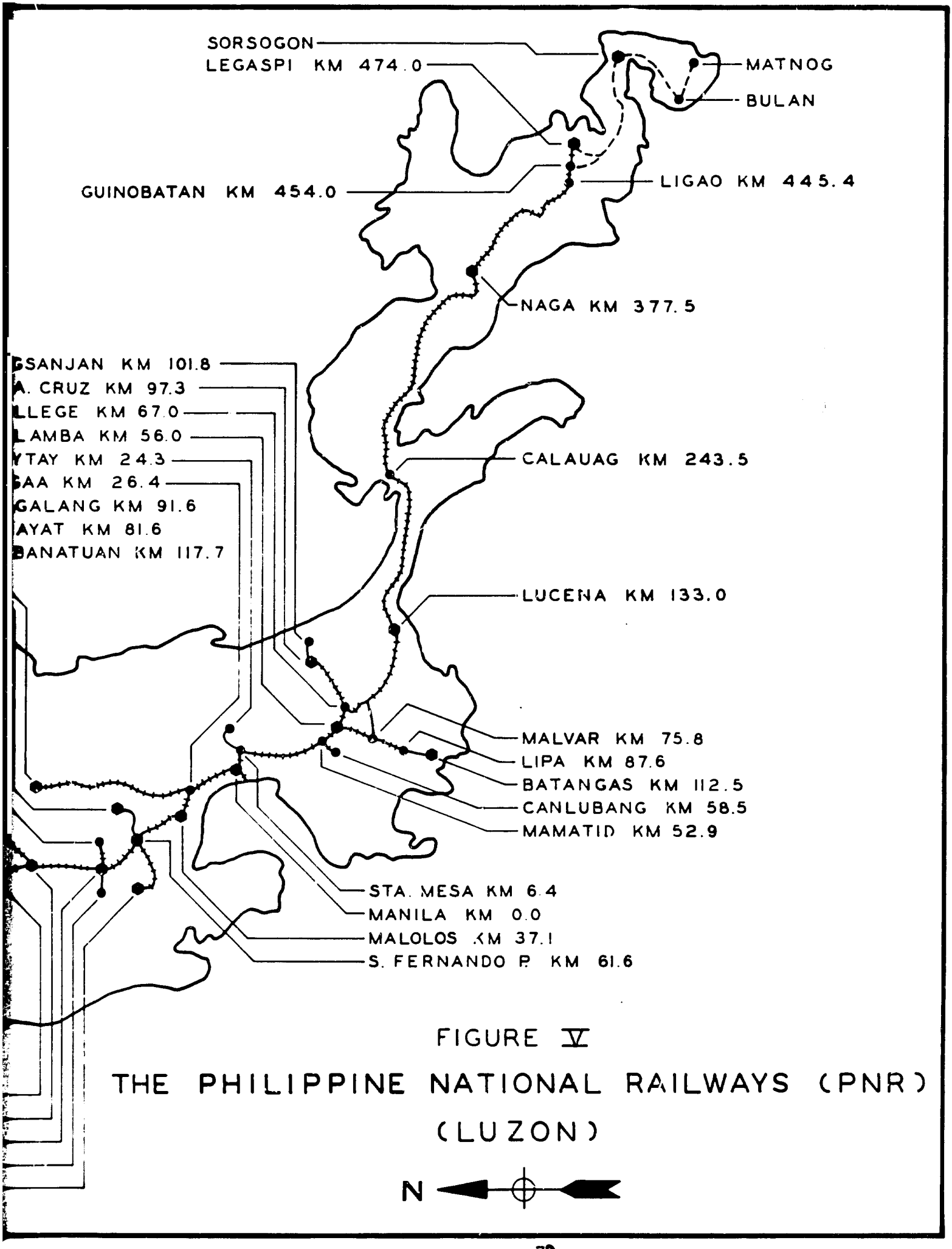


FIGURE V

THE PHILIPPINE NATIONAL RAILWAYS (PNR)

(LUZON)

Operating losses have prevented the company from undertaking the necessary maintenance work on the railway's equipment and tracks in recent years. Rail service is expected to improve when the materials procured from Japan under Indent Order 17 start arriving during the first quarter of 1968. Included in the order are new track materials, bridge materials, passenger coaches, diesel rail cars, baggage cars, power cars, flat cars and spare parts.

Shipment of Grains

Up to the present time, the PNR has not handled bulk shipment of grains such as palay, rice, corn, soybeans, or sorghums. The only agricultural commodity being handled in bulk is manufactured sugar which is hauled in steel containers each carrying ten tons of sugar. Three of these hinged type containers are mounted on a flat car measuring thirty-five feet in length. The containers are loaded at the top and unloaded by tilting and pivoting on the hinges. The sugar flows out by gravity through escape doors.

According to an interview with the Superintendent of Transportation and the Traffic Manager of the PNR, they have about 48 of these flat cars on hand and 160 on order from Japan. The steel containers are fabricated by the Railroad Company locally. These container cars could be converted to handle cereal grains in the bulk. It will be necessary to provide special mechanical tilting apparatus for the containers, however. Cost of the conversion would be approximately ₱4,500 for each car including the tilting apparatus.

Approximately 200 of the available box cars could be converted to handle cereal grains in the bulk. The cost of this conversion would be approximately ₱4,000 per car.

The railroad does not operate warehouses of its own. It does, however, lease part of its yards for warehouse space. The land is rented by rail distributors for warehouse construction at the rate of ₱2 per square meter per year. [7/]

Table 27 shows the shipments of rice and palay on the PNR for the period 1956 through 1967 and corn shipments for 1962 through 1967. The total shipments of both rice and palay declined during the 1956 to 1967 period. The decline in rail shipments of palay and rice reflect the Rice and Corn Administration's (RCA) decision to transfer its stocks by truck rather than rail. The average rail haul has increased in recent years as the shorter RCA hauls were eliminated. The transport of these commodities by express increased during the period. These shipments are made in 5 to 10 sack lots in baggage cars. The 1966-1967 leveling out and slight increase of total shipments by rail are probably the result of the increased rice production in these years.

The data for corn show less consistent trends than the data for rice and palay. This may be due in part to the lesser role played by RCA in the marketing of corn in Luzon and the secondary nature of the corn market itself in Luzon. The trend exhibited appears to be similar to that followed by rice and palay with an increase in rail shipments in 1967.

PNR Rail Rates

At present all palay, rice, corn, and corn grits are shipped by sack. The cost of shipping these grains on the PNR is shown in Appendix Tables A-13, A-14, A-15, and A-16 The rate for rice and palay is on a per sack basis. "Less-

7/ Data obtained in an interview with the Chief Engineer of the PNR on December 11, 1967.

TABLE 27

TOTAL TONNAGE OF RICE, PALAY, AND CORN SHIPPED ON THE PHILIPPINE NATIONAL RAILWAY, AND AVERAGE DISTANCE PER HAUL, BY YEARS, 1956-1967

Years Ending June 30	Rail[a/]	Express[b/]	Total	Average Distance[c/] Per Haul
				(kilometers)
		RICE		
1956	46,170	2,852	49,022	249.25
1957	49,967	2,866	52,833	344.01
1958	52,212	2,852	55,064	311.03
1959	43,487	2,395	45,882	324.64
1960	23,324	2,235	25,559	337.81
1961	29,738	2,754	32,492	344.61
1962	37,604	3,464	41,068	350.98
1963	27,661	4,086	31,747	366.14
1964	15,722	4,398	20,120	342.93
1965	9,231	5,044	14,275	386.45
1966	4,470	5,079	9,549	420.02
1967	7,706	5,282	12,988	d/
		PALAY		
1956	6,579	1,885	8,464	149.86
1957	7,075	1,955	9,030	151.15
1958	7,869	1,778	9,647	223.77
1959	7,070	2,156	9,226	212.45
1960	5,550	1,703	7,253	143.74
1961	2,913	1,183	4,096	187.97
1962	4,056	1,866	5,922	189.91
1963	3,841	2,103	5,944	208.79
1964	4,285	2,437	6,722	235.36
1965	910	1,510	2,420	228.88
1966	3,192	1,571	4,763	241.64
1967	3,144	1,157	4,301	d/
		CORN		
1963	2,842	176	3,018	362.98
1964	7,104	340	7,444	369.74
1965	3,050	149	3,199	466.11
1966	3,447	259	3,706	437.77
1967	6,126	205	6,331	d/

a/ "Rail" refers to shipments on trains stopping at all stations.
b/ "Express" refers to shipments on trains stopping only at major stations.
c/ "Rail" shipments only.
d/ 1967 average mileages were not recorded in the 1967 source.
Source: "Statistics for the Fiscal Years Ending June 30", Philippine National Railroad, Manila, 1967.

carload" rates apply to shipments under 350 sacks total.

Corn in shipped on a weight basis except for per sack rates for Naga, Sipocot and Legaspi. The "less-carload" rate applies to shipments of less than 7,000 kilos.

Appendix Table A-17 shows the rail distances between the major rail stations.

The shipper is required to pay the expense of loading and unloading the cars. The service may be contracted for with private personnel upon arrival at the track or the rail company will load, unload, count, or check carload shipments at the rates shown below: [8/]

(1) For loading and unloading:	₱1.00 per 1000 kilos
(2) For counting and checking only:	₱0.25 per 1000 kilos

Shippers are required to purchase an internal revenue stamp for each shipment based on cargo value. The maximum fee is ₱1.50.

Philippine Railway Company (PRC)

A second rail system, the Philippine Railway Company (PRC), presently owned by the Development Bank of the Philippines (DBP), is operated on the island of Panay. [9/] The line extends from the port of Iloilo City north (see Figure VI)

8/ "Rule 33 - PNR List of Articles with Corresponding Ratings in Freight Classification No. 11-E Including Supplements, Freight Kilometric Rates and Distance Table," Traffic Department, March 1, 1967, p. 21.

9/ Annual Report, 1965-1966, Philippine Railway Company, Iloilo City, pp. 5-6.

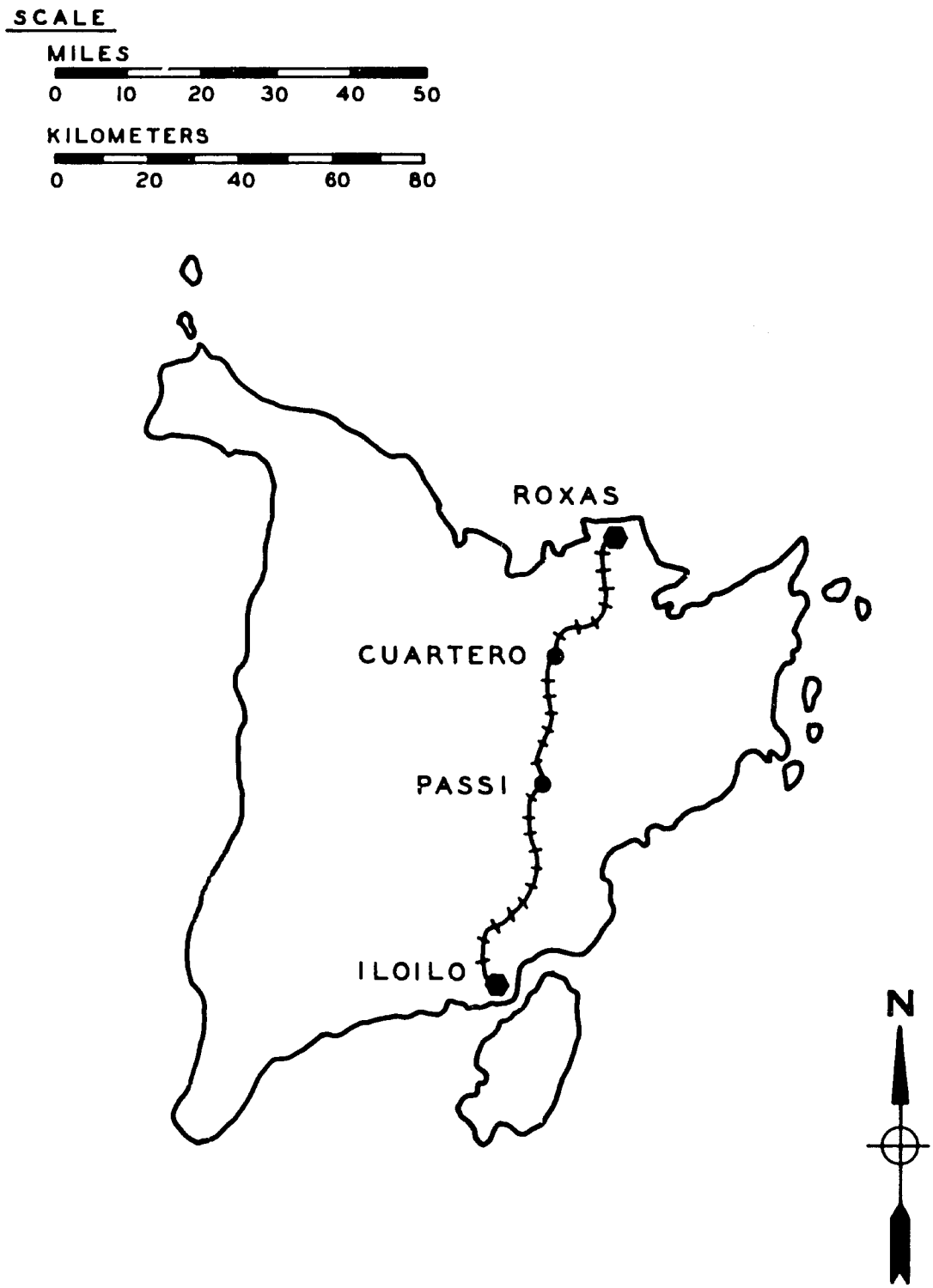


FIGURE VI

PHILIPPINE RAILWAY CO. (PRC)
(PANAY)

approximately 100 kilometers to Roxas City on the coast. [10] Eighty percent of the freight carried by the PRC in 1965-1966 fiscal year consisted of sugar cane and sugar products. The combined freight tonnage for rice, palay, and corn shipments amounted to less than 6 percent of the total freight hauled. [11] Some palay moves from flagstop to flagstop as excess baggage. During the sugar cane milling season, all available metal cars are put to use hauling sugar cane and sugar products. Shipments of other commodities are infrequent and there is a general shortage of boxcars. [12] The line owns sixteen 10-ton boxcars, nine 20-ton boxcars, and sixteen 30-ton boxcars. [13] The general movement of palay is from the Dao-Dumacao region south to the rice mills in the Lucena area. The milled rice then returns by train to the north.

The costs of shipping corn, rice, and palay on the PRC are shown in Appendix Table A-18. If the company does the loading and unloading of a shipment, the charge is ₱0.40 per ton for easily handled cargoes and ₱0.80 per ton for bulk and difficult to handle cargoes. Carload lots will be spotted along the waterfront within the Iloilo City limits without charge.

Philippine Road System

Roads throughout the Philippines have been built to avoid the numerous mountain ranges. As a result the network of roads on the smaller islands follows the coast, and the coast and valleys on the islands of Luzon and Mindanao.

10/ Ibid., p. 3.
11/ Ibid., computed from data on page 19.
12/ Ibid., pp. 9-10.
13/ Ibid., p. 24.

The present system of first class roads is shown in Figure VII, VIII, and IX. Short distance hauls from the farm to the warehouse and mill occur on all classes of roads, but major grain flows move only on the better first class roads. Appendix Table A-19 shows the kilometers of public roads by surface type for each province and Manila. First class roads include all surfacing from low type bituminous to Portland cement concrete. During the rainy season the earth, macadam, and some of the low type bituminous are not passable. During the dry season the extent to which roads are passable varies greatly between regions depending upon the terrain and road surface.

Luzon Area

It is evident from the map and the table that Manila is the center for a substantial network of first class roads extending northward through the central portions of Bulacan, Pampanga, Nueva Ecija, Tarlac, and Pangasinan provinces and southward through the Rizal, Cavite, Laguna, Batangas and parts of Quezon. However, much of the major grain producing areas of Luzon, the upper portion of Central Luzon and the Cagayan Valley, have but one artery over which grain can flow to Manila. This road, complemented by a few first class feeder roads, extends north through the Cagayan Valley to the coast at Apacci and then returns to Manila along the west coast of Luzon through the Ilocos region to San Ferranda, La Union and the first class road network. Much of this road, particularly above San Jose, Nueva Ecija is crushed rock and difficult to travel on. The region in Southern Luzon from the Manila network to Sorsogon is traversed by a road which is primarily a first class road laced by a few first class feeder roads. The main transportation from this area is by rail.

Central Islands Area

No first class roads exist in northern Samar. A coastal

system from upper Samar extends south through the Leytes. Mindoro does not have a first class road connecting the short stretches of road on the east and west coasts. A network of first class roads extend through the central valley on Panay and a coastal route encircles the eastern and western mountain ranges. Coastal routes encircle Negros, Cebu, and Bohol and extend inland where the absence of mountain ranges permits.

Mindanao Area

Mindanao has a highly inadquate system of roads. A first class road runs along the eastern and northern tip of the coast on the island to the port of Butuan and then southward through the Agusan River Valley to the port of Davao on the southern coast. It then proceeds south along the coast and passes west between mountain ranges to follow the river valleys to Cotabato on the east coast. Another first class route connects the part of Dadiangas on the southern coast with Cotabato. From Cotabato the road extends coastwise to the part of Zamboanga on the tip of Zamboanga del Sur. Another network extends southward from the part of Ilozan on the northern coast and a connection between this system and the Cotabato route is planned.

Road Transportation

At present commodities in much of the Philippines seem to flow in spite of the road system rather than because of it. Distribution of grains from surplus to deficit areas must rely heavily upon road transportation due to the limited rail service. The inadequacy of the present system has been recognized by the government and a four-year road construction and improvement plan was undertaken in 1967. The proposed program is partially diagrammed in Figure VII.

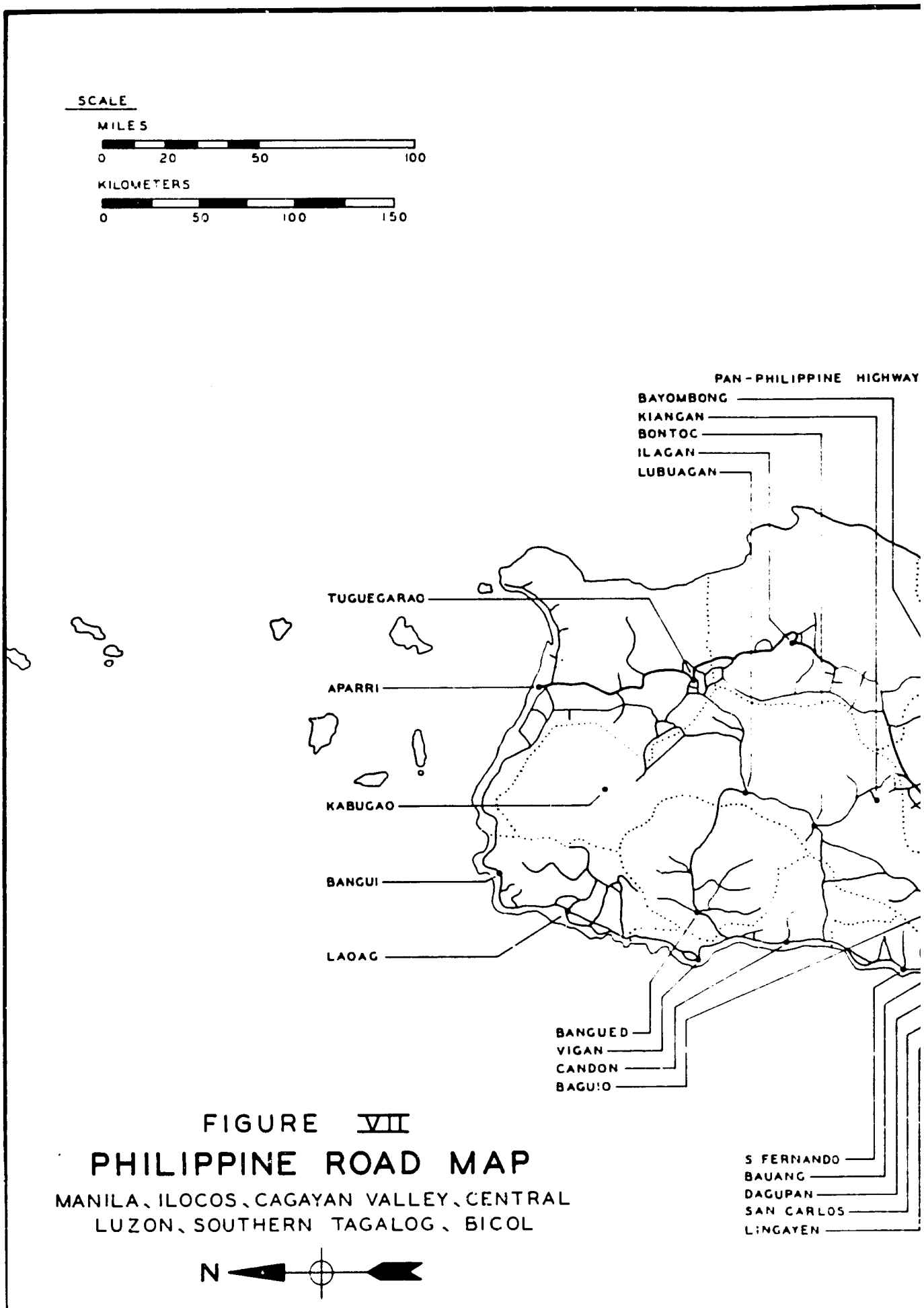
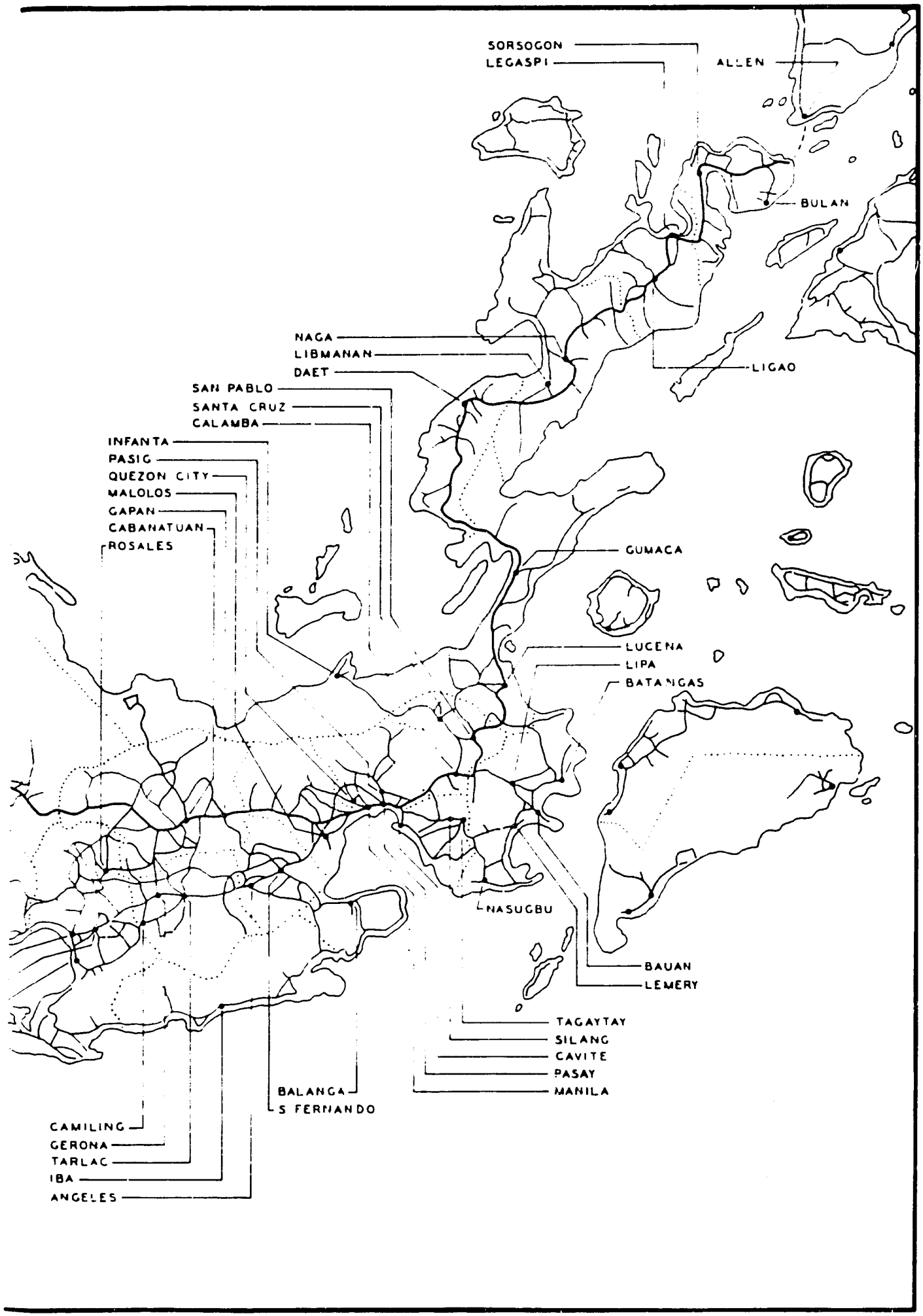


FIGURE VII

PHILIPPINE ROAD MAP

MANILA, ILOCOS, CAGAYAN VALLEY, CENTRAL LUZON, SOUTHERN TAGALOG, BICOL


SORSOGON
LEGASPI
ALLEN
BULAN
NAGA
LIBMANAN
DAET
LIGAO
SAN PABLO
SANTA CRUZ
CALAMBA
INFANTA
PASIG
QUEZON CITY
MALOLOS
GAPAN
CABANATUAN
ROSALES
GUMACA
LUCENA
LIPA
BATANGAS
NASUGBU
BAUAN
LEMERY
TAGAYTAY
SILANG
CAVITE
PASAY
MANILA
BALANGA
S FERNANDO
CAMILING
GERONA
TARLAC
IBA
ANGELES

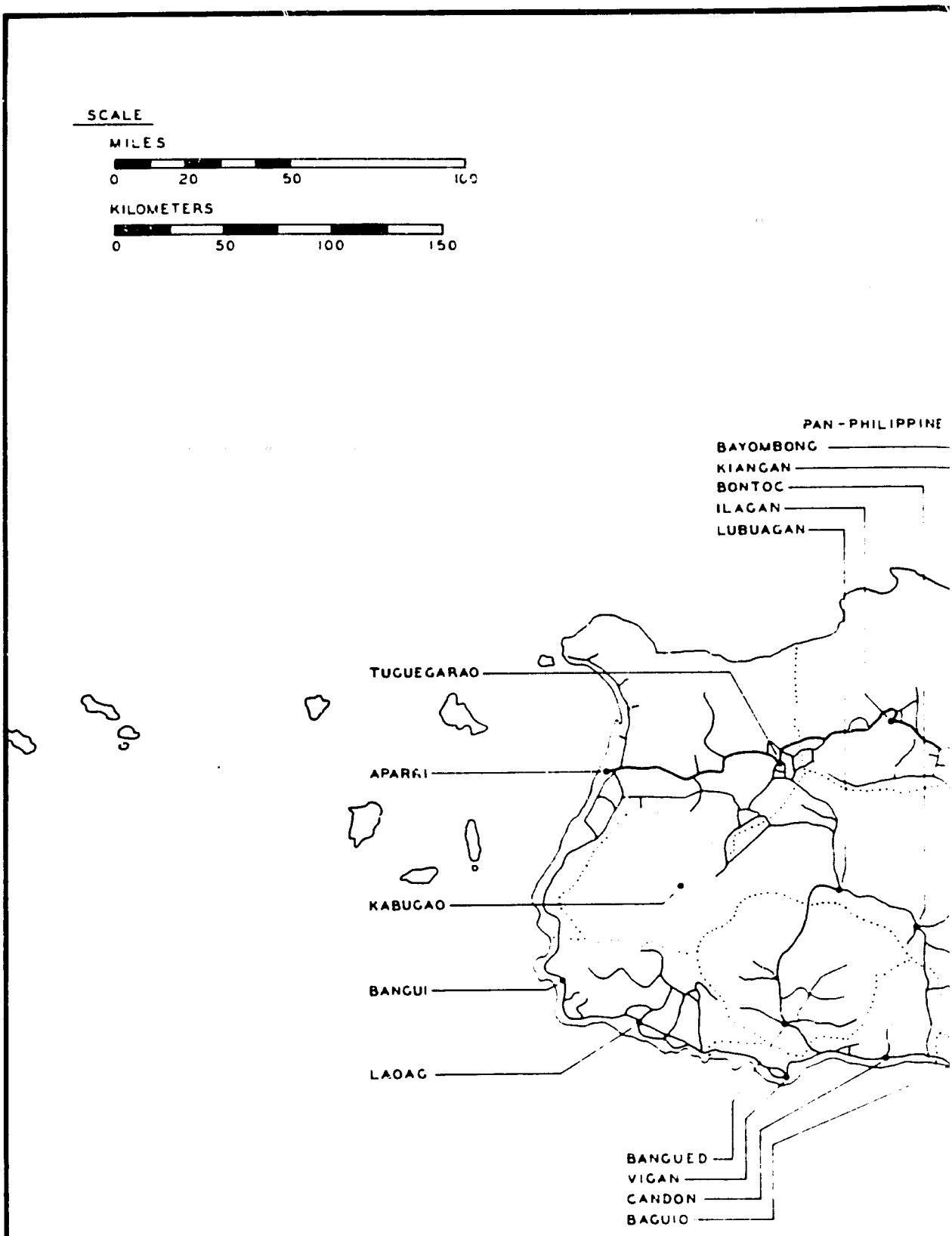
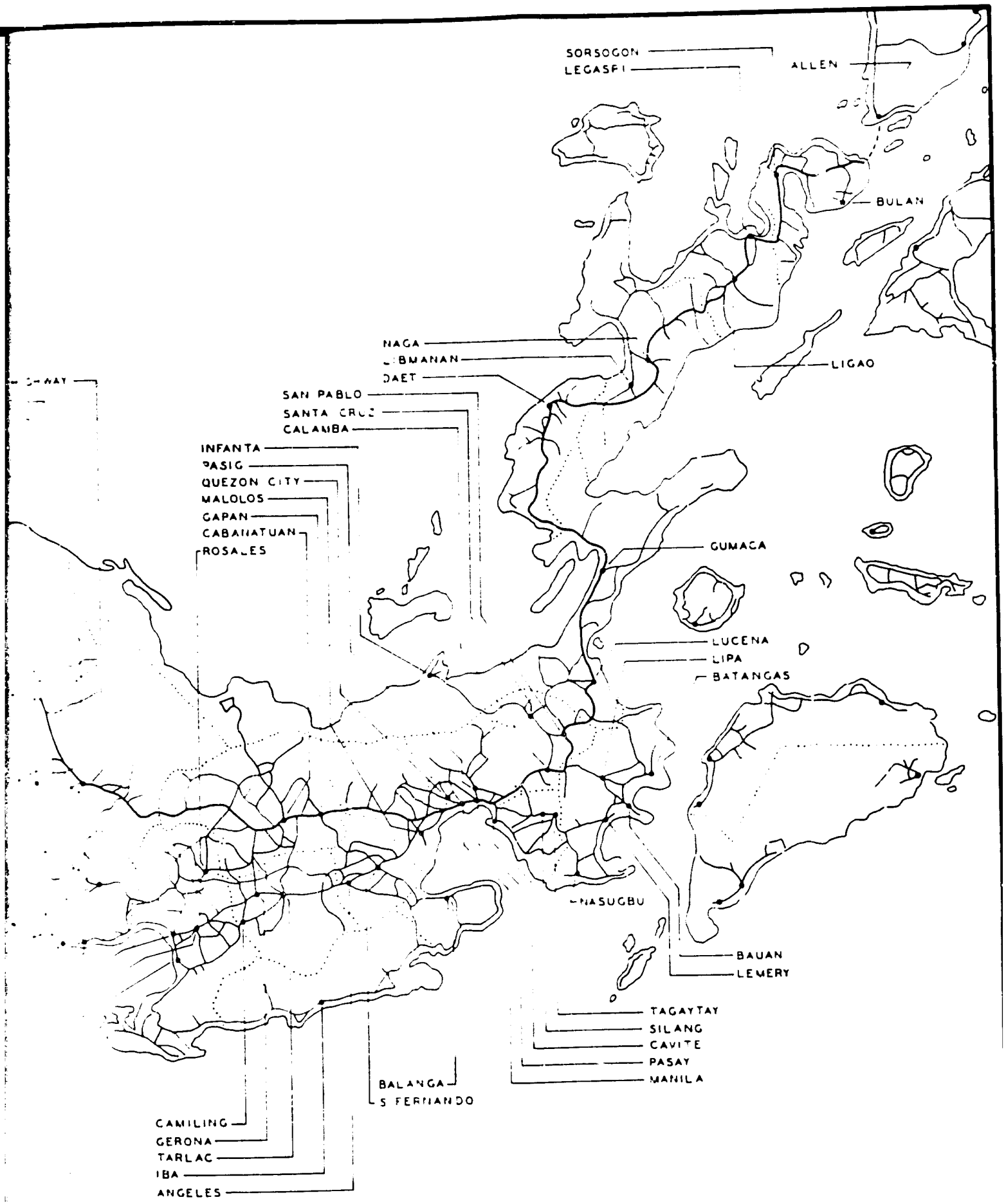


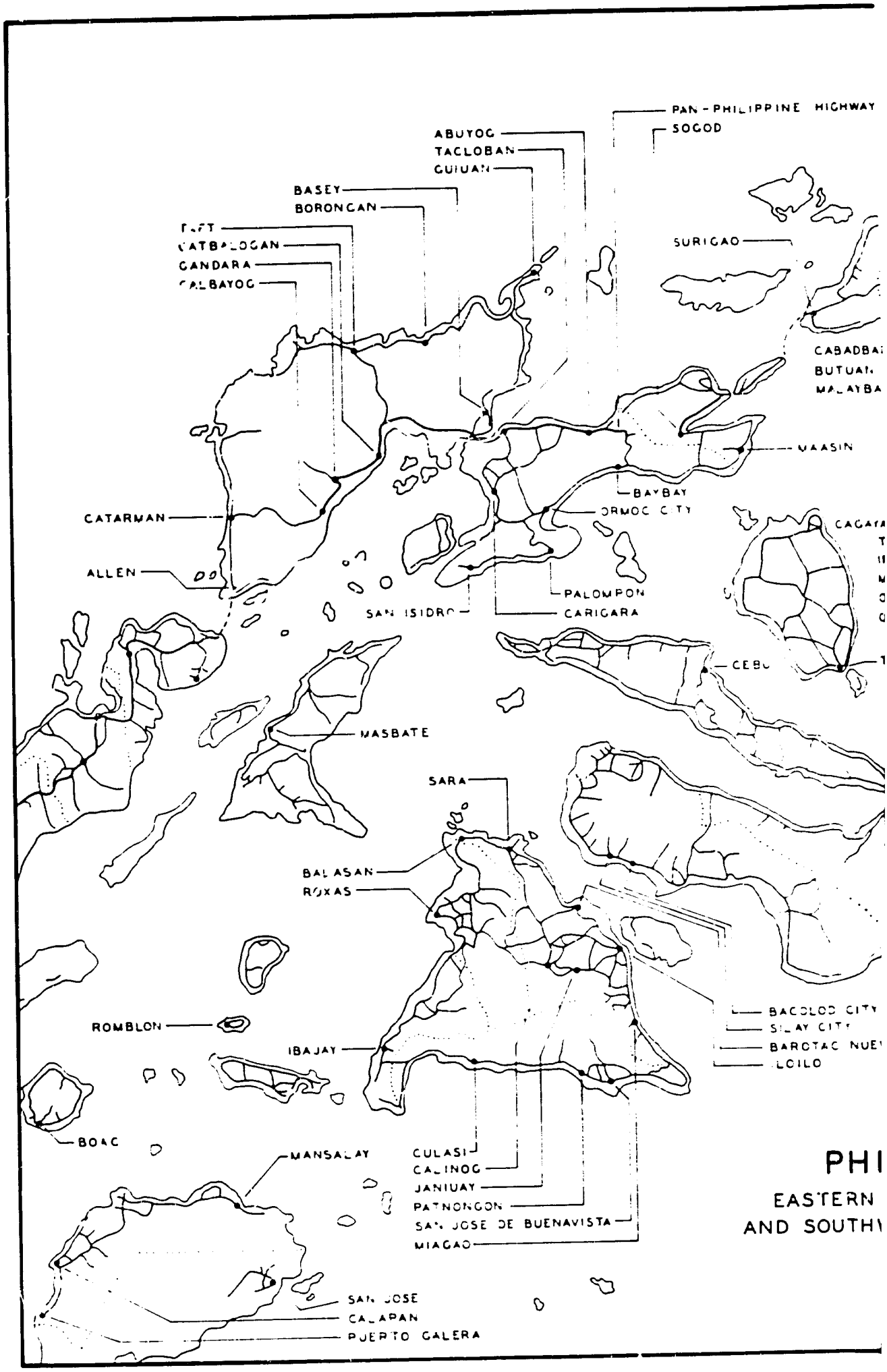
FIGURE VII

PHILIPPINE ROAD MAP

MANILA, ILOCOS, CAGAYAN VALLEY, CENTRAL LUZON, SOUTHERN TAGALOG, BICOL

N


SORSOGON
LEGASPI
ALLEN
BULAN
NAGA
LIBMANAN
DAET
LIGAO
SAN PABLO
SANTA CRUZ
CALAMBA
INFANTA
PASIG
QUEZON CITY
MALOLOS
GAPAN
CABANATUAN
ROSALES
GUMACA
LUCENA
LIPA
BATANGAS
NASUGBU
BAUAN
LEMERY
TAGAYTAY
SILANG
CAVITE
PASAY
MANILA
BALANGA
S FERNANDO
CAMILING
GERONA
TARLAC
IBA
ANGELES


PAN-PHILIPPINE HIGHWAY
SOGOD
ABUYOG
TACLOBAN
GUIUAN
BASEY
BORONGAN
SURIGAO
CATARMAN
ALLEN
BAYBAY
PALOMPON
CARIGARA
SAN ISIDRO
CEBU
MASBATE
SARA
BALASAN
ROXAS
ROMBLON
IBAJAY
BACOLOD CITY
BOAC
MANSALAY
CULASI
JANIUAY
PATNONGON
SAN JOSE DE BUENAVISTA
MIAGAO
SAN JOSE
PUERTO GALERA
EASTERN
AND SOUTH

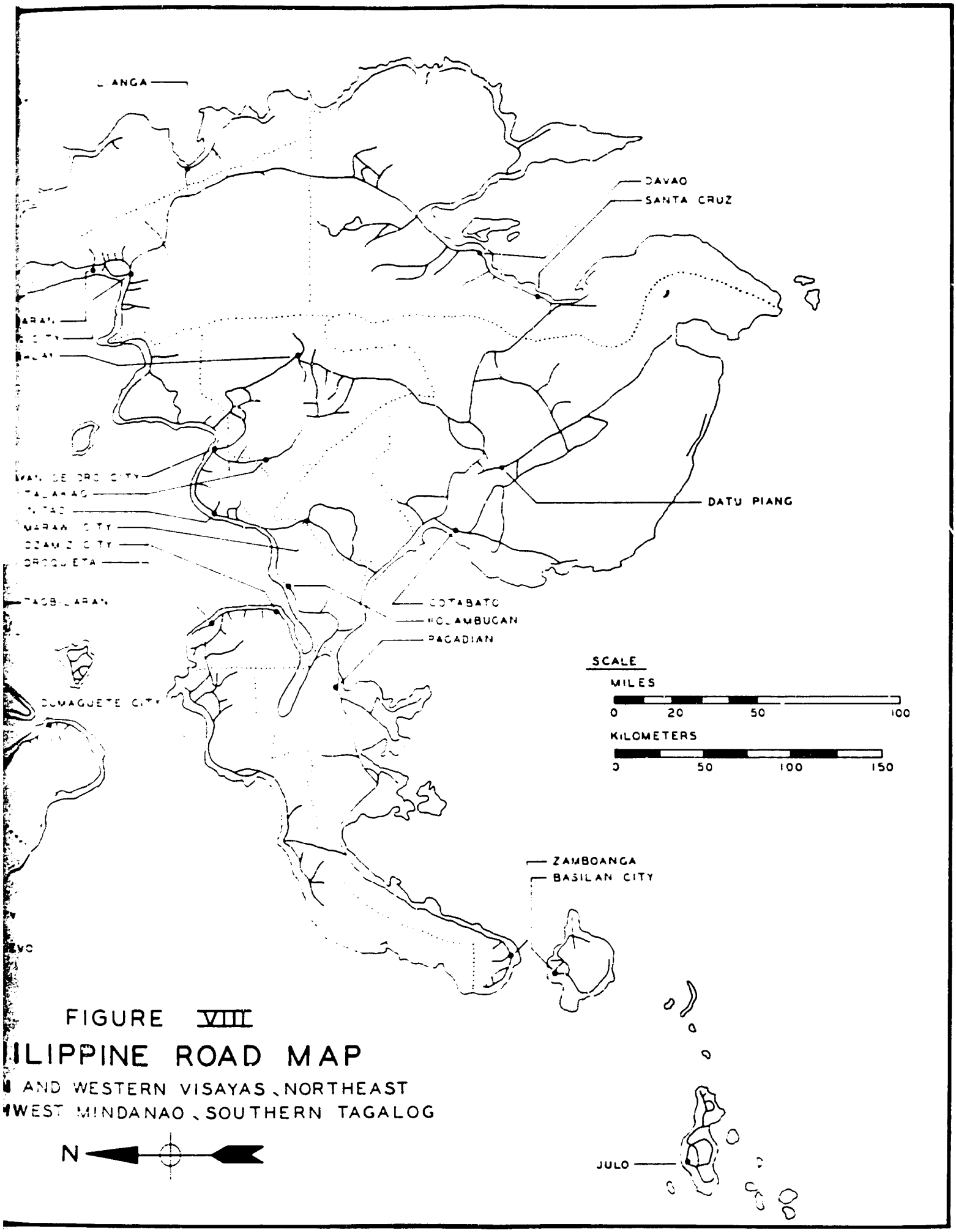


FIGURE VIII

ILIPPINE ROAD MAP

AND WESTERN VISAYAS, NORTHEAST
WEST MINDANAO, SOUTHERN TAGALOG

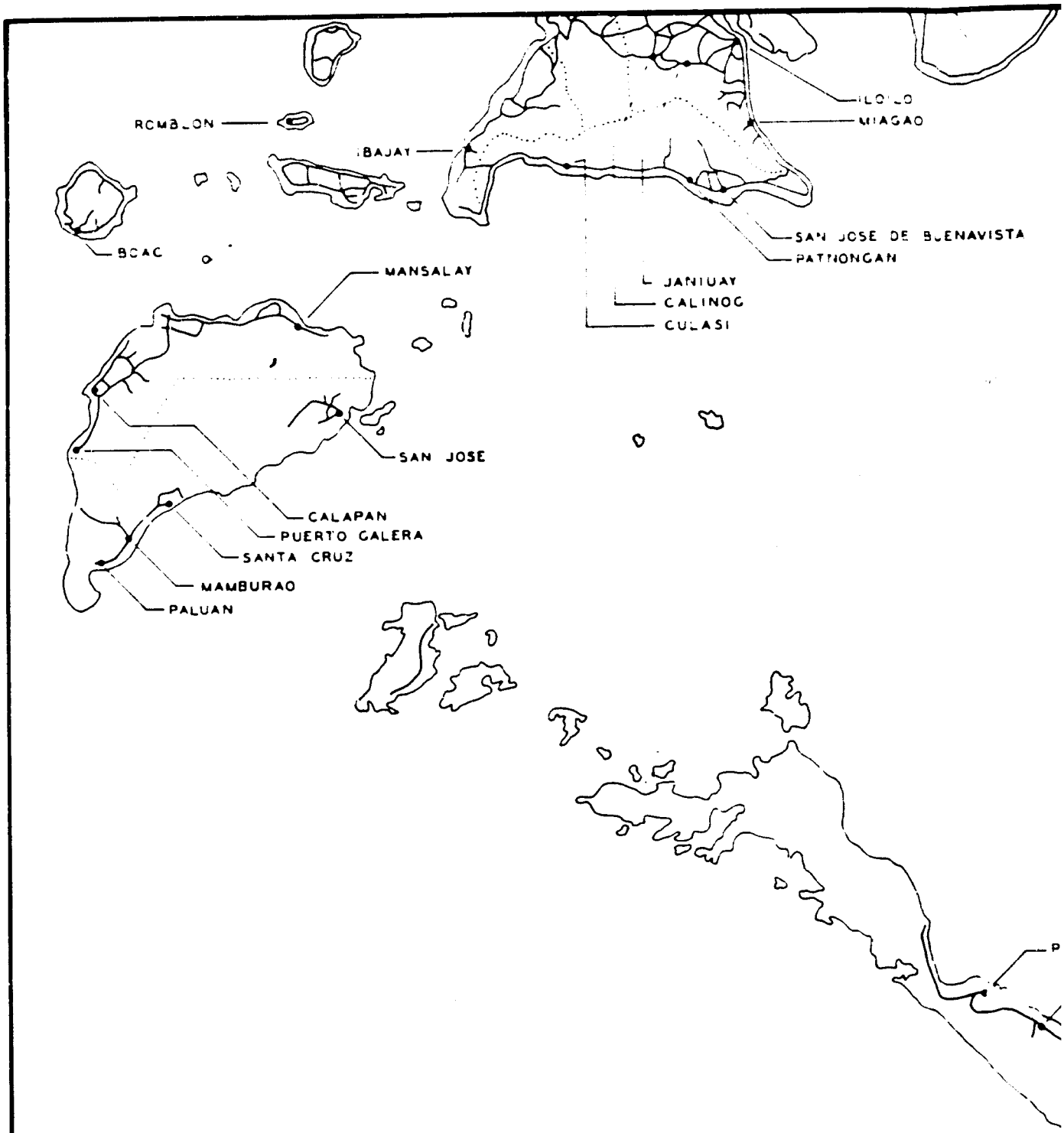
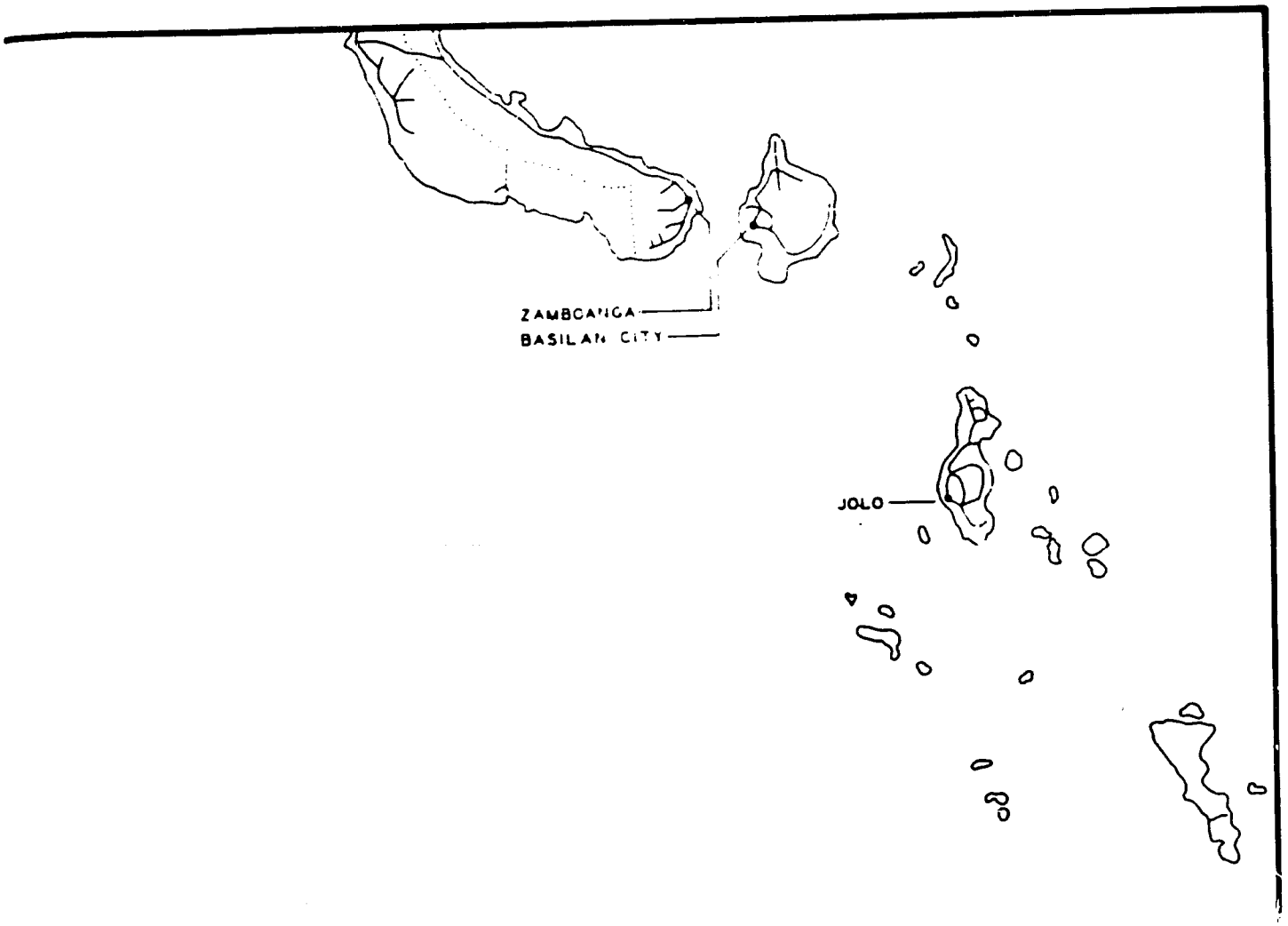


FIGURE IX

PHILIPPINE ROAD MAP

SOUTHERN TAGALOG

N


ZAMBOANGA
BASILAN CITY
JOLO

PUERTO PRINCESA
ABORLAN
BROOKE'S POINT
SCALE
MILES
0
20
50
100
KILOMETERS
0
50
100
150

Road Development

The major portion of the proposal concerns the construction of the Pan Philippine Highway to extend from Aparri on the northern coast of Luzon south through Cagayan Valley through Manila to Sorsogon, Samar, Leyte and through the Agusan Valley to Davao in Mindanao. When completed with proposed extensions to Cotabato and Zamboanga, the system will provide an excellent route for grain transportation.

Approximately 60 percent of the first year's proposed concrete paving was finished at the year's end. The work completed has been near larger cities. Thus, as work progresses into the more rugged terrain, accomplishments can be expected to drop below the 60 percent of target level.

Given sustained governmental interest and adequate funding, an optimistic assessment by informed sources is eight years to completion. In view of the terrain to be paved, the condition of the existing roads to be resurfaced, and the great distance to be covered, a more realistic estimate may be ten years.

A program for domestic financing of the project was set up in 1967. Approximately a quarter of the cost is to be met by funds that can be counted on: the "Highway Special Fund" from gas taxes and license fees, and the "President's Discretionary Fund." "General Fund Appropriations" and "Appropriations by Congress" amount to about half the total and are not assured.

The rest is to be financed by sale of bonds and by direct private financing whereby private contractors bear the expense of constructing a road parallel to an existing road and upon its completion collect toll fees to pay for the road. The Pan Philippine Highway displaced the rail extension proposals as the first priority project for the

Philippines in 1967 when Japan agreed to a $60 million loan to the Philippines. The loan is to be used to purchase spare parts, machinery, and bridge materials to be used in the construction of the highway.

Philippine Road Transportation and Rates

The means of transporting grain from field to market depends upon the farm size and whether the market is local or a distant commerical one.

Local Grain Transportation

The small farmer transports his grain from the field to the home on carabao-pulled carts and sleds. The grain that is not stored under the home in sacks or baskets for personal consumption may be transported to the local warehouse by carabao cart, bus, truck, jeepney, or small boats. The palay the farmer intends to use for personal consumption may be hand pounded or, as is the case with corn, be taken to the local kiskisas mill for milling. [14]

Palay and corn to be marketed locally by the farmer is also likely to be milled in the local kiskisas where he can pay in kind and not have to mill in large lots. Again transportation of the milled product to the local market is likely to be by cart, bus, or jeepney. The buses carrying grain are the regular public utility buses which hold from 5 to 8 sacks in the cargo section at the rear of the bus. Public utility jeeps, although used primarily for passenger service, at times carry palay, rice, and corn and have a capacity of 12 to 20 sacks. [15]

14/ The Demand for Transportation of Commodity Flows and Passenger Movements, Stanford Research Study, Vol. II, pp. 20, 83.

15/ Information by observation and by interview with the Chief of the Property Division and Chief of the Plate Section of the Land Transportation Commission.

The larger land operators transport their grain directly to the warehouse or mill via trucks.

Grain Transportation to Commercial Centers

Palay that is to be marketed in distant commercial centers is processed in cono mills because of their larger capacity and higher milling recovery. If the miller is the one intending to sell the finished rice he may collect purchased palay with his own private fleet of trucks or hire a trucking agent to collect it for him. Corn destined for commercial consumption is gathered by truckers at collection points and handled unmilled by dealers who truck it to the final market to be milled or ship it to a distribution center such as Cebu, to be milled and then moved to the final market. 16/

Truck Size

The trucks used by large land owners, millers, and agents to transport grains have been observed to have an average capacity of 2.5 to 3 metric tons. These trucks carry a T (private trucks) or a TH (trucks for hire) registry. Because they are expensive, trailers are not frequently used to transport grain. The breakdown of motor vehicle registration for 1966 is shown below: 17/

Types of Vehicles	Cars	Trucks	Trailers	Total
Total for provinces	59,814	70,150	4,859	134,823
Total for Cities	139,928	78,195	5,051	223,174
Grand Total	199,742	148,345	9,910	357,997

16/ The Demand for Transportation of Commodity Flows and Passenger Movements, pp. 22, 84.

17/ Data obtained from the Bureau of Public Highways.

It is difficult to estimate the size of the trucking fleet engaged in hauling grain. Approximately 64,000 of the trucks were T and TH licensed. However, this number also includes trucks not used to haul grain such as gravel and cement trucks.

Truck Transportation Rates

The rates for truck transportation are set by the Public Service Commission (PSC) as authorized by Commonwealth Act 146. The official rate set by the Commission for TH trucks is ₱0.30 per metric ton per kilometer throughout the Philippines. [18/] Appendix Tables A-20, A-21, A-22, and A-23 show the trucking cost to transport grain by TH trucks between major cities in the Philippines.

To decrease the cost of transporting governmentally controlled rice and corn, the Public Service Commission has allowed the Rice and Corn Administration to contract with private truckers at rates below the PSC standard.

* * *

18/ Annual Report of the Public Service Commission 1965-1966, p. 33.

CHAPTER VI

GOVERNMENTAL ACTIVITIES IN AGRICULTURE

Price Regulations and Production Policies

Governmental Agencies in Irrigation

The Rice and Corn Board (RICOB)

The Bureau of Plant Industry (BPI)

The Bureau of Agricultural Economics (BAE)

National Planning and Advisory Groups

The Agricultural Credit Administration (ACA)

The Agricultural Productivity Commission (APC)

The Rice and Corn Production Coordinating Council (RCPCC)

The Rice and Corn Administration (RCA)

CHAPTER VI

GOVERNMENTAL ACTIVITIES IN AGRICULTURE

Price Regulations and Production Policies

The basic agricultural policy of the Philippine government is to promote increased domestic production of basic food crops. At the present time special emphasis is being given to the attainment of self-sufficiency in the production of rice. Less attention is given to promoting agricultural exports such as abaca, coconut products, cigar tobacco and sugar. Several special programs are now underway to increase the production of corn, cattle and hogs.

There are no export taxes or export subsidies for agricultural products in the Philippines. Agricultural imports are subject to fixed duties under the Tariff and Customs Code of the Philippines, however. High tariffs are presently hindering the importation of feed grains, soybeans, oilseed meals, tallow and processed food products such as canned meats, frozen foods and canned fruits and vegetables.

There are direct import controls on some agricultural commodities. Rice and corn imports are prohibited unless the National Economic Council believes that a domestic shortage is likely to occur. Imports of rice and corn authorized by the National Economic Council are made by the Rice and Corn Administration directly or through the private trade free of duty and taxes. Imports of coffee and coffee products, fresh onions, garlic, cabbage and potatoes are also controlled. These products may be brought in only when required to relieve shortages of domestic production.

Philippine exports of sugar and cordage to the United States are regulated by absolute quotas under the Laurel-Langley trade agreement. Coconut oil, scrap tobacco, cigars, and pearl button exports to the United States are subject to tariff quotas at increasing duty rates. The Laurel-Langley treaty terminates in 1974, and it remains to be seen what form of trade agreement will exist between the United States and the Philippines after that time.

The Philippines is trying to broaden its foreign market to include a number of additional countries both in Europe and Asia. The possibility of trade with Russia and Red China received considerable public attention during 1967, but it appears unlikely that trade relations will be developed with these countries in the near future. The possibility of free trade among the Philippines, Thailand and Malaysia was discussed during the August 1967 meeting of the Association of Southeast Asia.

Republic Act 4643 provides for price supports for rice and corn. The Rice and Corn Administration is presently buying ordinary clean and dry palay at a minimum price of ₱16 per sack of 45 kilos. Support prices for corn range from ₱8 to ₱13 a sack of 56 kilos depending on the quality of the corn.

Virginia-type leaf tobacco is the only other agricultural crop with support prices. Republic Act 1194 sets the government buying price for Virginia-type leaf tobacco at ₱1.50 to ₱3.60 per kilo depending on the grade of the tobacco. As of January 1, 1967, the Philippine government had an inventory of approximately 72,982 metric tons of tobacco which was for sale.

There is no regulation of the production of any crop other than sugar. The government regulations on the

production of centrifugal sugar are conditioned by the sugar allotment set by the United States government. Present quotas allow for the production of 1,700,000 short tons (raw value) of which 1,050,000 short tons is for export to the United States.

Agricultural credit is one of the tools presently being used by the Philippine government to increase food output. The Agricultural Credit Administration (ACA), the rural banks and the Development Bank of the Philippines are the major outlets for agricultural credit. Most of the ACA loans during 1967 went to the priority rice producing areas and were for production purposes. The rural banks are participating in the government's rice program by extending supervised credit to rice farmers without collateral. The loans in turn are backed by the Agricultural Guaranty and Loan Fund of the Philippine government. The Development Bank of the Philippines tends to concentrate on the financing of special large scale agricultural financing programs. One of its special projects for 1967-68, for example, is the financing of the development of 1,100 hectares of fishponds.

There are a large number of agencies involved in formulating and carrying out the government's agricultural policies. A brief introduction to several of these agencies is provided in this chapter.

Governmental Agencies in Irrigation

There are two government agencies engaged in the operation, maintenance, and extension of the Philippine irrigation systems. These are the National Irrigation Administration (NIA) and the Irrigation Service Unit (ISU). Together these agencies are responsible for the irrigation of a first crop area of 276,737 hectares of land.

The National Irrigation Administration was formed from the Irrigation Division of the Bureau of Public Works in 1964. It functions as a government corporate agency under Republic Act 3601.

The powers and objectives of the NIA are to:

(1) improve and administer the existing national irrigation system;

(2) investigate the water resources available for irrigation purposes and to plan, design and construct national and communal irrigation projects;

(3) collect from the users of NIA irrigation systems such fees as may be necessary to finance the operation of the system and reimburse the NIA for the construction of the system.

In 1966, the NIA operated 79 gravity irrigation systems with a total first crop area of 238,644 hectares and a second crop area of 98,080 hectares. [1/]

In the four-year period from 1967-1970, the NIA proposes to: [2/]

(1) rehabilitate 78 of the existing systems which will service 40,000 hectares of new land and provide a better water supply to 226,000 hectares. The proposed cost is 14,000,000 pesos.

1/ Annual Report, National Irrigation Administration, Fiscal Year 1965-1966, p. 1.

2/ Ibid., p. 12.

(2) complete 22 projects under construction to provide irrigation to 109,800 hectares at a cost of ₱39,000,000.

(3) construct 42 new projects with an aggregate area of 114,650 hectares for ₱92,950,000.

The NIA has been severely handicapped by lack of funds. Republic Act 3601 authorized 30,000,000 pesos yearly for ten years to be financed entirely by the government through bonds floated by the Central Bank. However, after two years of operation only ₱5 million had been made available to the NIA. A ₱5 million financing loan under Public Law 480 was obtained but, as of 1966, only ₱3,650,000 had been released. 3/

On the average, 9 percent of the total NIA upkeep expenditures were funded by collections under the old irrigation fee. 4/ In 1966, the irrigation fee was changed from ₱12 per hectare to ₱25 per hectare for the first crop rice, ₱35 per hectare for second crop rice and ₱30 per hectare for the third crop rice. For crops other than rice the fee is ₱10 per hectare for the first crop and ₱20 per hectare for the second and third crops. 5/

The Irrigation Service Unit (ISU) of the Department of Public Works and Communications was established in 1952 to provide pump units and technical assistance to farmers and farm groups interested in the irrigation of their land. The pumps are purchased from the ISU on long-term financing arrangements. Operating funds for the ISU

3/ Ibid., p. 7.

4/ Ibid., computed from Table X.

5/ Ibid., Appendix A.

come from government appropriations, Agency for International Development (AID), the National Economic Council (NEC), and Japanese reparations payments.

In 1966, the ISU had 1,222 projects with a potentially irrigable area of 65,805 hectares. [6/] Only 549 ISU units were in operation during the first crop season irrigating 38,093 hectares while 174 units irrigated a second crop area of 8,278 hectares. [7/] The ISU proposed to irrigate an additional 10,000 hectares of land with 357 new pump units in 1967. [8/]

The success of the government's rice production program depends to a large extent on the success of the ISU and NIA in achieving their goals for irrigating new land. The targets assigned to the NIA and ISU by the Rice and Corn Production Coordinating Council (RCPCC) represent formidable challenges to these agencies.

The Rice and Corn Board (RICOB)

The Rice and Corn Board (RICOB) was created by Republic Act 3018 in 1960. The basic purpose of the Act was to assure that no person who is not a citizen of the Philippines (or association, partnership or corporation, the capital or capital stock of which is not wholly owned by citizens of the Philippines) shall directly or indirectly engage in the milling, warehousing, transporting or distribution of rice and corn in the Philippines. The job

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[6/] 14th Annual Report NEC-AID, Department of Public Works and Communications, Irrigation Service Unit, July, 1965-June 30, 1966, Appendix A.

[7/] Ibid., p. 4.

[8/] Ibid., p. 12.

of the Rice and Corn Board was to administer the provisions of Republic Act 3018 and to study and recommend measures for the improvement and development of the rice and corn industry.

The Rice and Corn Board has apparently been very successful in its efforts to "nationalize" the rice and corn industry. As of August 15, 1961, the Board registered 6,109 aliens in the rice and corn business, of which 5,418 were retailers and rice traders while the remaining 691 were millers and warehousemen. By the end of 1962 there were no aliens engaged in the retailing or wholesaling of rice and corn. During 1963, all alien millers and warehousemen withdrew from the rice and corn industry.

The RICOB has conducted an intense promotional campaign to encourage more Filipinos to engage in this industry. In order to ease the financial burdens of entry into the rice and corn industry, the Development Bank of the Philippines together with the Philippine National Bank, upon the recommendation of the RICOB, have loaned around ₱130 million to Filipinos wanting to do business in this field. Of this, approximately ₱20 million was devoted to the construction of around 200 warehouses and cono mills throughout the country.

The Bureau of Plant Industry (BPI)

The Bureau of Plant Industry (BPI) was established in 1930 under Act No. 3639 of the Philippine Legislature. The BPI performs three basic functions:

(1) to undertake plant research on important crops such as rice, corn, beans, vegetables, fruits and coconuts;

(2) to produce and distribute seeds and plant materials, and

(3) to suppress pest and disease outbreaks and to prevent the introduction of foreign plant diseases.

The Bureau of Plant Industry is composed of ten divisions with eight regional and 56 provincial offices. At the present time, it employs over 2,000 persons and maintains 27 experiment stations throughout the country.

Among other things, the BPI is conducting research on improved varieties of rice and corn, the proper use of fertilizers, better means of pest and disease control, and improved methods of storing and processing various crops. The BPI maintains seed testing laboratories in Manila, Bico, the Visayas, and Mindanao. It is involved in the seed multiplication programs for the IR-8, BPI-76 and C-18 rice varieties. It conducts programs for the massive control of rats, locusts and other major pests and presents demonstrations on the proper use of pesticides and spray equipment. The BPI also implements the nation's plant quarantine laws and regulations.

The Bureau of Agricultural Economics (BAE)

The Bureau of Agricultural Economics (BAE), as established by Republic Act 3627, is a fact-finding agency with the objective of improving the economic and social postion of the Philippine farmer. In particular, the BAE is responsible for measuring and evaluating the government's farm programs. To this end, the BAE undertakes major surveys for the collection of agricultural statistics. Periodic production forecasts are based on these data and are used in the formulation of government policies and programs.

Among the activities presently being undertaken by the BAE are:

(1) the crop and livestock survey;
(2) a survey of irrigation projects throughout the country;
(3) measuring the effects of the government's rice and corn production program;
(4) participation in the scheduled Philippine-Food and Agricultural Organization (FAO) national sample survey on coconuts;
(5) a rural income survey, and
(6) various surveys on farm wages, prices received and paid by farmers, prices at provincial capitals, and surveys of the transportation costs for major crops.

National Planning and Advisory Groups

The National Economic Council (NEC) and the Presidential Economic Staff (PES) are both involved in numerous programs designed to promote the economic development of the Philippines, and thus are vitally concerned with programs and projects affecting the agricultural development of the country.

The Agricultural Credic Administration (ACA)

The Agricultural Credit and Cooperative Financing Administration was established under Republic Act 821. Its objective was to assist small farmers in securing liberal credit and to promote the effective groupings of farmers into cooperative associations to enable them to market their agricultural commodities effectively. The Agricultural Credit and Cooperative Financing Administration was reorganized and renamed the Agricultural Credit Administration (ACA), after the passage of the Land Reform Code, Republic Act 3844.

The Agricultural Credit Administration is responsible for extending liberal credit to small farmers through farmer's cooperatives and supervising the operations and assisting in the financing of these farmers. A revolving fund of ₱250 million has been authorized for use by ACA. Of this amount, only ₱105 million had been released as of June 30, 1966, since ACA was created in 1952.

In addition to its normal loaning functions, the Agricultural Credit Administration has engaged in the procurement and distribution of fertilizers and certified rice seed.

The central office of ACA is located in Manila. Its nationwide activities are carried out through its nine regional and 25 provincial branch offices. The National Land Reform Council serves as the board of governors of ACA and thereby assures that ACA's loan policies are consistent with the goals of the land reform code. Over ₱55 million were loaned to farmers by ACA during the period from 1963 to 1967. A detailed breakdown of loan funds released since 1963 is provided in Table 28.

TABLE 28

LOANS RELEASED BY ACA

Fiscal Year	Number of Farmers Served	Loans Released
	(in thousand pesos)	
1963-64	13,876	5,190.0
1964-65	36,064	12,126.0
1965-66	35,327	13,946.0
1966-67	43,085	24,101.0
TOTAL	xxx	55,363.0

Source: Annual Report F4 1966,67, Manila, Department of Agriculture and Natural Resources, Agricultural Credi Administration.

The Agricultural Productivity Commission (APC)

The Bureau of Agricultural Extension (BAE) was created by Republic Act 680 in 1954 as part of the Department of Agriculture and Natural Resources (DANR). The BAE was charged with consolidating, coordinating and expanding agricultural extension work in the Philippines. The BAE was transferred from the Department of Agriculture and Natural Resources to the Office of the President after the passage of the Agricultural Land Reform Code (Republic Act 3844) in 1963 and was renamed the Agricultural Productivity Commission (APC). The duty of the APC was to accelerate the improvement in the productivity of farms and to strengthen the existing agricultural extension services through the consolidation of all promotional, educational and informational activities pertaining to agriculture. The APC carries out its job by providing farmers with practical and scientific information on crops, animal husbandry, fishery, soil conservation, forestry, public land and natural resource laws, home economics and rural life.

The APC employed over 5,000 persons during the fiscal year 1966-67. Nearly 45 percent of its personnel were involved in its farm management programs.

The Rice and Corn Production Coordinating Council (RCPCC)

The Rice and Corn Production Coordinating Council (RCPCC) was created by Republic Act 2084 in 1958. Its main objective is to make the Philippines self-sufficient in the production of rice and corn. In 1966, the RCPCC was directed to undertake a full scale national program to increase rice and corn production in the Philippines and was designated as the only body with the power and responsibility of coordinating all agencies of the government which are

directly or indirectly concerned with rice and corn production. (Executive Order No. 50, October 17, 1966.) The national program of the RCPCC consists of several sub-programs which include:

(a) the irrigation program;
(b) the seed multiplication and certification program;
(c) the soil management and fertilizer program;
(d) the pest and disease control program;
(e) the credit program;
(f) the research program, and
(g) the agricultural extension program.

The main government agencies involved in these programs are:

The Presidential Economic Staff (PES)
Department of Agriculture and Natural Resources (DANR)
Bureau of Agricultural Economics (BAE)
Office of the Statistical Coordination and Standards
Bureau of Plant Industry (BPI)
Agricultural Productivity Commission (APC)
U.P. College of Agriculture
National Irrigation Administration (NIA)
Irrigation Service Unit (ISU)
Presidential Arm on Community Development
Agricultural Credit Administration (ACA)
Development Bank of the Philippines
Rice and Corn Administration (RCA)
Rice and Corn Board (RICOB)

The main concern of the RCPCC has been to increase rice production. The RCPCC has concentrated on trying to increase yields rather than attempting to increase the area of rice cultivations. The various sub-programs have therefore been directed toward encouraging farmers to plant the new high

yielding rice varieties: IR-8, BPI-73, and C-18. These new varieties produce up to expectations only when planted on irrigated land and grown according to recommended practices. For this reason, the RCPCC selected the 12 provinces with the most irrigated land as areas of first priority for its rice production program. These provinces are:

(1)	Nueva Ecija	(7)	Nueva Vizcaya
(2)	Isabela	(8)	Camarines Sur
(3)	Cotabato	(9)	Pampanga
(4)	Iloilo	(10)	Bulacan
(5)	Pangasinan	(11)	Laguna
(6)	Tarlac	(12)	Cagayan

The RCPCC's rice program has been very effective to date. It appears likely that its program to increase corn production will be organized and directed in basically the same way as its rice program.

The Rice and Corn Administration (RCA)

The Rice and Corn Administration (RCA) supports the price for rice and corn as provided for in Republic Act 4643. It is charged with maintaining low retail prices of rice and corn while supporting farm prices at a "fair" level. RCA has contracts with the private grain trade to purchase and store rice and corn. In general, RCA maintains control of supplies. In case of a short supply, excessive price increases are prevented by importing rice and corn. By law RCA is the sole importer of these commodities. Apparently RCA has been more successful at maintaining prices to farmers than at stabilizing rice and corn prices to consumers.

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CHAPTER VII

PRICE POLICIES FOR RICE AND CORN

Introduction

The Rice and Corn Administration

Rice Prices

Farm Rice Prices
Wholesale Prices for Rice
Retail Prices for Rice

Corn Prices

Farm Prices for Corn
Wholesale and Retail Corn Prices

The Government's Price Policy

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CHAPTER VII

PRICE POLICIES FOR RICE AND CORN

Introduction

The Rice and Corn Administration

The price policy followed by the Philippine government will, to a large extent, determine whether or not the goal of self-sufficiency in rice production is obtained. The Rice and Corn Administration (RCA) is the governmental agency primarily responsible for the formulation and implementation of price policies for rice and corn. The RCA has a number of different goals. The most important appear to be:

(1) to maintain low retail prices,
(2) to maintain "fair" farm prices,
(3) to break even on its buying and selling operation,
(4) to minimize rice imports,
(5) to reduce within-year and between-year price fluctuations,
(6) to facilitate the "nationalization" of grain marketing,
(7) to supply consumers with rice of various qualities, and
(8) to encourage rice and corn dealers to improve the efficiency of the grain marketing system.

The relative importance of these goals has changed from time to time, but the first four have generally been the most important and the most troublesome. They are likely to remain important because rice is a mainstay in the

Philippine diet. They are also likely to remain troublesome because some of these goals are in conflict. The political debates over price policies for rice and corn are not likely to disappear with "self-sufficiency." Indeed, a rice surplus will bring with it new problems which will have to be discussed and acted on. Thus, there is a need to anticipate the new problems and to follow a flexible policy not only with respect to prices but also with respect to the importation and exportation of rice and corn.

Rice Prices

Farm Rice Prices

For most regions, the farm price of palay is usually lowest during the months of November, December and January and highest during the months of May, June and July. On the average, there is about a 20 percent difference between the high and low farm prices for palay. The differences in seasonal price variations between regions can be seen from the index numbers of seasonal price variation presented in Table 29.

For the Philippines as a whole, the RCA has usually been able to keep the average farm price of palay fairly close to the designated support price. A comparison of the RCA support price and the average price actually received by farmers during the crop season is presented in Table 30. The average price received by Philippine farmers during the 1957-58 to 1963-64 period was never more than 12 percent below the RCA support price. The RCA has usually had more difficulty in supporting farm prices in the Bicol, Western Visayas and Southern and Western Mindanao regions than in the other regions.

The ability of the RCA to support farm prices depends

TABLE 29

SEASONAL VARIATION IN PALAY FARM PR' S,
BY REGION, PHILIPPINES, 1957-'

Month	Philip-pines	Ilocos	Cagayan	Central Luzon	Southern Tagalog	Bicol	Western Visayas	Eastern Visayas	Southern & Western Mindanao	Northern & Eastern Mindanao
				(Means of ratios to a 12 month moving average)						
January	94.5	98.3	90.1	91.9	92.1	94.7	92.9	98.4	94.6	98.1
February	96.6	98.2	95.9	94.9	96.4	98.6	97.3	99.5	99.9	102.3
March	97.8	95.8	95.8	98.9	97.0	99.1	98.3	96.6	100.6	100.1
April	101.8	96.1	99.2	104.4	102.9	103.4	104.8	101.6	107.4	101.3
May	105.0	95.8	101.3	106.9	101.5	105.6	108.4	101.8	110.1	101.7
June	104.9	106.2	103.7	106.4	104.8	112.3	109.0	102.2	106.8	103.1
July	101.1	105.6	99.3	106.0	103.9	108.1	109.3	102.9	103.3	105.4
August	98.9	111.7	103.3	106.3	110.8	100.7	106.1	107.4	94.1	102.2
September	100.8	103.0	107.4	106.7	102.0	98.7	98.4	105.3	95.9	97.7
October	96.3	93.3	105.8	97.7	95.5	92.9	92.3	96.3	96.2	96.2
November	92.9	100.8	99.7	90.6	90.9	91.2	87.6	90.7	93.6	94.1
December	97.6	96.9	95.0	90.8	93.3	91.4	91.4	95.1	96.0	97.7

Source: Mangabas, M. The Response of Rice Farmers to Price, unpublished thesis, University of the Philippines (source of basic data: Prices Received and Prices Paid by Farmers series, DANR.)

TABLE 30

AVERAGE PRICES RECEIVED BY FARMERS FOR "MACAN ORDINARIO" PALAY DURING MONTHS OF LOWEST PALAY PRICES, PHILIPPINES 1957/58 - 1963/64

Year	RCA/NARIC Modal Support Price During Crop Season[a/]	Average Price Received by Farmers	Average Price as Percent of Support Price
	(Pesos per 100 kilos of Palay)		
1957/58	23.85	22.67	95
1958/59	20.97	19.72	94
1959/60	19.31	17.33	89
1960/61	19.31	23.10	119
1961/62	19.31	22.06	114
1962/63	25.56	22.62	88
1963/64	28.40	29.01	102

a/ Modal support prices are those believed to be in effect during the crop season "low price buying months."

Source: "Prices Received by Farmers" DANR, BAE, and unpublished papers of Leon Mears, School of Economics, University of the Philippines, Diliman, Quezon City.

TABLE 31

SEASONAL VARIATION IN THE WHOLESALE PRICE OF RICE IN MANILA, CEBU CITY, ILOILO CITY AND DAVAO CITY.

Month	Manila 1950-64	Cebu 1957-64	Iloilo 1957-64	Davao 1957-64
	(Means of ratios to a 12-month moving average.)			
January	93.4	97.8	91.5	98.9
February	93.6	97.4	94.2	98.4
March	95.5	96.2	95.6	97.9
April	97.8	98.4	100.0	100.2
May	99.8	100.2	102.8	106.3
June	101.8	99.6	102.7	104.8
July	102.6	102.3	104.8	101.7
August	104.2	103.0	104.4	96.9
September	106.5	107.1	107.4	101.9
October	105.7	103.3	99.9	102.5
November	101.4	100.2	98.6	100.2
December	96.4	98.2	95.0	92.9

a/ Macan first class.

Source: Mangabas, M. The Response of Rice Farmers to Price, unpublished thesis, University of the Philippines (source of basic data: Central Bank of the Philippines).

among other things on: (1) the quantity of palay it can buy and (2) its ability to control retail prices. The close correlation between the actual farm price and the support price of palay appears to be due to RCA's inability to maintain a ceiling on retail prices rather than its ability to buy substantial quantities of palay from the farmers. Grain dealers have been willing to meet the RCA's farm price as long as they felt confident that the RCA could not control the retail price of rice.

The low palay prices in the Bicol region are probably due to the fact that rice in this area is often marketed wet or with a high percentage of foreign material. The relatively low price of palay in the Southern and Western Mindanao region is partly accounted for by the transportation costs of moving rice from this area to the markets in Cebu and Manila.

Wholesale Prices for Rice

The wholesale price of rice in Manila is usually lowest in January and February and highest in August, September and October. Wholesale prices tend to vary less than farm prices. The index of seasonal variation of wholesale prices in Manila presented in Table 31, for example, varies from a low of 93.4 in January to a high of 106.5 in September--a difference of only 13.1 points. The average wholesale price of milled rice in Manila for the 1957-1967 period is presented in Table 32.

The wholesale price of rice in Cebu follows basically the same pattern as the price in Manila. In Iloilo, wholesale prices tend to be high in July, August and September and then fall sharply to a low in January. The wholesale price in Davao has usually been highest in May and lowest in December.

TABLE 32

AVERAGE WHOLESALE PRICE OF MILLED RICE
IN MANILA, 1957-1967

Year	Price
(Macas 2nd class, pesos per 100 kilos)	
1957	35.80
1958	41.32
1959	30.66
1960	32.79
1961	43.77
1962	38.27
1963	45.51
1964	55.32
1965	52.42
1966	61.49
1967	68.27 a/

a/ Price as of July, 1967.
Source: Bureau of Commerce and unpublished papers of Leon A. Mears, School of Economics, University of the Philippines, Diliman, Quezon City.

Retail Prices for Rice

The retail price of rice has increased more rapidly than most other consumer goods since 1960. The consumer's price index excluding rice rose from 109.6 in January 1960 to 142.7 in January 1966. The consumer's rice price index rose from 97.2 to 166.8 during the same period. Retail rice prices have risen more rapidly relative to other goods since late 1963 than during the period from 1960 to 1963. A quarterly comparison of the consumer's price index excluding rice and the rice price index is presented in Table 33.

TABLE 33

COMPARISON OF MANILA'S CONSUMER PRICE INDEX AND CONSUMER, RICE PRICE INDEX (1955=100)

	Consumer Price Index[a]	Consumer Rice Price Index
1960		
January	109.6	97.2
April	108.7	98.0
July	112.9	105.4
October	115.2	126.4
1961		
January	111.1	122.4
April	109.3	123.0
July	112.6	125.1
October	116.1	110.4
1962		
January	116.2	107.0
April	117.6	108.3
July	120.2	115.6
October	123.9	118.8
1963		
January	123.0	118.2
April	122.3	123.0
July	126.5	128.2
October	130.4	154.6
1964		
January	131.3	150.0
April	129.8	159.2
July	135.2	177.0
October	136.9	161.7
1965		
January	141.2	150.7
April	134.6	154.0
July	139.9	155.2
October	139.1	162.9
1966		
January	142.7	166.8
April	140.4	170.2
July	144.2	185.2

a/ Excluding rice.

Source: Unpublished papers of Leon A. Mears, School of Economics, University of the Philippines, Diliman, Quezon City; source of basic data: Central Bank of the Philippines, Manila.

The retail price of rice in most regions is usually lowest in March and April and highest in September and October. Retail rice prices tend to be somewhat less variable than wholesale rice prices. The index of seasonal variation in retail prices for Central Luzon presented in Table 34 has a low of 95.6 in March and a high of 107 5 in October--a difference of 11.9 points.

The RCA has usually been unable to maintain the retail price of rice at or below the RCA's ceiling price. A comparison of the RCA ceiling price and the average retail price of rice is presented in Table 35 for the years 1957 to 1966. The actual retail price of rice during the peak market price months was frequently 25 to 30 percent above the price that the RCA was trying to maintain. RCA has tended to concentrate its sales of rice during those months when retail prices are highest. As a result, retail prices of rice have undoubtedly been less than they would have been otherwise.

The average farm to retail price margins, by region, for the period 1957 to 1963 are presented in Table 36. The margins, as a percentage of retail price, range from 22 percent in Ilocos to 46 percent in Bicol. Actual margins on rice are probably somewhat higher than the average margins. Dealers buy most of their rice at the harvest seasons when prices are low and usually hold some of this rice until prices are high. Mixing different qualities of rice and upgrading of rice also provide grain dealers with additional profit opportunities. The research team concludes therefore that the average margin as a percentage of the retail price of rice is usually at least 25 percent in the Philippines.

Corn Prices

Farm Prices for Corn

Farm price statistics for corn are available from the

TABLE 34

SEASONAL VARIATION IN THE RETAIL PRICE OF RICE[a/] BY REGION, PHILIPPINES 1957 - 1963

Month	Ilocos	Cagayan	Central Luzon	Southern Tagalog	Bicol	Western Visayas	Eastern Visayas	Southern & Western Mindanao	Northern & Eastern Mindanao
			(Means of ratios to a 12 month moving average)						
January	96.8	100.7	98.1	97.9	97.4	97.7	99.4	100.0	97.8
February	95.8	96.4	95.8	95.0	96.4	95.1	98.4	97.9	101.9
March	92.9	94.3	95.6	94.2	96.4	92.9	98.1	97.6	101.1
April	95.1	95.2	96.0	96.6	97.1	95.6	97.4	98.8	100.4
May	96.7	95.4	97.8	99.6	97.3	99.9	98.9	101.8	96.7
June	99.2	98.5	98.9	99.6	101.2	100.5	98.1	100.2	96.5
July	102.8	100.3	99.0	100.8	104.5	102.4	102.5	105.3	101.0
August	102.4	99.6	100.5	103.0	101.0	105.0	101.6	101.2	104.4
September	107.1	106.2	107.2	109.7	105.8	106.4	103.8	104.7	103.6
October	108.2	106.3	107.5	105.6	103.6	100.0	103.2	103.4	103.3
November	102.2	104.9	104.3	99.8	101.7	100.2	99.2	96.6	99.7
December	99.8	100.6	98.7	96.5	99.3	98.7	98.0	96.7	96.7

a/ Macan first class.

Source: Mangabas, M. The Response of Rice Farmers to Price, unpublished thesis, University of the Philippines (source of basic data: Central Bank of the Philippines).

Bureau of Agricultural Economics of the Department of Agriculture and Natural Resources. The Central Bank of the Philippines and the Bureau of Commerce both gather wholesale and retail prices for corn. These agencies collect prices for both white and yellow corn on a monthly basis. Prices on different grades of corn are not available.

The farm prices of yellow and white corn are usually about the same within any given region. The farm price of white corn was fairly stable from 1957 to 1962. During this period, the average farm price in the Philippines was usually between ₱0 16 and ₱0.19 per kilo with the exception of 1959 when the average farm price fell to ₱0.12 per kilo. The average farm price of white corn in the Philippines increased to ₱0.24 per kilo in 1963 and had risen to ₱0.28 per kilo by 1966.

Farm prices of corn fluctuate considerably from week to week and from month to month in most regions of the Philippines. Within any given year, the prices in the various regions usually tend to move up or down together, however. The farm price of corn has usually been highest in Central Luzon and the Ilocos region and lowest in Southern and Western Mindanao. These general price patterns are expected to continue during the 1970's.

For the Philippines as a whole, the farm price of white corn tends to be highest in April, May nd June and lowest in August, December and January. There are distinct differences between regions, however, depending upon the timing of the harvest seasons and the locations of t.. regions relative to the principal corn markets.

Farm prices of white and yellow corn by region for 1957 to 1966 are presented in Tables 37 and 38.

TABLE 35

AVERAGE PEAK MARKET RETAIL PRICES COMPARED TO GOVERNMENT CEILING RETAIL PRICES, PHILIPPINES, 1957/58 TO 1965/66

Year	Modal Price RCA Ceiling Retail During Peak Market Price Months	Average Retail Price During Peak Market Price Months in Manila	Average Retail Price as Percent of RCA Modal Price
	(Pesos Per Cavan)		
1957/58	35.66	45.31	127
1958/59	35.66	44.89	125
1959/60	35.66	33.57	94
1960/61	33.57	42.38	126
1961/62	35.66	48.25	135
1962/63	37.76	44.06	117
1963/64	34.82	52.87	152
1964/65	46.15	61.68	134
1965/66	54.96	58.74	107

Source: Unpublished papers of Leon Mears, School of Economics, University of the Philippines, Diliman, Quezon City.

TABLE 36

FARM TO RETAIL PRICE MARGINS FOR RICE, BY REGIONS, PHILIPPINES, 1957-1963

	Region	Average Margin[a]	Average Retail Price[a]	Margin as Percent of Retail Price
		(Pesos Per 100 Kilos)		
II	Ilocos	10.53	47.35	0.22
III	Cagayan Valley	13.42	46.35	0.29
IV	Central Luzon	10.63	48.07	0.22
V	Southern Tagalog	13.06	49.73	0.26
VI	Bicol	27.79	61.06	0.46
VII	Western Visayas	9.85	44.98	0.22
VIII	Eastern Visayas	12.17	47.67	0.26
IX	S & W Mindanao	17.35	49.92	0.35
X	N & E Mindanao	16.15	51.35	0.31

a/ Average of trend observations (12-month moving average).
Source: Mangahas, M. The Response of Rice Farmers to Price, unpublished thesis, University of the Philippines, Diliman, Quezon City; basic source data: DANR and Central Bank of the Philippines.

TABLE 37

FARM PRICES OF WHITE CORN, BY REGION, 1957-1966

	Region	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
		(pesos per kilo of shelled corn)									
	Philippines	.19	.16	.12	.17	.17	.18	.24	.24	.26	.28
II	Ilocos	.21	.21	.18	.20	.21	.23	.29	.28	.35	.32
III	Cagayan Valley	.18	.16	.11	.15	.18	.16	.20	.22	.20	.28
IV	Central Luzon	.19	.19	.15	.19	.22	.20	.25	.29	.31	.33
V	Southern Tagalog	.18	.17	.15	.18	.22	.20	.29	.29	.22	.26
VI	Bicol	.19	.17	.12	.18	.19	.18	.22	.22	.25	.27
VII	Western Visayas	.20	.16	.12	.17	.20	.17	.24	.24	.26	.29
VIII	Eastern Visayas	.20	.16	.13	.19	.20	.20	.27	.25	.28	.29
IX	S & W Mindanao	.17	.14	.09	.15	.17	.17	.23	.20	.22	.22
X	N & E Mindanao	.19	.16	.11	.18	.18	.18	.25	.21	.27	.26

Source: Recto, A.E., Price and Market Relationships for Corn in the Philippines, unpublished thesis, University of Philippines, 1965 (source of basic data DANR).

TABLE 38

FARM PRICES OF YELLOW CORN, BY REGION, 1957-1966

	Region	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
					(pesos per kilo of shelled corn)						
	Philippines	.19	.17	.13	.17	.19	.18	.24	.25	.26	.28
II	Ilocos	.20	.18	.18	.21	.24	.24	.30	.29	.36	.34
III	Cagayan Valley	.18	.17	.12	.16	.17	.15	.20	.22	.24	.27
IV	Central Luzon	.20	.19	.15	.19	.22	.21	.26	.29	.31	.32
V	Southern Tagalog	.20	.16	.15	.20	.12	.22	.30	.29	.24	.27
VI	Bicol	.18	.18	.13	.18	.19	.17	.21	.23	.25	.27
VII	Western Visayas	.20	.16	.12	.16	.19	.17	.23	.24	.26	.27
VIII	Eastern Visayas	.18	.16	.13	.17	.19	.19	.26	.29	.25	.25
IX	S & W Mindanao	.17	.14	.09	.15	.17	.16	.22	.19	.18	.22
X	N & E Mindanao	.20	.16	.12	.16	.17	.16	.22	.21	.31	.27

Source: Recto, A. E., Price and Market Relationships for Corn in the Philippines, unpublished thesis, University of Philippines, 1965 (source of basic data DANR).

Wholesale and Retail Corn Prices

The wholesale price of yellow corn in Manila is usually higher than the wholesale price of white corn. Wholesale prices of white and yellow corn usually move in the same direction, however. No significant seasonal variation in the wholesale price of corn in Manila is evident.

The retail price of yellow corn in Manila is usually higher than the retail price of white corn. The retail prices of white and yellow corn tend to move in the same direction. There is no significant seasonal variation in the retail price of either white or yellow corn in Manila. Prices have usually tended to increase for a year or so and then decline for a year or so. The recent price trend has been upward. The average monthly retail price of white corn in Manila is shown in Table 39.

The margin between the farm and retail levels is usually higher for yellow corn than for white corn. The average farm to retail price spreads for white and yellow corn during the 1957 to 1963 period are presented in Table 40. The Cagayan Valley had the highest margins for both white and yellow corn. Margins were lowest in the Ilocos region for white corn and in the Southern Tagalog region for yellow corn.

The Government's Price Policy

The Rice and Corn Administration presently procures palay and corn through payment against warehouse receipts or quedans. A farmer who wants to sell his palay or corn deposits his produce in any RCA bonded warehouse or FACOMA and receives a warehouse receipt (quedan) in return. The farmer can then take the quedan to one of the rural banks and exchange it for cash. The rice or corn held by the warehouseman is milled upon order by RCA. The warehouseman

TABLE 39

RETAIL PRICE OF WHITE CORN, BY MONTHS, MANILA, 1957-1966

Month	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
				(pesos per kilo of shelled corn)						
January	.27	.28	.17	.22	.25	.31	.29	.35	.38	.40
February	.29	.28	.19	.22	.25	.31	.30	.35	.36	.39
March	.30	.27	.20	.22	.25	.31	.31	.35	.37	.37
April	.30	.25	.20	.22	.27	.31	.32	-	.40	.38
May	.29	.25	.20	.22	.31	.31	.32	-	.40	.40
June	.29	.21	.20	.23	.31	.31	.35	-	.40	.40
July	.26	.21	.20	.24	.31	.29	.36	.31	.40	.40
August	.26	.20	.20	.25	.31	.29	.36	.31	.40	-
September	.27	.18	.20	.25	.31	.29	.36	a/	.37	-
October	.28	.18	.20	.25	.31	.28	.36	a/	.37	-
November	.28	.17	.20	.25	.31	.26	.35	a/	.38	-
December	.27	.17	.21	.25	.31	.28	.35	a/	.40	-
Annual Average	.28	.22	.20	.23	.29	.29	.34	-	.38	.39

a/ Not available.

Note: Multiply ganta price by $\frac{1}{2.28}$ 0.4385

Source: Recto, A.E., Price and Market Relationships for Corn in the Philippines, unpublished thesis, University of Philippines, 1965 (source of basic data DANR).

TABLE 40

FARM TO RETAIL PRICE SPREAD FOR CORN, BY REGION, PHILIPPINES, 1957-1963

	Region	White Corn			Yellow Corn		
		Margin[a]	Retail Price	Margin as Percent of Retail Price	Margin[a]	Retail Price	Margin as Percent of Retail Price
		(pesos per 100 kilos)					
II	Ilocos	4.63	27.06	0.17	6.61	27.06	0.24
III	Cagayan Valley	8.89	24.87	0.36	8.52	24.74	0.34
IV	Central Luzon	7.49	27.06	0.28	7.57	27.55	0.27
V	Southern Tagalog	--	--	--	4.99	26.38	0.19
VI	Bicol	5.84	23.43	0.25	7.87	25.50	0.31
VII	Western Visayas	5.89	25.06	0.24	--	--	--
VIII	Eastern Visayas	5.68	23.36	0.24	7.40	24.92	0.30
IX	S & W Mindanao	7.02	25.07	0.28	--	--	--
X	N & E Mindanao	8.07	25.07	0.32	--	--	--

a The average margin figures are obtained by subtracting the average farm price from the average retail price for the same month. Actual margins received would depend on how long the corn is held and where the corn is marketed.

Source: Recto, A.E., Price and Market Relationships for Corn in the Philippines, unpublished thesis, University of the Philippines, 1965.

is required to deliver to RCA 52 cavans of 56 kilos each of second class milled rice for every 100 cavans of 46 kilos of clean and dry palay purchased from the farmers. The rice recovery in excess of 52 cavans and all by-products go to the warehouseman to compensate him for the rental of sacks, premium of the surety bond paid by his bonded warehouse, milling fee, warehousing fee, handling and other incidental expenses.

The RCA owned palay held by the warehouseman is to be stored in a separate area of the warehouse and be subject at all times to the inspection and supervision of RCA representatives. If the RCA palay is held for longer than one year, the RCA pays the warehouseman a storage fee of ₱0.50 per cavan of carry-over palay.

The RCA deposits funds with the Philippine National Bank (PNB) sufficient to cover the value of the quedans to be presented to the PNB. The PNB then transfers funds to its branch banks and RCA-designated agent banks. The PNB receives 3 percent per annum of the total value of the quedans paid for by the PNB. This is a payment for bookkeeping and credit investigations carried out by the PNB and agent banks for the RCA.

Authorized retailers who want to purchase RCA rice or corn pay the agent banks for the rice or corn and receive a certificate which is taken to one of the RCA bonded warehouses and exchanged for rice or corn. These certificates are then returned to the bank by the warehouseman and exchanged for the original quedans issued by the warehouseman to the farmer.

The Quedan System and RCA Warehouse Operation

The RCA's quedan system is in line with the government's policy of working with private rice and corn dealers to the

extent possible rather than directly competing with them. It also allows the RCA to operate with a minimum of direct cash outlays. The exact form of the quedan system varies somewhat from region to region depending on the warehouses available, the rural banks in the area and the size of the RCA's administrative staff in the region. Although the quedan system has some shortcomings, it has proven flexible enough to be useful throughout the Philippines during the past year.

At the present time, the RCA appears to be more concerned with keeping the farm price of rice high rather than keeping the retail price low. This policy is consistent with its goal of minimizing rice imports. Our projections of future rice production implicitly assume that the RCA will continue to consider high farm prices relatively more important than low consumer prices.

The prices paid by the RCA for palay and corn in different regions are determined by the RCA Board of Administrators with the condition that the price of palay shall not be less than ₱16.00 per cavan at 46 kg each of palay and not less than ₱13.00 per cavan at 56 kg each of corn.

The ability of the RCA to actually support prices at these levels is partly determined by the availability of funds and warehouse facilities. The RCA's funds are seldom sufficient to allow it to purchase the quantity of rice which it wants to purchase. In order to stabilize prices, the RCA often has to hold rice and corn for long time periods. Thus the RCA requires a larger amount of money to handle a given volume of rice or corn than private millers do. Given the present storage facilities, grain losses are bound to be larger the longer the grain is held. Under the quedan system, these losses are shifted to the rice and corn millers who store RCA rice and corn. This in turn reduces the incentive for bonded warehouses to cooperate with the RCA,

especially in regions where there are shortages of warehouse facilities. It seems likely that warehousemen, in regions where production is increasing rapidly, will become increasingly reluctant to participate in the present RCA quedan system unless new warehouse facilities are built rapidly enough to handle production increases.

RCA Price Support Operations

Even if funds and warehouse facilities are available, the legal restrictions on the RCA often reduce its ability to actively participate in the rice and corn market. The RCA is required by law to purchase rice directly from producers and to give priority to those producers whose total production is less than 100 cavans. The RCA is required to buy clean and dry rice and corn. Thus it is not in a position to make large purchases from rice dealers or to support the price of wet grain at some reasonable price below ₱16 per cavan of rice or ₱13 per cavan of corn.

The RCA's goal to stabilize retail prices reduces its ability to break even on the operation of large warehouse facilities. Such warehouse facilities are not likely to be profitable unless the total amount of grain handled by the facility during the year is at least 3 times the size of the warehouse. Price stabilization policies may require grain to be held for six months or longer thereby increasing the storage cost per unit of grain handled.

The RCA is restricted in the prices it can pay farmers for their palay and corn. As a result, it is not always able to compete with private dealers or to obtain the amount of grain that it would like to buy. It would be impossible for the RCA to efficiently operate large storage units unless the RCA was allowed complete freedom to alter its buying and selling prices for grain.

Future RCA Policies and Operations

The RCA will have to play an increasingly important role in the marketing of rice and corn during the 1970's. The RCA's price and import policies will be important factors in determining if the actual increases in rice production are as large as the projected increases. If production increases are as large as expected, the RCA will have to be able to buy larger quantities of rice in the future to maintain farm prices and stabilize retail prices.

The actions taken by the RCA during the next few years will undoubtedly affect the speed with which the grain marketing system of the Philippines is modernized. The restrictions on the RCA prevent it from being able to operate large, efficient, grain storage facilities. However, if the RCA adopts price and import policies that will prevent private grain dealers from earning reasonable profits on such facilities, then the facilities are not likely to be built and if built are not likely to operate.

The introduction of bulk grain handling in some parts of the Philippines will undoubtedly give a few grain dealers increased control over rice prices. The RCA's ability to reduce the market power of such dealers will depend partly on the amount of grain controlled by the RCA. Thus the RCA will undoubtedly have to continue to operate some warehouses in the future or to lease storage space from private warehousemen.

Considering the restrictions on its operations, the RCA has done a remarkably good job of maintaining the farm price of palay. Its inability to maintain the retail price of rice at the desired level was primarily due to the shortage of rice and the RCA's inability to place enough rice in the right markets at the right time.

If the world price of rice remains at its present high level during the next few years and the anticipated rice surplus develops, the RCA should be able to maintain the present farm and retail prices of rice simply by regulating rice exports. In this case, the RCA would not need to expand the overall size of its purchasing operation although it may want to direct more of its resources to the Bicol and Visayas regions.

If the world price of rice falls by 1970, the RCA's job will become increasingly difficult. Any attempt to maintain the farm price of rice above the world price would undoubtedly prove to be very expensive to the RCA. At the present support price of palay, it would cost the RCA over ₱145,000,000 just to purchase the surplus rice production in 1970. Its actual losses would depend on its operating costs and the level of the world price of rice relative to the support price.

It seems likely that the world price of rice will remain high enough during the next few years to allow the RCA to maintain the farm price of palay at about ₱16 per cavan. This appears to be a very favorable price to rice producers and should be adequate to encourage rice producers to support the government's efforts to increase rice production. The RCA will have to permit rice dealers to export rice, however.

It is not recommended that the RCA undertake a program to build up a large national stockpile of rice. Such a program would undoubtedly prove both expensive and wasteful. The cost of purchasing a two month supply of palay in 1970 at 1967 prices would be nearly ₱300,000,000. A great deal of this palay would be wasted if stored in existing facilities. If the palay were to be stored in modern facilities, it would

be necessary to construct enough new capacity to store about 850,000 metric tons of rice by 1970. Even if this storage capacity could be constructed for as little as US$100 per metric ton, the total cost of the facilities to store stock-piled palay would be about US$85,000,000 or ₱331,500,000. Such funds could undoubtedly be used more productively elsewhere.

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CHAPTER VIII

LIVESTOCK AND POULTRY

Introduction

Livestock

- Hogs
- Cattle

Chickens

Other Livestock and Poultry

CHAPTER VIII

LIVESTOCK AND POULTRY

Introduction

New emphasis is being placed on increasing the production of livestock and poultry in the Philippines. The combination of favorable meat prices and moderate feed prices has produced an environment conducive to increased livestock and poultry production. Private and governmental organizations are now beginning to promote livestock production on a commercial rather than on a home unit basis. Nutrition experts predict, however, that during the 1970's the Philippines will be able to produce only 75 percent of the amount of meat and poultry that is considered nutritionally desirable. [1/] The past performance and the factors expected to influence the future events in the poultry and livestock industry are examined below to assess the capacity of this industry to meet the challenge posed by a rapidly expanding population.

Livestock

Hogs

Hogs are the principal source of red meat in the Philippines. It is estimated that pork constituted approximately 77 percent of the total annual meat production (excluding poultry) during the four year period 1963-1967. Government statistics indicate that pork represents 64 percent of annual consumption of meat and meat products.

[1/] Intengan, Carmen. "The Food Needs in the Philippines," a paper presented to the Second Conference on Population, November 27-29, 1967, Manila, Table 8, p. 19.

The hog population of the Philippines increased by about 20 percent between 1965 and 1966, according to DANR estimates. Approximately 20 percent of the hog population is located in the Eastern Visayas, and another 20 percent in North and East Mindanao (Table 41).

Prospects are favorable for a more rapid growth of hog numbers during the next few years. Supplies of feed grains improved during 1967 and pork prices were favorable to producers. It is estimated that the cost of feed represents approximately 70 percent of the total cost of pork production in the Philippines. Therefore, the expansion of the hog industry depends largely upon an available supply of reasonably priced feeds. Domestic corn production is expected to increase significantly during the next few years. Thus, there is reason to believe that, on the average, the relationship of feed prices to pork prices will continue to be favorable to hog producers during the coming decade.

The Development Bank of the Philippines (DBP) is now putting emphasis on cattle and hog production. Its piggery financing plan aims at financing at least fifteen large scale piggery projects a year for the next ten years. The total cost of this ten year program is estimated to be ₱18,000,000. The 150 projects are expected to produce 73,437 tons of pork within the 10 year period and to increase the foundation herds from 7,950 head of swine to 176,690 head. Estimated projections, based on DANR data shown in Table 42, suggest that the hog population may increase by as much as 5 percent per year, on the average, between 1967 and 1980, with hog numbers reaching nearly 10 million head by 1980.

Cattle

The rate of growth of the cattle population has been

TABLE 41

LIVESTOCK AND POULTRY ON FARMS BY REGIONS IN 1966

	Region	Carabao		Cattle		Horses		Hogs		Goats		Sheep		Chickens		Ducks		Geese		Turkeys	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
		(thousands)																			
II	Ilocos	146.8	4.0	69.6	4.4	17.1	6.7	158.1	2.3	34.3	5.6	0.3	15.0	664.0	1.0	25.0	1.2	0.2	0.3	0.3	0.2
III	Cagayan Valley	380.3	10.5	46.3	2.9	12.1	4.7	598.9	8.7	14.4	2.3	0.2	10.0	3,501.5	5.1	47.8	2.3	4.8	6.8	6.0	4.7
IV	Central Luzon	401.2	11.0	223.8	14.2	18.6	7.2	571.3	8.3	110.0	17.8	0.9	45.0	7,795.5	11.4	124.5	6.1	10.2	14.5	18.5	14.6
V	Southern Tagalog	260.2	7.2	174.1	11.0	52.6	20.5	791.2	11.4	61.4	10.0	a/	-	9,673.6	14.2	391.6	19.3	5.1	7.3	23.4	18.4
VI	Bicol	402.9	11.1	135.8	8.6	33.0	12.8	717.3	10.4	31.3	5.1	0.1	5.0	3,965.3	5.8	331.7	16.3	17.0	24.2	3.3	2.6
VII	Western Visayas	558.6	15.4	146.8	9.3	22.6	8.8	657.5	9.5	109.3	17.7	0.3	15.0	10,869.9	16.0	98.7	4.9	14.4	20.5	31.6	24.9
VIII	Eastern Visayas	485.0	13.3	139.5	8.8	34.6	13.5	1,445.4	20.9	21.5	3.5	0.2	10.0	9,564.1	14.0	144.4	7.1	1.9	2.7	13.6	10.7
IX	S & W Mindanao	710.5	19.6	503.9	31.8	49.4	19.2	553.3	8.0	189.4	30.7	a/	-	16,180.7	23.8	738.5	36.3	8.2	11.7	24.5	19.3
X	N & E Mindanao	287.5	7.9	142.7	9.0	16.9	6.6	1,421.1	20.5	44.8	7.3	a/	-	5,907.1	8.7	131.3	6.5	8.4	12.0	5.9	4.6
	TOTAL	3,633.0	100.0	1,582.5	100.0	256.9	100.0	6,914.1	100.0	616.4	100.0	2.0	100.0	68,121.7	100.0	2,033.5	100.0	70.2	100.0	127.1	100.0

a/ Less than 100 heads
Source: DANR (Department of Agriculture and Natural Resources)

fairly rapid during the past ten years. Cattle numbers increased by over 80 percent between 1956 and 1966. Even so, the per capita consumption of beef in the Philippines is estimated to be less than 15 percent of the per capita pork consumption. Total beef production during 1966 has been estimated at 46,000 metric tons from 342,000 head of cattle with an average carcass weight of 135 kilos. [2/] According to the Bureau of Census and Statistics, 1966 beef exports totaled 1,733 metric tons or only 3 percent of total beef consumption.

Over 31 percent of the cattle population in 1966 was located in the Southern and Western Mindanao region and around 14 percent in Central Luzon (Table 41).

The Development Bank of the Philippines (DBP) has undertaken to finance a minimum of 20,000 hectares of ranch land a year, each year over a 13 year period at a cost of ₱3.62 million per year. This 260,000 hectares of pasture and ranch land is expected to provide for an additional 429,000 head of cattle. An estimated 176,040 head or 40,806 metric tons of beef will be available for slaughter from these herds over this time period.

The Bureau of Animal Industry (BAI) is conducting several programs to upgrade the existing stock through importation of breeding animals, artificial insemination, establishment and maintenance of breeding stations, and livestock disposal.

The increased attention being given the cattle industry by government and private agencies and the increased

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[2/] Livestock Report, U. S. Agricultural Attache's Office, Manila, August 25, 1967, p. 3.

TABLE 42

CATTLE, CHICKEN, AND HOG POPULATION IN THE PHILIPPINES, 1950 THROUGH 1966, WITH PROJECTIONS FOR 1970, 1975, AND 1980

Year	Cattle	Chickens	Hogs
	(Thousands)		
1950	698	25,235	3,899
1951	715	28,055	4,159
1952	739	32,090	4,443
1953	762	37,392	4,794
1954	763	39,805	4,868
1955	806	44,584	5,289
1956	861	49,776	5,750
1957	883	51,839	6,026
1958	896	52,409	6,084
1959	933	56,142	6,574
1960	1,110	52,335	6,573
1961	1,055	49,984	6,191
1962	1,094	51,354	6,726
1963	1,197	48,624	6,234
1964	1,383	51,648	6,616
1965	1,560	56,929	6,938
1966	1,582	68,122	6,914
1970a/	1,640	70,094	8,008
1975a/	1,905	79,782	8,941
1980a/	2,171	89,470	9,874
"a"b/	524.7	29,404.0	4,089.7
"b"c/	53.1	1,937.6	186.6

a/ Figures based on straight line least square regressions using DANR data for 1950 to 1966 except where otherwise noted, the regression line is N=a+bX where N is the number of livestock in thousands and X is year with 1950=1, 1970=21, and 1980=31.

b/ Regression line intercept.

c/ Regression line slope.

production of feed grains will allow moderate gains in the production of cattle over the next few years. The expected average rate of growth in the cattle population is 3 percent per year, and cattle numbers are expected to exceed 2 million by 1980 (Table 42).

Chickens

Chickens and other poultry are raised by most Filipino farmers. About 95 percent of the chickens raised are of the native variety and the remaining 5 percent are hybrid chickens used primarily for egg production. Almost a quarter of the birds are located in the Southern and Western Mindanao region and another quarter are produced around Manila in the Central Luzon-Southern Tagalog regions (Table 41).

Chickens are the second largest source of meat in the Philippines. On the average, 50 percent of the chicken population is slaughtered yearly for meat purposes. [3/] The chicken population is expected to increase approximately 30 percent between 1966 and 1980 with the number of chickens reaching nearly 90 million (Table 42).

Other Livestock and Poultry

Other livestock and poultry in the Philippines will continue to be of some, but still relatively minor, importance. They will not be major factors in feed consumption.

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[3/] U. S. Department of Agriculture, "The Philippines Long Term Projection of Supply and Demand for Selected Agriculture Products," Regional Analysis Division-Economic Research Service, ERS-Foreign-34, 1961, p. 127.

CHAPTER IX

RICE

Introduction

Planting and Harvesting Rice

- Drying and Threshing
- Rice Storage

Marketing Rice

- Methods of Selling Rice
- Pricing of Rice

The Location of Rice Production

- Rice Yields

Projected Rice Production

- Additions to Rice Land
- Land Planted to New Rice Varieties
- Land Planted to Rice by Regions
- Yield Estimates
- Projections of Rice Production

Projected Rice Consumption

- Rice Consumed as Food
- Other Uses
- Total Rice Consumption

CHAPTER IX

RICE

Introduction

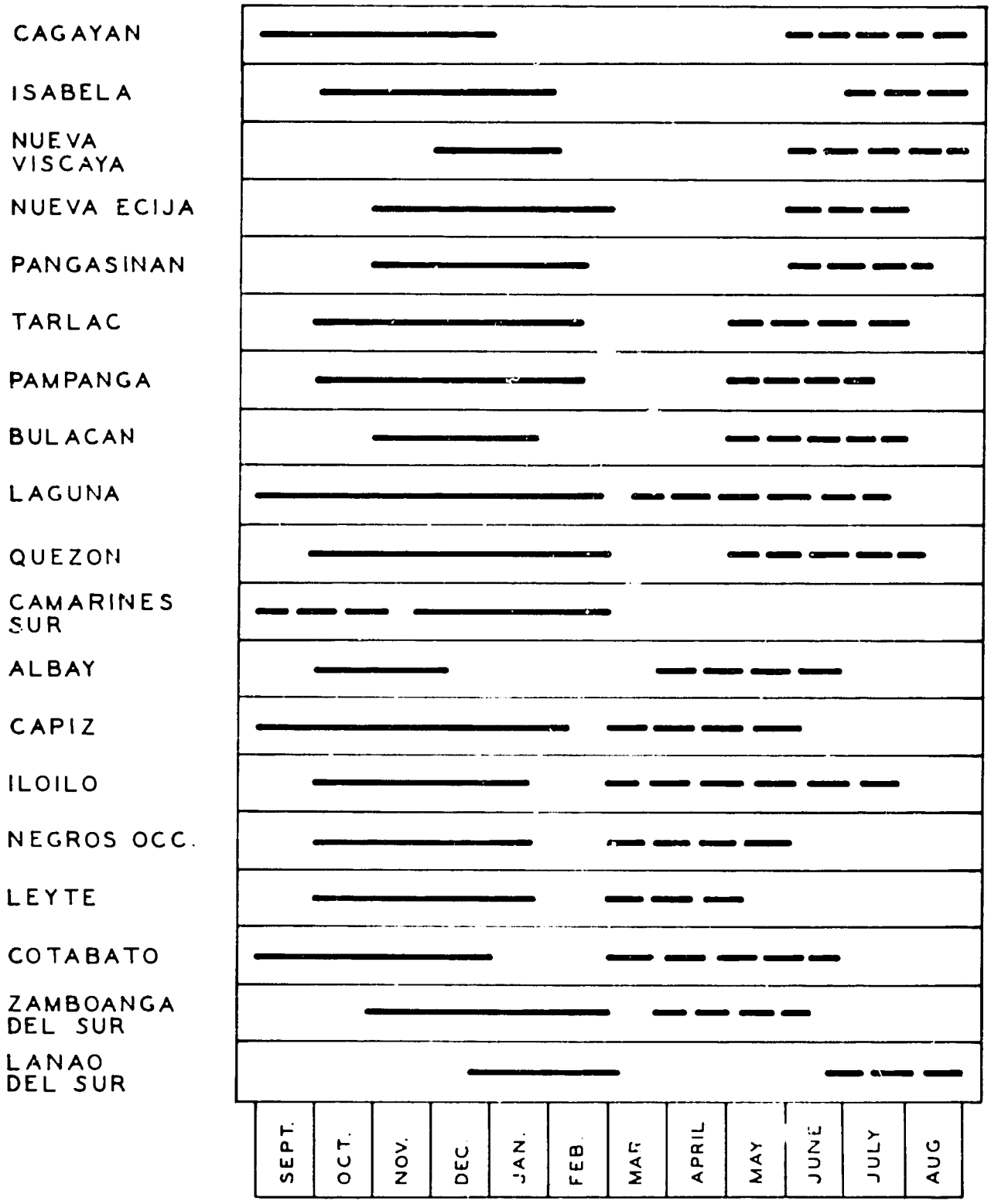
Rice is by far the most important food crop grown in the Philippines. Palay (rough rice) is produced in every region of the country and rice is the staple food for nearly 80 percent of the population. Nearly 39 percent of the cultivated land of the Philippines was planted to palay in 1965.

Over 1,041,000 palay farms were enumerated in the 1960 agricultural census of the Philippines. The average palay farm was approximately 3.0 hectares in size. About 20 percent of the palay farms were larger than 10 hectares while less than 2 percent were larger than 200 hectares. The average size of palay farms varies considerably from one region to another. In general, the smallest farms are found in the Cagayan Valley, Central Luzon, and Southern Tagalog.

A large number of different rice varieties are grown in the Philippines. The Rice and Corn Administration (RCA), for example, lists 30 different varieties in its buying price bulletins. Rice is usually classified as Fancy, Special, or Ordinary depending on the variety, condition of the grain, percentage of grains broken, and freedom from foreign matter. Wagwag, Milfor, and Milagrosa are frequently classified as Fancy. Varieties such as BE-3, BPI-76, Raminad, IR-8, Intan, and Elon-Elon are usually classified as Special. The Peta and Macan varieties are generally considered to be Ordinary varieties.

FIGURE X

HARVESTING AND MARKETING SEASONS IN MAJOR RICE GROWING PROVINCES (1ST AND 2ND CROP LOWLAND)



LEGEND

FIRST CROP ———

SECOND CROP — — — —

Planting and Harvesting Rice

The planting and cultivation practices used to grow rice vary somewhat from region to region and depend to a large extent on whether the rice grown is upland rice, lowland irrigated rice, or lowland non-irrigated rice.

Farmers raising upland rice use kaingin methods of cultivation. They clear a hillside of trees and vegetation and plant rice on the land for several years until yields become too low to justify further cropping. Only one crop of upland rice is obtained each year. Yields of upland rice are very low and cultivation practices result in substantial amounts of soil erosion in many areas.

Farmers raising lowland rice are often able to obtain two crops during the year. The amount of land planted to a second crop is usually about 20 percent of the lowland area planted to the first rice crop. The relative importance of second crop lowland rice will increase, however, as more land is irrigated. The first crop is usually planted from June to September and harvested from October to January. A second crop may be planted from November to February and harvested during the March to June period with April being the largest second crop harvest season in most regions. The exact timing of the planting varies considerably between regions and from year to year within any given region depending on the rainfall. A harvesting calendar for rice grown in several of the main production areas is presented as Figure X. The percentage distribution of palay harvest by month is found in Table 43.

The introduction of new high yielding varieties will tend to reduce the seasonal variation in the amount of rice harvested. Varieties such as IR-8 can be harvested in about 125 days. It is therefore possible to obtain about two and a half crops a year on irrigated land using these

TABLE 43

MONTHLY PERCENTAGE DISTRIBUTION OF PALAY HARVEST, BY REGION, PHILIPPINES, 1955 1956[a]

Month	II Ilocos	III Cagayan	IV Central Luzon	V Southern Tagalog	VI Bicol	VII Western Visayas	VIII Eastern Visayas	IX S & W Mindanao	X N & E Mindanao	Philippines
January	7.36	16.40	19.82	10.76	15.43	18.70	1.38	13.50	7.67	14.44
February	2.85	20.00	4.19	7.47	9.05	1.75	0.16	0.28	6.58	5.30
March	--	13.70	3.58	3.83	7.34	2.55	8.59	0.14	6.91	4.87
April	0.57	12.67	1.14	3.88	11.78	1.01	39.11	0.33	14.15	7.54
May	1.43	--	1.16	2.88	3.87	--	2,84	0.59	4.92	1.57
June	0.86	3.32	0.63	6.67	1.86	--	4.32	1.61	1.78	2.05
July	--	7.54	0.64	0.91	7.51	--	--	3.51	4.83	2.17
August	1.46	5.42	0.96	8.04	2.68	0.45	--	18.55	10.82	4.53
September	6.82	6.84	0.73	13.68	5.21	6.99	0.82	6.05	13.86	5.59
October	12.74	2.42	7.72	16.95	13.66	32.06	31.87	17.23	7.19	15.57
November	22.51	5.46	29.18	8.63	15.76	19.05	9.74	27.92	7.69	18.71
December	43.40	6.23	30.25	16.30	6.85	17.44	1.17	10.28	13.60	17.66
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

a/ Crop year.

Source: Dimas A. Maulit, "Palay Harvest and the Supply of Rice" Philippine Statistician, June 1957, 96.

early maturing varieties. Some farmers are now beginning to use continuous planting and harvesting systems. Thus, the percentage distribution of palay harvest by month presented in Table 43 will slowly change during the 1970's. Less storage space will be needed to store a given volume of rice production as the seasonal variations in production are reduced.

Drying and Threshing

The extent to which palay is allowed to dry in the field before being threshed varies from region to region. Farmers in the Nueva Ecija area allow much of the palay to be dried in the field while in Leyte more of the palay is allowed to dry in the farmer's home after threshing. Sun-drying of palay on bamboo mats is common practice throughout the Philippines.

Threshing of palay, either before or after drying, is performed in several different ways. Most of the palay is threshed by machine in the Nueva Ecija area while the basic procedure in threshing in Iloilo is to tramp the grain out of the straw by human feet. Pounding the rice and use of work animals to tramp out the grain are common practices in Cagayan.

The use of threshing machines makes it possible to clean the rice at the time of harvest. Hand winnowing is commonly used throughout the Philippines. In Iloilo, the practice of pouring palay from an elevated platform and allowing the wind to carry the empty grains and chaff away is commonly used. Present cleaning practices of farmers frequently result in excessive amounts of empty hulls, chaff and dirt left with the palay.

Rice Storage

Most rice farmers store some palay on the farm. Several different forms of storage structures are commonly used for palay. The particular form of storage used depends partly on the size of the farm of operation and the region in which the farm is located. Bamboo baskets, located under the farm houses, are used throughout the Philippines and are especially common in Central Luzon. Farmers in the Cagayan Valley region make more use of small granaries or bodegas while much of the palay in Iloilo and Leyte is stored in homes. Rice stored in granaries and homes may be stored loose, in boxes, or burlap bags.

Landlords deposit most of their rice in commercial warehouses usually on an outright sales basis. Thus, very little of the landlord's share of the crop is stored on the farm for any length of time.

Marketing Rice

There are substantial differences between regions with respect to the percentage of palay marketed. Official estimates of the DANR indicate that 30 to 40 percent of the total production of palay is "market directed" in surplus regions (Table 44). The introduction of high yielding varieties will tend to increase the percentage of total palay production marketed.

Methods of Selling Rice

Local rice mills and local palay wholesalers are the most important market outlets for both farmers and landlords. The general practice in paying for palay is cash on delivery. A large proportion of the rice marketed by farmers is sold on an advance sales basis. The rice

TABLE 44

DISPOSITION OF PALAY OUTPUT IN THE PHILIPPINES[a/], BY REGION, 1960-1961

	Philippines	II Ilocos	III Cagayan	IV Central Luzon	V Southern Tagalog	VI Bicol	VII Western Visayas	VIII Eastern Visayas	IX S & W Mindanao	X N & E Mindanao
					(percent)					
Market Directed[b/]	46.6	24.2	48.1	58.8	37.7	43.7	39.1	30.0	57.8	33.1
1. Rent and/or Share to Landlord[c/]	21.2	18.2	13.6	35.4	24.3	26.3	22.7	14.5	9.6	6.0
2. Debt Service of Operators[d/]	7.7	0.6	8.0	14.6	3.3	7.8	3.9	4.4	4.9	1.6
3. Sold and/or given exchange for services	17.7	5.4	26.5	8.8	10.1	9.6	12.5	11.1	43.3	25.5
Non-Market Directed	53.4	75.8	51.9	41.2	62.3	56.3	60.9	70.0	42.2	66.9
4. Payments for harvesting, threshing and hauling	13.8	6.3	9.8	13.4	16.6	11.3	14.4	12.9	4.2	16.3
5. Seed	3.6	3.8	3.8	2.9	5.4	4.8	3.5	4.1	2.6	4.3
Feed	1.3	0.3	0.8	1.8	1.1	1.4	1.0	1.1	0.4	0.8
Waste	--	--	--	--	--	--	--	--	--	--
Other	1.0	0.1	0.9	0.3	0.1	0.5	1.9	0.4	3.0	1.1
6. Consumed by farm family	33.7	65.3	36.6	22.8	39.1	38.3	--	51.5	32.0	44.4
7. Gross Addition to Inventory	--	--	--	--	--	--	40.1	--	--	--
Total Output	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

a/ DANR (Regions).
b/ Marketed surplus.
c/ Surveys not available as to market direction of items 1 and 4, but experience indicates major portion goes in direction as indicated, with that portion of items 1 and 4 going in opposite direction probably balance.
d/ Refers to repayment of loans and interest to: landlord, and other creditors.
Source: Crop and Livestock Survey, DANR, BAE.

wholesaler or miller advances credit to the farmer and is repaid in palay at harvest time. The marketing of palay by landlords is less often related to credit advances and thus most of the palay marketed by landlords is on an outright sales basis. The introduction of high yielding varieties will tend to reduce the farmers' dependence on credit from palay dealers. They will still be forced to sell their palay shorthly after harvest, however, unless on-farm storage facilities are expanded.

Most of the palay marketed by farmers is sold within a month after harvest. Landlords will often hold their share of the rice for 2 to 3 months before marketing it.

Pricing of Rice

Palay buyers and local rice dealers are the main source of price information for both farmers and landlords. Transient rice dealers, retailers, and government agencies also provide farmers with some price information.

Palay is usually sold by the cavan (46 kg.). The actual price received depends on the type of rice, the estimated moisture content, how clean the rice is and whether the farmer or wholesaler transports the rice to the warehouse. Palay prices are usually lowest at harvest time. Thus, most farmers could receive high prices for their palay if they were able to hold it for a longer period of time.

The Location of Rice Production

Central Luzon is the most important rice producing region in the Philippines at the present time and is expected to become a relatively more important rice producing region in the future. During the 1965-66 season, nearly

twice as much rice was produced in Central Luzon as in any other region. The research team expects that about one-third of the nation's total production of palay will come from the Central Luzon region in 1980. Over 10 percent of the palay produced in the Philippines in 1965-66 came from Southern and Western Mindanao. The relative importance of this region is expected to increase during the next 15 years. According to the research team's estimates, the Southern and Western Mindanao region will be producing over 15 percent of the nation's palay by 1980. A detailed breakdown of palay production by region for the 1956-66 period is given in Table 45 while the area planted (or harvested) is presented in Table 46.

Rice Yields

The average yield of palay for the Philippines was 1.3 metric tons per hectare in 1965-66, one of the lowest in the world. Average yields for palay have increased at the rate of less than 1 percent per year during the past 10 years. Since 1960, the average yield of palay has been highest in Central Luzon and lowest in the Eastern Visayas and Northern and Eastern Mindanao. Average yields have decreased throughout the past 10 years in the Eastern Visayas, Northern and Eastern Mindanao and Southern and Western Mindanao. Reductions in yields in Southern and Western Mindanao are partially explained by the rapid expansion in the amount of land devoted to rice in the region. Average yields have been falling as less productive land has been brought under cultivation. Palay yields by region for the 1956-66 period are presented in Table 47.

The government's present rice program is directed towards those provinces with the largest amount of irrigated land. As a result, the differences between regions with respect to yields will widen during the next 15 years. By 1980, for example, the research team expects the average

TABLE 45

PALAY PRODUCTION, BY REGION, PHILIPPINES, 1956 - 1966

	Region	1955-56[a]	1956-57[a]	1957-58[a]	1958-59[a]	1959-60[a]	1960-61[a]	1961-62[a]	1962-63[a]	1963-64[b]	1964-65[b]	1965-66[b]
		(metric tons)										
II	Ilocos	108,565	121,986	102,697	115,922	104,355	141,311	139,556	150,453	145,464	183,513	209,774
III	Cagayan Valley	292,169	295,662	268,689	333,075	475,249	193,528	448,619	402,129	328,311	415,238	537,429
IV	Central Luzon	945,762	967,211	986,938	1,162,917	948,192	858,670	922,459	949,502	923,005	927,814	1,030,572
V	Southern Tagalog	355,243	370,959	388,082	484,369	400,224	381,777	484,294	451,356	458,460	475,957	553,265
VI	Bicol	227,022	228,311	244,597	295,165	265,491	325,651	318,742	382,272	369,424	365,890	550,673
VII	Western Visayas	485,553	485,389	417,325	489,314	609,472	523,318	498,957	481,782	471,293	491,022	412,496
VIII	Eastern Visayas	303,996	309,842	211,399	270,356	386,507	336,600	253,638	258,082	233,836	252,432	224,316
IX	S & W Mindanao	321,460	329,463	404,232	322,429	316,696	497,381	629,472	700,242	710,994	699,147	431,618
X	N & E Mindanao	228,914	236,718	179,133	210,514	232,873	146,011	213,850	199,962	201,610	201,317	122,492
	Philippines	3,268,684	3,345,541	3,263,092	3,684,061	3,739,059	3,704,310	3,909,587	3,975,780	3,842,397	3,992,360	4,072,635

Note: Assumption: 1 cavan 57 kilos.

Source: a Crop and Livestock Statistics, DANR.
b Mimeographed Sheets on Rice Production, Area and Yield in the Philippines, DANR.
Unpublished papers of Leon A. Mears, School of Economics, University of the Philippines, Diliman, Quezon City.

TABLE 46

PALAY AREA PLANTED (OR HARVESTED) BY REGION, PHILIPPINES, 1955 - 1966

	Region	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66
						(hectares)						
II	Ilocos	95,500	102,400	105,503	115,420	104,760	110,630	104,620	119,920	120,080	139,220	144,710
III	Cagayan Valley	234,010	236,960	249,780	260,880	344,380	453,890	370,620	313,250	289,710	341,180	354,390
IV	Central Luzon	588,800	602,170	698,180	769,630	682,520	545,730	513,550	520,760	495,700	510,240	519,310
V	Southern Tagalog	320,080	337,120	399,210	480,030	377,080	363,850	406,860	398,410	414,080	433,280	467,290
VI	Bicol	253,870	260,810	293,230	302,990	239,650	317,800	290,540	310,530	305,370	299,260	366,910
VII	Western Visayas	547,450	531,070	508,870	569,840	569,080	414,310	400,960	415,950	396,310	383,680	377,870
VIII	Eastern Visayas	294,980	285,400	294,680	323,580	428,980	377,940	283,770	289,760	271,600	299,470	323,480
IX	S & W Mindanao	238,060	242,600	389,610	309,440	307,950	441,200	553,780	549,390	565,500	671,740	410,130
X	S & E Mindanao	169,730	169,590	215,010	198,100	252,070	172,830	254,490	243,350	226,100	218,600	145,090
	Philippines	2,742,480	2,768,120	3,151,073	3,329,410	3,306,470	3,198,180	3,179,190	3,161,320	3,087,450	3,299,670	3,109,180

Source: DANR and unpublished papers of Leon A. Mears, School of Economics, University of the Philippines, Diliman, Quezon City.

TABLE 47

PALAY YIELD, BY REGION, PHILIPPINES, 1955 - 1966

	Region	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66
						(MT per hectare)						
II	Ilocos	1.14	1.19	0.97	1.00	0.99	1.20	1.33	1.25	1.20	1.26	1.45
III	Cagayan Valley	1.25	1.25	1.08	1.28	1.38	1.09	1.21	1.28	1.13	1.21	1.52
IV	Central Luzon	1.61	1.61	1.41	1.51	1.39	1.57	1.79	1.82	1.86	1.82	1.98
V	Southern Tagalog	1.11	1.10	0.97	1.01	1.06	1.05	1.19	1.13	1.10	1.09	1.18
VI	Bicol	0.89	0.86	0.83	0.97	1.04	1.02	1.10	1.23	1.21	1.22	1.50
VII	Western Visayas	0.88	0.91	0.82	0.86	1.07	1.26	1.24	1.16	1.19	1.28	1.09
VIII	Eastern Visayas	1.03	1.08	0.72	0.84	0.90	0.89	0.89	0.89	0.85	0.87	0.70
IX	S & W Mindanao	1.35	1.36	1.03	1.04	1.03	1.13	1.14	1.27	1.26	1.04	1.05
X	N & E Mindanao	1.35	1.39	0.83	1.60	0.92	0.84	0.84	0.82	0.89	0.92	0.85
	Philippines	1.19	1.21	1.02	1.12	1.13	1.16	1.23	1.25	1.24	1.25	1.31

Note: Assumption: 1 Cavan 44 Kilos.
Source: DANR and unpublished papers of Leon A. Mears, School of Economics, University of the Philippines, Diliman, Quezon City.

yield of palay in Central Luzon to be over 3 times as large as the average yield in Northern and Eastern Mindanao.

Projected Rice Production

Rice production in the Philippines in 1980 is estimated to be almost double the 4.1 million metric tons produced in 1967. The introduction and rapid acceptance of new high yielding rice varieties in the Philippines in addition to other technological advances makes past trends inadequate as a basis for projecting future rice production. The projections presented in this section are based on a set of assumptions about the amount of new land used to produce rice, the amount of irrigated land planted to the new varieties, the average yields of the old and new varieties, and the amount of land used to produce a second crop of rice. In general, these assumptions are based on the research team's belief that the Philippine government will be reasonably successful in meeting its irrigation targets and its targets for the introduction of the new rice varieties.

The attainment of the production targets will be possible only if rice farmers are able to obtain the credit needed to purchase the additional inputs required to obtain high yields from the new varieties and are able to sell their palay at a reasonable price. Credit appears to be available at the present time. As production increases, it will become more difficult for the Philippine government to assure farmers reasonable prices for their rice. Plans should be made now to alter the government's price support program to meet anticipated changes in future production.

Additions to Rice Land

Increases in land area devoted to rice can come from

two sources: (1) new land brought under cultivation and (2) increases in second crop planting. The rate of increase of new land being brought under cultivation in the late forties and early fifties was approximately equal to the rate of population growth. The rate of expansion of new land brought under cultivation began to decline in the late 1950's however. The research team projections are based on the assumption that the geographic area allocated to rice cultivation will increase at the rate of only one and one-half percent per year. [1/] The research team further assumes that three-fifths of this increment will be used to produce upland rice while the remaining two-fifths will be planted to a first season crop of lowland rice. It is estimated that 15 percent of the new land used to produce lowland rice will also produce a second crop of unirrigated rice. Increases in the irrigated land planted to rice are assumed to come from unirrigated lands previously planted to rice.

For the purpose of this study, it is assumed that additional irrigated lands amounting to 410,000 hectares will be added by 1975, and that another 410,000 will be added by 1980. These assumptions seem reasonable in light of past achievement records of the National Irrigation Administration and the Irrigation Service Unit. [2/] Official RCPCC targets for additions to irrigated land are higher than this but the actual additions to irrigated land have usually been considerably short of the targets in the past.

[1/] This assumption is based on Dr. Frank Golay's study entitled Philippines: Cereal Requirements in 1990: Introduction and Summary, Cornell University, commissioned by Agency for International Development, 1967, pp. 65-66.

[2/] For a more detailed discussion see Chapter 4 of Philippines: Cereal Requirements in 1990: Introduction and Summary.

Land Planted to New Rice Varieties

The RCPCC has programmed the following areas as their targets for the amount of land to be planted to new rice varieties:

1968-69	450,000 hectares
1969-70	470,000 hectares

Since it seems unlikely that these targets will be achieved in their entirety, it is assumed that the following areas will be planted to the high yielding varieties:

1968-69	350,000 hectares
1969-70	450,000 hectares
1975	600,000 hectares
1980	700,000 hectares

Land Planted to Rice by Regions

To obtain regional estimates of the amount of land planted to rice, 3-year averages of the areas (1964-1966) producing first and second crop, irrigated and non-irrigated, rice and upland rice were used.

The estimated increments in land area, irrigated land, etc., were added to the national figures for the crop year 1965-66 to obtain the estimated land in rice production in 1968/69, 1970, 1975 and 1980. The regional averages obtained for the 1964-66 period were used as a basis for estimating the projected regional distribution of the land areas devoted to rice. The resulting projections of land area are presented in Table 48.

In earlier trials, attempts were made to estimate regional areas with the use of past trends and the percentage distribution based on the 1960 census. This approach could

TABLE 48

PROJECTED RICE LAND AREA, BY REGIONS, PHILIPPINES, 1970, 1975, AND 1980

	Region and Province	Effective Crop Area	Total Land Area	First Crop Lowland			Second Crop Lowland			Upland & Kaingin
				Sub-Total	Irrigated	Non-Irrigated	Sub-Total	Irrigated	Non-Irrigated	
				(hectares)						
1969/70										
	Philippines	3,399,683	2,847,000	2,103,000	802,069	1,300,931	552,683	320,435	232,248	744,000
II	Ilocos	141,328	132,886	117,261	53,402	63,859	8,442	8,082	360	15,625
III	Cagayan Valley	372,218	305,409	284,354	105,276	179,078	66,829	44,774	22,035	21,055
IV	Central Luzon	567,628	182,576	437,687	236,620	231,067	83,052	61,614	21,438	16,889
V	Southern Tagalog	479,474	413,434	228,848	88,256	140,592	66,040	43,548	22,492	184,586
VI	Bicol	352,733	259,723	147,156	82,094	65,062	93,010	56,287	36,723	112,567
VII	Western Visayas	409,791	346,463	256,514	50,120	206,394	33,328	16,912	46,416	89,949
VIII	Eastern Visayas	313,602	227,908	186,392	42,547	143,845	85,694	32,702	52,992	41,516
IX	Southern and Western Mindanao	546,551	481,952	308,228	121,397	186,831	64,599	47,673	16,926	173,724
X	Northern and Eastern Mindanao	216,358	194,649	106,450	22,357	84,203	21,709	8,843	12,866	88,089
1975										
	Philippines	3,791,786	3,067,000	2,191,000	1,031,076	1,159,924	724,786	446,369	278,117	876,000
II	Ilocos	146,701	136,538	118,141	55,693	62,448	10,163	9,344	819	18,397
III	Cagayan Valley	450,196	335,544	310,754	167,108	143,646	114,652	78,857	35,795	24,790
IV	Central Luzon	677,191	522,773	307,287	332,803	170,084	154,418	114,632	39,786	19,886
V	Southern Tagalog	522,552	448,824	231,488	99,706	131,782	73,728	49,860	23,868	217,336
VI	Bicol	384,372	283,215	150,676	93,548	57,132	101,157	62,599	38,558	132,539
VII	Western Visayas	429,619	363,302	257,394	54,700	202,694	66,317	19,437	46,875	105,908
VIII	Eastern Visayas	323,568	236,153	187,272	44,837	142,435	87,415	33,964	53,451	48,881
IX	Southern and Western Visayas	620,403	528,613	324,068	155,748	168,320	91,790	66,608	25,182	204,545
X	Northern and Eastern Mindanao	237,189	212,038	108,320	26,937	81,383	25,151	11,368	13,783	103,718
1980										
	Philippines	4,246,055	3,304,000	2,286,000	1,170,476	1,115,524	942,055	604,069	337,986	1,018,000
II	Ilcos	152,806	140,470	119,091	57,087	62,004	12,336	10,918	1,418	21,379
III	Cagayan Valley	543,174	368,063	339,254	204,746	134,508	175,111	121,355	53,756	28,809
IV	Central Luzon	808,468	563,995	540,887	391,351	149,536	244,473	180,740	63,733	23,108
V	Southern Tagalog	570,298	486,904	234,338	106,676	127,662	83,394	57,730	25,664	252,566
VI	Bicol	419,921	308,499	154,476	100,514	53,962	111,422	70,469	40,953	154,023
VII	Western Visayas	451,479	381,420	258,344	57,488	200,856	70,059	22,585	47,474	123,076
VIII	Eastern Visayas	334,615	245,027	188,222	46,231	141,991	89,588	35,538	54,050	56,805
IX	Southern and Western Mindanao	705,047	578,871	341,168	176,658	164,510	126,176	90,218	35,958	237,705
X	Northern and Eastern Mindanao	260,247	230,751	110,220	29,725	80,495	29,496	14,516	14,980	120,531

not be used, however, because by 1980 some regions would have had land areas planted to rice in excess of the cultivated land or irrigated areas in excess of the areas which could possibly be cultivated.

After the area estimates were made, projections of production were obtained using the following assumptions:

(1) There are regional differences in the yields of first crop lowland (irrigated and non-irrigated), second crop lowland (irrigated and non-irrigated) and upland rice.

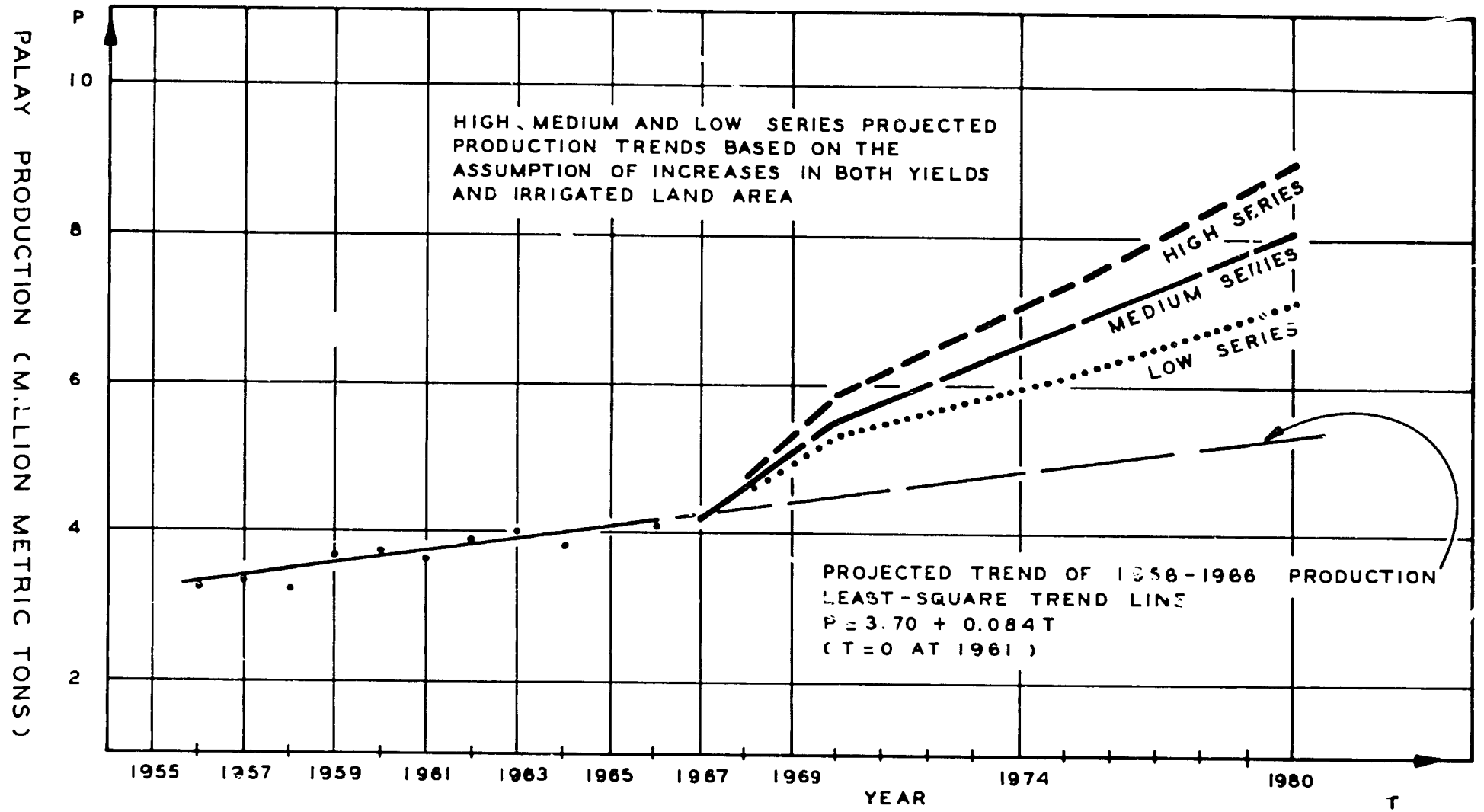
(2) That rice yields would be higher in the RCPCC target areas.

Yield Estimates

The average yields were obtained for crop year 1964-66 and used to estimate the regional production by type of crop in the non-target areas in the low and in the medium series. For the high series in the non-target areas, the yield per hectare was increased by two cavans for each of the chosen years: 1970, 1975 and 1980, so that by 1980, the average yields were 6 cavans per hectare greater than the 1964-66 average yields. For the target areas, the following yield factors were used for irrigated palay: 1969-70, 90 cavans per hectare; 1975, 100 cavans per hectare; and 1980, 110 cavans per hectare. For the low series, the factors used were for irrigated palay: 90 cavans per hectare in 1970 and 1975, and 95 cavans per hectare in 1980. It is possible that even in the non-target areas yields might go up after 1970 as a consequence of the diffusion of improved practices. If so, total production will be even higher than estimated here.

FIGURE XI

PRODUCTION OF PALAY, PHILIPPINES, 1956-1966
WITH PROJECTIONS TO 1980



Projections of Rice Production

A trend line based on past production figures for 1956 to 1966 was computed by means of least squares. Projections of palay production based on the trend line and the three sets of assumptions about yields are presented in Table 49 and shown graphically in Figure XI. Using the medium series, production is estimated to increase from about 4.1 million metric tons of palay in 1967 to over 5.5 million metric tons in 1970 and to about 8.1 million metric tons in 1980. This represents an average annual rate of increase of about 4.6 percent between 1970 and 1980. These are substantial increases in production but the Philippines is entirely capable of producing 8.1 million metric tons of palay by 1980 if present irrigation programs are carried out and farmers with irrigated land can be induced to plant high yielding rice varieties.

A detailed breakdown of the medium projections for the Philippines are given in Table 50 and the projections of regional production are presented in Tables 51, 52 and 53. In 1970, approximately 42 percent of the total production of palay will come from the first crop on irrigated land. By 1980, over 50 percent of palay production will come from first crop irrigated land.

Central Luzon will continue to be the most important rice producing region in the Philippines. According to the medium projections, about 29 percent of total palay production will come from the Central Luzon region in 1970 and about 33 percent in 1980.

Southern and Western Mindanao will continue to be the nation's second most important rice producing region throughout the 1970's. However, the relative importance of Southern and Western Mindanao will remain about constant during the 1970's.

TABLE 49

ESTIMATED PRODUCTION OF PALAY IN THE PHILIPPINES, PROJECTED FOR YEARS 1970, 1975, AND 1980

Production Estimate	1970	1975	1980
	(Metric Tons)		
Trend	4,465,000	4,876,000	5,296,000
Low	5,345,348	6,166,963	7,204,887
Medium	5,533,558	6,795,198	8,105,919
High	5,856,398	7,396,218	9,035,584

TABLE 50

SOURCE OF PALAY ESTIMATED PRODUCTION[a] IN THE PHILIPPINES, PROJECTED FOR YEARS 1970, 1975, AND 1980

Source of Production	1970	1975	1980
	(1,000 Metric Tons)		
1st Crop Irrigated	2,323	3,322	4,139
1st Crop Non-Irrigated	1,664	1,460	1,395
2nd Crop Irrigated	762	1,082	1,473
2nd Crop Non-Irrigated	198	241	297
Upland and Kaingin	584	688	799
TOTAL PRODUCTION	5,533	6,795	8,105

a/ Based on medium production series for palay.

TABLE 51

PROJECTED CONSUMPTION, PRODUCTION, AND SURPLUS OR DEFICIT OF PALAY, BY REGION, PHILIPPINES, 1970

	Region	Per Capita Consumption of Palay	Food Consumption[a]	Seed, Feed and Waste[b]	Total Consumption	1970 Production[c]	Surplus or Deficit
		(kilos)	(metric tons)				
I	Manila	114.2	355,048	--	355,048	--	-355,048
II	Ilocos	186.3	357,137	15,631	372,768	195,389	-177,379
III	Cagayan Valley	127.2	192,962	54,955	247,917	686,939	439,022
IV	Central Luzon	201.8	987,609	128,694	1,116,303	1,608,678	492,375
V	Southern Tagalog	146.7	686,996	50,364	737,360	629,549	-107,811
VI	Bicol	185.5	607,698	42,040	649,738	525,507	-124,231
VII	Western Visayas	114.1	543,116	44,024	587,140	550,307	- 36,833
VIII	Eastern Visayas	71.2	331,436	21,105	352,541	263,810	- 88,731
IX	Southern and Western Mindanao	71.2	392,526	69,250	461,776	865,621	403,845
X	Northern and Eastern Mindanao	71.2	219,011	16,620	235,631	207,758	- 27,873
	Philippines						
	Palay		4,673,539	442,683	5,116,222	5,533,558	417,336

a/ Food consumption figures are based on the medium population projections.
b/ Seed, Feed and Waste are assumed to be equal to 8 percent of regional productions.
c/ Production figures are based on the medium projection values.

TABLE 52

PROJECTED CONSUMPTION, PRODUCTION, AND SURPLUS OR DEFICIT OF PALAY, BY REGION, PHILIPPINES, 1975

	Region	Per Capita Consumption of Palay	Food Consumption[a/]	Seed, Feed and Waste[b/]	Total Consumption	1975 Production[c/]	Surplus or Deficit
		(kilos)	(metric tons)				
I	Manila	114.2	425,966	--	425,966	--	-425,966
II	Ilocos	186.3	409,301	16,749	426,050	209,359	-216,691
III	Cagayan Valley	127.2	231,377	75,420	306,797	942,754	635,957
IV	Central Luzon	201.8	1,139,968	171,216	1,311,184	2,140,200	829,016
V	Southern Tagalog	146.7	818,733	57,820	876,553	722,749	-153,804
VI	Bicol	185.5	713,990	48,166	762,156	602,071	-160,035
VII	Western Visayas	114.1	611,233	48,221	659,454	602,763	- 56,691
VIII	Eastern Visayas	71.2	362,194	22,327	384,521	279,086	-105,435
IX	Southern and Western Mindanao	71.2	492,562	85,049	577,611	1,063,117	485,506
X	Northern and Eastern Mindanao	71.2	262,158	18,648	280,806	233,099	- 47,707
	Philippines						
	Palay		5,467,482	543,616	6,011,098	6,795,198	734,100

a/ Food consumption figures are based on the medium population projections.
b/ Seed, Feed and Waste are assumed to be equal to 8 percent of regional productions.
c/ Production figures are based on the medium projection values.

TABLE 53

PROJECTED CONSUMPTION, PRODUCTION, AND SURPLUS OR DEFICIT OF PALAY, BY REGION, PHILIPPINES, 1980

	Region	Per Capita Consumption of Palay	Food Consumption[a]	Seed, Feed and Waste[b]	Total Consumption	1980 Production[c]	Surplus or Deficit
		(kilos)	(metric tons)				
I	Manila	114.2	508,418	--	508,418	--	-508,418
II	Ilocos	186.3	470,035	17,900	487,935	223,754	-264,181
III	Cagayan Valley	127.2	276,151	96,282	372,433	1,203,529	831,096
IV	Central Luzon	201.8	1,317,350	216,128	1,533,478	2,701,599	1,168,121
V	Southern Tagalog	146.7	972,181	65,447	1,037,628	818,083	-219,545
VI	Bicol	185.5	837,903	54,470	892,373	680,883	-211,490
VII	Western Visayas	114.1	690,533	52,475	743,008	655,943	- 87,065
VIII	Eastern Visayas	71.2	398,008	23,557	421,565	294,466	-127,099
IX	Southern and Western Mindanao	71.2	609,116	101,453	710,569	1,268,163	557,594
X	Northern and Eastern Mindanao	71.2	312,354	20,760	333,114	259,499	- 73,615
	Philippines						
	Palay		6,392,049	648,472	7,040,521	8,105,919	1,065,398

a/ Food consumption figures are based on the medium population projections.
b/ Seed, Feed and Waste are assumed to be equal to 8 percent of regional productions.
c/ Production figures are based on the medium projection values.

The Cagayan Valley will be the third most important rice producing region in the Philippines during the 1970's. The amount of rice available for "export" from the Cagayan Valley, however, is expected to exceed the surplus rice in the Southern and Western Mindanao region because of the smaller population in the Cagayan Valley region.

Projected Rice Consumption

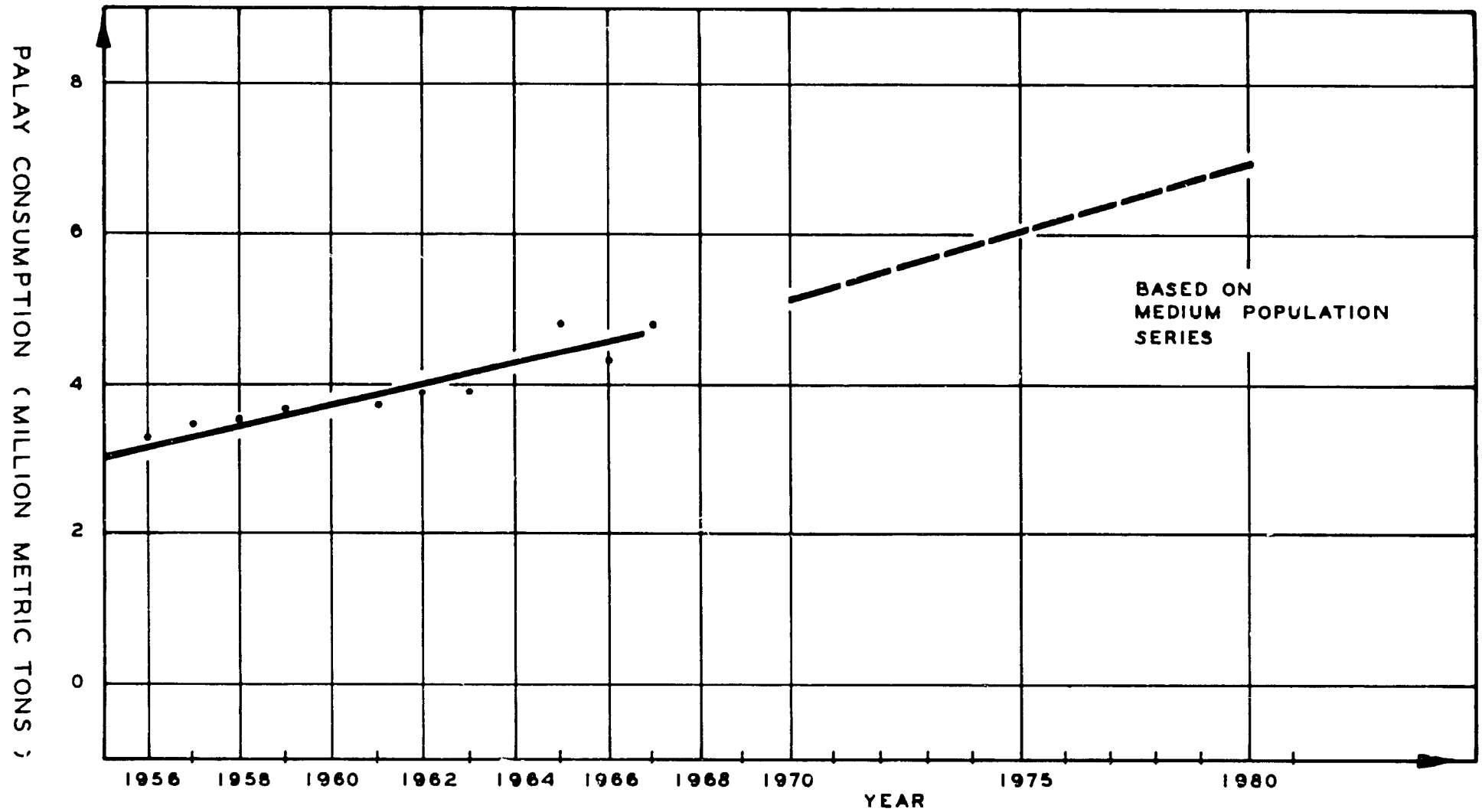
Almost all of the rice produced in the Philippines is used for human consumption. The average Filipino consumes about 83 kilos of rice (125 kilos of palay) each year. There are substantial regional differences in the per capita consumption of rice, however. In general, rice consumption is highest in the rural areas in the Northern part of the Philippines and lowest in the Southern regions. According to the research team's estimates, the average consumer in Central Luzon, for example, consumes over 150 kilos of rice a year while the average consumer in the Eastern Visayas consumes less than 55 kilos.

Rice Consumed as Food

The average per capita consumption of rice in the Philippines is expected to remain constant throughout 1970 to 1980. Taking into account surveys of rice consumption made by the Food and Nutrition Research Center and other available data, the resulting estimates of per capita consumption of palay are presented in the first column of Table 51. On the average, per capita consumption of grains is expected to be near the level recommended by the Food and Nutrition Research Center. Thus, in those regions where per capita consumption of rice is relatively low, the per capita consumption of corn is expected to be relatively high.

FIGURE XII

CONSUMPTION OF PALAY, PHILIPPINES, 1956-1967
WITH PROJECTIONS TO 1980



Other Uses

The amount of rice used as seed, feed or wasted is estimated to be about 8 percent of the total production in each region. The total consumption of palay is the sum of the amount used for food consumption and the amount used as seed, feed and wasted. The research team's observations indicate that official estimates of the amount of rice wasted are unrealistic. The official DANR data on the disposition of palay output in the Philippines found in Table 44 indicate that there is no palay wasted and that only 5.9 percent of the palay went to seed, feed or industrial uses. The team believes that the 8 percent figure used for seed, feed and waste is a conservative one. The palay losses due to present rice drying practices alone appear to be at least 3 percent of total production. Total losses appear to be close to 12 percent. These losses are discussed in detail later. If present losses could be reduced by only one percent, there would be an extra 55,000 metric tons of rice available for human consumption in 1970.

Total Rice Consumption

According to the research team's estimates, total consumption of palay will be 5,116,222 metric tons in 1970; 6,011,098 metric tons in 1975, and 7,040,521 metric tons in 1980. These estimates are presented in Figure XII along with past consumption data. These consumption figures are based on the medium population estimates and the medium projections of rice production. The projected consumption of palay in 1970 is slightly higher than the RCPCC's estimated "palay consumption requirement" of 5,090,184 metric tons. The 26,038 metric ton difference is primarily due to this team's assumptions as to the amount of rice used for seed, feed or wasted.

If the government's rice production program is reasonably successful, the Philippines will have a surplus of 417,336 metric tons of palay in 1970 and a surplus of 1,065,398 metric tons of palay by 1980. This surplus will come from the Cagayan Valley, Central Luzon, and Southern and Western Mindanao. A detailed breakdown of regional consumption, surpluses and deficits is presented in Tables 51, 52 and 53.

* * *

CHAPTER X

CORN

Introduction

- Uses of Corn
- Corn Yields
- Regions for Expansion of Corn Production

Planting and Harvesting Corn

Marketing Corn

The Location of Corn Production

Projected Production of Corn

Projected Corn Consumption

- Total Corn Consumption

CHAPTER X

CORN

Introduction

Corn is the second most important food crop produced in the Philippines, accounting for approximately 23 percent of the total food crop area harvested in 1965. It is the staple food of over 20 percent of the population. The nutritional content of rice and corn are nearly equal; however, the price of corn is usually considerably lower than that of rice. Thus, in terms of calories or protein purchased per peso, corn is usually a better food buy than rice.

Both yellow and white varieties of flint corn are grown on a large scale in the Philippines. In 1959, 62 percent of the total corn production was composed of white flint, 22 percent of yellow flint and 16 percent of other types of corn such as popcorn and sweet corn. Dent corn is not commonly grown in the Philippines because of its susceptibility to weevils and its low percentage yields of corn grits. White flint corn is used primarily for human consumption and yellow flint as feed for livestock and poultry.

The production of white and yellow flint corn varies considerably among the different regions. White flint accounts for a much larger proportion of corn production than yellow flint in the Cagayan Valley, Bicol, Eastern Visayas, and Mindanao where corn is a more important food in the average diet. Yellow flint is more important than white flint in Central Luzon, Ilocos and Southern Tagalog. Corn is not a very important food in the diet of most families in these regions, thus much of the corn grown in these regions is used as livestock feed. The proportion of corn

production by variety and region are shown in Table 54.

Uses of Corn

The proportion of total corn production used as food has declined slowly in recent years while the proportion used for livestock feeds and industrial uses has tended to increase. Official estimates suggest that approximately 60 percent of total corn production is used as food and 30 percent as livestock feed. The remaining 10 percent of total production goes to industrial uses, seeds, and waste. Field observations suggest that the percentage of corn lost in the marketing system far exceeds the official estimates of approximately 2 percent. The actual amount of corn lost to insects, rodents, and spoilage appears to average 10 to 12 percent of total production.

Corn Yields

Low productivity is the major problem of the corn industry in the Philippines. Production has never been expanded by definite concentration on intensive scientific farming. Corn yields in the Philippines are among the lowest in the world.

The average yield in 1967 was 661 kilograms per hectare. This is approximately one-half the average rice yield per hectare. Thus, on the average, a hectare of rice provides the nation's population with nearly twice as much protein and calories as a hectare of corn. This is a point to be considered in developing a government program designed to promote corn production at the expense of rice production.

There is a great deal of variation in corn yields between regions. The regional variations in yields for the 1957 and 1967 period are shown in Table 55. In general,

TABLE 54

DISTRIBUTION OF CORN PRODUCTION BY VARIETY AND REGION IN 1959

Region		Flint Corn White	Flint Corn Yellow	Others
II	Ilocos	28	72	--
III	Cagayan Valley	62	17	21
IV	Central Luzon	17	67	16
V	Southern Tagalog	18	80	2
VI	Bicol	86	9	5
VII	Western Visayas	37	51	12
VIII	Eastern Visayas	92	5	3
IX	S & W Mindanao	58	10	32
X	N & E Mindanao	77	19	4
	TOTAL FOR PHILIPPINES	62	22	16

Source: BAE, DANR, unpublished data, reported by Recto, A.E., "Price and Market Relationships for Corn in the Philippines," thesis, University of the Philippines, 1965.

corn yields are lowest in the Visayas and highest in Mindanao.

Regions for Expansion of Corn Production

The Southwest Mindanao region is a relatively new corn production region. The total area planted to corn in Southwest Mindanao increased from 82,360 hectares in 1947 to over 900,000 hectares in 1967. Most of the land area planted to corn in this region is located in the provinces of Davao and Cotabato. The relatively high corn yields in these provinces are likely to decline in the future unless present cultivation practices which promote soil erosion are changed. The research team expects the Southwest Mindanao region to become an increasingly important corn raising area, however.

TABLE 55

CORN YIELDS, BY REGION, PHILIPPINES, 1956 - 1967

Region	1955-56[a]	1956-57[a]	1957-58[a]	1958-59[a]	1959-60[b]	1960-61[b]	1961-62[b]	1962-63[b]	1963-64[c]	1964-65[c]	1965-66[c]	1966-67[c]
	(kgs. per hectare)											
II Ilocos	564	558	694	539	516	471	310	337	408	401	504	524
III Cagayan Valley	895	858	722	657	676	913	758	945	951	955	638	513
IV Central Luzon	519	538	485	529	677	490	445	507	529	513	549	536
V Southern Tagalog	548	439	350	576	673	406	667	739	811	847	546	547
VI Bicol	458	498	557	479	627	474	479	584	608	627	679	673
VII Western Visayas	463	381	364	395	499	538	570	548	540	572	485	456
VIII Eastern Visayas	391	348	346	301	522	515	456	419	422	408	455	445
IX S & W Mindanao	709	712	916	567	770	641	775	793	827	821	820	838
X N & E Mindanao	521	509	670	614	695	613	650	653	714	699	700	735
Philippines	541	501	617	482	631	591	627	653	681	683	655	661

Note: Assumption: 1 cavan 57 kilos.
Source: a/ Crop and Livestock Statistics, DANR.
b/ Mimeographed Sheets on Corn Production, Area and Yield in the Philippines, DANR.
Recto, A.E., Price and Market Relationships for Corn in the Philippines, (thesis), University of the Philippines, Diliman, Quezon City, 1965.
c/ op. cit., DANR.

The land area planted to corn can be increased more readily in this region than in most other parts of the country with the exception of Cagayan Valley. Farmers can grow up to three crops of corn in many parts of Southwest Mindanao. Furthermore, the area is not as subject to typhoons which make corn raising a more risky business in the northern part of the Philippines.

Planting and Harvesting Corn

Corn farmers in the Philippines usually plant at least two crops a year. The flint type varieties grow mature in about 95 to 110 days. Ordinarily, the wet season crop is planted from April to June, reaching maturity in late August and October. A second crop is planted in September or October, to be harvested in December or January. A third crop, if grown, is planted from January to March and harvested from April to June. A third crop is only possible in regions exhibiting moderate year-round rainfall or an extremely brief dry period. Thus a third crop is usually not grown in the Cagayan Valley region but can be grown in many parts of Southeast Mindanao. A planting and harvesting calendar for 12 major corn producing regions is presented in Figure XIII.

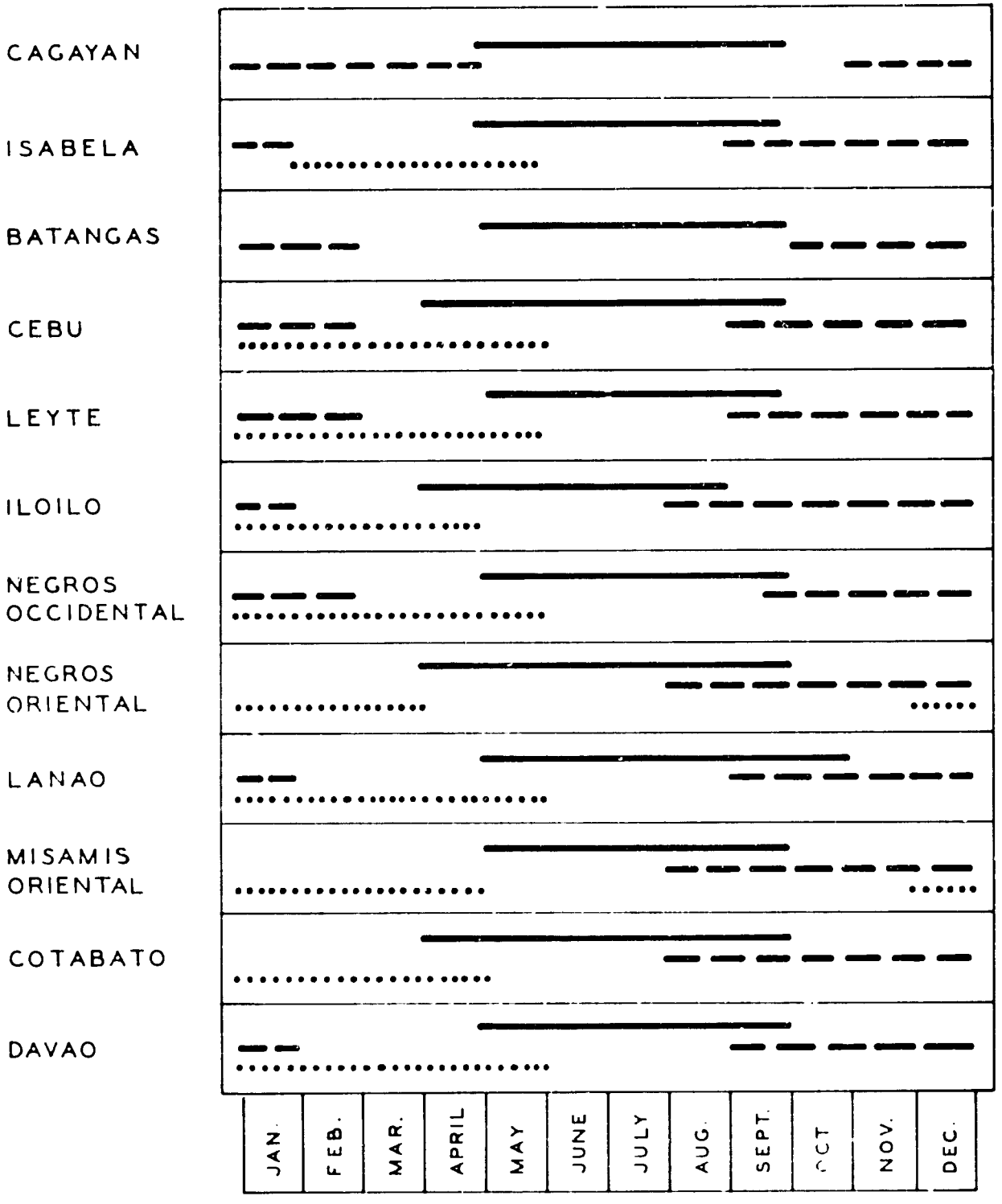
Harvesting practices vary somewhat between regions. Farmers in Davao and Cotabato frequently husk their corn in the field and sell it as soon as possible after maturity. There is very little drying of corn on the stalks or on the farm in these areas. As a result, much of the corn marketed in these areas has a high moisture content. In the Isabela area, on the other hand, many farmers harvest corn in husks and may hold their corn for 1 to 3 months before marketing it.

Marketing Corn

The percentage of total corn production marketed has increased steadily since 1955. DANR estimates indicate that

FIGURE XIII

PLANTING AND HARVESTING CALENDAR OF 12 MAJOR CORN PRODUCING PROVINCES, PHILIPPINES



LEGEND:

WET SEASON ——— DRY SEASON — — — THIRD CROP .....

SOURCE A. E. RECTO, "PRICE AND MARKET RELATIONSHIPS FOR CORN IN THE PHILIPPINES, 1965."

only 25.5 percent of total corn production was "market directed" in 1955 while 47.6 percent was "market directed" in 1965. A detailed breakdown of the disposition of corn output in 1955, 1960 and 1965 is presented in Table 56.

There are apparently substantial differences between provinces with respect to the percentage of corn marketed. Farmers in the Davao and Cotabato area reportedly sell as much as 75 to 80 percent of their corn and later buy back corn grits. Farmers in Cebu, on the other hand, sell a much smaller percentage of their total corn production.

Private wholesalers are the most important market outlet for corn farmers. Most of the corn marketed is shelled. Agent buyers and small wholesalers with trucks usually purchase the farmer's corn at the farm or roadside and then deliver it to corn millers in nearby urban areas. These buyers are the main source of price information available to the farmer. The small buyer agents purchase corn from the farmer in sacks, cans, baskets, or by the cart. The larger corn wholesalers usually purchase corn in sacks at a certain price per kilo depending on the estimated moisture content of the corn.

The general price level for corn in the Visayas and Mindanao depends to a large extent on the supply and demand for corn in Cebu. The large corn wholesalers in Davao and Cotabato, for example, tend to set their prices on the basis of what they can sell their corn for in Cebu. The price of corn varies considerably more from day to day and week to week than does the price of rice. The large corn dealers in Mindanao keep up to date on price movements in Cebu by means of radio or cable.

The Location of Corn Production

Corn production has increased most rapidly in the Southern and Western Mindanao region with Southern Tagalog and

TABLE 56

DISPOSITION OF CORN OUTPUT IN THE PHILIPPINES, 1954/55, 1959/60 AND 1964/65

Year	1954/55	1959/60	1964/65
	(Percentage of Production)		
Market Directed	25.5	40.4	47.6
1. Rent and/or share of landlord	9.1	7.5	8.8
2. Debt service of operators	1.3	1.4	2.5
3. Sold and/or given in exchange for services	15.1	31.5	36.3
Non-Market Directed	74.5	59.6	52.4
4. Payments for harvesting, threshing and hauling	6.2	9.4	10.0
5. Seed, feed, waste, and other uses	11.2	12.9	10.1
6. Consumed by farm family	44.4	29.1	26.9
7. Gross addition to inventory	12.7	8.2	5.4
TOTAL OUTPUT	100.0	100.0	100.0

Source: Crop and Livestock Surveys, DANR, BAE.
Unpublished papers of Leon A. Mears, Visiting Professor, School of Economics, University of the Philippines, Diliman, Quezon City, Table 6-C.

Bicol showing the second and third most rapid rate of growth in production. Although the rate of growth in corn production has been very rapid in the Southern Tagalog and Bicol regions, these two regions together accounted for only 9 percent of total corn production in 1965 while the Southern and Western Mindanao region accounted for nearly 50 percent of the nation's corn production.

The team has presented the DANR data because it is the government's official data on corn production; however, our projections of future production are not based entirely on the DANR data. Although the DANR data may tend to underestimate total corn production, it appears to provide the best available guidelines of the regional changes taking place in corn production.

Corn production has increased most rapidly in the Southern and Western Mindanao region with Southern Tagalog and Bicol showing the second and third most rapid rate of growth in production. Although the rate of growth in corn production has been very rapid in the Southern Tagalog and Bicol regions, these two regions together accounted for only 9 percent of total corn production in 1965 while the Southern and Western Mindanao region accounted for nearly 50 percent of the nation's corn production. Regional changes which have occurred with respect to corn production, area, and yield since 1946 are presented in Table 57.

In absolute terms, the Eastern Visayas region was the most important corn production region in the Philippines until 1956 when it was replaced by Southern and Western Mindanao. At the present time; Southern and Western Mindanao, the Eastern Visayas, Northern and Eastern Mindanao, and the Cagayan Valley are the most important corn producing regions in the Philippines. A detailed breakdown of area planted to corn and corn production for the 1956 to 1967 period is presented in Tables 58 and 59.

TABLE 57

CHANGES IN CORN PRODUCTION, AREA AND YIELD IN THE PHILIPPINES BY REGION, 1946-47-1951-52 AND 1965-66

	Region	Production			Area			Yield		
		1946/47	1951/52	1965/66	1946/47	1951/52	1965/66	1946/47	1951/52	1965/66
		(Index: 1938/39 = 100)								
II	Ilocos	77	77	51	105	68	82	74	113	63
III	Cagayan Valley	104	160	118	113	160	136	92	101	87
IV	Central Luzon	83	100	129	95	95	142	90	106	92
V	Southern Tagalog	146	268	498	127	186	295	114	144	169
VI	Bicol	137	270	489	118	127	344	116	212	142
VII	Western Visayas	100	182	203	105	142	174	95	127	116
VIII	Eastern Visayas	80	88	82	88	98	119	91	89	69
IX	S & W Mindanao	89	224	784	107	192	908	83	116	86
X	N & E Mindanao	67	116	170	65	87	163	102	133	104
	Philippines	88	141	232	94	121	220	93	117	105

Source: Ona, P. L. and Hsieh, S. C., "Output Growth of Rice and Corn in the Philippines", published in Growth of Output in the Philippines, papers of the IRRI Conference, December 9-10, 1966. Los Banos, Laguna, Philippines.

TABLE 58

CORN AREA, BY REGION, PHILIPPINES 1956 - 1967

Year	Ilocos II	Cagayan Valley III	Central Luzon IV	Southern Tagalog V	Bicol VI	Western Visayas VII	Eastern Visayas VIII	S & W Mindanao IX	N & E Mindanao X	Philippines
					(1000 Hectares)					
1955-56	20.9	109.2	98.5	90.3	64.5	303.9	442.3	371.2	173.8	1,674.6
1956-57	18.7	110.3	95.6	114.6	60.5	357.9	484.1	370.6	174.4	1,786.7
1957-58	18.2	128.8	41.5	63.4	121.5	161.9	243.0	364.1	238.1	1,380.5
1958-59	24.9	172.1	59.7	84.8	171.2	310.3	504.9	553.9	225.2	2,107.0
1959-60	21.2	128.6	71.5	80.5	76.3	302.7	446.2	449.3	269.3	1,845.8
1960-61	24.0	151.1	77.4	107.7	86.8	337.8	345.0	586.9	328.6	2,043.3
1961-62	20.5	133.7	71.5	105.2	77.5	272.2	421.7	630.3	283.5	2,016.1
1962-63	19.3	126.3	63.7	96.9	72.4	257.4	393.6	685.1	234.9	1,949.6
1963-64	16.6	118.1	57.1	94.9	68.9	272.2	366.7	687.5	215.6	1,897.6
1964-65	16.5	121.8	58.5	93.3	70.2	275.2	367.6	709.1	210.5	1,922.7
1965-66	16.6	102.6	55.0	118.6	87.1	250.9	419.7	832.2	223.7	2,106.4
1966-67	15.8	106.0	58.2	117.9	88.0	229.7	415.0	901.4	234.7	2,166.7
Percent of Total Area in 1965-66	0.79	4.87	2.61	5.63	4.14	11.91	19.93	39.50	10.61	100.00

Sources: 1955-56 to 1958-59 DANR, Crop and Livestock Statistics.
1959-60 to 1962-63 DANR, Mimeographed Sheets on Corn Production, Area and Yield in the Philippines.
Recto, A. E., Price and Market Relationships for Corn in the Philippines, Thesis, University of the Philippines, 1965.
1963-64 to 1966-67 DANR, Mimeographed Sheets on Corn Production, Area and Yield in the Philippines.

TABLE [illegible]

CORN PRODUCTION, BY REGION, PHILIPPINES, 1955-56-1966-67

	Region	1955-56[a]	1956-57[a]	1957-58[a]	1958-59[a]	1959-60[b]	1960-61[b]	1961-62[b]	1962-63[c]	1963-64[c]	1964-65[c]	1965-66[c]	1966-67[c]
		(metric tons)											
II	Ilocos	11,793	10,431	12,642	13,123	10,955	11,320	6,373	6,504	6,754	6,623	8,373	8,259
III	Cagayan Valley	97,749	94,648	93,001	113,122	86,936	137,991	100,987	119,352	112,301	116,342	65,430	54,230
IV	Central Luzon	51,134	51,522	20,155	31,584	48,410	37,950	31,745	31,732	30,238	30,067	30,204	31,270
V	Southern Tagalog	49,476	50,348	22,184	18,838	54,121	43,730	70,129	71,546	76,950	79,053	64,769	64,781
VI	Bicol	29,577	30,141	67,693	82,017	47,845	41,137	36,883	42,294	41,895	44,032	59,217	59,223
VII	Western Visayas	140,602	137,221	58,972	122,482	150,902	181,853	154,997	141,041	147,054	157,525	121,775	104,213
VIII	Eastern Visayas	173,137	168,298	84,172	151,933	233,010	177,811	191,912	164,998	154,949	149,973	191,275	185,102
IX	S & W Mindanao	263,271	264,018	333,575	314,132	345,836	376,365	488,932	543,102	568,757	581,879	682,125	755,244
X	N & E Mindanao	90,636	88,755	159,674	138,379	187,256	201,398	184,311	152,281	153,809	147,185	156,659	172,647
	Philippines	907,375	895,382	852,068	1,015,910	1,165,271	1,209,555	1,266,269	1,272,850	1,292,707	1,312,679	1,379,827	1,434,969

Source: a. Crop and Livestock Statistics, DANR.
b. Mimeographed Sheets on Corn Production, Area and Yield in the Philippines, DANR.
Beeto, A. V., Price and Market Relationships for Corn in the Philippines, (thesis), University of the Philippines, Diliman, Quezon City, 1965.
c. op. cit., DANR.

The land area in corn increased in all regions except Ilocos between 1946 and 1966. In general, land area in corn has increased more rapidly than yields. For the Philippines as a whole it appears likely that a good deal of marginal land has been going into corn production in recent years. This is part of the reason why average corn yields have shown very small increases since 1960. Continuous planting of corn without proper fertilization, poor seed selection, and crude cultivation practices are still the main reason for low average corn yields, however.

Projected Production of Corn

The projections of corn production for 1970, 1975 and 1980 are based on the assumption that some type of government program to increase corn production will be underway by 1969. The research team believes that any such government program will be patterned on the present rice production program with emphasis on increasing corn yields rather than the total amount of land planted to corn. It is, therefore, assumed that 200,000 hectares of land will be used in the production of high yielding corn varieties in 1970; 360,000 hectares in 1975, and 540,000 hectares in 1980. The regional breakdown of projected areas in old and new varieties as well as expected yields is presented in Table 60. The regional projections of corn production for 1970, 1975 and 1980 are presented in Table 61 and were obtained by multiplying the expected yields times the projected land area in each region.

The research team expects total corn production in the Philippines to be 1,700,202 metric tons in 1970; 1,955,183 metric tons in 1975, and 2,262,700 metric tons in 1980 (see Table 61). These total production figures are about 5 percent higher than total production projections based on the linear trend of corn production from 1956 to 1967. Even so, the team considers the projections of total corn production to be rather conservative projections. A graph of

TABLE 60

PROJECTED CORN AREA, BY REGION, PHILIPPINES, 1970, 1975, AND 1980

	Region	1970 Area in Old Varieties	1970 Area in New Varieties	1970 Total Area	1975 Area in Old Varieties	1975 Area in New Varieties	1975 Total Area	1980 Area in Old Varieties	1980 Area in New Varieties	1980 Total Area	Assumed Yields[a] Old Varieties (MT Ha.)	Assumed Yields[a] New Varieties (MT Ha.)
II	Ilocos	13,749	--	13,749	14,811	--	14,811	16,189	--	16,189	0.468	--
III	Cagayan Valley	125,189	12,000	137,189	126,515	21,600	148,115	129,492	32,400	161,892	0.682	1.557
IV	Central Luzon	53,287	4,000	57,287	54,515	7,200	61,715	56,655	10,800	67,455	0.535	1.390
V	Southern Tagalog	106,575	8,000	114,575	109,029	14,400	123,429	113,310	21,600	134,910	0.622	1.477
VI	Bicol	69,911	8,000	77,911	69,532	14,400	83,932	70,139	21,600	91,739	0.663	1.518
VII	Western Visayas	250,979	24,000	274,979	253,029	43,200	296,229	258,984	64,800	323,784	0.469	1.324
VIII	Eastern Visayas	383,926	40,000	423,926	384,687	72,000	456,687	391,167	108,000	499,167	0.422	1.277
IX	Southern and Western Mindanao	882,425	80,000	962,425	892,804	144,000	1,036,804	917,244	216,000	1,133,244	0.927	1.683
X	Northern and Eastern Mindanao	205,149	24,000	229,149	203,658	43,200	246,858	205,020	64,800	269,820	0.745	1.600
	Philippines	2,091,490	200,000	2,291,490	2,108,580	360,000	2,468,580	2,158,200	540,000	2,698,200	0.669	1.519

a/ Assumed yields of old varieties is equal to average yields during the period 1965-68.

the projected total corn production is presented in Figure XIV.

Projected Corn Consumption

The regional estimates of per capita food consumption of corn are based on the nutrition surveys which have been made plus available information on average total consumption of rice and other grains. In general terms, with the exception of the Cagayan Valley, per capita consumption of corn is low in the Northern regions and high in the Southern regions.

The actual consumption of corn in any given region depends to some extent on the price of corn relative to the price of rice. There is reason to believe, for example, that per capita consumption of corn increased in Manila and Central Luzon in 1967. This increased corn consumption appears to be due to the increase in the price of rice relative to corn rather than a basic change in consumption habits, however. The estimated per capita food consumption figures for corn are found in the first column of Tables 62, 63 and 64. The food consumption figures for Manila and the Eastern Visayas include the estimated amount of corn used in corn starch and corn oil production in these areas.

Estimates of the amount of corn used as animal feed are based on the assumption that approximately 30 percent of total corn production would continue to be used as livestock feed. The regional allocations of this 30 percent of total corn production were based on weighted averages of the projected number of chickens, cattle and hogs in the various regions. The weights were based on the relative amounts of corn consumed by chickens, cattle and hogs.

It was estimated that approximately 7 percent of total production in each region would be used as seed or wasted.

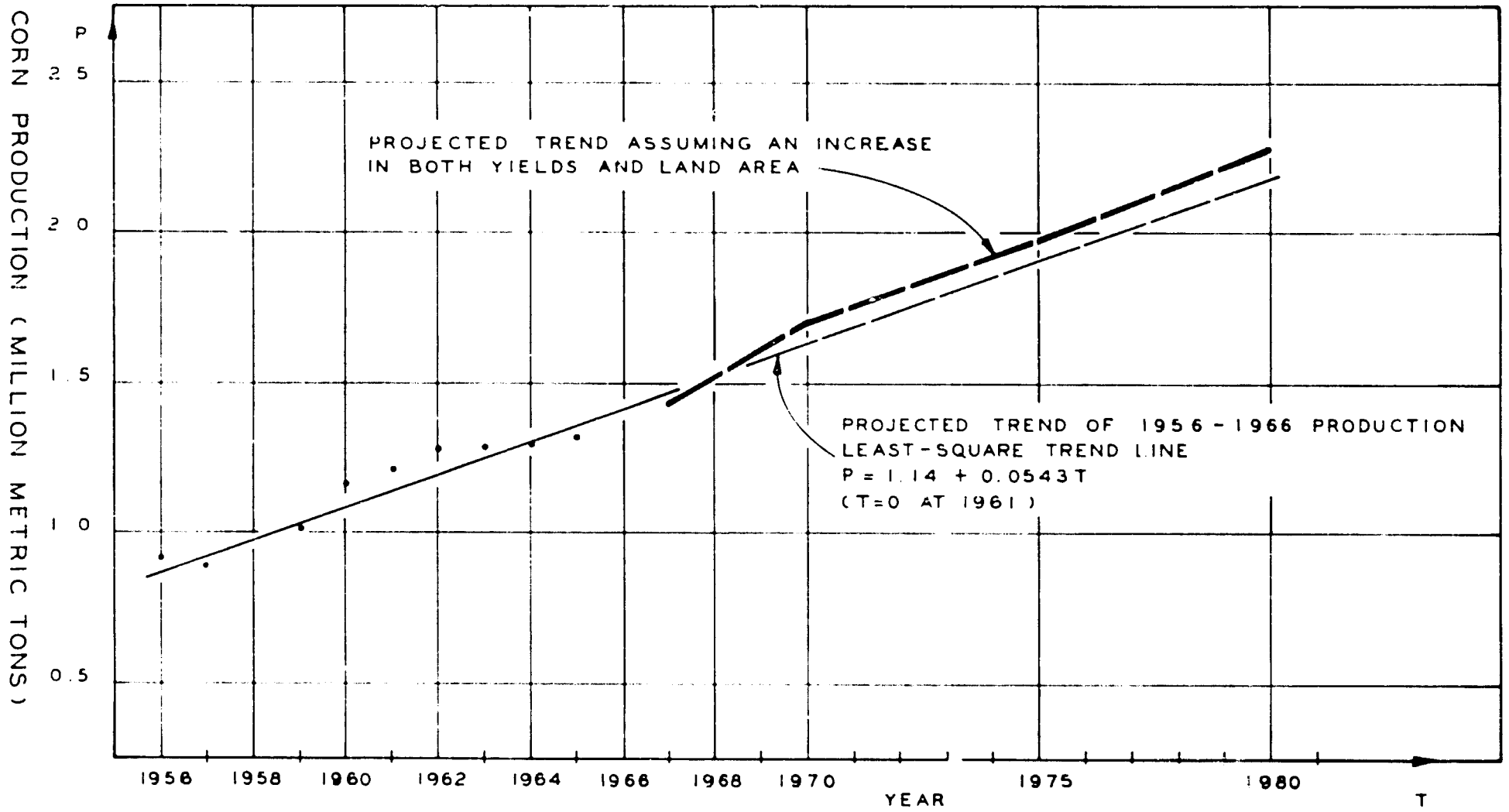
TABLE 61

PROJECTED CORN PRODUCTION, BY REGIONS, PHILIPPINES 1970, 1975 AND 1980

	Regions	1970	1975	1980
		(Metric Tons)		
II	Ilocos	6,434	6,931	7,576
III	Cagayan Valley	104,067	119,525	138,159
IV	Central Luzon	34,049	39,153	45,299
V	Southern Tagalog	78,090	89,069	102,364
VI	Bicol	58,488	67,951	79,283
VII	Western Visayas	149,515	175,900	207,294
VIII	Eastern Visayas	213,254	254,451	303,173
IX	S & W Mindanao	864,941	981,220	1,122,981
X	N & E Mindanao	191,364	220,983	256,571
	Philippines	1,700,202	1,955,183	2,262,700

FIGURE XIV

PRODUCTION OF CORN (SHELLED), PHILIPPINES, 1956-1966
WITH PROJECTIONS TO 1980



This is somewhat larger than past official estimates of the percentage of total production going to seed and waste and reflects the team belief that the actual percentage of corn wasted is higher than 2 percent.

Total Corn Consumption

Total consumption of corn is expected to be 1.6 million metric tons in 1970; 1.9 million metric tons in 1975 and 2.2 million metric tons in 1980. Corn available for export to other countries is projected at 76,867 metric tons in 1970; 63,105 metric tons in 1975, and 75,527 metric tons in 1980 (see Tables 62, 63 and 64). This "exportable surplus" could be easily absorbed by proposed corn starch and corn oil factories and/or the expansion of the feed industry. The projected exportable surplus in 1980 is less than 4 percent of total corn production.

Although net exports of corn are projected at 75,527 in 1980, a successful government program to increase corn production could well result in gross exports to other countries of several hundred thousand metric tons of corn. The basic reason for this is that the largest increases in production are likely to come for the Eastern Visayas and Mindanao areas which traditionally have produced much more white flint corn than yellow corn. Thus, it may well prove profitable to export white flint to other countries from Davao and Cotabato while at the same time importing some yellow corn at Cebu and Manila to be used in livestock feeds. Any government actions to restrict such movements of corn would only tend to reduce the farm price of corn and increase the price of livestock feed.

The Cagayan Valley, the Western Visayas, and Southern and Western Mindanao will be the only regions with surplus corn during the 1970 to 1980 period. Over 80 percent of

TABLE 62

PROJECTED CONSUMPTION, PRODUCTION, AND SURPLUS OR DEFICIT OF CORN, BY REGION, PHILIPPINES, 1970

	Region	Estimated Per Capita Food Consumption of Corn	Food Consumption	Animal Feed	Seed & Waste	Total Consumption	Production	Surplus or Deficit
		(kilos)	(metric tons)					
I	Manila	14.6	52,391[a]	--	--	52,391	--	(52,391)
II	Ilocos	5.5	10,543	8,734	450	19,727	6,434	(13,293)
III	Cagayan Valley	26.3	39,897	31,205	7,285	78,387	104,067	25,680
IV	Central Luzon	5.0	24,470	41,468	2,383	68,321	34,049	(34,272)
V	Southern Tagalog	11.0	51,513	53,864	5,466	110,843	78,090	(32,753)
VI	Bicol	10.0	32,760	36,839	4,094	73,693	58,488	(15,205)
VIII	Western Visayas	15.0	71,400	51,610	10,466	133,476	149,515	16,039
VII	Eastern Visayas	53.0	296,715[b]	76,819	14,928	388,462	213,254	(175,208)
IX	Southern and Western Mindanao	60.0	330,780	62,242	60,546	453,568	864,941	411,373
X	Northern and Eastern Mindanao	53.0	163,028	68,044	13,395	244,467	191,364	(53,103)
	Philippines	253.4	1,073,497	430,825	119,013	1,623,335	1,700,202	76,867

a Excludes 17,000 metric tons for industrial use in 1970.
b Excludes 50,000 metric tons for industrial use in 1970.

TABLE 63

PROJECTED CONSUMPTION, PRODUCTION, AND SURPLUS OR DEFICIT OF CORN, BY REGION, PHILIPPINES, 1975

	Region	Estimated Per Capita Food Consumption of Corn	Food Consumption	Animal Feed	Seed & Waste	Total Consumption	Production	Surplus or Deficit
		(kilos)	(metric tons)					
I	Manila	14.6	74,458[a]	--	--	74,458	--	(74,458)
II	Ilocos	5.5	12,683	9,479	485	22,047	6,931	(15,116)
III	Cagayan Valley	26.3	47,397	33,857	8,367	89,621	119,525	29,904
IV	Central Luzon	5.0	28,245	45,541	2,741	76,527	39,153	(37,374)
V	Southern Tagalog	11.0	61,390	59,245	6,235	126,870	89,069	(37,801)
VI	Bicol	10.0	38,490	40,006	4,756	83,252	67,951	(15,301)
VII	Western Visayas	15.0	80,355	57,025	12,313	149,693	175,900	26,207
VIII	Eastern Visayas	53.0	329,611[b]	84,792	17,811	432,214	254,451	(177,763)
IX	Southern and Western Mindanao	60.0	415,080	69,385	68,685	553,150	981,220	428,070
X	Northern and Eastern Mindanao	53.0	195,146	73,633	15,467	284,246	220,983	(63,263)
	Philippines	253.4	1,282,255	472,963	136,860	1,892,078	1,955,183	63,105

a Excludes 20,000 metric tons for industrial use in 1975.
b Excludes 60,000 metric tons for industrial use in 1975.

TABLE 64

PROJECTED CONSUMPTION, PRODUCTION, AND SURPLUS OR DEFICIT OF CORN, BY REGION, PHILIPPINES, 1980

	Region	Estimated Per Capita Food Consumption of Corn	Food Consumption	Animal Feed	Seed & Waste	Total Consumption	Production	Surplus or Deficit
		(kilos)	(metric tons)					
I	Manila	14.6	89,999[a]	--	--	89,999	--	(89,999)
II	Ilocos	5.5	13,876	10,167	530	24,573	7,576	(16,997)
III	Cagayan Valley	26.3	57,097	36,569	9,671	103,337	138,159	34,822
IV	Central Luzon	5.0	32,640	49,991	3,171	85,802	45,299	(40,503)
V	Southern Tagalog	11.0	72,897	64,575	7,165	144,637	102,364	(42,273)
VI	Bicol	10.0	45,170	43,172	5,550	93,892	79,283	(14,609)
VII	Western Visayas	15.0	90,780	62,439	14,510	167,729	207,294	39,565
VIII	Eastern Visayas	53.0	366,270[b]	91,647	21,222	479,139	303,173	(175,966)
IX	Southern and Western Mindanao	60.0	513,300	76,528	78,608	668,436	1,122,981	454,545
X	Northern and Eastern Mindanao	53.0	232,511	79,158	17,960	329,629	256,571	(73,058)
	Philippines	253.4	1,514,540	514,246	158,387	2,187,173	2,262,700	75,527

a Excludes 25,000 metric tons for industrial use in 1980.
b Excludes 70,000 metric tons for industrial use in 1980.

the regional "surplus" corn is located in the Southern and Western Mindanao region. Thus, the team expects over 400,000 metric tons to be shipped out of this region each year between 1970 and 1980. Most of this corn will have to move out of the region via the ports of Davao City, Dadiangas (General Santos), and the City of Cotabato. The remainder will move by road into Northern and Eastern Mindanao.

It should be kept in mind that, although a region as a whole may have a corn deficit (or surplus), there will usually be one or more provinces within the region which are surplus (or deficit) areas. Thus there will usually be a good deal of corn moving between provinces within a region as well as the trade in corn between regions.

The research team expects Davao City, Dadiangas (General Santos), Cebu and Manila to continue to be the main trading centers for corn during the 1970's. The relative importance of Cebu as a trading center for corn will decline as more corn is shipped directly from Davao and Cotabato to Manila and as the feed industry and corn starch industry develops in Mindanao. Even so, the team expects Cebu to remain the nation's most important corn trading center during the 1970's.

* * *

CHAPTER XI

SOYBEANS AND SORGHUM

Introduction

The Supply of Sorghum and Soybeans

The Demand for Sorghum and Soybeans

- Sorghums
- Soybeans

A Sorghum and Soybean Program

- Programs to Encourage Soybean Production
- Programs to Encourage Sorghum Production
- Summary of Recommendations

CHAPTER XI

SOYBEANS AND SORGHUM

Introduction

Natural conditions are favorable for the production of soybeans and sorghum in many parts of the Philippines. Sorghum, being a dry-weather, quick-maturing plant, can be grown throughout the Philippines. It can tolerate more standing water than corn and yet be grown in areas which are too dry for corn production. The soybean can be grown in soil suitable for corn, sugarcane, cotton, sweet potato and cowpeas. It does well in well-drained clay soils supplied with lime and liberal amounts of potash and phosphorous.

Very little sorghum or soybeans are grown in the Philippines at the present time. There appears to be several reasons for this:

(1) there have been no intensive efforts on the part of the government to encourage the production of these crops;

(2) farmers, in general, lack information on proper cultivation practices for sorghum and soybeans;

(3) soybean varieties suitable for the Philippines were not available until recently;

(4) there has been uncertainty about a market for these crops.

Sorghum can be used to make flour, starch, paste,

dextrose, syrup, alcohol and edible oil as well as being used for livestock feed. White sorghum is eaten in place of rice or corn in some countries. It appears unlikely that sorghum will be widely used as a foodgrain in the Philippines during the next twenty years, however. The livestock feed industry is the largest potential market for sorghum in the Philippines. Initial experiments with sorghum have emphasized the production of grain sorghum rather than the grass or forage type sorghum.

Soybeans are used in several different ways in the Philippines Food products such as soybean flour, tahure, tokwa, miso, tao-si, soybean coffee and soy sauce are produced in small quantities. Substantial amounts of soybean oil meal are used in hog and poultry feeds. There are two soybean oil extractions plants in the Philippines. They are not in operation at the present time, however, due to high tariffs on imported soybeans.

The Supply of Sorghum and Soybeans

Domestic production of soybeans was 1,132 metric tons in 1966. Nearly 70 percent of the domestic soybeans were produced in the Western Visayas region. Over 17,150 metric tons of soybeans were imported in 1966. Domestic production of soybeans has declined slightly since 1962 while imports have increased substantially. The volume of domestic production and soybeans imports for the 1960-1966 period are shown in Table 65. The regional distribution of soybean production is presented in Table 66.

Very little information is available on the domestic production of sorghum. Grain sorghum grows wild in many parts of the Philippines but very little is grown as a commercial crop.

TABLE 65

DOMESTIC SOYBEAN PRODUCTION AND IMPORTS, PHILIPPINES, 1960-1966

Year	Domestic	Imports	Total
		(metric tons)	
1960	981	653	1,634
1961	1,899	1,599	3,498
1962	2,067	130	2,197
1963	1,762	11,461	13,223
1964	1,490	4,397	5,887
1965	1,405	11,567	12,972
1966	1,132	17,150	18,282

Source: Unpublished reports, Department of Economic Research, Central Bank of the Philippines and the Bureau of Agricultural Economics, Department of Agriculture and Natural Resources.

The volume of Philippine sorghum imports has not been sufficient to warrant an official account other than part of the "Other Cereals" classification in official data. Between 1964 and 1966 approximately 2,300 metric tons of sorghum seed were brought in under USPL-480 for distribution to various cooperatives Sorghum imported for commercial use is subject to a tariff of ₱250 per metric ton.[1/] If U.S. #2 yellow sorghum were purchased, the import price would be approximately ₱475 per metric ton plus transportation charges from the U.S.

The Demand for Sorghum and Soybeans

Sorghum

Sorghum has more easily assimilable protein per kilogram

[1/] Tariff and Customs Laws, Central Lawbook Publishing Co., Inc., 1967 edition, Manila, Section 10.07, p. 12.

TABLE 66

SOYBEANS PRODUCTION, BY REGION 1960-1966

Region	1960	1961	1962	1963	1964	1965	1966
			(metric tons)				
Ilocos	31.5	24.2	15.5	8.3	18.6	10.5	1.0
Cagayan Valley	126.0	11.3	10.3	8.5	12.1	10.6	12.5
Central Luzon	-	46.5	50.5	52.8	58.4	57.2	72.2
Southern Tagalog	32.2	48.5	52.7	64.9	90.2	94.6	94.4
Bicol	1.2	1.2	5.8	5.1	0.6	2.8	2.8
Western Visayas	257.3	1316.0	1363.8	1323.2	1087.9	1071.4	789.2
Eastern Visayas	7.4	7.8	26.5	7.5	10.7	15.7	1[illegible].9
Southern & Western Mindanao	88.7	65.3	85.2	153.0	119.6	116.4	116.8
Northern & Eastern Mindanao	437.0	378.5	456.6	139.2	92.0	25.6	28.7
Philippines	981.3	1899.3	2066.9	1762.5	1490.1	1404.8	1131.5

Source: Bureau of Agricultural Economics, Department of Agriculture and Natural Resources.

than corn and is an excellent poultry and hog feed ingredient. Grain sorghum could replace up to 30 percent of the corn presently being used in the production of commercial feeds. Assuming that commercial feeds are 30 percent corn by weight, existing feed mills operating 300 days a year on an 8 hour shift basis will use 77,160 metric tons of corn annually A total of 23,148 metric tons of sorghum would be needed to replace 30 percent of the 77,160 metric tons of corn.

Sorghum can be fed to livestock directly. If it were to replace 30 percent of the total corn used as animal feed, the total demand for sorghum would be nearly 130,000 metric tons by 1970. Not all farmers would be able to substitute sorghum for corn, however. Thus, for purposes of this study, it is assumed that the maximum potential domestic demand for sorghum will be around 100,000 metric tons by 1970.

The effective demand for sorghum will depend on the price of sorghum relative to the price of corn. At the present time, domestic corn is selling for about ₱230 per metric ton while imported sorghum costs around ₱500 per metric ton. There is no incentive for feed manufacturers to substitute sorghum for corn under these price conditions. The 100,000 metric ton potential demand for sorghum would become an effective demand only if the price of sorghum is reduced to around ₱235 per metric ton and even at this price there is little incentive for farmers to switch from corn to sorghum. Also at this price, there is no incentive for the lowland rice producer to switch from the production of rice to sorghum.

In order to be competitive on the world market, Philippine farmers would have to sell their sorghum at about ₱200 per metric ton. Available data on the cost of production of sorghum indicates that most farmers would make very

little profit at this price. In this case, the Philippine farmer has little interest in the world market regardless of how much sorghum can be sold at the world price.

Soybeans

The greatest potential users of soybeans are the soybean oil extraction plants and commercial feed plants. Soybeans are between 17 and 20 percent oil by weight. The oil is extracted by mechanical and chemical processes and marketed as a cooking oil. The by-products of this operation, soybean meal, is used as a primary ingredient in the production of hog and poultry feeds.

At present, the combined capacity of the two soybean oil extraction plants is 250 metric tons of soybeans per 24 hour period. If the plants were to operate 24 hours a day for 300 days a year, they would use 75,000 tons of soybeans. Using the 17 percent oil figure, the by-product is 62,250 tons of soybean meal. Each extraction plant has a complementary feed mill. The meal in excess of these needs is marketed to other feed manufacturers. The 27 feed mills of the Philippine Association of Feed Millers have a total annual production capacity of 257,200 metric tons a year if they work 300 days of single 8 hour shifts. The feed mills would therefore use 38,580 metric tons of soybean meal (46,482 metric tons of soybeans) were they to work a single 8 hour shift 300 days a year and to produce feeds with 15 percent soybean meal.

The actual production of soybean meal and cake was about 13,978 metric tons in 1965 while imports of soybean meal and cake amounted to 6,254 metric tons. This provided a total of 20,232 metric tons of soybean meal and cake for use by domestic feed manufacturers. Domestic production of soybean meal and cake increased to about 16,600 metric tons in 1966.

Feed production in 1965 was 206,477 metric tons. Thus it appears that the feed manufacturers were producing feeds which were approximately 10 percent soybean meal by weight.

The feed industry is growing rapidly in the Philippines. Even so, it appears unlikely that within the next five years the feed manufacturers will require more soybean oil meal than the two oil extraction plants are capable of producing. Thus, for purposes of this study it is assumed that the maximum domestic potential demand for soybeans will be approximately 50,000 metric tons in 1970 and around 75,000 metric tons in 1975. If national production exceeds these levels, the soybeans would have to be sold on the world market.

Prior to 1967 soybeans were imported under the Namarco trade assistance program at US$120 per long ton plus a 15 percent service charge for Namarco. The effective landed price for soybeans under this arrangement was ₱530 per metric ton.[2/] In 1967, soybeans became subject to a tariff of ₱250 per metric ton.[3/] This boosted the price by 43 percent to ₱750 per metric ton. At this price the oil extraction plants were unable to operate profitably and closed down. The feed mills are now importing soybean meal and have made substitutions for soybean meal when possible. One soybean oil extraction plant stands ready to purchase domestic soybeans at ₱700 per metric ton to encourage domestic production. It seems doubtful that the plant could afford to buy substantial quantities of domestic soybeans at that price, however.

A Sorghum and Soybean Program

Local farm scientists believe that with a suitable

2/ "Hints to Farmers," The Rural Banker, March-April, 1967, p. 18.

3/ Tariff and Customs Laws, Section 12.01, p. 14.

variety and good management, Philippine farmers can readily obtain two metric tons of soybeans per hectare. Research institutes have been developing varieties suitable to Philippine conditions. A new variety which is being tested for regional adoptation yields from 2 to 3 metric tons per hectare under recommended production practices and can be planted in both the wet and dry seasons. Average yields in the Philippines are presently about one ton per hectare.

The production cost of soybeans has been estimated to be approximately ₱ 324 per hectare under present production practices and ₱463 per hectare when using improved production practices. Assuming a yield of 2.0 metric tons and a market price of ₱700 (the present domestic price) per metric ton, the net profit per hectare, using the new soybean varieties and recommended practices, would be about ₱937. Even if the domestic farm price were to fall to ₱312 per metric ton, farmers producing 2 metric tons of soybeans per hectare would earn a net profit of ₱161 per hectare.[4/]

At the present time, the delivered cost of soybean oil meal is approximately ₱550 per metric ton.[5/] The soybean oil extraction plants should be willing to pay at least ₱50 per metric ton more for soybeans than the market price of soybean oil meal. Thus, it is estimated that domestic producers should be able to sell between 30,000 and 40,000

[4/] The present world price of soybeans is about ₱416 per metric ton. Assuming a marketing margin of 25 percent, the farm price would be ₱312 per metric ton of soybeans

[5/] The world price of soybean oil meal is approximately ₱390 per metric ton FOB Import duties on soybean oil meal are 26 percent ad valorem or about ₱100 per metric ton. Adding shipping costs of ₱60 per metric ton gives a total cost of ₱550 per metric ton.

metric tons of soybeans at a farm price of approximately ₱450 at the present time.[6/]

When domestic production reaches the point where the oil extraction plants have more soybean oil meal than they can sell to the local feed manufacturers, the farm price of soybeans would fall to a level determined by the world price of soybean oil meal. At the present time, it is expected that the farm price of soybeans would fall to about ₱312 per metric ton if domestic production were to exceed 40,000 metric tons.

Programs to Encourage Soybean Production

Any program designed to increase soybean production in the Philippines will require the close cooperation of several different government agencies, the two soybean oil extraction plants and the Philippine Association of Feed Millers. It may be possible to obtain the needed cooperation by establishing a Soybean Development Coordinating Council to coordinate the efforts of the government agencies and to allow for an exchange of ideas and information between these agencies and the private sector. Such a coordinating council would include representatives from the Department of Agriculture and Natural Resources, the Bureau of Plant Industry, the University of the Philippines College of Agriculture, the Agricultural Productivity Commission, The Agricultural Credit Administration, the Presidents Economic Staff, the National Economic Council, the soybean oil extraction plants, and the Philippine Association of Feed Millers.

No government program is likely to be successful in

6/ The farm price is 75 percent of the assumed wholesale price of ₱600 per metric ton of soybeans.

increasing soybean production if the price and costs relationships of the farmers and soybean users are not taken into account. The domestic price of soybeans will depend, to a large extent, on the cost of soybean oil meal. The Philippine government can control the domestic cost of soybean oil meal, to some extent, by altering the import duties on soybean oil meal. As long as the tariff on soybeans is so high that the soybean oil extraction plants can not afford to operate, the tariff on soybeans does not serve to support the domestic price of soybeans. The only effect of the present high tariff on soybeans is to force feed manufacturers to buy their soybean oil meal on the world market. In this situation, the domestic price of soybeans is being supported by the tariff on soybean oil meal rather than the tariff on soybeans themselves.

The present tariff on soybeans should be adjusted downward and brought in line with the tariff on soybean oil meal so that the soybean oil extraction plants can again begin operation. A policy of equal tariffs on soybeans and soybean oil meal would appear much more realistic than the present tariff policy. The general level of the tariff on soybeans and soybean oil meal could then be adjusted so as to support the domestic price of soybeans at the desired level. The present ad valorem tariff of 26 percent on soybean oil meal, if applied to soybeans as well, should provide a sufficiently attractive farm price for soybean producers. A considerably higher tariff would only serve to increase the price of animal feeds and thereby slow the progress of the nation's growing livestock and poultry industries. The 26 percent tariff would have to be reduced when the national production of soybeans increased sufficiently to provide all of the soybean oil meal required by the feed manufacturers.

The first action of the Soybean Development Coordinating Council should be to estimate the future demand for soybeans during the next five years and to establish a

tariff and price policy that will:

(1) allow the soybean oil extraction plants to operate,
(2) allow the feed manufacturers to obtain their soybean oil meal requirements, and
(3) provide farmers an incentive price for soybeans during the first few years of the soybean production program.

The tariff and price policy should be subject to annual review so that the domestic price can be adjusted to the world price when the nation becomes self-sufficient in the production of soybeans.

The basic program for increasing soybean production could be patterned after the rice production program. The research phase of the program could be concentrated at the U.P. College of Agriculture and the Bureau of Plant Industry (BPI) experiment station at Los Banos, Laguna. Regional adaptability tests could be conducted in several of the experiment stations of the BPI. These experiment stations would produce the foundation seeds. The foundation seeds would then be distributed to farmer-cooperators who would produce the registered and certified seeds which would be released for commercial production. Technical guidance and assistance to farmers would be provided by the Agricultural Productivity Commission (APC). Farm credit requirements would be provided by the Agricultural Credit Administration (ACA). The research team believes that an intensive four to five year program would have a higher probability of success than a 10 to 15 year long range program.

A four year program proposed by the DANR has an estimated annual cost of ₱720,000 or a total cost of ₱2,880,000

for the entire program.[7] If this program were to increase domestic production of soybeans by 30,000 metric tons a year without reducing the production of other grains, the total discounted benefits to the nation's farmers would be approximately ₱29,000,000.[8] The benefit-cost ratio in this case is about 10. Such a program would be well worth undertaking.

The value of a program to increase soybean production is reduced considerably if the increase in soybean production is accompanied by a decrease in the production of rice or corn. It should be possible to increase soybean production with a program designed to introduce multiple cropping systems. Soybeans would then be planted as a third crop each year in a rotation with other crops. The new rice varieties mature in 110 to 135 days, most varieties of corn grown in the Philippines reach maturity in 100 to 120 days. Soybeans planted during the dry season could be harvested in about 100 to 125 days after planting. They could therefore be introduced easily in a multiple cropping system in many parts of the Philippines. Priority regions for a soybean program should be selected on the basis of:

(1) their nearness to Manila, the main market for soybeans,
(2) the suitability of the area for multiple cropping, and
(3) the ease with which farmers can be given technical assistance.

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[7] Four-Year Soybean Program for Fiscal Year 1967-1970, DANR, an undated report.

[8] This assumes that farmers will earn a net profit of ₱100 per metric ton or a total of ₱3,000,000 each year for a 20 year period on the increased production of soybeans. This flow of pesos was discounted at the rate of 8 percent to obtain the present value figure of ₱29,000,000.

Programs to Encourage Sorghum Production

A government program to promote the production of sorghum in the Philippines could be undertaken in conjunction with the program to increase soybean production. The basic form of the program would be the same. Initial efforts would be devoted to research and the development of suitable varieties. This would be followed by a seed multiplication program which in turn would be followed by an intensive extension program to introduce sorghum to Philippine farmers. The Soybean Development Coordinating Council (or Sorghum and Soybean Development Coordinating Council) would act as the control group for the program. As in the case of soybeans, the program should encourage the planting of sorghum as part of a multiple cropping system rather than as a crop to be planted in the place of rice or corn.

Since sorghum can be grown under a wide range of moisture conditions, it can be especially useful in helping farmers to make more efficient use of limited water supplies. Soils in Central Luzon, for example, often contain enough residual moisture after the rice harvest in October and November to make them suitable for growing a crop of sorghum without irrigation.

The cost of production per hectare has been estimated to be ₱640 using recommended production practices. Sorghum yields can range from 1 to 5 tons per hectare depending upon the rainfall at the planting and harvesting period, available irrigation water, the extent of fertilizer use and the cultivation practices followed. Present yields are about 1 ton per hectare but could be increased considerably with the help of a well designed extension program. Assuming an average yield per hectare of 3.1 metric tons and a market price of ₱235 per metric ton, the net profit per hectare, per crop, would be about ₱88. Under these conditions, sorghum

would be less profitable than lowland rice or soybeans but would be competitive with corn. A more detailed idea of the cost of production and expected revenue for rice, corn, soybeans and sorghum is provided in Table 67

Any government program designed to increase sorghum production will have to take into account the relationship between sorghum and corn prices. The present high import duties on sorghum will not help the farmer receive a high price for his sorghum because feed manufacturers will not be willing to buy sorghum at a price substantially higher than the price of corn. Efforts to support sorghum prices indirectly by increasing the support price for corn will not improve the profitability of sorghum relative to corn and will not induce farmers to substitute sorghum for corn.

According to estimates of the research team, farmers should be able to sell around 100,000 metric tons of sorghum at a price of about ₱235 at the present time. If production were to exceed 100,000 metric tons, the domestic price of sorghum would begin to approach the world price which is presently about ₱195 per metric ton. It appears that only the most efficient producers of sorghum could earn adequate profits at the present world price. Thus it seems doubtful that the Philippines will be exporting substantial quantities of sorghum during the next 5 years unless the world price of corn and sorghum were to increase substantially.

Summary of Recommendations

It is recommended that any government program to increase sorghum and soybean production should emphasize the advantages of multiple cropping systems rather than encourage farmers to switch from the production of rice

TABLE 67

ESTIMATED NET GAIN FOR PRODUCTION OF SOYBEANS, SORGHUM, CORN, AND RICE, PER HECTARE, PHILIPPINES, 1960-67

Crop		Variety	Environment	Comment	Yield	Price	Total Revenue	Total Cost	Net Gain
					(metric tons)	(pesos per metric ton)	(pesos)		
RICE	(1)	Ordinary (Intan)	Irrigated	Estimated to be near the national average[a]	2.30	348	800	605	195
	(2)	IR-8	Irrigated	Estimated to be near the national average using the present practices[b]	4.60	348	1,600	1,070	530
	(3)	IR-8	Irrigated	Recommended expenditures and corresponding yields by IRRI for dry season[c]	6.90	348	2,401	1,835	566
	(4)	Ordinary	Rainfed	Estimated from (1)[d]	1.60	348	557	385	172
	(5)	IR-8	Rainfed	Estimated from (2)[e]	3.90	348	1,357	900	457
	(6)	Ordinary	Upland	[f]	0.85	348	296	250	46
CORN	(7)	Ordinary		Estimated national averages[g]	0.75	228	171	125	46
	(8)	Improved		Recommended expenditures and estimated yield by RCPCC	2.85	228	650	518	132
	(9)	Improved	Dry Season	Recommended by the BPI, DANR	2.85	228	650	400	250
SOYBEANS	(10)	Ordinary		Present average yield and estimated present cost[h]	1.0	700[i]	700	324	376
	(11)	Improved (B256)		Bureau of Plant Industry recommended cost and expected yield[j]	2.0	700	1,400	463	937
	(12)	Improved at export prices		Assumed equivalent to US#2 yellow ordinary soybeans, FOB price	2.0	312	624	463	161
SORGHUM	(13)	Improved Grain	Dry Season	Economic Garden data.[k] No commercial data	3.1	235	728	640	88
	(14)	Improved Sweet	Wet Season	Economic Garden data.[k] No commercial production data	2.1	235	493	550	(57)
	(15)	Improved at import price	Dry Season	Assumed equivalent to US#2 yellow grain sorghum, FOB price[l]	3.1	500	1,550	640	910

a/ "Farm Management Studies of Costs and Returns in Rice Production," Randolph Barker and E. U. Quintana, Mimeographed IRRI publication, 1967, p.34.
b/ Ibid.
c/ "Approximate Production Investments for General Cultural Recommendations IR8-288-3 and Similar Selections," October 27, 1966, The International Rice Research Institute.
d/ Estimated by multiplying the figure (1) data by a ratio computed from the Agricultural Economics and Statistics Digest, Vols. III, Nos. 7 and 8 on production costs per hectare for rainfed and irrigated rice.
e/ The production cost differential between rainfed and irrigated IR8 should not be as striking as for ordinary varieties because the major difference is in crop care and IR8 requires virtually the same amount of care regardless of the environment.
f/ The basic data for the estimate was obtained from Vol. III, No. 9 of the Agricultural Economics and Statistics Digest publication on cost of production for upland rice. These were adjusted for price changes.
g/ The information division of the Agricultural Productivity Commission estimates that 60% of the corn farmers in the Philippines spend less than P100 per hectare and that 70% spend less than P200 per hectare.
h/ The average yield (yearly) computed from BAE, DANR data for the period 1960-1966 is 0.88 ton per hectare. This is probably an underestimate, but it is doubtful the average yield exceeds 1.0 ton per hectare. The cost estimate is from "Soybean Development Project" (mimeographed, undated), Bureau of Plant Industry.
i/ One feed company has offered to purchase 2,600 tons of beans a month at P700 per ton.
j/ "Guide for Soybean Production in the Philippines" Plant Industry Digest, October-November, 1966, Vol. 29 Nos. 10-12. Published by BPI of the DANR, pp.13,14.
k/ Costs are from "Estimated Cost of Production/Hectare on Sorghum" (mimeographed, undated) from the BPI, DANR.
l/ Per Ton Sorghum price equals P195 U.S. grain plus P55 transportation plus P250 tariff equals P500.

or corn to the production of sorghum and soybeans. The team believes that an intensive four to five year program would have the highest probability of success. The soybean oil extraction plants and the feed manufacturers should be actively involved in establishing the production targets of the program. The initial estimates by the research team indicate that it should be possible to maintain reasonable farm prices for sorghum and soybeans as long as soybean production does not exceed about 40,000 metric tons and sorghum production is less than 100,000 metric tons.

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CHAPTER XII

EXISTING FACILITIES

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CHAPTER XII

EXISTING FACILITIES

Existing Warehouse Storage (Sacks)

Warehouse storage space in the Philippines for sacked commodities amounted to nearly 40 million cavans or 1.8 million metric tons in mid-1967. The ownership of the warehouses, and the capacities in cavans and metric tons, by regions and provinces is shown in Table 68. As to ownership, approximately 18 percent of total warehousing capacity of the Philippines is operated by the Farmer's Cooperative Marketing Association (FACOMA), 8 percent is operated by the Rice and Corn Administration, and 74 percent is privately operated.

As to location, the Central and Northern Luzon rice and corn areas (Regions I-IV) account for 59.3 percent of the total storage capacity of the Philippines. The Mindanao rice and corn areas (Regions IX, X) hold 18.8 percent of the storage facilities, and the remaining 21.9 percent is located in the central islands area of the Philippines.

Seventy percent of the FACOMA warehousing, 75 percent of RCA warehousing and 55 percent of all private warehousing is located in the Northern and Central Luzon regions. A regional breakdown for total warehousing is presented below:

	Region	Percent of Total Warehousing
I	Manila	2.2
II	Ilocos	3.9
III	Cagayan Valley	12.2
IV	Central Luzon	41.0
V	Southern Tagalog	6.4

	Region	Percent of Total Warehousing
VI	Bicol	3.8
VII	Western Visayas	7.8
VIII	Eastern Visayas	3.9
IX	Southern and Western Mindanao	15.5
X	Northern and Eastern Mindanao	3.3
	Total	100.0

The survey of warehouse facilities referred to above was made under the auspices of a Committee on warehousing established by the Development Bank of the Philippines (DBP), the Philippine National Bank (PNB), the Rice and Corn Administration (RCA), and the Agricultural Credit Association (ACA). While the survey is subject to some limitations, it appears to be the best assessment of the situation with respect to warehouse location and capacity.

Records are not available of warehouses for rice and corn under construction. While the operator must obtain a license under the Bonded Warehouse Act 3893 before he can handle grain, he does not make application until after he has completed the construction work and is ready to operate.

All the existing sack warehouses have access to roads for trucks, wagons, or sleds. Only a very small percentage is located at or near rail access.

Physical Condition of the Warehouses

The majority of the warehouses are constructed with wood trusses and wood columns. The roofs and walls are of corrugated galvanized iron. In all cases the floors are of concrete and about 12 to 18 inches above grade. In some cases the walls are made of concrete blocks. Some

TABLE 68

EXISTING WAREHOUSE FACILITIES (IN SACKS) BY OWNERSHIP
BY PROVINCES AND REGIONS, 1967

REGION AND PROVINCE	FACOMA No.	FACOMA Capacity[a] In Cavans	FACOMA Capacity[a] In Metric Tons	RCA No.	RCA Capacity[a] In Cavans	RCA Capacity[a] In Metric Tons	PRIVATE No.	PRIVATE Capacity[a] In Cavans	PRIVATE Capacity[a] In Metric Tons	TOTAL No.	TOTAL Capacity[a] In Cavans	TOTAL Capacity[a] In Metric Tons
I MANILA	--	---	---	9	418,000	13,228	38	467,200	21,191	47	885,200	40,719
II ILOCOS	77	1,060,000	48,760	--	---	---	61	478,500	22,011	138	1,538,500	70,771
Abra	7	97,000	4,462	--	---	---	1	7,000	322	8	104,000	4,784
Ilocos Norte	15	228,000	10,488	--	---	---	45	62,500	2,875	60	290,500	13,363
Ilocos Sur	29	470,000	21,620	--	---	---	1	5,000	230	30	475,000	21,850
La Union	19	187,000	8,602	--	---	---	4	190,500	8,763	23	377,500	17,365
Mt. Province	7	78,000	3,588	--	---	---	10	213,500	9,823	17	291,500	13,409
III CAGAYAN VALLEY	46	1,495,000	68,770	6	310,000	14,260	234	3,029,500	139,357	286	4,834,500	222,387
Cagayan	20	530,000	24,380	4	205,000	9,430	46	328,000	15,088	70	1,063,000	48,898
Isabela	19	690,000	31,740	2	105,000	4,830	120	1,643,000	75,578	141	2,438,000	112,148
Nueva Vizcaya	7	275,000	12,650	--	---	---	67	1,057,500	48,643	74	1,332,500	61,293
Batanes	--	---	---	--	---	---	1	1,000	46	1	1,000	46
IV CENTRAL LUZON	91	2,763,000	127,098	18	1,534,300	70,578	763	11,950,600	549,728	875	16,247,900	747,404
Bataan	5	110,000	5,060	--	---	---	54	312,000	14,352	59	422,000	19,412
Bulacan	19	1,133,000	52,118	--	---	---	194	2,423,300	111,472	213	3,556,300	163,590
Nueva Ecija	23	654,200	30,093	15	1,297,300	59,676	255	2,704,600	124,412	293	4,656,100	214,181
Pampanga	18	260,800	11,997	1	80,000	3,680	87	2,859,200	131,523	106	3,200,000	147,200
Pangasinan	17	355,000	16,330	2	157,000	7,222	74	1,861,500	85,629	93	2,373,500	109,181
Tarlac	11	240,000	11,040	--	---	---	71	1,620,000	74,520	82	860,000	85,560
Zambales	1	10,000	460	--	---	---	28	170,000	7,820	29	180,000	8,280
V SOUTHERN TAGALOG	21	126,800	19,633	2	71,500	3,289	298	2,032,700	93,504	321	2,531,000	116,426
Batangas	1	20,000	920	--	---	---	68	240,000	11,040	69	260,000	11,960
Cavite	1	10,000	460	--	---	---	50	314,000	14,444	51	324,000	14,904
Laguna	5	117,800	5,419	--	---	---	41	200,200	9,209	46	318,000	14,628
Marinduque	--	---	---	--	---	---	6	31,000	1,564	6	31,000	1,564
Mindoro Occidental	1	17,800	819	--	---	---	16	267,200	12,291	17	285,000	13,110
Mindoro Oriental	1	17,800	819	--	---	---	20	192,200	8,841	21	210,000	9,660
Palawan	1	20,000	920	1	41,500	1,909	6	28,500	1,311	8	90,000	4,140
Quezon	--	---	---	1	30,000	1,380	70	250,000	11,500	71	280,000	12,880
Rizal	11	223,100	10,276	--	---	---	21	500,600	23,304	32	730,000	33,580

VI BICOL	13	238,400	10,967	3	100,000	4,600	156	1,149,600	52,881	172	1,488,000	68,488
Albay	2	35,600	1,638	2	75,000	3,450	30	301,400	13,864	34	412,000	18,952
Camarines Norte	--	---	---	--	---	---	28	224,000	10,304	28	224,000	10,304
Camarines Sur	9	175,000	8,050	1	25,000	1,150	47	375,000	17,250	57	575,000	26,450
Catanduanes	--	---	---	--	---	---	10	55,000	2,530	10	55,000	2,530
Masbate	--	---	---	--	---	---	17	72,000	3,312	17	72,000	3,312
Sorsogon	2	27,800	1,279	--	---	---	24	122,200	5,621	26	150,000	6,900
VII WESTERN VISAYAS	31	624,800	28,740	2	161,000	7,544	221	2,287,700	105,234	254	3,076,500	141,518
Aklan	--	---	---	--	---	---	15	20,500	943	15	20,500	943
Antique	--	---	---	--	---	---	17	55,800	2,567	17	55,800	2,567
Iloilo	18	358,600	16,495	1	141,000	6,621	81	1,092,000	50,232	100	1,594,600	73,351
Capiz	6	115,600	5,317	--	---	---	45	229,000	10,534	51	344,600	15,851
Negros Occidental	7	150,600	6,928	1	20,000	920	52	761,100	35,021	60	932,000	42,872
Negros Oriental	--	---					32	99,000	4,554	32	99,000	4,554
Romblon	--	---					9	30,900	1,380	9	30,000	1,380
VIII EASTERN VISAYAS	8	105,000	1,830	2	21,200	975	118	1,399,300	64,368	128	1,525,500	70,173
Bohol	1	20,000	920	--	---	---	20	33,000	1,518	21	53,000	2,438
Cebu	--	---	---	--	---	---	10	844,000	38,824	10	844,000	38,824
Leyte	7	85,000	3,910	--	---	---	58	268,000	12,328	65	353,000	16,238
Samar	--	---	---	2	21,200	975	30	254,300	11,698	32	275,500	12,673
IX SOUTHERN AND WESTERN MINDANAO	19	410,000	18,860	5	389,600	17,922	298	5,368,400	246,947	323	6,168,000	283,729
Cotabato	11	285,000	13,110	2	160,000	7,360	154	4,038,300	185,762	167	4,483,300	206,232
Davao	3	45,000	2,070	3	229,600	10,562	60	245,000	11,270	66	519,600	23,902
Sulu	--	---	---	--	---	---	5	50,000	2,300	5	50,000	2,300
Zamboanga del Norte	--	---	---	--	---	---	45	188,100	8,653	45	188,100	8,653
Zamboanga del Sur	5	80,000	3,680	--	---	---	35	847,000	38,962	40	927,000	42,642
X NORTHERN AND EASTERN MINDANAO	9	167,800	7,719	--	---	---	129	1,131,200	52,035	138	1,299,000	59,754
Agusan	2	50,000	2,300	--	---	---	8	31,000	1,426	10	81,000	3,726
Bukidnon	2	40,000	1,840	--	---	---	5	12,000	552	7	52,000	2,392
Lanao	--	---	---	--	---	---	63	590,000	27,140	63	590,000	27,140
Misamis Occidental	--	---	---	--	---	---	15	35,000	1,610	15	35,000	1,610
Misamis Oriental	2	40,000	1,840	--	---	---	13	171,000	7,866	15	211,000	9,706
Surigao	3	37,800	1,739	--	---	---	25	292,200	13,441	28	330,000	15,180
PHILIPPINES	318	7,290,800	335,377	47	3,008,600	138,396	2,347	29,294,700	1,347,556	2,712	39,594,100	1,821,329

a/ Capacity is listed "In Cavans" of palay weighing 46 kilos each and its equivalent in "Metric Tons" of palay rounded out to the closest digit.
Source: Warehouse Survey Report - Submitted by the Committee on Warehousing Composed of members of the PNB, DBP, ACA, and RCA - July, 1967.

of the most recently constructed have structural steel open rigid frames with either corrugated galvanized iron or concrete block walls and galvanized iron roofs.

All the warehouses have rigid louver type ventilators located in the lower and upper part of the walls and in the roof. The doors are metal and of the sliding type. The windows are glass with solid sash, either wood or steel.

Most of the warehouses were in relatively poor condition. They show lack of proper maintenance and good housekeeping from the standpoint of cleanliness. In many cases the galvanized iron walls and roofs have sections that have deteriorated due to rust. Some of the glass windows are broken and require replacing. The sliding doors need repairing and the ventilators should be cleaned of debris and refuse which have collected through the years.

The concrete floors and concrete footings appear to be structurally sound. However, some show deterioration due to spalling or flaking of the concrete. In many instances the joints have widened which may have been caused by differential settlement and lack of repairs. Many evidences of vermin, birds, and insects have been found inside the warehouses. Furthermore, there are definite indications that rain and moisture have penetrated causing damage to the structure and to the goods in storage. Very little evidence was found of paint being used on the metal parts to prevent rusting. Losses of grains under the existing storage system in the Philippines and the estimated savings of grain under the recommended system are discussed in later chapters.

Warehouse Laws

The law governing warehousing is Public Act 3893, the Bonded Warehouse Act, put into effect in January 1932. Under this Act no person is to receive rice for storage

without having a license. The license must be applied for annually from the Director of the Bureau of Commerce and Industry. The warehouseman is required to state the location of the warehouse and the maximum amount of commodity he will receive for storage. A bond is required in value equal to or greater than 1/3 of the value of the maximum amount of the commodity stored.

There is no law governing the kind of commodities which may be stored with palay, rice, and corn and other food products except a law prohibiting storage of inflammable goods in warehouses. For instance, the study team observed in some of the warehouses that sacked chemical insecticides were stored next to palay. The serious danger of contamination is unavoidable. There is no law controlling the re-use of damaged foodgrains for human consumption. It was also found that in many cases where heavy rains flooded inside the warehouse, the water damaged palay and rice was emptied, redried, and re-sacked as saleable merchandise.

Recommendations

For the purpose of realizing the optimum economic advantages in warehouse storage of foodgrains, it is recommended that the following procedure be implemented:

1. Inaugurate an intensive and long range repair and maintenance program of: (a) replace and/or repair damaged galvanized walls, roofs, window glass, and window sash; (b) repair damaged concrete floors; (c) rework and repair all ventilators and doors; (d) eliminate the use of warehouses that are beyond repair.

2. Inaugurate an effective fumigating program for the control of insects, birds, and vermin.

3. Introduce laws prohibiting storing of commodities, in the same warehouse, that may contaminate foodgrains by contact.

4. Investigate the economy of using mechanical handling equipment for stacking bags in the larger warehouses.

5. Conduct a more thorough investigation, than is covered by the scope of this report, of the physical needs and mechanical improvements of the many warehouses particularly those that are owned and/or rented by governmental agencies to determine a cost estimate of doing the work and implementation of same.

6. Further encourage the purchase and use of mechanical warm-air driers in the existing warehouses, as the Philippine Government is now doing.

Silo Storage (Bulk)

There are twelve silo storage facilities in the Philippines for handling and storing grains in bulk such as palay, corn, and wheat (Table 69). Eight of these, with a total capacity of 135,200 metric tons, are owned by private companies and used in their own grain processing activities. The remaining four, with a total capacity of 15,050 metric tons, are owned by government agencies and intended for use in the government grain storage program. Also 116,000 metric tons of the total bulk grain storage capacity is operated in conjunction with flour mills and, while suitable for other grains, is used almost exclusively for imported wheat.

The privately owned silo facilities are efficiently and effectively operated. They were only recently constructed and are modern in design.

TABLE 69

EXISTING BULK SILO GRAIN STORAGE FACILITIES, PHILIPPINES, 1967

Owner	Location	Capacity[a]	Design
		(metric tons)	
Republic Flour Mills, Inc.	Pasig, Rizal	25,000 (Wheat)	Concrete
Wellington Flour Mills, Inc.	Pasig, Rizal	15,200 (Wheat)	Concrete
Liberty Flour Mills, Inc.	Mandaluyong, Rizal	12,500 (Wheat)	Concrete
Philippine Flour Mills	Hondagua, Quezon	20,000 (Wheat)	Concrete
General Milling Corp.	Lapu-Lapu City, Cebu	30,000 (Wheat)	Concrete
General Milling Corp.	General Santos, Catabato	2,800 (Corn)	Steel
Pillsbury - Mindanao Flour Milling Co., Inc.	Iligan City, Lanao del Norte	13,700 (Wheat)	Concrete
Universal Corn Products, Inc.	Pasig, Rizal	16,000 (Corn & Soyabeans)	Concrete
RCA Facility	Digos, Davao	5,600 (Rice & Corn)	Wood
RCA Facility	Camalaniugan, Cagayan	2,200 (Rice & Corn)	Wood
ACA Facility	San Jose, Nueva Ecija	1,800 (Rice)	Steel
ACA Facility	Solano, Nueva Vizcaya	5,450 (Rice)	Steel

a The storage capacities represent volume for bulk grains and do not include warehouse sack storage.

ACA Owned Facilities

Two ACA owned bulk facilities, both of bolted steel construction, are located in Solano, Nueva Vizcaya and San Jose, Nueva Ecija. Each is equipped with a mechanical heated-air grain drier. The latter is also equipped with a rice mill. Solano had a rice mill but it was destroyed by fire in 1964 and was never rebuilt. Both of these facilities were constructed during 1954 but have had very little effective operation during the past 7 or 8 years. Deterioration has set in, but both can be reactivated. The Government has allocated ₱256,760 and ₱57,240, respectively, to rehabilitate Solano and San Jose facilities.

RCA Owned Facilities

The other two Government (RCA) owned bulk facilities located in Digos, Davao and in Camalaniugan, Cagayan are constructed of wooden staves held together with steel bands.

The bulk silo at Digos was constructed in 1958. It includes a heated-air grain drier and a corn mill. This facility has been practically inoperative since 1963 except for very few small lots of corn and palay. The wood bins have suffered damage caused by a combination of: dry rot; moisture; the lack of paint coverage and maintenance. Request has been made by RCA for ₱28,000 to cover rehabilitation.

The bulk silo at Camalaniugan, Cagayan is located on the east bank of the Cagayan River and was built in 1957 but has had but little operational service since 1958. The facility includes a heated-air grain drier, a rice mill and a corn mill. The belt conveyors and the bucket elevators have very small capacity requiring about 40 to 44 hours to empty or load one storage bin holding 325 metric tons.

The wood bin walls have suffered damage similar to the silo at Digos. The typhoon, during November 1967, caused extensive wind damage to an end bin wall and extensive water damage to the lower belt conveyors, boot pit, and receiving pit. The typhoon also caused some structural damage to the silo facility.

It is felt that it would not be economically justifiable to rehabilitate the silo portion of the complex at Camalaniugan because of (1) the extensive typhoon damage, and (2) some basic engineering deficiencies found in the original design. However, it would be practical to reactivate and operate the four warehouse storage areas which total about 1,800 metric tons. Both the corn mill and the rice mill at Camalaniugan with capacities of 250 and 200 cavans/8 hours repsectively, can be made operable with a little expense as they were not extensively damaged by the typhoon.

Existing Rice Mills and Corn Mills

Central Luzon, a heavy rice production area with some corn in the northern provinces, has over a third (37.5 percent) of the nation's rice milling capacity and a very small portion of the corn milling capacity (about 1 percent) (see Table 70). The Southern Tagalog and Western Visayas regions hold another 27 percent of the total capacity. The rest is spread somewhat evenly over the nation with the exception of the smaller rice production areas of the Eastern Visayas and the Northern and Eastern Minanao regions.

As could be expected from corn production patterns, Cagayan Valley holds a third of the corn milling capacity, the Mindanao region over 40 percent and Eastern Visayas is high with 16 percent of total corn milling capacity. The major rice production areas discussed above have few mills solely for corn milling.

TABLE 70

TOTAL CAPACITY OF RICE AND CORN MILLS, COMBINED CAPACITY, AND PERCENTAGE DISTRIBUTION OF RICE AND CORN MILLS, BY REGIONS, PHILIPPINES, 1966

	Region	Capacity of Rice Mills		Capacity of Corn Mills		Combined Capacity of Rice and Corn Mills	
		Total	Percent of Total	Total	Percent of Total	Total	Percent of Total
I	Manila	--	-	--	-	--	-
II	Ilocos	26,775	7.9	72	0.2	3,053	3.3
III	Cagayan Valley	28,352	8.4	10,635	32.7	14,422	15.7
IV	Central Luzon	126,724	37.5	285	0.9	8,329	9.2
V	Southern Tagalog	51,709	15.3	80	0.2	4,095	4.5
VI	Bicol	28,137	8.3	1,155	3.6	5,535	6.0
VII	Western Visayas	39,288	11.6	2,415	7.4	11,026	12.0
VIII	Eastern Visayas	11,625	3.4	5,097	15.6	6,852	7.5
IX	Southern and Western Mindanao	20,726	6.2	8,074	24.8	25,174	27.5
X	Northern and Eastern Mindanao	4,742	1.4	4,708	14.6	13,088	14.3
	Philippines	338,078	100.0	32,521	100.0	91,574	100.0

Source: Table A-24

The magnitude of combined rice and corn milling capacity is three times the capacity of mills used for milling corn alone. They are concentrated in the areas where both rice and corn are produced: 41 percent in Mindanao; 25 percent in the transition area between the corn producing Cagayan Valley and rice producing Central Luzon; and 19 percent in the Visayas.

The location of rice and corn mills by type for regions and provinces is shown in Appendix Table A-24.

Republic Act 3018 limits the right to engage in the rice and corn industry to citizens of the Philippines. Since the inception of Republic Act 3018 in May of 1960, persons engaged in the rice and corn industry have been required to obtain a license to operate on an annual basis. The Rice and Corn Board (RICOB), created to implement Republic Act 3018, issues the licenses from December to January 20. The licensing process enables RICOB to compile a complete list of mills including ownership, location, type and capacity of the mills.

Milling Capacities and Recovery

About 30 percent of the country's palay production is milled in small capacity mills called "Kiskisan." These mills have an average capacity of 45 cavans at 46 kilos each of palay input per 12 hours and an average recovery of approximately 60 percent by weight. The "Kiskisan" mills deal primarily with the small local farmer and the operators are paid in kind. In many areas, portable "Kiskisan" mills make it possible for the operator to mill close to the farm.

About 50 percent of the palay in commercial channels is processed in the "Cono" mills. However, in Central

Luzon as much as 80 percent is processed in the "Cono" because this region supplies a large percentage of rice for the domestic market.

The "Cono" mills have an average capacity of 135 cavans at 46 kilos each of palay input per 12 hours. However, some have a capacity of 200 cavans in 12 hours. They are more efficient than the "Kiskisan" having an average recovery of approximately 67 percent by weight. Most of the remaining 20 percent of the total palay production is milled by hand pounding and a very small amount in the rubber roller mill.

Over the years the number of "Cono" mills has increased at a faster rate than the "Kiskisan." This is due, in part, to the greater ease with which "Cono" mills can be financed through the Rice and Corn Board (RICOB). Although some foreign model mills are being listed, most of the mills are manufactured in the Philippines.

Corn milling, as is usually practiced in the Philippines, is basically grinding corn into grits for human consumption supplementing rice. The grits are graded on a shaker screen having 10-12-14-16-18-22 square openings per lineal inch. The numbers 10-12-14 are sold as first quality grits and the recovery is approximately 65 percent by weight in the "Cono" mills and 70 percent when number 16 is added. The by-products, usually sold for animal feeds, amounts to 20 percent to 25 percent consisting of germ, fine grits, and bran. The remaining 10 percent or 15 percent is loss and waste. In the "Kiskisan" mills, the edible recovery is approximately 5 percent less.

Under Republic Act 3704, rice and corn mills are exempted from the 2 percent internal revenue tax. A highly progressive tax load on capacity and type of mill has replaced the internal revenue tax.

Description of the "Kiskisan" Mill

The "Kiskisan" is a one unit machine consisting of a huller and polisher. This is a very short system milling process for palay or corn and optimum recovery is impossible. Accessory equipment can be attached consisting of a blower and a sifter. The blower is designed to separate the husk from the rice after it has been milled. The sifter separates the small broken grains of rice (binlid) and the tiki-tiki (darak) from the unbroken grains. The huller requires only about 6 horsepower. The huller, polisher, blower, and sifter together require about 15 horsepower. The capacity of a "Kiskisan" ranges from 45 to 90 cavans at 46 kilos each of palay input in 12 hours. The smaller size predominates in the Philippines.

Description of the "Cono" Mill

The "Cono" mill is a longer system of milling and requires a number of unit machines. The usual equipment for milling palay consists of hullers, polishing cones, graders, separators, and aspirators. Also included are scales, bucket elevators, screw conveyors, blowers, cyclone dust collectors, motors, drives, and other necessary accessories. By a combination of an adequate number of unit machines the capacity range of a "Cono" is approximately 100 to 450 cavans at 46 kilos each of palay input per 12 hours. The power requirements range from 20 to 100 horsepower.

The "Cono" mill for processing corn is also a long system consisting of such machine units as a corn cleaner, scale, degerminators, roller mills, polishers, aspirators, blowers, cyclone dust collectors, bran drier, grits mixer, sifters, magnetic separators, grader, bucket elevators, screw conveyors, motors, driers, and other necessary accessories. The most efficient capacity is approxiamtely 75 to 100 cavans at 56 kilos each of corn input per one (1)

hour. The power required is approximately 300 horsepower for this capacity.

Flour Mills

All of the six flour mills in the Philippines are privately owned and operated. The input grinding capacity of the six (6) plants is approximately 583,195 metric tons of wheat based on operating 300 days/24 hours per year (Table 71). At 72 percent extraction, the equivalent flour yield would be approximately 419,900 metric tons resulting in approximately 163,295 metric tons of feed by-products.

The flour mills import all of their requirements since there is practically no domestically grown wheat. The Philippines imported 456,591 metric tons of wheat and spelt; 56,341 metric tons of flour; and produced 351,340 metric tons of flour in 1966 (Table 72). Presently there are no government import restrictions on wheat but there is an import duty of ₱1.50 per metric ton of wheat. The mill operators, therefore, negotiate for their wheat needs directly from foreign exporters. They receive, handle, and store all the incoming wheat in bulk in their storage silos which make up part of the mill compound.

The flour mills are relatively new and modern, are efficiently operated, and have effective laboratory controls.

Commercial Feed Mills

The manufacture of commercial feeds for livestock is concentrated largely in Manila and vicinity and in the provinces of Bulacan and Rizal. All this area is tributary to the largest population center of Manila (Table 73). In addition, Cebu Province has a potential capacity of 32,600 metric tons and the provinces of Camarines Sur and Mindanao

TABLE 71

EXISTING WHEAT FLOUR MILLS, PHILIPPINES, 1966

Location	Finished Flour Produced Yearly If Operating 300 Days/24 Hours	Wheat Input Equivalent Based on 72% Extraction	Approximate Feed By-Products
	(Yearly Capacity, Metric Tons)		
Mill A Pasig, Rizal	107,500	149,306	41,806
Mill B Pasig, Rizal	65,100	90,417	25,317
Mill C Mandaluyong, Metro Manila	60,000	83,333	23,333
Mill D Hondagua, Quezon	59,600	82,778	23,178
Mill E Lapu-Lapu, Cebu	68,100	94,583	26,483
Mill F Iligan City, Lanao del Norte	59,600	82,778	23,178
TOTAL	419,900	583,195	163,295

Source: Philippine Association of Flour Millers, (PAFMI) 1966 Reports.

TABLE 72

IMPORTS OF WHEAT AND WHEAT FLOUR, AND WHEAT FLOUR PRODUCTION, PHILIPPINES, 1958 - 1966

Year	Imports[a]		Wheat Flour Production in Philippines [b]
	Wheat and Spelt	Wheat Flour	
	(Metric Tons)		
1958	4,907	297,945	6,441
1959	72,212	141,746	55,566
1960	127,219	122,242	86,206
1961	236,739	76,409	191,804
1962	294,076	41,032	228,477
1963	386,321	19,772	352,536
1964	317,823	69,738	297,514
1965	358,980	65,094	364,420
1966	456,591	56,341	351,340

Sources: a/ Unpublished reports, Dept. of Economic Research, Central Bank of the Philippines, 1966.
b/ Philippine Association of Flour Millers, 1966.

TABLE 73

EXISTING COMMERCIAL FEED MILLS, PHILIPPINES, 1966

Location	Yearly Capacity If Operating 300 Days/8 Hours[a]	Location	Yearly Capacity If Operating 300 Days/8 Hours[a]
	(Metric Tons)		(Metric Tons)
Manila & Vicinity		Bulacan Province	
Mill A - Azcarraga	4,600	Mill S - Marilao	48,000
Mill B - Caloocan	5,100	Mill T - Polo	11,900
Mill C - Caloocan	3,400	Mill U - Polo	10,300
Mill D - Caloocan	600	Mill V - Valenzuela	1,600
Mill E - Caloocan	600		
Mill F - Caloocan	200		
Mill G - Espana	2,200	Cebu Province	
Mill H - Manila	17,300		
Mill I - Manila	6,200	Mill W - Cebu City	1,200
Mill J - Quezon City	3,700	Mill X - Lapu-Lapu City	25,900
Mill K - Quezon City	6,400	Mill Y - Mandawe	5,500
Rizal Province		Mindanao Province	
Mill L - Balintawak	48,000	Mill Z - Davao City	1,100
Mill M - Las Pinas	5,100		
Mill N - Malabon	2,300		
Mill O - Malabon	1,600	Camarines Sur Province	
Mill P - Mandaluyong	14,300		
Mill Q - Navotas	2,700	Mill AA - Tigaon	3,400
Mill R - Pasig	24,000		
	Total yearly capacity in metric tons if operating 300 days/8 hours		257,200

a/ Since the production capacity of the feed mills is directly proportional to the number of hours operated, the total production may be easily increased from the figures shown in the table.

Source: Development Bank of the Philippines, 1966 Reports.
Bureau of Animal Industry of the Philippines, 1966 Reports.

have a total manufacturing capacity of 4,500 metric tons. By operating 300 days/8 hour yearly the mills can produce a total of 257,200 metric tons of various feeds.

Poultry feed makes up the largest proportion of manufactured feed. Hog feed is next in importance, with a small amount of pigeon feed and cattle feed.

The volume of commercial feeds manufactured in the years of 1961 through 1965 as reported by the members of the Philippine Association of Feed Millers (PAFMI) is shown in Table 74. While the membership does not represent 100 percent of the manufacturers, it does include at least 90 percent of the total feed industry capacity.

The commercial feed industry is expanding, but the limiting factor of growth is the availability of feed grains. Corn usually accounts for approximately 30 percent of the total tonnage feed manufactured in the Philippines. After interviewing several of the larger manufacturers it was found that there is more demand for feed than can be met. The short supply of corn will not permit the full scale operation required to meet this demand. The feed industry could easily utilize 77,000 metric tons or about 1,375,000 cavans at 56 kilos each of corn or its equivalent per year if operating only 300 days/8 hours.

Since all the feed mills are privately owned and operated, it is assumed that the private sector will continue to expand its efforts to supply the needs of the animal feed market as long as the basic ingredients can be obtained at reasonable prices.

It is recommended that the farmers be encouraged to plant grain sorghums as feed grains (see Chapter XI on this subject). This would release more corn for human

TABLE 74

PRODUCTION OF COMMERCIAL FEEDS MANUFACTURED
IN THE PHILIPPINES, 1961-1965

Year	Feeds Manufactured				
	Poultry Feed	Hog Feed	Cattle Feed	Bird and Pigeon Feed	Total
	(Metric Tons)				
1961	117,684	2,362	263	938	121,247
1962	156,458	6,121	182	1,260	164,021
1963	148,916	25,799	9	1,215	175,939
1964	141,567	42,974	---	496	185,037
1965	156,198	49,875	29	375	206,477

Source: Philippine Association of Feed Millers (PAFMI) as reported by members which represent at least 90% of the total industry capacity.

consumption as corn-grits and for other commercial purposes such as corn starch processing. Soybean meal is another source of high protein ingredient used in the manufacture of animal feeds. As in the case of grain sorghums the farmers should be encouraged to grow soybeans for the same reasons.

The larger feed mills are quite modern semi-automatic in operation and employ the batch-type mixing system. A few are introducing the punch card fully-automatic mixing.

In addition to corn, other ingredients may be used in the manufacture of animal feeds. These can be found in the Philippines as follows:

From Flour Mills

Assuming that the quantity of wheat flour produced in 1966 was 351,340 metric tons in the Philippines, the by-products available for the manufacture of feed would be approximately **95,000 metric tons.**

From Rice Mills

Assuming the tonnage of palay milled in 1966 was 4,072,635 metric tons, the by-products available for the manufacture of feed would be approximately 7 percent or **285,000 metric tons.**

From Corn Mills

Assuming the tonnage of corn milled in 1966 was about 966,000 metric tons the by-products available for the manufacture of feed would be approximately 20 percent or 193,000 metric tons.

From Breweries [1/]

The feed by-products in the manufacture of beer would be approximately 10 percent as feed barley, 1.5 percent as sprouts, and 16.5 percent as spent grains. The quantity of these ingredients are not available N.A.

From Corn Starch Plants

If the two existing corn starch plants should operate about 150 twenty-four days per year they would process approximately 75,000 tons of corn. Roughly 20 percent of this amount could be made available in the manufacture of animal feeds or 15,000 metric tons.

Data are not available as to the quantity of the foregoing by-products presently used in the manufacture of

[1/] Note: There is only one manufacturer of beer in the Philippines. This firm is also one of the largest manufacturers of commercial feeds. It is therefore assumed that the by-products of the brewery are utilized in its feed mill.

animal feeds and the quantity which remains with the farmers and the original processors. However, the figures point out that certain by-products are created in the Philippines and are available as feed per se or feed ingredients for the manufacture of commercial feeds.

Import Duty on Feed Grains

The Philippine Government presently controls the imports of corn. Other feed grains may be imported but are subject to the following import duties:

Grain Sorghums	₱ 250.00 per metric ton
Soybeans	₱ 250.00 per metric ton
Soybean meal	26 percent ad valorem

In view of the above, it is suggested that the government review the existing import policies to afford relief to the feed miller until more of the feed grains are produced domestically.

Corn Starch Plants

The major plants (2) for processing corn starch by the "wet milling" process are located in:

Mandaluyong	- Input 200 tons of corn per 24 hours
Cebu	- Input 300 tons of corn per 24 hours

The normal production is approximately 66 percent corn starch; 30 percent gluten feed; and 4 percent corn oil. The starch is used by textile firms, food industries, flour mills, bakers, pasta processing, paper mills, and in foundries. Gluten feed is used in commercial feed manufacturing. The corn oil is refined and some of it is consumed as food and also used as raw materials by some manufacturers. Glucose is also manufactured and is used by candy makers.

Oil Extraction Plants

There are two (2) major oil extraction plants in the Philippines. Both are located in Pasig, Rizal and both use the solvent process. One has an input capacity of 100 tons of soybeans per 24 hours and the other has an input capacity of 150 tons of soybeans per 24 hours. (They can also be used for corn oil extraction at a lower capacity).

When handling soybeans the average extraction is approximately 83 percent when processing the beans into 44 percent protein meal for the animal feed industry. Under normal operating conditions of about 300 days/24 hours, the two plants would process about 75,000 metric tons of soybeans per year as compared to a domestic production of 1,132 metric tons in 1966.

* * *

CHAPTER XIII

GRAIN STORAGE REQUIREMENTS

Introduction

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CHAPTER XIII

GRAIN STORAGE REQUIREMENTS

Introduction

The term "grain storage balances" is used in a very restricted sense in this chapter. The basic question is: "How much storage capacity is needed in a given region to store the rice and corn produced in that region?" The "balancing" capacity in a region is then compared to the existing capacity to determine if an "over-balance" or an "under-balance of storage capacity exists.

There is, of course, no compelling reason for storage facilities to be located always in the region where the rice and corn is produced. In some cases, it may be more economical to ship grain produced in one region to another region for storage than to store it in the region where it is produced. This possibility must be kept in mind in the analysis of the storage balance figures.

In other cases, the lack of storage facilities in the area where the grain is produced leads to grain being shipped out of the area at harvest time and then shipped back into the area several months later. In such cases, additional storage facilities within the region would reduce such grain movements and should benefit consumers and warehousemen as well as the farmers.

The purpose of this chapter is to provide:

(1) a general idea of the grain storage balances in the various regions of the Philippines during the 1970's; and,

(2) information on the expected pattern of grain movements in 1970 and 1975.

A more detailed discussion of storage balances in the various provinces will be provided in Chapter XIV along with recommendations for new facilities.

Regional Storage Balances

The estimates of regional storage balances are based on a set of assumptions about the percentage of rice and corn marketed and the number of times the grain turns over in a region. The percentage of rice and corn production marketed is based on DAMR estimates of the percentage of these grains which are "market directed".

The DAMR estimates have been adjusted upward in some cases to take into account the fact that the percentage of grain production marketed has tended to increase during past years. The estimated grain turnover figures are based on an analysis of grain flows and the DAMR data on the percentage of rice harvested each month in the various regions. The analysis of grain flows indicates that, for most regions, approximately one ton of storage capacity is needed for each 3 tons of grain marketed. The actual turnover in any given warehouse within a region may be more (or less) than 3 times. The turnover figures used are average figures for all warehouses in the region.

Method of Estimating Grain Storage Balances by Regions for 1970

To illustrate the procedure used in estimating the grain storage balances by regions shown in Table 75, the Ilocos

TABLE 75

GRAIN STORAGE BALANCES FOR 1970, BY REGION: PHILIPPINES

	Region	Existing Warehouse Capacity[a]	Palay Production	Palay Percent Marketed	Palay Amount Marketed	Corn Production	Corn Percent Marketed	Corn Amount Marketed	Total Grain Marketed	Grain Turnover per Year	Apparent Storage Capacity Needed[f]	Balance Situation: Over-Balance	Balance Situation: Under-Balance
		Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 12	Col. 13
		(metric tons)		(percent)	(metric tons)		(percent)	(metric tons)			(metric tons)	(metric tons)	
I	Manila	36,647	355,048[b]	100.0	355,048	52,391[b]	100.0	52,391	407,439	10.0	40,744	--	1,097
II	Ilocos[c]	18,170	195,389	40.0	78,156	6,431	40.0	2,571	80,730	3.0	26,910	--	8,740
III	Cagayan Valley	200,148	686,939	70.0	480,857	104,067	60.0	62,440	543,297	2.5	217,318	--	17,170
IV	Central Luzon	672,664	1,608,678	60.0	965,207	34,049	60.0	20,429	985,636	2.0	492,818	179,846	--
V	Southern Tagalog	404,784	629,549	50.0	314,774	78,090	60.0	46,854	361,628	3.0	120,543	--	15,759
VI	Bicol	61,603	524,507	50.0	262,753	58,488	50.0	29,244	291,997	3.0	97,332	--	35,729
VII	Western Visayas	127,366	550,307	50.0	275,153	149,515	50.0	74,757	349,910	3.0	116,637	10,729	--
VIII	Eastern Visayas	63,156	263,810	45.0	118,714	213,254	45.0	95,964	214,678	3.0	71,559	--	8,403
IX	S & W Mindanao	255,356	865,621	55.0	476,091	864,941	60.0	518,965	995,056	3.0	331,685	--	76,329[d]
X	N & E Mindanao	53,779	207,758	45.0	93,491	191,364	50.0	95,682	189,173	3.0	63,058	--	9,279
	Philippines	1,593,673	5,533,558[e]	xxx	3,065,196[e]	1,700,202[e]	xxx	946,909[e]	4,012,105[e]	xxx	1,578,604	190,575	175,506

a Facilities existing in 1967 less 10% depreciation. Estimated useful life of present facilities is 30 years. Metric tons converted to 40 kilos.
b Consumption figure.
c A substantial amount of the warehouse facilities reported in the Ilocos region are used for tobacco and vegetable storage. According to our estimates, only 28.4 percent of the 1967 warehouse facilities will be available for grain storage in 1970.
d This figure is probably an over estimation of the actual under-balance of storage capacity because of under-reporting of private warehouse facilities in Davao Province. For more details, see Chapter II.
e Total does not include Manila.
f The "Apparent Storage Capacity Needed" is computed on the assumption that grain produced and marketed in a region is to be stored in the region.

region is chosen as an example for discussion:

(a) It is estimated that about 40 percent of the rice and corn produced in the region will be stored in commercial warehouses during the year (Col. (6), Table 75).

(b) The grain turnover for the region is assumed to be equal to 3 (Col. (9), Table 75).

In other words, an average 2,000 ton warehouse will handle 6,000 tons of grain during the year.

(c) Using the estimates of rice and corn production projected for this region, 80,730 metric tons of rice and corn will be marketed (Col. (8), Table 75); and

(d) a storage capacity of 26,910 metric tons would be needed to handle the grain marketed (Col. (10), Table 75).

(e) The existing storage facilities in the region would provide storage for 18,170 metric tons of grain in 1970 (Col. (1), Table 75).

(f) Thus, an additional 8,740 metric tons of storage capacity would be needed by 1970 in order to store the expected grain production in the region.

The estimated grain storage balances for the other regions of the Philippines in 1970 is also presented in Table 75.

This type of analysis leads the team to conclude that by 1970 there will be an "under-balance" in grain storage capacity in all regions except Central Luzon and Western Visayas.

The surplus palay from the Cagayan Valley tends to move into the provinces of Bulacan and Nueva Ecija in Central Luzon where it is held until it is milled and shipped to wholesalers in Manila. Thus, part of the apparent "over-balance" of capacity in Central Luzon is used to offset the apparent "under-balance" of capacity in the Cagayan Valley region.

Both Bicol and the Southern and Western Mindanao regions are expected to have a substantial "under-balance" in grain storage facilities by 1970. The shortage of storage facilities in the Bicol region is coupled with a very serious shortage of drying facilities in this region. The Bicol region has rain throughout the year. Sun-drying is therefore a very unreliable method of drying rice and corn in this region.

The shortage of storage facilities in the Southern and Western Mindanao region appears to be due to the rapid increase in the production of corn that has taken place in the region in recent years. A number of warehouses are presently under construction in this region. The actual "under-balance" in capacity will therefore be somewhat less than estimated. Since warehousemen are not required to report on construction in progress, there are no records of the amount of storage capacity presently under construction in this region. It is likely that considerably less warehouse capacity has been reported in Davao province than actually exists. If so, the figures tend to overestimate the actual "under-balance" in storage capacity in Southern and Western Mindanao. This will

be discussed in more detail in Chapter XIV.

Method of Estimating Additional Grain Storage Needs for Regions by 1975 and 1980

The storage capacity needed to handle the increases in production between 1970 and 1975, and between 1975 and 1980, are presented in Table 76 and 77 respectively.

Again, using the Ilocos region to illustrate the procedure by which these estimates were obtained:

(a) The expected increase in palay production between 1970 and 1975 in the Ilocos region is estimated to be 13,970 metric tons (Col.(1), Table 76).

(b) The expected increase in corn production during the same period is estimated to be 497 metric tons (Col. (4), Table 76).

(c) It is assumed that the increases in grain marketed would be turned over 4 times (Col. (7), Table 76) (The turnover figure for all grain marketed in the region would, of course, be less than 4).

(d) Thus, 1,808 metric tons of storage capacity would be needed to handle this increase in grain production (Col. (10), Table 76).

(e) An additional 3,689 metric tons of storage capacity would be needed by 1975 to cover the 1970 to 1975 depreciation on presently existing facilities (Col. (11), Table 76).

(f) The total amount of storage facilities needed to handle the increase in grain marketed and to cover the 1970-1975 depreciation would therefore be equal to 5,497 metric tons (Col.(12), Table 76).

(g) An additional 5,569 metric tons would be needed to cover depreciation in existing facilities and increases in rice and corn production during the 1975 to 1980 period (Col.(12), Table 77).

Recommended additions to storage capacity between 1970 and 1975 (or 1975 to 1980) will depend partly on the facilities recommended for 1970, partly on the estimated storage capacity "needs", and partly upon expected grain flows. Thus, storage capacity "needs" are not, in themselves, a measure of the amount of new storage facilities that would be economical to construct.

The largest production increases are expected in Central Luzon, the Cagayan Valley, and Southern and Western Mindanao. These regions will therefore need larger amounts of storage facilities than other regions to handle the increases in rice and corn production during the 1970 to 1975, and 1975 to 1980, periods. The "over-balance" capacity existing in the Central Luzon region in 1970 will be completely eliminated by 1975.

Regional Grain Movements

Available data on grain movements is not adequate to allow a detailed quantification of grain movements within the Philippines. There is undoubtedly a good deal of cross-shipments of rice and corn at the present time. Such cross-shipments are partly due to inadequate information on the supply and demand of grain in the various regions, the personal

TABLE 76

APPARENT ADDITIONAL GRAIN STORAGE NEEDS BETWEEN 1970-1975, BY REGION, PHILIPPINES

	Region	Palay			Corn			Grain Turnover per Year	Apparent Additional Storage Capacity Needed before Depreciation[d]			Depreciation[a]	Total Apparent Additional Storage Capacity Needed after Depreciation
		Increase in Production	Percent Marketed	Amount Marketed	Increase in Production	Percent Marketed	Amount Marketed		Palay	Corn	Total		
		Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
		(metric tons)	(percent)	(metric tons)	(metric tons)	(percent)	(metric tons)		(metric tons)				
I	Manila	70,918[b]	100.0	70,918	22,067[b]	100.0	22,067	10	7,092	2,207	9,299	6,718	16,017
II	Ilocos	13,970	50.0	6,985	497	50.0	249	4	1,746	62	1,808	3,689	5,497
III	Cagayan Valley	255,815	70.0	179,071	15,458	[illegible]	10,048	4	44,768	2,512	47,280	36,200	83,480
IV	Central Luzon	331,522	65.0	345,489	5,104	60.0	3,062	4	86,372	766	87,138	123,321	210,459
V	Southern Tagalog	93,200	65.0	60,580	10,979	60.0	6,587	4	15,145	1,647	16,792	19,210	36,002
VI	Bicol	76,564	50.0	38,282	9,463	55.0	5,205	4	9,471	1,301	10,872	11,294	22,166
VII	Western Visayas	52,456	50.0	26,228	26,385	55.0	14,512	4	6,557	3,628	10,185	23,350	33,535
VIII	Eastern Visayas	15,276	50.0	7,638	41,197	50.0	20,599	4	1,910	5,150	7,060	11,592	18,652
IX	S & W Mindanao	197,496	60.0	118,498	116,279	60.0	69,767	4	29,624	17,442	47,066	46,815	93,881
X	N & E Mindanao	25,341	50.0	12,671	29,619	55.0	16,291	4	3,168	4,073	7,241	9,859	17,100
	Philippines	1,261,640[c]	xxx	795,442[c]	254,981[c]	xxx	146,320[c]	xx	205,953	38,788	244,741	292,048	536,789

a/ Depreciation of 1967 facilities computed on straight line basis with assumed useful life of 30 years for existing storage structures. Depreciation figures do not include depreciation for facilities built after 1967.
b/ Consumption figure.
c/ Total does not include Manila.
d/ The "Apparent Additional Storage Capacity Needed before Depreciation" is computed on the assumption that increases in production in a region are stored in the region.

TABLE 77

APPARENT ADDITIONAL GRAIN STORAGE NEEDS BETWEEN 1975-1980, BY REGION, PHILIPPINES

	Region	Palay			Corn			Grain Turnover per Year	Apparent Additional Storage Capacity Needed before Depreciation[d]			Depreciation[a]	Total Apparent Additional Storage Capacity Needed after Depreciation
		Increase in Production	Percent Marketed	Amount Marketed	Increase in Production	Percent Marketed	Amount Marketed		Palay	Corn	Total		
		Col. 1 (metric tons)	Col. 2 (percent)	Col. 3 (metric tons)	Col. 4 (metric tons)	Col. 5 (percent)	Col. 6 (metric tons)	Col. 7	Col. 8	Col. 9	Col. 10 (metric tons)	Col. 11	Col. 12
I	Manila	82,452[b]	100.0	82,452	15,541[b]	100.0	15,541	10	8,245	1,554	9,799	6,718	16,517
II	Ilocos	14,395	50.0	7,197	645	50.0	322	4	1,799	81	1,880	3,689	5,569
III	Cagayan Valley	260,775	70.0	182,542	18,634	65.0	12,112	4	45,636	3,028	48,664	36,200	84,864
IV	Central Luzon	561,399	65.0	364,909	6,146	60.0	3,687	4	91,227	922	92,149	123,321	215,470
V	Southern Tagalog	95,334	65.0	61,967	13,295	60.0	7,977	4	15,492	1,994	17,486	19,210	36,696
VI	Bicol	78,812	50.0	39,406	11,332	55.0	6,232	4	9,851	1,558	11,409	11,294	22,703
VII	Western Visayas	53,180	50.0	26,590	31,394	55.0	17,267	4	6,647	4,317	10,964	23,350	34,314
VIII	Eastern Visayas	15,380	50.0	7,690	48,722	50.0	24,361	4	1,922	6,090	8,012	11,592	19,604
IX	S & W Mindanao	205,046	60.0	123,028	141,761	60.0	85,057	4	30,757	21,264	52,021	46,815	98,836
X	N & E Mindanao	26,400	50.0	13,200	35,588	55.0	19,573	4	3,300	4,893	8,193	9,859	18,052
	Philippines	1,310,721[c]	xxx	826,529[c]	307,517[c]	xxx	176,588[c]	xx	214,876	45,701	260,577	292,048	552,625

a/ Depreciation of 1967 facilities computed on straight line basis with 1967 facilities as the starting point. Thus, depreciation is equal to 0.166 times 1967 capacity, since the assumed useful life of a facility is 30 years and the depreciation figure is the sum of 5 years depreciation.
b/ Consumption figures.
c/ Total does not include Manila.
d/ The "Apparent Additional Storage Capacity Needed before Depreciation" is computed on the assumption that increases in production in a region are stored in the region.

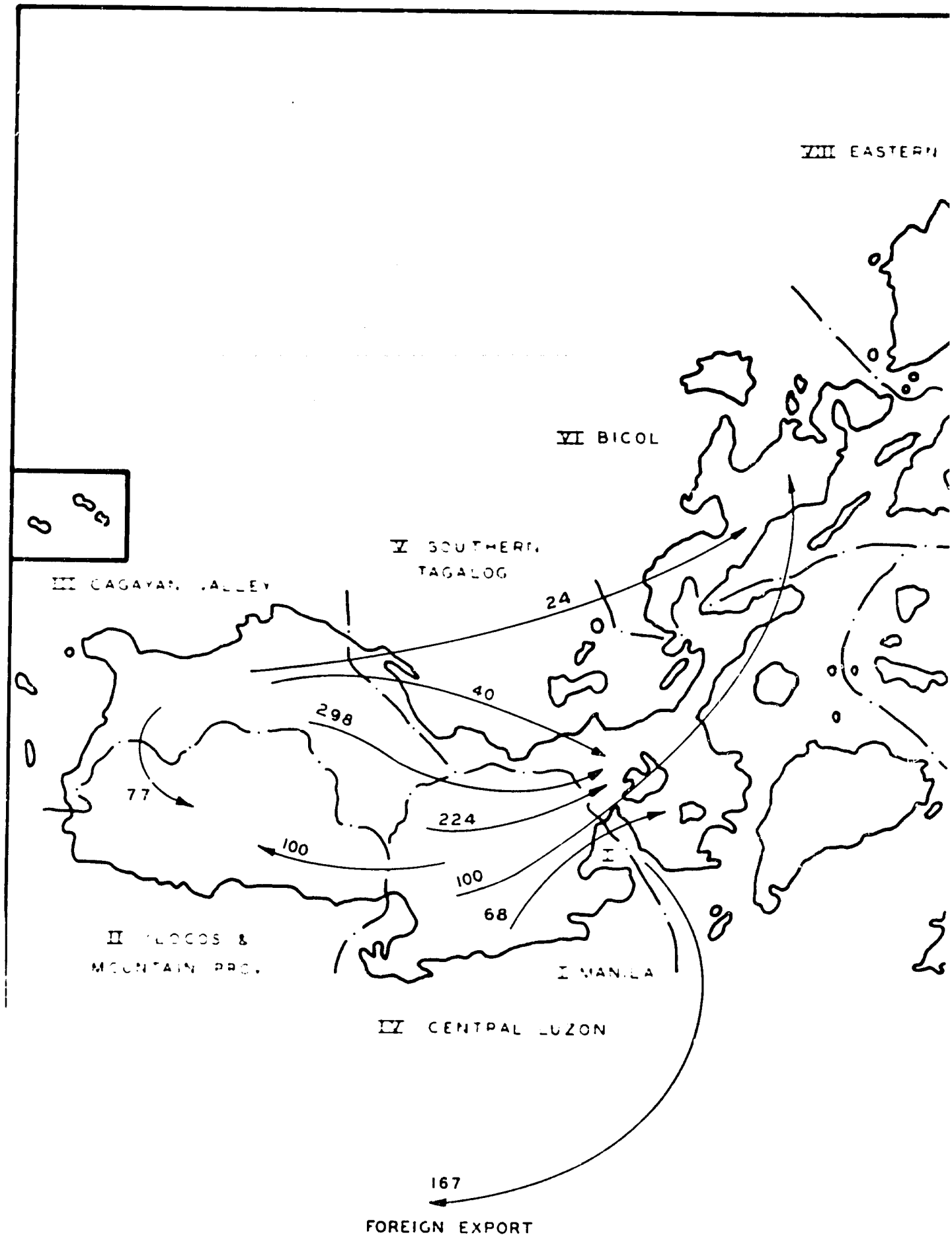
nature of business relationships between grain dealers, lack of storage facilities in some areas, and regional differences in the seasonality of production. It is neither possible nor desirable to eliminate all cross-shipments of grain. Nor is detailed information on gross grain flows, which take cross-shipments into account, absolutely necessary for a broad study of grain storage requirements. A general knowledge of the location and direction of the net grain flows is needed, however, and will be provided in this section.

Regional Movements of Rice

There are two main trading areas for rice in the Philippines. In the northern area, rice moves from the Cagayan Valley into the Ilocos region and south into Central Luzon where it is held for later shipment into Manila and the Southern and Bicol provinces. Rice from Central Luzon flows north to the Ilocos region and south into Southern Tagalog and Bicol. In the southern part of the Philippines, rice moves from Southern and Western Mindanao into the Western Visayas, Eastern Visayas and Northern and Eastern Mindanao.

The present movements of rice between the northern and southern trading areas will be reduced as the Philippines become self-sufficient in rice production. The rice movements within the trading areas will tend to increase, however, because of regional differences in the rates of production increases and population growth.

If production increases according to the estimated medium projections, there will be about 166,928 metric tons of exportable palay from the Central Luzon and Cagayan Valley regions and around 250,408 metric tons of exportable palay from the Southern and Western Mindanao regions in 1970. By 1975, the exportable palay from the Central Luzon and Cagayan Valley regions will have increased to 508,427 metric tons while that



FIGURES IN THOUSAND METRIC TONS OF PALAY

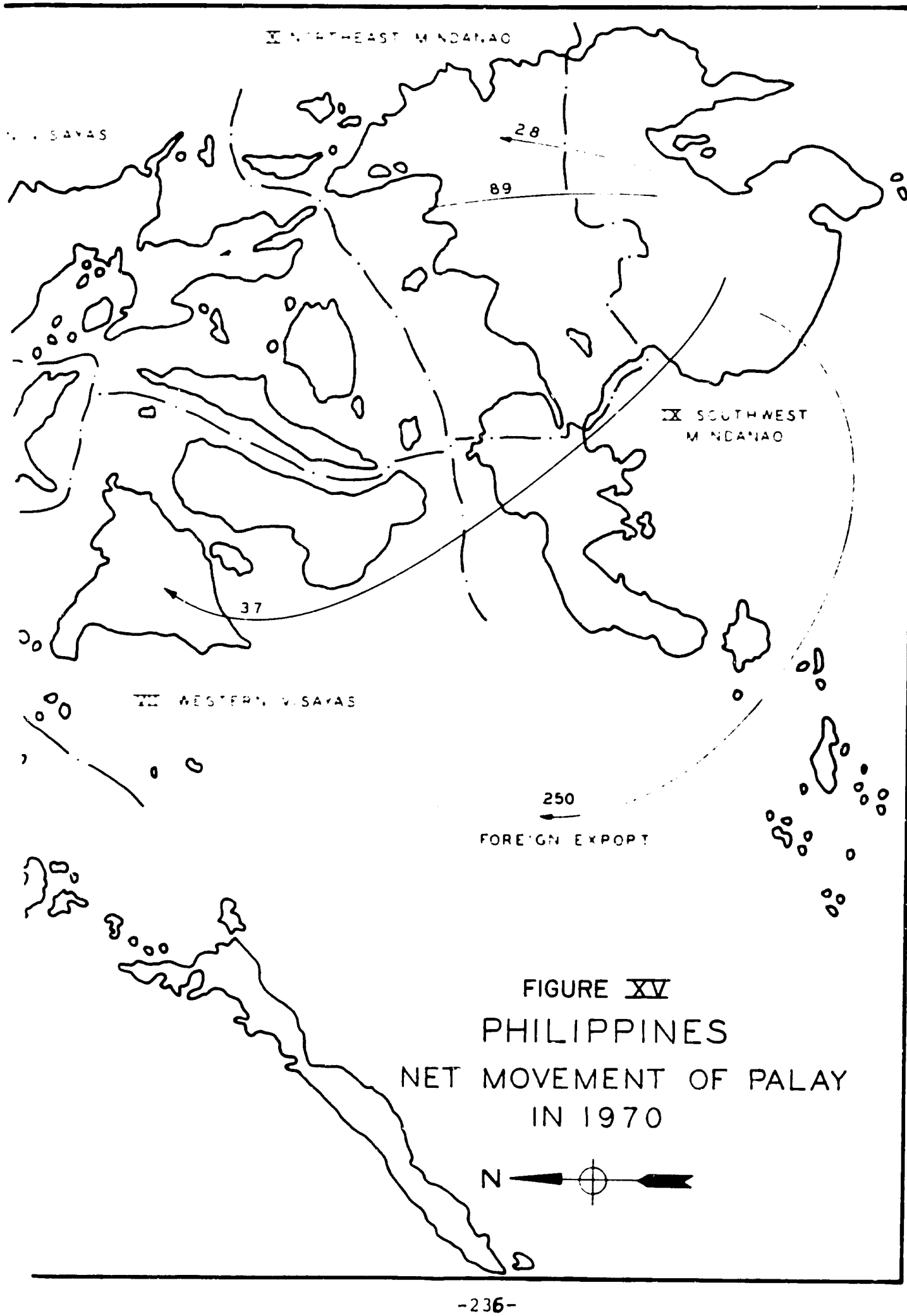
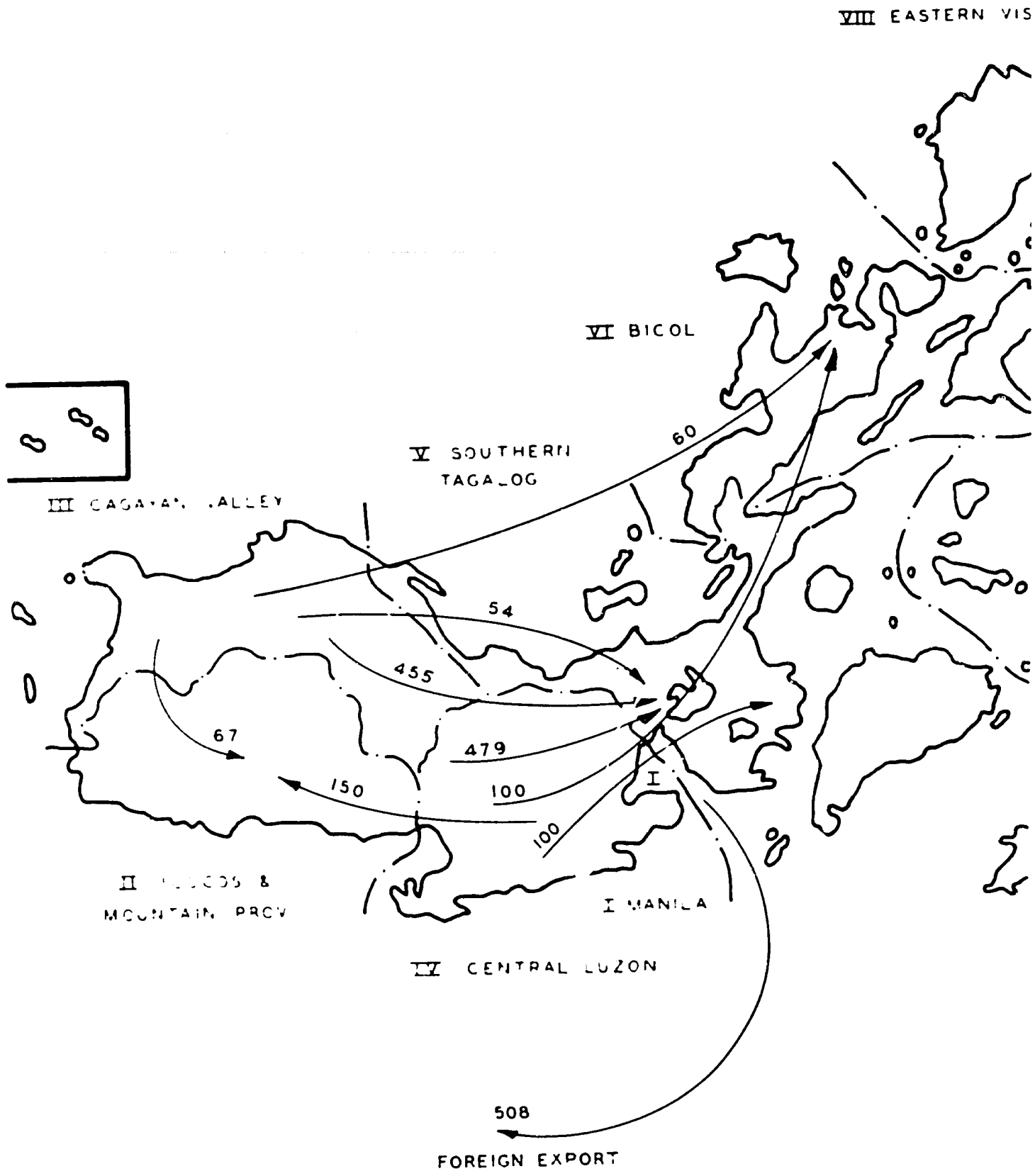


FIGURE XV
PHILIPPINES
NET MOVEMENT OF PALAY
IN 1970



FIGURES IN THOUSAND METRIC TONS OF PALAY

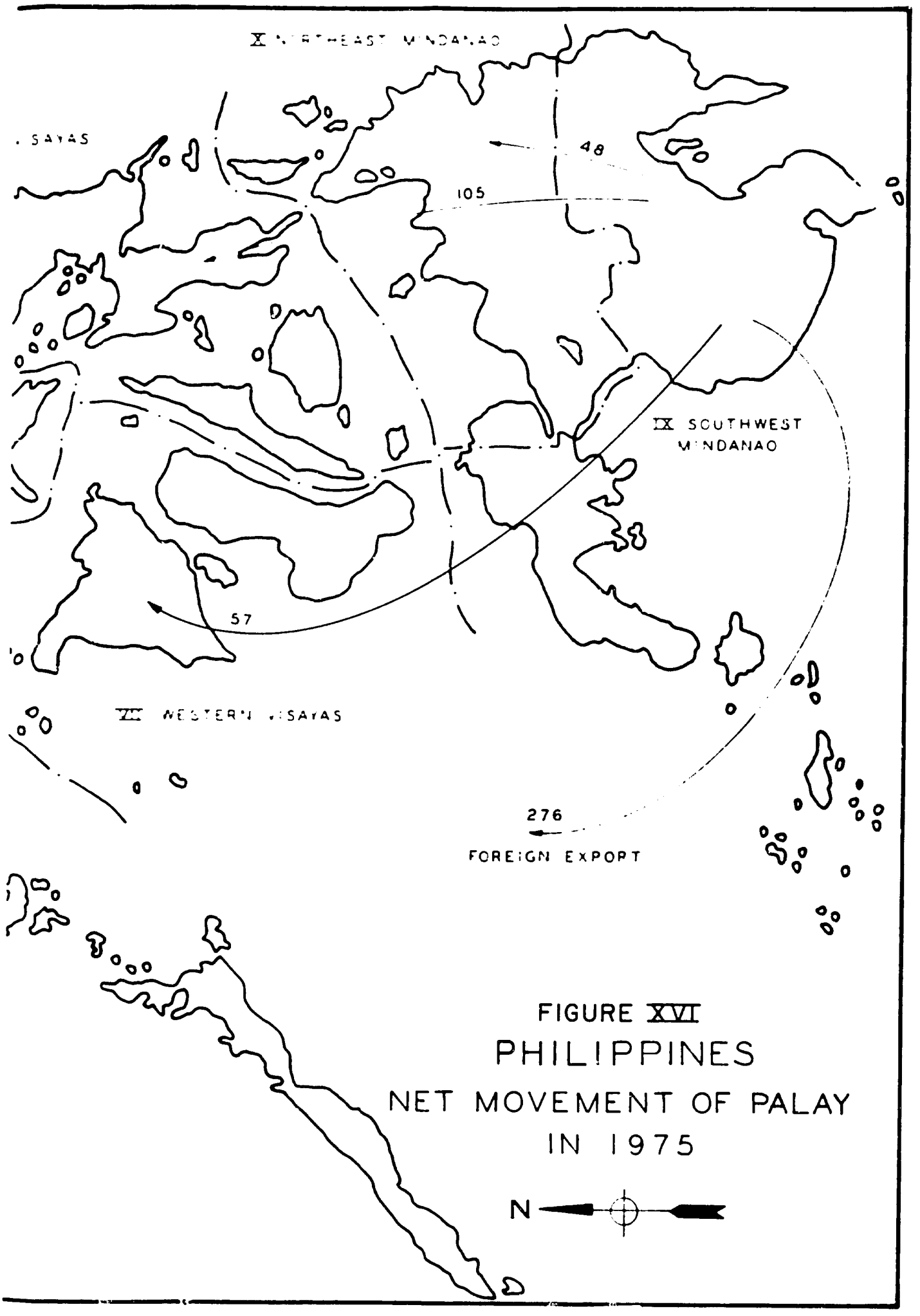
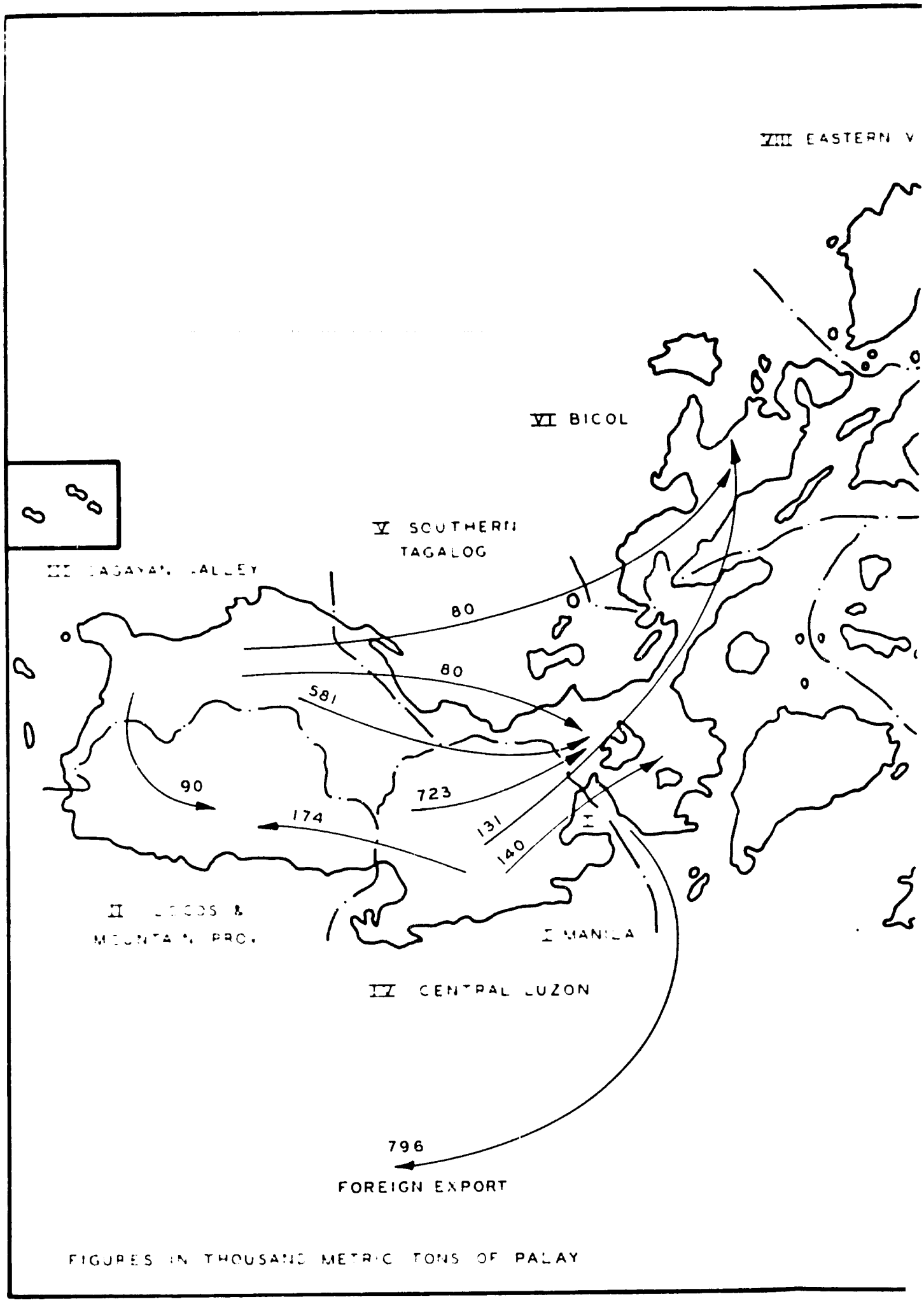


FIGURE XVI
PHILIPPINES
NET MOVEMENT OF PALAY
IN 1975


VIII EASTERN V
VI BICOL
V SOUTHERN
TAGALOG
80
80
581
90
723
174
131
140
I MANILA
IV CENTRAL LUZON
796
FOREIGN EXPORT
FIGURES IN THOUSAND METRIC TONS OF PALAY

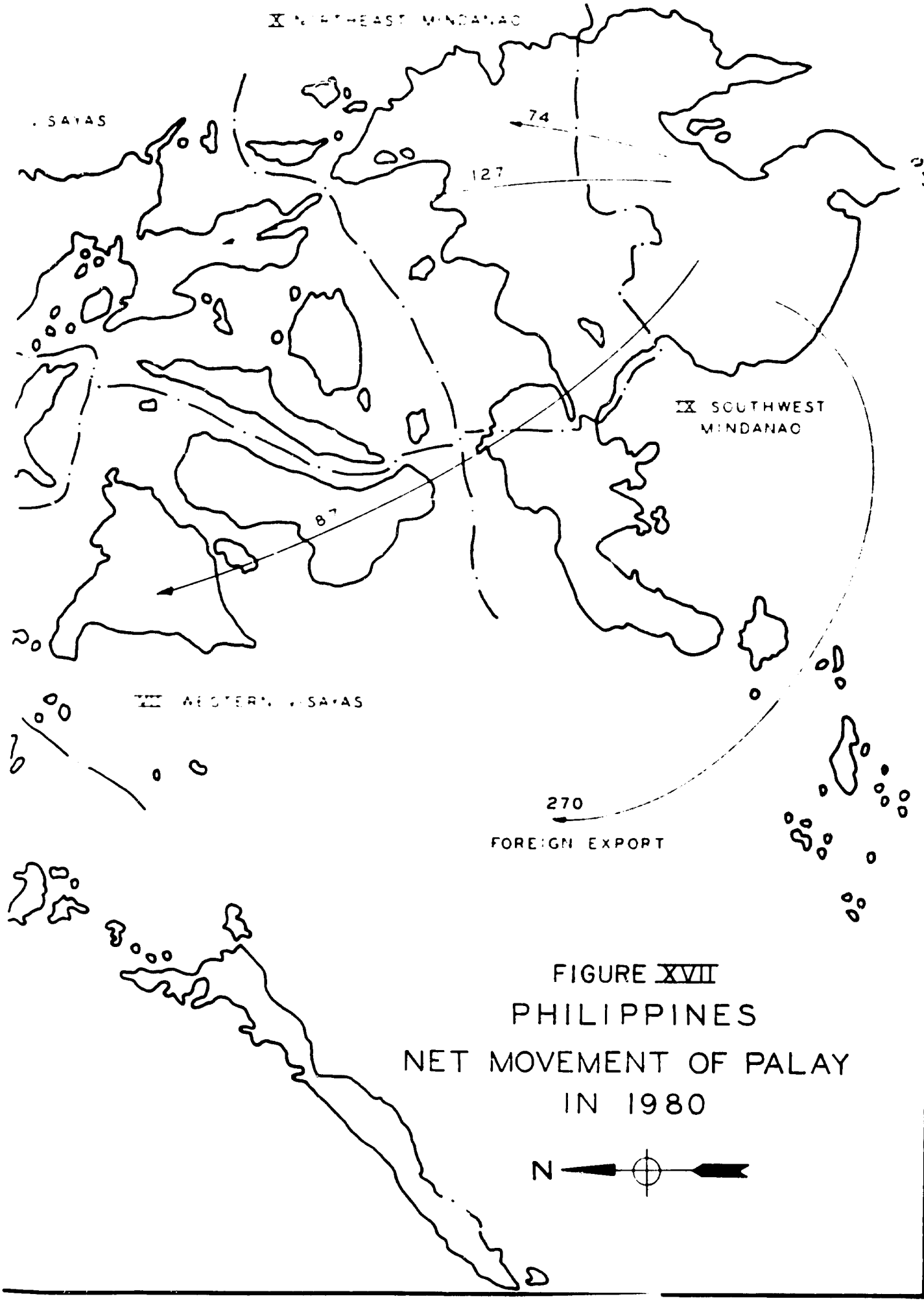


FIGURE XVII
PHILIPPINES
NET MOVEMENT OF PALAY
IN 1980

from Southern and Western Mindanao will have increased to around 275,673 metric tons.

All of the exportable palay from Central Luzon and Cagayan Valley is expected to move through Manila.[1/] Most of the exportable rice from Southern and Western Mindanao is expected to move through the port at the City of Cotabao; and the remainder is expected to move through the ports at Dadiangas (General Santos) and Davao City.

A more complete idea of the net movements of rice in 1970, 1975, and 1980 can be obtained from Figures XV, XVI, and XVII. It should be noted that these estimates do not take into account the fact that rice produced in one region may be held in another region for several months before being transshipped to a third region.

Regional Movements of Corn

The Southern and Western Mindanao region is the only region that is expected to have a substantial quantity of surplus corn in 1970. This corn will flow to nearly all parts of the Philippines. The largest corn flow is from Southern and Western Mindanao to the Eastern Visayas. The net flow between these two regions is estimated to be about 159,169 metric tons in 1970. The gross flow of corn will be larger than this, however, because a good deal of corn shipped to Cebu is transshipped to Manila, Southern Tagalog and Bicol.

Between 60 to 70 percent of the corn shipped from the

1/ Rice for foreign export could move through the port at San Fernando in La Union. Transportation costs of moving rice to this port will be higher than transportation costs to Manila. Thus, it is doubtful that much rice will move through San Fernando.

Southern and Western Mindanao region will pass through the City of Davao. The remaining 30 to 40 percent will move through the ports at Dadiangas and the City of Cotabato. Both shelled corn and corn grits are shipped from these ports. Figures XVIII, XIX, and XX indicate the net movements of corn in 1970, 1975, and 1980.

Grain Drying

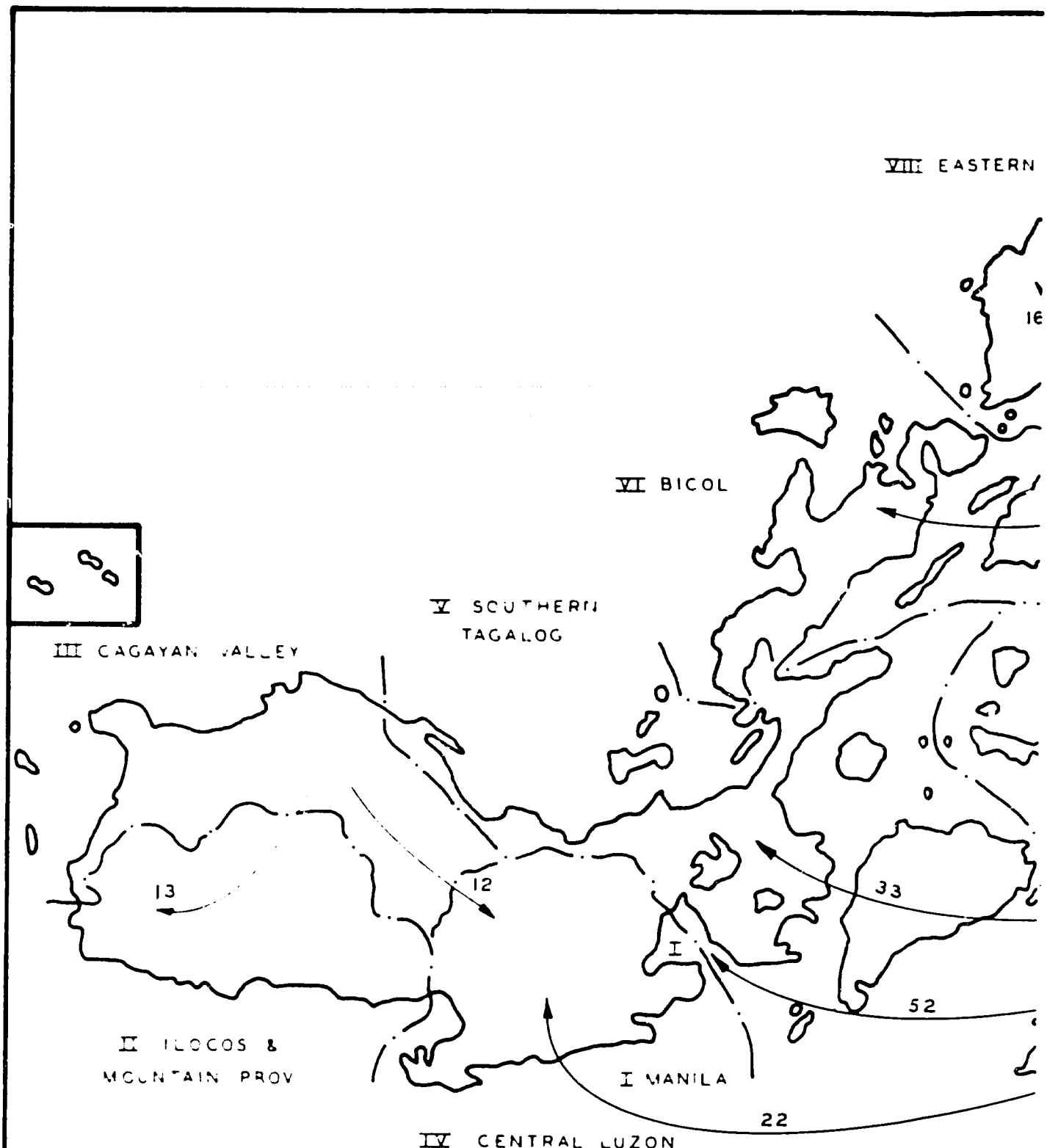
Present Methods

Since the farmer sells most of his palay immediately after harvesting, the drying and conditioning before milling is left almost entirely to the middlemen and millers. The palay remaining on the farms is dried on mats spread on rural roads or farm drying sheds. Middlemen and millers usually have large concrete drying pavements adjacent to the warehouse and mill building for sun-drying palay and shelled corn.

The determination of the moisture content is usually done by cracking the hull in the case of palay. If the hull cracks easily, the moisture content is "estimated" to be about 14 percent and the grain is ready for storage. Grains intended for long storage periods are more thoroughly dried; oftentimes spreading them twice on the concrete pavement. Aeration in storage is not used. It was noted that some palay stored in sacks for as long as twelve months had not been aerated. In a very few instances, where palay is stored commercially in bulk, aeration is practiced by occasionally "turning" the grain from one bin to another.

Mechanical Drying

Mechanical warm-air driers are not extensively used at present except in research institutions, in a few government



FIGURES IN THOUSAND METRIC TONS OF SHELLED CORN

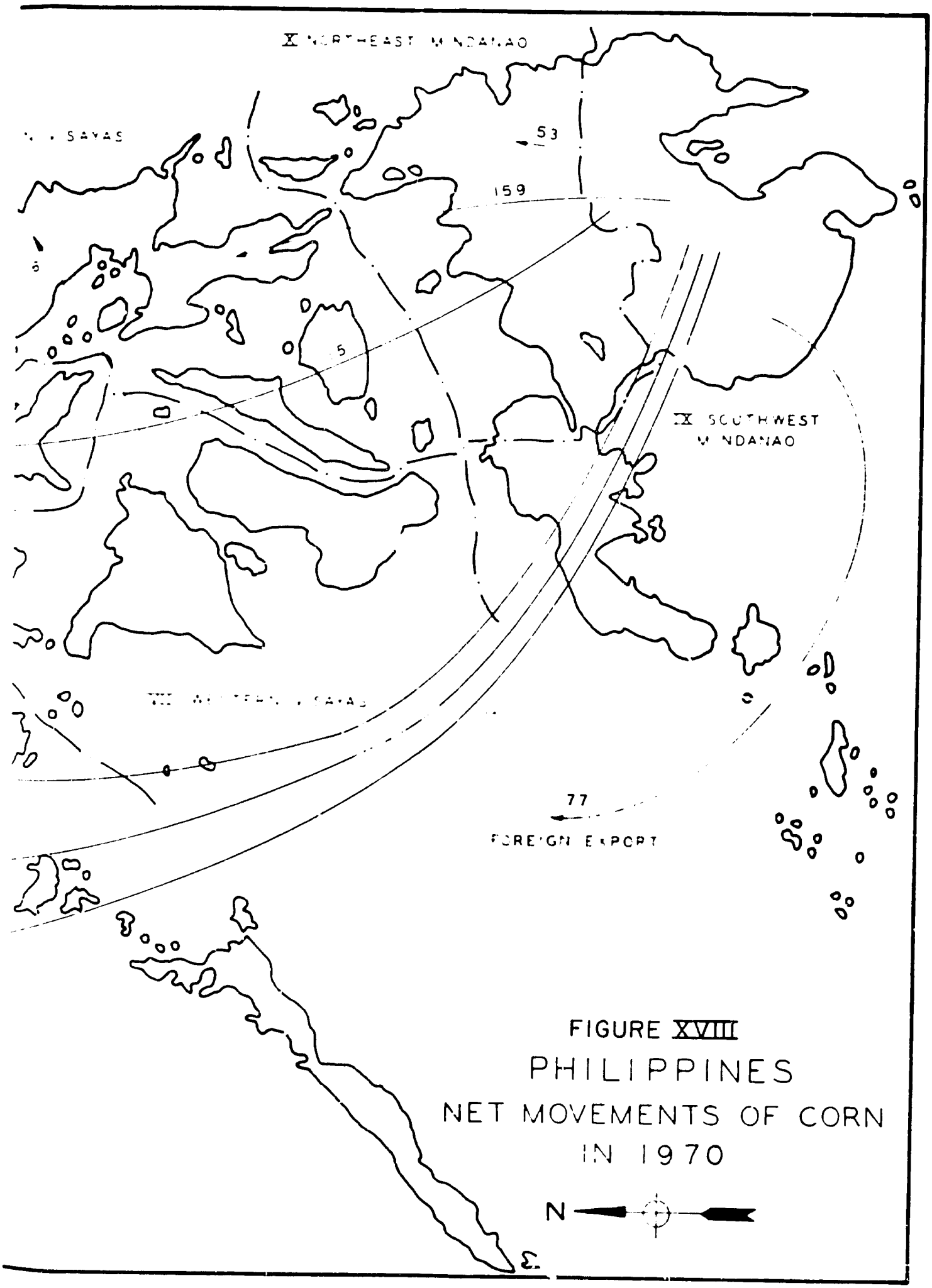
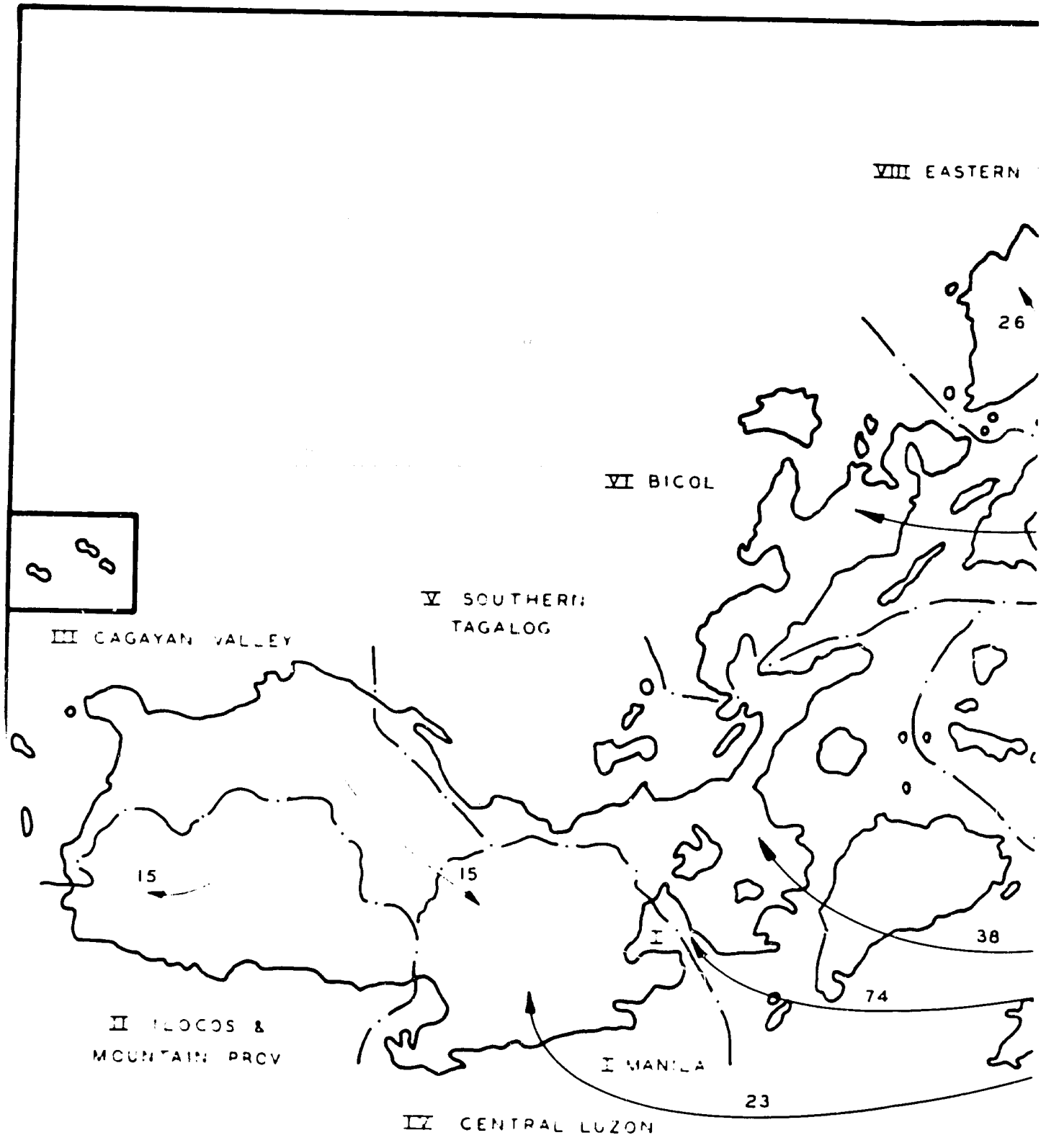


FIGURE XVIII
PHILIPPINES
NET MOVEMENTS OF CORN
IN 1970



FIGURES IN THOUSAND METRIC TONS OF SHELLED CORN

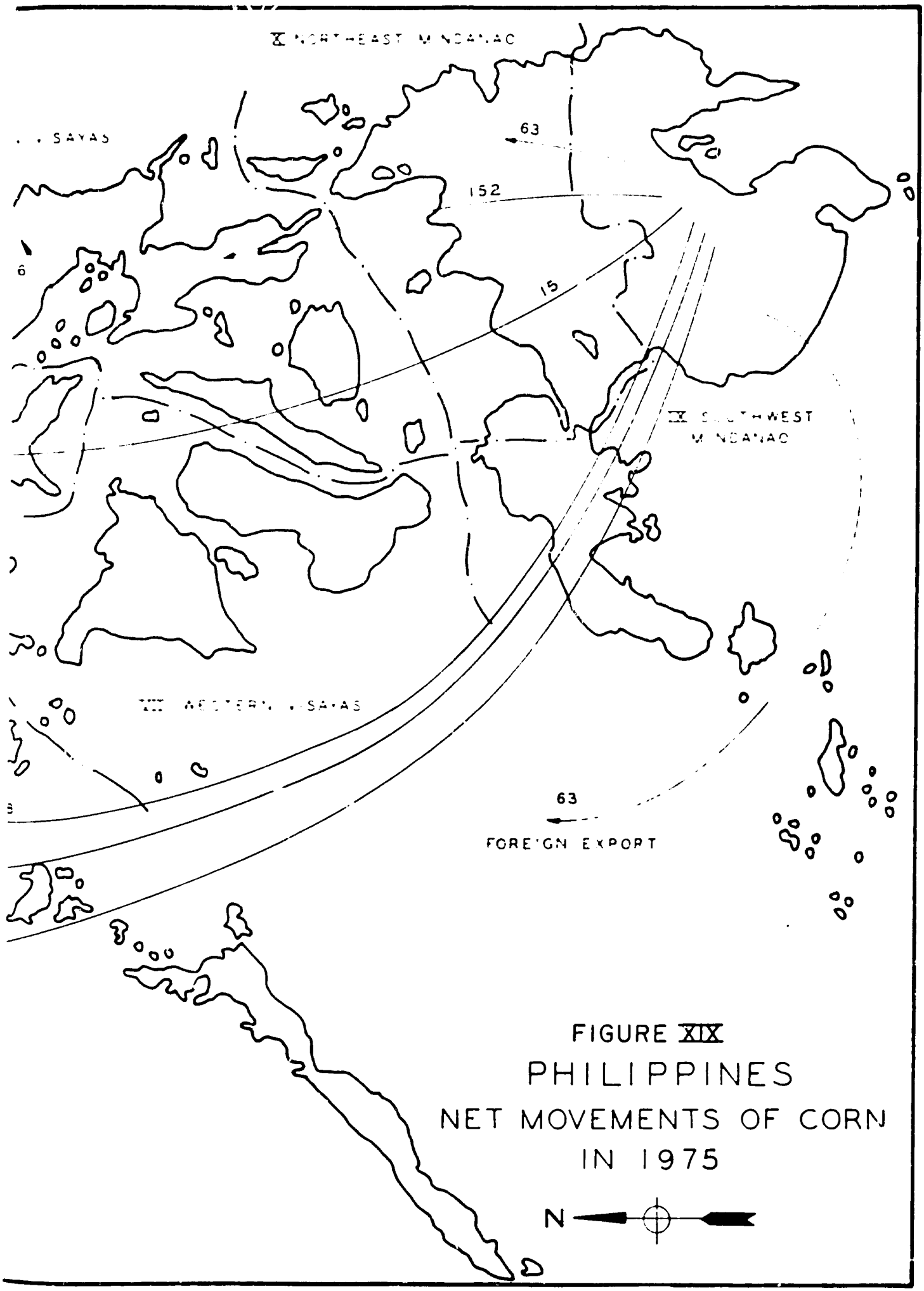
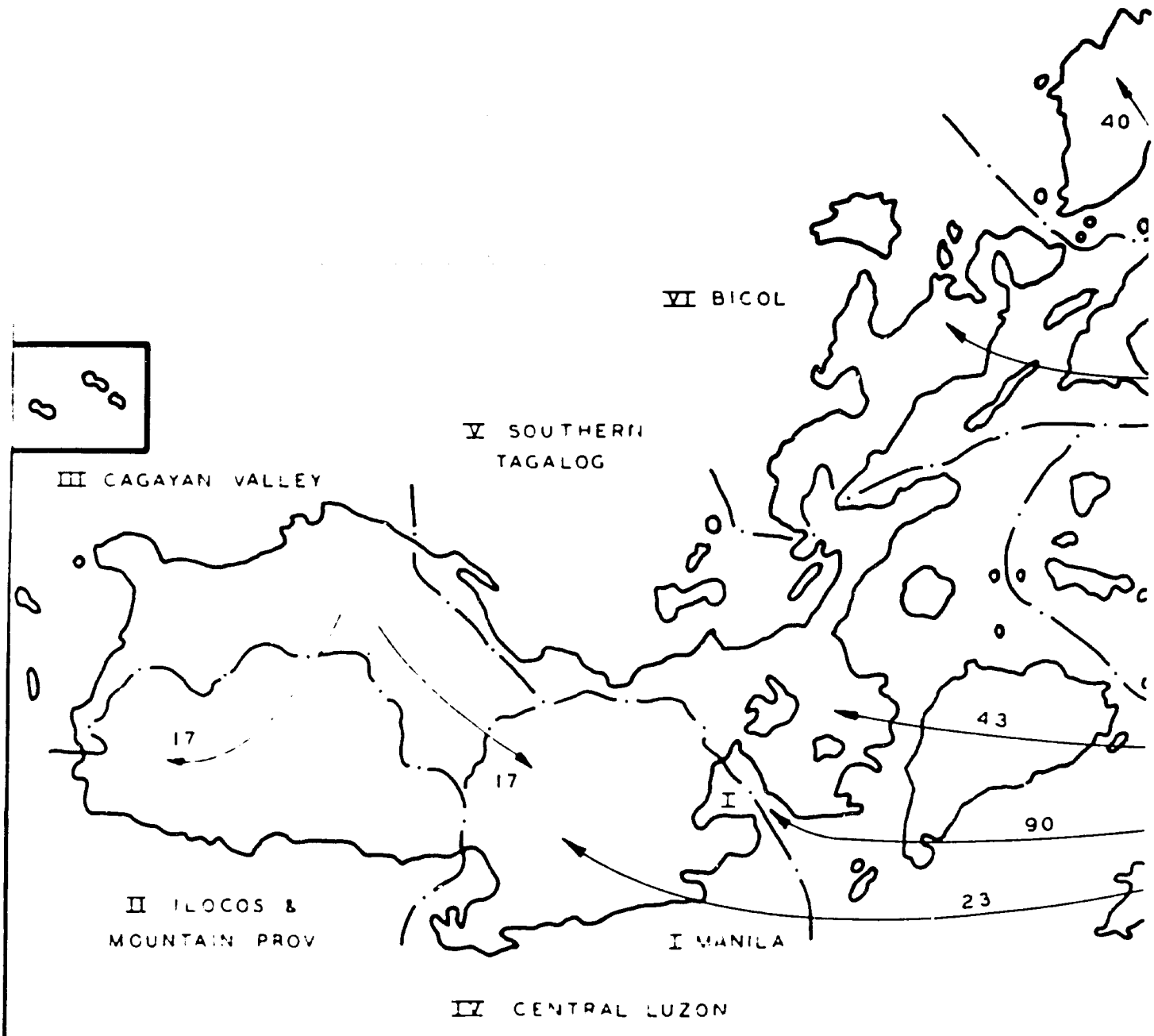


FIGURE XIX
PHILIPPINES
NET MOVEMENTS OF CORN
IN 1975



FIGURES IN THOUSAND METRIC TONS OF SHELLED CORN

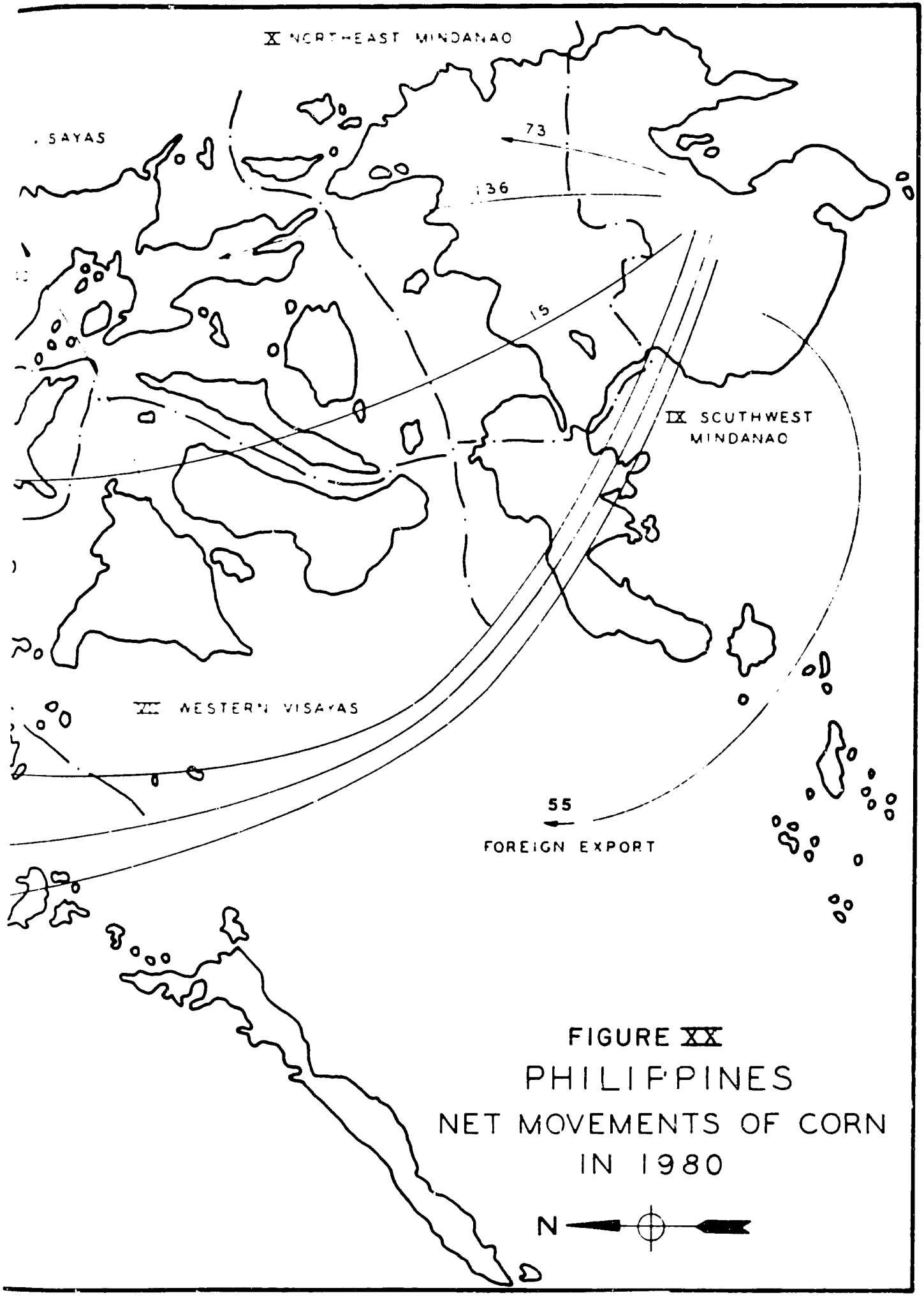


FIGURE XX
PHILIPPINES
NET MOVEMENTS OF CORN
IN 1980

operations, and by a few private warehouse and mill owners. Recognizing the need of mechanical driers, the Philippine Government has undertaken a program of drier education and has already purchased a number of these machines which are to be installed in the near future. Credit will also be made available through banking institutions for the purchase of these driers.

Experiments on the use of driers have been conducted and education materials prepared by the College of Agriculture, University of the Philippines, Los Banos (UPCA); the Agricultural Credit Administration (ACA); the Rice and Corn Administration (RCA); International Rice Research Institute (IRRI); and several local manufacturers of grain driers. Information, therefore, about benefits of mechanical drying is available to those interested in the subject.

There are no data available as to the number of mechanical warm-air driers in the government or private warehouses. However, in the course of the investigations, the research team found about 33 of these machines installed at the following locations, and perhaps there are others in existence; some of these found are: the batch-type flat bed, continuous-type shaker screen, continuous-type column; and batch-type column:

Cagayan:

1 - Continuous-type Column Drier

Isabela:

3 - Batch-type Flat Bed Driers

2 - Continuous-type Shaker Screen Driers

Bulacan:

1 - Batch-type Column Drier

Nueva Ecija:

2 - Batch-type Column Driers

2 - Batch-type Flat Bed Driers

2 - Continuous-type Column Driers

1 - Continuous-type Shaker Screen Drier

Laguna:

1 - Batch-type Column Drier

1 - Continuous-type Column Drier

1 - Batch-type Flat Bed Drier

Albay:

3 - Batch-type Column Driers

2 - Continuous-type Column Driers

Camarines Sur:

2 - Continuous-type Shaker Screen Driers (ready to be installed)

Iloilo:

1 - Continuous-type Column Drier

Negros Occidental:

1 - Batch-type Flat Bed Drier

Cotabato:

2 - Batch-type Column Driers

1 - Continuous-type Column Drier

Davao:

1 - Batch-type Column Drier

1 - Continuous-type Column Drier

Zamboanga del Sur:

2 - Batch-type Column Driers

Immediate steps should be taken to reactivate many of the above driers as about half of these machines have been idle for the past few years, some because of needed repairs and others because of lack of proper operational instructions.

The Agricultural Productivity Committee (APC) has recently ordered and has on hand, 108 ISEKI [Japanese manufacture] warm-air batch-type flat bed driers (these are not included in the above list). They are to be sold or leased to selected warehouse operators. Plans are being formulated to order several hundred more.

In addition, ACA and RCA have built about 60 batch-type flat bed warm-air driers for use in selected warehouses.

Unheated Air Drying

Palay may be dried with unheated air in bulk grain storage structures by moving a volume of air through the grain. This is known as the "deep bed grain drying". The advantage of this system is; the low initial cost and ease of operation. The disadvantages of "deep bed grain drying" are: the long drying period which may be up to three months or even longer; continued high humidity weather which may cause delayed drying or even unsatisfactory results; and, the mass of grain which does not dry uniformly from top to bottom.

Heated Air Drying

Mechanical warm-air drying has distinct advantages over natural drying, namely: the drying can be accomplished at any time and under most weather conditions; air temperature can be controlled in order to remove the moisture percentage desired to obtain the best milling results.

Palay is usually harvested when the moisture content is 20 percent to 25 percent. Early harvesting is done in order to minimize field losses due to shattering of the grain and due to rodent and bird infestation. At this moisture content, the palay is too wet for milling or storage. Since there is no limitation on the initial moisture content for drying with heated air, the palay can be easily dried in passes to 13 percent or 14 percent moisture content which is required for proper storage before milling.

Palay in limited amounts can be sun-dried in fair weather, but during the rainy season for the early maturing and high-yielding varieties this traditional method is not feasible. Heated air drying will, therefore, be necessary to handle the increased volume of palay anticipated in most areas.

Drying in Passes

The drying process for palay having about 25 percent moisture should consist of a series of passes through the drier. Faster over-all drying rate and better market quality can be obtained by the multi-pass drying method than by any other. Tempering periods are interspersed by holding the palay in bins 6 to 12 hours between drier passes thus allowing the moisture to equalize within the rice kernel. This will minimize stresses in the grain and produce more head rice as cracking is reduced during milling.

Cooling rice to outdoor temperature by aeration during the tempering period, between passes through the drier, will result in savings of both fuel and operation time as additional moisture is removed through cooling.

Moreover, palay must be cooled before final storage to

preserve quality. A pass through the drier, with blowers on and burners off, cools the rice adequately. A tempering period between the last heated air pass and the cooling pass will permit the drier to reduce moisture content about 1/2 percent during cooling.

With the less desirable one-pass system, the palay is subjected continuously to hot air for several hours until all the grain is reduced to 14 percent moisture. Because of this continued exposure to the hot air, internal stresses are created in the grain which will cause a high percentage of broken kernels in the milling process.

Cleaning Palay before Drying

Cleaning palay to remove foreign materials as early as possible after harvest will speed drying, increase accuracy of moisture measurements, and lessen the danger of spoilage during holding and tempering periods. Heating will often develop where there is a concentration of foreign materials.

Recommendations

For the immediate present as well as for the long range storage program of handling cereal grains, there is an urgent need of mechanical warm-air driers. Warehouse operators, millers, and even farmers should be strongly urged to use them.

Traditional sun-drying will always be used in the Philippines. However, this method is grossly inadequate during the wet season when the new variety palay must be harvested. The only substitute for sun-drying is the use of mechanical warm-air driers.

Grain Drying Requirements

It is estimated that the grain drying capacity needed in the Philippines by 1970 should be capable of drying a throughput of 14,792 cavans per hour (Col. (4), Table 78). The procedure used in arriving at this estimate is based on the amount of grain marketed in each region during the peak harvest month of the rainy season. The Ilocos region will serve to illustrate the calculations involved:

(a) The rainy season in the Ilocos region extends from June to September. Two percent or less of the region's total grain production is marketed each month during the June to August period, and 8 percent is marketed in September, the "peak" month of the rainy season (Col. (1), Table 78).

(b) It is estimated that approximately 1,743,000 cavans of grain grown in this region will enter commercial channels in 1970 (Col. (2), Table 78).

(c) Eight percent of these 1,743,000 cavans (or 139,440 cavans) is marketed during the peak rainy season month (Col. (3), Table 78).

(d) Assuming that one-half of the 139,440 cavans are dried by mechanical driers, working 16 hours a day, 25 days a month, then a total grain drying capacity of 174 cavans per hour throughput is required in the Ilocos region in 1970 (Col. (4), Table 78).

The drying capacity needed to handle one-half of the grain marketed during the peak month of the rainy season

TABLE 78

APPARENT GRAIN DRYING NEEDS IN THE PHILIPPINES, BY REGION, 1970

	Region	Rainy Season	Percent of Grain Harvested During Peak Month of Rainy Season[a]	Total Grain Marketed in 1970[b]	Grain Marketed During Peak Month of Rainy Season[c]	Apparent Needed Drying Capacity[d]	Estimated Percent of Total Grain Marketed and Dried During Rainy Season[e]	Total Grain Dried During Rainy Season[f]	Apparent Needed Drying Capacity Utilized During the Rainy Season[g]
			Col 1 (percent)	Col 2 (000 cavans)	Col 3 (000 cavans)	Col 4 (throughput in cavans per hour)	Col 5 (percent)	Col 6 (000 cavans)	Col 7 (percent)
II	Ilocos	June-Sept.	8	1,743	139	171	6	104	37
III	Cagayan Valley	July-Nov.	7	11,544	808	1,010	14	1,616	80
IV	Central Luzon	May-Oct.	10	21,332	2,133	2,666	11	2,346	37
V	Southern Tagalog	June-Nov.	16	7,661	1,225	1,531	27	2,068	56
VI	Bicol	June-Dec.	15	6,222	933	1,166	27	1,679	51
VII	Western Visayas	June-Nov.	30	7,290	2,187	2,734	29	2,114	32
VIII	Eastern Visayas	June-Nov.	25	4,262	1,063	1,329	20	852	27
IX	S & W Mindanao	June-Nov.	15	19,448	2,917	3,646	34	6,612	75
X	N & E Mindanao	June-Nov.	12	3,709	445	556	22	815	61
	Philippines	xxx	xx	83,211	11,850	14,792	xx	18,206	xx

a The "peak month of the rainy season" is the month during the rainy season when the most grain is harvested. It is estimated, for example, that 8 percent of the grain produced in Ilocos in 1970 will be harvested in September.

b Total grain marketed refers to rice and corn.

c Column 3 is equal to Column 1 times Column 2.

d It is assumed that one-half of the grain marketed during the peak month of the rainy season is dried with mechanical driers and that all driers work 25 days, 16 hours a day, during the peak harvest month of the rainy season. The throughput is therefore equal to one-half of Column 3 divided by 400.

e It is assumed that the percentage of total grain marketed and dried is equal to one-half of the estimated percentage of total grain harvested during the entire rainy season.

f Column 6 is equal to Column 5 times Column 2.

g Column 7 is equal to Column 6 divided by Ø, where

$$Ø = \left[\frac{\text{Number of months in the rainy season}}{2}\right] \times \left[\text{Column 3}\right]$$

may be considerably different than the amount of drying capacity that warehousemen find profitable to invest in. The profitability of mechanical driers will depend, among other things, on the length of the rainy season, the percentage of total grain harvested during the rainy season, and the percentage of the grain marketed. There are substantial differences in these factors between regions. Thus, the mechanical grain driers are likely to be considerably more profitable in some regions than in others.

Other things being equal, the greater the degree of utilization of a region's mechanical drying capacity, the more profitable the system should be and the more likely it is that warehousemen will be interested in mechanical driers. The percentage of drying capacity utilized during the rainy season can therefore be used as an "index" of profitability of mechanical driers. To obtain such an index it was assumed that one-half of the total grain marketed during the rainy season is dried by mechanical driers. The resulting estimates are presented in Column (6) of Table 78. An index of drying capacity utilization can be obtained by dividing the total grain dried during the rainy season by the quantity of grain that could be dried if the required drying capacity (shown in Column (4) of Table 78) was fully utilized throughout the rainy season.

Using the Ilocos region, the following discussion illustrates the calculations involved in approximating the apparent grain drying needs for the regions in 1970:

(a) The rainy season last for 4 months (from June to September) in the Ilocos region. If the required drying capacity of 174 cavans per hour throughput was available and fully utilized for 16 hours a day, 25 days a month during the 4-month rainy season, it would be possible to

to dry 278,400 cavans of grain. This far exceeds the estimated 104,000 cavans of grain that would be dried by mechanical driers if they were available. Thus, the "apparent needed" drying capacity of 174 cavans per hour throughput would be utilized at only (104,000/278,400=) 37 percent of its potential capacity during the 4-month rainy season (Col.(7), Table 78).

It is estimated that the "apparent needed" drying capacity in the Cagayan Valley would be utilized at about 80 percent of its capacity if it were available. This percentage is much higher than the corresponding percentage for the Ilocos region because:

(a) the rainy season in the Cagayan Valley is longer;

(b) the percentage of the total grain marketed during the peak month of the rainy season is lower in the Cagayan Valley than in Ilocos; and

(c) the percentage of the total grain marketed during the entire rainy season is higher in the Cagayan Valley than in Ilocos.

The estimated percentages of utilization of the "apparent needed" drying capacity for the various regions of the Philippines are presented in Column (7) of Table 78. In brief, the "apparent needed" drying facilities would be operated most intensely in the Cagayan Valley, and Southern and Western Mindanao, and least intensely in the Eastern and Western Visayas. Thus, with other things being equal, it should be easier to convince warehousemen in the Cagayan Valley and Southern and Western Mindanao to install the required amount of mechanical

grain driers than warehousemen in the Eastern and Western Visayas. Individual drying facilities may be just as profitable in the Eastern Visayas as in the Cagayan Valley, at least as long as there is not enough drying capacity in either region to dry the grain available for drying during the peak month of the rainy season. Even so, it is likely that a government program designed to promote the use of mechanical driers is likely to be more successful in the Cagayan Valley, for example, than in the East Visayas.

Regional Grain Milling Needs

It is assumed in this section that all rice is marketed as polished rice, and corn as corn grits. Columns (1) and (6) of Table 79 show the expected total production of palay and corn in 1970. Columns (2) and (7) indicate the estimated proportions of palay and corn that will be marketed in each region. By definition, the "apparent milling capacity" is equal to the milling capacity needed to mill the palay or corn marketed.

The "apparent needed" figures are obtained as follows:

(a) Consumption is expected to be more or less uniform throughout the year. Thus, the amount of grain marketed each month by millers is the total amount marketed yearly divided by 12.

(b) Milling capacity is stated in terms of cavans of palay or corn that can be milled if existing mills were to operate 12 hours a day, 25 days per month.

(c) The "apparent needed" milling capacity is therefore equal to the amount of palay marketed monthly divided by 25.

TABLE 79

APPARENT REGIONAL MILLING NEEDS, PHILIPPINES, 1970

	Region/Province	Rice: Palay Production	Rice: Percent Marketed	Rice: Apparent[a] Needed Capacity	Rice: Existing Capacity	Rice: Surplus or Deficit Capacity	Corn: Production	Corn: Percent Marketed	Corn: Apparent[a] Needed Capacity	Corn: Existing Capacity	Corn: Surplus or Deficit Capacity	Total: Deficit[b] Capacity Subtotal	Total: Combination[c] Mill Capacity	Total: Total Deficit Capacity
		Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13
		(cavans)	(percent)	(capacity is based on cavans per 12-hour day operation)			(cavans)	(percent)	(capacity is based on cavans per 12-hour day operation)					
II	Ilocos	4,247,757	40	5,663	26,775	-21,112	112,594	40	150	72	- 78	- 78	3,053	--
III	Cagayan Valley	14,934,054	70	34,846	28,352	- 6,494	1,821,189	60	3,642	10,635	6,993	- 6,494	14,422	--
IV	Central Luzon	34,972,660	60	69,939	126,724	56,785	595,840	60	1,192	285	- 907	- 907	8,329	--
V	Southern Tagalog	13,686,395	50	22,811	51,709	28,898	1,366,574	60	2,733	80	- 2,653	- 2,653	4,095	--
VI	Bicol	11,424,522	50	19,040	28,137	9,097	1,023,540	50	1,706	1,155	551	- 551	5,535	--
VII	Western Visayas	11,963,674	50	19,938	39,288	19,350	2,616,513	50	4,361	2,415	- 1,946	- 1,946	11,026	--
VIII	Eastern Visayas	5,725,229	45	8,602	11,625	3,023	3,731,944	45	5,598	5,097	501	- 501	6,852	--
IX	S & W Mindanao	18,818,601	55	34,500	20,726	-13,774	15,153,969	60	30,308	8,074	-22,234	-36,008	25,174	-10,834
	Cotabato	11,758,623	55	21,557	17,186	- 4,371	4,724,248	60	9,449	2,168	- 7,281	-11,652	9,630	- 2,022
	Davao	2,267,069	55	4,156	1,138	- 3,018	7,115,745	60	14,232	3,972	-10,260	13,278	9,918	- 3,360
	Sulu	981,583	55	1,800	770	- 1,030	271,898	60	544	--	- 1,574	- 1,574	--	- 1,574
	Zamboango del Norte	547,435	55	1,004	806	- 198	794,850	60	1,590	473	- 1,117	- 1,315	1,998	--
	Zamboango del Sur	3,263,891	55	5,983	826	- 5,157	2,247,228	60	4,495	1,461	- 3,034	- 8,191	3,628	- 4,563
X	N & E Mindanao	4,516,659	45	6,775	4,742	- 2,033	3,348,872	50	5,582	4,708	- 874	- 2,907	13,088	--

a/ The apparent needed capacity is equal to the year's total production multiplied by the percent marketed, divided by 12 to get a monthly figure, divided by 25 to get a daily milling requirement. Thus "Apparent Needed Capacity" = $\frac{\text{(Production) x (Percent Marketed)}}{12 \text{ X } 25}$

b/ Assuming rice mills mill only rice, and corn mills mill only corn, then surplus rice mill capacity cannot mill excess corn, so the "Deficit Capacity Subtotal" is the total of deficits only.

c/ Combination mill capacity designates milling capacity that can be used to mill both rice and corn.

It is assumed that the rice and corn not entering the market is hand-pounded, milled by the "surplus" capacity, or milled by mills operating more than 12 hours a day.

Subtraction of "existing capacity" from "apparent needed" capacity yields the "surplus capacity" and/or "deficit capacity" figures. Only the "deficit capacity" figures are sub-totaled in Column (11) of Table 79 because the surplus rice (corn) milling capacity cannot be used to offset a deficit in corn (rice) milling capacity. The milling capacity that can be used to mill both rice and corn is presented in Column (12) of Table 79. This capacity can be used to offset a deficit in either rice and/or corn milling capacity. A total deficit in milling capacity exists if the "deficit capacity subtotal" is greater than the combination mill capacity.

Only the Southern and Western Mindanao region will be "deficit" in total estimated milling capacity in 1970. There appears to be two reasons for this "deficit". First, the estimated 20 percent under-reporting of milling capacity is probably very conservative for the Southern and Western Mindanao region. Second, about two-thirds of the "deficit" is in corn milling capacity. Substantial quantities of corn and some palay are shipped unmilled to points such as Cebu for milling and subsequent distribution. The procedure used to estimate the milling capacity "deficit" therefore appears to overstate the actual "deficit" of milling capacity in this region. This is particularly true in the provinces containing the major ports such as Davao City, Cotabato City, and Zamboanga City which are the provinces with the largest "deficits" in milling capacity.

It is the opinion of the research team that there is

sufficient milling capacity to handle the expected production of rice and corn in 1970. Whether or not new milling facilities are installed when new storage facilities are constructed depends on the long-term demands for milling in the 1970's.

* * *

CHAPTER XIV

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CHAPTER XIV

RECOMMENDATIONS FOR NEW STORAGE FACILITIES

Introduction

There are many criteria by which to judge a grain marketing and storage system. What constitutes an "ideal" system depends on the goals of the government, the objective of the people operating the system, and how the system affects the welfare of consumers and producers. The recommendations presented by the research team are partly based on certain assumptions about the goals of the government and the goals of private rice and corn wholesalers.

Government Goals Affecting Grain Storage

One of the government's goals is to assure that only Philippine citizens participate in the marketing of rice and corn. Thus, any new storage and milling facilities will have to be built and operated either by Philippine citizens or the Philippine government. Finances for new storage facilities must therefore come from within the Philippines, from international loans to the Philippine government, or from funds borrowed by Philippine citizens from foreign banks or companies. This rules out the possibility of direct financing and operation of storage facilities by foreign companies.

A second government goal is to limit the ability of any group of individuals (or companies) to affect the market price of rice or corn. It therefore seems doubtful that any company

(or small groups of companies) would be allowed to operate a large system of storage facilities throughout the Philippines unless the company was able to closely associate itself with the government's goals of maintaining high farm prices and low consumer prices for rice and corn. Any attempt by a large company to maintain high farm prices and low consumer prices would be inconsistent with the goal of profit maximization. Several small systems of large warehouse facilities located in different parts of the Philippines, operated by several companies, would therefore appear to be more consistant with the government's goal of limiting the ability of small groups to affect market prices.

It is assumed that the government will continue to participate directly in the rice and corn market but that its total purchases of rice and corn will not exceed 10 to 15 percent of the total production of these grains. The absolute size of the government's operation will increase as grain production increases. Even so, the purchase of as much as 15 percent of production will provide the government with only limited control over the farm and retail prices of rice and corn. Control of a substantially larger amount of grain would be inconsistent with the government's goal of promoting free enterprise and would tie up large sums of money which might well be put to better use elsewhere.

Reluctance to Build Bulk Grain Handling Facilities

The desire to market rice and corn efficiently with as little loss as possible is common to both private grain dealers and the Philippine government. Bulk grain handling facilities would reduce grain losses and handling costs in the Philippines. Private grain dealers have been reluctant to build bulk grain handling facilities, however. There appears

to be several reasons for this:

(1) In many areas, total production of rice and corn is too small to justify economically sized bulk handling facilities;

(2) The value of a bulk handling unit depends partly upon the existence of other bulk handling units within a given trading region; thus, the decision of a wholesaler to build (or not to build) bulk storage facilities depends on the existence (or lack of existence) of other bulk storage facilites;

(3) Tradition and lack of personnel trained to operate bulk facilities may prevent the construction of bulk facilities; and

(4) Uncertainty about the government's price policies causes grain dealers to build traditional bodega storage facilities.

Such facilities may be less efficient, but they are more flexible in the sense that they can be used to store many types of commodities should the grain dealer find it no longer profitable to deal in rice or corn.

Grain Storage Balances, by Provinces, 1970-1975

The grain storage balances in 1970 by provinces, are presented in Table 80. The data in Table 80 was obtained in basically the same way as the regional storage balances presented in Tables 75, 76, and 77. Production projections for rice and corn by province were obtained from the regional production projections under the assumption that the provinces would produce

about the same proportions of their region's production in the future as they have in the past. The percentage of rice and corn sold and the average turnover for a province were assumed to be equal to the respective percentage and turnover for the region. The existing capacity in the province, less depreciation, was then subtracted from the capacity required to store the projected amount of rice and corn marketed in the province in 1970. The result was the "over-balance" or "under-balance" storage capacity for the province in 1970. In Ilocos Norte, for example, the "under-balance" capacity in 1970 was estimated to be equal to 3,209 metric tons.

Province Data Relation to Grain Storage Location

The province data provides an idea as to where the regional "over-balances" and "under-balances" discussed in Chapter XIII are located. The data do not, in themselves, indicate how much new storage is needed in a particular province. As we shall see later, there are several cases where it appears appropriate to use storage facilities in one province to store the grain produced in another province. The recommendations of the research team for new storage facilities are based on available information about the existing transportation facilities and the expected grain flows as well as the estimates of "over-balance" and "under-balance" capacities in the various regions.

The additional storage capacity needed between 1970 and 1975 (Table 81, which was obtained in basically the same way as Table 80) is equal to the storage capacity needed to handle increases in grain production plus replacement capacity for facilities that will wear out between 1970 and 1975. In Cagayan province, for example, an additional 16,252 metric tons of storage capacity will be needed to store the increased grain production in that region. An additional 8,312 metric tons of

TABLE 80

RECOMMENDED ADDITIONS TO GRAIN STORAGE CAPACITY, 1970

	Location	Apparent Under-Balance or (+)Over-Balance in Capacity by 1970	Recommended New Capacity by 1970	Standard Sack Warehouses[a] Number	Standard Sack Warehouses[a] Size	Standard Sack Warehouses[a] Total Capacity	Small Bulk Silos[b] Number	Small Bulk Silos[b] Total Capacity	Large Bulk Silos[c] Capacity	Large Bulk Silos[c] Location
		(capacity metric tons)								
I	Manila	xx	xx	x	xx	xx	x	xx	xx	xx
II	Ilocos	8,740	12,000	4	xx	6,000	4	6,000	xx	xx
	Abra	3,727	4,000	1	1,000	1,000	2	3,000	--	--
	Ilocos Norte	3,209	4,000	1	1,000	1,000	2	3,000	--	--
	Ilocos Sur	(+ 1,411)	--	-	--	--	-	--	--	--
	La Union	(+ 609)	--	-	--	--	-	--	--	--
	Mt. Province	3,824	4,000	2	2,000	4,000	-	--	--	--
III	Cagayan Valley	17,170	20,000	3	xx	4,000	4	6,000	10,000	xx
	Batanes[d]	163	1,000	1[d]	1,000	1,000	-	--	--	--
	Cagayan	31,168	11,000[e]	1	1,000	3,000	2	3,000	5,000	Tuguegarao
	Cagayan			1	2,000					
	Isabela	2,970	8,000[f]	-	--	--	2	3,000	5,000	Ilagan
	Nueva Viscaya[g]	(+ 17,131)	--	-	--	--	-	--	--	--
IV	Central Luzon[1]	(+179,846)	13,000	4	xx	7,000	4	6,000	xx	xx
	Pataan	(+ 5,331)	--	-	--	--	-	--	--	--
	Bulacan	(+ 92,620)	--	-	--	--	-	--	--	--
	Nueva Ecija[g]	(+ 19,378)	--	-	--	--	-	--	--	--
	Pampanga	(+ 72,698)	--	-	--	--	-	--	--	--
	Pangasinan	(+ 6,087)	--	-	--	--	-	--	--	--
	Tarlac	7,672	4,000	1	1,000	1,000	2	3,000	--	--
	Zambales	8,596	9,000	3	2,000	6,000	2	3,000	--	--
V	Southern Tagalog[1]	15,759	36,000	12	xx	21,000	8	12,000	3,000	xx
	Batangas	16,575[h]	5,000	1	1,000	3,000	2	3,000	3,000	Batangas
	Batangas			1	2,000					
	Cavite	1,469	2,000	1	2,000	2,000	-	--	--	--
	Laguna	7,214	7,000	2	2,000	4,000	2	3,000	--	--
	Marinduque	1,173	2,000	1	2,000	2,000	-	--	--	--
	Mindoro Occidental	(+ 5,791)	--	-	--	--	-	--	--	--
	Mindoro Oriental	6,697	7,000	2	2,000	4,000	2	3,000	--	--
	Palawan	2,291	3,000	1	1,000	3,000	-	--	--	--
	Palawan	--	--	1	2,000					
	Quezon	5,559	6,000	1	1,000	3,000	2	3,000	--	--
	Quezon	--	--	1	2,000					
	Rizal	(+ 19,428)	--	-	--	--	-	--	--	--
VI	Bicol	35,729	35,000	8	xx	15,000	8	12,000	8,000	xx
	Albay	7,127	7,000	1	1,000	1,000	2	3,000	3,000	Legaspi
	Camarines Norte	(+ 3,779)	--	-	--	--	-	--	--	--
	Camarines Sur	18,792	15,000	2	2,000	4,000	4	6,000	5,000	Naga
	Catanduanes	4,337	4,000	2	2,000	4,000	-	--	--	--
	Masbate	7,121	7,000	[illegible][d]	[illegible]	4,000	2[d]	3,000	--	--

Masbate	7,121	7,000							
Masbate			2[d]	2,000	4,000	2[d]	3,000	--	--
Sorsogon	2,131	2,000	1	2,000	2,000	-	--	--	--
VII Western Visayas	(+ 10,729)	15,000	5	xx	9,000	4	6,000	xx	xx
Aklan	5,111	3,000	-	--	--	2	3,000	--	--
Antique	6,963[h]	3,000	-	--	--	2	3,000	--	--
Capiz	2,936	3,000	1	1,000	3,000	-	--	--	--
Capiz	--	--	1	2,000					
Iloilo	(+ 21,478)	--	-	--	--	-	--	--	--
Negros Occidental	(+ 16,237)	--	-	--	--	-	--	--	--
Negros Oriental[d]	10,157[h]	4,000	2[d]	2,000	4,000	-	--	--	--
Romblon	1,819	2,000	1	2,000	2,000	-	--	--	--
VIII Eastern Visayas	8,403	17,000	4	xx	8,000	6	9,000	xx	xx
Bohol	13,223[h]	7,000	2	2,000	4,000	2	3,000	--	--
Cebu	(+ 19,600)	--	-	--	--	-	--	--	--
Leyte[m]	10,738	5,000	1	2,000	2,000	2	3,000	--	--
Samar	4,042	5,000	1	2,000	2,000	2	3,000	--	--
IX S & W Mindanao[l]	12,849	39,000	8	xx	15,000	6	9,000	15,000	xx
Cotabato	(+ 32,657)	--	-	--	--	-	--	--	--
Davao[d]	15,449	15,000	1[d]	2,000	2,000	2[d]	3,000	10,000[d]	Davao City
Sulu	9,315	3,000	1	1,000	3,000	-	--	--	--
Sulu	--	--	1	2,000					
Zamboanga Norte[d]	5,913	6,000	3[d]	2,000	6,000	-	--	--	--
Zamboanga Sur[d]	14,829	15,000	2[d]	2,000	4,000	4[d]	6,000	5,000[d]	Pagadian
X S & E Mindanao[l]	9,279	16,000	1	xx	2,000	6	9,000	5,000	xx
Agusan	3,531	3,000	-	--	--	2	3,000	--	--
Bukidnon	8,085[h]	3,000	-	--	--	2	3,000	--	--
Lanao	(+ 1,938)	--	-	--	--	-	--	--	--
Misamis Occidental	1,911	2,000	1	2,000	2,000	-	--	--	--
Misamis Oriental	5,027	8,000	-	--	--	2	3,000	5,000	Cagayan de Oro
Surigao	(+ 7,337)	--	-	--	--	-	--	--	--
TOTAL[k]	(+ 82,646)	203,000	49	xx	87,000	50	75,000	41,000	xx

Over-Balance Capacity	+343,510
Under-Balance Capacity	-260,864

a The 2000 ton standard sack warehouses will be equipped with milling and drying equipment; the 1000 ton warehouses will be equipped with only drying equipment

b The standard small bulk silo is 1500 metric tons. These silos have drying facilities, but no milling capacity. They serve as up-country holding facilities or as additions to existing warehouse facilities.

c The large bulk silos are fully equipped for drying and milling grain.

d Recommended facilities would be used primarily for corn.

e Part of the grain produced in Cagayan province is stored in Central Luzon and later sold in Manila. This grain flow is likely to continue until the mid-1970's.

f Production is expected to increase rapidly in this province. We therefore recommend construction of facilities in anticipation of future needs.

g The 5450 metric ton bulk silo at Solano and the 1800 metric ton at San Jose should be reconditioned and put into operation as soon as possible.

h Actual deficit is probably considerably less than apparent deficit, due to under-reporting of existing facilities.

i Road system is such that "surplus" capacity in some provinces can be used to store rice from the Cagayan Valley.

j Regional "under-balance" in capacity is considerably less than recommended new capacity, due to large "over-balance" in capacity in a province.

k Most of the total "over-balance" in capacity is due to large "over-balances" in the Central Luzon region.

l Part of the rice produced in the Cagayan province is stored in Central Luzon before being shipped to Manila. This reduces the need for storage capacity in Cagayan province. This flow of rice is expected to continue until the early 1970's.

m Some grain produced in Leyte is stored in Cebu. This decreases the need for storage facilities in Leyte.

TABLE 81

RECOMMENDED ADDITIONS TO GRAIN STORAGE CAPACITY, 1975

	Location	Apparent Additional Capacity Needed Between 1970-75	Recommended Additional Capacity by 1975	Standard Sack Warehouses[a] Number	Size	Total Capacity	Small Bulk Silos[b] Number	Total Capacity	Large Bulk Silos[c] Capacity	Location
		(capacity metric tons)								
I	Manila	50,000	50,000	5(1972)[g]	5,000[d]	25,000	x	xx	25,000	North Port (1972)[e]
II	Ilocos	5,237	3,000	3	xx	3,000	x	xx	xx	xx
	Abra	570	1,000	1	1,000	1,000	-	--	--	--
	Ilocos Norte	1,098	1,000	1	1,000	1,000	-	--	--	--
	Ilocos Sur	1,341	--	-	--	--	-	--	--	--
	La Union	1,101	--	-	--	--	-	--	--	--
	Mt. Province	1,127	1,000	1	1,000	1,000	-	--	--	--
III	Cagayan Valley	84,683	54,000	3	xx	3,000	4	6,000	45,000	xx
	Batanes	144	1,000	1[f]	1,000	1,000	-	--	--	--
	Cagayan	24,564	19,000	1	1,000	1,000	2	3,000	10,000	Tuguegarao
	Cagayan	--	--	-	--	--	-	--	5,000	Near Appari
	Isabela	40,814	34,000	-	--	--	-	--	5,000	Santiago (1972)[e]
	Isabela	--	--		1,000	1,000	2	3,000	15,000	Ilagan
	Isabela	--	--	-	--	--	-	--	10,000	So. of Ilagan
	Nueva Viscaya[1]	19,161	--	-	--	--	-	--	--	--
IV	Central Luzon	214,347	112,000	8	xx	14,000	12	18,000	80,000	xx
	Bataan	5,469	1,000	1	1,000	1,000	-	--	--	--
	Bulacan[1]	37,479	--	-	--	--	-	--	--	--
	Nueva Ecija	67,220	50,000	-	--	--	-	--	25,000	Cabanatuan (1972)[e]
	Nueva Ecija	--	--	-	--	--	-	--	25,000	Cabanatuan
	Pampanga[1]	35,663	--	-	--	--	-	--	--	--
	Pangasinan	34,445	30,000	4	2,000	8,000	8	12,000	10,000	Dagupan
	Tarlac	29,645	28,000	-	--	--	-	--	10,000	Tarlac (1972)[e]
	Tarlac	--	--	1	2,000	2,000	4	6,000	10,000	Tarlac
	Zambales	4,426	3,000	1	2,000	3,000	-	--	--	--
	Zambales	--	--	1	1,000		-	--	--	--
V	Southern Tagalog	36,668	28,000	9	xx	16,000	8	12,000	xx	xx
	Batangas	5,614	6,000	3	2,000	6,000	-	--	--	--
	Cavite	4,621	4,000	1	1,000	1,000	2	3,000	--	--
	Laguna	5,483	6,000	-	--	--	4	6,000	--	--
	Marinduque	634	--	-	--	--	-	--	--	--
	Mindoro Occidental	3,080	--	-	--	--	-	--	--	--
	Mindoro Oriental	3,838	4,000	2	2,000	4,000	-	--	--	--
	Palawan	1,537	3,000	1	1,000	3,000	-	--	--	--
	Palawan			1	2,000					
	Quezon	4,600	5,000	1	2,000	2,000	2	3,000	--	--
	Quezon	--	--	-	--	--	-	--	--	--
	Rizal	7,261	--	-	--	--	-	--	--	--
VI	Bicol	22,506	27,000	5	xx	10,000	6	9,000	8,000	xx
	Albay	5,904	8,000	1	2,000	2,000	2	3,000	3,000	Polanqui (1972)[e]

Albay	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Camarines Norte	2,359	--	-	--	--	-	--	--	--
Camarines Sur	9,192	13,000	1	2,000	2,000	4	6,000	5,000	Iriga (1972)[e]
Catanduanes	1,178	2,000	1	2,000	2,000	-	--	--	--
Masbate	1,758	2,000	1[f]	2,000	2,000	-	--	--	--
Sorsogon	2,115	2,000	1	2,000	2,000	-	--	--	--
VII Western Visayas	34,241	15,000	5	xx	7,000	2	3,000	5,000	xx
Aklan	632	1,000	1	1,000	1,000	-	--	--	--
Antique	1,137	1,000	1	1,000	1,000	-	--	--	--
Capiz	4,135	4,000	2	2,000	4,000	-	--	--	--
Iloilo	16,091	5,000	-	--	--	-	--	5,000	Iloilo (1972)[e]
Negros Occidental	9,200	--	-	--	--	-	--	--	--
Negros Oriental	2,579	3,000	-	--	--	2	3,000	--	--
Romblon	467	1,000	1	1,000	1,000	-	--	--	--
VIII Eastern Visayas	18,987	20,000	2	xx	4,000	4	6,000	10,000	xx
Bohol	1,956	2,000	1	2,000	2,000	-	--	--	--
Cebu	9,015	5,000	-	--	--	-	--	5,000[i]	Cebu (1972)[e]
Leyte	4,703	10,000	1	2,000	2,000	2	3,000	5,000	Tacloban (1972)[e]
Samar	3,313	3,000	-	--	--	2	3,000	--	--
IX S & W Mindanao	95,300	55,000	4	xx	8,000	18	27,000	20,000	xx
Cotabato[d]	58,993	25,000	2(1972)[e]	2,000[g]	4,000	-	--	10,000	Cotabato City (1972)[e]
Cotabato	--	--	-	--	--	4	6,000	5,000[i]	Dadiangas
Davao	15,831	11,000	-	--	--	1[f]	6,000	5,000[i]	Near Davao
Sulu	2,250	3,000	-	--	--	2[f]	3,000	--	--
Zamboanga N	3,219	3,000	-	--	--	2[f]	3,000	--	--
Zamboanga S	14,977	13,000	2[f]	2,000	4,000	6[h]	9,000	--	--
X N & E Mindanao	17,396	13,000	4	xx	7,000	4	6,000	xx	xx
Agusan	1,439	2,000	1	2,000	2,000	-	--	--	--
Bukidnon	1,647	2,000	1	2,000	2,000	-	--	--	--
Lanao	7,081	5,000	1	2,000	2,000	2	3,000	--	--
Misamis Occidental	655	1,000	1	1,000	1,000	-	--	--	--
Misamis Oriental	3,309	3,000	-	--	--	2	3,000	--	--
Surigao	3,265	--	-	--	--	-	--	--	--
TOTAL	579,365	377,000	48	xx	97,000	58	87,000	193,000	xx

a/ The 2000 ton standard sack warehouses will be equipped with milling and drying equipment; the 1000 ton warehouses will be equipped with only drying equipment.
b/ The standard small bulk silo is 1,500 metric tons. These silos have drying facilities, but no milling capacity. They serve as up-country holding facilities or as additions to existing warehouse facilities.
c/ The large bulk silos are fully equipped for drying and milling grain.
d/ These warehouse facilities would be part of the export facilities at the North Port in Manila and should be constructed by 1972.
e/ Facilities followed by (1972) are ommended to be constructed between 1970 and 1972.
f/ Recommended facilities would be used primarily for corn.
g/ These warehouse facilities are part of the large bulk silo facility recommended for Cotabato City.
h/ One-half of these units will be used for rice, the other half for corn.
i/ Discussed further in text of Chapter XIV.

capacity will be needed to replace worn out facilities. The total additional capacity "needed" between 1970 and 1975 is therefore equal to 24,564 metric tons. The recommendations of the research team for new facilities between 1970 and 1975 depend on expected changes in the transportation system, anticipated grain flows, and recommended new facilities for 1970, as well as the estimated additional capacity needs between 1970 and 1975.

The additional storage capacity needed between 1975 and 1980 would be slightly larger than the additional capacity needed between 1970 and 1975. Thus, those provinces that need large increases in storage capacity between 1970 and 1975 will, in general, need equally large increases in storage capacity between 1975 and 1980. There are several exceptions to this general statement, however, due to expected changes in grain marketing patterns that are expected to take place as the recommended construction program for the 1970-1975 period is carried out.

A summary of the grain storage needs matched with the recommended facilities for each province is presented in Appendix Table A-25.

Specific Grain Storage Recommendations, by Regions, 1970-1975

Ilocos Region

In general, the Ilocos region is a "deficit" region in both rice and corn. The "deficit" in corn is fairly small. The "deficit" in palay is about 177,000 metric tons. Rice is expected to move into Mountain Province and Ilocos Norte from the Cagayan province. Rice "deficits" in Ilocos Sur, La Union, and the southern part of Mountain Province are supplied from

the provinces of Nueva Ecija and Tarlac in Central Luzon.

It is estimated that only about 40 percent of the total rice and corn production in the Ilocos region will enter the commercial warehouse system in 1970. The mountainous terrain and poor roads in this region make it costly to move rice and corn within the region. The main population centers in the region are Laong in Ilocos Norte, Vigan in Ilocos Sur, and Baguio City in the Mountain Province.

Much of the warehouse capacity reported in this region is used for the storage of tobacco and vegetables. It is, therefore, difficult to accurately judge how much warehouse capacity is available for rice and corn production. The research team's best estimate is that about 30 percent of the total storage capacity reported in this region is actually used for the storage of rice and corn. In general, it appears that conventional warehouse facilities are likely to be preferred by grain dealers in this region because of the flexibility they provide and because of the relatively small amounts of grain which move between any two given points within the region. Operators of larger warehouses may find it economical to add small bin bulk facilities to their present warehouses when they expand their storage facilities, however.

Abra: The Abra province in the Ilocos region will have an estimated "under-balance" of about 3,727 metric tons of additional storage capacity by 1970. In order to handle estimated production increases between 1970 and 1975, about 570 metric tons of storage capacity will be needed. The additional storage facilities required for this region can be provided by expanding existing facilities and by constructing small bulk silos. Bangued is the main trading center of the province and will be the best location for new storage facilities.

Ilocos Norte: The Ilocos Norte province will have an estimated 3,209 metric ton "under-balance" of capacity in 1970. About 1,098 metric tons of additional capacity is estimated to be needed by 1975. The additional storage requirements can be provided by expanding existing facilities by constructing several small bulk silos in the province. Laoag will be the appropriate location for the construction of new facilities.

Ilocos Sur: The provincial data indicates that there is sufficient storage capacity in the Ilocos Sur province to handle the rice and corn production in the area. Available data is not detailed enough to allow the team to determine if the existing facilities are properly located, however. It is very probable that some additional storage facilities could be used in the Vigan area. Loan funds should therefore be made available to anyone wishing to construct new grain storage facilities in this province.

La Union: There is a small "surplus" of storage capacity in La Union province at the present time. Some additional warehouse facilities is estimated to be needed by 1975, however. Loan funds should therefore be available for grain dealers who want to expand their warehouse facilities in this province.

Mountain Province: An "under-balance" of 3,824 metric tons of storage capacity is estimated in the Mountain Province in 1970. Additional capacity can be provided by expanding existing facilities or by the construction of several new warehouses in the main trading centers. An additional 1,127 metric tons of warehouse capacity is

estimated to be needed by 1975 to handle the expected increases in rice and corn production and to replace old facilities.

Cagayan Valley Region

The Cagayan Valley region has a "surplus" of rice and corn. Most of the "surplus" grain from this region flows south into Central Luzon and is held for later shipment to Manila. Some of the grain from Cagayan province moves to the north into the Ilocos Norte province by road and some moves south through Tuguegarao into the Mountain Province. Trucks bringing consumer goods, farm equipment, flour and fertilizer into the Cagayan Valley region from Manila provide low back-haul rates for bagged grain which moves to the large warehouses in Nueva Ecija, Bulacan and Pampanga provinces. Thus, the large "under-balance" in storage capacity in the Cagayan Valley is not as serious as it may seem because much of the surplus grain from the region is being stored in Central Luzon. By the same token, the actual "over-balance" of capacity in Central Luzon tends to over-estimate "surplus" capacity. Farms in the Cagayan Valley region are larger than in most other regions of the Philippines and available evidence suggests that there is more on-farm storage in this region than in most other regions. If so, the procedure used to estimate the balance in storage capacity tends to over-estimate the actual "under-balance" of capacity.

The higher yields of the new rice varieties would not create a serious storage problem if the rice could be easily moved out of the region and stored elsewhere. The new rice varieties will mature during the rainy season, however, when the roads are at their worst, making it difficult to move the rice out of the region. Local buyers will be in no position to buy rainy-season rice, even if they have storage space, unless they have mechanical grain drying facilities. Thus,

farmers in the Cagayan Valley are likely to receive a substanially lower price for their rainy-season rice unless both additional storage and drying facilities are available within the region.

Bulk grain storage facilities would be much more practical in some areas of the Cagayan Valley than in the Ilocos region. Substantial increases in rice production are projected for the Cagayan Valley, especially for Isabella province. Much of this increased rice production will move out of the region either for consumption in Manila or for foreign export. The total production of rice and corn is much greater in the Cagayan Valley and a larger percentage of the grain is marketed than in the Ilocos region Thus, the grain flows within the Cagayan Valley region are much larger than those in the Ilocos region. Furthermore, the road system is such that there are several natural collection points for grain leaving the region. Although the road linking the Cagayan Valley with Central Luzon should be considerably improved by 1975, it is still desirable to have the grain storage and drying facilities fairly close to the production areas in the Cagayan Valley region.

Batanes: There is a small "under-balance" in storage capacity in the province of Batanes. This "under-balance" can be easily corrected by expanding existing warehouse facilities.

Cagayan: If rice production in the Cagayan province increases as much as expected, at least 100,000 metric tons of palay will pass through Tuguegarao by 1970 as it moves south to Central Luzon and Manila. This volume of palay should be sufficient to support a 5,000 metric ton bulk facility in Tuguegarao by 1970. The grain flow through Tuguegarao is expected to increase by at least 50,000

metric tons between 1970 and 1975. It would be advantageous to be able to hold more of this rice in the Cagayan province for a longer period of time. Thus, plans should be made for the construction of another 10,000 metric tons of capacity at Tuguegarao by 1975. A bulk facility capable of handling about 5,000 metric tons will be needed near Aparri by 1975 to replace the bulk facility at Camalaniugan. The facilities at Tuguegarao and Appari would obtain grain from standard warehouses and small bulk storage bins.

Loan funds should also be available to allow warehousemen building new facilities of 2,000 metric tons or over to install efficient grain drying units.

Some of the grain from the Cagayan Valley will continue to flow into the Central Luzon region for storage and later shipment to Manila. Thus, it is not recommended that a construction program to completely off-set the "under-balance" of capacity expected to exist in 1970 be followed. These grain flows will be taken into account later in our discussion of storage requirements for the Central Luzon region.

Isabela: Palay production in Isabela province is expected to be over 300,000 metric tons in 1970 and to increase by nearly 120,000 metric tons between 1970 and 1975. Corn production is estimated at about 60,000 metric tons in 1970, and to increase at the rate of 2,000 metric tons a year between 1970 and 1975. It is estimated than an "under-balance" of about 3,000 metric tons of storage capacity will exist by 1970. The rapid increase in rice production added to the depreciation of existing facilities will create a need for 40,000 metric tons of storage capacity between 1970 and 1975. It is,

therefore, recommended that the construction of new storage facilities be undertaken immediately in anticipation of the substantial increases in storage capacity that will be needed in the early 1970's. It is estimated that this province will have over 200,000 metric tons of "surplus" palay in 1970 and over 300,000 metric tons "surplus" palay in 1975. Nearly all of this rice will eventually move to Manila for consumption or export.

The anticipated grain movements appear to be large enough to justify a 5,000 metric ton bulk facility at Ilaga by 1970 and a similar facility in Santiago in 1975. Grain production is expected to increase rapidly enough to justify an additional 25,000 metric tons of bulk silo capacity near Ilaga by 1975. These facilities should be supplemented with several small-bin bulk silo units for drying and holding rice.

Nueva Viscaya: It is estimated there will be a 17,131 metric ton "over-balance" of "surplus" storage capacity in the Nueva Viscaya province in 1970. The 5,450 metric ton steel silo facility at Solano, which is included in this "surplus" capacity figure, is presently not in operation. This facility could be put in operation in less than six months time and could be used to store grain from Isabela and Cagayan province to relive part of the storage problem presently existing in these provinces. It is recommended that this facility be reconditioned and sold to private grain dealers as soon as possible.

In summary, the grain flows in the Cagayan Valley region will be large enough during the 1970's to justify some bulk grain handling facilities in this region. The bulk facilities

recommended will purchase palay produced north of the facilities and ship milled rice in bag or bulk south to Manila for consumption or export. They will serve as drying centers and points where grain can be easily fumigated and reconditioned. Additional warehouse facilities will also be needed in the region. Once sub-terminal bulk facilities are available in the region, it is expected that some on-farm construction of small bin bulk storage facilities, which would be used to dry and store rice and corn for later shipment to the sub-terminals in the region, would take place.

Central Luzon Region

It is estimated there will be an "over-balance" of storage capacity in Central Luzon at the present time. As mentioned earlier, this "over-balance" is not as large as the figures suggest because some of the rice produced in the Cagayan Valley is stored in Nueva Ecija, Pampanga and Bulacan. The rapid increases in rice production presently taking place in Central Luzon will eliminate most of the "over-balance" capacity by the early 1970's. Plans need to be made now for future storage facilities in this region.

Bataan: There is no serious storage problem in Bataan province at the present time. Standard warehouse facilities should be constructed if a grain storage shortage develops in this province during the 1970's. In anticipation of this, a warehouse with a capacity of 1,000 metric tons should be constructed by 1975 in Bataan.

Bulacan and Pampanga: Available storage capacity in Bulacan and Pampanga provinces should be more than adequate to handle expected production increases in these

provinces between 1968 and 1975. The larger grain dealers in these provinces will undoubtably finance and build any additional storage facilities which appear profitable. The research team feels there is little need for the Philippine government to be extremely concerned about storage "problems" in these provinces.

Part of the "over-balance" capacity in Bulacan and Pampanga will undoubtably be used to store palay from Nueva Ecija and Tarlac in 1975. This will otherwise reduce the amount of new storage that would have to be built in Nueva Ecija and Tarlac.

Nueva Ecija: It is estimated there will be about 19,378 metric tons of "over-balance" storage capacity in Nueva Ecija in 1970. This is a fairly small "over-balance" when one considers that total palay production in this region is expected to be over 570,000 metric tons in 1970 and "surplus" palay production is estimated to be about 360,000 metric tons in 1975. A total of 67,220 metric tons of storage capacity will be needed by 1975 to handle the increase in production expected and to cover the depreciation of existing facilities during the 1970 to 1975 period. Estimated increases in production alone during the 1975 to 1980 period will require at least another 30,000 metric tons of capacity by 1980.

Pangasinan: There is no immediate storage problem in Pangasinan, but an additional 34,445 metric tons of storage capacity is expected to be needed by 1975. Most of the palay produced in this province is consumed in the province. Production increases during the 1970's are expected to be large enough to enable the province to export some rice by 1975.

Most of the warehouses constructed in this province will serve the local market. A 10,000 metric ton storage facility at Dagupan City is expected to be needed by 1975. This facility would serve as a shipping point for rice moving north into Ilocos and would supply part of the consumption requirements of Dagupan City. The additional storage requirements of this region should be met by the construction of smaller bulk facilities and the expansion of existing warehouses.

Tarlac: By 1970, it is expected there will be an estimated "under-balance" of 7,672 metric tons of grain storage capacity in the province of Tarlac. Another 29,645 metric tons of storage capacity is estimated to be needed by 1975. The "surplus" palay production in Tarlac is estimated to be about 143,000 metric tons in 1970 and 211,000 metric tons in 1975. Part of this rice will flow north to the Ilocos region and part will move to Manila for consumption or export.

Some additional warehouse facilities will undoubtably be needed in Tarlac and Nueva Ecija during the 1970's to store grain in areas that are more difficult to reach by road. The construction of bulk facilities in the city of Tarlac and near Cabanatuan would help to improve the efficiency of the grain handling system in these provinces. The size of the bulk facilities at Tarlac and Cabanatuan depends to a large extent on the function of the facilities. If the function of the facilities is simply to "buy and sell" rice, the grain flows appear to be large enough to justify a 10,000 metric ton bulk facility at Tarlac and a 25,000 metric ton facility at Cabanatuan. If the facilities are to be used for the storage of rice for long periods of time, as part of the government's price stabilization program, then the size

of the facililities depends on the quantity of rice that the government wants to store at these points. Cabanatuan is ideally located to handle grain moving out of the Cagayan Valley. Furthermore, the expected increases in grain production in Nueva Ecija are such that substantial amounts of additional storage capacity will be needed in the late 1970's. Thus, any capacity used to store grain for price stabilization in the early 1970's is likely to be needed for "buying and selling" grain in the late 1970's.

There are several reasons why the government might want to hold some grain for long-term storage either at Tarlac or Cabanatuan. The operation of the system of storage facilities which the research team has recommended so far should be undertaken by private firms. These firms would control substantial amounts of grain and as a result would have a good deal of control over farm and retail prices. Any additional storage space and grain controlled by RCA at Tarlac and Cabanatuan would increase RCA's ability to regulate farm prices thoughout Central Luzon and the Cagayan Valley and to stabilize retail prices in Manila. Large purchases of rice by the RCA may be especially necessary in the early 1970's to support farm prices during the period when the Philippines is becoming established in the world export market. The RCA's grain storage program could also be used as a means to subsidize the construction of new storage facilities.

It is recommended that a 25,000 metric ton bulk facility be constructed at Cabanatuan and a 10,000 metric ton facility be constructed at Tarlac by 1972. The size of these facilities should be doubled by 1975. The facility at Tarlac would receive part of its rice from the six small bulk silos recommended for construction by 1975. The facility at Cabanatuan would handle rice from the Cagayan Valley as well as Nueva Ecija.

Zambales: The estimated "under-balance" in storage facilities in the province of Zambales can be corrected by expanding present warehouses or building several new warehouses in the province. Loan funds should be available for the construction of up to 12,000 metric tons of new capacity in this region by 1975.

Southern Tagalog Region

The production of palay in the Southern Tagalog region is estimated to be about 107,800 metric tons in 1970 and over twice as much in 1980. Both Cagayan Valley and Central Luzon will supply rice for the Southern Tagalog region during the 1970's. Storage facilities used to store local production of palay will also handle part of the rice coming into the region during periods of short supply.

Batangas: The "under-balance" capacity in Batangas in 1970 is estimated to be over 16,000 metric tons. It is likely that the capacity of existing facilities are larger than actually reported, however. Thus, we have recommended the construction of only 9,000 metric tons of new capacity in this province for 1970. An additional 5,614 metric tons of capacity is estimated to be needed by 1975. This capacity can be provided by expanding existing facilities or by the construction of new warehouses. No new bulk facilities are recommended for 1975.

Cavite: The provinces of Cavite, Marinduque, and Palawan are expected to have small "under-balances" in storage capacity by 1970. These provinces are "deficit" in rice production. It would not be expected that much palay would be shipped through storage facilities

constructed in these provinces to other areas, but would probably be used to store milled rice coming into the provinces. The research team recommends that loan funds be available to finance the construction of up to 6,000 metric tons of warehouse facilities or small bulk silo facilities in Cavite and Palawan, and up to 2,000 metric tons in Marinduque during the 1968 to 1975 period.

Laguna: About 7,000 metric tons of new storage capacity is estimated to be needed in Laguna province by 1970. This capacity can be provided by expanding existing warehouses and the construction of several new warehouses or small bulk silo facilities. Another 5,483 metric tons of warehouse capacity is estimated to be needed in Laguna province by 1975 to handle increases in production and replace worn-out facilities.

Mindoro Occidental: There is an estimated "over-balance" of storage capacity in Mindoro Occidental at the present time. Some additional storage may be needed in this region during the last half of the 1970's, however.

Mindoro Oriental: The estimated "under-balance" of storage facilities in Mindoro Oriental in 1970 is 6,697 metric tons. An additional 3,838 metric tons of storage is estimated to be needed by 1975. Loan funds should be made available for the construction of warehouse and small bulk silo facilities to correct these "deficits".

Palawan: There is an "under-balance" of 2,291 metric tons of storage capacity estimated in Palawan by 1970. An additional 3,000 metric tons of warehouses capacity is recommended by 1970. An additional capacity of 3,000 metric tons of warehouse capacity is recommended by 1975.

Quezon: An additional 6,000 metric tons of warehouse and small bulk silo facilities is estimated to be needed in Quezon province by 1970. These facilities will handle some of the rice that comes into the province from Central Luzon and Cagayan Valley. The new warehouse facilities in this province should therefore be located near population centers such as Lucena. An additional capacity of 5,000 metric tons in warehouse and small bulk silos will be needed by 1975.

Rizal: Part of the "surplus" storage capacity in Rizal province is undoubtably used to store rice from Laguna and from Central Luzon. The existing capacity in Rizal should be more than adequate to handle the production increases in this province during the 1970's.

Bicol Region

The Bicol region is deficient in the production of both rice and corn. Rice moves into the region from Southern Tagalog and Central Luzon. Corn originating in Southern and Western Mindanao is brought into the region from Cebu. Rail facilities link Manila with Legaspi City in Albay province. Roads are generally poor throughout the region. Some rice and corn moves out of the region during the harvest season and is shipped back into the region when supplies are short. There is a good deal of movement of rice and corn between the provinces within this region. This is primarily due to regional differences during harvest.

Albay: Palay productin in Albay is estimated to be about 135,000 metric tons in 1970. Corn production will be about 10,000 metric tons. The 1970 estimated "underbalance" in storage capacity in Albay is approximately 7,000 metric tons. Another 8,000 metric tons of storage

capacity is estimated to be needed to handle production increases between 1970 and 1975. A 3,000 metric ton bulk facility should be constructed at Legaspi by 1970. A similar facility should be constructed at Polanqui by 1972. An additional 9,000 metric tons of warehouse and small bulk silo facilities should be constructed in this province by 1975.

Camarines Norte: There is no apparent shortage of storage capacity in Camarines Norte at the present time. However, some additional warehouse facilities may be needed in this province by the late 1970's.

Camarines Sur: Total production of palay in Camarines Sur is estimated to be over 245,000 metric tons by 1970. This is the only province in the Bicol region with a "surplus" in rice production. The "under-balance" of storage capacity by 1970 in this province is estimated to be about 18,792 metric tons. Over 9,000 metric tons of additional storage capacity is estimated to be needed to handle the expected increased in rice and corn production between 1970 and 1975.

The grain flows in this province appear to be large enough to justify the construction of a 5,000 metric ton bulk facility near Naga City. This facility would serve as a drying center for both rice and corn, and could provide a storage point for RCA stocks in this region. A similar facility capable of handling about 5,000 metric tons will be needed near Iriga by 1972. Additional warehouses and small bulk silo facilities will also be needed in this province. Loan funds should be available for the construction of up to 28,000 metric tons of storage facilities in this province between 1968 and 1975.

Catanduanes and Masbate: Additional warehouse facilities will be needed in Catanduanes and Masbate. The roads in Catanduanes are very poor. Masbate province consists of a set of three islands: Masbate, Burias, and Ticao.

Total production of palay in Catanduanes is estimated to be about 33,000 metric tons in 1970, while corn production is estimated to be around 6,000 metric tons.

Masbate is the leading province in the production of corn for this region. Total corn production in Masbate is estimated to be over 22,000 metric tons in 1970 while palay production is estimated to be about 38,000 metric tons.

Warehouses appear to be the most economical way to handle most of the stored grain in these provinces. The construction of 6,000 metric tons of warehouse capacity is recommended for Catanduanes by 1975. Two small bulk silo units are recommended for Masbate by 1970. These units will handle corn primarily. Loan funds should also be available for the construction of up to 6,000 metric tons of standard warehouse capacity in Masbate province during the 1968 to 1975 period.

Sorsogon: Sorsogon is deficient in the production of both rice and corn. Rice moves into Sorsogon from Camarines Sur and Albay. Some corn comes from Masbate to Bulan by barge. About 2,000 tons of additional warehouse capacity is estimated to be needed in this province by 1970 and another estimated 2,000 metric tons by 1975.

Western Visayas Region

A good deal of rice and corn moves between the provinces in the Western Visayas region. The provinces of Antique, Capiz and Iloilo have a rice "surplus". The province of Negros Oriental has the largest corn "surplus". Capiz and Iloilo are also expected to have small surpluses of corn in 1970. Rice from Capiz moves down into Iloilo where it is milled and then sent back to Capiz. Some rice from Capiz is shipped into Aklan province. The "surplus" rice production of Capiz and Iloilo provinces moves to Iloilo City where it is shipped to Negros, Cebu, and Manila.

Aklan: Grain flows within the provinces of Aklan, Antique and Capiz are not large enough to justify bulk handling at the present time. It is recommended that loan funds be available for the construction of up to 4,000 metric tons of warehouse facilities and small bulk silo facilities in Aklan; 7,000 metric tons in Capiz; and, 4,000 metric tons in Antique by 1975.

Iloilo: There is an "over-balance" of storage capacity estimated in Iloilo by 1970. Some of the apparent "surplus" capacity is expected to be used to store rice from Capiz, however. No additional storage facilities are recommended for Iloilo by 1970. A 5,000 metric ton bulk silo facility is recommended for the port at Iloilo by 1972. This facility would handle grain for shipment to Negros, Cebu, and Manila. It would also serve for drying part of the large amount of grain harvested during the wet season in this province.

Negros Occidental: There is a "surplus" of storage capacity estimated in Negros Occidental. Some of this "surplus" capacity may be used to store sugar. Even so, there

appears to be no need for additional grain storage facilities in this province until the late 1970's.

Negros Oriental: The large apparent "under-balance" of storage capacity in Negros Oriental estimated by 1970 is due to under-reporting of existing facilities. Thus, only 7,000 metric tons of additional warehouse and small bulk silo capacity is recommended for Negros Oriental by 1975. This province exports some corn, but the volume at any one point does not appear to be large enough to justify the use of large bulk handling facilities at the present time.

Romblon: A small amount of additional warehouse facilities is estimated to be needed in Romblon by 1970. An additional 3,000 metric tons of new warehouse capacity is recommended for this province by 1975.

Eastern Visayas Region

In general, the Eastern Visayas region has a "deficit" of both rice and corn. The main "deficit" is in Cebu City. Most of the rice that moves into this region comes from Central Luzon (via Manila) and from Southern and Western Mindanao. Corn comes from Southern and Western Mindanao to Cebu City and is then transshipped to other consumption centers. Corn coming to Cebu City is used in animal and poultry feeds, for corn starch and corn grits. There is only one company in Cebu City that can handle bulk corn which it receives from its shipping elevator in Dadiangas.

Bohol: Part of the shortage in storage capacity in Bohol and Leyte can be off-set by the "surplus" of capacity

which exists in Cebu. Thus, only 7,000 metric tons of new storage capacity is recommended for Bohol by 1970, and it is recommended that an additional 2,000 metric tons of capacity should be constructed by 1975. The grain flows in this province appear to be too small to justify large bulk handling facilities.

Cebu: There is an estimated "over-balance" of storage capacity in Cebu province at the present time. Some of this existing capacity is used to hold and transfer grain from other regions. Thus, the "surplus" capacity is considerably less than the estimated "over-balance" figure suggests.

The relative importance of Cebu City as a transshipment point for grains is expected to decline during the 1970's, as more of the corn produced in Southern and Western Mindanao is processed into feed or corn starch within this area or shipped directly to consumption centers. The absolute volume of grain passing through Cebu City is not expected to decline very much during the 1970's.

A 5,000 metric ton bulk silo facility for corn at the Port of Cebu would be profitable once facilities are available for shipping corn in the bulk from Davao. This facility would receive shelled corn in the bulk from Davao and mill corn for local consumption and shipment to other provinces.

As discussed later in this report, the construction program recommended for Davao is based on the assumption that the 5,000 metric ton bulk silo facility at Cebu will be constructed by 1972.

Leyte: If the estimated 18,000 metric tons of palay expected to be exported from Leyte province in 1970 is stored in Cebu, then only about 5,000 metric tons of grain storage capacity is needed in Leyte by 1970. The additional capacity needed can be most easily supplied by expanding existing warehouse facilities and by the construction of several small bulk silo facilities.

By 1972, a bulk facility of 5,000 metric tons should prove profitable near Tacloban City. Another 5,000 metric tons of warehouse and small bulk silo facilities should also be constructed in this province between 1970 and 1975.

Samar: Loan funds should be available to allow grain dealers to build up to 8,000 metric tons of grain storage capacity either by expanding existing facilities or by building several new warehouses and small bulk silo units.

Southern and Western Mindanao Region

Southern and Western Mindanao is a large and rapidly developing region. The area around Cotabato City is the main rice producing area in the region, while the area near Davao is the main corn producing region. The relative importance of Davao as a corn producing region is likely to decline somewhat during the 1970's as new land is brought into corn production in Cotabato province.

Only barges can reach the port at Cotabato City. Grain leaving this port moves in sacks by barge to the mouth of the river where it is loaded into the inter-island ships. It is doubtful that a new port will be built at Cotabato City during

the 1970's. A good deal of corn and some rice is shipped out of Cotabato province from Dadiangas. The port at Dadiangas is capable of handling the inter-island vessels. Corn produced in the heart of Cotabato province may flow toward either Cotabato City or Dadiangas depending on where the highest price is being offered. Some of the corn produced in Cotabato province goes to Davao City for shipment to other regions.

It is likely that facilities for mixing feeds and for processing corn starch will be located at either Davao City or Dadiangas during the 1970's. If so, this will reduce the amount of corn that would be handled by an export facility at either of these ports.

It seems likely that there was a substantial under-reporting of milling and storage facilities in several provinces in Southern and Western Mindanao in the 1967 Warehouse Survey Report. The estimated storage requirements should therefore be considered as the maximum amount needed. Some of the warehouses needed in this region are already under construction; but the data showing location and sizes are not yet available.

<u>Cotabato:</u> The estimated "over-balance" in storage capacity in Cotabato province is over 32,000 metric tons in 1970. An estimated 59,000 metric tons of storage facilities will be needed to handle increases in grain production between 1970 and 1975.

The province of Cotabato is a very large one and the statistical data available did not allow the team to determine exactly where the "over-balance" capacity was located. The present construction of several new warehouses in the area around Dadiangas, for example, suggests that there is a felt need for additional storage facilities in this part of Cotabato even though

there appears to be a surplus capacity for the province as a whole.

The expected rapid increase in rice production should come in the area near Cotabato City. If the goverment's rice production program is successful in this province, a number of storage facilities will be needed in this part of Cotabato during the early 1970's. It is recommended that a 10,000 metric ton bulk facility be constructed near Cotabato City by 1972. This facility would provide for efficient drying of some of the rice harvested near Cotabato City during the wet season. The better quality rice from this facility would be shipped to Cebu or exported. Additional storage facilities to support this facility will also be needed near Cotabato City between 1970 and 1975. By 1975, it is expected that a 5,000 metric ton bulk facility for corn will be needed in Dadiangas to handle the increased corn production estimated to be shipped out of this port. Several new storage facilities for corn will be needed near Dadiangas to support this facility.

Davao: According to the estimates of the research team, the total production of rice and corn in Davao province is about 63 percent that of the production of rice and corn in the province of Cotabato. There were 154 "private" warehouses reported in Cotabato province in the 1967 Warehouse Survey Report. These warehouses had a total capacity of 185,762 metric tons or an average capacity of 1,206 metric tons per warehouse. Only 60 "private" warehouses were reported in Davao province. Their total capacity was reported as 11,270 metric tons which is about 188 metric tons per warehouse. The total reported capacity of the private warehouses in Davao was therefore only 6 percent of the private warehouse

capacity reported in Cotabato. There is little doubt that the actual private warehouse capacity in Davao is considerably larger than the capacity reported in this province.

If we assume that the 60 "private" warehouses reported in Davao have an average capacity equal to the "private" warehouses in Cotabato, then the total warehouse capacity in Davao would be about 84,992 metric tons. If so, the "under-balance" in storage capacity is only 15,449 metric tons rather than 78,929 metric tons as estimated on the basis of the Warehouse Survey Report figures. The recommendations contained in this report for new storage facilities in this province are based on an estimated storage capacity "deficit" of 15,449 metric tons.

An export facility of 10,000 metric tons for bulk corn in Davao City would serve primarily as a shipping point for shelled corn going to Cebu and Manila. Additional storage capacity of about 5,000 metric tons would be needed by 1970 to support this facility. The construction of another 11,000 metric tons of storage capacity, including a large bulk facility of 5,000 metric tons is recommended by 1975. The bulk facility in Davao City could well develop into a feed mixing facility by the late 1970's.

Sulu: An additional 6,000 metric tons of new storage facilities are recommended for Sulu province by 1975.

Zamboanga Norte: It is recommended that 6,000 metric tons of standard warehouse facilities be constructed in Zamboanga Norte by 1970. These warehouses will handle corn primarily. An additional 3,000 metric tons of storage capacity will be needed to handle production increases between 1970 and 1975. Two small bulk silo

units are recommended to provide this capacity.

Zamboanga Sur: Substantial quantities of corn are produced in Zamboanga Sur as well as rice. The production of grain is expected to increase fairly rapidly between 1970 and 1975. Recommended storage facilities for 1970 consist of 2,000 metric tons of standard warehouse capacity, 4 small bulk silo units and a 5,000 metric ton bulk silo unit to be located near Pagadian. The construction of an additional 13,000 metric tons of warehouse and small bulk silo capacity is recommended by 1975.

Northern and Eastern Mindanao Region

In general, the Northern and Eastern Mindanao region is deficient in the production of both rice and corn. The provinces of Lanao and Bukidnon are connected to Cotabato province by road, but relatively small amounts of grain move between these provinces by truck at the present time. Fairly small increases in rice and corn production are projected for this region during the 1970's.

Agusan: An additional 5,000 metric tons of warehouse capacity is estimated to be needed in Agusan between 1968 and 1975.

Bukidnon: The "surplus" grain from Bukidnon province flows to Cagayan de Oro in Misamis Oriental for shipment to other provinces in Northern and Eastern Mindanao and Cebu. By increasing the storage capacity in Cagayan de Oro it is possible to reduce, to some extent, the need for additional storage capacity in Bukidnon province. The recommendations of the research team for additional storage capacity in Misamis Oriental are therefore determined partly by the need for additional storage

capacity in Bukidnon and partly by the estimated grain flows between these two provinces. Thus, only 3,000 metric tons of new storage capacity is recommended for Bukidnon by 1970. Another 2,000 metric tons of capacity should be added by 1975.

Lanao: There is a small "over-balance" of storage capacity in Lanao province at the present time. However, about 5,000 metric tons of additional warehouse capacity is estimated to be needed by 1975.

Misamis Occidental: Up to 3,000 metric tons of warehouse capacity is estimated to be needed in the province of Misamis Occidental by mid-1970.

Misamis Oriental: A 5,000 metric ton bulk facility for rice and corn at Cagayan de Oro in Misamis Oriental province would provide efficient handling of grain being shipped out of Misamis Oriental and Bukidnon. An additional 3,000 metric tons of storage capacity will be needed in Misamis Oriental by 1970 to support the facility in Cagayan de Oro. An additional 3,000 metric tons of storage capacity is estimated to be needed in this province by 1975.

Surigao: Estimates of the team indicate that no new storage capacity will be needed in Surigao province until after 1975.

Facilities for Rice Exports

It is estimated that the exportable surplus of palay in Central Luzon will be 166,928 metric tons (108,595 metric tons of milled rice) by 1970. All of this palay will be milled in production areas and shipped to the export points as

bagged rice.

Poro Point, near San Fernando in La Union, and the South Port in Manila are two possible shipping points for exportable rice. Warehouse facilities presently exist at both of these locations and very little additional investment in warehouse storage space would be needed at either location to handle the exportable surplus of rice in 1970.

The present congested condition of Manila's South Port is not likely to improve until the North Port is opened for international shipping. The North Port has rail facilities whereas the South Port does not. This will facilitate bulk handling of exportable rice once the North Port is opened for international shipping.

Although work has been started to reclaim and rework the North Port in Manila, it seems unlikely that the North Port will be open for international shipping before 1972. Another two years would be needed to plan and construct bulk grain storage facilities in the reclaimed area of the North Port. Any recommendations for facilities in Manila must therefore be based on the assumption that the facilities could not be in full operation until about 1974.

The warehouse and dock facilities at Poro Point are excellent. About 12,000 metric tons of warehouse capacity is presently available at this location. Bagged milled rice from these warehouses could be quickly and efficiently loaded for export. The only disadvantage of Poro Point for export is its location relative to the areas of "surplus" rice production. The distance by road from Cabanatuan to Poro Point is 172 kilometers or 56 kilometers more than the distance to Manila. It would, therefore, cost about ₱.80 per metric ton more to truck rice from Cabantuan to Poro Point than to Manila. The cost of trucking rice from Tarlac to Poro Point

is about ₱7.00 per metric ton more than sending the rice to Manila. Transportation costs for rice coming from Cagayan Valley to Manila would be about ₱13.00 per metric ton less than the transportation costs to Poro Point. The opportunities for back-hauls from Poro Point to Tarlac, Cabanatuan, or the Cagayan Valley are considerably fewer than in the case of return trips from Manila. Thus, the possibilities of reduced truck rates for rice shipped to Poro Point seem unlikely.

By 1975, the exportable surplus of palay in Central Luzon is estimated to be about 508,427 metric tons (330,478 metric tons of milled rice). Neither Manila nor Poro Point could efficiently handle this amount of rice with existing facilities. It is therefore recommended that export facilities at North Port in Manila be constructed as soon as possible to handle this grain.

Much of the rice shipped to Manila from Cagayan Valley in 1975 will be bagged milled rice. If this rice flows into Manila at a constant rate and is held for about one month before being shipped, then about 15,000 metric tons of warehouse capacity for milled rice would be needed at the North Port to handle rice coming from the Cagayan Valley region. Most of the exportable surplus from Central Luzon could be sent to Manila as palay and stored in silos until milled and exported. A bulk storage facility capable of holding 25,000 metric tons of palay and additional warehouse facilities for storing up to 10,000 metric tons of milled rice will be needed to handle the grain from Central Luzon.

If rice production increases as much as expected between 1975 and 1980, another 20,000 metric tons of bulk storage for palay and 5,000 metric tons of warehouse storage for rice will be needed in Manila by 1980.

New Storage Facilities Needed by 1980

The recommendations of new storage facilities for 1970 and 1972 occasionally require the construction of facilities within a province before the demand for the facilities actually exists. For example, the construction of 8,000 metric tons of warehouse facilities is recommended for Isabela in 1970 (Table 82), although the "under-balance" capacity appears to be less than 3,000 metric tons for 1970. Grain production is expected to increase very rapidly in Isabela and the additional capacity is likely to be needed within a short time after it is constructed.

In most cases, where construction ahead of demand is recommended, the recommendations reflect the research team's belief that the size of the grain flows and the probability of future production increases are large enough to justify beginning to change the grain marketing system in that province or the marketing network in which the province is located. A 5,000 metric ton bulk facility for corn is recommended for Cebu by 1972 (Table 82), for example, as part of a bulk grain handling network for corn produced in the Mindanao area.

In some cases, the team has not recommended the construction of new facilities within a province even though the data suggests that an "under-balance" in storage capacity may exist within the province. The reason for not recommending new facilities is usually because adequate storage facilities exist outside the province that can continue to be used to store the "surplus" production of the province during the early 1970's.

By 1975, it is expected that there will be few provinces with "surplus" storage facilities that can be used to store grain from other provinces. The transportation system in the main surplus production regions should also be improved considerably by 1975, thus allowing the movement of grain out

TABLE 82

ADDITIONAL STORAGE FACILITIES NEEDED IN OPERATION BY 1980, BY REGIONS AND PROVINCES, PHILIPPINES

Region and Province	Standard Sack Warehouses	Bulk Silo Storage
	(metric tons)	
I Manila	5,000	15,000
II Ilocos		
Abra	1,000	---
Ilocos Norte	1,000	---
Ilocos Sur	1,500	---
La Union	1,000	---
Mt. Province	1,000	---
III Cagayan Valley		
Cagayan	8,000	15,000
Isabela	10,000	25,000
Nueva Viscaya	6,000	10,000
IV Central Luzon		
Bataan	5,000	---
Bulacan	---	10,000
Nueva Ecija	---	40,000
Pampanga	---	10,000
Pangasinan	10,000	20,000
Tarlac	10,000	15,000
Zambales	4,000	---
V Southern Tagalog		
Batangas	2,000	3,000
Cavite	4,000	---
Laguna	---	5,000
Marinduque	1,000	---
Mindoro Occidental	1,000	---
Mindoro Oriental	4,000	---
Palawan	2,000	---
Quezon	5,000	---
VI Bicol		
Albay	3,000	3,000
Camarines Norte	2,000	---

TABLE 82 (Continued)

ADDITIONAL STORAGE FACILITIES NEEDED IN OPERATION BY 1980, BY REGIONS AND PROVINCES, PHILIPPINES

Region and Province	Standard Sack Warehouses	Bulk Silo Storage
	(metric tons)	
VI Bicol (Continued)		
Camarines Sur	4,000	5,000
Catanduanes	1,000	---
Masbate	1,000	---
Sorsogon	2,000	---
VII Western Visayas		
Aklan	1,000	---
Antique	1,000	---
Capiz	4,000	---
Iloilo	6,000	5,000
Negros Occidental	4,000	---
Negros Oriental	2,000	---
Romblon	1,000	---
VIII Eastern Visayas		
Bohol	2,000	
Cebu	4,000	10,000
Leyte	4,000	---
Samar	3,000	---
IX S. & W. Mindanao		
Cotabato	10,000	25,000
Davao	5,000	10,000
Sulu	2,000	---
Zamboanga Norte	3,000	---
Zamboanga Sur	10,000	5,000
X N. & E. Mindanao		
Agusan	1,000	---
Bukidnon	2,000	---
Lanao	4,000	3,000
Misamis Occidental	1,000	---
Misamis Oriental	3,000	---
Surigao	3,000	---

Note: The requirements for 1980 should be carefully reviewed between 1973 and 1975 and adjustments made in keeping with conditions found at that time.

of these regions throughout most of the year. The turnover of grain in storage facilities should increase somewhat by 1975 as production tends to even out during the year. Basic knowledge of mechanical grain drying should be fairly widespread by 1975. (Both the RCA and private companies will undoubtably continue to promote mechanical grain drying during the 1970's.) These factors should increase the profitability of bulk grain handling facilities in provinces where surplus grain exists.

The recommendations of the research team for new storage facilities needed by 1980 are summarized in Table 82. Additional bulk storage facilities are recommended in provinces with surplus grain and relatively large grain movements. Standard warehouses are recommended for those provinces with relatively small increases in grain production.

Bulk facilities are recommended to handle expected production increases in Bulacan, Nueva Ecija, and Pampanga. No new facilities are recommended to replace the facilities in these provinces that have been used in the past to store grain from the Cagayan Valley region. The recommended new facilities in Cagayan Valley are adequate to handle all of the grain produced in that region. Thus, storage facilities would no longer be needed in Central Luzon for grain for the Cagayan Valley.

It is urged that the recommendations for new storage facilities needed by 1980 be reviewed between 1973 and 1975. They should then be revised in keeping with any new information that will become available during the next five years.

* * *

CHAPTER XV

DESCRIPTIONS AND COSTS OF THE RECOMMENDED FACILITIES

Description

- 3,000, 5,000, and 6,000 Metric Ton Bulk Silo Facilities
- 10,000 and 15,000 Metric Ton Bulk Silo Facilities
- 25,000 Metric Ton Bulk Silo Facility
- 1,500 Metric Ton Up-Country Satellite Facilities
- Standard Sack Warehouses

Costs

- Cost of the Recommended New Facilities
- Personnel Requirements
- Operating Costs and Break-Even Analysis
- Benefit Cost Ratio
- Losses in Storage

Training Program

Priorities of Construction

Construction Schedule

CHAPTER XV

DESCRIPTIONS AND COSTS OF THE RECOMMENDED FACILITIES

The new bulk silos recommended for 1970, 1972, and 1975, are shown in Drawings 1 through 10. These drawings show the site plan, elevations, and flow diagram for each silo; and are prepared in sufficient detail to arrive at a cost appraisal for budget purposes and to provide information on the operational functions of each silo. The following is a description of the design and grain flow or operational procedures of the bulk silo facilities:

3,000, 5,000, and 6,000 Metric Ton Bulk Silo Facilities

Drawings

These silos are shown in Drawings 1, 2, and 3. The basic design of these facilities consists of galvanized steel storage bins with a connecting 1,000 metric ton steel warehouse and milling plant.

Handling

The silos are primarily designed for bulk handling of grains. However, sacked grains can be also received, stored, and processed. The grain may be shipped out in sacks and in bulk. Bagging is performed in the warehouse.

Receiving and Weighing

All inbound grain is weighed either on a platform truck

scale located by the office or in an automatic scale located inside the headhouse. All outbound shipments are weighed in the same manner.

After the inbound grain is weighed on the platform truck scale, it is delivered into the truck dump pits and conveyed into a vertical bucket elevator leg located in the headhouse for further distribution. In case the grain is received by rail, it is delivered into the track dump pit then conveyed and elevated for weighing in the headhouse before distribution. The two main 60 metric ton per hour elevator legs are equipped with permanent type magnets which remove ferrous metallic particles which may be embedded in the grain. The headhouse scale can also be used for taking physical inventory of the bulk grains in the bins. This is accomplished by transferring the grain from one bin to another and weighing it during this operation.

Cleaning

A 25 metric ton per hour reciprocating type shaker screen grain cleaner is located in the headhouse with working or holding bins above and below the cleaner. The upper bins provide an even and continuous supply of grain necessary for efficient operation of the cleaner. The clean grain is discharged into the lower headhouse bins and the coarse screenings are discharged into a special bin for bagging as animal feed. The clean grain is re-elevated from the lower headhouse bins to the top of the headhouse where it may be diverted to the grain drier, to storage, to shipping, or to milling. The cleaner is equipped with a fan which creates an air suction for removing light impurities from the grain at the head and discharge ends of the machine. The dust and chaff thus removed are blown into a cyclone dust collector which in turn discharges into the bins used for collecting screenings.

Drying

A continuous-flow column type recirculating grain drier is provided for in each of the 3,000, 5,000, and 6,000 metric ton silo facilities. The machine is equipped with a fuel oil burner and automatic electrical temperature controls with safety devices to prevent overheating and flame failure. Automatic fuel ignition system is included. The drier has a capacity of 10 metric tons per hour through-put of palay (rough rice); basis 25 percent to 14 percent moisture removal in four passes. The grain to be dried is first delivered into one of the 364 metric ton storage or wet bins in order that the drier may have two or three days of continuous operation. However, good drying results may be obtained by only 10 or 12 hours of continuous operation of the drier. In case the wet bin is not available at the beginning of the drier operation, one of the tempering bins may be used.

After each two or three percent of moisture removal per pass through the drier, the palay is delivered into the tempering bins for a rest period of about 6 to 8 hours in order to equalize and stabilize the inner moisture of the grain. The drying cycle is repeated until after the proper moisture content is reached. Ordinarily corn does not require pass-drying unless the initial moisture content is too high. Corn may be dried in one pass from 20 percent to 15 percent moisture.

Temperature Indicating

The large storage bins will be equipped with temperature indicating thermocouple cables to permit periodical instantaneous temperature readings of the grain along the entire height of each bin. Any sudden increase of the temperature in the grain is a danger signal. This may be caused by insect life and/or high moisture content and immediate corrective

action should be taken. All bins have 45 degree hoppers for ease of self-cleaning.

Aeration

Aeration fans with automatic humidity controls are provided for the storage bins and the temperature bins. These fans will also serve to furnish recirculating forced air to hasten the action of fumigant in case of treating heavily infested grains.

Dust Collecting

Dust collecting equipment is provided to aid in maintaining cleanliness and to minimize dust hazards.

Grain Testing

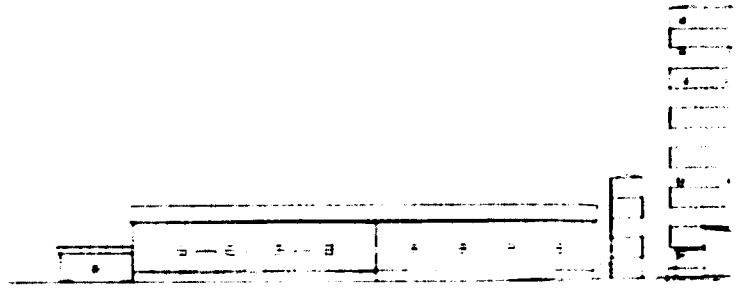
Each new silo will be provided with grain testing equipment consisting of an electric moisture tester, balance, grain probes, hand testing sieves, and dockage or foreign material tester. This will permit all the silos to have uniform methods of grain testing.

Milling

The 3,000, 5,000, and 6,000 metric ton facilities are provided with a milling plant for producing polished rice or corn grits, as may be required, at the rate of one ton per hour input of palay (rough rice) or shelled corn.

Passenger Lift

An electric service elevator traveling from the first floor to the scale floor, is provided in the headhouse. A circular steel stairway is also included in the headhouse.



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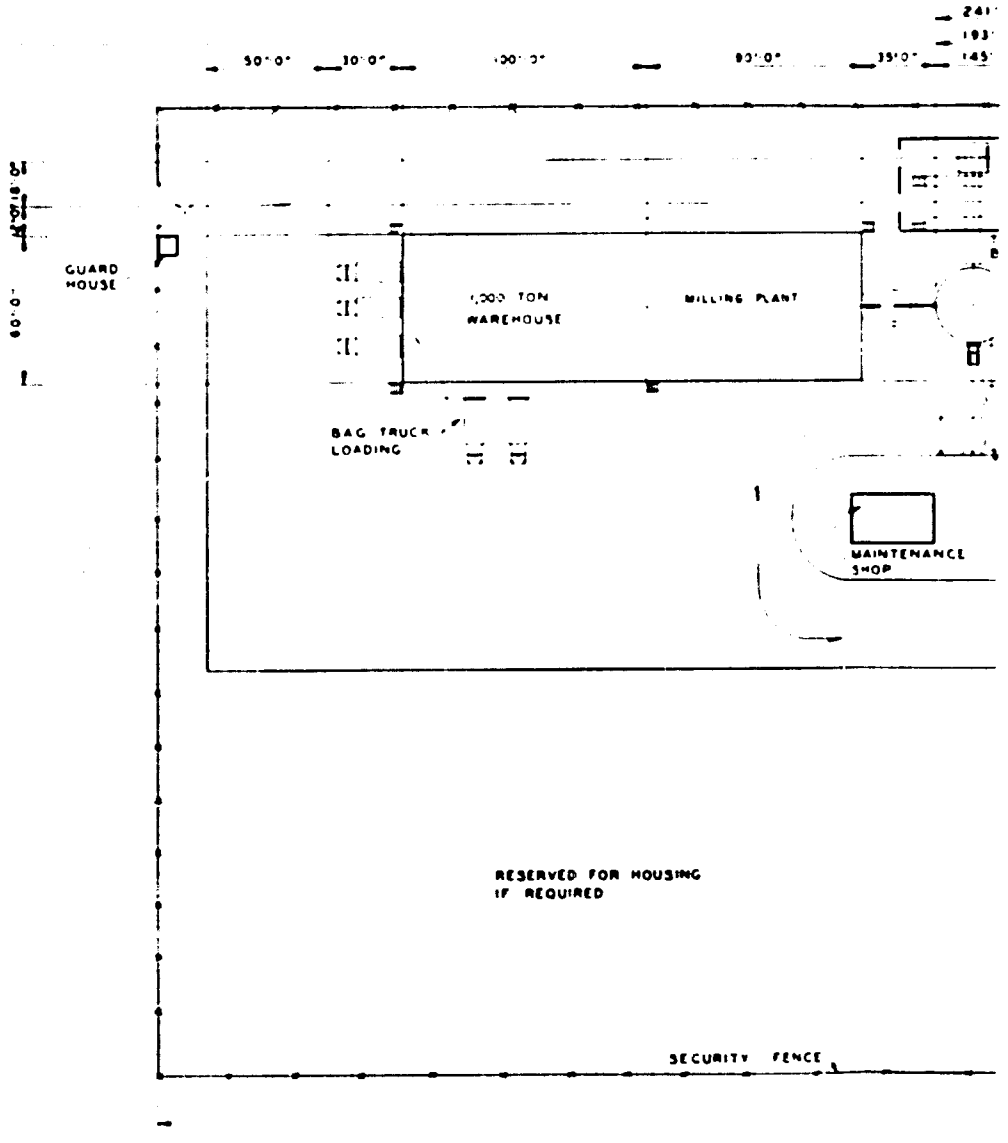

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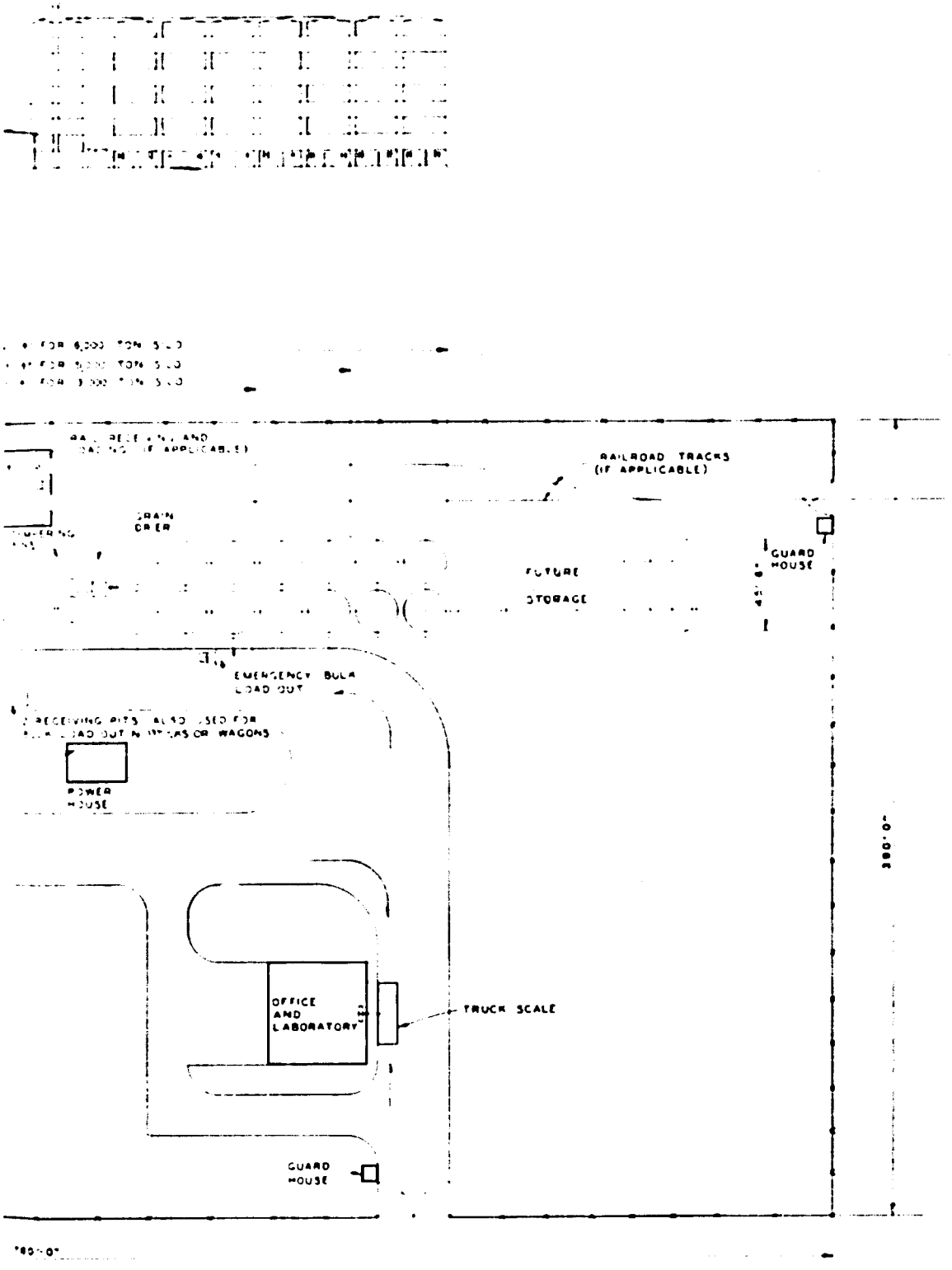
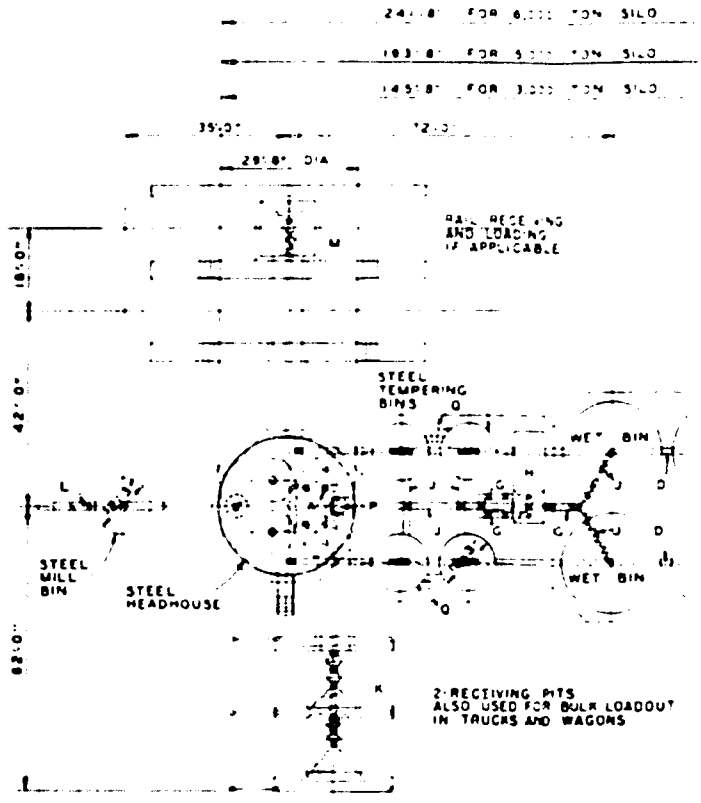


GRAIN STORAGE AND HANDLING
REPUBLIC OF THE PHILIPPINES
USAID

SITE PLAN AND ELEVATION
FOR 3,000, 5,000 AND 6,000 TON SILOS
WEITZ-HETTELSATER ENGINEERS
DES MOINES KANSAS CITY
TE-505



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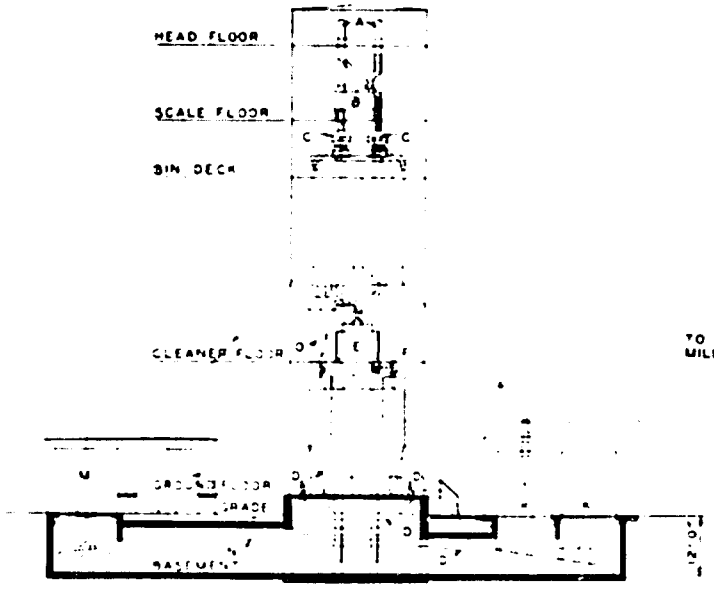
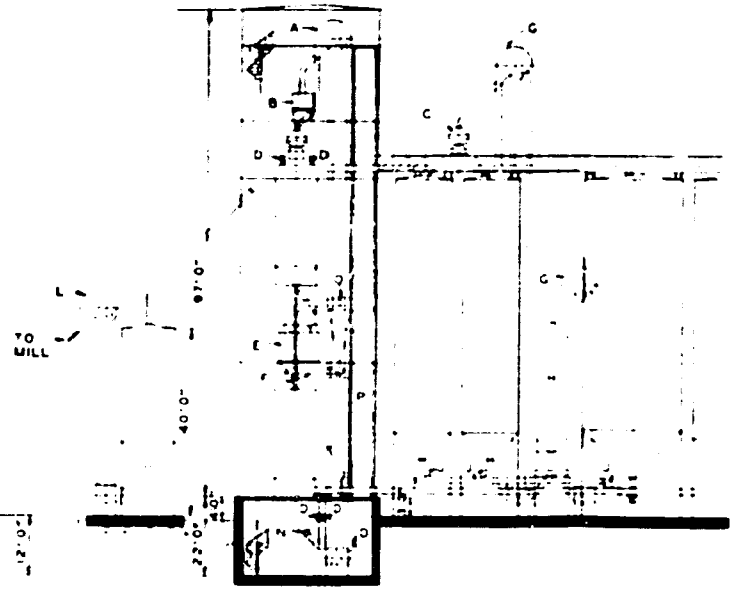
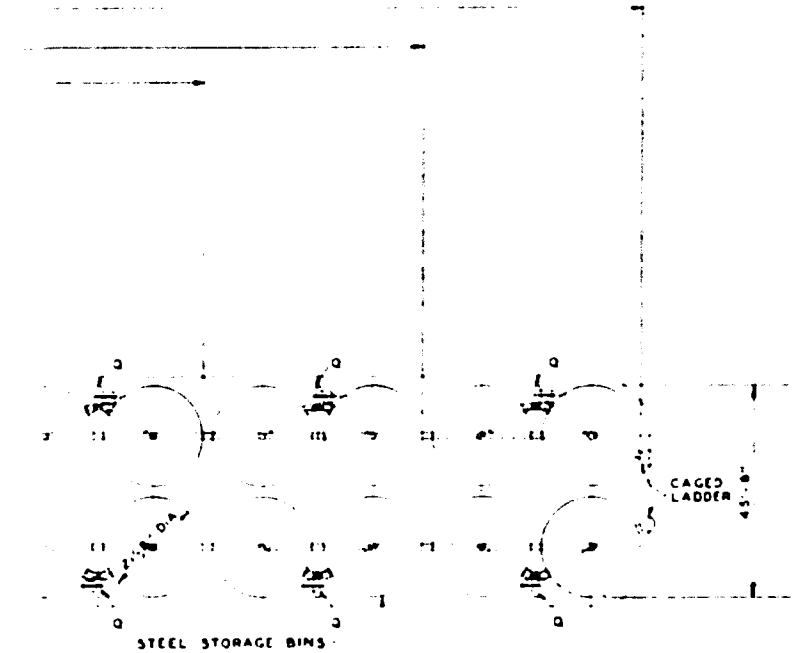


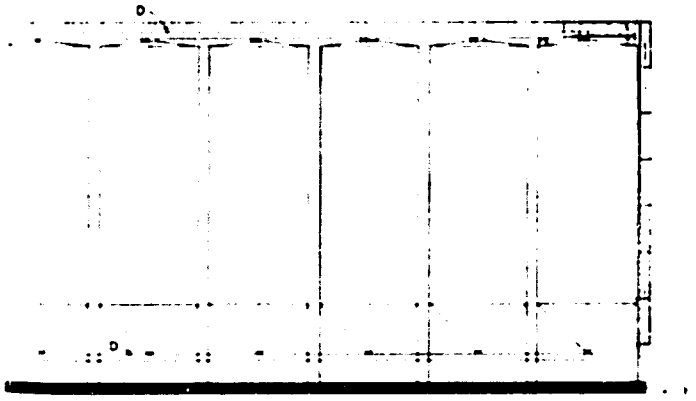


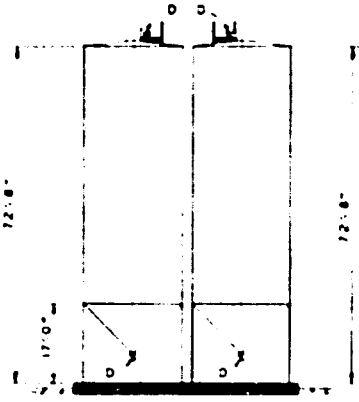
CROSS SECTION THRU HEADHOUSE

LONGITUDIN

LOCATION	DESCRIPTION	LOCATION	DESCRIPTION	LOCATION	DESCRIPTION	LOCATION







CROSS SECTION THRU STORAGE

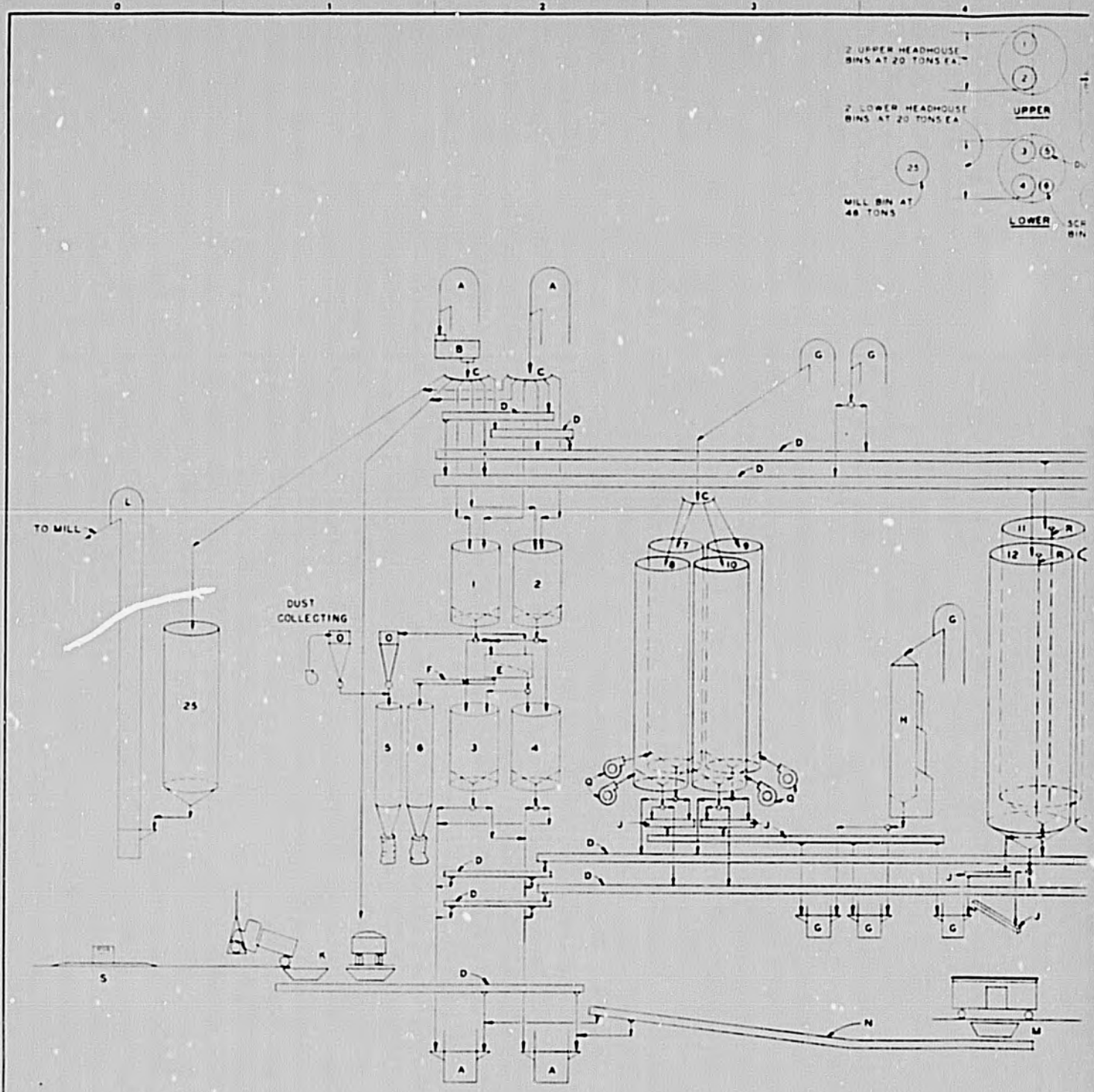
CROSS SECTION THRU DRIER

SECTION

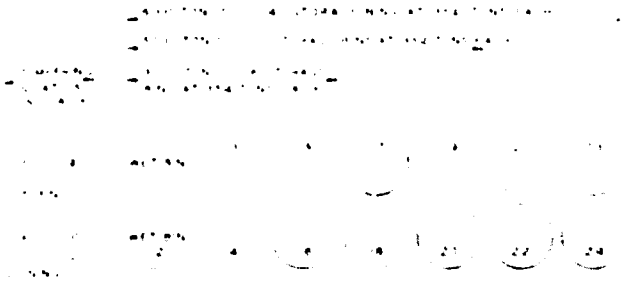
NOTE

GRAIN STORAGE AND HANDLING
REPUBLIC OF THE PHILIPPINES
U.S.A.D.

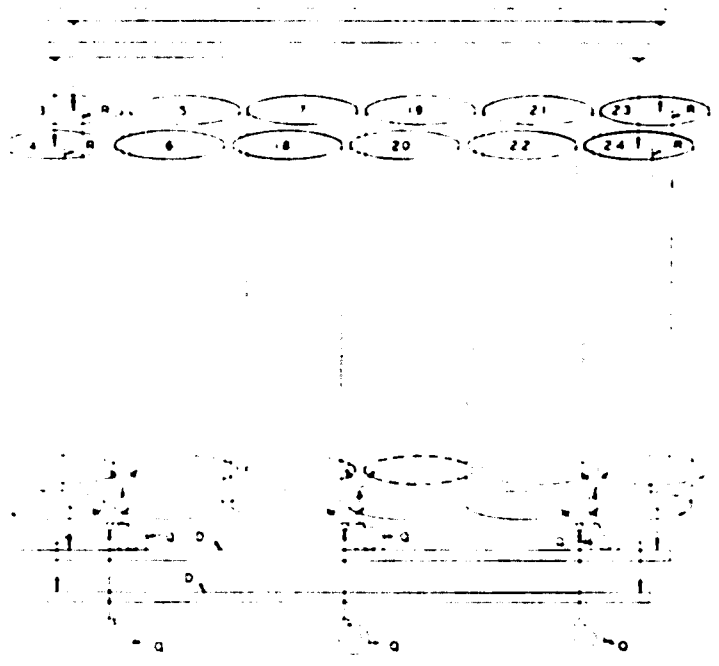
PLAN AND SECTIONS
FOR 3,000, 5,000 AND 6,000 TON SILOS
WEITZ-BETTELSATER ENGINEERS
DES MOINES KANSAS CITY
7E 505 2



LOCATION	DESCRIPTION	REV. BY DATE	APP. BY DATE	REV. NO.	LOCATION	DESCRIPTION	REV. BY DATE	APP. BY DATE	REV. NO.	LOCATION	DESCRIPTION	REV. BY DATE	APP. BY DATE	REV. NO.	LOCATI



KEY PLAN



LEGEND

A MAIN LEG 60 TONS PER HOUR
B AUTOMATIC BELT SCALE
C DISTRIBUTOR REMOTELY CONTROLLED
D CONVEYOR [illegible] TONS PER HOUR
E CLEANER [illegible] TONS PER HOUR
F SCREW CONVEYOR
G DRYER [illegible] TONS PER HOUR (BASIS PALAY 25% TO 4% MOISTURE)
H CONVEYOR [illegible] TONS PER HOUR
I RECEIVING BINS (ALSO USED FOR BULK LOAD-OUT IN TRUCK OR WAGONS)
J MILL [illegible] TONS PER HOUR
M RAIL RECEIVING AND LOADING (IF APPLICABLE)
N CONVEYOR 80 TONS PER HOUR (IF APPLICABLE)
O CYCLONE COLLECTORS FOR CLEANER AND DUST COLLECTING
P PASSENGER ELEVATOR (NOT SHOWN)
Q AERATION AND FUMIGATION FANS
R TEMPERATURE CABLES IN ALL STORAGE BINS
S 30 TON TRUCK SCALE

CAPACITY TABLES

3,000 TON SILO

6	STORAGE BINS	AT	354	TONS EACH	=	2,124 TONS
4	TEMPERING BINS	AT	115	TONS EACH	=	460 TONS
4	HEADHOUSE BINS	AT	20	TONS EACH	=	80 TONS
	MILL BIN	AT	48	TONS	=	48 TONS
	WAREHOUSE				=	000 TONS
				TOTAL	=	3,7[illegible]2 TONS

5,000 TON SILO

9	STORAGE BINS	AT	354	TONS EACH	=	3,540 TONS
4	TEMPERING BINS	AT	115	TONS EACH	=	460 TONS
4	HEADHOUSE BINS	AT	20	TONS EACH	=	80 TONS
1	MILL BIN	AT	48	TONS	=	48 TONS
	WAREHOUSE				=	000 TONS
				TOTAL	=	5,[illegible]28 TONS

8,000 TON SILO

4	STORAGE BINS	AT	354	TONS EACH	=	4,956 TONS
4	TEMPERING BINS	AT	115	TONS EACH	=	460 TONS
4	HEADHOUSE BINS	AT	20	TONS EACH	=	80 TONS
1	MILL BIN	AT	48	TONS	=	48 TONS
	WAREHOUSE				=	000 TONS
				TOTAL	=	6,544 TONS

NOTE:

CAPACITIES ARE BASED ON PALAY (ROUGH RICE) WEIGHING 30 POUNDS PER CUBIC FOOT

CAPACITIES ARE IN METRIC TONS (2204 POUNDS)

		GRAIN STORAGE AND HANDLING REPUBLIC OF THE PHILIPPINES FOR U S A I D U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT	FLOW DIAGRAM FOR 3,000 5,000 AND 8,000 TON SILOS WEITZ-HETTELSATER ENGINEERS A Division of THE WEITZ COMPANY INC DES MOINES KANSAS CITY DRAWN DATE SCALE [illegible] 1 = [illegible] 3

Truck Lift

One of the truck receiving pits is equipped with a hydraulic lift to raise the front end of a truck to hasten unloading bulk grains.

Diesel Electric Generators

Diesel electric generators are included in the 3,000, 5,000, and 6,000 metric ton facilities to provide electric current for the various electric motors and other electrical equipment throughout the silo. A 175 kilowatt unit is included for the 3,000 metric ton facility and a 200 kilowatt unit is included for each of the 5,000 and 6,000 metric ton facilities.

Design Criteria

The main storage structure and the headhouse for the 3,000, 5,000, and 6,000 metric ton facilities is of steel design erected on reinforced concrete foundations. The warehouse, mill building, maintenance shop, powerhouse, and guardhouse is also of steel design. The main office is of masonry construction.

Because specific site locations have not been selected for the facilities, the actual load bearing capacity and condition of the soil cannot be determined for proper evaluation of the necessary foundations. However, allowances were made in the design criteria for supporting the bin structure on a mattress type concrete slab foundation built on soil with a minimum load bearing value of 3,000 pounds per square foot.

The drawings show optional handling of inbound and outbound shipments of grain by rail in case the facility is to be located on existing or future rail siding.

The recommended design, as shown in the drawings, represent a practical and workable storage plant model. Use of this model will enable the operator to perform each function in an efficient and economical manner at a minimum cost. After final site selections are made for each new facility, it may become necessary to change or modify the various buildings, the bin arrangement, and the traffic flow in and out of the premises.

10,000 and 15,000 Metric Ton Bulk Silo Facilities

Drawings

These silos are shown in Drawings 4, 5, and 6. The basic design of these facilities consists of galvanized steel storage bins with a connecting 2,000 metric ton steel warehouse and milling plant. Insofar as it has been practical to do so, the flow and handling of the grain in these silos were designed similar in concept, except at greater capacity, as described previously for the 3,000, 5,000 and 6,000 ton facilities. The features that are pertinent to, as well as different from, those previously described are listed in the following.

Handling

The basic flow of the grain in the 10,000 and 15,000 metric ton facilities is primarily in bulk and is very similar to that previously described for the lesser capacity facilities except at a greater rate per hour.

Receiving and Weighing

The weighing in the 10,000 and 15,000 metric ton facilities is accomplished on a platform truck scale located adjacent to the office; also in an automatic scale located in the headhouse, same as previously described. However, the main receiving elevator

legs have a rated capacity of 100 metric tons per hour; and three truck dump pits are provided in order to handle the grain at a higher rate. Otherwise, the distribution of the grain is same as previously described.

Cleaning

A 50 metric ton per hour grain cleaner is provided for the 10,000 and 15,000 metric ton silos. The operation of this cleaner with its tributary bins is very similar to that previously described.

Drying

The drier for the 10,000 and 15,000 metric ton facilities has a capacity of 20 metric tons per hour through-put of palay (rough rice); basis 25 percent to 14 percent moisture removal in four passes. The operation of this drier with its tempering bins and other accessories is very similar to that previously described.

Temperature Indicating

The storage bins in the 10,000 and 15,000 metric ton facilities are also provided with temperature indicating thermocouple cables and all bins have 45 degree hoppers for ease of self-cleaning.

Aeration

The tempering bins and storage bins in the 10,000 and 15,000 metric ton facilities are also provided with aeration fans as previously described.

Dust Collecting

Dust collecting equipment is also provided in the 10,000 and 15,000 metric ton facilities.

Grain Testing

Each of the bulk silo facilities are provided with grain testing equipment as previously described.

Milling

The 10,000 and 15,000 metric ton facilities are provided with a milling plant for producing polished rice or corn grits, as may be required, at the rate of one and one-half tons per hour input of palay (rough rice) or shelled corn.

Passenger Lift

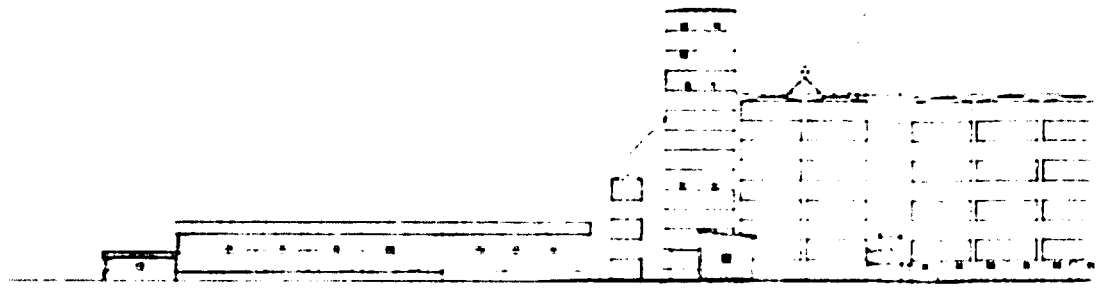
An electric service elevator, traveling from the first floor to the scale floor, is provided in the headhouse. A circular steel stairway is also included in the headhouse.

Truck Lift

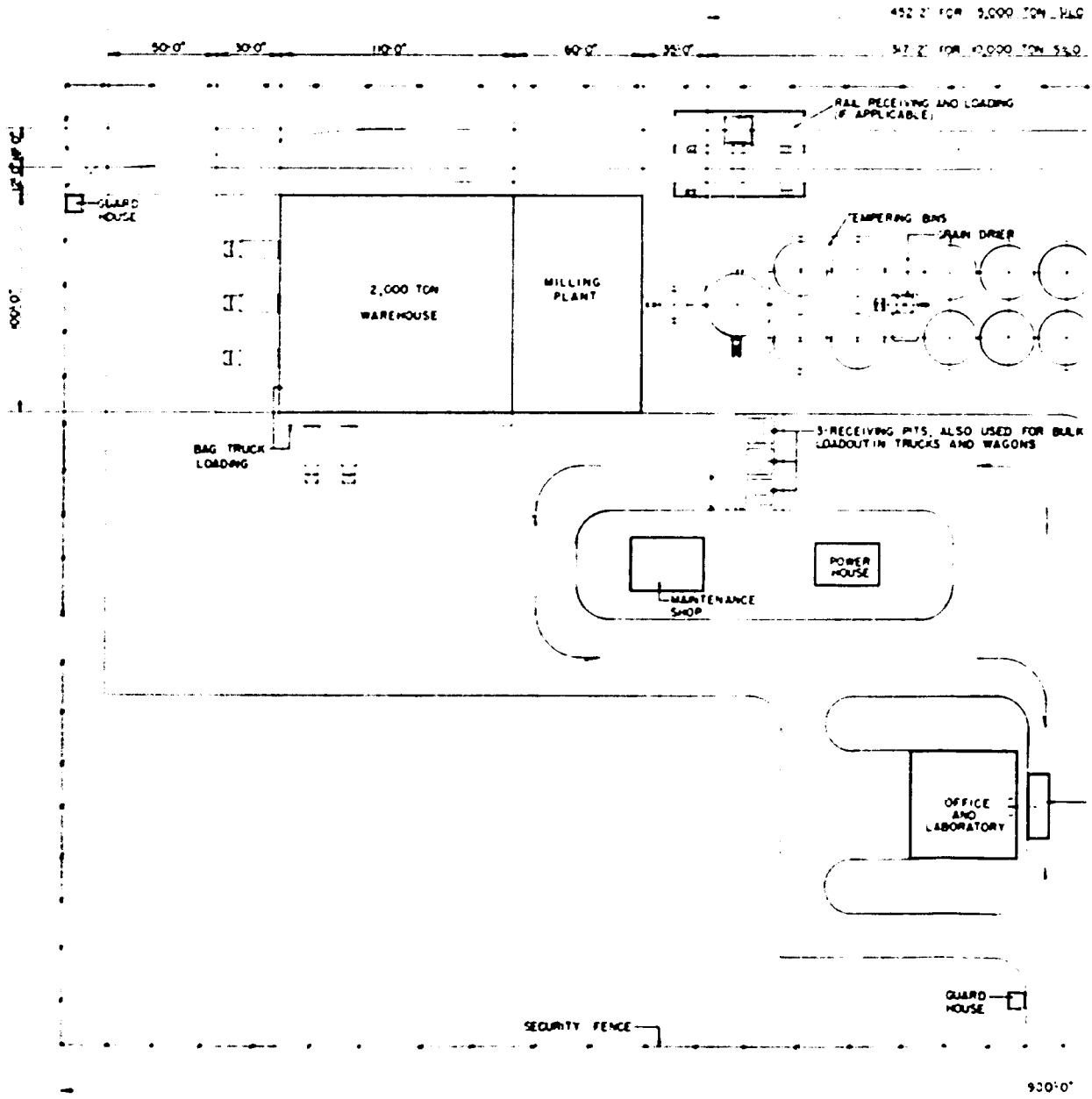
One of the truck receiving pits is equipped with a hydraulic lift to raise the front end of a truck to hasten unloading bulk grains.

Diesel Electric Generators

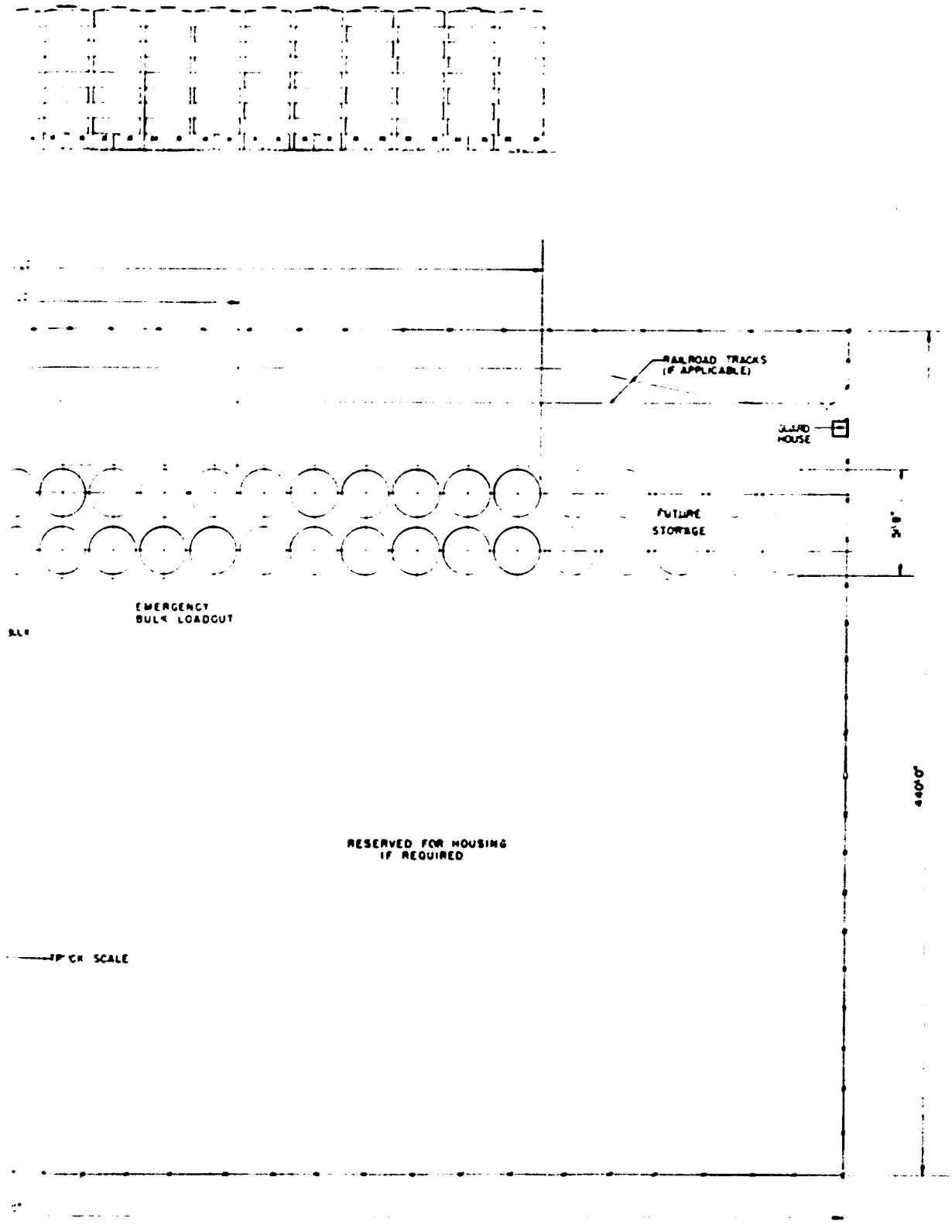
The 10,000 and 15,000 metric ton facilities are each equipped with 300 kilowatt diesel electric generators to provide electric current for the various electric motors and other electrical equipment throughout the silo.



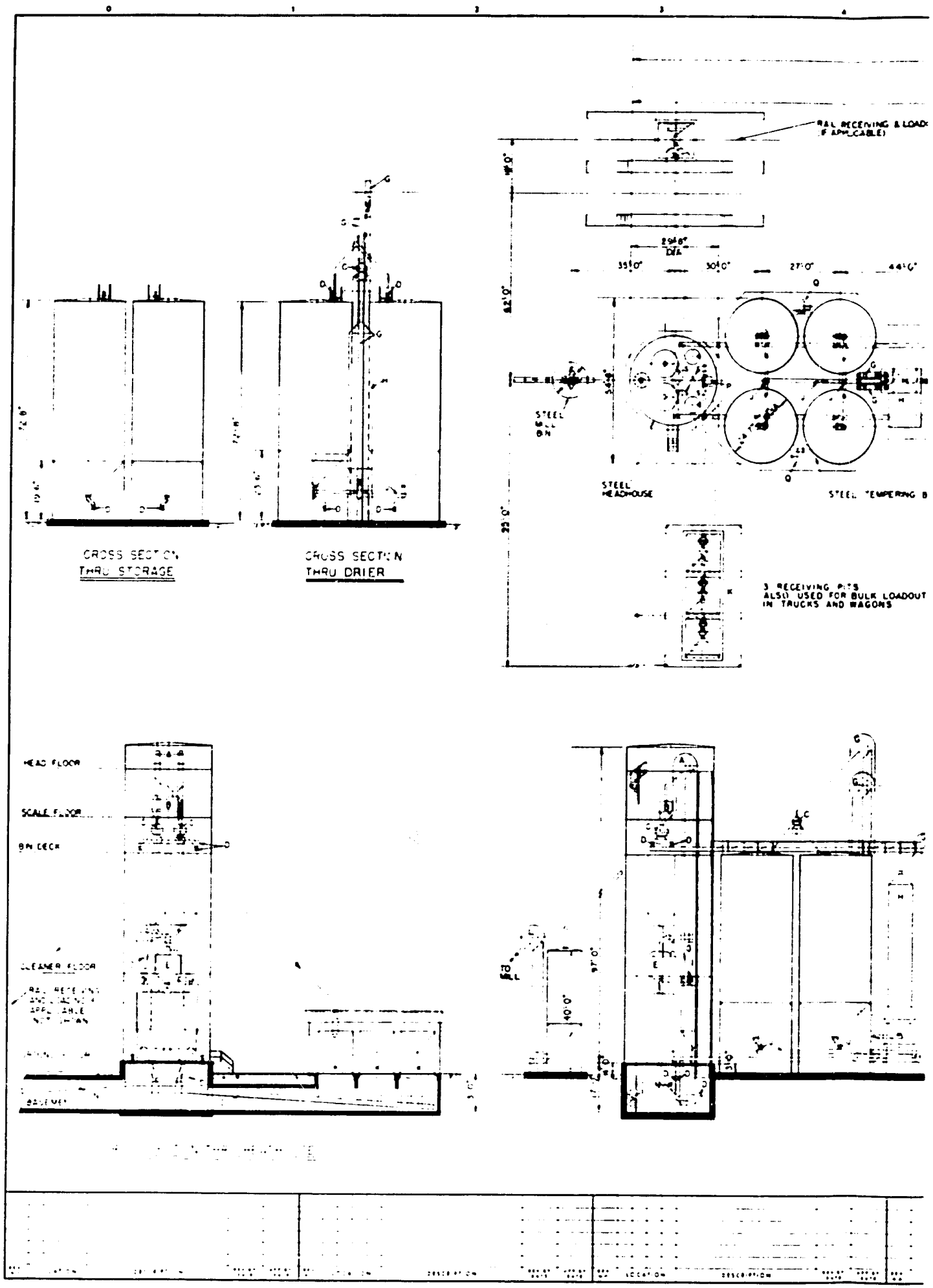
ELEVATION

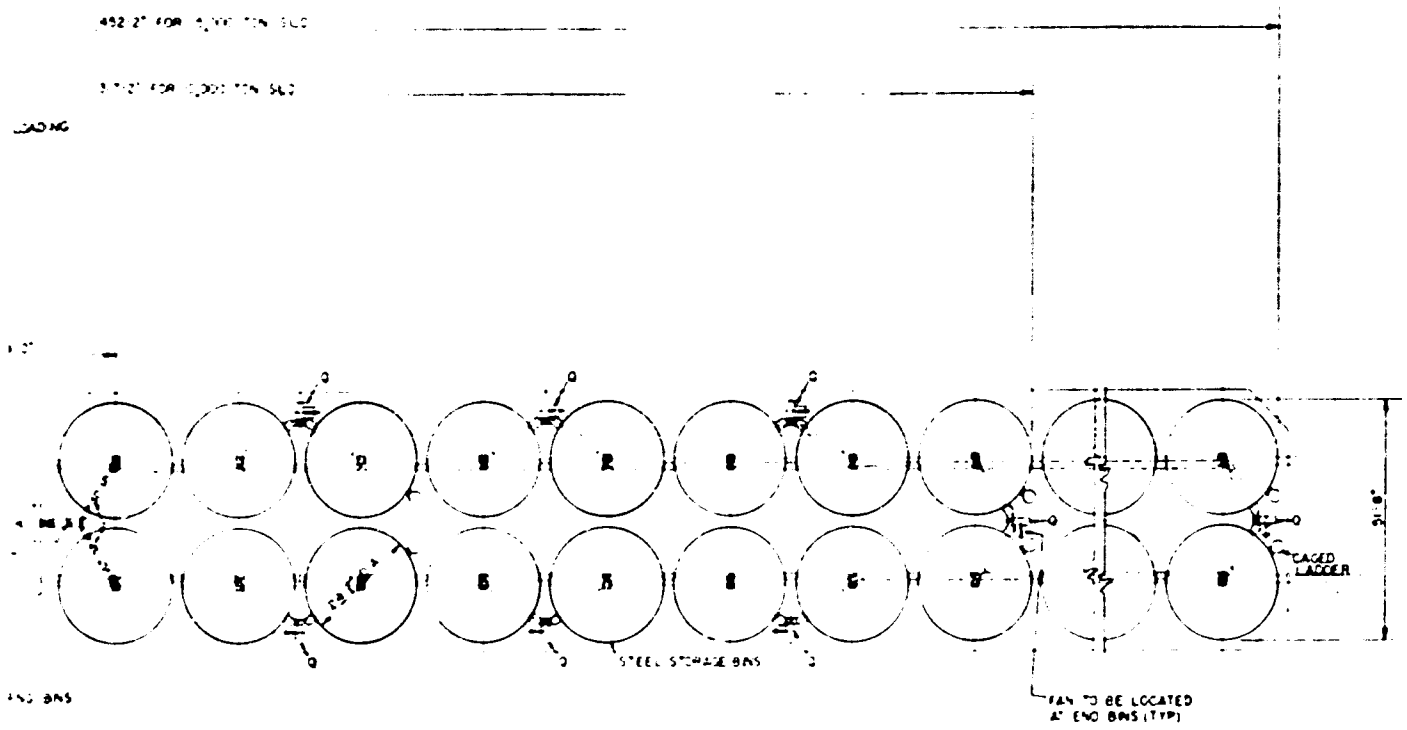


SITE PLAN

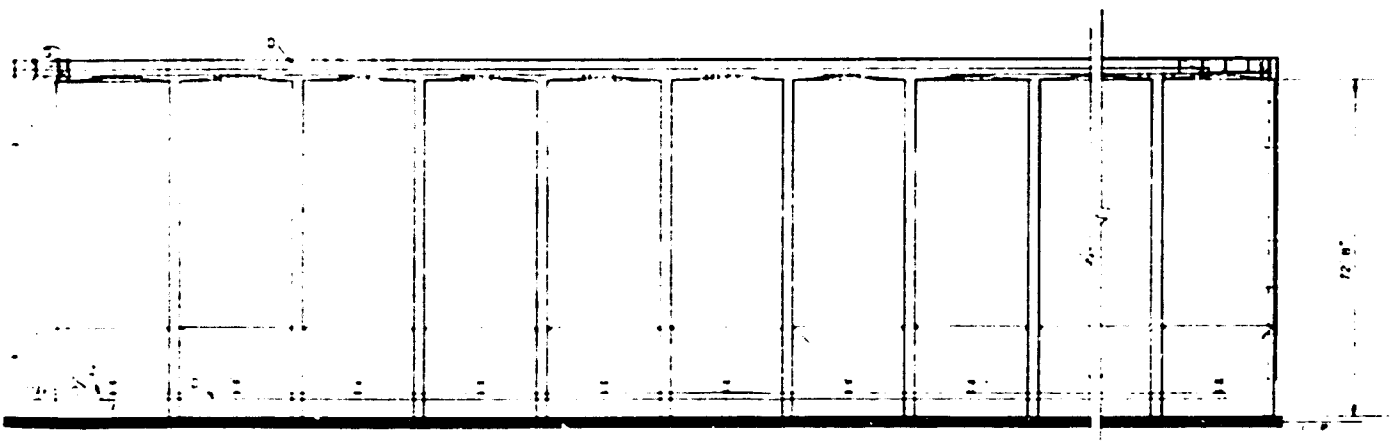


	SCALE 1" = 30'-0"	GRAIN STORAGE AND HANDLING REPUBLIC OF THE PHILIPPINES FOR U.S. A.I.D. U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT	SITE PLAN AND ELEVATION FOR 10,000 AND 15,000 TON SILOS WEITZ-HETTELSATER ENGINEERS a division of THE WEITZ COMPANY, INC. DES MOINES KANSAS CITY Drawing No. 7E-505 Sheet No. 4


CROSS SECTION
THRU STORAGE
CROSS SECTION
THRU DRIER
RAIL RECEIVING & LOADOUT
(IF APPLICABLE)
STEEL
HEADHOUSE
STEEL TEMPERING B
3 RECEIVING PITS
ALSO USED FOR BULK LOADOUT
IN TRUCKS AND WAGONS
HEAD FLOOR
SCALE FLOOR
BIN DECK
CLEANER FLOOR



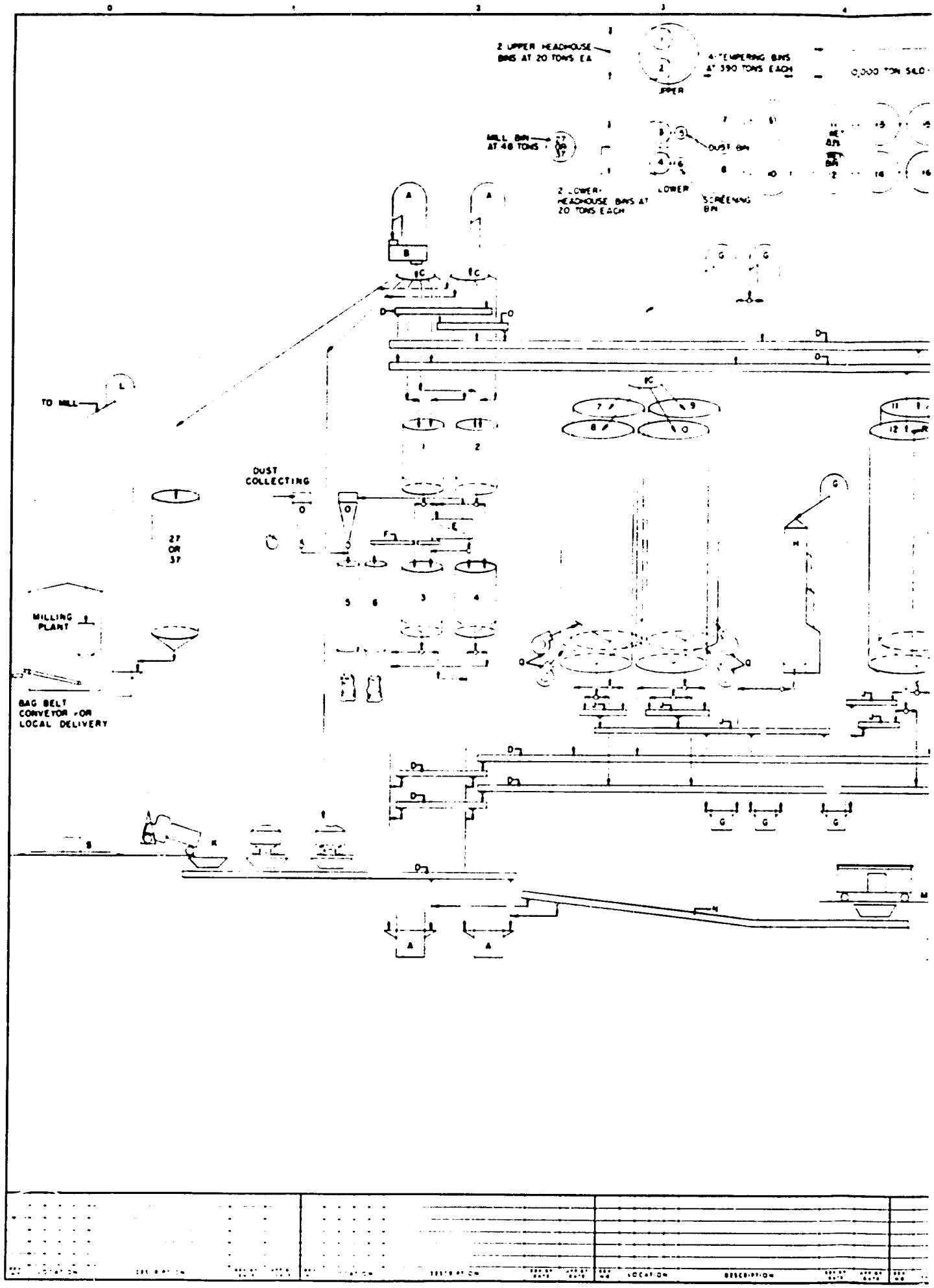
PLAN

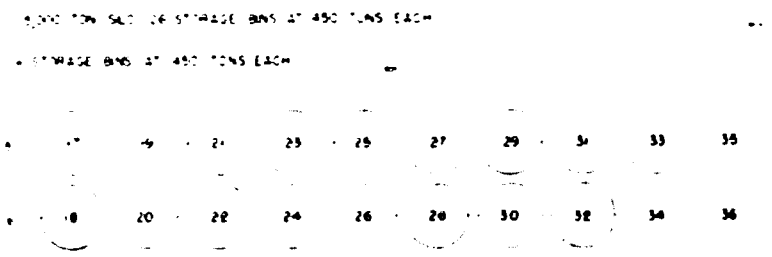


LONGITUDINAL SECTION

NOTE
FOR LEGEND SEE DRAWING NO. 8

		GRAIN STORAGE AND HANDLING REPUBLIC OF THE PHILIPPINES U.S. AID U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT	PLAN AND SECTIONS FOR 10,000 TON AND 15,000 TON SILOS WEITZ-HETTELSATER ENGINEERS DES MOINES KANSAS CITY E-505 5

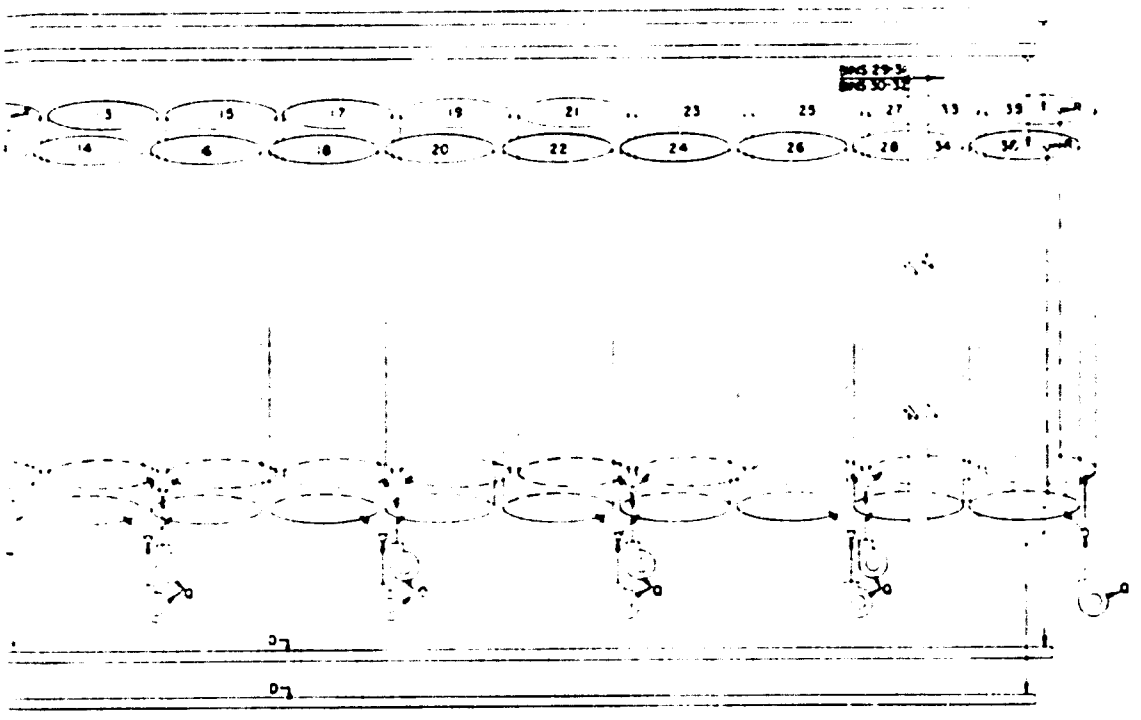

2 UPPER HEADHOUSE BINS AT 20 TONS EA
4 TEMPERING BINS AT 390 TONS EACH
UPPER
MILL BIN AT 48 TONS
DUST BIN
2 LOWER HEADHOUSE BINS AT 20 TONS EACH
LOWER
SCREENING BIN
TO MILL
DUST COLLECTING
27 OR 37
MILLING PLANT
BAG BELT CONVEYOR FOR LOCAL DELIVERY



KEY PLAN

LEGEND

A MAIN LEG 100 TONS PER HOUR
B AUTOMATIC BELT SCALE
C DISTRIBUTOR REMOTELY CONTROLLED
D CONVEYOR 100 TONS PER HOUR
E CLEANER 40 TONS PER HOUR
F SCREW CONVEYOR
G DRYER LEG 50 TONS PER HOUR
H DRYER 20 TONS PER HOUR (BASIS FALL AT 25% TO 14% MOISTURE)
I CONVEYOR 50 TONS PER HOUR
K RECEIVING PIT ALSO USED FOR BULK LOADOUT IN TRUCK OR WAGONS
L MILL LEG 15 TONS PER HOUR
M RAIL RECEIVING AND LOADING (IF APPLICABLE)
N CONVEYOR 100 TONS PER HOUR (IF APPLICABLE)
O CYCLONE COLLECTORS FOR CLEANER AND DUST COLLECTING
P PASSENGER ELEVATOR NOT SHOWN
Q AERATION AND FUMIGATION FANS
R TEMPERATURE CABLES IN ALL STORAGE BINS
S 30 TON TRUCK SCALE



CAPACITY TABLES

10,000 TON SILO

6 STORAGE BINS AT	450	TONS EACH	+ 7,200	TONS
4 TEMPERING BINS AT	390	TONS EACH	+ 1,560	TONS
4 HEADHOUSE BINS AT	20	TONS EACH	+ 80	TONS
1 MILL BIN AT	48	TONS EACH	+ 48	TONS
WAREHOUSE			+ 2,000	TONS
		TOTAL	+ 10,888	TONS

5,000 TON SILO

26 STORAGE BINS AT	450	TONS EACH	+ 11,700	TONS
4 TEMPERING BINS AT	390	TONS EACH	+ 1,560	TONS
4 HEADHOUSE BINS AT	20	TONS EACH	+ 80	TONS
1 MILL BIN AT	48	TONS EACH	+ 48	TONS
WAREHOUSE			+ 2,000	TONS
		TOTAL	+ 15,388	TONS

NOTE
CAPACITIES ARE BASED ON FALLAT ROUGH RICE
WEIGHING 36 POUNDS PER CUBIC FOOT
CAPACITIES ARE IN METRIC TONS (2204 POUNDS)

SCALE NONE	GRAIN STORAGE AND HANDLING	FLOW DIAGRAM FOR 10,000 TON AND 15,000 TON SILOS	
BY	REPUBLIC OF THE PHILIPPINES	WEITZ-HETTELSATER ENGINEERS	
DATE	FOR	a division of THE WEITZ COMPANY, INC.	
APPROVED FOR CONSTRUCTION	US / AID	DES MOINES KANSAS CITY	
BY	U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT	Project Job No. 7E-505	Drawing No. 6
DATE			

Design Criteria

The main storage structure and the headhouse for the 10,000 and the 15,000 metric ton facility is of steel design erected on reinforced concrete foundations. The warehouse, mill building, maintenance shop, powerhouse, and guardhouse is also of steel design. The main office is of masonry construction.

Because specific site locations have not been selected for the facilities, the actual load bearing capacity and condition of the soil cannot be determined for proper evaluation of the necessary foundations. However, allowances were made in the design for supporting the bin structure on a mattress type concrete slab foundation erected on soil with a minimum load bearing value of 3,000 pounds per square foot.

The drawings show optional handling of inbound and outbound shipments of grain in case the facility is to be located on existing or future rail siding.

The recommended designs as shown in the drawings represents practical and workable storage plant models. Use of these models will enable the operators to perform each function in an efficient and economical manner at a minimum cost. After site selections are made for each new facility, it may become necessary to change or modify the various buildings, the bin arrangement, and the traffic flow in and out of the premises.

25,000 Metric Ton Bulk Silo Facility

General

A 25,000 metric ton facility is recommended to be constructed at Manila (North Port development) between 1970 and 1972. A similar size facility is recommended to be constructed

at Cabanatuan, Nueva Ecija province, by 1970 and 1972, and an additional 25,000 metric ton capacity is recommended at Cabanatuan by 1975.

Table 83 shows the estimated flow of palay through the Manila facility. The figures in this table are based on the 1975 projections of rice consumption and production in Northern Luzon.

Table 84 shows the estimated flow of palay through the Cabanatuan facility. The total surplus of palay in Nueva Ecija in 1975 is estimated to be 511,000 metric tons. The facility recommended to be built at Cabanatuan by 1972 will handle 60,000 metric tons of this surplus or 11.7 percent. The second facility recommended (or expansion of the first facility) will also handle 60,000 metric tons of the 1975 surplus.

Drawings

The 25,000 metric ton facility is shown in Drawings 7, 8, and 9. It is designed to be constructed of reinforced concrete using the sliding or slip-form method. The 2,000 ton connecting warehouse and mill building is designed to be of steel construction. The following is a description of the design and grain flow or operational procedures of this bulk silo facility.

Handling

This silo is primarily designed for bulk handling of grains. However, sacked grains can be also received, stored, and processed. The palay may be shipped out in bulk or in sacks if required. After processing, the rice is bagged for export shipment or for local consumption. The bagging is performed in the warehouse on pre-weighed automatic bagging and sewing equipment.

TABLE 84

PALAY FLOW THROUGH CABANATUAN FACILITY, PHILIPPINES, 1975

Month	Percent of Palay Marketed	Intake of Palay	Offtake of Palay	Net Change	End of Month Inventory	End of Month Inventory with minimum one month offtake held at all times
January	16	9,600	5,000	4,600	23,200	28,200
February	6	3,600	5,000	-1,400	21,800	26,800
March	6	3,600	5,000	-1,400	20,400	25,400
April	4	2,400	5,000	-2,600	17,800	22,800
May	4	2,400	5,000	-2,600	15,200	20,200
June	2	1,200	5,000	-3,800	11,400	16,400
July	2	1,200	5,000	-3,800	7,600	12,600
August	2	1,200	5,000	-3,800	3,800	8,800
September	2	1,200	5,000	-3,800	--	5,000
October	10	6,000	5,000	1,000	1,000	6,000
November	21	12,600	5,000	7,600	8,600	13,600
December	25	15,000	5,000	10,000	18,600	23,600
TOTAL		60,000	60,000	xxx	xxx	xxx

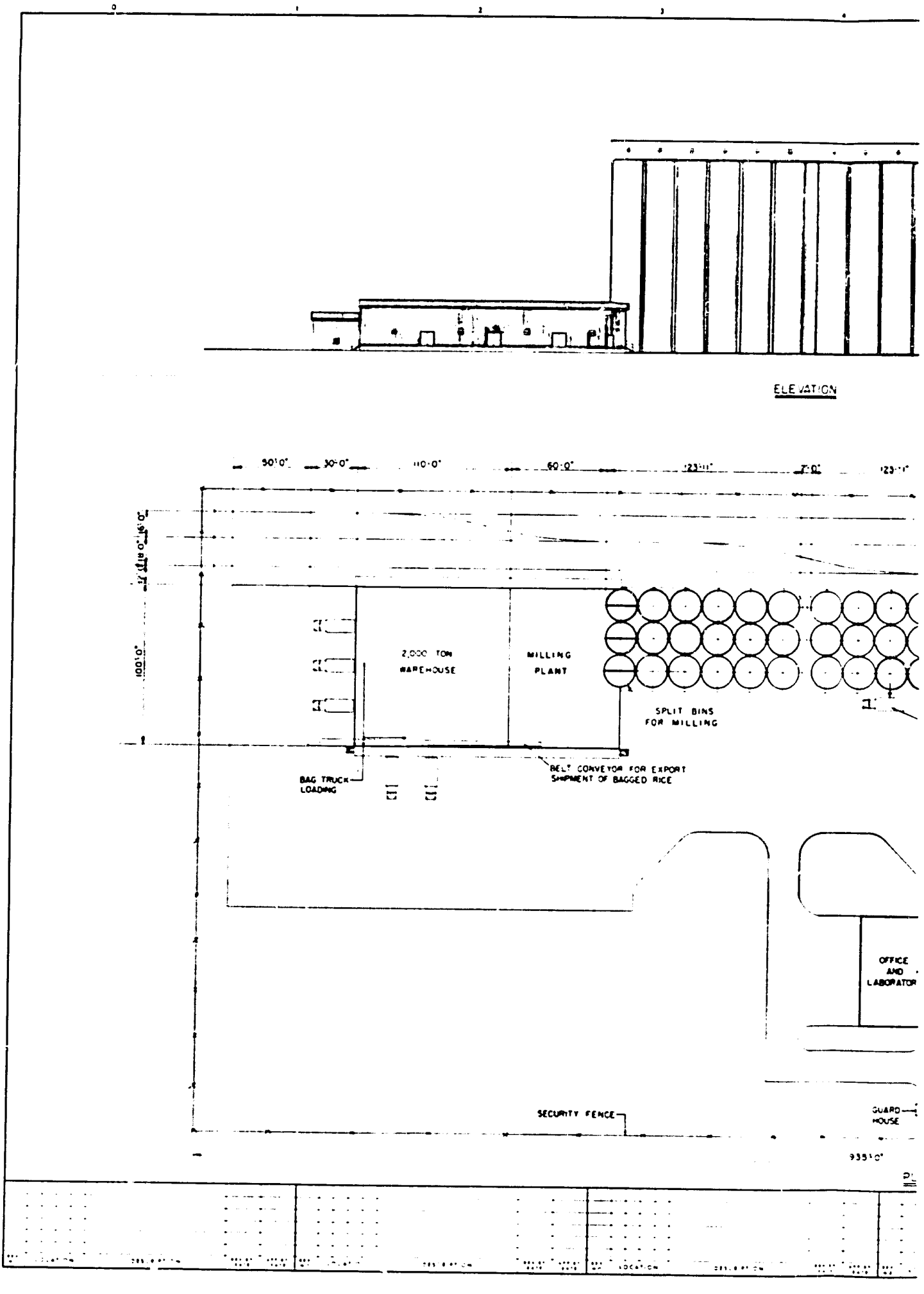
Notes: Total surplus of palay in Nueva Ecija in 1975 is 511,000 metric tons.
The facility built in 1972 would handle 60,000 metric tons of this surplus or 11.7%.
The second facility (or expansion of the 1st) would also handle 60,000 metric tons of the 1975 surplus rice.

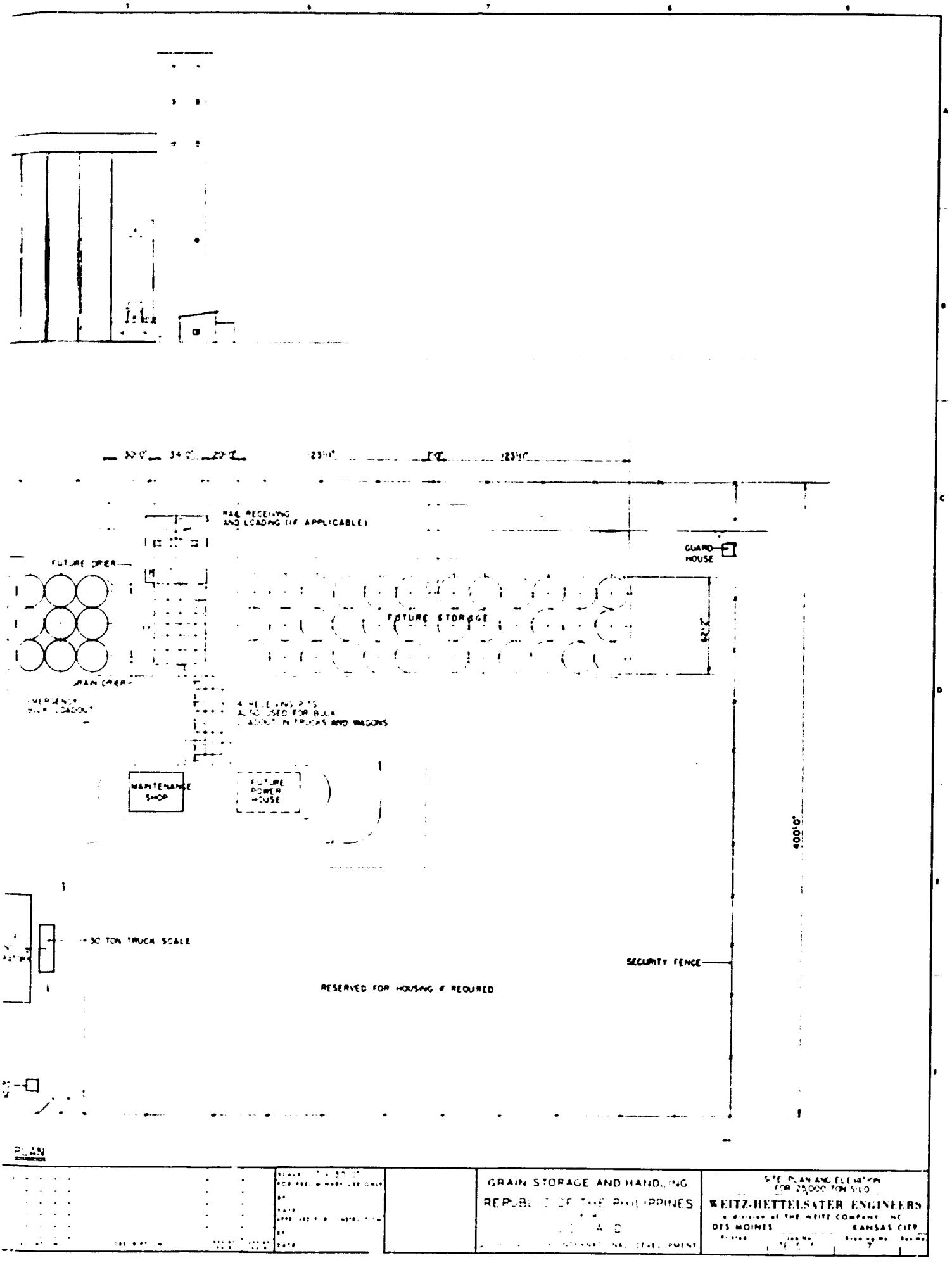
TABLE 83

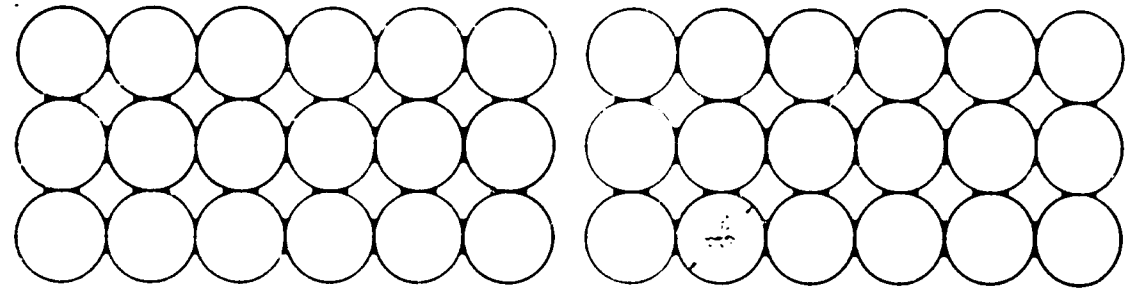
PALAY FLOW [a] THROUGH MANILA FACILITY, PHILIPPINES, 1975

Month	Intake: Milled Rice from Cagayan Valley	Intake: Palay from Cabanatuan	Intake: Palay from Tarlac	Intake: Palay from Other Sources	Intake: Total Intake of Palay	Off-take: Total Intake (milled rice)	Off-take: Export (bagged milled rice from bulk)	Off-take: Maximum Milled Rice from bulk held at one time	Off-take: Maximum Monthly Inventory of Milled Rice
	(metric tons)								
January	12,426	10,000	2,000	11,251	23,251	27,539	15,113	10,000	22,426
February	12,426	10,000	2,000	11,251	23,251	27,539	15,113	10,000	22,426
March	12,426	10,000	2,000	11,251	23,251	27,539	15,113	10,000	22,426
April	12,426	10,000	2,000	11,251	23,251	27,539	15,113	10,000	22,426
May	12,426	10,000	2,000	11,251	23,251	27,539	15,113	10,000	22,426
June	12,426	10,000	2,000	11,251	23,251	27,539	15,113	10,000	22,426
July	12,426	10,000	2,000	11,251	23,251	27,539	15,113	10,000	22,426
August	12,426	10,000	2,000	11,251	23,251	27,539	15,113	10,000	22,426
September	12,426	10,000	2,000	11,251	23,251	27,539	15,113	10,000	22,426
October	12,426	10,000	2,000	11,251	23,251	27,539	15,113	10,000	22,426
November	12,426	10,000	2,000	11,251	23,251	27,539	15,113	10,000	22,426
December	12,431	10,000	2,000	11,255	23,255	27,548	15,117	10,000	22,431
TOTAL	149,117	120,000	24,000	135,016	279,016	330,477	181,360	xxx	xxx

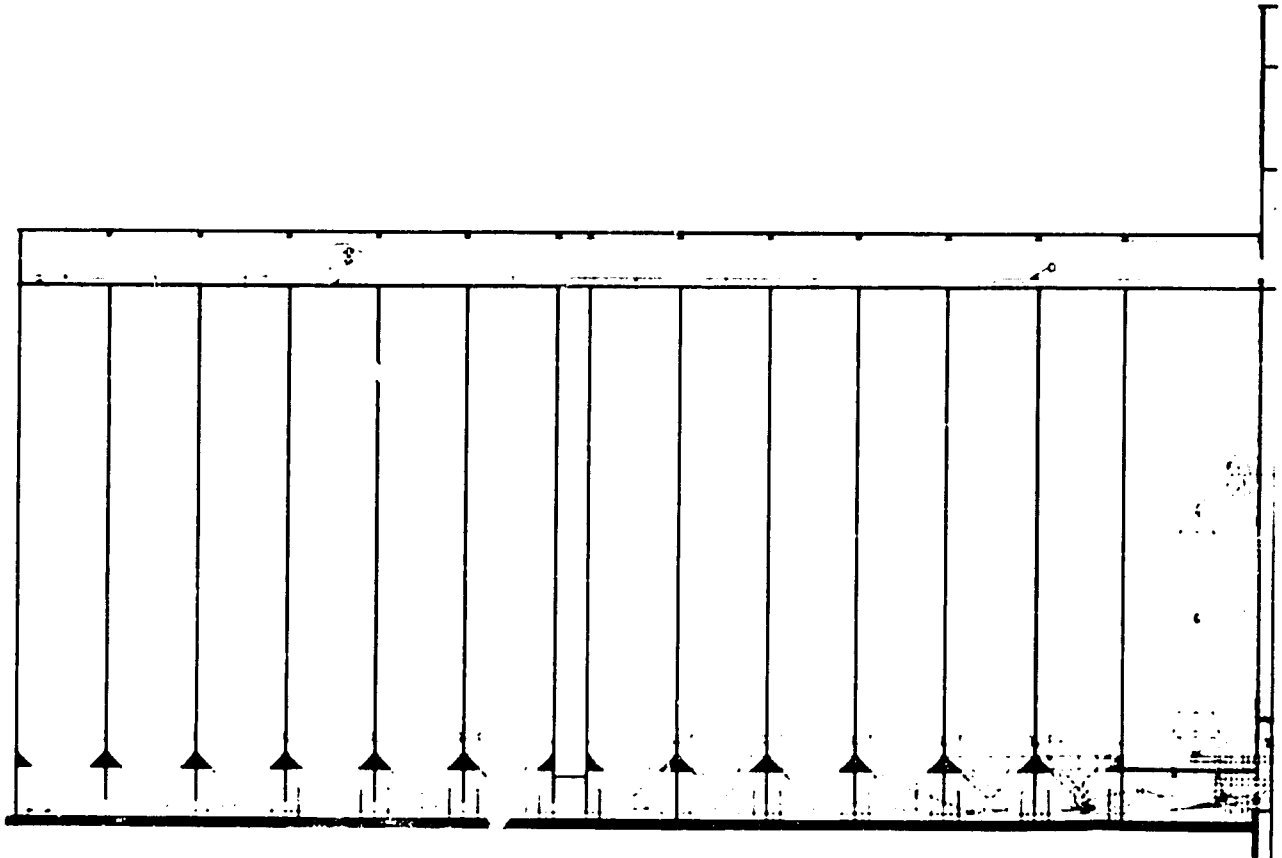
a The figures in this table are based on the 1975 projections of rice consumption and production in Northern Luzon.

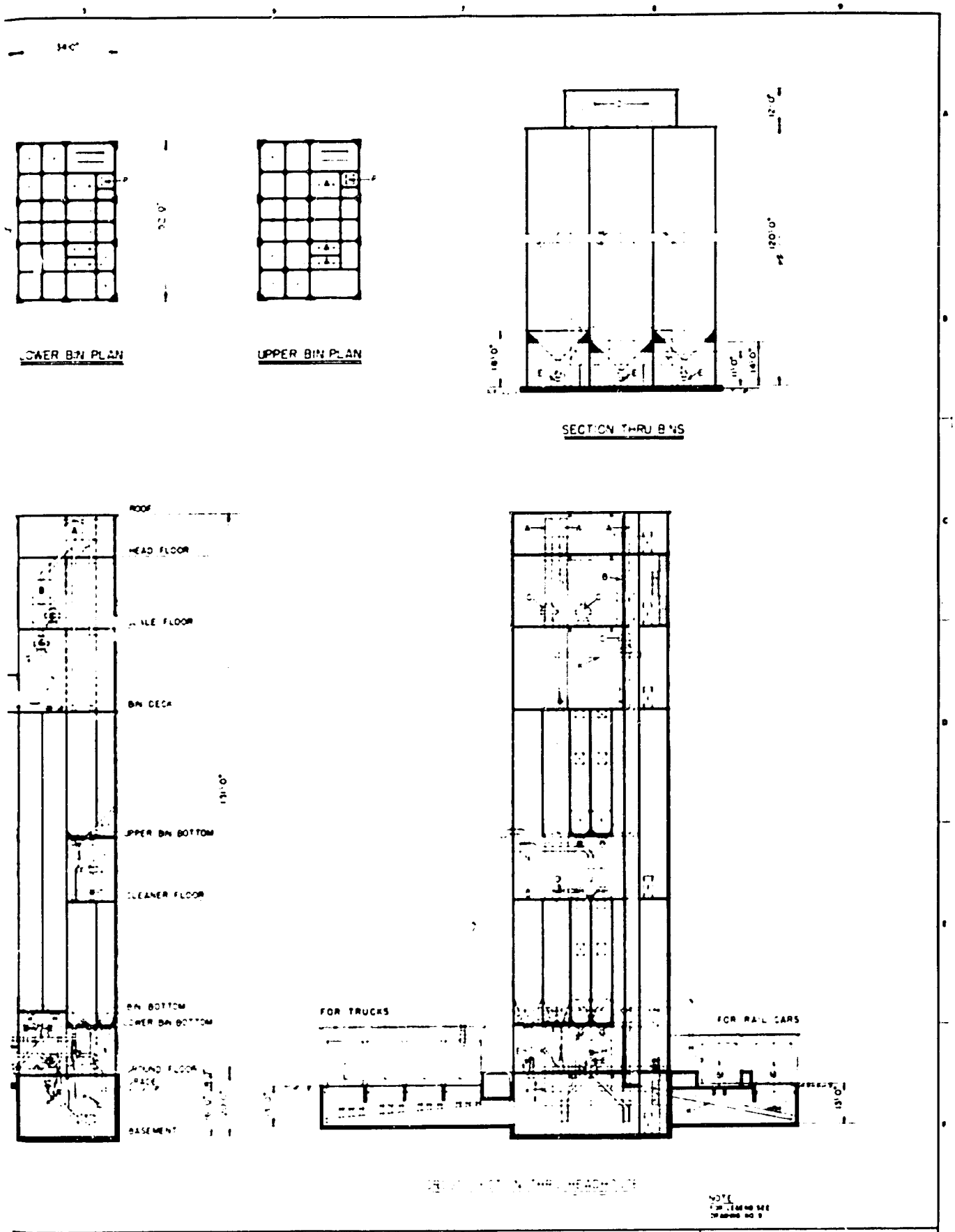

ELEVATION
50'0"
30'0"
110'0"
60'0"
100'0"
2,000 TON
WAREHOUSE
MILLING
PLANT
SPLIT BINS
FOR MILLING
BAG TRUCK
LOADING
BELT CONVEYOR FOR EXPORT
SHIPMENT OF BAGGED RICE
OFFICE
AND
LABORATOR
SECURITY FENCE
GUARD
HOUSE
935'0"


RAIL RECEIVING AND LOADING (IF APPLICABLE)
FUTURE DRIER
GUARD HOUSE
FUTURE STORAGE
MAIN DRIER
MAINTENANCE SHOP
FUTURE POWER HOUSE
400'-0"
50 TON TRUCK SCALE
SECURITY FENCE
RESERVED FOR HOUSING IF REQUIRED
PLAN
GRAIN STORAGE AND HANDLING
REPUBLIC OF THE PHILIPPINES
WEITZ-HETTELSATER ENGINEERS
DES MOINES
KANSAS CITY



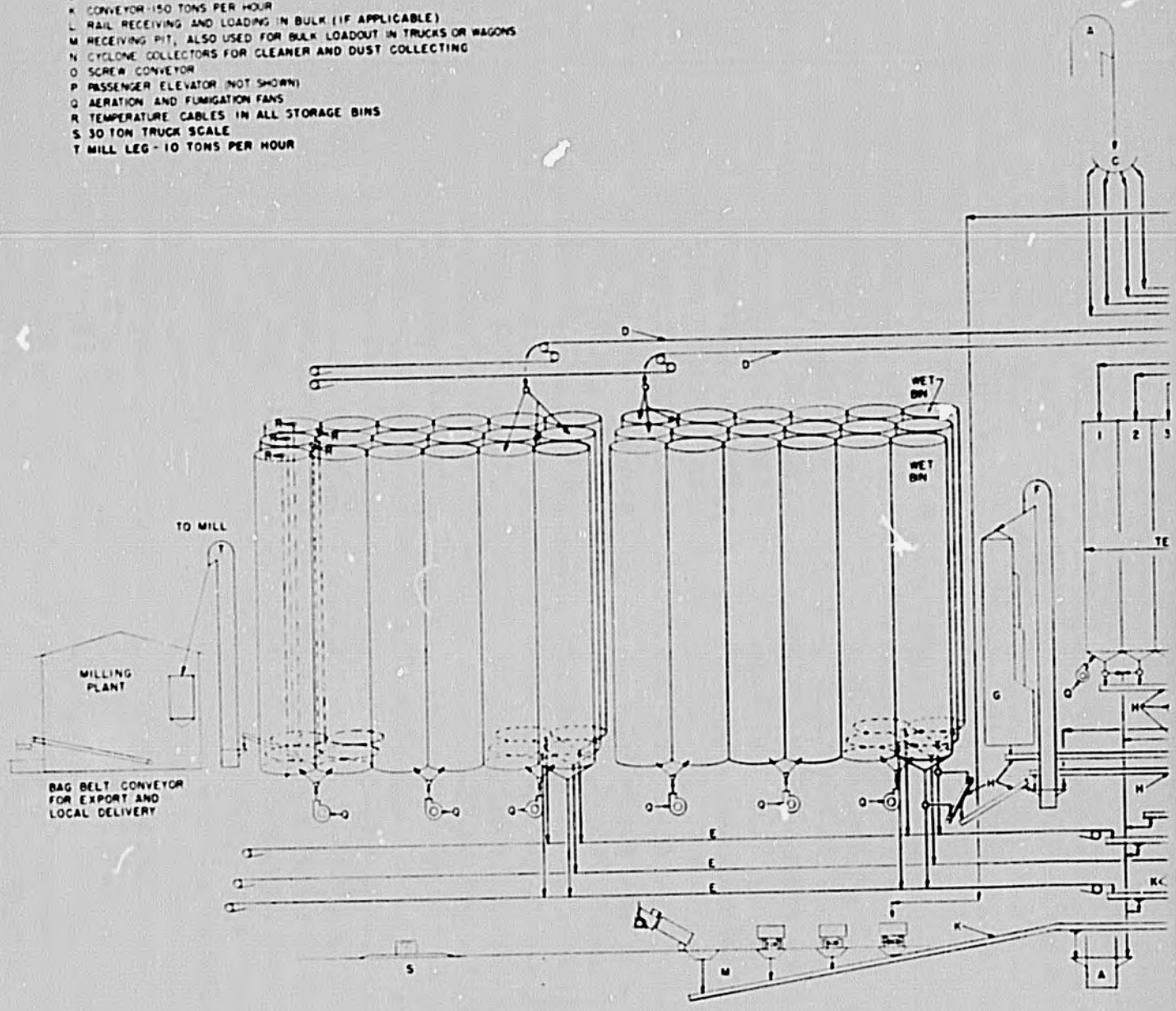
BIN PLAN



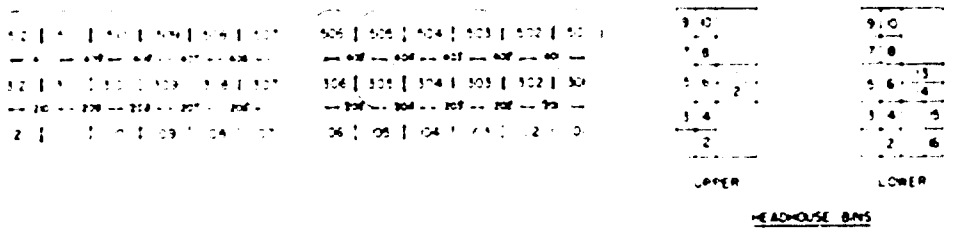

LOWER BIN PLAN
UPPER BIN PLAN
SECTION THRU BINS
ROOF
HEAD FLOOR
BIN DECK
UPPER BIN BOTTOM
CLEANER FLOOR
BIN BOTTOM
LOWER BIN BOTTOM
BASEMENT
FOR TRUCKS
FOR RAIL CARS
GRAIN STORAGE AND HANDLING
REPUBLIC OF THE PHILIPPINES
PLAN AND SECTIONS
WEITZ-HETTELSATER ENGINEERS
DES MOINES
KANSAS CITY
7E-505
8

LEGEND

A LEG-150 TONS PER HOUR
B AUTOMATIC SCALE
C DISTRIBUTOR-REMOTELY CONTROLLED
D BELT CONVEYOR WITH TRIPPER-150 TONS PER HOUR
E BELT CONVEYOR-150 TONS PER HOUR
F DRIER LEG-50 TONS PER HOUR
G DRIER-20 TONS PER HOUR (BASIS PALAY 25% TO 14% MOISTURE)
H CONVEYOR-50 TONS PER HOUR
J CLEANER-75 TONS PER HOUR
K CONVEYOR-150 TONS PER HOUR
L RAIL RECEIVING AND LOADING IN BULK (IF APPLICABLE)
M RECEIVING PIT, ALSO USED FOR BULK LOADOUT IN TRUCKS OR WAGONS
N CYCLONE COLLECTORS FOR CLEANER AND DUST COLLECTING
O SCREW CONVEYOR
P PASSENGER ELEVATOR (NOT SHOWN)
Q AERATION AND FUMIGATION FANS
R TEMPERATURE CABLES IN ALL STORAGE BINS
S 30 TON TRUCK SCALE
T MILL LEG - 10 TONS PER HOUR



REV. NO.	LOCATION	DESCRIPTION	REV. BY DATE	APP. BY DATE	REV. NO.	LOCATION	DESCRIPTION	REV. BY DATE	APP. BY DATE	REV. NO.	LOCATION	DESCRIPTION	REV. BY DATE	APP. BY DATE	REV. NO.



KEY PLAN

CAPACITY TABLE

STORAGE BINS

24 BINS	AT 550 TONS	EACH =	13,200	TONS
2 BINS	AT 465 TONS	EACH =	6,780	TONS
20 BINS	AT 118 TONS	EACH =	2,360	TONS
		TOTAL =	22,340	TONS

HEADHOUSE BINS

8 BINS	AT 100 TONS	EACH =	800	TONS
2 BINS	AT 150 TONS	EACH =	300	TONS
4 BINS	AT 53 TONS	EACH =	212	TONS
		TOTAL =	1,312	TONS

WAREHOUSE	=	2,000 TONS
	GRAND TOTAL =	25,652 TONS

NOTE

CAPACITIES ARE BASED ON ROLLED ROUGH RICE WEIGHING 36 POUNDS PER CUBIC FOOT

CAPACITIES ARE IN METRIC TONS (2204 POUNDS)

SCALE NONE	GRAIN STORAGE AND HANDLING	FLOW DIAGRAM FOR 25,000 TON SILO	
BY	REPUBLIC OF THE PHILIPPINES	WEITZ-HETTELSATER ENGINEERS	
DATE	FOR	DES MOINES	KANSAS CITY
APPROVED FOR CONSTRUCTION	U.S. AID		
BY		7E505	9
DATE			

Receiving and Weighing

All inbound grain is weighed either on a platform truck scale located by the office or on an automatic scale located in the headhouse. All outbound shipment can be weighed in the same manner.

After the inbound grain is weighed on the platform truck scale, it is delivered into one of four truck dump pits and conveyed to a vertical bucket elevator leg located in the headhouse for further distribution. In case the grain is received by rail, it is delivered into the track dump pit, then conveyed and elevated for weighing in the headhouse before distribution. Two of the main 150 metric ton per hour elevator legs are equipped with permanent type magnets which remove ferrous metallic particles which may be embedded in the grain. The scale in the headhouse can also be used for taking physical inventory of the bulk grains in the bins. This is accomplished by transferring the grain from one bin to another and weighing it during this operation.

Cleaning

A 75 metric ton per hour reciprocating type shaker screen grain cleaner is located in the headhouse with working or holding bins above and below the cleaner. The upper bins provide an even and continuous supply of grain necessary for efficient operation of the cleaner. The clean grain is discharged into the lower headhouse bins and the coarse screenings are discharged into a special bin for bagging as animal feed. The clean grain is re-elevated from the lower headhouse bins to the top of the headhouse, where it may be diverted to the grain drier, to shipping, or to the storage bins. The cleaner is equipped with a fan which creates an air suction for removing light impurities from the grain at the head and discharge ends of the machine. The dust and chaff thus removed are blown

into a cyclone dust collector which in turn discharges into the bins used for collecting the screenings.

Drying

A continuous-flow column type recirculating grain drier is provided in the 25,000 metric ton facility. The machine is equipped with fuel oil burner and automatic electrical temperature controls with safety devices to prevent overheating and flame failure. Automatic fuel ignition system is included. The drier has a capacity of 20 metric tons per hour through-put of palay (rough rice); basis 25 percent to 14 percent moisture removal in four passes. The grain to be dried is first delivered into one of the several wet bins in order that the drier may have several days of continuous operation. However, good drying results may be obtained by only 10 or 12 hours of continuous operation of the drier. In case there is an oversupply of wet grains to be dried and the specially assigned wet bins are not available, other empty storage bins may be used to store the wet grain as it is relatively easy to transfer the grain from one bin to another.

After each two or three percent of moisture removal per pass through the drier, the palay is delivered into the tempering bins for a rest period of about six to eight hours in order to equalize and stabilize the inner moisture of the grain. The drying cycle is repeated until after the proper moisture content is reached. Ordinarily, corn does not require pass-drying unless the initial moisture content is too high. Corn may be dried in one pass from 20 percent to 15 percent moisture.

Temperature Indicating

All of the round bins as well as the interstice bins in the 25,000 metric ton facility will be equipped with temperature indicating thermocouple cables to permit periodical

instantaneous temperature readings of the grain along the entire height of each bin. Any sudden increase of the temperature in the grain is a danger signal. This may be caused by insect life, and/or high moisture content, and immediate corrective action should be taken. All bins have 45 degree hoppers for ease of self-cleaning.

Aeration

Aeration fans with automatic humidity controls are provided in the 25,000 metric ton facility. These fans will also serve to furnish recirculating forced air to hasten the action of the fumigant in case of treating heavily infested grains.

Dust Collecting

Dust collecting equipment is provided to aid in maintaining cleanliness and to minimize dust hazards.

Grain Testing

The 25,000 metric ton facility is provided with grain testing equipment consisting of an electric moisture tester, balance, grain probes, hand testing sieves, and dockage or foreign material tester. This will permit uniform methods of testing with the other silo facilities.

Milling

The 25,000 metric ton facility is provided with a milling plant for producing polished rice at the rate of two tons per hour input of palay (rough rice).

Passenger Lift

An electric service elevator, traveling from the first

floor to the top floor of the headhouse, is provided. A concrete stairway is also included.

Truck Lift

One of the truck receiving pits is equipped with a hydraulic lift to raise the front end of a truck to hasten unloading bulk grains.

Bag Conveyor for Polished Rice

The 25,000 metric ton facility recommended in Manila is provided with a belt conveyor system in the warehouse for shipment of finished bags of rice for export and local delivery.

Electrical Power Supply

It is assumed that the local power company will furnish electricity to serve the needs of the 25,000 metric ton facilities. However, 600 kilovolt-ampere transformers are provided to transform the current supply from the high-line of the power company.

Design Criteria

The main storage structure and the headhouse for the 25,000 metric ton facility is of reinforced concrete design using the sliding or slip-form method of construction. The warehouse, mill building, maintenance shop, and guard house is of steel design. The main office is of masonry construction.

Because specific site locations have not been selected for the facilities, the actual load bearing capacity and condition of the soil cannot be determined for proper evaluation of the necessary foundations. However, allowances were made

in the design criteria for supporting the bin structure on a mattress type concrete slab foundation built on soil with a minimum load bearing value of 5,500 pounds per square foot.

The design includes handling inbound and outbound shipments by rail as well as by truck.

The recommended design as shown in the drawings represents a practical and workable storage plant model. Use of this model will enable the operator to perform each function in an efficient and economical manner at a minimum cost. After site selections are made, it may become necessary to change or modify the various buildings, the bin arrangement, and the traffic flow in and out of the premises.

1,500 Metric Ton Up-Country Bulk Type Satellite Facilities

General

The 1,500 metric ton silos recommended are to be used primarily as collecting satellite stations to receive directly from the farms and to serve as holding facilities or as additions to existing warehouse facilities. Drawing 10 shows the 1,500 metric ton facility consisting of galvanized steel bins and auxiliary steel buildings.

Handling

This facility is designed for receiving the grain in sacks or in small bulk containers. Storing is in bulk. Outbound shipments can be made in bulk or in sacks as described later in more detail.

Grain Flow

All inbound shipments are weighed on a platform scale and elevated to the grain cleaner. From the cleaner the grain is re-elevated into the wet bin preparatory to drying.

A continuous-flow column type recirculating grain drier is provided for the 1,500 metric ton facility. This machine has a capacity of three metric tons per hour through-put of palay (rough rice); basis 25 percent to 14 percent moisture removal in four passes with tempering bins between each pass. Except for its smaller capacity, the operation of this drier is very similar to that previously described for the other silos.

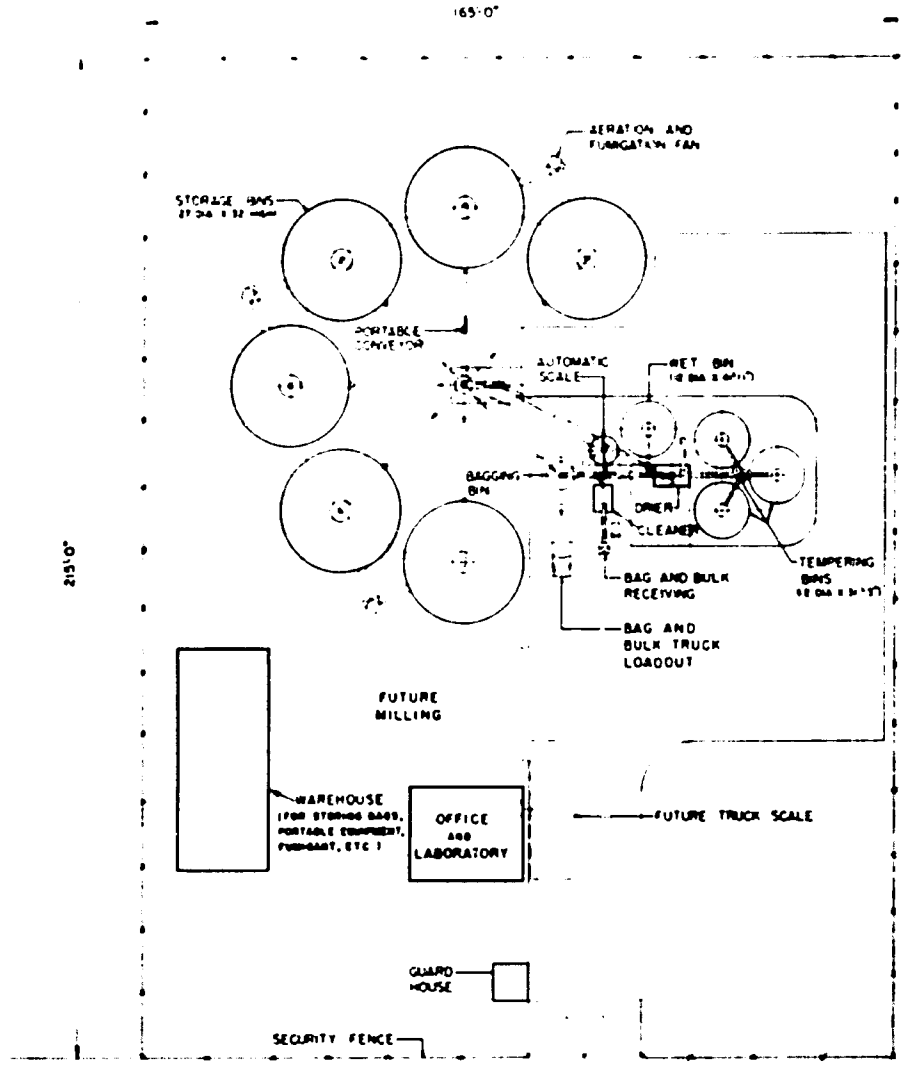
After the grain is cleaned and dried it is conveyed and elevated into the storage bins which are provided with combination aeration and fumigating fans.

The tempering bins, the wet bin, and the bagging bin have 45 degree hopper bottoms for self-cleaning. The storage bins have flat bottoms and are emptied by means of screw conveyors and mechanical bin sweep augurs. The bins will be erected on reinforced concrete slab foundations.

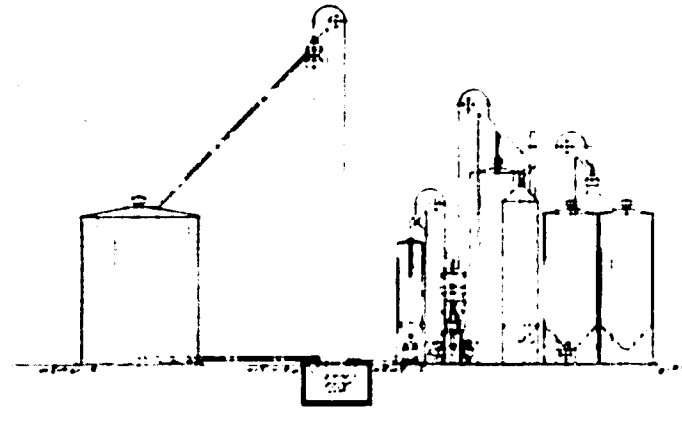
Outbound shipments in bulk are conveyed from the storage bins, then elevated and pre-weighed in an automatic scale before loading into a truck or wagon. A bagging bin is also included for making outbound shipments in sacks. Each bag of grain is weighed on a platform scale before shipment.

Temperature Indicating

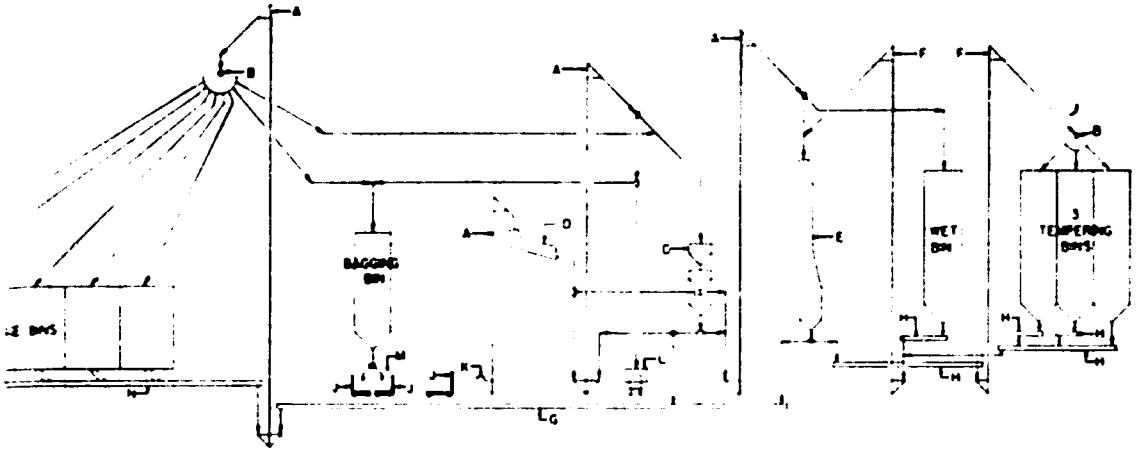
The storage bins in the 1,500 metric ton facility are provided with temperature indicating thermocouple cables the same as previously described for the other silos.



SITE PLAN



ELEVATION



FLOW DIAGRAM

LEGEND

A ELEVATOR LEGS - 15 TONS PER HOUR
B DISTRIBUTOR - REMOTELY CONTROLLED
C AUTOMATIC SCALE - 362 KILOGRAMS PER DRAFT
D CLEANER - 10 TONS PER HOUR
E DRIER - 3 TONS PER HOUR (BASIS PALAY 25% TO 14% MOISTURE)
F DRIER LEGS - 6 TONS PER HOUR
G CONVEYOR - 15 TONS PER HOUR
H CONVEYOR - 6 TONS PER HOUR
J PLATFORM SCALES
K BAG AND BULK RECEIVING HOPPER
L BULK TRUCK LOADOUT
M BAG LOADOUT FOR TRUCK AND WAGON
N PORTABLE CONVEYOR - 15 TONS PER HOUR

CAPACITY TABLE

6 - STORAGE BINS AT	290 TONS EACH	=	1740 TONS*
3 - TEMPERING BINS AT	38 TONS EACH	=	114 TONS*
1 - WET BIN AT	55 TONS EACH	=	55 TONS*
	TOTAL	=	1909 TONS

*NOTES
1 CAPACITIES ARE BASED ON PALAY (ROUGH RICE) WEIGHING 36 POUNDS PER CUBIC FOOT
2 WEIGHT BASED ON METRIC TON

SCALE 1/8" = 1'-0" FOR PRELIMINARY USE ONLY BY DATE APPROVED FOR CONSTRUCTION BY DATE	GRAIN STORAGE AND HANDLING REPUBLIC OF THE PHILIPPINES FOR US / AID U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT	SITE PLAN, ELEVATION AND FLOW DIAGRAM FOR 1500 TON UP-COUNTRY DRYING AND STORAGE WEITZ-HETTELSATER ENGINEERS a division of THE WEITZ COMPANY, INC. DES MOINES KANSAS CITY Project / Job No. 7E-505 / Drawing No. 10	

Grain Testing

Grain testing equipment is provided consisting of an electric moisture tester, balance, grain probes, hand testing sieves, and dockage or foreign material tester. This will permit all the silos to have uniform methods of grain testing.

Diesel Electric Generator

A 50 kilowatt diesel electric generator is provided at the 1,500 metric ton facility to furnish electric current for the various electric motors and other electrical equipment throughout the facility.

Miscellaneous

A 25-foot by 20-foot steel office building and a 48-foot by 20-foot warehouse building are included. Provisions are also made for future installation of a milling plant and a truck scale.

Standard Sack Warehouses

The recommended standard sack warehouses not shown on the drawings are designed to be constructed of steel frames with with galvanized iron siding, ventilating louvers, doors, and windows. The floor is to be reinforced concrete on compacted fill. The storage capacity of the warehouse is based on an average of two metric tons of palay per square meter of floor area; the side walls are 5.50 meters high.

The 1,000 metric ton units are equipped with drying equipment only and are to be constructed as additions to existing milling plants which presently are not equipped with drying.

The 2,000 metric ton units are equipped with both milling and drying equipment.

The 5,000 metric ton units do not have either milling or drying equipment as they are designed to be built as part of the export facilities at the Manila North Port.

The capacity of the milling equipment where specified in the standard sack warehouses is one ton per hour input of palay (rough rice) or shelled corn. The drying equipment where specified in the standard sack warehouse is to have a capacity of three tons per hour through-put of palay (rough rice); basis 25 percent to 14 percent moisture removal in four passes with tempering bins between each pass. Except for its smaller capacity, the operation of this drier is very similar to that previously described for the 3,000, 5,000, and 6,000 metric ton bulk silo facilities.

Cost of Recommended Facilities

The estimated cost, per unit, of the facilities recommended to be built by 1970, 1972 and 1975 is shown in Table 85. The itemized cost of each facility is divided into two parts: (a) foreign currency requirements expressed in U.S. dollars, and (b) local currency requirements expressed in Philippine pesos. Conversion to equivalents in Philippine pesos and U.S. dollars is based on an exchange rate of ₱3.90 equal to US$1.00. Tables 86 and 87 show the locations by provinces with estimated costs of the recommended facilities to be built by 1970, 1972 and 1975. Figures XXI and XXII show the geographical locations by regions of the recommended facilities to be built in this same period.

These costs were estimated by using detailed bills of material take-off for each facility and were based on January

ESTIMATED COST (PER UNIT)[c] OF TH

Size in Metric Tons[a] Nominal Capacity	Actual Capacity	Type of Construction Concrete	Steel	Milling Tons Input Per Hour	Drying Tons Per Hour	Civil Works (Buildings) Foreign Currency	Local Currency	Machinery/ Electrical Foreign Currency	Local Currency	Contractor's Equipment Rental	Fo Cu
						(US $)	(pesos)	(US $)	(pesos)	(pesos)	(
Bulk Silo Facilities[e]											
3,000	3,712	-	x	1.0	10	180,961	542,349	194,223	222,883	Included	
5,000	5,128	-	x	1.0	10	265,900	642,980	221,325	233,418	Included	
6,000	6,544	-	x	1.0	10	366,581	769,563	228,067	244,288	Included	
10,000	10,888	-	x	1.5	20	417,803	940,592	307,216	383,309	Included	1(
15,000	15,388	-	x	1.5	20	591,705	1,094,922	333,849	417,473	Included	1:
25,000	26,002	x	-	2.0	20	78,630	4,701,085	493,431	553,527	136,900	8
1,500[f]	1,740	-	x	-	3	37,703	41,530	47,880	37,270	Included	1
Standard Sack Warehouse[d]											
1,000	1,000	-	x	-	3	--	90,480	29,938	39,685	Included	
2,000	2,000	-	x	1.0	3	--	166,920	29,938	98,185	Included	
5,000	5,000	-	x	-	-	--	440,000	--	--	Included	

a Storage capacity is based on palay (rough rice) weighing 36 pounds per cubic foot. When storing shelled corn wei 25% greater.

b Contingency is estimated at 5% on U.S. dollars and 10% on local pesos.

c Estimated costs are based on January, 1968 prices and do not include cost of the land, cost of training program. Exchange rate, 3.90 Philippine pesos equal one (1) U.S. dollar.

d Local contractor will be used to build the standard sack warehouses.

e The 25,000 ton silo includes railroad facilities. In case railroad facilities will be required for the other sil 6,000 ton silos and $38,388 plus ₱217,525 each for the 10,000 and 15,000 ton silos.

f The 1,500 ton bulk silo is a special "up-country" facility with weighing, cleaning, and drying equipment. Millin

TABLE 85

RECOMMENDED NFA FACILITIES: PHILIPPINES, 1970-1975

Contractor's Overhead					Contingencies[b]		Financial Requirements			
Foreign Currency	Local Currency	Contractor's Margin	Bonds and Taxes-3%	Engineering	Foreign Currency	Local Currency	Foreign Currency	Local Currency	Total Cost	Equivalent
(US $)	(pesos)	(US $)	(pesos)	(US $)	(US $)	(pesos)	(US $)	(pesos)	(US $)	(pesos)
6,080	114,820	80,114	94,820	41,956	28,112	88,208	581,446	1,063,080	854,030	3,330,719
3,146	131,162	99,582	119,011	64,913	36,265	100,787	761,131	1,227,658	1,075,915	4,196,068
9,204	152,082	119,202	142,941	77,784	44,044	116,596	924,882	1,425,470	1,290,433	5,032,510
98,843	198,581	148,165	187,863	96,248	53,887	152,190	1,132,162	1,862,535	1,609,735	6,277,967
38,841	226,853	182,633	223,868	118,223	68,267	173,921	1,433,521	2,137,037	1,981,479	7,727,769
85,809	809,360	269,740	340,236	176,230	55,192	620,088	1,159,032	7,161,196	2,995,236	11,681,420
12,837	11,820	14,598	17,910	9,537	6,130	4,500	128,685	113,030	157,667	614,902
4,190	32,464	3,128	10,170	2,500	Included	14,000	40,056	186,799	87,953	343,016
4,190	56,753	3,128	15,780	2,500	Included	25,410	40,056	363,048	133,145	519,266
--	Included	--	15,000	Included	--	40,000	--	495,000	--	495,000

...ing 45 pounds per cubic foot, the storage capacity will be

...cost of construction supervision. Piling is not included

...s and $34,397 plus P189,302 each for the 3,000; 5,000 and

...can be added at a future date

TABLE

REGIONAL RECOMMENDED NEW GRAIN STORAGE FACI

Region	Standard Sack Warehouse[a]					Small Bulk Silos-Up Country w Cleaning and Drying[b]		
		Estimated Cost					Estimated	
			Add for Drier		Add for Milling			
	Number and Size	Warehouse Only	Foreign Currency	Local Currency	Local Currency	Number and Size	Foreign Currency	C
	(metric tons)	(pesos)	(US $)	(pesos)	(pesos)	(metric tons)	(US $)	
I Manila	--	--	--	--	--	--	--	
II Ilocos								
Abra	1 - 1,000	135,677	40,056	51,122	--	2 - 1,500	257,370	2
Ilocos Norte	1 - 1,000	135,677	40,056	51,122	--	2 - 1,500	257,370	2
Ilocos Sur	--	--	--	--	--	--	--	
La Union	--	--	--	--	--	--	--	
Mt. Province	2 - 2,000	495,152	80,112	102,244	128,700	--	--	
III Cagayan Valley								
Batanes	1 - 1,000[d]	135,677	40,056	51,122	--	--	--	
Cagayan	1 - 1,000	135,677	40,056	51,122	--	2 - 1,500	257,370	2
Cagayan	1 - 2,000	247,576	40,056	51,122	64,350	--	--	
Isabela[d]	--	--	--	--	--	2 - 1,500	257,370	2
Nueva Vizcaya	--	--	--	--	--	--	--	
IV Central Luzon								
Bataan	--	--	--	--	--	--	--	
Bulacan	--	--	--	--	--	--	--	
Nueva Ecija	--	--	--	--	--	--	--	
Pampanga	--	--	--	--	--	--	--	
Pangasinan	--	--	--	--	--	--	--	
Tarlac	1 - 1,000	135,677	40,056	51,122	--	2 - 1,500	257,370	2
Zambales	3 - 2,000	742,728	120,168	153,366	193,050	2 - 1,500	257,370	2
V Southern Tagalog								
Batangas	1 - 1,000	135,677	40,056	51,122	--	--	--	
Batangas	1 - 2,000	247,576	40,056	51,122	64,350	2 - 1,500	257,370	2
Cavite	1 - 2,000	247,576	40,056	51,122	64,350	--	--	
Laguna	2 - 2,000	495,152	80,112	102,244	128,700	2 - 1,500	257,370	2
Marinduque	1 - 2,000	247,576	40,056	51,122	64,350	--	--	
Mindoro Occidental	--	--	--	--	--	--	--	
Mindoro Oriental	2 - 2,000	495,152	80,112	102,244	128,700	2 - 1,500	257,370	2
Palawan	1 - 1,000	135,677	40,056	51,122	--	--	--	
Palawan	1 - 2,000	247,576	40,056	51,122	64,350	--	--	
Quezon	1 - 1,000	135,677	40,056	51,122	--	2 - 1,500	257,370	2
Quezon	1 - 2,000	247,576	40,056	51,122	64,350	--	--	
Rizal	--	--	--	--	--	--	--	
VI Bicol								
Albay	1 - 1,000	135,677	40,056	51,122	--	2 - 1,500	257,370	2
Camarines Norte	--	--	--	--	--	--	--	
Camarines Sur	2 - 2,000	495,152	80,112	102,244	128,700	4 - 1,500	514,740	4
Catanduanes	2 - 2,000	495,152	80,112	102,244	128,700	--	--	
Masbate	2 - 2,000[d]	495,152	80,112	102,244	128,700	2 - 1,500[d]	257,370	2
Sorsogon	1 - 2,000	247,576	40,056	51,122	64,350	--	--	
VII Western Visayas								
Aklan	--	--	--	--	--	2 - 1,500	257,370	2
Antique	--	--	--	--	--	2 - 1,500	257,370	2
Capiz	1 - 1,000	135,677	40,056	51,122	--	--	--	
Capiz	1 - 2,000	247,576	40,056	51,122	64,350	--	--	
Iloilo	--	--	--	--	--	--	--	
Negros Occidental	--	--	--	--	--	--	--	
Negros Oriental	2 - 2,000[d]	495,152	80,112	102,244	128,700	--	--	
Romblon	1 - 2,000	247,576	40,056	51,122	64,350	--	--	
VIII Eastern Visayas								
Bohol	2 - 2,000	495,152	80,112	102,244	128,700	2 - 1,500	257,370	2
Cebu	--	--	--	--	--	--	--	
Leyte	1 - 2,000	247,576	40,056	51,122	64,350	2 - 1,500	257,370	2
Samar	1 - 2,000	247,576	40,056	51,122	64,350	2 - 1,500	257,370	2
IX S & W Mindanao								
Cotabato	--	--	--	--	--	--	--	
Davao[d]	1 - 2,000[d]	247,576	40,056	51,122	64,350	2 - 1,500[d]	257,370	2
Sulu	1 - 1,000	135,677	40,056	51,122	--	--	--	
Sulu	1 - 2,000	247,576	40,056	51,122	64,350	--	--	
Zamboanga Norte	3 - 2,000[d]	742,728	120,168	153,366	193,050	--	--	
Zamboanga Sur	2 - 2,000[d]	495,152	80,112	102,244	128,700	4 - 1,500[d]	514,740	
X N & E Mindanao								
Agusan	--	--	--	--	--	2 - 1,500	257,370	2
Bukidnon	--	--	--	--	--	2 - 1,500	257,370	
Lanao	--	--	--	--	--	--	--	
Misamis Occidental	1 - 2,000	247,576	40,056	51,122	64,350	--	--	
Misamis Oriental	--	--	--	--	--	2 - 1,500	257,370	
Surigao	--	--	--	--	--	--	--	
Totals - Metric Tons	87,000					75,000		
Totals - Number of Units	49					50		

a/ The 2,000 ton standard sack warehouses will be equipped with milling and drying equipment; the 1,000 ton standard warehouses will be equipped with only drying equipment.

b/ The small bulk silo has a capacity of 1,500 tons and will be equipped with cleaning, drying and weighing equipment, but no milling. They serve as holding facilities or as additions to existing warehouse facilities.

c/ The large bulk silos will be equipped with cleaning, drying, weighing and milling equipment.

d/ These facilities will be used primarily for handling corn.

ILITIES WITH ESTIMATED COSTS, PHILIPPINES, 1970

with Cost Local Currency	Large Bulk Silos with Cleaning, Drying and Milling[c] Number and Size	Location	Estimated Cost Foreign Currency	Estimated Cost Local Currency	Financial Requirements Foreign Currency	Financial Requirements Local Currency	Total Equivalent Foreign Currency	Total Equivalent Local Currency
(pesos)	(metric tons)		(US $)	(pesos)	(US $)	(pesos)	(US $)	(pesos)
--	--	--	--	--	--	--	--	--
226,060	--	--	--	--	297,426	549,047	438,207	1,709,008
226,060	--	--	--	--	297,426	549,047	438,207	1,709,008
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	80,112	726,096	266,290	1,038,533
--	--	--	--	--	40,056	186,799	87,953	343,017
226,060	1 - 5,000	Tuguegarao	761,131	1,227,658	1,058,557	1,640,317	1,479,202	5,768,889
--	--	--	--	--	40,056	363,048	133,145	519,266
226,060	1 - 5,000	Ilagan	761,131	1,227,658	1,018,501	1,453,718	1,391,249	5,425,872
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
226,060	--	--	--	--	297,426	412,459	403,287	1,572,820
226,060	--	--	--	--	377,538	1,315,204	714,770	2,787,602
--	--	--	--	--	40,056	186,799	87,953	343,017
226,060	1 - 3,000	Batangas	581,446	1,063,080	878,872	1,652,188	1,302,510	5,079,789
--	--	--	--	--	40,056	363,048	133,145	519,266
226,060	--	--	--	--	337,482	952,156	581,625	2,268,336
--	--	--	--	--	40,056	363,048	133,145	519,266
--	--	--	--	--	--	--	--	--
226,060	--	--	--	--	337,482	952,156	581,625	2,268,336
--	--	--	--	--	40,056	186,799	87,953	343,017
--	--	--	--	--	40,056	363,048	133,145	519,266
226,060	--	--	--	--	297,426	412,459	403,287	1,572,820
--	--	--	--	--	40,056	363,048	133,145	519,266
--	--	--	--	--	--	--	--	--
226,060	1 - 3,000	Legaspi		1,063,080	878,872	1,475,939	1,257,318	4,903,540
--	--	--	--	--	--	--	--	--
452,120	1 - 5,000	Naga	761,131	1,227,658	1,355,983	2,405,874	1,972,874	7,694,208
--	--	--	--	--	80,112	726,096	266,290	1,038,533
226,060	--	--	--	--	337,482	952,156	581,625	2,268,336
--	--	--	--	--	40,056	363,048	133,145	519,266
226,060	--	--	--	--	257,370	226,060	315,334	1,229,803
226,060	--	--	--	--	257,370	226,060	315,334	1,229,803
--	--	--	--	--	40,056	186,799	87,953	343,017
--	--	--	--	--	40,056	363,048	133,145	519,266
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	80,112	726,096	266,290	1,038,533
--	--	--	--	--	40,056	363,048	133,145	519,266
226,060	--	--	--	--	337,482	952,156	581,625	2,268,336
--	--	--	--	--	--	--	--	--
226,060	--	--	--	--	297,426	589,108	448,479	1,749,069
226,060	--	--	--	--	297,426	589,108	448,479	1,749,069
--	--	--	--	--	--	--	--	--
226,060	1 - 10,000[d]	Davao City	1,132,162	1,862,335	1,429,588	2,418,603	2,049,743	7,993,996
--	--	--	--	--	40,056	186,799	87,953	343,017
--	--	--	--	--	40,056	363,048	133,145	519,266
--	--	--	--	--	120,168	1,089,144	399,476	1,557,799
452,120	1 - 5,000[d]	Pagadin	761,131	1,227,658	1,355,983	2,405,874	1,972,874	7,694,208
226,060	--	--	--	--	257,370	226,060	315,334	1,229,802
226,060	--	--	--	--	257,370	226,060	315,334	1,229,802
--	--	--	--	--	--	--	--	--
--	--	--	--	--	40,056	363,048	133,145	519,266
226,060	1 - 5,000	Cagayan de Oro	761,131	1,227,658	1,018,501	1,453,718	1,391,249	5,425,872
--	--	--	--	--	--	--	--	--
	11,000			Total Cost	14,497,703	31,868,424	22,669,132	88,409,467

[c] Part of the grain produced in Cagayan province is stored in Central Luzon and later sold in Manila. This grain flow is likely to continue until the mid-1970's.

[d] Production is expected to increase rapidly in Isabela province. It is recommended that facilities be constructed in anticipation of future needs.

Note: Estimated costs are based on January, 1968 prices. Exchange rate: 3.90 Philippine pesos equals one (1) U.S. dollar.

Region	Standard Sack Warehouse[a] Number and Size	Estimated Cost: Warehouse Only	Add for Drier: Foreign Currency	Add for Drier: Local Currency	Add for Milling: Local Currency	Small Bulk Silos-Up Country with Cleaning and Drying[b] Number and Size	Estimated Foreign Currency
	(metric tons)	(pesos)	(US $)	(pesos)	(pesos)	(metric tons)	(US $)
I Manila (1972)[c]	5 - 5,000[d/e]	2,475,000	No drying or milling.			--	--
II Ilocos							
Abra	1 - 1,000	135,677	40,056	51,122		--	--
Ilocos Norte	1 - 1,000	135,677	40,056	51,122	--	--	--
Ilocos Sur	--	--	--	--	--	--	--
La Union	--	--	--	--	--	--	--
Mt. Province	1 - 1,000	135,677	40,056	51,122	--	--	--
III Cagayan Valley							
Batanes	1 - 1,000[f]	135,677	40,056	51,122	--	--	--
Cagayan	1 - 1,000	135,677	40,056	51,122	--	2 - 1,500	257,370
Cagayan	--	--	--	--	--	--	--
Isabela (1972)[c]	--	--	--	--	--	--	--
Isabela	1 - 1,000	135,677	40,056	51,122	--	2 - 1,500	257,370
Isabela	--	--	--	--	--	--	--
Nueva Vizcaya[i]	--	--	--	--	--	--	--
IV Central Luzon							
Bataan	1 - 1,000	135,677	40,056	51,122	--	--	--
Bulacan[i]	--	--	--	--	--	--	--
Nueva Ecija (1972)[c]	--	--	--	--	--	--	--
Nueva Ecija	--	--	--	--	--	--	--
Pampanga[i]	--	--	--	--	--	--	--
Pangasinan	4 - 2,000	990,304	160,224	204,488	257,400	8 - 1,500	1,029,480
Tarlac (1972)[c]	--	--	--	--	--	--	--
Tarlac	1 - 2,000	247,576	40,056	51,122	64,350	4 - 1,500	514,740
Zambales	1 - 2,000	247,576	40,056	51,122	64,350	--	--
Zambales	1 - 1,000	135,677	40,056	51,122	--	--	--
V Southern Tagalog							
Batangas	3 - 2,000	742,728	120,168	153,366	193,050	--	--
Cavite	1 - 1,000	135,677	40,056	51,122	--	2 - 1,500	257,370
Laguna	--	--	--	--	--	4 - 1,500	514,740
Marinduque	--	--	--	--	--	--	--
Mindoro Occidental	--	--	--	--	--	--	--
Mindoro Oriental	2 - 2,000	495,152	80,112	102,244	128,700	--	--
Palawan	1 - 1,000	135,677	40,056	51,122	--	--	--
Palawan	1 - 2,000	247,576	40,056	51,122	64,350	--	--
Quezon	1 - 2,000	247,576	40,056	51,122	64,350	2 - 1,500	257,370
Rizal	--	--	--	--	--	--	--
VI Bicol							
Albay (1972)[c]	--	--	--	--	--	--	--
Albay	1 - 2,000	247,576	40,056	51,122	64,350	2 - 1,500	257,370
Camarines Norte	--	--	--	--	--	--	--
Camarines Sur (1972)[c]	--	--	--	--	--	--	--
Camarines Sur	1 - 2,000	247,576	40,056	51,122	64,350	4 - 1,500	514,740
Catanduanes	1 - 2,000	247,576	40,056	51,122	64,350	--	--
Masbate	1 - 2,000[f]	247,576	40,056	51,122	64,350	--	--
Sorsogon	1 - 2,000	247,576	40,056	51,122	64,350	--	--
VII Western Visayas							
Aklan	1 - 1,000	135,677	40,056	51,122	--	--	--
Antique	1 - 1,000	135,677	40,056	51,122	--	--	--
Capiz	2 - 2,000	495,152	80,112	102,244	128,700	--	--
Iloilo (1972)[c/i]	--	--	--	--	--	--	--
Negros Occidental	--	--	--	--	--	--	--
Negros Oriental	--	--	--	--	--	2 - 1,500	257,370
Romblon	1 - 1,000	135,677	40,056	51,122	--	--	--
VIII Eastern Visayas							
Bohol	1 - 2,000	247,576	40,056	51,122	64,350	--	--
Cebu (1972)[c]	--	--	--	--	--	--	--
Leyte (1972)[c]	--	--	--	--	--	--	--
Leyte	1 - 2,000	247,576	40,056	51,122	64,350	2 - 1,500	257,370
Samar	--	--	--	--	--	2 - 1,500	257,370
IX S & W Mindanao							
Cotabato (1972)[c/i]	2 - 2,000[c/g]	495,152	No drying or milling.			--	--
Cotabato	--	--	--	--	--	4 - 1,500	514,740
Davao	--	--	--	--	--	4 - 1,500[f]	514,740
Sulu	--	--	--	--	--	2 - 1,500	257,370
Zamboanga Norte	--	--	--	--	--	2 - 1,500[f]	257,370
Zamboanga Sur	2 - 2,000[f]	495,152	80,112	102,244	128,700	6 - 1,500[h]	772,110
X N & E Mindanao							
Agusan	1 - 2,000	247,576	40,056	51,122	64,350	--	--
Bukidnon	1 - 2,000	247,576	40,056	51,122	64,350	--	--
Lanao	1 - 2,000	247,576	40,056	51,122	64,350	2 - [illegible]	257,370
Misamis Occidental	1 - 1,000	135,677	40,056	51,122	--	--	--
Misamis Oriental	--	--	--	--	--	2 - 1,500	257,370
Surigao	--	--	--	--	--	--	--
Totals - Metric Tons	97,000					87,000	
Totals - Number of Units	48					58	

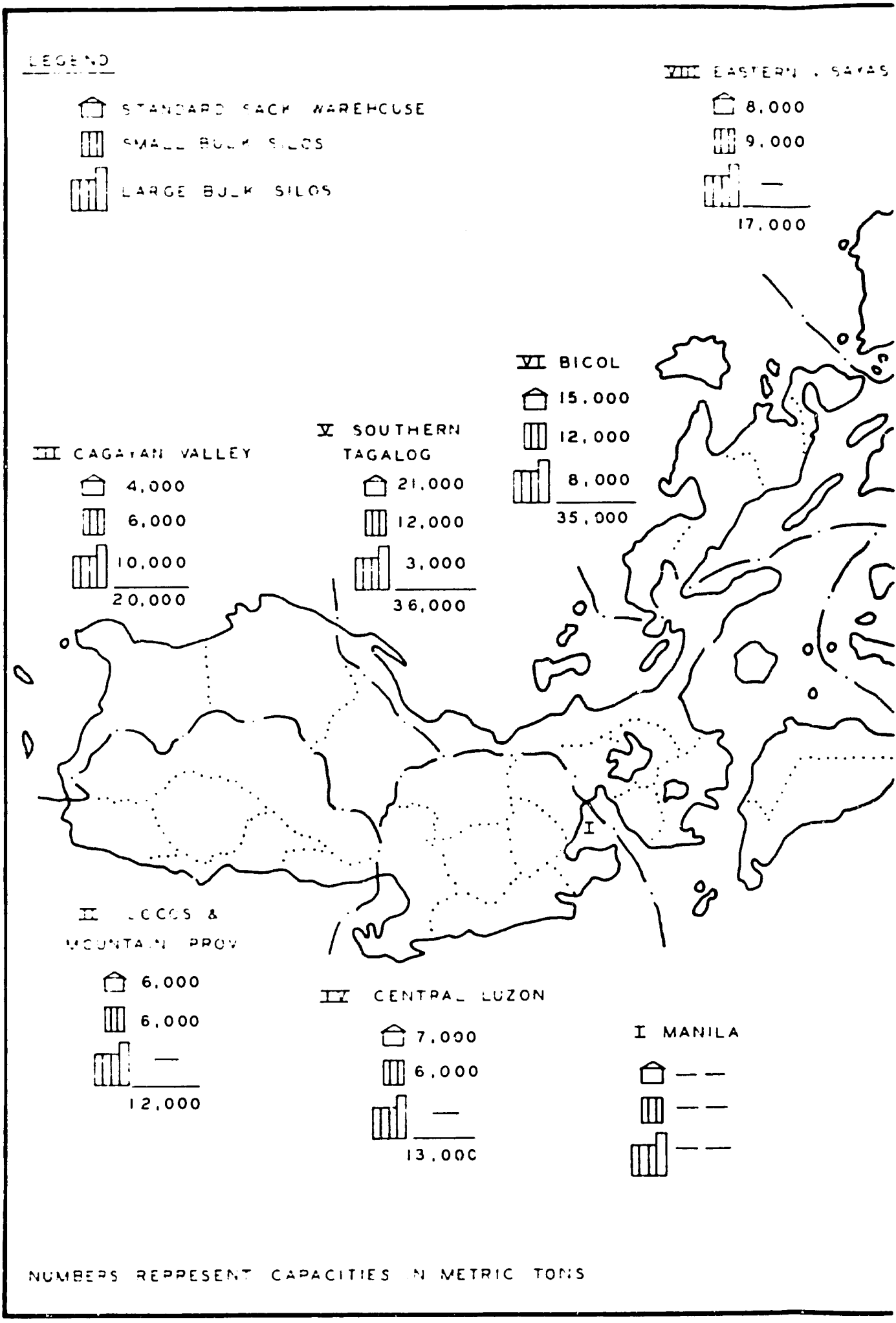
a/ The 2,000 ton standard sack warehouses will be equipped with milling and drying equipment; the 1,000 ton warehouses will be equipped only with drying equipment. The sack warehouses in Manila will not include drying or milling equipment.
b/ The small bulk silo has a capacity of 1,500 tons and will be equipped with cleaning, drying and weighing, but no milling.
c/ The large bulk silos will be equipped with cleaning, drying and milling equipment.
d/ The Manila warehouse facilities to be part of the export facilities at the North Port in Manila and should be constructed by 1972.
e/ Facilities followed by (1972) are recommended to be constructed between 1970 and 1972.

TABLE 87

FACILITIES, PHILIPPINES, 1972-1975

Cost	Large Bulk Silos with Cleaning, Drying and Milling[c]				Financial Requirements		Total Equivalent	
			Estimated Cost					
Local Currency	Number and Size	Location	Foreign Currency	Local Currency	Foreign Currency	Local Currency	Foreign Currency	Local Currency
(pesos)	(metric tons)		(US $)	(pesos)	(US $)	(pesos)	(US $)	(pesos)
--	1 - 25,000[e]	Manila	1,159,032	7,161,196	1,159,032	9,636,196	3,629,851	14,156,420
--	--	--	--	--	40,056	186,799	87,953	343,016
--	--	--	--	--	40,056	186,799	87,953	343,017
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	40,056	186,799	87,953	343,017
--	--	--	--	--	40,056	186,799	87,953	343,017
226,060	1 - 10,000	Tuguegarao	1,132,162	1,862,535	1,429,588	2,275,394	2,014,672	7,850,786
--	1 - 5,000	Near Appari	761,131	1,227,658	761,131	1,227,658	1,075,915	4,196,069
--	1 - 5,000[e]	Santiago	761,131	1,227,658	761,131	1,227,658	1,075,915	4,196,069
226,060	1 - 15,000	Ilagan	1,433,521	2,137,037	1,730,947	2,549,896	2,384,766	9,300,588
--	1 - 10,000	So. of Ilagan	1,132,162	1,862,535	1,132,162	1,862,535	1,609,735	6,277,967
--	--	--	--	--	--	--	--	--
--	--	--	--	--	40,056	186,799	87,953	343,017
--	--	--	--	--	--	--	--	--
--	1 - 25,000[e]	Cabanatuan	1,159,032	7,161,196	1,159,032	7,161,196	2,995,236	11,681,421
--	1 - 25,000	Cabanatuan	1,159,032	7,161,196	1,159,032	7,161,196	2,995,236	11,681,421
--	--	--	--	--	--	--	--	--
904,240	1 - 10,000	Dagupan	1,132,162	1,862,535	2,321,866	4,218,967	3,403,652	13,274,243
--	1 - 10,000[e]	Tarlac	1,132,162	1,862,535	1,132,162	1,862,535	1,609,735	6,277,967
452,120	1 - 10,000	Tarlac	1,132,162	1,862,535	1,636,958	2,677,703	2,373,548	9,256,839
--	--	--	--	--	40,056	363,048	133,145	519,266
--	--	--	--	--	40,056	186,799	87,953	343,017
--	--	--	--	--	120,168	1,089,144	399,436	1,557,799
226,060	--	--	--	--	297,426	412,859	403,287	1,572,819
452,120	--	--	--	--	514,740	452,120	630,668	2,459,605
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
--	--	--	--	--	80,112	726,096	266,290	1,038,572
--	--	--	--	--	40,056	186,799	87,953	343,017
--	--	--	--	--	40,056	363,048	133,145	519,266
226,060	--	--	--	--	297,426	589,108	449,487	1,749,099
--	--	--	--	--	--	--	--	--
--	1 - 3,000[e]	Polanqui	581,446	1,063,080	581,446	1,063,080	854,030	3,330,719
226,060	--	--	--	--	297,426	589,108	448,479	1,749,069
--	--	--	--	--	--	--	--	--
--	1 - 5,000[e]	Iriga	761,131	1,227,658	761,131	1,227,658	1,075,915	4,196,068
452,120	--	--	--	--	554,796	815,168	763,813	2,978,872
--	--	--	--	--	40,056	363,048	133,145	519,266
--	--	--	--	--	40,056	363,048	133,145	519,266
--	--	--	--	--	40,056	363,048	133,145	519,266
--	--	--	--	--	40,056	186,799	87,953	343,017
--	--	--	--	--	40,056	186,799	87,953	343,017
--	--	--	--	--	80,112	726,096	266,290	1,038,532
--	1 - 5,000[e]	Iloilo	761,131	1,227,658	761,131	1,227,658	1,075,915	4,196,068
--	--	--	--	--	--	--	--	--
226,060	--	--	--	--	257,370	226,060	315,334	1,229,803
--	--	--	--	--	40,056	186,799	87,953	343,017
--	--	--	--	--	40,056	363,048	133,145	519,266
--	1 - 5,000[e] f	Cebu	761,131	1,227,658	761,131	1,227,658	1,075,915	4,196,068
--	1 - 5,000[e]	Tacloban	761,131	1,227,658	761,131	1,227,658	1,075,915	4,196,068
226,060	--	--	--	--	297,426	589,108	448,479	1,749,069
226,060	--	--	--	--	257,370	226,060	315,334	1,229,803
--	1 - 10,000[e]	Cotabato City	1,132,162	1,862,535	1,132,162	2,357,687	1,736,697	6,773,118
452,120	1 - 5,000[f]	Dadiangas	761,131	1,227,658	1,275,871	1,679,778	1,706,583	6,655,674
452,120	1 - 5,000[f]	Near Davao	761,131	1,227,658	1,275,871	1,679,778	1,706,583	6,655,674
226,060	--	--	--	--	257,370	226,060	315,334	1,229,803
226,060	--	--	--	--	257,370	226,060	315,334	1,229,803
678,180	--	--	--	--	852,222	1,404,276	1,212,292	4,727,941
--	--	--	--	--	40,056	363,048	133,145	519,226
--	--	--	--	--	40,056	363,048	133,145	519,226
226,060	--	--	--	--	297,426	589,108	448,479	1,749,069
--	--	--	--	--	40,056	186,799	87,953	343,017
226,060	--	--	--	--	257,370	226,060	315,334	1,229,803
--	--	--	--	--	--	--	--	--
	193,000							
	19				ost 27,180,089	67,623,553	44,819,461	174,795,900

f These facilities to be used primarily for corn.
g These warehouses are part of the large bulk silo facility recommended for Cotabato City.
h Half of these facilities will be used for rice, the other half for corn.
i Refer to text for further explanation.
Note: Estimated costs are based on January, 1968 prices. Exchange rate: 3.90 Philippine pesos equals one (1) U.S. dollar.


LEGEND
STANDARD SACK WAREHOUSE
SMALL BULK SILOS
LARGE BULK SILOS
VIII EASTERN . SAMAS
8,000
9,000
—
17,000
VI BICOL
15,000
12,000
8,000
35,000
V SOUTHERN TAGALOG
21,000
12,000
3,000
36,000
III CAGAYAN VALLEY
4,000
6,000
10,000
20,000
I
II ILOCOS & MOUNTAIN PROV
6,000
6,000
—
12,000
IV CENTRAL LUZON
7,000
6,000
—
13,000
I MANILA
— —
— —
— —
NUMBERS REPRESENT CAPACITIES IN METRIC TONS

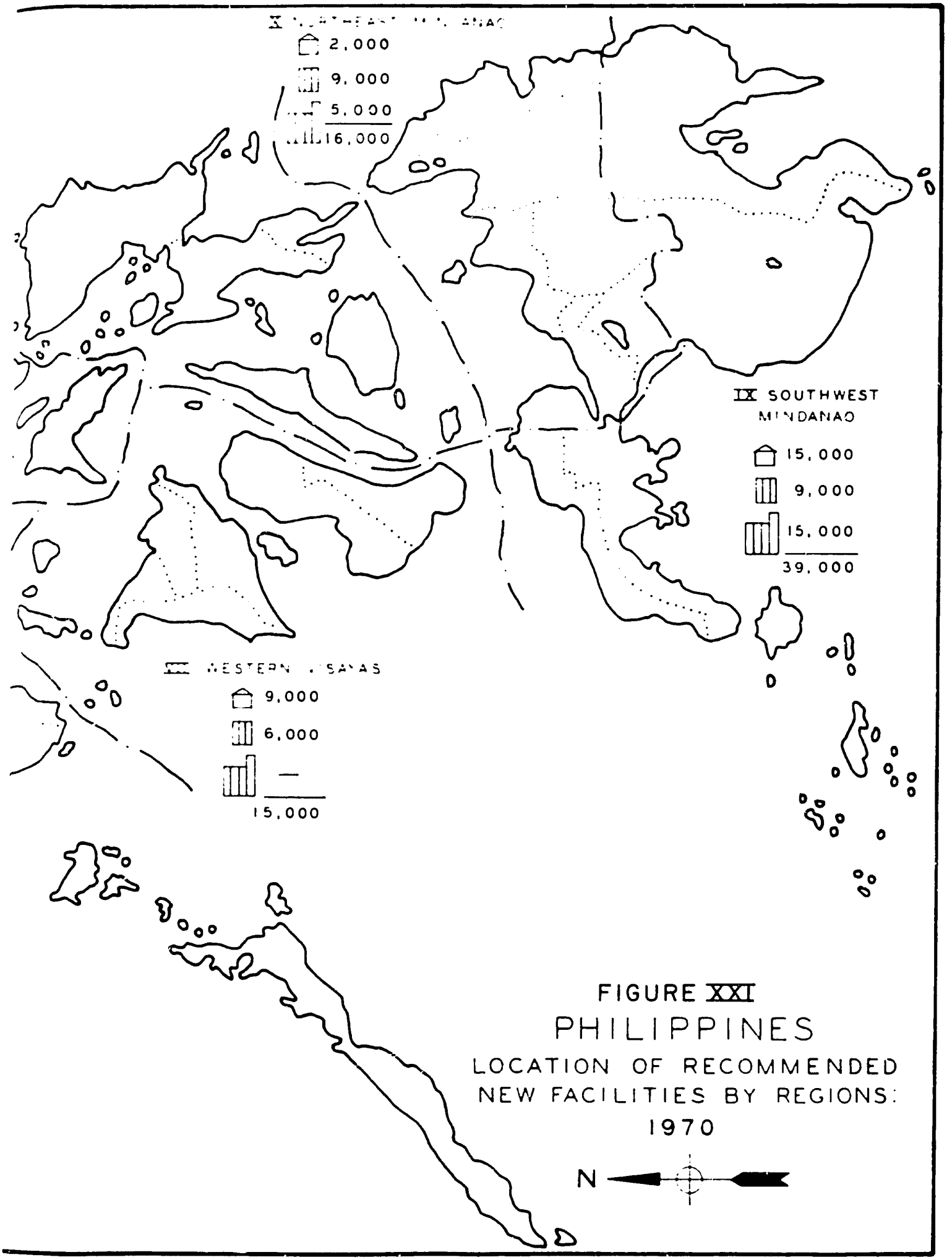
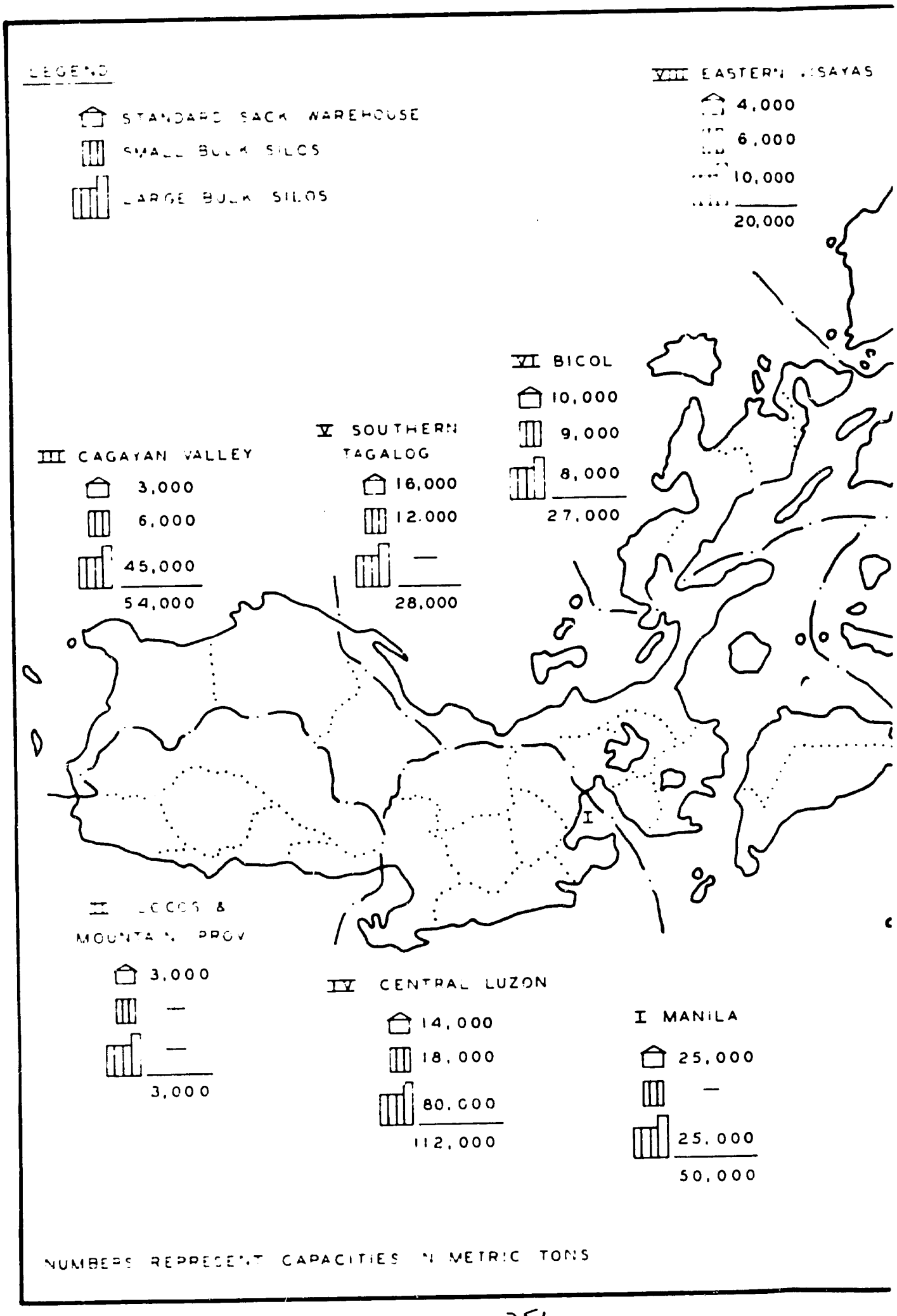


FIGURE XXI
PHILIPPINES
LOCATION OF RECOMMENDED NEW FACILITIES BY REGIONS: 1970


LEGEND
STANDARD SACK WAREHOUSE
SMALL BULK SILOS
LARGE BULK SILOS
VIII EASTERN VISAYAS
4,000
6,000
10,000
20,000
VI BICOL
10,000
9,000
8,000
27,000
V SOUTHERN TAGALOG
16,000
12,000
—
28,000
III CAGAYAN VALLEY
3,000
6,000
45,000
54,000
II ILOCOS & MOUNTAIN PROV
3,000
—
—
3,000
IV CENTRAL LUZON
14,000
18,000
80,000
112,000
I MANILA
25,000
—
25,000
50,000
I
NUMBERS REPRESENT CAPACITIES IN METRIC TONS

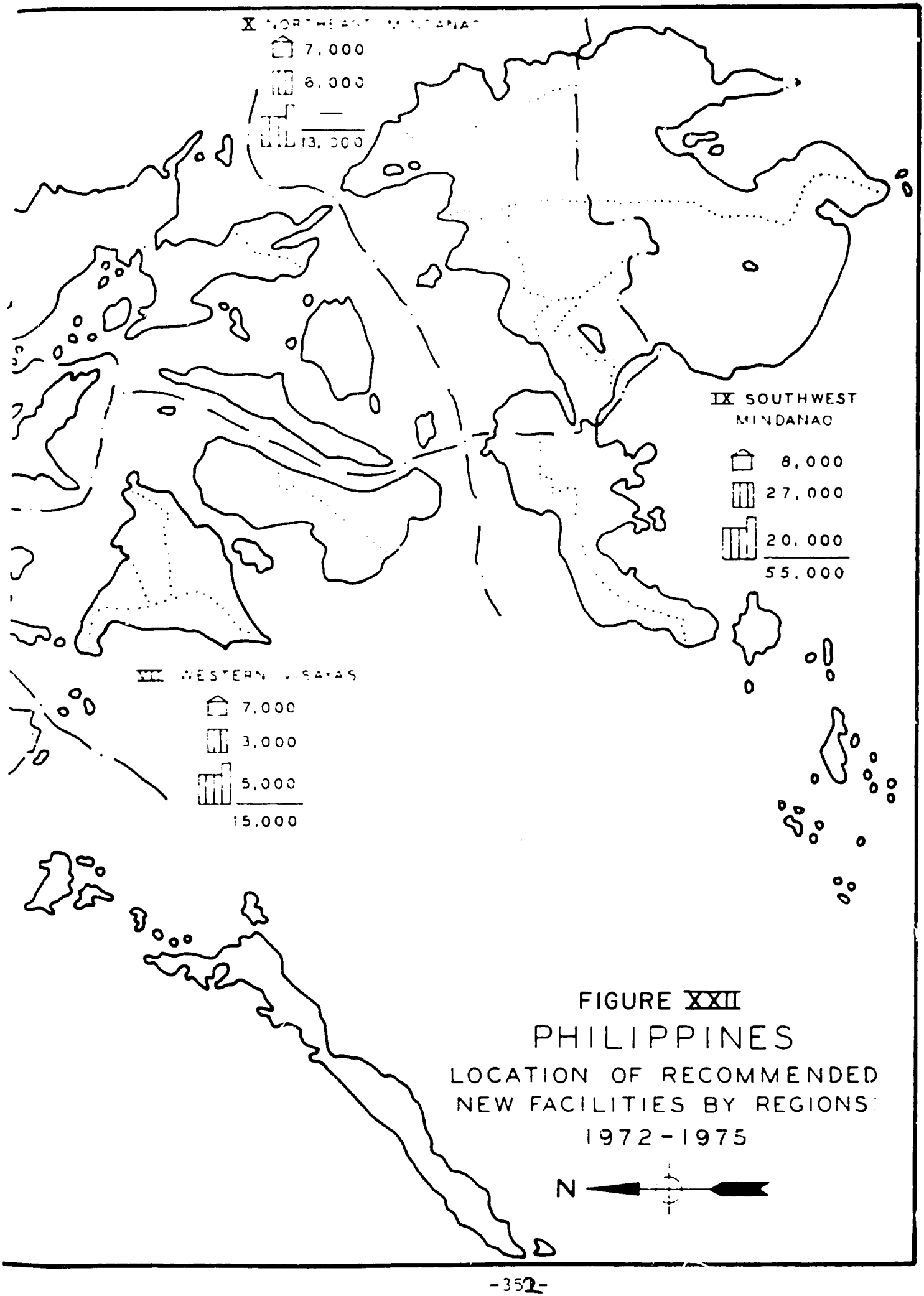


FIGURE XXII
PHILIPPINES
LOCATION OF RECOMMENDED NEW FACILITIES BY REGIONS
1972-1975

1968 prices. The final cost will be affected by the number and type of units to be constructed in any one period. It is possible to complete the engineering and construction work within the time indicated in this report based on the assumption that the necessary foreign engineering contract for the design work be awarded during September/October 1968.

It should be emphasized that these estimates are for budget purposes only since specific sites have yet to be selected. However, considering all known factors at the time the estimates were made, the figures shown represent an accurate appraisal as is possible of the magnitude of the project. The estimates are based on the following:

(1) The estimates are based on current cost of construction and using wherever possible, local labor and local building materials such as cement, aggregates, reinforcing steel, lumber, brick, masonry blocks, and roofing. Other items of building materials, mainly the prefabricated metal for the steel facilities which are not presently available locally, are assumed to being imported requiring foreign currency.

Pieces of machinery equipment which are to be specially "tailor made" from sheet metal such as spouting, chutes, bucket elevator legs, and small miscellaneous metal items are available locally Other items of the machinery equipment not manufactured locally are assumed to be imported requiring foreign currency.

(2) It is assumed that qualified foreign engineers will be engaged to prepare final design drawings for constructing and for construction supervision of the facilities and that they will supplement their own

activities with technically capable Philippine nationals.

(3) Local contractors will construct the flat warehouse buildings.

(4) The estimates do not include the costs of acquiring the land for the sites; construction supervision; fill material for the sites; unusual foundation or piling. Until the exact site selections are made it is not possible to determine these costs.

(5) All costs are based on design criteria as shown on Drawings 1 through 10 and as described in this chapter. The size and physical shape of the final sites may require a rearrangement of buildings which may affect the estimates.

(6) Where railroad handling is included, only the cost of the tracks within the site is estimated. Off-site rail and road access is not included. Tube wells for supplying water is included. Septic tanks for sanitary plumbing are also included in the cost estimates.

(7) All facilities except the 25,000 metric ton silo include diesel electric generator sets.

(8) It is assumed that all imported materials and equipment as well as foreign firms and their imported personnel engaged in connection with the project will be exempt from all Philippine local and/or central government duties, taxes, permits, benefits, income taxes, and any other like assesments.

(9) The estimates do not include the cost of converting the existing railroad cars to handle bulk grains.

Personnel Requirements for Operating the Bulk Silo Facilities

The recommended new bulk silos would provide the various private firms or governmental agencies of the Philippines with physical plants necessary to carry out the recommendations for the additional storage and handling facilities. With the bulk silo facilities, it is also necessary to provide adequately trained and experienced personnel to make these modern facilities operate efficiently and effectively. In addition to the actual working people in the facilities, the management has a direct responsibility for successful results.

Table 88 shows the estimated number of people, with their job classification, required to operate each silo. It also shows the average monthly compensation rates, plus 15 percent for fringe benefits, used in estimating the payroll costs in Table 89 (Annual Cost of Operation).

If one firm or an individual chooses to own and operate several facilities, it is possible to reduce the number of operating people as the key supervisory personnel may be able to travel between, and exercise control over, several facilities simultaneously.

The plant superintendent should be trained in all the operating and handling procedures with particular emphasis in drying, fumigating, and quality control as well as grain testing techniques. A laboratory technician is recommended for the 25,000 ton facility, particularly for the purpose of controlling quality, grades and specifications of grains to be exported.

The correct measurement of the quantity of all incoming and outgoing grains in the 3,000 ton and larger bulk silos is the responsibility of the weighmaster. This function in the 1,500 metric ton silo can be handled by the warehousemen and plant manager. The weighmaster is in charge of the headhouse scales and truck scales. He must have training in the use, as well as the maintenance, of the scales and the methods of recording each receipt or shipment.

The maintenance people will receive valuable training by being present at the silo sites during the time the equipment is installed and tested. This provides the best method of becoming familiar with the installation and the maintenance of all parts of the facility.

Operating Cost of the Recommended New Facilities

Operating Cost and Break-Even Analysis

Most of the total operating cost of the recommended bulk silo facilities are fixed costs (Table 89). Variable costs, excluding transportation costs and the purchase price of palay, are about ₱11.00 per metric ton for all silo units. Sack cost is the most important item in variable costs. It is anticipated, however, that the volume of bulk grain handling in the silos will be greatly increased after the new bulk facilities are in operation. This will automatically reduce the cost of sacks by a large margin. The basic reason for the small variable costs is the fact that the total operative personnel required to operate the silo facilities is effectively the same whether the units handle one or five turn-overs. Thus, all labor costs are considered to be "fixed" up to at least five turn-overs per year.

When a grain dealer has under consideration the investing

TABLE 88

PERSONNEL REQUIREMENTS FOR OPERATING THE RECOMMENDED NEW BULK SILO FACILITIES:[a] PHILIPPINES, 1970-1972-1975

Job Classification and Title	Size of Bulk Silo Facility in Metric Tons							Average Monthly Compensation[b]
	1,500	3,000	5,000	6,000	10,000	15,000	25,000	
								(pesos)
Administrative								
Plant Manager	1	1	1	1	1	1	1	500-600
Assistant	-	-	-	-	1	1	1	375-425
Accountant	-	1	1	1	2	2	3	300-350
Laboratory Technician	-	-	-	-	-	-	1	300
Secretary-Clerk	1	1	1	1	2	2	3	200
Operative								
Superintendent or Warehouseman	1	1	1	1	1	1	1	400-500
Assistant	-	-	-	-	-	-	1	375
Weighmaster	-	1	1	1	1	1	1	375-425
Supervisor-Sampling	-	-	-	-	-	-	1	300
Receiving-Sampling	↑	↑	↑	↑	1	1	-	225
Receiving					1	1	2	225
Shipping	3	4	4	4	2	2	3	225
Clean-Dry-Temper					1	1	1	225
Aerate-Fumigate	↓	↓	↓	↓	1	1	1	225
Chief Miller	-	1	1	1	1	1	1	300
Mill Operators	-	2	2	2	2	2	2	225
Shipping	-	1	1	1	1	1	1	225
Maintenance Elec.	1	2	2	2	2	2	3	300
Laborer	1	2	2	2	3	3	4	180
Security Guard	2	3	3	3	3	3	3	180
Totals	10	20	20	20	26	26	34	

a Standard operations based on average 8-hour day and 25 days per month.

b These are average basic rates of compensation used for estimating payroll cost of operations. To these are added 15% for fringe benefits. Payroll cost for operating central office not included.

TABLE 89

ESTIMATED ANNUAL COST OF OPERATION OF THE RECOMMENDED NFA FACILITIES, PHILIPPINES, 1970-1975[a]

Size of Facility	Fixed Costs: Depreciation: Machinery 10 percent Per Year	Fixed Costs: Depreciation: Building 3 percent Per Year	Fixed Costs: Maintenance and Repairs 1 percent Per Year	Fixed Costs: Annual Payroll: Administrative	Fixed Costs: Annual Payroll: Operative	Fixed Costs: Insurance 1 percent Per Year	Fixed Costs: Interest 7 percent Per Year	Fixed Costs: Loan[b] Payments 8 percent Per Year	Variable Cost Per Turn-Over: Electrical Energy Cost	Variable Cost Per Turn-Over: Fuel Cost for Elec Generator	Variable Cost Per Turn-Over: Fuel Cost for Dryer	Variable Cost Per Turn-Over: Fumigant[c] Cost	Variable Cost Per Turn-Over: Bag Cost[d]	Totals Per Turn-Over: Fixed Cost Per Year	Totals Per Turn-Over: Variable Cost Per One Turn-Over	Totals Per Turn-Over: Operating Cost Per One Turn-Over
(metric tons)	(figures in pesos)															
Bulk Silo																
1,500	33,377	8,474	6,149	10,350	27,117	6,149	43,043	49,192	--	4,000	1,020	600	14,775	183,811	20,395	204,206
3,000	146,531	55,962	33,307	14,835	58,305	33,307	233,150	266,457	--	6,000	1,380	1,200	29,550	841,854	38,000	879,984
5,000	165,727	76,164	41,961	14,835	58,305	41,961	293,725	335,686	--	7,500	2,300	2,000	49,250	1,208,364	61,050	1,089,414
6,000	171,189	99,618	50,325	14,835	58,305	50,325	352,276	402,601	--	9,000	2,620	2,400	59,100	1,199,474	73,300	1,272,774
10,000	239,158	116,592	62,780	27,600	67,000	62,780	439,458	502,238	--	11,250	4,850	4,000	98,500	1,517,608	118,400	1,636,008
15,000	259,431	154,004	77,278	27,600	67,000	77,278	540,944	618,222	--	15,000	7,000	6,000	147,750	1,821,757	175,750	1,997,507
25,000	386,684	234,437	116,814	38,985	86,043	116,814	817,699	934,513	41,440	--	9,000	10,000	246,250	2,731,989	306,690	3,038,679
Warehouse																
2,000	11,547	4,070	1,357	12,000	40,000	3,630	25,413	29,043	--	4,000	1,200	800	40,000	127,060	46,000	173,000

a Costs are based on January, 1968 prices. Cost of land, taxes, insurance on inventory and central office payroll are not included (also, see text this chapter Analysis of Operating Costs for further explanation of Table 89.

b It is assumed that 80 percent of the cost of building and equipment is borrowed and paid back in equal installments over a 10-year period. Thus, loan payments are equal to 8 percent of total cost of a unit.

c Fumigant cost is based on an average application of 120 "Phostoxin" pellets per 12 metric tons at a cost of ₱0.40 per metric ton.

d Based on the assumption that the palay is handled once in bags, that bags can be used 3 times, and sell for ₱1.30 each. Thus, the cost of bags per metric ton is approximately ₱0.85.

in bulk silo facilities, he will need to estimate the amount of grain to be handled before a profit is made and compare this with the amount of grain available in the locality where the storage facility is to be located. According to estimates, the expected number of turn-overs for the average grain dealer is about three in most regions of the Philippines. However, some grain dealers will undoubtably be able to turn over their stocks more than three times a year.

The amount of grain that must be handled in order to break even depends partly upon the farm price at which the grain is purchased and the wholesale price at which the grain is sold These prices can vary considerably during the year and will depend on the disposition of the grain after it is purchased.

The basic data for the break-even analyses are contained in Table 89. The cost data in this table are based on January 1968 prices. Cost of land, insurance, and interest on inventory, taxes and central office payroll are not included. These costs will depend to a large extent on the location of a particular facility and the manner in which the facility is controlled. In instances where it is necessary to take these costs into account, they should be placed on an annual basis and added to total "fixed" costs.

"Total operating costs" presented in Table 89 are computed on a "one turn-over basis" and have been partitioned into "total fixed cost" and "total variable cost". The "total fixed cost" remains the same regardless of the level of operation of the storage facility. The "total variable cost" is computed on a "per turn-over" basis. Therefore the complete total operating cost of a facility that turns over its grain stocks three times a year is equal to the "total fixed cost" plus three times the "total variable cost per turn-over". For example, the total operating cost of a 1,500 metric ton unit handling three

turn-overs is equal to:

Total Fixed Cost	₱183,811
Variable Cost: [(3)(20,395)]	61,185
Total Operating Cost	₱244,996

The cost per metric ton of grain handled by a 1,500 metric ton unit handling three turn-overs per year is therefore equal to:

$$\frac{₱244,996}{4,500 \text{ (metric tons)}} = ₱54.42 \text{ per metric ton}$$

The cost per metric ton of grain handled will decline as more grain is handled by the storage unit.

"Fixed" costs can be partitioned into "out-of-pocket" cost and "depreciation" cost. The depreciation costs are based on the estimated useful life of machinery and buildings. Depreciation on machinery was computed on a straight-line basis at 10 percent per year. Depreciation on buildings was estimated to be 3 percent per year on a straight-line basis. The salvage value of machinery and equipment does not enter into the calculation of the break-even point. All "fixed" costs other than "depreciation" are classified as "out-of-pocket" costs, that is, costs which must be paid each year if the dealer is to remain in business. The "out-of-pocket" costs will vary depending on the amount of money borrowed by the grain dealer to construct the new storage facility. It was assumed that the typical grain dealer would be able to borrow 80 percent of the total cost of the building and equipment and that this would be repaid in equal installments over a ten year period at an eight percent interest rate.

The following break-even analysis does not take into account all of the within-year price variations but does provide

guidelines for estimating the profitability of bulk silo facilities. Individual grain dealers can easily modify the basic parameters in accordance with their particular situation and thereby quickly determine the profitability of a bulk silo unit suited to their own needs.

1,500 Metric Ton Bulk Silos

The operating costs of the 1,500 metric ton bulk silos are computed on the assumption that these units will dry and store palay, but will not sell milled rice. According to estimates, the average grain dealer could not expect to sell palay for more than about ₱55 per metric ton than he pays for it. This is equivalent to about a 15 percent mark-up on palay purchased at ₱16.50 per cavan (₱375 per metric ton). Philippine pesos 10 per metric ton has been subtracted for transportation costs, which results in a net of ₱45per metric ton of palay handled. The ₱45 is referred to as the value added by the storage and drying services provided by the grain dealer.

A grain dealer earning ₱45 per metric ton would need to handle about 5,500 metric tons of palay per year in order to cover total operating costs for a 1,500 metric ton bulk silo unit. This is equivalent to about 3.7 turn-overs per year. The break-even chart for 1,500 metric ton bulk silo units is presented in Chart 1 of Figure XXIII.

Out-of-pocket costs (total costs less depreciation) could be covered if the dealer handled about 4,500 metric tons of grain per year which is equivalent to a turn-over of three. Dealers in some regions could supplement their income by doing custom drying.

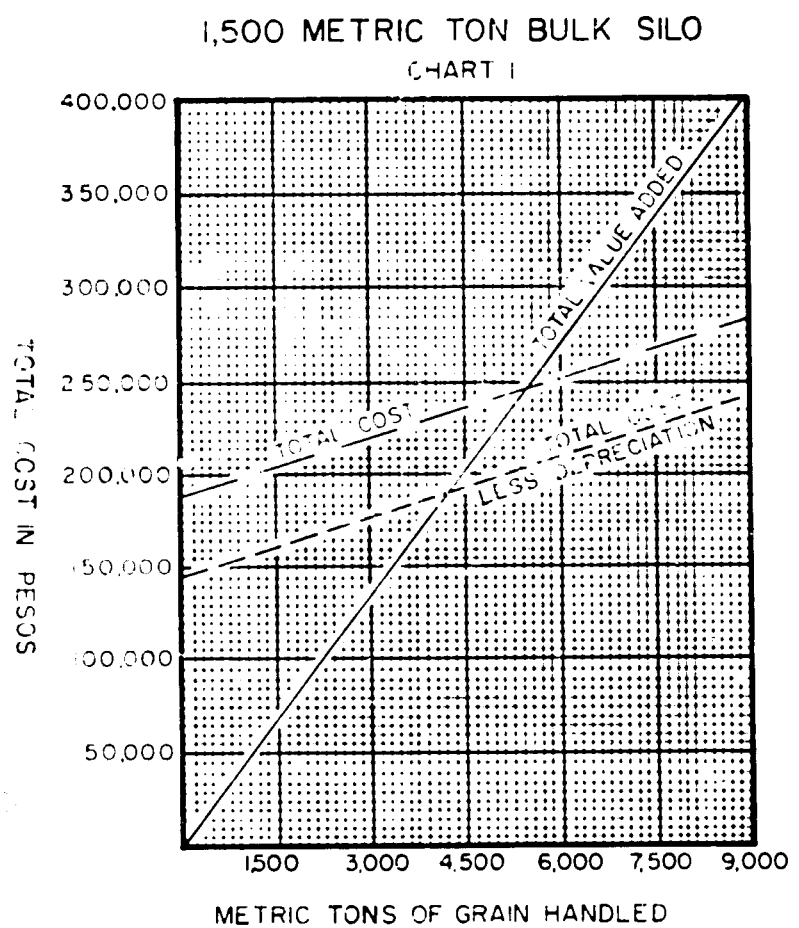
3,000 Metric Ton Bulk Silos

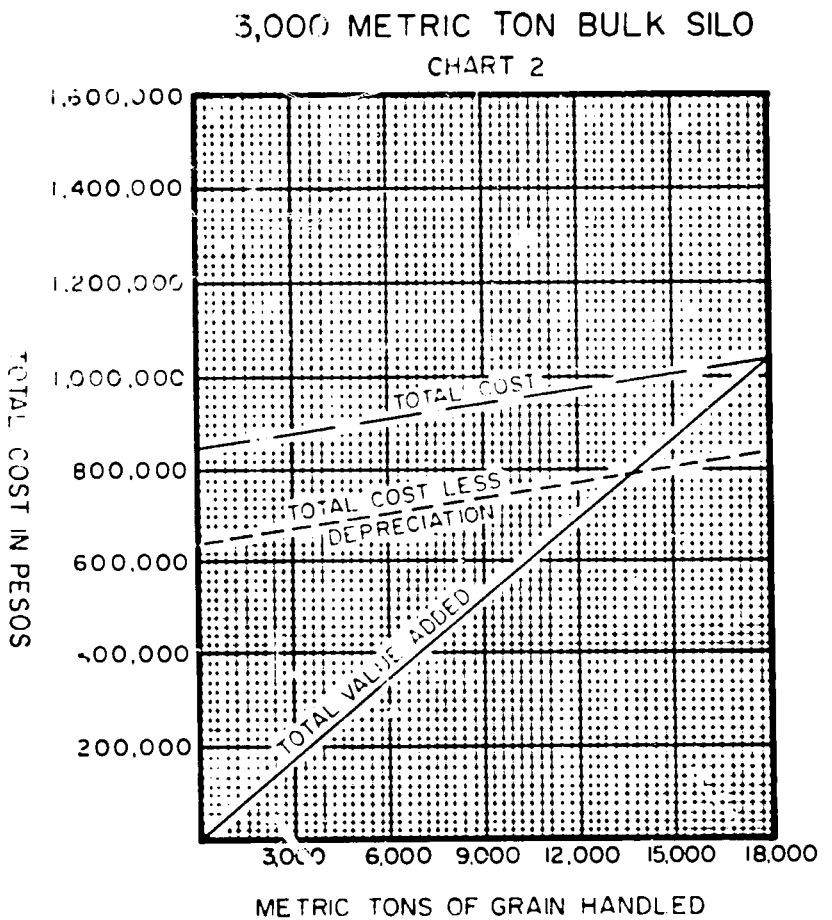
The operating costs of all bulk silos units larger than

FIGURE XXIII

BREAK-EVEN CHARTS FOR

GRAIN HANDLING IN THE PHILIPPINES: 1970-1975





1,500 metric tons are computed on the assumption that these units will sell milled rice. The value added per metric ton of palay handled by the larger bulk silo units is obtained as follows:

Income per metric ton of palay:		
660 kgs. of milled rice (₱36/cavan)	₱428	
100 kgs. of by-products (₱0.15/kg.)	15	
Total income/metric ton palay		₱443
Costs per metric ton of palay:		
Palay (₱16.50/cavan)	₱375	
Transportation cost	10	
Total costs/metric ton palay		₱385
Total value added per metric ton of palay		₱ 58

These estimates are used to obtain the break-even point for all bulk silo units larger than 1,500 metric tons.

The fixed costs of operating a 3,000 metric ton bulk silo unit are about 4.5 times as large as the fixed costs of operating a 1,500 metric ton bulk silo facility. The large increase in fixed cost is due primarily to the addition of milling equipment and other machinery not found in the 1,500 metric ton units.

A 3,000 metric ton unit would have to handle about 18,000 metric tons of grain per year in order to cover total costs. This is equivalent to a turn-over of six. The unit would have to handle about 14,000 metric tons of grain per year in order to cover total cost less depreciation. It, therefore, appears that a 3,000 metric ton unit would have to earn more than a ₱58 margin per metric ton of grain sold in order to be profitable. This may well be possible in regions such as Bicol where a

relatively large amount of wet grain is marketed. The break-even chart for 3,000 metric ton units is presented in Chart 2 of Figure XXIII.

5,000 and 6,000 Metric Ton Bulk Silos

A 5,000 metric ton bulk silo facility should be able to cover total costs at a turn-over of about 4.5 and to cover out-of-pocket costs at a turn-over of about 3.5. The break-even chart for a 5,000 metric ton unit is presented in Chart 3 of Figure XXIV.

A 6,000 metric ton bulk silo unit has a break-even point at about 4.3 turnovers as shown in Chart 4 of Figure XXIV. Out-of-pocket costs would be covered at about 3.3 turn-overs.

10,000 and 15,000 Metric Ton Bulk Silos

The break-even point for a 10,000 metric ton bulk silo unit is at about 3.3 turn-overs as shown in Chart 5 of Figure XXV. Out-of-pocket costs can be covered at about 2.5 turn-overs.

For a 15,000 metric ton unit, the break-even point drops to about 2.5 turn-overs as shown in Chart 6 of Figure XXV. Out-of-pocket costs can be covered at about 2 turn-overs.

The profitability of larger bulk silo units may vary considerably depending on where the units are located. The price structure for a 10,000 metric ton unit located in Cotabato City, for example, is likely to be considerably different than the price structure for a similar unit in Tarlac. The break-even analysis presented here suggests, however, that the larger bulk silo units will be able to earn a profit without turning

over their stocks very many times.

25,000 Metric Ton Bulk Silos

A 25,000 metric ton bulk silo unit outside of Manila would have to handle about 60,000 metric tons of grain per year in order to break even and about 45,000 metric tons in order to cover out-of-pocket costs. The break-even chart for such a facility is presented in Chart 7 of Figure XXVI.

The export facility in Manila will have to pay more for palay and milled rice than the storage facilities located in the production areas. Even so, at present world prices, the export facility in Manila would be very profitable.

2,000 Metric Ton Standard Warehouse Units

A 2,000 metric ton standard warehouse facility operating with no grain losses would have to handle about 3,500 metric tons of palay per year in order to cover its total operating costs. The break-even chart for such a facility is presented in Chart 8 of Figure XXVI.

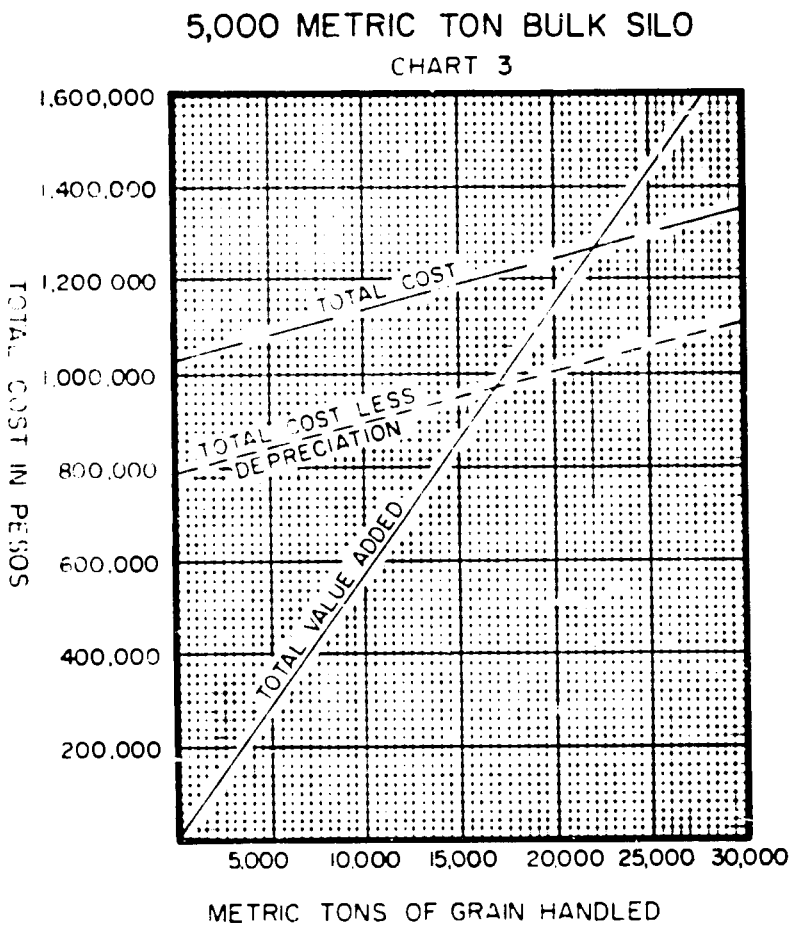
If grain losses in the standard warehouse facility were five percent greater than losses in bulk silo units, it would be necessary to handle about 9,000 metric tons of grain per year in order to cover total operating costs. Small losses of palay make a big difference in profits on the operation of these facilities.

At least part of the losses within any storage facility are probably reflected in the form of lower selling prices by the farmer for his grain. In the break-even analysis for the bulk silo units, it was assumed that all of the expected losses for the storage unit were passed back to the farmer in

FIGURE XXIV

BREAK-EVEN CHARTS FOR

GRAIN HANDLING IN THE PHILIPPINES: 1970-1975



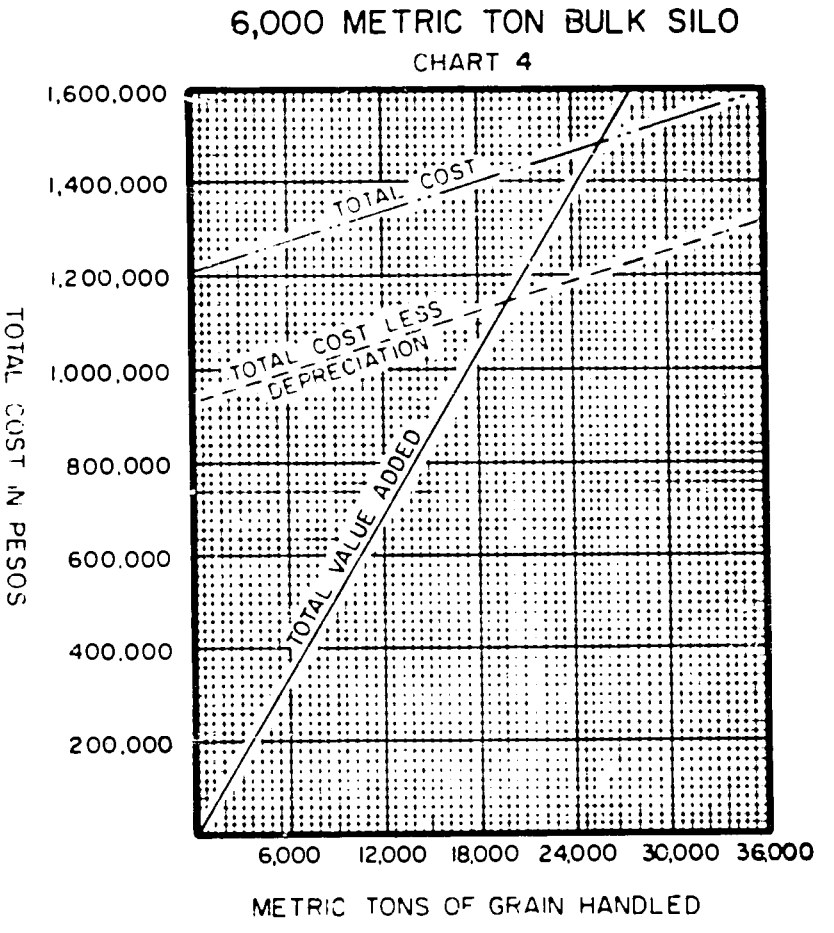
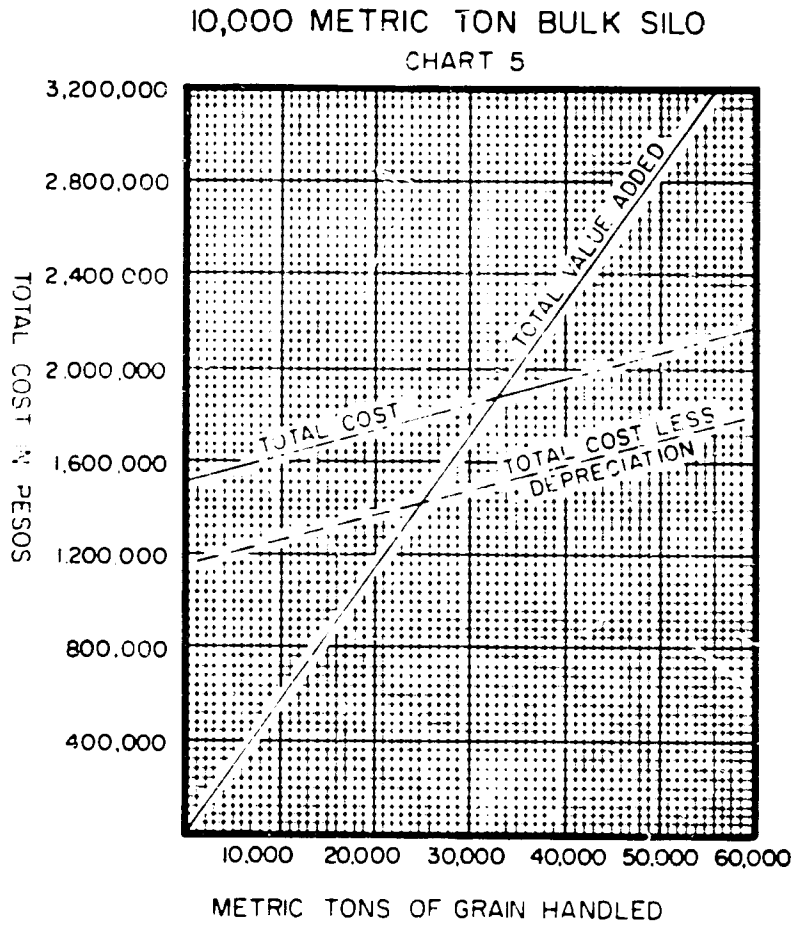


FIGURE XXV

BREAK-EVEN CHARTS FOR

GRAIN HANDLING IN THE PHILIPPINES: 1970-1975



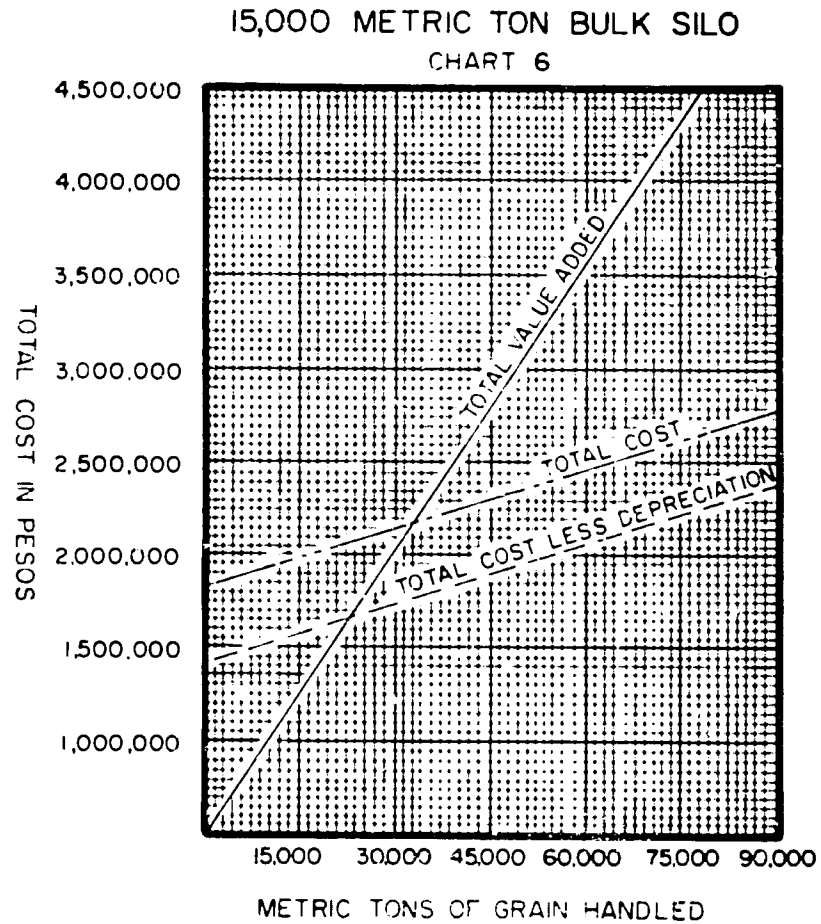
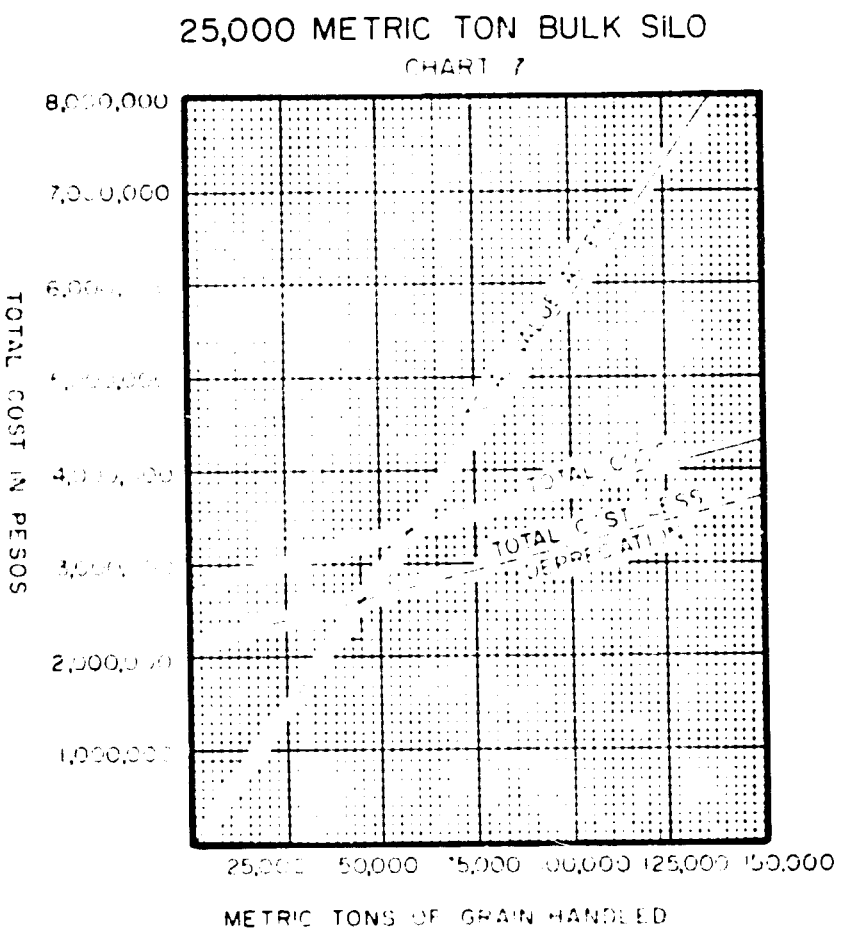
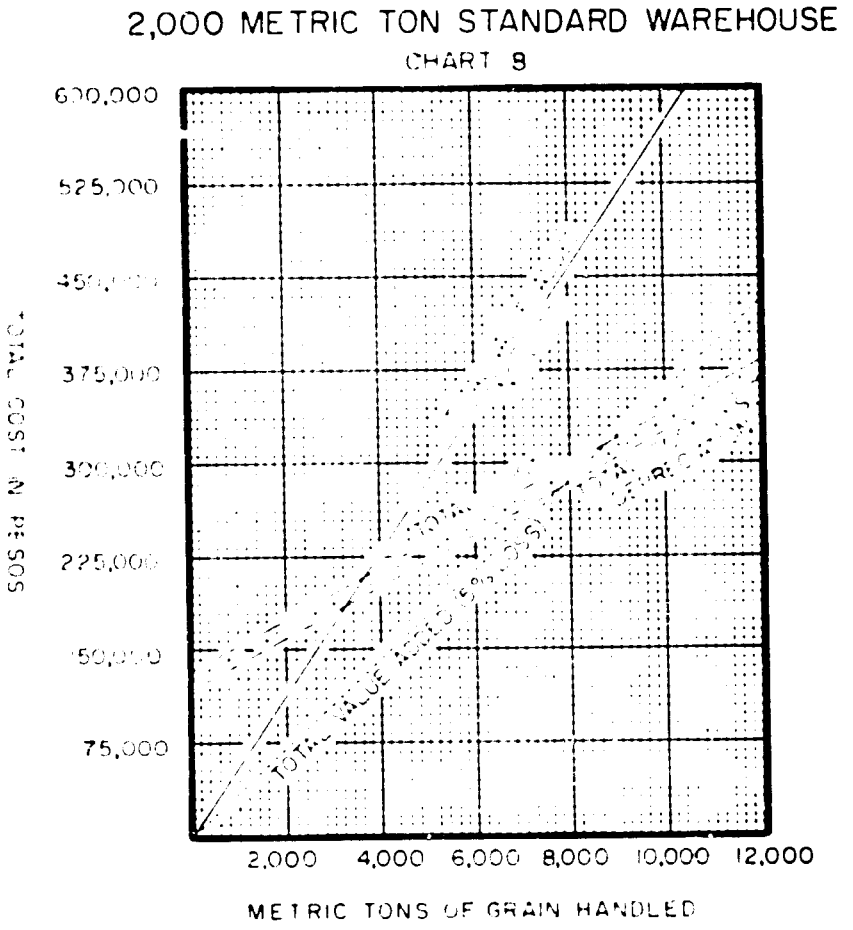


FIGURE XXVI

BREAK-EVEN CHARTS FOR

GRAIN HANDLING IN THE PHILIPPINES: 1970-1975





this manner. Grain losses in standard warehouse units are expected to exceed the losses in silo facilities and it may not be possible for grain dealers operating standard warehouse units to shift their losses entirely to the farmer The actual break-even point for 2,000 metric ton standard warehouse facilities, therefore, is probably somewhere between 2.8 and 4 4 turn-overs per year.

Summary of Break-Even Cost Analysis

A number of broad conclusions can be drawn from the preceeding break-even analysis These are as follows:

(1) Private grain dealers are likely to find the standard warehouses to be somewhat more profitable than the small 1,500 metric ton bulk silo facilities if they would be able to keep grain losses at a low level. However, this is very unlikely. Even so, the break-even point on the 1,500 metric ton bulk silo facilities is low enough that these units should be profitable in the Philippines.

(2) Private grain dealers are maybe somewhat reluctant to invest in 3,000, 5,000, and 6,000 metric ton bulk silo units at the present time. These units have to be operated at over four turn-overs per year in order to cover total costs. Governmental support programs may be needed to encourage investment in such storage units.

(3) Private grain dealers are likely to become increasingly interested in large bulk silo units of 10,000 metric tons or over as the road system of the Philippines improves. The operating costs of these units can be covered at a fairly low turn over. These

units will have to obtain grain from a fairly wide geographical area in order to have the volume of grain needed to break even, however.

(4) From the standpoint of the nation as a whole, the benefits of the new storage facilities are substantially greater than the cost of building the facilities. It appears doubtful, however, that private grain dealers will find all of the storage facilities recommended to be profitable unless the government is able to develop some way to transfer part of the total benefits resulting from these facilities back to the grain dealer. There are several ways in which this could be done. Loans for new storage facilities could be made to grain dealers by the government at interest rates below seven percent per year. The length of construction loans could be extended to at least 15 years.

Estimated Benefits of the New Grain Storage Facilities

Benefit-Cost Ratio

The new facilities as recommended are required to handle expected increases in the production of rice and corn in the Philippines. If these new facilities are not constructed, then substantial amounts of the increased grain production will be undoubtedly lost. It is estimated that in most provinces at least 20 percent of the grain that would be stored in the new facilities would be lost if the new facilities are not available. These losses will be more detrimental to the farmer than to the warehousemen and as a result will tend to discourage the use of high-yielding grain varieties.

Although it is impossible to estimate the magnitude of such "indirect losses", they would undoubtedly be substantial. In addition to these direct and indirect losses, the failure to build new storage facilities will result in more grain being shipped from production areas during the harvest season and then back to the same areas at a later date.

To estimate the value of the grain saved by the new facilities, it was assumed that:

(a) the turn-over of the facilities will be equal to two;

(b) that, in those provinces with relatively small increases in grain production, 10 percent of the grain handled by the new facilities will be lost if the new facilities are not constructed, and

(c) that, in those provinces with relatively large increases in grain production, 20 percent of the grain handled by the new facilities will be lost if the new facilities are not constructed.

A detailed presentation of the resulting estimates of grain saved by the new facilities is presented in Table 90. The basic assumptions appear to be very conservative in view of the facts that

(a) the average turn-over of most of the new facilities is expected to be at least three;

(b) there is already a shortage of storage facilities in most regions;

(c) the introduction of the new high yielding rice varities is expected to result in increased amounts

of rice harvested during the rainy season;

(d) that, in most parts of the Philippines, it is usually difficult to move grain by road during the rainy season and there is thus less opportunity to save grain by shipping it to other regions for storage;

(e) the percentage of the increased production that can be stored on the farm or elsewhere is considerably less in those areas with relatively large increases in grain production, and

(f) only direct losses are being taken into account.

The total amount of grain saved each year by the new facilities recommended for 1970 is estimated to be 64,600 mettric tons which, at present prices, would be worth over ₱20.6 million or US$5.28 million. The new facilities should last for at least 15 years and with reasonable upkeep should last longer. The present value of ₱20.6 million per year, for a period of 15 years, discounted at 8 percent is over ₱176.3 million or US$45.2 million (Table 91).

The total cost of the construction program recommended for 1970 is estimated to be ₱88.4 million or US$22.7 million. Thus, total benefits exceed investment costs by ₱89.9 million or US$22.5 million. The benefit-cost ratio for this part of the program is 1.99. In other words, the present value of the grain saved per peso invested in new storage facilities by 1970 is ₱1.99. Thus, the recommended construction program for 1970 is certainly worthwhile from the standpoint of the nation, provided that grain production increases as much as expected.

The new facilities recommended for 1975 should save an estimated additional 140,000 metric tons of grain per year

TABLE 90

GRAIN SAVED BY THE RECOMMENDED NEW STORAGE FACILITIES, PHILIPPINES, 1970 AND 1975

	Location	Recommended New Capacity in 1970[a]	Grain Saved as % of New Capacity	Total Grain Saved per Year	Recommended New Capacity in 1975	Grain Saved as % of New Capacity	Total Grain Saved per Year
I	Manila	--	--	--	50,000	40	20,000
II	Ilocos						
	Abra	1,000	20	800	1,000	20	200
	Ilocos Norte	4,000	20	800	1,000	20	200
	Ilocos Sur	--	20	--	--	20	--
	La Union	--	20	--	--	20	--
	Pt. Province	1,000	20	800	1,000	20	200
III	Cagayan Valley						
	Batanes	1,000	20[c]	200	1,000	20[c]	200
	Cagayan	11,000	40	4,400	19,000	40	7,600
	Isabela	8,000	40	3,600	34,000	40	13,600
	Nueva Vizcaya	--	40	--	--	40	--
IV	Central Luzon						
	Bataan	--	40	--	1,000	40	400
	Bulacan	--	40	--	--	40	--
	Nueva Ecija	--	40	--	50,000	40	20,000
	Pampanga	--	40	--	--	40	--
	Pangasinan	--	40	--	30,000	40	12,000
	Tarlac	4,000	40	1,600	28,000	40	11,200
	Zambales	9,000	40	3,600	3,000	40	1 200
V	Southern Tagalog						
	Batangas	9,000	40	3,600	6,000	40	2,400
	Cavite	2,000	40	800	4,000	40	1,600
	Laguna	7,000	40	2,800	6,000	40	2,400
	Camarines Sur	2,000	20	400	--	20	--
	Mindoro Occidental	--	20	--	--	20	--
	Mindoro Oriental	7,000	40	2,800	4,000	40	1,600
	Palawan	3,000	20	600	3,000	20	600
	Quezon	6,000	40	2,400	5,000	40	2,000
	Rizal	--	20	--	--	20	--
VI	Bicol						
	Albay	7,000	40	2,800	8,000	40	3,200
	Camarines Norte	--	20	--	--	20	--
	Camarines Sur	15,000	40	6,000	13,000	40	5,200
	Catanduanes	4,000	20	800	2,000	20	400
	Masbate	7,000	20[c]	1,400	2,000	20[c]	400
	Sorsogon	2,000	20	400	2,000	20	400
VII	Western Visayas						
	Aklan	3,000	20	600	1,000	20	200
	Antique	3,000	20	600	1,000	20	200
	Capiz	3,000	20	600	4,000	20	800
	Iloilo	--	40	--	5,000	40	2,000
	Negros Occidental	--	40	--	--	40	--
	Negros Oriental	4,000	20[c]	800	3,000	20[c]	600
	Bohol	2,000	20	400	1,000	20	200
VIII	Eastern Visayas						
	Bohol	7,000	20	1,400	2,000	20	400
	Cebu	--	20	--	5,000	20	1,000
	Leyte	5,000	20	1,000	10,000	20	2,000
	Samar	5,000	20	1,000	3,000	20	600
IX	N. & Mindanao						
	Cotabato	--	40	--	25,000	40	10,000
	Davao	15,000	40[c]	6,000	11,000	40[c]	4,400
	Sulu	3,000	40	1,200	3,000	40	1,200
	Zamboanga Norte	6,000	20[c]	1,200	3,000	20[c]	600
	Zamboanga Sur	15,000	40[c]	6,000	13,000	40[c]	5,200
X	N. & Mindanao						
	Agusan	4,000	20	800	2,000	20	400
	Bukidnon	3,000	20	600	2,000	20	400
	Lanao	--	40	--	5,000	40	2,000
	Misamis Occidental	2,000	20	400	1,000	20	200
	Misamis Oriental	8,000	20	1,600	3,000	20	600
	Surigao	--	20	--	--	20	--
	Philippines			61,600			110,000

a Figures from Table 80
b Figures from Table 81
c Facilities used primarily for corn.

for at least 15 years. The total value of the additional grain saved is approximately ₱47.3 million. The present value of ₱47.3 million, discounted over 15 years at 8 percent, is over ₱405 million, or US$103.9 million (Table 91).

TABLE 91

VALUE OF GRAIN SAVED BY THE RECOMMENDED NEW STORAGE FACILITIES, PHILIPPINES

Item	Annual Savings Beginning in 1970	Additional Annual Savings Beginning in 1975
Amount of Palay Saved (in metric tons)	49,000	128,600
Total Value of Palay Saved (@₱348/metric ton)	₱ 17,052,000	₱ 44,752,800
Amount of Corn Saved (in metric tons)	15,600	11,400
Total Value of Corn Saved (@₱228/metric ton)	₱ 3,556,800	₱ 2,599,200
Total Amount of Grain Saved (in metric tons)	64,600	140,000
Total Value of Grain Saved	₱ 20,608,800 (or US$ 5,284,000 a/)	₱ 47,352,000 (US$ 12,141,000 a/)
Present Value of Grain Saved over a 15-Year Period Discounted at 8 Percent	₱176,300,000 b/ (or US$ 45,205,000)	₱405,285,000 b/ (US$103,919,000)

a/ Based on Exchange Rate of: ₱3.90 equal US$1.00.
b/ The present value "P" of "A" dollars per year, discounted over a period of "n" years at an interest rate "r", is: $P = A[1-(1+r)^{-n}]/r$

The total cost of constructing the facilities recommended by 1975 is estimated to be ₱174.8 million or US$44.8 million. The present value of the grain saved by these facilities exceeds the investment costs by ₱230.3 million or US$59.1 million. The benefit-cost ratio for this part of the recommended construction program is 2.32. In other words, the present value of grain saved per peso invested in new storage facilities between 1970 and 1975 is ₱2.32.

The benefit-cost ratio for the construction program recommended for the 1970-1975 period is somewhat higher than the benefit-cost ratio for the 1970 period because expected increases in grain production after 1970 are large enough to justify the construction of larger bulk silo facilities. As a result, the average cost per metric ton of bulk silo capacity is somewhat less for the 1975 construction program than for the 1970 program.

The estimates of grain saved are valid only if the grain production increases as much as expected. Otherwise, the recommended new facilities will tend to replace existing facilities and the amount of grain saved will be somewhat less than expected. The replacement of existing facilities with modern facilities would be worthwhile in itself if the grain losses in the new facilties were substantially less than those in existing facilities.

Losses in Storage

According to official estimates, less than three percent of the total grain produced in the Philippines is "wasted". The percentage of grain "lost" between the farmer and the consumer is undoubtedly higher than indicated by the official statistics on grain "wasted". On the basis of interviews with warehousemen and grain marketing experts in the Philippines, it is estimated that, on the average, at least 12 percent of

the grain that is marketed through existing facilities is lost before it reaches the consumer. With proper storage, drying and handling, it should be possible to reduce the percentage of grain lost in marketing to around five percent. A detailed breakdown of these percentages is presented below.

TABLE 92

ESTIMATED PERCENTAGE OF GRAIN LOSS IN EXISTING FACILITIES AND PROJECTED LOSS IN RECOMMENDED NEW FACILITIES, PHILIPPINES

Source of Grain Loss	Percent of Grain Loss	
	In Existing Facilities	In New Facilities
	(percent)	
Insects	5.0	2.0
Moisture	3.0	1.0
Breakage	2.0	1.0
Rodents & Birds	2.0	1.0
TOTAL PERCENT OF LOSS	12.0	5.0

The actual percentage of grain "lost" in the Philippines due to lack of mechanical drying facilities is probably somewhat higher than three percent. If more mechanical grain driers were available, there would probably be less grain dried in the field and smaller field losses due to rats and birds. In some areas, farmers lose considerable amounts of grain when they are unable to sell grain harvested during the rainy season because buyers, having no way to dry it, will not buy it. These farms losses were not included when estimating losses due to moisture at three percent.

It is recommended that 116,000 metric tons of bulk silo facilities be constructed by 1970, and an additional 280,000 metric tons of bulk silo facilities be constructed by 1975. Assuming an average turn-over of two and a net savings of seven percent of the grain handled, the bulk silo facilities recommended for 1970 would save 16,240 metric tons of grain each year for at least 15 years. Those recommended for 1975

TABLE 93

VALUE OF GRAIN SAVED IN THE RECOMMENDED NEW BULK SILO FACILITIES, PHILIPPINES

Item	Annual Savings Beginning in 1970	Additional Annual Savings Beginning in 1975
Amount of Palay Saved (in metric tons)	14,420	36,260
Total Value of Palay Saved (@₱348/metric ton)	₱ 5,018,160	₱ 12,618,480
Amount of Corn Saved (in metric tons)	1,820	2,940
Total Value of Corn Saved (@₱228/metric ton)	₱ 414,960	₱ 670,320
Total Amount of Grain Saved (in metric tons)	16,240	39,200
Total Value of Grain Saved	₱ 5,433,120 (or US$ 1,393,000 a/)	₱ 13,288,800 US$ 3,407,000 a/)
Present Value of Grain Saved over a 15-Year Period Discounted at 8 Percent	₱ 46,502,000 b/ (or US$ 11,923,000	₱113,739,000 b/ US$ 29,163,000)

a/ Based on Exchange Rate of: ₱3.90 equal US$1.00.
b/ The present value "P" of "A" dollars per year, discounted over a period of "n" years at an interest rate "r", is: $P = A[1-(1+r)^{-n}]/r$

would save an additional 39,200 metric tons of grain per year. Using a 15-year discount period and an eight percent discount rate, the present value of the grain saved by the bulk silo facilities recommended for 1970 would be over ₱46.5 million The corresponding present value for 1975 is ₱113.7 million The basic data used to obtain these present values is presented in Table 93.

Some private grain dealers may find it profitable to replace existing warehouse facilities with bulk silo facilities if their turn-over rate is high enough or if variable costs are sufficiently reduced by changing to bulk silos. It would not be worthwhile for the government to promote the entire construction program, however, unless rice and corn production increases as much as expected.

It appears likely that grain production will increase enough during the next 3 years to justify the construction of the facilities recommended for 1970. Thus, work on this part of the program should get under way immediately. A careful review of the supply situation should be made in the early 1970's, however, before undertaking the entire construction program for 1975. The value of the export facility recommended for Manila, for example, depends to a large extent on the amount of rice available for export from Central Luzon and the Cagayan Valley. If production increases during the next five years are not as large as expected, or not located where expected, a general revision of the recommendations for 1975 will be necessary.

Training Program

Because the efficient function of a facility is so largely dependent upon its operating people, it is of the utmost importance that they receive the best possible training to carry out their duties. It is the intention of the Philippine

government to lend aid and to encourage private firms or individuals to invest in and own the new facilities. Consequently, an all inclusive training program cannot be recommended as it is not known at this time how many and the type of facilities which will be owned by any one group. Furthermore, it is likely that these private entrepreneurs may wish to conduct their own training program. However, it is suggested that the Philippine government, through RCA, sponsor a short-term training program of one to two years to include all phases of managerial and operational functions of storage, handling, and marketing of grains; and also, recommend that private entrepreneurs be encouraged to become active and party to the program. The purpose of the program is to provide added assurance that adequately trained people will be available for operation of the facilities when needed by 1970.

The program should include administrative work, inventory control, operations, planning, and marketing. The technical phase should include quality control, functional operations of the equipment, maintenance and repair, fumigating needs, drying and aerating necessities, sampling and grading, and other matters relating to operations. Foreign talents may be engaged who are proficient and knowledgeable in these fields to work in the Philippines. This would provide means for intensive on-the-job training for the various crafts during the latter part of construction and during installation of the equipment.

It is further suggested that an agri-business program be established at the University of the Philippines, College of Agriculture, to train students in the art of managing and operating modern grain storage facilities. This would supplement the short-term training program sponsored by the RCA. The University already has a program in agricultural engineering and is conducting experiments in grain drying.

Priorities of Construction, 1970-1975

In the event funds for financing the entire program for 1970-1975 are not available, the following priorities are recommended for initiating a part of the project, taking into account the contribution of each new facility to the successful operation of the storage program.

Priority A

1,500 ton Bulk Silos
Standard Sack Warehouses
Expedite Improvement of North Harbor in Manila for Silo Construction

Priority B

25,000 ton Bulk Silo at Manila North Harbor
25,000 ton Bulk Silo at Cabanatuan, in Central Luzon
5,000 ton Bulk Silo at Ilagan, in Cagayan Valley
5,000 ton Bulk Silo at Santiago, in Cagayan Valley
6,000 ton Bulk Silo at Naga, in Bicol
3,000 ton Bulk Silo at Legaspi, in Bicol

Priority C

10,000 ton Bulk Silo at Davao City, in South and West Mindanao
5,000 ton Bulk Silo at Cagayan de Oro, in North and East Mindanao
5,000 ton Bulk Silo at Cebu, in Eastern Visayas
10,000 ton Bulk Silo at Tarlac, in Central Luzon
10,000 ton Bulk Silo at Cotabato, in South and West Mindanao

Priority D

The balance of the recommended facilities.

Construction Schedule

In order to implement the recommendations of this study, it is necessary to develop a schedule for performing the following engineering services necessary to complete the requirements for obtaining financing for the recommended project. These steps would not be taken until it was decided by those interested parties or agencies to adopt all or part of the recommendations.

Selection and Acquisition of Sites

The suggested design criteria shown in this study are based on certain assumptions of site conditions. However, after the actual selection is made, the characteristics may be different. For this reason, an Engineer thoroughly familiar with this type of project should assist and advise the Owner of the many considerations in the selection of the site which would affect the cost of the facility.

In the selection and acquisition of the specific site, consideration must be given to existing and planned overland highways for truck traffic and to existing and planned railroad operations in order that access to all modes of transportation can be easily provided with a minimum cost.

Engineering Survey of the Sites

The surveying and staking of the site for each facility should be under the supervision of the Engineer who has the responsibility for the design of the project.

Exploratory Soil Borings to Determine Final Foundation Design

As the new silos are large and heavy structures, it is very essential that the conditions of the soil on which the

foundation is built be thoroughly investigated and studied. This work should be done under the supervision of the designing Engineer. For this purpose, numerous soil borings on each site must be made and analyzed. From these results the safe load-bearing value of the soil will be determined and the results will be used to design the necessary type of foundation.

Determination of Site Improvements which will be Required Prior to the Construction of the Facility

After the sites have been selected and while the surveys and soil analyses are being developed, the Engineer responsible for the design work should investigate all of the local conditions which would affect the cost of the project. These would include connections to existing railroads, to highways, to water, to sewage, to electric power supply; site clearance, grading, filling, dredging, and all other conditions which would be necessary to prepare the site for construction.

Preparation of Preliminary Plans with Complete Cost Estimates Based on the Above Site Information

After the foregoing data are analyzed and studied, the Engineer responsible for the design work should review the designs suggested in this report and make any changes that are necessary to adapt the facility to the selected site. At this point, the Engineer should consult with the Owner and assist in resolving any problems or questions that may be pending. The Engineer should then offer final recommendations for the most economical and suitable design and should prepare preliminary drawings with new cost estimates.

Approval from the Owner of the Preliminary Plans and Estimates

The final preliminary plans and estimates and all the

supporting data which may be required by the financing agency should be submitted to the Owner for Approval.

Preparation of Final Construction Drawings

When instructed by the Owner, the design Engineer should proceed with the preparation of the final construction drawings, specifications, contractual and bidding documents. During this phase of the work, the Engineer should have a representative in the Philippines who will keep in constant contact with the Owner to resolve promptly all questions that might arise.

Awarding of Construction Contracts

The design Engineer should assist the Owner in the prequalification of the bidding contractors. The Engineer should also assist in analyzing each bid and make recommendations as to the acceptance or rejection of any bids submitted.

Supervisions of Construction

This phase of the engineering services should consist of supplying adequate engineering supervision in the Philippines during the entire construction period. The Engineer should maintain a central office in Manila staffed with personnel from his home office. The central office should also include Philippine assistants, clerks, and secretaries as are necessary.

Each new silo facility, except the 1,500 ton, should have a job office staffed with a Project Engineer, and Philippine assistants as maybe necessary to handle the field inspection and office work. It would not be necessary to have a permanent job office for the 1,500 ton silos or the separate warehouses. The inspection and supervision of these latter

mentioned facilities can be handled by a combination of the central office staff and the local job office personnel at the other locations.

It should be the duty of the Engineer to inspect all of the work, labor, and material used in construction and installation. The Engineer should prepare progress reports to the Owner and should certify progress payments to the contractor as provided in the contract. The Engineer should be authorized to reject all sub-standard material and workmanship. The Engineer should represent the Owner in all forms of arbitration in connection with the execution of the work performed by the contractor.

After the contractor has completed his part of the work he should officially notify the Engineer. If, in the opinion of the Engineer, the contractor has performed in accordance with the contract, the Engineer should call for test-run operations to make certain that all facets of the work will function as intended. This will be followed with the actual handling and processing of the grain to make certain that the guarantees are met as provided for in the contract. If, after careful evaluation of the test runs and final inspection, and if the Engineer is satisfied with his findings, he should so advise the Owner.

It should finally be the duty of the Engineer to be on hand during the period after construction when the contractor in combination with representatives of the various major pieces of equipment will instruct the operators about the proper handling, function and operation of the specific machine or equipment. If the Engineer is satisfied that all stipulations of the contract have been fully complied with by all parties, he should advise the Owner accordingly.

* * *

APPENDIX

TABLE A-1

AVERAGE MONTHLY RAINFALL, BY REGIONAL STATIONS, PHILIPPINES, 1960

Region	Station	Years of Record	January	February	March	April	May	June	July	August	September	October	November	December	Annual
							(inches)								
I	Manila														
	Central Office	90	0.90	0.43	0.66	1.27	5.05	9.94	16.28	17.20	13.90	7.69	5.43	2.69	81.44
II	Ilocos and Mt. Province														
	Bonga River, Dingras	13	0.20	0.05	0.54	1.41	8.42	16.05	17.60	23.31	16.08	5.20	3.47	0.51	92.84
	Vigan	52	0.12	0.24	0.33	0.80	7.35	14.53	25.63	27.96	15.78	5.51	1.72	0.52	100.49
III	Cagayan Valley														
	Tuguegarao	51	1.23	0.98	1.34	2.54	5.19	6.15	9.17	8.12	9.30	9.35	10.59	5.46	69.42
	Ilagan Tobacco	25	2.32	1.76	1.64	2.36	4.89	5.44	7.66	7.25	9.78	11.30	12.11	6.53	73.04
IV	Central Luzon														
	Cabanatuan City	15	0.22	0.25	1.01	2.07	4.93	8.30	10.88	16.16	11.97	6.91	5.10	3.02	70.82
	Dagupan City	52	0.35	0.51	1.00	3.33	7.99	12.40	21.05	21.31	17.17	6.72	3.17	1.01	96.01
V	Southern Tagalog														
	Caliraya, Lumban	12	7.20	3.21	3.22	4.39	7.24	11.21	10.26	12.18	11.54	15.83	16.50	15.49	118.27
	Ambulong, Tanauan	41	1.04	0.55	0.81	1.86	5.79	7.86	12.04	13.34	11.77	9.14	6.63	4.37	75.20
VI	Bicol														
	Daet	34	15.04	9.84	8.36	6.00	6.40	6.54	8.84	7.80	11.76	21.29	25.99	22.69	150.55
	Naga City	9	4.22	1.95	2.46	2.13	4.81	6.86	8.70	9.99	9.06	15.06	13.75	9.83	88.82
VII	Western Visayas														
	Iloilo City	52	2.33	1.50	1.40	2.03	6.04	10.42	15.34	14.58	11.56	10.35	8.13	4.76	88.44
	Culasi	26	4.63	7.97	2.02	3.11	10.95	18.40	26.60	29.23	24.04	20.17	15.88	9.91	167.51
VIII	Eastern Visayas														
	Cebu City	52	4.13	2.80	2.15	2.08	4.76	6.97	7.74	6.01	7.36	7.93	6.41	5.42	63.76
	Catbalogan	39	11.07	7.25	6.26	5.35	6.50	7.92	9.76	8.42	10.09	12.54	14.32	14.78	114.26
IX	Southeast Mindanao														
	Cotabato City	43	3.18	3.35	3.31	5.91	8.74	9.43	10.50	9.56	8.86	11.06	7.23	4.09	85.22
	Kabakan	11	3.78	3.43	4.03	5.38	9.33	8.13	7.50	6.27	7.64	7.10	5.82	5.22	73.63
X	Northeast Mindanao														
	Butuan	49	11.96	7.43	7.14	5.89	6.93	6.57	6.00	4.[illegible]4	5.72	7.46	9.72	12.36	91.52
	Cagayan de Oro	45	3.55	2.14	1.78	1.37	5.02	8.35	9.22	[illegible].59	8.53	7.61	5.32	4.90	65.38
	Regional Averages														
	Luzon		4.95	3.50	3.46	3.58	6.97	9.88	14.42	15.84	13.33	11.52	11.02	6.87	107.34
	Visayas		7.17	4.58	4.03	3.48	6.26	8.58	9.[illegible]2	9.16	9.23	10.99	11.03	9.94	94.47
	Mindanao		7.90	5.58	5.81	5.32	7.61	8.25	[illegible].32	7.56	7.89	9.03	8.84	9.70	91.72
	Philippines Average		6.33	4.32	4.18	3.94	6.89	9.10	11.54	11.83	10.77	10.78	10.53	9.40	99.61

Source: Monthly Average Rainfall and Rainy Days in the Philippines
Department of Commerce and Industry, Weather Bureau, Manila, 1960

TABLE A-2

NUMBER OF RAINY DAYS PER MONTH BY REGIONAL STATIONS - PHILIPPINES - 1960

	Region Station	January	February	March	April	May	June	July	August	September	October	November	December	Annual
I	Manila													
	Central Office	6	3	4	4	12	17	24	23	22	19	14	11	159
II	Ilocos and Mt. Province													
	Bonga River, Dingras	1	1	1	3	13	18	21	23	18	10	5	2	116
	Vigan	1	1	1	2	10	18	22	22	17	9	4	2	109
III	Cagayan Valley													
	Tuguegarao	7	5	5	6	11	12	15	15	14	14	14	11	129
	Ilagan	11	7	6	6	10	11	13	13	14	16	17	15	139
IV	Central Luzon													
	Cabanatuan City	2	1	2	4	11	17	20	24	21	14	9	6	131
	Dagupan City	2	2	3	6	13	19	23	23	20	13	7	3	134
V	Southern Tagalog													
	Calirayа, Lumban	20	14	13	10	13	18	20	21	20	21	21	24	215
	Sabutong, Tanauan	6	3	3	5	11	15	19	19	19	15	13	11	139
VI	Bicol													
	Daet	24	18	16	13	15	14	18	16	18	24	25	25	226
	Naga City	11	8	7	6	11	19	20	20	18	20	18	13	171
VII	Western Visayas													
	Iloilo City	11	7	7	6	14	18	21	20	19	18	15	14	170
	Culasi	8	5	7	6	14	18	21	21	18	17	15	13	163
VIII	Eastern Visayas													
	Cebu City	14	11	11	8	12	16	17	16	17	19	15	16	172
	Catbalogan	19	15	16	14	15	17	18	16	18	21	21	21	211
IX	Southeast Mindanao													
	Cotabato City	11	9	9	13	17	18	19	17	17	18	17	12	177
	Kabakan	8	7	7	10	14	13	12	12	14	11	13	10	131
X	Northeast Mindanao													
	Butuan	22	18	18	17	18	18	16	14	16	19	20	22	218
	Cagayan de Oro	10	7	7	5	12	17	17	16	16	16	11	11	145
	Regional Averages													
	Luzon	11	8	8	8	13	16	19	19	19	17	15	14	167
	Visayas	15	11	11	9	13	17	18	17	17	19	17	17	181
	Mindanao	14	11	12	12	15	17	17	16	16	17	17	16	180
	Philippines Average	13	10	10	9	14	17	18	18	18	18	16	15	176

Source: Monthly Average Rainfall and Rainy Days in the Philippines
Department of Commerce and Industry, Weather Bureau, Manila, 1960

TABLE A-3

AVERAGE MONTHLY TEMPERATURE, BY REGIONAL STATIONS, PHILIPPINES, 1960

Region	Station	Years of Record	January	February	March	April	May	June	July	August	September	October	November	December	Annual
							(degrees centigrade)								
I	Manila														
	Central Office	71	25.1	25.6	26.9	28.3	28.7	28.0	27.2	27.0	26.9	26.8	26.0	25.3	26.8
II	Ilocos & Mt. Province														
	Vigan	52	25.4	25.7	27.0	28.3	28.7	28.0	27.3	26.9	27.1	27.3	26.7	26.0	27.0
III	Cagayan Valley														
	Tuguegarao	51	23.4	24.4	26.4	28.2	29.0	28.9	28.2	27.9	27.5	26.4	25.1	24.0	26.6
IV	Central Luzon														
	Cabanatuan City	14	24.9	26.6	27.8	29.3	29.8	28.7	28.1	27.6	27.7	27.6	26.7	26.0	27.7
	Dagupan City	52	25.8	26.4	27.7	29.0	29.0	28.2	27.4	27.3	27.4	27.5	26.8	26.1	27.4
V	Southern Tagalog														
	Ambulong, Tanauan	41	25.5	26.1	27.3	28.5	28.7	27.8	27.1	27.0	26.8	26.5	26.4	25.6	26.9
VI	Bicol														
	Daet	34	25.1	25.2	25.9	26.9	27.7	27.9	27.4	27.4	27.1	26.6	26.3	25.5	26.6
VII	Western Visayas														
	Iloilo City	52	25.8	26.1	26.9	28.2	28.3	27.7	27.2	26.9	27.1	26.9	26.6	26.1	27.0
VIII	Eastern Visayas														
	Cebu City	52	26.3	26.4	27.2	28.2	28.4	28.0	27.6	27.7	27.6	27.5	27.1	26.7	27.4
	Catbalogan	24	25.9	26.1	26.7	27.6	28.1	28.1	27.9	28.2	27.9	27.5	26.8	26.3	27.3
IX	Southwest Mindanao														
	Cotabato City	22	27.1	27.4	27.8	28.3	28.0	27.7	27.2	27.3	27.4	27.6	27.5	27.2	27.5
X	Northeast Mindanao														
	Butuan	12	22.9	23.1	23.6	24.2	24.4	24.1	23.5	23.5	23.6	23.7	23.6	23.1	23.6
	Cagayan de Oro City	24	25.9	26.2	26.8	27.6	28.0	27.7	27.2	27.4	27.2	27.2	26.8	26.2	27.0
	Regional Averages														
	Luzon		24.5	25.3	26.4	27.7	28.4	28.1	27.6	27.5	27.3	26.9	26.2	25.3	26.8
	Visayas		26.2	26.4	27.1	28.0	28.3	27.9	27.5	27.6	27.5	27.3	27.0	26.5	27.3
	Mindanao		26.3	26.4	26.9	27.4	27.5	27.2	26.9	27.1	27.0	27.0	26.9	26.4	26.9
	Philippines Average		25.6	25.9	26.7	27.7	28.2	27.9	27.4	27.4	27.3	27.1	26.6	25.9	27.0

Source: Monthly Average Temperature in the Philippines (in Degrees Centigrade) 1960
Department of Commerce & Industry, Weather Bureau, Manila

TABLE A-4

AVERAGE MONTHLY RELATIVE HUMIDITY, BY REGIONAL STATIONS, PHILIPPINES, 1960
(NORMAL VALUES)

Region	Station	January	February	March	April	May	June	July	August	September	October	November	December	Annual
							(percent)							
I	Manila													
	Central Office	77	73	70	69	74	80	83	84	84	83	81	80	78
II	Ilocos & Mt. Province													
	Vigan	72	74	74	74	76	81	84	86	85	79	75	73	78
III	Cagayan Valley													
	Tuguegarao	81	77	74	70	70	75	78	79	81	83	85	85	78
IV	Central Luzon													
	Cabanatuan City	72	70	65	66	70	80	83	85	85	81	79	74	76
	Dagupan City	75	74	72	72	75	80	84	85	85	81	78	77	78
V	Southern Tagalog													
	Ambulong, Tanauan	78	75	71	71	75	81	84	84	86	84	81	81	79
VI	Bicol													
	Daet	84	83	82	82	82	82	79	83	85	86	85	85	83
VII	Western Visayas													
	Iloilo City	81	78	76	73	78	81	83	83	84	84	84	83	81
VIII	Eastern Visayas													
	Cebu City	77	75	73	72	75	77	78	77	78	79	79	78	77
	Catbalogan	83	83	81	81	81	82	81	80	82	84	85	85	82
IX	Southwest Mindanao													
	Cotabato City	80	79	77	79	82	83	84	84	84	83	83	82	82
X	Northeast Mindanao													
	Butuan	82	81	80	78	82	85	86	86	86	85	85	84	83
	Cagayan de Oro	80	79	77	75	77	80	80	79	80	81	81	82	79
	Regional Averages													
	Luzon	80	79	77	76	78	81	83	83	84	83	82	81	81
	Visayas	82	81	80	77	80	82	83	82	83	84	84	83	82
	Mindanao	83	82	81	81	82	84	84	83	84	84	85	84	83
	Philippines Average	81	80	79	78	80	84	83	83	84	83	83	82	82

Note: The years of record range from 10 - 71 years

Source: Monthly Average Relative Humidity in the Philippines (in percent)
Department of Commerce & Industry, Weather Bureau, Manila, 1960

TABLE

1980 PHILIPPINE POPULATION BY S-

Age Groups	Region I Ilocos Region			Region II Cagayan Valley			Region III Central Luzon			Region IV Southern Tagalog			Region Southern Tagalog			Ph
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
																(thousa
0- 4 years	166	86	80	230	118	112	189	97	92	626	321	305	721	371	350	414
5- 9 years	145	74	71	220	113	107	172	88	84	590	303	287	659	338	321	399
10-14 years	126	63	63	171	88	83	121	62	59	494	253	241	518	263	255	326
15-19 years	144	58	86	134	68	66	95	48	47	372	185	187	430	202	228	263
20-24 years	119	66	83	124	61	63	93	47	46	314	153	161	404	193	211	200
25-29 years	100	47	53	103	50	53	76	38	38	248	120	128	322	157	165	150
30-34 years	73	37	36	83	40	43	58	29	29	207	100	107	258	128	130	127
35-39 years	58	28	30	88	42	46	55	28	27	189	91	98	223	109	114	111
40-44 years	46	23	23	68	32	36	42	21	21	149	70	79	175	87	88	87
45-49 years	43	22	21	66	31	35	40	20	20	145	70	75	163	83	80	85
50-54 years	31	17	14	[illegible]	[illegible]	27	29	15	14	105	52	53	112	59	53	54
55-59 years	20	11	9	38	17	21	20	10	10	72	37	35	73	38	35	41
60-64 years	15	8	7	32	15	17	17	9	8	60	31	29	61	33	28	39
65 and over	20	9	11	64	30	34	29	15	14	120	58	62	113	56	57	63
All Ages	1,178	589	589	1,473	727	743	1,036	527	509	3,691	1,844	1,847	4,232	2,117	2,115	2,565
Percent Distribution by Region	4.2			5.4			3.8			13.6			15.6			9.5

Source: [illegible] Statistics, Department of Commerce and [illegible] of the Philippines [illegible]

[illegible] REGIONS

[illegible]		[illegible]			[illegible]			[illegible]			[illegible]			[illegible]		
[illegible]	[illegible]	[illegible]			[illegible]			[illegible]			[illegible]			[illegible]		
[illegible]	[illegible]	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
[illegible]	200	631	324	307	634	334	320	573	298	275	349	191	178	4 373	2.354	2.219
[illegible]	193	632	325	307	634	324	310	564	296	266	355	166	169	4.370	2.255	2.115
[illegible]	159	492	252	240	506	256	248	423	224	199	259	136	123	3.436	1.766	1.670
[illegible]	130	405	202	203	411	204	207	345	176	169	215	109	106	2.814	1.385	1.429
[illegible]	101	337	164	173	338	162	170	391	152	149	198	98	100	2.158	1.194	1 264
[illegible]	77	263	127	136	265	126	139	258	131	127	168	83	85	1.953	952	1.001
[illegible]	[illegible]	204	97	107	223	107	116	193	99	94	127	64	63	1.555	765	790
[illegible]	50	202	96	106	211	103	108	176	90	86	115	58	57	1.428	702	726
[illegible]	43	154	75	79	162	79	83	129	70	59	87	46	41	1 099	546	553
[illegible]	41	150	77	73	157	77	80	108	59	49	75	41	34	1.032	524	508
[illegible]	27	95	49	46	113	56	57	71	40	31	48	26	22	711	366	345
[illegible]	20	66	34	32	82	41	41	45	25	20	31	17	14	488	253	235
[illegible]	17	62	33	29	79	42	37	39	23	16	28	16	12	432	232	200
[illegible]	22	115	57	58	131	65	66	48	27	21	36	19	17	739	369	370
[illegible]	[illegible]	[illegible]	1.911	[illegible]	1.966	1.978	1.986	3.273	1.710	1.563	[illegible]	1.090	1.021	27.088	13.663	13.425
		[illegible]			11.72			12.17			7.8			100.0%		

[illegible]

TABLE A-6

POPULATION AND POPULATION DENSITY, BY REGIONS AND PROVINCES, PHILIPPINES, 1960

	Region and Province	Land Area In Square Kilometers[a]	Population[b]	Percent of Total Population	Persons per Square Kilometer
I	City of Manila	40	1,138,611	1.2	28,465.0
II	Ilocos	25,770	1,469,753	5.4	57.0
	Abra	3,980	115,193	.4	28.9
	Ilocos Norte	3,400	287,333	1.1	84.5
	Ilocos Sur	2,580	338,058	1.2	131.0
	La Union	1,190	293,330	1.1	196.8
	Pt. Province	14,320	435,839	1.6	30.4
III	Cagayan Valley	26,830	1,035,750	3.8	38.6
	Batanes	210	10,309	c/	19.0
	Cagayan	9,000	445,289	1.6	49.5
	Isabela	10,660	442,062	1.6	41.5
	Nueva Vizcaya	6,960	138,090	.5	19.8
IV	Central Luzon	23,630	3,690,996	13.6	156.2
	Bataan	1,370	145,323	.5	106.1
	Bulacan	2,670	555,819	2.1	208.2
	Nueva Ecija	5,280	608,362	2.3	115.2
	Pampanga	2,180	617,259	2.3	283.2
	Pangasinan	5,370	1,124,144	4.2	209.3
	Tarlac	3,050	426,647	1.6	139.9
	Zambales	3,710	213,442	.8	57.5
V	Southern Tagalog	16,130	1,231,973	15.6	91.7
	Batangas	3,170	681,414	2.5	215.0
	Cavite	1,290	378,138	1.4	293.1
	Laguna	1,760	472,064	1.7	268.2
	Marinduque	960	114,586	.4	119.4
	Mindoro Occidental	5,880	84,316	.3	14.3
	Mindoro Oriental	4,360	228,998	.9	52.5
	Palawan	14,900	162,669	.6	10.9
	Quezon	11,950	653,426	2.4	54.7
	Rizal	1,860	1,456,362	5.4	783.0
VI	Bicol	17,630	2,362,707	8.7	134.0
	Albay	2,550	514,980	1.9	202.0
	Camarines Norte	2,110	188,091	.7	89.1
	Camarines Sur	5,270	819,565	3.0	155.5
	Catanduanes	1,510	156,329	.6	103.5
	Masbate	4,050	335,971	1.2	83.0
	Sorsogon	2,140	347,771	1.3	162.5

TABLE A-6 (Continued)

POPULATION AND POPULATION DENSITY, BY REGIONS AND PROVINCES, PHILIPPINES, 1960

Region and Province	Land Area In Square Kilometers[a]	Population[b]	Percent of Total Population	Persons per Square Kilometer
VII Western Visayas	27,330	3,807,721	14.1	139.3
Aklan	1,820	226,232	.8	124.3
Antique	2,520	238,405	.9	94.6
Iloilo	5,320	966,266	3.6	181.6
Capiz	2,630	315,679	1.2	119.8
Negros Occidental	7,930	1,332,323	4.9	168.0
Negros Oriental	5,750	597,761	2.2	104.0
Romblon	1,360	131,658	.5	96.8
VIII Eastern Visayas	30,640	3,966,007	14.7	129.4
Bohol	4,120	592,194	2.2	143.7
Cebu	5,090	1,332,847	4.9	261.9
Leyte	8,000	1,172,972	4.4	146.6
Samar	13,430	867,994	3.2	64.6
IX S.W. Mindanao	62,160	3,272,873	12.1	52.6
Cotabato	23,800	1,029,119	3.8	43.2
Davao	19,670	893,023	3.3	45.4
Sulu	2,690	326,898	1.2	121.5
Zamboanga del Norte	6,080	281,129	1.0	46.3
Zamboanga del Sur	9,920	742,604	2.8	74.8
X N.E. Mindanao	39,840	2,111,291	7.8	53.0
Agusan	11,560	271,010	1.0	23.4
Bukidnon	8,290	194,368	.7	23.4
Lanao del Norte	3,090	270,603	1.0	87.6
Lanao del Sur	3,870	378,327	1.4	97.8
Misamis Occidental	1,940	248,471	1.0	128.0
Misamis Oriental	3,800	388,615	1.4	102.3
Surigao del Norte	2,740	359,997	1.3	19.4
Surigao del Sur	4,550			
TOTAL	300,000	27,087,685	100.0	90.3

a The Philippine Economic Atlas, Program Implementation Agency, Republic of the Philippines, Bureau of Printing (1962).

b Census of the Philippines: 1960-Population and Housing, Volume II, Summary Report, Bureau of Census and Statistics, Republic of the Philippines, Manila.

c Less than 0.1 percent.

TABLE A-7

LITERACY[a] OF PERSONS 10 YEARS OLD AND OVER, PHILIPPINES, BY REGIONS, 1960

		Males			Females			Both Sexes		
		Total	Literate	Percent of Total	Total	Literate	Percent of Total	Total	Literate	Percent of Total
I	Metropolitan Manila	389	361	92.8	438	395	90.2	827	756	91.5
II	Ilocos	496	356	71.7	524	325	62.0	1,020	681	66.7
III	Cagayan Valley	342	254	74.2	333	230	69.0	675	483	71.6
IV	Central Luzon	1,219	1,008	82.6	1,256	972	77.4	2,475	1,980	80.0
V	Southern Tagalog	1,407	1,182	84.0	1,445	1,166	80.8	2,852	2,348	82.4
VI	Bicol	787	608	77.2	763	565	74.0	1,550	1,173	75.7
VII	Western Visayas	1,065	747	70.1	1,083	756	69.7	2,148	1,503	70.0
VIII	Central and Eastern Visayas	1,519	982	64.7	1,556	983	63.2	3,075	1,965	63.9
IX	Southern Mindanao	1,115	636	57.0	1,022	530	51.9	2,137	1,166	54.6
X	Northern Mindanao	714	526	73.8	673	492	73.0	1,387	1,019	73.4
	TOTAL	9,053	6,660	73.6	9,093	6,414	70.6	18,146	13,074	72.0

a For census and survey purposes, a literate person is defined as one who can both read and write a simple message in any language or dialect.

Source: Bureau of the Census and Statistics, Facts and Figures about the Philippines, Bureau of Printing, Manila.

TABLE A-8

EMPLOYMENT STATUS OF POPULATION TEN YEARS OLD AND OVER, BY SEX, PHILIPPINES, 1960

Employment Status	Number			Percent of Total Persons Ten Years Old and Over			Percent of Total Labor Force		
	Both Sexes	Male	Female	Both Sexes	Male	Female	Both Sexes	Male	Female
	(thousands)			(percent)			(percent)		
Total Persons 10 years old and over	17,873	8,931	8,942	100.0	100.0	100.0	--	--	--
In the Labor Force:	8,536	6,352	2,184	47.8	71.1	24.5	100.0	100.0	100.0
Employed	7,945	5,990	1,955	44.5	67.1	21.9	93.1	94.3	89.5
Unemployed	591	362	229	3.3	4.0	2.6	6.9	5.7	10.5
Not in the Labor Force:	9,124	2,467	6,657	51.0	27.6	74.4	--	--	--
Labor Force Status Not Reported:	213	112	101	1.2	1.3	1.1	--	--	--

Source: Facts and Figures about the Philippines, Bureau of the Census and Statistics, Republic of the Philippines, Manila.

TABLE A-9

PROJECTION OF THE PHILIPPINE POPULATION, BY REGION, FOR 1970, 1975, 1980

	Region	1960[a]	1965	1970	1975	1980
				(thousands)		
HYPOTHESIS A (Low Estimates)						
I	Metropolitan Manila[b]	2,120	2,576	3,083	3,648	4,217
II	Ilocos	1,470	1,676	1,905	2,161	2,418
III	Cagayan Valley	1,036	1,258	1,505	1,780	2,058
IV	Central Luzon	3,691	4,246	4,863	5,551	6,246
V	Southern Tagalog	3,251	3,912	4,615	5,460	6,288
VI	Bicol	2,362	2,784	3,253	3,775	4,303
VII	Western Visayas	3,808	4,247	4,247	5,279	5,829
VIII	Eastern Visayas	3,966	4,283	4,637	5,031	5,430
IX	Southern and Western Mindanao	3,273	4,307	5,456	6,735	8,029
X	Northern and Eastern Mindanao	2,111	2,557	3,052	3,603	4,160
	TOTAL	27,088	31,846	37,434	43,023	48,978
HYPOTHESIS B (Medium Estimates)						
I	Metropolitan Manila[b]	2,120	2,576	3,409	3,730	4,152
II	Ilocos	1,470	1,676	1,917	2,197	2,523
III	Cagayan Valley	1,036	1,258	1,517	1,849	2,171
IV	Central Luzon	3,691	4,246	4,894	5,649	6,598
V	Southern Tagalog	3,251	3,912	4,683	5,581	6,627
VI	Bicol	2,362	2,784	3,276	3,849	4,517
VII	Western Visayas	3,808	4,247	4,761	5,359	6,055
VIII	Eastern Visayas	3,966	4,283	4,656	5,088	5,592
IX	Southwestern Mindanao	3,273	4,307	5,513	6,918	8,555
X	Northeastern Mindanao	2,111	2,557	3,076	3,682	4,387
	TOTAL	27,088	31,846	37,702	43,872	51,407
HYPOTHESIS C (High Estimates)						
I	Metropolitan Manila[b]	2,120	2,576	3,434	3,815	4,643
II	Ilocos	1,470	1,676	1,929	2,237	2,612
III	Cagayan Valley	1,036	1,258	1,530	1,862	2,266
IV	Central Luzon	3,691	4,246	4,926	5,755	6,763
V	Southern Tagalog	3,251	3,912	4,720	5,706	6,905
VI	Bicol	2,362	2,784	3,300	3,929	4,695
VII	Western Visayas	3,808	4,247	4,785	5,441	6,238
VIII	Eastern Visayas	3,966	4,283	4,673	5,149	5,726
IX	Northwestern Mindanao	3,273	4,307	5,572	7,115	8,991
X	Northeastern Mindanao	2,111	2,557	3,102	3,767	4,576
	TOTAL	27,088	31,846	37,671	44,776	53,415

a. Based on 1960 Census data adjusted for Metropolitan Manila.
b. Includes the City of Manila, Quezon City, Pasay City, Caloocan City, San Juan, Mandaluyong, Makati, Paranaque.

TABLE A-10

IMPORTS OF PRINCIPAL CEREAL GRAINS BY COUNTRY OF ORIGIN, PHILIPPINES, 1958-1967

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967[a]
					(metric tons)					
Wheat and Spelt[b]										
U.S.A.	4,907	21,987	77,206	209,600	160,562	182,841	151,857	237,521	389,956	--
Canada	--	33,412	33,174	25,130	127,044	186,351	158,574	121,201	65,313	--
Belgium	--	--	--	--	--	--	--	--	740	--
France	--	--	--	--	--	--	--	230	952	--
Japan	--	--	--	--	--	--	--	--	14	--
Australia	--	16,803	13,391	--	7	16,595	5,900	28	16	--
United Kingdom	--	--	--	2,000	--	533	965	--	--	--
China	--	--	--	--	--	1	300	--	--	--
Hongkong	--	--	--	--	--	--	227	--	--	--
Panama	--	--	--	--	3,770	--	--	--	--	--
Mexico	--	--	--	--	2,693	--	--	--	--	--
Israel	--	10	--	--	--	--	--	--	--	--
Switzerland	--	--	1,448	--	--	--	--	--	--	--
Total4	4,907	72,212	127,219	236,739	294,076	366,321	317,823	358,980	456,591	--
Wheat Flour[b]										
U.S.A.	203,794	78,977	49,024	29,330	23,759	3,225	12,869	21,828	698	--
Canada	85,504	59,264	71,594	45,637	9,714	--	8,230	7,664	--	--
Argentina	--	--	--	--	--	--	3	--	--	--
France	--	--	--	--	--	--	4,427	12,257	20,705	--
Italy	--	--	--	--	2,122	--	500	1,895	6,738	--
China	--	--	--	--	--	--	2,671	5,483	2,946	--
Hongkong	5	--	--	--	--	227	3,118	3,179	797	--
Japan	80	--	--	6	--	--	101	5,366	13,767	--
Australia	8,471	3,247	1,624	918	4,856	16,274	37,819	4,263	271	--
Netherlands	--	5	--	147	--	46	--	313	1,116	--
Germany	--	140	--	148	581	--	--	1,337	2,570	--
Mexico	--	--	--	56	--	--	--	--	--	--
United Kingdom	68	68	--	157	--	--	--	--	--	--
Egypt & Syria	--	--	--	10	--	--	--	--	--	--
India	--	45	--	--	--	--	--	--	--	--
Austria	23	--	--	--	--	--	--	--	--	--
Belgium & Luxemburg	--	--	--	--	--	--	--	1,500	6,733	--
Okinawa	--	--	--	--	--	--	--	9	--	--
Totals	297,945	141,746	122,242	76,409	41,032	19,772	69,738	65,094	56,341	--
Soybeans[b]										
U.S.A.	2,390	1,512	653	1,579	130	11,363	4,296	11,262	16,747	--
Canada	10	--	--	--	--	--	--	--	--	--
Hongkong	114	130	--	--	--	37	101	305	403	--
British East Indies	19	--	--	--	--	--	--	--	--	--
Cambodia	--	--	--	20	--	--	--	--	--	--
Japan	10	--	--	--	--	--	--	--	--	--
Chila	--	--	--	--	--	50	--	--	--	--
Dutch Guiana	--	--	--	--	--	15	--	--	--	--
Totals	2,543	1,642	653	1,599	130	11,461	4,397	11,567	17,150	--
Maize (Corn Unmilled)[b]										
U.S.A.	11,633	--	--	--	22	59	43	--	--	45
Australia	--	--	--	--	--	--	--	--	--	--
Union of South Africa	20,000	--	--	--	--	--	--	--	--	--
Totals	31,633	--	--	--	22	59	43	--	--	45
Rice										
Burma	--	--	--	--	--	--	--	--	--	34,507
Thailand										99,661
U.S.A.										55,497
Venezuela	(Information of origin of rice imports not available for 1958 through 1966.)									31,152
Cambodia										15,049
Egypt										100,937
Uruguay	--	--	--	--	--	--	--	--	--	4,954
Totals	230,669	6,502	--	146,380	--	256,300	300,000	569,275	108,010	341,797

a/ 1967 data on Rice Imports cover only January through October; obtained from Plans and Planning RCA, Quezon City, based on figures submitted by RCA Accounting Dept.

b/ Department of Economic Research, Central Bank of the Philippines, 1966 Unpublished Reports.

TABLE A-11

RICE AND MAIZE (CORN) EXPORTS, PHILIPPINES, 1958-1966

Classification and Destination	1958	1959	1960	1961	1962	1963	1964	1965	1966
				(kilos)					
RICE:									
(1) Pre-mixed Rice	--	10,357	26,676	51,121	52,000	78,875	89,700	16,176	19,877
Singapore	--	--	--	17,121	--	27,550	--	16,176	--
Australia	--	10,357	26,676	34,000	52,000	51,325	69,700	--	--
Hongkong	--	--	--	--	--	--	20,000	--	19,877
(2) Rice, glutinous	1,399	2,190	1,122	1,250	500	806	116	--	--
Guam	1,399	2,190	1,122	1,250	500	--	--	--	--
USA	--	--	--	--	--	694	116	--	--
Hawaii	--	--	--	--	--	112	--	--	--
(3) Rice, non-glutinous	27,960	--	1,500,002	--	338	166	--	--	--
USA	80	--	--	--	338	--	--	--	--
Australia	27,880	--	--	--	--	--	--	--	--
Hongkong	--	--	1,499,912	--	--	--	--	--	--
Okinawa	--	--	90	--	--	--	--	--	--
Hawaii	--	--	--	--	--	--	--	--	--
RICE TOTAL	29,359	12,547	1,527,800	52,371	52,838	79,847	89,816	16,176	19,877
MAIZE CORN:									
(1) Corn germs	226,750	--	--	--	--	--	--	203,405	--
USA	226,750	--	--	--	--	--	--	--	--
Japan	--	--	--	--	--	--	--	203,405	--
(2) Corn in grains	--	68,977,448	12,181,459	--	--	--	--	--	--
Japan	--	57,977,448	12,181,459	--	--	--	--	--	--
United Kingdom	--	11,000,000	--	--	--	--	--	--	--
(3) Corn gluten feeds	445,517	3,887,150	748,818	272,687	273,515	--	--	--	--
USA	--	771,393	--	--	227,882	--	--	--	--
Denmark	--	508,000	--	--	--	--	--	--	--
Netherlands	--	1,012,647	--	--	--	--	--	--	--
Hawaii	445,517	1,595,110	748,818	272,687	--	--	--	--	--
Hongkong	--	--	--	--	45,633	--	--	--	--
MAIZE TOTAL	672,267	72,864,598	12,930,277	272,687	273,515	--	--	203,405	--

a/ The official exchange rate during those years was P 2.00 = $1.00

Source: Central Bank of the Philippines; based on the manifests of the Bureau of Customs.

TABLE A-12

CISO[a] FREIGHT RATES FOR CLASS "C" COMMODITIES[b]

	Manila	Cebu	Iloilo	Cagayan de Oro	Dumaguete	Davao	Cotabato[c]	Dadiangas	Ozamis Iligan	Tacloban	Tagbilaran	Zamboanga	Jolo	Maasin Southern Leyte	Capiz	Butuan	Batangas	Poro Pt	Aparri	Tabaco-Legaspi	Catbalogan
	(pesos per metric ton)																				
Manila	--	11.50	13.75	15.05	13.85	23.90	20.40	22.30	16.15	12.50	15.40	15.40	15.90	16.45	13.71	17.10	4.92	8.08	12.20	12.84	11.90
Cebu	11.50	--	3.60	5.85	4.60	17.45	13.60	15.65	7.05	5.00	4.75	7.05	10.45	6.05	6.94	7.65	--	--	--	8.20	7.05
Iloilo	13.75	3.60	--	--	7.75	12.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cagayan de Oro	15.05	5.45	--	--	5.70	17.35	--	--	5.00	5.70	5.95	8.95	--	--	--	--	--	--	--	8.15	10.05
Dumaguete	13.85	4.60	7.75	5.70	--	15.30	12.40	14.45	5.85	--	5.35	7.90	10.20	--	--	--	--	--	--	--	--
Davao	23.90	17.45	12.50	17.35	16.00	--	11.05	7.40	--	--	18.30	11.30	--	--	--	--	--	--	--	--	--
Cotabato[c]	20.40	13.60	--	--	12.40	11.05	--	--	--	--	--	7.05	9.20	--		--	--	--	--	--	--
Dadiangas	22.30	15.65	--	--	14.45	7.40	8.50	--	--	--	--	9.00	10.45	--	--	--	--	--	--	--	--
Ozamis Iligan	16.15	7.05	--	5.00	5.85	--	--	--	--	9.20	6.80	9.20	--	--	--	--	--	--	--	13.00	12.00
Tacloban	12.50	5.00	--	5.70	--	--	--	--	9.20	--	9.10	--	--	7.15	--	--	--	--	--	5.35	4.60
Tagbilaran	15.40	4.75	--	5.95	5.35	18.30	--	--	6.80	9.10	--	9.60	--	--	--	--	--	--	--	10.45	--
Zamboanga	15.40	7.05	--	8.95	8.60	11.30	7.05	9.00	9.20	--	9.60	--	4.00	--	--	--	--	--	--	--	--
Jolo	15.90	10.45	--	--	10.20	--	9.20	10.45	--	--	--	4.00	--	--	--	--	--	--	--	--	--
Maasin, Southern Leyte	16.45	6.05	--	--	--	--	--	--	--	7.15	--	--	--	--	--	7.05	--	--	--	--	--
Capiz	13.71	6.94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butuan	17.10	7.65	--	--	--	--	--	--	--	--	--	--	--	7.05	--	--	--	--	--	--	--
Batangas[d]	4.92	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10.23	--	--	--
Poro Pt.[d] La Union	8.08	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10.23	--	7.70	--	--
Aparri[d]	12.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.70	--	--	--
Tabaco-Legaspi	12.84	8.20	--	8.15	--	--	--	--	13.00	5.35	10.45	--	--	--	-	--	--	--	--	--	7.15
Catbalogan	11.90	7.05	--	10.05	--	--	--	--	12.00	4.60	--	--	--	--	--	--	--	--	--	7.15	--

a (CISO) Conference of Inter-Island Ship Owners and Operators.
b Class "C" commodities include palay, rice, corn, and corn grits in sacks.
c Rates include 10% lighterage fee for freights destined for Cotabato.
d This rate, not covered by CISO, was compiled from the Public Service Commission (PSC) formula using official PSC mileages between ports.

TABLE A-13

RAIL FREIGHT RATES[a] FOR SHIPMENTS OF SACKED PALAY, BETWEEN MAJOR CITIES, PHILIPPINES, 1967

Major Cities	San Fernando La Union	Dagupan	San Jose	Tarlac	Dau	Cabanatuan	Carmen	San Fernando Pampanga	Malolos	Manila	Calamba	Lipa	Santa Cruz	Lucena	Manato	Naga	Legaspi
	(rates are per sack of 44 kilos)																
San Fernando, La Union																	
LCL		0.125	0.29	0.215	0.265	0.41	0.325	0.29	0.31	0.365	0.44	0.475	0.49	0.49	0.565	0.735	0.825
CL		0.10	0.265	0.19	0.24	0.415	0.30	0.265	0.29	0.34	0.415	0.45	0.4[illegible]	0.465	0.54	0.70	0.77
Dagupan																	
LCL	0.125		0.20	0.125	0.175	0.365	0.24	0.20	0.225	0.275	0.35	0.39	0.4[illegible]	0.44	0.49	0.635	0.76
CL	0.10		0.175	0.10	0.15	0.34	0.215	0.175	0.20	0.25	0.325	0.365	0.375	0.415	0.465	0.61	0.735
San Jose																	
LCL	0.29	.20		0.115	0.15	0.325	0.20	0.175	0.20	0.25	0.31	0.365	0.375	0.415	0.49	0.61	0.735
CL	0.265	.175		0.09	0.125	0.30	0.175	0.15	0.175	0.225	0.29	0.34	0.35	0.39	0.465	0.585	0.70
Tarlac																	
LCL	0.215	.125	.115		0.10	0.265	0.14	0.115	0.14	0.175	0.25	0.29	0.30	0.35	0.49	0.525	0.66
CL	0.19	.10	.09		0.075	0.24	0.115	0.09	0.115	0.15	0.225	0.265	0.275	0.325	0.465	0.50	0.635
Dau																	
LCL	.265	.175	.15	.10		0.215	0.115	0.10	0.115	0.14	0.20	0.25	0.25	0.30	0.465	0.49	0.61
CL	.24	.15	.125	.075		0.19	0.09	0.075	0.09	0.115	0.175	0.225	0.225	0.275	0.44	0.465	0.585
Cabanatuan																	
LCL	0.4[illegible]	.365	.325	.265	.215		0.225	0.19	0.165	0.175	0.25	0.29	0.30	0.35	0.49	0.525	0.66
CL	0.415	.34	.30	.24	.19		0.20	0.165	0.14	0.15	0.225	0.265	0.275	0.325	0.465	0.50	0.635
Carmen																	
LCL	.325	.24	.20	.14	.115	.225		0.10	0.115	0.14	0.215	0.25	0.265	0.31	0.465	0.49	0.55
CL	.30	.215	.175	.115	.09	.20		0.075	0.09	0.115	0.19	0.225	0.24	0.29	0.44	0.465	0.525
San Fernando, Pampanga																	
LCL	.29	.20	.175	.115	.10	.19	.10		0.10	0.125	0.175	0.215	0.225	0.275	0.44	0.49	0.585
CL	.265	.175	.15	.09	.075	.165	.075		0.075	0.10	0.15	0.19	0.20	0.25	0.415	0.465	0.55
Malolos																	
LCL	.31	.225	.20	.14	.115	.165	.115	.10		0.10	0.15	0.19	0.20	0.24	0.40	0.49	0.55
CL	.29	.20	.175	.115	.09	.14	.09	.075		0.075	0.125	0.165	0.175	0.215	0.375	0.465	0.525
Manila																	
LCL	.365	.275	.25	.175	.14	.175	.14	.125	.10		0.115	0.14	0.15	0.20	0.35	0.49	0.50
CL	.34	.25	.225	.15	.115	.15	.115	.10	.075		0.09	0.115	0.125	0.175	0.325	0.465	0.475
Calamba																	
LCL	.44	.35	.31	.25	.20	.25	.215	.175	.15	.115		0.10	0.115	0.125	0.29	0.44	0.49
CL	.415	.325	.29	.225	.175	.225	.19	.15	.125	.09		0.075	0.09	0.10	0.265	0.415	0.465
Lipa																	
LCL	.475	.39	.365	.29	.25	.29	.25	.215	.19	.14	.10		0.125	0.165	0.325	0.475	0.49
CL	.45	.365	.34	.265	.225	.265	.225	.19	.165	.115	.075		0.10	0.14	0.30	0.45	0.465
Santa Cruz																	
LCL	.49	.40	.375	.30	.25	.30	.265	.225	.20	.15	.115	.125		0.15	0.34	0.465	0.49
CL	.465	.375	.35	.275	.225	.275	.24	.20	.175	.125	.09	.10		0.125	0.29	0.44	0.465
Lucena																	
LCL	.49	.44	.415	.35	.30	.35	.31	.275	.24	.20	.125	.165	15		0.19	0.34	0.465
CL	.465	.415	.39	.325	.275	.325	.29	.25	.215	.175	.10	.14	.125		0.165	0.31	0.44
Manato																	
LCL	.565	.49	.49	.49	.465	.49	.465	.44	.40	.35	.29	.325	.31	.19		0.175	0.30
CL	.54	.465	.465	.465	.44	.465	.44	.415	.375	.325	.265	.30	.29	.165		0.15	0.275
Naga																	
LCL	.735	.635	.61	.525	.49	.525	.49	.49	.49	.49	.44	.475	.465	.34	.175		0.15
CL	.70	.61	.585	.50	.465	.50	.465	.465	.465	.465	.415	.45	.4[illegible]	.31	.15		0.125
Legaspi																	
LCL	.825	.76	.735	.66	.61	.66	.625	.585	.55	.50	.49	.49	.49	.465	.30	.15	
CL	.77	.735	.70	.635	.585	.635	.60	.55	.525	.475	.465	.465	.465	.44	.275	.125	

a. LCL-Less Carload for shipments of less than 350 sacks; CL-Carload for shipments of 350 sacks and over.
Source: Special Freight Tariff No. 2A, Philippine National Railways (PNR).

TABLE A-14

RAIL FREIGHT RATES[a] FOR SHIPMENTS OF MILLED RICE IN SACKS, BETWEEN MAJOR CITIES, PHILIPPINES, 1967

(rates are per sack of 37-1/2 kilos)

Major Cities	San Fernando La Union	Dagupan	San Jose	Tarlac	Dau	Cabanatuan	Carmen	San Fernando Pampanga	Malolos	Manila	Calamba	Lipa	Santa Cruz	Lucena	Manato	Naga	Legaspi
San Fernando, La Union																	
LCL		0.215	0.39	0.315	0.365	0.615	0.44	0.39	0.425	0.49	0.60	0.65	0.665	0.665	0.775	0.985	1.14
CL		0.19	0.365	0.285	0.34	0.59	0.415	0.365	0.40	0.465	0.575	0.625	0.635	0.635	0.75	0.96	1.11
Dagupan																	
LCL	.215		0.30	0.215	0.275	0.49	0.34	0.30	0.325	0.375	0.475	0.525	0.55	0.60	0.665	0.85	1.01
CL	.19		0.275	0.19	0.25	0.465	0.315	0.275	0.30	0.35	0.45	0.50	0.525	0.575	0.635	0.84	1.00
San Jose																	
LCL	.39	.30		0.175	0.25	0.44	0.30	0.275	0.30	0.35	0.425	0.49	0.50	0.565	0.665	0.825	0.985
CL	.365	.275		0.15	0.225	0.415	0.275	0.25	0.275	0.325	0.40	0.465	0.475	0.54	0.635	0.80	0.96
Tarlac																	
LCL	.315	.215	.175		0.14	0.365	0.24	0.175	0.24	0.275	0.35	0.39	0.40	0.475	0.665	0.725	0.90
CL	.285	.19	.15		0.115	0.34	0.215	0.15	0.215	0.25	[illegible]	[illegible]	0.375	0.45	0.635	0.70	0.875
Dau																	
LCL	.365	.275	.25	.14		0.315	0.175	0.14	0.175	0.24	0.30	0.35	0.3[illegible]	0.40	0.625	0.685	0.825
CL	.34	.25	.225	.115		0.285	0.15	0.115	0.15	0.215	0.275	0.325	0.325	0.375	0.60	0.635	0.80
Cabanatuan																	
LCL	.615	.49	.44	.365	.315		0.325	0.285	0.265	0.275	0.35	0.39	0.40	0.475	0.665	0.725	0.90
CL	.59	.465	.415	.34	.285		0.30	0.265	0.24	0.25	0.325	0.365	0.375	0.45	0.635	0.70	0.875
Carmen																	
LCL	.44	.34	.30	.24	.175	.325		0.14	0.175	0.24	0.315	0.3[illegible]	0.365	0.425	0.625	0.685	0.84
CL	.415	.315	.275	.215	.15	.30		0.115	0.15	0.215	0.285	0.325	0.34	0.40	[illegible]	0.635	0.825
San Fernando, Pampanga																	
LCL	.39	.30	.275	.175	.14	.285	.14		0.14	0.215	0.275	0.315	0.325	0.375	0.60	[illegible]	0.79
CL	.365	.275	.25	.15	.115	.265	.115		0.115	0.19	0.25	0.285	0.30	0.35	0.575	0.63[illegible]	0.775
Malolos																	
LCL	.425	.325	.30	.24	.175	.265	.175	.14		0.14	0.25	0.285	0.30	0.34	0.55	0.665	0.[illegible]5
CL	.40	.30	.275	.215	.15	.24	.15	.115		0.115	0.225	0.265	0.275	0.315	0.525	0.635	0.74
Manila																	
LCL	.49	.375	.35	.275	.24	.275	.24	.215	.14		0.175	0.24	0.25	0.30	0.475	0.665	0.675
CL	.465	.35	.325	.25	.215	.25	.215	.19	.115		0.15	0.215	0.225	0.275	0.45	0.635	0.65
Calamba																	
LCL	.60	.475	.425	.35	.30	.35	.315	.275	.25	.175		0.14	0.175	0.215	0.39	0.60	0.665
CL	.575	.45	.40	.325	.275	.325	.285	.25	.225	.15		0.115	0.15	0.19	0.365	0.575	0.635
Lipa																	
LCL	.65	.525	.49	.39	.35	.39	.35	.315	.285	.24	.14		0.215	0.265	0.44	0.65	0.665
CL	.625	.50	.465	.365	.325	.365	.325	.285	.265	.215	.115		0.19	0.24	0.415	0.625	0.635
Santa Cruz																	
LCL	.665	.55	.50	.40	.35	.40	.365	.325	.30	.25	.175	.215		0.25	0.425	0.625	0.665
CL	.635	.525	.475	.375	.325	.375	.34	.30	.275	.225	.15	.19		0.225	0.40	0.60	0.635
Lucena																	
LCL	.665	.60	.565	.475	.40	.475	.425	.375	.34	.30	.215	.265	.25		0.285	0.45	0.625
CL	.635	.575	.54	.45	.375	.45	.40	.35	.315	.275	.19	.24	.225		0.265	0.44	0.60
Manato																	
LCL	.775	.665	.665	.665	.625	.665	.625	.60	.55	.475	.39	.44	.425	.285		0.275	0.40
CL	.75	.635	.635	.635	.60	.635	.60	.575	.525	.45	.365	.415	.40	.265		0.25	0.375
Naga[b]																	
LCL	.985	.85	.825	.725	.665	.725	.665	.665	.665	.665	.60	.65	.625	.45	.275		0.25
CL	.96	.84	.80	.70	.635	.70	.635	.635	.635	.635	.575	.625	.60	.44	.25		0.225
Legaspi																	
LCL	1.14	1.01	.985	.90	.825	.90	.84	.79	.75	.675	.665	.665	.665	.625	.40	.25	
CL	1.11	1.00	.96	.875	.80	.875	.825	.775	.74	.65	.635	.635	.635	.60	.375	.225	

a/ LCL-Less Carload for shipments of less than 350 sacks; CL-Carload for shipments of 350 sacks and over.

b/ Special rates for carload shipments of 500 sacks or over from Manila to Naga are 0.60 pesos per sack and for Manila to Legaspi 0.65 pesos per sack as established by Special Freight Tariff No. 45-F.

Source: Special Freight Tariff No. IA, Philippine National Railways (PNR).

TABLE A-15

RAIL FREIGHT RATES[a] FOR SHIPMENTS OF SHELLED CORN IN SACKS BETWEEN MAJOR CITIES, PHILIPPINES, 1967

Major Cities	San Fernando La Union	Dagupan	San Jose	Tarlac	Dau	Cabanatuan	Carmen	San Fernando Pampanga	Malolos	Manila	Calamba	Lipa	Santa Cruz	Lucena	Manato	Naga	Legaspi
	(Rates are based on per metric ton)																
San Fernando, La Union																	
LCL		6.85	12.25	10.00	11.50	16.60	13.30	12.25	13.15	14.60	16.30	17.15	17.45	18.40	22.00	25.20	27.80
CL		6.35	11.40	9.30	10.65	15.40	12.40	11.40	12.20	13.55	15.15	15.95	16.15	17.05	20.45	23.40	25.85
Dagupan																	
LCL	6.85		9.40	7.05	8.60	14.40	10.65	9.40	10.45	11.90	14.05	15.10	15.45	16.45	19.90	23.25	25.90
CL	6.35		8.75	6.55	7.95	13.35	9.90	8.75	9.70	11.05	13.00	14.00	14.35	15.25	18.50	21.60	24.05
San Jose																	
LCL	12.25	9.40		5.95	7.70	13.50	9.60	8.60	9.60	11.05	13.15	14.40	14.75	15.90	19.40	22.70	25.30
CL	11.40	8.75		5.50	7.15	12.55	8.90	7.95	8.90	10.25	12.20	13.35	13.70	14.75	17.95	21.05	23.50
Tarlac																	
LCL	10.00	7.05	5.95		5.30	11.50	7.30	6.20	7.30	8.75	11.05	12.45	12.80	14.05	17.85	21.20	23.80
CL	9.30	6.55	5.50		4.90	10.65	6.75	5.75	6.75	8.15	10.25	11.55	11.90	13.00	16.55	19.65	22.10
Dau																	
LCL	11.50	8.60	7.70	5.30		10.00	5.75	4.65	5.75	7.30	9.60	11.05	11.25	12.80	16.85	20.20	22.85
CL	10.65	7.95	7.15	4.90		9.30	5.30	4.30	5.30	6.75	8.90	10.25	10.45	11.90	15.65	18.75	21.20
Cabanatuan																	
LCL	16.60	14.40	13.50	11.50	10.00		10.45	9.15	8.15	8.75	11.05	12.45	12.65	14.05	17.85	21.20	23.80
CL	15.40	13.35	12.55	10.65	9.30		9.70	8.50	7.55	8.15	10.25	11.55	11.75	13.00	16.55	19.65	22.10
Carmen																	
LCL	13.30	10.65	9.60	7.30	5.75	10.45		4.85	5.95	7.50	10.00	11.25	11.65	13.00	17.00	20.35	23.00
CL	12.40	9.90	8.90	6.75	5.30	9.70		4.50	5.50	6.95	9.30	10.45	10.85	12.05	15.80	18.85	21.35
San Fernando, Pampanga																	
LCL	12.25	9.40	8.60	6.20	4.65	9.15	4.85		4.65	6.40	8.75	10.00	10.45	11.90	16.30	19.50	22.30
CL	11.40	8.75	7.95	5.75	4.30	8.50	4.50		4.30	5.95	8.15	9.30	9.70	11.05	15.15	18.10	20.70
Malolos																	
LCL	13.15	10.45	9.60	7.30	5.75	8.15	5.95	4.65		5.30	7.70	8.95	9.40	10.85	15.65	18.80	21.55
CL	12.20	9.70	8.90	6.75	5.30	7.55	5.50	4.30		4.90	7.15	8.35	8.75	10.10	14.50	17.45	20.05
Manila																	
LCL	14.60	11.90	11.05	8.75	7.30	8.75	7.50	6.40	5.30		6.20	7.50	7.95	9.40	14.20	17.85	20.50
CL	13.55	11.05	10.25	8.15	6.75	8.15	6.95	5.95	4.90		5.75	6.95	7.40	8.75	13.20	16.55	19.00
Calamba																	
LCL	16.30	14.05	13.15	11.05	9.60	11.05	10.00	8.75	7.70	6.20		5.05	[illegible]	7.05	12.25	16.30	18.95
CL	15.15	13.00	12.20	10.25	8.90	10.25	9.30	8.15	7.15	5.75		4.70	5.15	6.55	11.40	15.15	17.60
Lipa																	
LCL	17.15	15.10	14.40	12.45	11.05	12.45	11.25	10.00	8.95	7.50	5.05		6.85	8.35	13.50	17.15	19.75
CL	15.95	14.00	13.35	11.55	10.25	11.55	10.45	9.30	8.35	6.95	4.70		6.35	7.75	12.55	15.95	18.35
Santa Cruz																	
LCL	17.45	15.45	14.75	12.80	11.25	12.65	11.65	10.45	9.40	7.95	5.50	6.85		7.95	13.00	16.85	19.50
CL	16.15	14.35	13.70	11.90	10.45	11.75	10.85	9.70	8.75	7.40	5.15	6.35		7.40	12.05	15.65	18.10
Lucena																	
LCL	18.40	16.45	15.90	14.05	12.80	14.05	13.00	11.90	10.85	9.40	7.05	8.35	7.95		9.15	13.70	16.85
CL	17.05	15.25	14.75	13.00	11.90	13.00	12.05	11.05	10.10	8.75	6.55	7.75	7.40		8.50	12.70	15.65
Manato																	
LCL	22.00	19.90	19.40	17.85	16.85	17.85	17.00	16.30	15.65	14.20	12.25	13.50	13.00	9.15		8.75	12.65
CL	20.45	18.50	17.95	16.55	15.65	16.55	15.80	15.15	14.50	13.20	11.40	12.55	12.05	8.50		8.15	11.75
Naga [b]																	
LCL	2	23.25	22.70	21.20	20.20	21.20	20.35	19.50	18.80	17.85	16.30	17.15	16.85	13.70	8.75		7.95
CL	22.10	21.60	21.05	19.65	18.75	19.65	18.85	18.10	17.45	16.55	15.15	15.95	15.65	12.70	8.15		7.40
Legaspi																	
LCL	27.80	25.90	25.30	23.80	22.85	23.80	23.00	22.30	21.55	20.50	18.95	19.75	19.50	16.85	12.65	7.95	
CL	25.85	24.05	23.50	22.10	21.20	22.10	21.35	20.70	20.05	19.00	17.60	18.35	18.10	15.65	11.75	7.40	

a/ LCL-Less Carload for shipments of less than 7000 kilos; CL-Carload for shipments of 7000 kilos and over.

b/ Special Freight Tariff No. 45-F sets rates for shipments of 500 sacks and over between Manila and Naga at 0.60 pesos per sack and between Manila and Legaspi at 0.65 pesos per sack of 53 kilos.

Source: Philippine National Railways Freight Classification No. 11-E and supplements thereto.

TABLE A-16

RAIL FREIGHT RATES[a] FOR SHIPMENTS OF MILLED CORN GRITS IN SACKS, BETWEEN MAJOR CITIES, PHILIPPINES, 1967

Major Cities	San Fernando La Union	Dagupan	San Jose	Tarlac	Dau	Cabanatuan	Carmen	San Fernando Pampanga	Malolos	Manila	Calamba	Lipa	Santa Cruz	Lucena	Manato	Naga	Legaspi
	(rates are based on per metric ton)																
San Fernando, La Union																	
LCL		7.85	14.05	11.45	13.10	18.95	15.25	14.05	15.05	16.65	18.65	19.60	19.90	21.05	25.15	28.80	31.80
CL		6.85	12.25	10.00	11.50	16.60	13.30	12.25	13.15	14.60	16.30	17.15	17.45	18.40	22.00	25.20	27.80
Dagupan																	
LCL	7.85		10.75	8.05	9.80	16.45	12.20	10.75	11.90	13.60	16.05	17.25	17.65	18.80	22.75	26.60	29.60
CL	6.85		9.40	7.05	8.60	14.40	10.65	9.40	10.45	11.90	14.05	15.10	15.45	16.45	19.90	23.25	25.90
San Jose																	
LCL	14.05	10.75		6.80	8.80	15.45	11.00	9.80	11.00	12.65	15.05	16.45	16.85	18.20	22.15	25.90	28.95
CL	12.25	9.40		5.95	7.70	13.50	9.60	8.60	9.60	11.05	13.15	14.40	14.75	15.90	19.40	22.70	25.30
Tarlac																	
LCL	11.45	8.05	6.80		6.05	13.10	8.30	7.05	8.30	10.00	12.65	14.20	14.65	16.05	20.40	24.20	27.20
CL	10.00	7.05	5.95		5.30	11.50	7.30	6.20	7.30	8.75	11.05	12.45	12.80	14.05	17.85	21.20	23.80
Dau																	
LCL	13.10	9.80	8.80	6.05		11.45	6.55	5.30	6.55	8.30	11.00	12.65	12.85	14.65	19.30	23.05	26.10
CL	11.50	8.60	7.70	5.30		10.00	5.75	4.65	5.75	7.30	9.60	11.05	11.25	12.80	16.85	20.20	22.85
Cabanatuan																	
LCL	18.95	16.45	15.45	13.10	11.45		11.90	10.50	9.35	10.00	12.65	14.20	14.45	16.05	20.40	24.20	27.20
CL	16.60	14.40	13.50	11.50	10.00		10.45	9.15	8.15	8.75	11.05	12.45	12.65	14.05	17.85	21.20	23.80
Carmen																	
LCL	15.25	12.20	11.00	8.30	6.55	11.90		5.55	6.80	8.60	11.45	12.85	13.35	14.80	19.45	23.25	26.25
CL	13.30	10.65	9.60	7.30	5.75	10.45		4.85	5.95	7.50	10.00	11.25	11.65	13.00	17.00	20.35	23.00
San Fernando, Pampanga																	
LCL	14.05	10.75	9.80	7.05	5.30	10.50	5.55		5.30	7.30	10.00	11.45	11.90	13.60	18.65	22.25	25.45
CL	12.25	9.40	8.60	6.20	4.65	9.15	4.85		4.65	6.40	8.75	10.00	10.45	11.90	16.30	19.50	22.30
Malolos																	
LCL	15.05	11.90	11.00	8.30	6.55	9.35	6.80	5.30		6.05	8.80	10.25	10.75	12.40	17.85	21.50	24.65
CL	13.15	10.45	9.60	7.30	5.75	8.15	5.95	4.65		5.30	7.70	8.95	9.40	10.85	15.65	18.80	21.55
Manila																	
LCL	16.65	13.60	12.65	10.00	8.30	10.00	8.60	7.30	6.05		7.05	8.30	9.05	10.75	16.30	20.40	23.40
CL	14.60	11.90	11.05	8.75	7.30	8.75	7.50	6.40	5.30		6.20	7.30	7.95	9.40	14.20	17.85	20.50
Calamba																	
LCL	18.65	16.05	15.05	12.65	11.00	12.65	11.45	10.00	8.80	7.05		5.80	6.30	8.05	14.05	18.65	21.65
CL	16.30	14.05	13.15	11.05	9.60	11.05	10.00	8.75	7.70	6.20		5.05	5.50	7.05	12.25	16.30	18.95
Lipa																	
LCL	19.60	17.25	16.45	14.20	12.65	14.20	12.85	11.45	10.25	8.60	5.80		7.85	9.55	15.45	19.60	22.60
CL	17.15	15.10	14.40	12.45	11.05	12.45	11.25	10.00	8.95	7.50	5.05		6.85	8.35	13.50	17.15	19.75
Santa Cruz																	
LCL	19.90	17.65	16.85	14.65	12.85	14.45	13.35	11.90	10.75	9.05	6.30	7.85		9.05	14.80	19.30	22.25
CL	17.45	15.45	14.75	12.80	11.25	12.65	11.65	10.45	9.40	7.95	5.50	6.85		7.95	13.00	16.85	19.50
Lucena																	
LCL	21.05	18.80	18.20	16.05	14.65	16.05	14.80	13.60	12.40	10.75	8.05	9.55	9.05		10.50	15.65	19.30
CL	18.40	16.45	15.90	14.05	12.80	14.05	13.00	11.90	10.85	9.40	7.05	8.35	7.95		9.15	13.70	16.85
Manato																	
LCL	25.15	22.75	22.15	20.40	19.30	20.40	19.45	18.65	17.85	16.30	14.05	15.45	14.80	10.50		10.00	14.45
CL	22.00	19.90	19.40	17.85	16.85	17.85	17.00	16.30	15.65	14.20	12.25	13.50	13.00	9.15		8.75	12.65
Naga[b]																	
LCL	28.80	26.60	25.90	24.20	23.05	24.20	23.25	22.25	21.50	20.40	18.65	19.60	19.30	15.65	10.00		9.05
CL	25.20	23.25	22.70	21.20	20.20	21.20	20.35	19.50	18.80	17.85	16.30	17.15	16.85	13.70	8.75		7.95
Legaspi																	
LCL	31.80	29.60	28.95	27.20	26.10	27.20	26.25	25.45	24.65	23.40	21.65	22.60	22.25	19.30	14.45	9.05	
CL	27.80	25.90	25.30	23.80	22.85	23.80	23.00	22.30	21.55	20.50	18.95	19.75	19.50	16.85	12.65	7.95	

a/ LCL-Less Carload for shipments of less than 7000 kilos; CL-Carload for shipments of 7000 kilos and over.

b/ Special Freight Tariff No. 45-F sets rates for shipments of 500 sacks and over between Manila and Naga at 0.60 pesos per sack and between Manila and Legaspi at 0.65 pesos per sack of 53 kilos.

Source: Philippine National Railways Freight Classification No. 11-E and supplements thereto.

TABLE A-17

DISTANCES BETWEEN MAJOR STATIONS ON THE PHILIPPINE NATIONAL RAILWAYS

(All distances are measured in kilometers.)

	San Fernando La Union	Dagupan	San Jose	Tarlac	Dau	Cabanatuan	San Fernando Carmen	San Fernando Pampanga	Malolos	Manila	Calamba	Lipa	Santa Cruz	Lucena	Manato	Naga	Legaspi
San Fernando La Union		71	202	147	183	332	232	204	229	266	322	354	363	399	526	644	740
Dagupan	71		131	76	112	261	161	133	158	195	251	283	292	328	455	573	669
San Jose	202	131		55	91	240	140	112	137	174	230	262	271	307	434	552	648
Tarlac	147	76	55		36	185	85	57	82	119	175	207	216	252	379	497	593
Dau	183	112	91	36		149	49	21	46	83	139	171	180	216	343	461	557
Cabanatuan	332	261	240	185	149		156	128	103	118	174	206	215	251	378	496	592
Carmen	232	161	140	85	49	156		28	53	90	146	178	187	223	350	468	564
San Fernando Pampanga	204	133	112	57	21	128	28		25	62	118	150	159	195	322	440	536
Malolos	229	158	137	82	46	103	53	25		37	93	125	134	170	287	415	511
Manila	266	195	174	119	83	118	90	62	37		56	88	97	133	260	378	474
Calamba	322	251	230	175	139	174	146	118	93	56		32	41	77	204	322	418
Lipa	354	283	262	207	171	206	178	150	125	88	32		73	109	236	354	450
Santa Cruz	363	292	271	216	180	215	187	159	134	97	41	73		96	223	341	437
Lucena	399	328	307	252	216	251	223	195	170	133	77	109	96		127	245	341
Manato	526	455	434	379	343	378	350	322	297	260	204	236	223	127		118	214
Naga	644	573	552	497	461	496	468	440	415	378	322	354	341	245	118		96
Legaspi	740	669	648	593	557	592	564	536	511	474	418	450	437	341	214	96	

Source: Philippine National Railways, Distance Table 1-F, May 21, 1964.

TABLE A-18

PHILIPPINE RAILWAY COMPANY OF ILOILO
RAIL FREIGHT RATES[a] FOR CORN, PALAY, AND RICE[b]

		Capiz		Panitan		Dao		Cuartero		Bunting		Dumarao		Bitaogan		Passi		Duenas		Pototan		Lucena		Sta. Barbara		Jaro		La Paz		Iloilo	
		LCL	CL	LCL	CL	LCL	CL	LCL	CL	LCL	CL	LCL	CL	LCL	CL	LCL	CL	LCL	CL	LCL	CL	LCL	CL	LCL	CL	LCL	CL	LCL	CL	LCL	CL
Capiz	Corn			168	140	354	165	398	194	435	218	479	248	553	297	621	336	641	356	677	392	703	417	728	442	736	476	737	482	738	487
	Palay			168	168	354	198	398	232	435	261	479	298	553	356	621	407	641	427	677	474	703	500	728	530	736	571	737	578	738	584
	Rice			339		438		485		524		569		647		716		762		869		928		970		1,025		1,033		1,043	
Panitan	Corn	168	140			168	140	213	140	318	150	383	184	450	228	516	272	561	302	641	356	663	378	689	403	722	437	728	442	729	448
	Palay	168	168			168	168	213	168	318	180	383	220	450	279	516	326	561	362	641	427	663	454	689	484	722	524	728	530	729	538
	Rice	339				338		372		416		469		548		608		655		742		824		893		981		970		979	
Dao	Corn	354	165	168	140			160	140	164	140	171	140	354	165	413	204	465	238	561	302	627	342	652	367	683	395	691	408	697	412
	Palay	354	198	168	168			160	168	164	168	171	168	354	198	413	244	465	285	561	362	627	410	652	440	683	478	691	487	697	494
	Rice	438		338				277		308		362		410		500		554		655		724		793		878		901		916	
Cuartero	Corn	398	194	213	140	160	140			158	140	165	140	255	140	369	174	420	209	516	272	583	316	635	350	666	381	675	389	681	395
	Palay	398	232	213	168	160	168			158	168	165	168	255	168	369	209	420	251	516	326	583	379	635	420	666	466	675	467	681	474
	Rice	485		377		277				262		316		393		454		508		608		678		747		839		855		870	
Bunting	Corn	435	218	318	150	164	140	158	140			161	140	171	140	339	155	391	189	487	253	546	393	620	339	655	370	661	375	666	381
	Palay	435	261	318	180	164	168	158	168			161	168	171	168	339	186	391	227	487	304	546	350	620	407	655	444	661	454	666	461
	Rice	524		416		308		262				284		361		424		477		578		639		716		801		824		839	
Dumarao	Corn	479	248	383	184	171	140	165	140	161	140			164	140	192	140	339	155	435	218	494	258	568	307	635	350	644	358	649	364
	Palay	479	298	383	220	171	168	165	168	161	168			164	168	192	168	339	186	435	262	494	310	568	368	635	420	644	430	649	437
	Rice	569		469		362		316		284				308		370		423		524		585		662		747		770		783	
Bitaogan	Corn	553	297	450	228	354	165	255	140	171	140	164	140			162	140	189	140	361	169	428	214	494	258	575	312	588	326	612	336
	Palay	553	356	450	279	354	198	255	168	171	168	164	168			162	168	189	168	361	253	428	257	494	310	575	362	588	391	612	403
	Rice	647		548		410		393		361		308				293		347		441		516		585		670		693		708	
Passi	Corn	612	336	516	272	413	204	369	174	339	155	192	140	162	140			180	140	234	140	361	169	435	218	516	272	539	287	553	297
	Palay	612	407	516	326	413	244	369	209	339	186	192	168	162	168			180	168	234	168	361	203	435	261	516	326	539	344	553	356
	Rice	716		608		500		454		424		370		293				284		385		447		524		608		631		647	
Duenas	Corn	641	356	561	302	465	238	420	209	391	189	339	155	189	140	180	140			198	140	276	140	383	184	472	243	487	253	502	263
	Palay	641	427	561	362	465	285	420	251	391	227	339	186	189	168	180	168			198	168	276	168	383	221	472	292	487	304	502	316
	Rice	762		655		554		508		477		423		347		284				338		400		470		562		578		595	
Pototan	Corn	677	392	641	356	561	302	516	272	487	253	435	218	361	169	234	140	198	140			162	140	192	140	369	174	391	189	406	199
	Palay	677	474	641	427	561	362	516	326	487	304	435	262	361	203	234	168	198	168			162	168	192	168	369	209	391	226	406	238
	Rice	869		762		655		608		578		524		416		385		338				293		370		454		427		492	
Lucena	Corn	703	417	663	378	627	342	583	316	546	292	494	258	428	214	361	169	276	140	162	140			163	140	255	140	297	145	339	155
	Palay	703	500	663	454	627	410	583	379	546	350	494	310	428	257	361	203	276	168	162	168			163	168	255	168	297	168	339	174
	Rice	928		824		724		678		639		588		516		447		400		293				300		393		408		424	
Sta. Barbara	Corn	728	442	689	403	652	367	635	350	620	339	568	307	494	258	435	218	383	184	192	140	163	140			166	140	168	140	170	140
	Palay	728	530	689	484	652	440	635	420	620	407	568	368	494	310	435	261	383	221	192	168	163	168			166	168	168	168	170	168
	Rice	970		893		793		747		716		662		585		524		470		370		300				323		339		354	
Jaro	Corn	736	476	722	437	683	398	666	381	655	370	635	350	575	312	516	272	472	243	369	174	255	140	166	140			156	140	158	140
	Palay	736	571	722	524	683	478	666	460	655	444	635	420	575	362	516	326	472	292	369	209	255	168	166	168			156	168	158	168
	Rice	1,025		981		878		839		801		747		670		608		562		454		393		323				246		262	
La Paz	Corn	737	482	728	442	691	406	675	389	661	375	644	358	588	326	539	287	487	253	391	189	297	145	168	140	156	140			156	140
	Palay	737	578	728	530	691	487	675	467	661	454	644	430	588	391	539	344	487	304	391	226	297	174	168	168	156	168			156	168
	Rice	1,033		970		901		855		824		770		693		631		578		497		408		339		246				246	
Iloilo	Corn	738	487	729	448	697	412	680	395	666	381	649	364	612	336	553	297	502	263	406	199	338	155	170	140	158	140	156	140		
	Palay	738	584	729	538	697	494	680	474	666	461	649	437	612	403	553	356	502	316	406	238	339	186	170	168	158	168	156	168		
	Rice	1,043		979		916		870		839		783		708		647		595		492		424		354		262		246			

a. LCL-Less than Carload, CL-Carload.
b. All shipments below 20 tons are charged as 20 tons.
Source: The Philippine Railway Company, Rules Governing Traffic, General Freight and Passenger Tariffs Freight Classification, Effective April 15, 1925 (Revised).

TABLE A-19

PUBLIC ROADS BY TYPE OF SURFACE MATERIALS USED, BY REGIONS, PHILIPPINES, 1966

	Region	Total		Earth[a]		Macadam[b]		Low-Type[c] Bituminous		High-Type[d] Bituminous		P. C. Concrete[e]		Miscellaneous[f] and Combination	
		National	Others[g]	National	Others[g]	National	Others[g]	National	Others[g]	National	Others[g]	National	Others[g]	National	Others[g]
		(kilometers)													
I	Manila	97	331	--	--	6	118	--	3	75	201	15	9	2	1
II	Ilocos	1,603	3,177	93	998	871	1,826	263	247	143	77	233	5	--	23
	Abra	136	304	17	120	85	174	4	2	28	8	--	--	--	--
	Ilocos Norte	219	644	8	176	141	408	17	29	53	28	1	2	--	--
	Ilocos Sur	186	679	--	196	36	410	15	73	22	--	112	--	--	--
	La Union	204	581	3	154	34	388	29	18	21	19	118	2	--	--
	Mt. Province	858	969	65	352	575	446	198	125	19	22	2	1	--	23
III	Cagayan Valley	1,072	2,134	70	698	753	1,377	136	30	77	19	33	2	2	8
	Cagayan	508	665	--	168	396	469	55	9	49	18	7	h/	--	--
	Isabela	314	1,102	1	400	261	682	46	15	--	--	6	--	--	6
	Nueva Vizcaya	188	275	39	59	81	210	21	5	28	1	19	--	--	--
	Batanes	61	92	30	71	15	16	14	1	--	--	1	2	2	2
IV	Central Luzon	1,701	6,539	80	1,621	503	4,123	459	574	304	168	353	49	2	3
	Bataan	164	208	--	35	40	84	103	86	2	--	19	3	--	--
	Bulacan	233	921	--	36	58	767	101	95	24	12	51	11	--	--
	Nueva Ecija	295	1,290	--	121	127	1,122	22	14	69	29	77	3	--	--
	Pampanga	246	946	15	595	63	212	36	75	62	39	69	25	--	--
	Pangasinan	367	2,037	10	622	169	1,264	60	73	59	76	69	2	h/	--
	Tarlac	176	638	19	112	21	409	38	102	36	10	61	5	2	--
	Zambales	220	499	36	100	25	265	99	129	52	2	7	--	--	3
V	Southern Tagalog	2,792	5,932	102	1,249	1,415	2,804	852	849	280	682	143	308	1	41
	Batangas	330	1,068	2	207	63	684	261	170	4	2	h/	5	--	--
	Cavite	231	432	19	88	49	202	95	138	26	3	43	--	--	--
	Laguna	277	539	24	126	46	220	144	169	30	8	33	17	--	--
	Marinduque	129	232	--	29	91	181	38	19	--	--	--	--	--	3
	Mindoro Occidental	215	349	10	74	175	261	30	9	--	--	--	1	--	5
	Mindoro Oriental	250	391	14	68	195	297	40	13	--	--	--	--	--	12
	Palawan	411	803	5	534	375	254	31	9	--	--	--	--	h/	7
	Quezon	567	744	13	84	375	526	158	113	--	--	20	7	1	14
	Rizal	382	1,374	15	39	46	179	55	209	220	669	47	278	--	--
VI	Bicol	929	2,865	65	603	407	1,784	414	463	30	10	8	3	4	2
	Albay	161	1,044	--	354	53	506	96	184	6	--	5	1	h/	--
	Camarines Norte	143	376	--	30	61	265	78	80	1	--	2	--	--	--
	Camarines Sur	250	526	36	45	49	353	149	116	15	10	1	2	--	h/
	Catanduanes	158	277	16	83	116	188	25	6	1	--	--	--	--	--
	Masbate	142	360	7	73	105	282	23	5	7	--	--	h/	--	--
	Sorsogon	75	282	6	18	23	190	43	72	--	--	--	--	4	2

TABLE A-19 (Continued)

PUBLIC ROADS, BY TYPE OF SURFACE MATERIALS USED, BY REGIONS, PHILIPPINES, 1966

Region	Total		Earth[a]		Macadam[b]		Low-Type Bituminous[c]		High-Type Bituminous[d]		P. C. Concrete[e]		Miscellaneous[f] and Combination	
	National	Others[g]	National	Others[g]	National	Others[g]	National	Others[g]	National	Others[g]	National	Others[g]	National	Others[g]
	(kilometers)													
VII Western Visayas	2,022	5,662	45	1,180	1,235	3,911	344	369	231	115	164	82	2	3
Aklan	106	346	--	78	91	246	10	16	3	h/	1	6	--	--
Antique	188	572	5	245	145	289	34	35	5	3	--	1	--	--
Iloilo	363	1,494	5	125	113	1,220	134	90	58	38	54	21	--	--
Capiz	168	485	--	83	117	344	17	31	23	6	11	20	--	--
Negros Occidental	538	1,569	17	214	241	1,118	65	137	122	66	90	34	2	1
Negros Oriental	438	811	3	254	336	502	74	55	18	h/	7	--	--	--
Romblon	221	385	15	181	192	192	10	5	2	2	1	--	--	4
VIII Eastern Visayas	1,984	5,482	70	1,070	1,581	4,134	190	159	109	77	35	42	--	--
Bohol	380	1,879	32	482	273	1,354	60	42	16	--	h/	h/	--	--
Cebu	594	1,559	12	100	413	1,312	79	80	63	59	27	9	--	--
Leyte	565	1,261	26	425	470	787	36	14	26	11	7	25	--	--
Samar	444	783	--	63	425	681	15	23	4	7	1	8	--	--
IX S & W Mindanao	2,168	5,977	40	2,680	1,803	3,107	214	146	55	30	56	8	--	6
Cotabato	694	1,091	19	1,189	578	749	61	37	20	7	16	3	--	6
Davao	488	1,448	15	517	384	883	32	32	16	16	40	1	--	--
Sulu	145	265	6	145	98	110	42	7	--	--	--	2	--	--
Zamboanga del Norte	214	1,100	--	339	191	727	19	31	4	4	--	--	--	--
Zamboanga del Sur	627	1,173	--	490	552	638	60	39	15	3	--	2	--	h/
X N & E Mindanao	1,820	3,600	92	1,310	1,432	2,167	194	69	51	16	42	18	9	20
Agusan	292	432	1	103	259	320	13	2	--	--	20	8	--	--
Bukidnon	240	414	1	108	208	307	18	h/	14	--	--	--	--	--
Lanao	433	763	11	328	359	396	34	17	6	--	14	1	8	20
Misamis Occidental	139	821	--	285	104	513	15	7	20	16	--	--	--	--
Misamis Oriental	351	704	71	385	181	278	87	41	11	--	1	h/	--	--
Surigao	365	465	8	101	321	353	27	2	--	--	7	9	1	h/
Philippines	16,188	41,699	657	11,409	10,006	25,351	3,066	2,909	1,355	1,395	1,082	526	22	109

Note: This table rounded to nearest kilometer.
a/ Earth is plain earth without gravel.
b/ Macadam is composed of stone or gravel surface.
c/ Low-Type Bituminous is low grade asphalt.
d/ High-Type Bituminous is higher type asphalt with thicker surfacing.
e/ P. C. Concrete is Portland cement concrete surface.
f/ Miscellaneous and Combination is one-half asphalt and one-half concrete.
g/ Others include Provincial, Municipal and City roads.
h/ Less than 1 kilometer.
Source: Journal of Philippine Statistics, Vol. 18, Number 2, April to June, 1967, pp. 49 and 50.

TABLE A-20

TRUCKING RATES[a] BETWEEN MAJOR CITIES IN LUZON, PHILIPPINES, 1967

	Baguio	Batangas	Cabanatuan	Ilagan	Laoag	Legaspi	Lingayen	Lucena	Manila	Naga	Quezon City	San Fernando La Union	San Fernando Pampanga	Tarlac	Vigan
	(pesos per metric ton)														
Angeles	50.4	57.6	25.8	107.4	121.2	187.8	37.5	65.4	24.6	157.5	24.6	56.1	4.8	12.3	97.8
Aparri	127.2	211.5	143.7	56.7	66.6	341.7	151.8	219.3	178.5	311.4	178.5	135.9	158.7	158.4	90.0
Baguio		108.0	46.2	76.2	82.2	238.2	24.6	115.8	75.0	207.9	75.0	17.1	55.2	38.1	58.8
Balanga	72.6	70.2	38.4	125.4	141.6	200.4	57.9	78.0	37.2	170.1	37.2	76.5	17.4	32.7	118.2
Bargued	59.1	155.7	105.5	133.2	43.5	285.9	65.7	181.5	122.7	255.6	122.7	42.0	102.9	85.8	20.1
Bongui	102.0	198.6	136.5	98.7	19.8	328.8	108.6	206.4	165.6	248.5	165.6	84.9	145.8	128.7	43.2
Batangas	108.0		67.8	154.8	178.8	145.8	95.1	23.4	33.0	115.5	33.6	113.7	52.8	69.9	155.4
Bataan	108.0	2.1	67.8	154.8	178.8	147.9	95.1	25.5	33.0	117.6	33.6	113.7	52.8	69.9	155.4
Batang	14.1	110.7	49.8	96.3	68.1	240.9	20.7	148.5	77.7	210.6	47.7	3.0	57.9	40.8	44.7
Batombong	37.5	113.1	45.3	41.7	125.7	243.3	62.1	120.9	80.1	213.0	80.1	54.6	66.3	53.4	102.3
Bonton	43.8	151.8	84.0	70.2	87.0	282.0	68.4	159.6	118.8	251.7	118.8	52.5	99.0	81.9	63.0
Balan	273.0	180.6	232.8	319.8	343.8	34.8	280.1	157.2	198.0	65.1	197.4	278.7	217.8	234.9	320.4
Cabanatuan	46.2	67.8		87.0	116.7	198.0	38.4	75.6	34.8	167.7	34.8	51.6	21.0	14.7	93.3
Calamba	91.2	16.8	51.0	138.0	142.0	147.0	78.3	24.6	16.2	116.7	16.8	96.9	36.0	53.1	138.6
Carilling	34.8	80.7	25.2	99.9	100.2	210.9	14.4	88.5	47.7	180.6	47.7	32.1	27.9	10.8	73.8
Cardon	40.5	137.1	75.0	114.9	41.7	247.3	47.1	144.9	104.1	237.0	104.1	23.4	84.3	67.2	18.3
Cavite	84.6	33.6	44.4	131.4	155.4	165.6	71.7	43.2	9.6	124.2	11.4	90.3	29.4	46.5	132.0
Daet	180.3	87.9	140.1	227.1	251.1	57.9	187.4	64.5	105.3	27.6	104.7	186.0	125.1	142.2	227.7
Dagupan	21.0	96.9	34.8	100.2	85.2	227.1	3.6	104.7	63.9	196.8	63.9	20.1	44.1	27.0	61.8
Gapan	52.8	61.2	6.6	93.6	123.3	191.4	43.8	69.0	28.2	161.1	28.2	58.2	14.4	18.6	99.9
Gerona	33.6	74.4	17.1	90.6	104.4	204.6	26.1	82.2	41.4	174.3	41.4	39.3	21.6	4.5	81.0
Guinan	135.0	42.6	94.8	181.8	205.8	103.2	122.1	19.2	60.0	72.9	59.4	140.7	79.8	96.9	182.4
Iba	74.1	93.6	61.8	148.8	138.3	223.8	19.5	101.4	60.6	193.5	60.6	73.2	40.8	57.9	111.9
Infanta, Quezon	117.9	50.4	77.7	164.7	188.7	162.6	105.0	40.2	42.9	132.3	42.0	123.6	62.7	79.8	165.3
Kiangan	36.3	131.1	63.3	49.5	107.1	261.3	80.1	158.9	98.1	231.0	98.1	73.2	84.3	71.4	83.7
Laoag	82.2	178.8	116.7	115.5		309.0	88.8	186.6	145.8	278.7	145.8	65.1	126.0	108.9	23.4
Legaspi	238.2	145.8	198.0	285.0	309.0		225.3	122.4	163.2	30.3	162.6	243.9	183.0	200.1	285.6
Lemery	102.6	7.5	62.4	149.4	1,712.4	153.3	89.7	30.9	27.6	123.0	29.4	108.3	47.4	64.5	150.0
Libenan	202.8	110.4	162.6	249.6	273.6	35.4	189.9	87.0	127.8	6.6	127.2	208.5	147.6	164.7	250.2
Lizao	229.8	137.4	189.6	276.6	300.6	8.4	216.9	114.0	154.8	21.9	154.2	235.5	174.6	191.7	277.2
Lingayen	21.6	95.1	38.4	103.8	88.8	225.3		102.9	62.1	195.0	62.1	23.7	42.3	25.2	65.4
Lipa	101.2	7.8	60.0	147.0	171.0	141.6	87.3	19.2	25.2	111.3	25.8	105.9	45.0	62.1	147.6
Lubuagan	63.9	171.9	104.1	53.1	107.1	302.1	88.5	179.7	138.9	271.8	138.9	72.6	119.1	102.0	83.7
Lucena	115.8	23.4	75.6	162.6	186.6	122.4	102.9		40.8	92.1	40.2	121.5	60.6	77.7	163.2
Malolos	62.4	46.5	24.3	111.3	132.3	176.7	48.6	54.3	13.5	146.4	13.8	67.2	6.3	21.0	108.9
Manila	75.0	33.0	34.8	121.8	145.8	163.2	62.1	40.8		132.9	2.4	80.7	19.8	36.9	122.4
Naga	207.9	115.5	167.7	254.7	278.7	30.3	195.0	92.1	132.9		132.3	213.6	152.7	169.8	255.3
Nasugbu	105.9	20.7	65.7	152.7	176.7	186.5	93.0	44.1	30.9	136.2	31.5	111.6	50.7	67.8	153.3
Pasay	78.5	31.5	36.3	123.3	147.3	161.7	63.9	39.3	1.5	131.4	3.9	82.2	21.3	38.4	123.9
Pasig	77.4	31.2	37.2	124.2	148.2	161.4	64.5	39.0	3.3	131.1	2.4	83.1	22.2	39.3	124.8
Quezon City	75.0	33.6	34.8	121.8	145.8	162.6	62.1	40.2	2.4	132.3		80.7	19.8	36.9	122.4
Rosales, Pangasinan	24.6	85.8	22.5	86.7	95.4	216.0	17.1	93.6	52.8	185.7	52.8	30.3	33.0	12.9	72.0
San Carlos, Pangasinan	25.8	95.3	32.1	96.3	90.0	223.5	6.0	111.1	60.3	193.2	60.3	24.9	38.1	21.0	66.6
San Fernando, La Union	17.1	113.7	51.6	99.3	65.1	243.9	23.7	121.5	80.7	213.6	80.7		60.9	43.8	41.7
San Fernando, Pampanga	55.2	52.8	21.0	108.0	126.0	183.0	42.3	60.6	19.8	152.7	19.8	60.9		17.1	102.6
San Pablo, Laguna	100.2	15.3	60.0	177.0	171.0	138.2	87.3	13.8	25.2	105.9	25.8	105.9	45.0	62.1	147.6
Santa Cruz, Laguna	103.8	24.6	63.6	150.6	174.6	139.8	90.9	17.4	28.8	109.5	28.8	109.5	48.6	65.7	151.2
Silang	87.9	22.2	47.7	134.7	158.7	154.2	75.0	31.8	12.9	123.9	13.8	93.6	32.7	49.8	135.3
Sorsogon	254.1	161.7	213.9	300.9	324.9	17.4	241.2	138.3	179.1	46.2	178.5	259.8	198.9	216.0	301.5
Tagaytay	91.8	18.3	51.6	138.6	162.6	153.0	78.9	30.6	16.8	122.7	18.6	97.5	36.6	53.7	139.2
Tarlac	37.1	69.9	14.7	95.1	109.5	200.1	23.2	77.7	36.9	169.8	36.9	43.8	17.1		85.5
Tuguegarao	93.3	177.6	109.8	22.8	92.7	307.8	117.9	185.4	144.6	277.5	144.6	102.9	136.8	131.4	35.3
Vigan	58.8	155.4	93.3	133.2	23.4	285.6	65.4	163.2	122.4	255.3	122.4	41.7	102.6	85.5	

Note: Distances are based on the Esso Luzon Distance Chart.

a Rates are per metric ton based on 0.30 pesos per ton per kilometer for foodgrains (palay, rice, corn) in sacks, as computed from the Public Service Commission Rate Schedule.

TABLE A-21

TRUCKING RATES[a] BETWEEN MAJOR CITIES IN PANAY, PHILIPPINES, 1967

	Balasan	Barotac Nuevo	Calinog	Culasi	Ibajay	Iloilo	Janiuay	Miagao	Patnongon	Roxas	San Jose de Buenavista	Sara
						(pesos per metric ton)						
Balasan		29.70	28.20	64.20	47.70	39.90	32.70	50.10	73.80	16.80	66.90	9.60
Barotac Nuevo	29.70		12.60	63.60	57.00	10.20	7.80	22.20	44.70	33.90	37.80	20.10
Calinog	28.20	12.60		60.90	44.40	17.70	8.10	25.50	49.20	21.30	42.30	18.60
Culasi	64.20	63.60	60.90		16.50	54.60	66.00	42.60	18.90	51.60	25.80	67.80
Ibajay	47.70	57.00	44.40	16.50		62.10	52.50	59.10	35.40	35.10	42.30	51.30
Iloilo	39.90	10.20	17.70	54.60	62.10		9.60	12.00	35.70	39.00	28.80	30.30
Janiuay	32.70	7.80	8.10	60.00	52.50	9.60		17.40	41.10	29.40	34.20	23.10
Miagao	50.10	22.20	25.50	42.60	59.10	12.00	17.40		23.70	46.80	16.80	40.50
Patnongon	73.80	44.70	49.20	18.90	35.40	35.70	41.10	23.70		70.50	6.90	64.20
Roxas	16.80	33.90	21.30	51.60	35.10	39.00	29.40	46.80	70.50		63.60	5.40
San Jose de Buenavista	66.90	37.80	42.30	25.80	42.30	28.80	34.20	16.80	6.90	63.60		57.30
Sara	9.60	20.10	18.60	67.80	51.30	30.30	23.10	40.50	64.20	5.40	57.30	

Note: Distances are based on the Esso Panay Distance Chart.

a Rates are per metric ton based on 0.30 pesos per ton per kilometer for foodgrains (palay, rice, corn) in sacks, as computed from the Public Service Commission Rate Schedule.

TRUCKING RATES[a] BETWEEN MAJOR CI

	Abuyog	Allen	Basey	Baybay	Borongan	Calbayog	Carigara	Catarman
Abuyog		109.50	29.70	13.50	76.50	72.30	27.00	95.10
Allen	109.50		90.00	123.00	76.20	37.20	107.10	14.40
Basey	29.70	90.00		43.20	51.90	52.80	27.30	75.60
Baybay	13.50	123.00	43.20		90.00	85.80	29.70	108.60
Borongan	76.50	76.20	51.90	90.00		65.40	74.10	61.80
Calbayog	72.30	37.20	52.80	85.80	65.40		69.90	22.80
Carigara	27.00	107.10	27.30	29.70	74.10	69.90		92.70
Catarman	95.10	14.40	75.60	108.60	61.80	22.80	92.70	
Catbalogan	50.70	58.80	31.20	64.20	43.80	21.60	48.30	44.40
Gandara	63.30	46.20	43.80	76.80	56.40	9.00	60.90	31.80
Guiuan	63.60	111.60	33.90	77.10	35.40	86.70	61.20	97.20
Maasin	36.00	145.50	65.70	23.40	112.50	108.30	53.10	131.10
Ormoc City	26.70	123.60	43.80	13.20	90.60	86.40	16.50	109.20
Palompon	43.80	128.10	48.30	30.30	95.10	90.90	21.00	113.70
San Isidro	42.90	123.00	43.20	36.60	90.00	85.80	15.90	108.60
Sogod	35.40	144.90	65.10	22.50	111.90	107.70	52.20	130.50
Tacloban	17.70	91.80	12.00	31.20	58.80	54.60	15.30	77.40
Taft	62.10	61.80	42.60	75.60	14.40	51.00	59.70	47.40

Note: Distances are based on the Esso Leyte-Samar Distance Chart.
a Rates are per metric ton based on 0.30 pesos per ton per kilometer for foodgrains (palay, rice, corn

TABLE A-22

CITIES IN LEYTE AND SAMAR, PHILIPPINES 1967

Catbalogan	Gandara	Guiuan	Maasin	Ormoc City	Palompon	San Isidro	Sogod	Tacloban	Tatt
(pesos per metric ton)									
50.70	63.30	63.60	36.00	26.70	43.80	42.90	35.40	17.70	62.10
58.80	46.20	111.60	145.50	123.60	128.10	123.00	144.90	91.80	61.80
31.20	43.80	33.90	65.70	43.80	48.30	43.20	65.10	12.00	42.60
64.20	76.80	77.10	23.40	13.20	30.30	36.60	23.50	31.20	75.60
43.80	56.40	35.40	112.50	90.60	95.10	90.00	111.90	58.80	14.40
21.60	9.00	86.70	103.30	86.40	90.90	85.80	107.70	54.60	51.00
48.30	60.90	61.20	53.10	16.50	21.00	15.90	52.20	15.30	59.70
44.40	31.80	97.20	131.10	109.20	113.70	108.60	130.50	77.40	47.40
	12.60	65.10	86.70	64.80	69.30	64.20	86.10	33.00	29.40
12.60		77.70	99.30	77.10	81.90	76.80	98.70	45.60	42.00
65.10	77.70		99.60	77.70	82.20	77.10	99.00	45.90	49.80
86.70	99.30	99.60		36.60	53.70	60.00	17.70	53.70	98.10
64.80	77.40	77.70	36.60		17.10	23.40	35.70	31.80	76.20
69.30	81.90	82.20	53.70	17.10		27.90	52.80	36.30	80.70
64.20	76.80	77.10	60.00	23.40	27.90		59.10	31.20	75.60
86.10	98.70	99.00	17.70	35.70	52.80	59.10		53.10	97.50
33.00	45.60	45.90	53.70	31.80	36.30	31.20	53.10		44.40
29.40	42.00	49.80	98.10	76.20	80.70	75.60	97.50	44.40	

5) in sacks, as computed from the Public Service Commission Rate Schedule.

T3

TRUCKING RATES[a] BETWEE MAJOR

	Butuan	Cabadbaran	Cagayan	Cotabato	Datu Piang	Davao	Initao	Kolambug
Butuan		8.10	56.70	135.60	143.70	164.40	72.30	95.70
Cabadbaran	8.10		64.80	143.70	151 80	172.50	80.40	103.60
Cagayan	56.70	64.80		78.90	89 70	116.10	15.60	39.00
Cotabato	135.60	143.70	78.90		18.00	64.50	63.30	45.90
Datu Piang	143.70	151.80	89.70	18.00		60.30	74.10	56.70
Davao	164.40	172.50	116.10	64.50	60.30		120.60	103.20
Initao	72.30	80.40	15.60	63.30	74.10	120.60		23.40
Kolambugan	95.70	103.80	39.00	15.90	56.70	103.20	23.40	
Lianga	27.90	31.80	84.60	163.50	171.60	192.30	100.20	123.60
Malaybalay	79.20	87.30	30.90	68.70	64.50	85.20	46.50	69.90
Marawi	93.60	101.70	36.90	42 [illegible]	53.70	100.20	21.30	20.40
Oroquieta	144.30	152.40	87.60	77.10	87 90	134.40	72.00	48.60
Ozamis City	131.40	139.50	74.70	64.20	75.00	121.50	59.10	35.70
Pagadian	121.20	129.30	64.50	54.00	64.80	111.30	48.90	25.50
Santa Cruz	153.00	161.10	104.70	53.10	48.90	11.40	109.20	91.80
Surigao	36.90	28.80	93.60	172.50	180.60	201.30	109.20	132.60
Talakag	65.10	73.20	8.40	87.30	98.10	124.50	24.00	47 40
Zamboanga	198 90	207.00	142.20	131 70	142.50	189.00	126.60	103.20

Note: Distances are based on the Esso Mindanao Distance Chart.
a Rates are per metric ton based on 0.30 pesos per ton per kilometer for foodgrains (palay, rice, corn) in

TABLE A-23

CITIES IN MINDANAO, PHILIPPINES 1967

	Iligan	Valaybalay	Varaai	Oroquieta	Ozamis City	Pagadian	Santa Cruz	Surigao	Talakag	Zamboanga
	(pesos per metric ton)									
	27.90	79.20	93.60	144.30	131.40	121.20	153.00	36.90	65.10	198.90
	31.80	87.30	101.70	152.40	139.50	129.30	161.10	28.80	73.20	207.00
	84.60	30.90	36.90	87.60	74.70	64.50	104.70	93.60	8.40	142.20
	163.50	68.70	42.90	77.10	64.20	54.00	53.10	172.50	87.30	131.70
	171.60	64.50	53.70	87.90	75.00	64.80	48.90	180.60	98.10	142.50
	192.30	85.20	100.20	134.40	121.50	111.30	11.40	201.30	124.50	189.00
	100.20	46.50	21.30	72.00	59.10	48.90	109.20	109.20	24.00	126.60
	123.60	69.90	20.40	48.60	35.70	25.50	91.80	132.60	47.40	103.20
		107.10	121.50	172.20	159.30	149.10	180.90	60.60	93.00	226.80
	107.10		67.80	118.50	105.60	95.40	73.80	116.10	39.30	173.10
	121.50	67.80		69.00	56.10	45.90	88.80	130.50	45.30	123.60
	172.20	118.50	69.00		12.90	42.30	123.00	181.20	96.00	120.00
	159.30	105.60	56.10	12.90		29.40	110.10	168.30	83.10	107.10
	149.10	95.40	45.90	42.30	29.40		99.90	158.10	72.90	77.70
	180.90	73.80	88.80	123.00	110.10	99.90		189.90	113.10	177.60
	60.60	116.10	130.50	181.20	168.30	158.10	189.90		102.00	235.80
	93.00	39.30	45.30	96.00	83.10	72.90	113.10	102.00		150.60
	226.80	173.10	123.60	120.00	107.10	77.70	177.60	235.80	150.60	

sacks, as computed from the Public Service Commission Rate Schedule.

	Region and Province	Rice Mills: Cono No.	Rice Mills: Cono Capacity	Rice Mills: Kiskisan No.	Rice Mills: Kiskisan Capacity	Rice Mills: Total No	Rice Mills: Total Capacity	Corn Mills: Cono No.	Corn Mills: Cono Cap.
							(capacity is measured in		
II	Ilocos	15	2,121	737	24,654	782	26,775	--	
	Abra	--	--	31	1,050	31	1,050	--	
	Ilocos Norte	29	550	333	5,433	362	5,983	--	
	Ilocos Sur	2	70	152	6,293	154	6,363	--	
	La Union	12	1,401	143	7,454	155	8,855	--	
	Mt. Province	2	100	78	4,424	80	4,524	--	
III	Cagayan Valley	56	11,460	339	16,892	395	28,352	2	
	Cagayan	17	2,340	259	11,985	276	14,325	--	
	Isabela	35	8,920	57	3,235	92	12,155	2	
	Nueva Vizcaya	4	200	23	1,672	27	1,872	--	
	Batanes	--	--	--	--	--	--	--	
IV	Central Luzon	520	83,844	740	42,880	1,260	126,724	3	
	Bataan	38	4,520	21	635	59	5,155	--	
	Bulacan	125	15,578	54	2,630	179	18,208	--	
	Nueva Ecija	147	28,245	119	8,700	266	36,945	--	
	Pampanga	66	9,625	61	3,292	127	12,917	--	
	Pangasinan	62	8,616	250	15,134	312	23,750	2	
	Tarlac	62	14,760	138	7,354	200	22,114	--	
	Zambales	20	2,500	97	5,135	117	7,635	1	
V	Southern Tagalog	167	19,847	786	31,862	953	51,709	--	
	Batangas	6	950	128	6,731	134	7,681	--	
	Cavite	27	3,276	33	695	60	3,971	--	
	Laguna	48	1,843	68	1,451	116	6,294	--	
	Marinduque	2	112	42	1,377	44	1,489	--	
	Mindoro Occidental	2	450	57	2,305	59	2,755	--	
	Mindoro Oriental	16	3,890	77	6,330	93	10,220	--	
	Palawan	2	190	66	2,057	68	2,247	--	
	Quezon	28	3,532	287	10,058	315	13,590	--	
	Rizal	36	2,604	28	858	64	3,462	--	
VI	Bicol	65	8,183	395	19,954	460	28,137	2	
	Albay	19	2,445	79	3,677	98	6,122	1	
	Camarines Norte	9	450	24	985	33	1,435	--	
	Camarines Sur	31	4,738	196	10,748	227	15,486	--	
	Catanduanes	--	--	16	1,028	16	1,028	--	
	Masbate	--	--	27	1,328	27	1,328	1	
	Sorsogon	6	550	53	2,188	59	2,738	--	
VII	Western Visayas	103	11,794	674	27,494	777	39,288	23	1
	Aklan	6	150	38	1,289	44	1,439	--	
	Antique	8	580	75	4,721	83	5,301	--	
	Iloilo	51	6,896	372	12,830	423	19,726	1	
	Capiz	14	1,525	100	5,110	114	6,635	--	
	Negros Occidental	21	2,357	60	2,887	81	5,244	7	
	Negros Oriental	3	286	4	120	7	406	15	1
	Romblon	--	--	25	537	25	537	--	
VIII	Eastern Visayas	73	3,444	190	8,181	263	11,625	40	3
	Bohol	21	1,389	37	1,224	61	2,613	2	
	Cebu	--	--	2	65	2	65	36	3
	Leyte	32	1,263	75	3,697	107	4,960	1	
	Samar	17	792	76	3,195	93	3,987	1	
IX	S. & W. Mindanao	39	5,358	287	15,368	326	20,726	47	1
	Cotabato	20	4,150	243	13,036	263	17,186	6	
	Davao	7	188	16	950	23	1,138	35	1
	Sulu	5	450	7	320	12	770	--	
	Zamboanga del Norte	4	320	10	486	14	806	--	
	Zamboanga del Sur	3	250	11	576	14	826	6	
X	N. & E. Mindanao	21	1,359	67	3,383	88	4,742	40	2
	Agusan	3	220	1	30	4	250	13	1
	Bukidnon	1	50	10	420	11	470	12	
	Lanao	8	769	5	250	13	1,019	8	
	Misamis Occidental	3	75	26	1,450	29	1,525	--	
	Misamis Oriental	3	75	1	200	4	275	7	
	Surigao	3	170	24	1,033	27	1,203	--	
	Philippines	1,089	117,110	4,215	190,668	5,304	338,078	157	9

Source: Survey of Rice and Corn Mills in the Philippines (as of June 30, 1966) as compiled by the Rice and Corn Boa

TABLE A-24

TYPE FOR PROVINCES AND REGIONS, PHILIPPINES, 1966

	Corn Mills				Combined Rice and Corn Mills					
	Kiskisan		Total		Como		Kiskisan		Total	
...ts	No.	Capacity	No.	Capacity	No.	Capacity	No.	Capacity	No.	Capacity
...vans (46 kilos each) input per day of 12 hour operation)										
--	3	72	3	72	3	145	58	2,908	61	3,053
--	2	60	2	60	1	25	27	852	28	877
--	--	--	--	--	--	--	5	150	5	150
--	--	--	--	--	2	120	5	133	7	253
--	--	--	--	--	--	--	2	88	2	88
--	1	12	1	12	--	--	19	1,685	19	1,685
120	92	10,515	94	10,635	10	800	246	13,622	256	14,422
--	36	8,969	36	8,969	5	404	76	3,614	81	4,018
120	55	1,486	57	1,606	2	96	138	8,386	140	8,482
--	1	60	1	60	3	300	32	1,622	35	1,922
--	--	--	--	--	--	--	--	--	--	--
230	1	55	4	285	22	3,080	83	5,249	105	8,329
--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	12	1,415	6	230	18	1,645
--	--	--	--	--	3	500	32	2,205	35	2,705
--	--	--	--	--	--	--	--	--	--	--
150	--	--	2	150	5	765	38	2,329	43	3,094
--	1	55	1	55	2	400	7	485	9	885
80	--	--	1	80	--	--	--	--	--	--
--	2	80	2	80	4	330	67	3,765	71	4,095
--	2	80	2	80	--	--	21	2,029	21	2,029
--	--	--	--	--	2	250	--	--	2	250
--	--	--	--	--	1	50	--	--	1	50
--	--	--	--	--	--	--	3	100	3	100
--	--	--	--	--	--	--	1	50	1	50
--	--	--	--	--	--	--	21	1,015	21	1,015
--	--	--	--	--	--	--	5	230	5	230
--	--	--	--	--	--	--	16	341	16	341
--	--	--	--	--	1	30	--	--	1	30
200	24	955	26	1,155	11	1,130	66	4,405	77	5,535
50	11	460	12	510	--	--	16	1,412	16	1,412
--	--	--	--	--	--	--	10	385	10	385
--	2	80	2	80	4	710	27	1,655	31	2,365
--	--	--	--	--	--	--	--	--	--	--
150	11	415	12	565	7	420	11	653	18	1,073
--	--	--	--	--	--	--	2	300	2	300
1,484	21	931	44	2,415	29	2,392	1,[illegible]5	8,634	205	11,026
--	--	--	--	--	1	50	8	190	9	240
--	--	--	--	--	8	380	9	512	17	892
4	1	60	2	64	6	1,164	73	4,140	79	5,304
--	2	144	2	144	2	120	36	1,940	38	2,060
240	1	100	8	340	1	100	21	895	22	995
1,240	17	627	32	1,867	11	578	19	650	30	1,228
--	--	--	--	--	--	--	10	307	10	307
3,487	33	1,610	73	5,097	43	3,328	81	3,524	124	6,852
110	--	--	2	110	9	389	5	139	14	528
3,067	12	450	48	3,517	1	25	21	863	22	888
260	20	1,145	21	1,405	25	2,460	51	2,400	76	4,860
50	1	15	2	65	8	454	4	122	12	576
7,530	191	6,544	238	8,074	48	3,554	428	21,620	476	25,174
75	36	2,093	42	2,168	2	530	152	9,100	154	9,630
3,109	106	2,863	141	3,972	38	2,114	171	7,804	209	9,918
--	--	--	--	--	--	--	--	--	--	--
--	12	473	12	473	1	50	39	1,948	40	1,998
346	37	1,115	43	1,461	7	860	66	2,768	73	3,628
2,318	57	2,590	97	4,708	34	6,947	117	6,141	151	13,088
1,100	14	762	27	1,862	4	158	11	580	15	738
305	19	767	31	1,072	15	689	38	1,909	53	2,598
523	13	720	21	1,243	4	1,440	20	1,179	24	2,619
--	4	180	4	180	--	--	25	1,350	25	1,350
190	7	161	14	351	8	4,400	9	321	17	4,721
--	--	--	--	--	3	260	14	802	17	1,062
9,169	424	23,352	581	32,521	204	21,706	1,322	69,868	1,526	91,574

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TABLE A-25

APPARENT GRAIN STORAGE NEEDS, BY PROVINCE, 1975

Province	Apparent Under-Balance or (+) Over-Balance in Capacity by 1976	Apparent Additional Capacity Needed Between 1970 & 1975 (before depreciation)	Total Depreciation 1970-1975	Apparent Additional Capacity Needed Between 1970 & 1975 (after depreciation)	Total Apparent New Capacity Needed by 1975
	(metric tons)				
II Ilocos	8,740	1,809	3,428	5,237	13,977
Abra	3,727	336	234	570	4,297
Ilocos Norte	3,209	447	651	1,098	4,307
Ilocos Sur	(+ 1,411)	282	1,059	1,341	(70)
La Union	(+ 609)	259	842	1,101	492
Mt. Province	3,824	485	642	1,127	4,951
III Cagayan Valley	17,170	46,878	37,805	84,683	101,853
Batanes	163	136	8	144	307
Cagayan	31,168	16,252	8,312	24,564	55,732
Isabela	2,970	21,749	19,065	40,814	43,784
Nueva Viscaya	(+ 17,131)	8,741	10,420	19,161	2,030
IV Central Luzon	(+179,846)	87,291	127,056	214,347	34,501
Bataan	(+ 5,331)	2,169	3,300	5,469	138
Bulacan	(+ 92,620)	9,669	27,810	37,479	(55,141)
Nueva Ecija	(+ 19,378)	30,810	36,410	67,220	47,842
Pampanga	(+ 72,698)	10,639	25,024	35,663	(37,035)
Pangasinan	(+ 6,087)	15,885	18,560	34,445	28,358
Tarlac	7,672	15,100	14,545	29,645	37,317
Zambales	8,596	3,019	1,407	4,426	13,022
V Southern Tagalog	15,759	16,881	19,787	36,668	52,427
Batangas	16,575	3,581	2,033	5,614	22,189
Cavite	1,469	2,088	2,533	4,621	6,090
Laguna	7,214	2,997	2,486	5,483	12,697
Marinduque	1,173	369	265	634	1,807
Mindoro Occidental	(+ 5,791)	852	2,228	3,080	(2,711)
Mindoro Oriental	6,697	2,196	1,642	3,838	10,535
Palawan	2,291	834	703	1,537	3,828
Quezon	5,559	2,411	2,189	4,600	10,159
Rizal	(+ 19,428)	1,553	5,708	7,261	(12,167)

VI	Bicol	35,729	10,872	11,634	22,506	58,235
	Albay	7,127	2,683	3,221	5,904	13,031
	Camarines Norte	(+ 3,779)	608	1,751	2,359	(1,420)
	Camarines Sur	18,792	4,696	4,496	9,192	27,984
	Catanduanes	4,337	748	430	1,178	5,515
	Masbate	7,121	1,195	563	1,758	8,879
	Sorsogon	2,131	942	1,173	2,115	4,246
VII	Western Visayas	(+ 10,729)	10,186	24,055	34,241	23,512
	Aklan	5,111	472	160	632	5,743
	Antique	6,963 b/	701	436	1,137	8,100
	Capiz	2,936	1,441	2,694	4,135	7,071
	Iloilo	(+ 21,478)	3,622	12,469	16,091	(5,387)
	Negros Occidental	(+ 16,237)	1,912	7,288	9,200	(7,037)
	Negros Oriental	10,157 b/	1,805	774	2,579	12,736
	Romblon	1,819	233	234	467	2,286
VIII	Eastern Visayas	8,403	7,059	11,928	18,987	27,390
	Bohol	13,223 b/	1,542	414	1,956	15,179
	Cebu	(+ 19,600)	2,415	6,600	9,015	(10,585)
	Leyte	10,738	1,943	2,760	4,703	15,441
	Samar	4,042	1,159	2,154	3,313	7,355
IX	S & W Mindanao	12,849	47,067	48,233	95,300	108,149
	Cotabato	(+ 32,657)	23,934	35,059	58,993	26,336
	Davao	15,449 a/	11,768	4,063	15,831	31,280
	Sulu	9,315	1,859	391	2,250	11,565
	Zamboanga Norte	5,913	1,773	1,471	3,249	9,162
	Zamboanga Sur	14,829	7,728	7,249	14,977	29,806
X	N & E Mindanao	9,279	7,241	10,155	17,396	26,675
	Agusan	3,531	806	633	1,439	4,970
	Bukidnon	8,085 b/	1,241	406	1,647	9,732
	Lanao	(+ 1,938)	2,468	4,613	7,081	5,143
	Misamis Occidental	1,911	382	273	655	2,566
	Misamis Oriental	5,027	1,659	1,650	3,309	8,336
	Surigao	(+ 7,337)	685	2,580	3,265	(4,072)
	Philippines	(+ 82,646)	235,284	294,081	529,365	446,719

a/ A discussion as to how this estimate was obtained is presented in the text.
b/ Actual deficit is probably considerably less than apparent deficit, due to under-reporting of existing facilities.