THE REPUBLIC OF THE PHILIPPINES

FEASIBILITY REPORT
ON
THE GRAIN TERMINAL CONSTRUCTION PROJECTS
IN
MANILA AND CEBU

MAIN REPORT

MAY 1977

JAPAN INTERNATIONAL COOPERATION AGENCY

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FOREWORD

In response to the request from the Government of the Philippines, the Government of Japan decided to undertake a feasibility study on a grains terminal construction project in Manila and Cebu. Japan International Cooperation Agency(JICA) carried out the study.

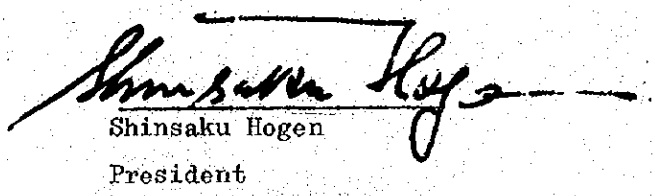
The Agency dispatched a survey team consisting of twelve experts, headed by Mr. Toyokazu Kitagawa, Managing Director of Nisshin Engineering Co., Ltd. to the Philippines from November 14 to December 23, 1976.

The Republic of the Philippines imports year by year some amount of wheat which is not produced domestically and the Government developed a plan for construction of grains terminals in several locations throughout the country, aiming at enhancing an efficient handling of imported wheat as well as improving the marketing of other grains. Present survey covers the sites in Manila and Cebu based on the request by the National Grains Authority.

It is my great pleasure if this report proves to be of value to promote the construction of grains terminal and also to contribute to improve grains marketing in the Philippines.

Finally, I wish to take this opportunity to express my heartful gratitude to the officials concerned of the Government of the Philippines and Embassy of Japan in Manila for the wholehearted support and cooperation extended to the team throughout the survey period.

May 1977



Shinsaku Hogen
President
Japan International Cooperation
Agency
Tokyo, Japan

LETTER OF TRANSMITTAL

Mr. Shinsaku Hogen
President
Japan International Cooperation Agency
Tokyo, Japan

Dear Sir,

We have the pleasure of submitting herewith our final feasibility report in compliance with the commission by your esteemed agency for the survey activities concerning the Republic of the Philippines Grain Terminal Construction Project.

The survey work for this project was carried out on the sites from November 14 to December 23, 1976 by the survey team consisting of 12 members. The work was practiced in order to determine the scale of the grain terminal through discussions with the officials of the Philippine National Grains Authority (NGA) on the project and the field investigation of the grain distribution trends in the areas surrounding the proposed sites and the handling of grain imports at the concerned ports, and upon accomplishing the geological survey of the proposed sites, the construction plans have been brought to a conclusion.

The views and comments of the NGA and the Project Advisory Committee were included in the draft report of the project and these have also been reflected in the final report.

It is our sincere hope that this report will contribute to the construction of grain terminals in Manila and Cebu, and that it will also be of value toward improving grain marketing systems in the Philippines.

In submitting this report, we wish to tender our best thanks to the NGA of the Philippines for its heartful assistance and cooperation. We wish to express our deep gratitude to Ministries concerned of Japan, Japan International Cooperation Agency, and Embassy of Japan in the Philippines for their generous support and leadership.

May, 1977

T. Kitagawa

Toyokazu Kitagawa
Leader, JICA Survey Team
Managing Director
Nisshin Engineering Co. Ltd.

THE REPUBLIC OF THE PHILIPPINES

FEASIBILITY REPORT
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MAIN REPORT

CONTENTS

SUMMARY AND CONCLUSION

The purpose of this feasibility study was to ascertain the feasibility, from technical, financial and economic aspects, of the grain terminal construction projects proposed for Manila and Cebu. It was made on the basis of relevant information and data available locally in order to determine therefrom the optimum scale for the project.

The feasibility study includes preliminary design, cost estimation and the construction plan for major facilities covered under the proposed Project, as well as a financial and economic evaluation of the Project. The results of the study and investigation are detailed in each chapter of the Report and in the annexes attached.

1. Manila District

(1) Distribution of principal grains

Rice: After milled in Luzon, the place of origin, rice is bagged and transported to consuming areas. Technical inspection is required for preservation of the quality of milled rice and prevention of kernel breakage in regards to bulk intake and silo storage. As a technical matter milled rice has not been included in the scope of this present study.

Wheat: Wheat is imported totally in required quantity and distributed in bulk. It is transferred from ship into barge in Manila Bay and carried to the flour mill. However, this method of unloading presents three problems as follows:

a) Port congestion arises as only three (3) anchorages are available for large vessels.

b) Big losses arise from spillage and excessive time required for transferring into barges.

c) As the result of above, marine transport costs become rather high.

Corn: Nearly all imported quantities of corn are unloaded in Manila, the bulk of which are distributed in the same condition as wheat. Bagged corn is unloaded at the quay of Manila Port and spillage arises during the time of baggage handling.

(2) Construction plan

a) The Project envisages construction of the Manila Grain Terminal at lot A on the reclaimed land of Manila International Port. It will be carried out for the purposes of planning suitable vessel assignments, reducing freight handling loss by quick unloading operations, providing cost-saving for marine transport and rationalizing distribution systems for bulk grain supply. The silo is designed for a total practical storage capacity of 26,000 tons; 15,000 tons for storage of wheat, 6,000 tons for bulk handling of wheat and 5,000 tons for feed grain. The wharf for large ocean-going vessels will be provided with one (1) high-efficient travelling pneumatic unloader unit, capable of handling 300 tons per hour.

b) Wheat consumption in the Manila District is estimated to continue its tendency of increasing each year in correspondence with population increases. In order to meet such an increasing demand, the Project envisages additional construction of a silo capable of storing 15,000 tons of wheat by 1986, including the additional installation of a pneumatic unloader with a handling capacity of 300 tons per hour.

(3) Work schedule

The total construction period required for completion of the work is scheduled for 15 months, excluding time for engineering service and preparatory works. Construction will start in 1978 and terminate in 1979. A two month test running period will be required after completion of work.

(4) Construction costs

Total construction costs as estimated on the price level as of end of 1976 amount to 103 million Pesos (13.8 million U.S. dollars). Of this it is estimated that 44.4 million Pesos (6 million U.S. dollars, or 42.7% of total costs) in foreign currency will be used, and 58.5 million Pesos (7.8 million U.S. dollars, or 57.3% of the total cost) in local currency will be used. Financial and economic evaluations for the Project are all based upon total construction costs as estimated above.

(5) Economic analysis

The expected benefits from completion of this Project are visibly quotable in figures, (such as reduced spoilage and spillage of grains by storage in silo, lowered costs of marine transport through improving freight handling systems and the efficient use of barges). The cumulative 30-year net benefit is estimated to reach 233 million Pesos.

Economic analysis for the Project has been made by calculation for the internal rate of return on the basis of 50-year durable service-life for building, and 20-years for equipment. The internal rate of return thus calculated indicates 11.7%, which should prove to be economically appropriate if other hidden benefits such as a stabilized supply of grains and improved social welfare are taken into account.

(6) Financial analysis

It is recommended that the project be operated on a commercial basis with service charges for handling, storage and delivery.

Import fees have been imposed to provide revenue to appropriate to expenses incurred in the storage of grain. On this basis, it is estimated that the internal rate of return will be 14.4%

(7) Alternative studies

As alternatives to the proposed unloading equipment, comparative studies have been made on floating-type, glove-type and marine-leg type elevators. However, compared with the facilities proposed under the Project, all of these alternatives are less profitable and less advisable as a means of solving port congestion.

Moreover, the storage of bagged grains in warehouses has been taken up as an alternative method for comparison with storage in silos. And, results reveal the supremacy of silo for general purposes.

2. Cebu District

(1) Distribution trneds for principal grains

Corn is the principal grain in this district, accounting for about 75% of total distribution. Cebu is noted as the processing center of corn, of which about 82% is processed into corn grits. About two-thirds of the corn grits processed in Cebu are locally consumed and the remaining one-third are transferred to other regions.

Major grains unloaded at the port of Cebu are already packed in bags and carried by truck to widely dispersed warehouses. Evidently, there is a high rate of loss from inefficient handling as well as due to deficiencies in both properties and number of warehouses.

(2) Construction plan

a) The Project proposes the construction of the Cebu Grain Terminal at a site located at the north-east end of the city port. The purpose is mainly to construct a buffer

stock silo to secure supply and to stabilize grain prices. However, it will also serve as a bulk handling facility for improving grain distribution systems and minimizing the loss of grains through handling. A processing plant for corn grits is also included in the construction plan. The silo is designed for a 10,000 ton practical storage capacity. For the unloading facility one (1) fixed type pneumatic unloader unit, designed with a highly efficient 150-ton per-hour capacity will be constructed on the wharf for ships serving domestic routes.

The Project also calls for the construction of a corn-grit plant with a monthly 2,000-ton processing capacity neat the grain terminal in order to save transport costs.

b) The continuing tendency toward increase of corn storage in the proposed grain terminal is forecasted with increasing demand for corn in Cebu. In order to cope with this situation a future plan has been made for construction of an additional silo with a practical storage capacity of 4,000-tons by 1990.

(3) Work schedule

Same as that for the Project being proposed in Manila.

(4) Construction costs

The total construction costs as estimated based on price levels at the end of 1976 amount to 49 million Pesos (6.6 million U.S. dollars). Of this it is estimated that 22 million Pesos (2.9 million U.S. dollars, or 44.9% of total costs) in foreign currency will be used, and 27 million Pesos (3.7 million U.S. dollars, or 55.1% of the total cost) in local currency will be used. Financial and economic evaluations for the Project are all based upon total construction costs as estimated above.

(5) Economic analysis

Expected benefits from implementation of the Project are visibly quotable in figures (such as reducing spoilage and spillage from improved storage and handling systems, transport-cost savings, as well as added value from grits processing). Net benefits in 30 years from the Project are estimated at a cumulative total of 113 million Pesos. The internal rate of return for the project is calculated at 11.1%, which will fully prove to be economical if, as is the case of the Manila Project, some other hidden benefits are taken into account.

(6) Financial analysis

Financial analysis has been made on a basis similar to that used for the Manila project with calculations also having been made to include charges for corn grit processing. Import fees, however, will not be a factor in the Cebu Project. On this basis, the financial internal rate of return is estimated to be 6.8%. As the silos to be constructed in Cebu are to serve mainly as bulk storage facilities for supply and price stabilization, they will have to be made larger than commercial size. Consequently, increased construction costs will have to be taken into account.

(7) Alternative study

To evaluate the method of storing grains into warehouse by fork-lift or pallet following the present method of unloading and transporting grain in bags, an alternative study was made. Results showed, however, that compared with the proposed silo storage method, the alternative method is of far less profitable and unsuitable as a system for the bulk-supply of grains proposed for the future.

3. Recommendations

(1) Operation of grain terminals

The grain terminals to be constructed under the Project will be managed and operated under direct supervision of NGA as the independent profit unit within jurisdiction of NGA. Managerial and supervisory personnel should be selected from among the NGA's staff or other able experts designated by NGA.

(2) Implementation of the Project

a) Time for completion of the Project is scheduled for less than 15 months. In order to make sure that the time schedule is maintained, NGA should retain a general engineering consultant fully experienced in this specific area of engineering, who should be participate in final-design approval, selection of an eligible contractor, field supervision and test running the initial operation.

b) In order to promote implementation of the Project, the construction project team should be organized mainly by an NGA work force at the initial stage of the Project.

c) Prior to commencing operations for the final stage of the Project, a management team should be organized to train staff for terminal operations.

d) Advanced arrangements should be made by NGA as a separate project, for construction of a wharf for large-size oceangoing vessels at its proposed site and for reinforcement of the existing quays.

4. Conclusion

The projects being proposed in Manila and Cebu are considered as essential for improving handling efficiency for the distribution of grains as well as for stabilizing of supply and prices in these regions. As stated earlier, the results of this survey reveal the feasibility of the Project from technical, financial and economic stand points. It is, therefore, considered advisable that the Projects should be implemented as drafted in this Report and necessary measures for implementation should be taken as promptly as possible.

5. Appendix (Planned facilities)

(1) Capacity specification

		Phase I Plan		Phase II Plan	
No.	Items	Manila	Cebu	Manila	Cebu
1	Max. storage capacity of silo	33,976 T	12,276 T	17,248 T	5,000 T
	Practical storage capacity of silo	26,000 T	10,000 T	15,000 T	4,000 T
2	Unloader capacity	300 T/H	150 T/H	300 T/H	-
3	Loading capacity of barge (Bulk)	300 T/H	-	300 T/H	-
4	Discharge-conveying capacity (Bulk)	100 T/H x 3	60 T/H x 2	100 T/H x 3	-
5	Delivery capacity (Bagged)	20 T/H	40 T/H	-	-
6	Warehouse srorage capacity (based on bags)	360 T at average	930 T at average	-	-
7	Corn-grit plant	-	4 T/H	-	-
	Target year of completion	Year end of '79	Year end of '79	Year end of '86	Year end of '90

(2) Construction work schedule

a)	Final engineering and completion of tender documents:	6 months
b)	Tendering and award of contract:	4 months
c)	Civil work, erection of facilities and installation of machinery and equipment:	15 months
d)	Test running:	2 months
	Total:	27 months

(3) Estimated construction costs

Manila

Note: Figures in ( ) are equivalents in U.S. $.

No.	Items	Step I Construction Cost		Step II Construction Cost	
		₱ (F. C.)	₱ (L. C.)	₱ (F. C.)	₱ (L. C.)
1	Silo structure	250,000 (33,600)	29,014,000 (3,894,600)		11,359,000 (1,524,700)
2	Other buildings	23,000 (3,100)	2,758,000 (370,200)		
3	Mechanical equipment of silo	14,650,000 (1,966,400)	2,665,000 (357,700)	13,503,000 (1,812,500)	2,332,000 (313,000)
4	Electrical equipment of silo	4,058,000 (544,700)	1,755,000 (235,600)	1,426,000 (191,400)	1,064,000 (142,800)
5	Accessory facilities	108,000 (14,500)	2,217,000 (297,500)		16,000 (2,100)
6	Spare parts	500,000 (67,100)			
7	Design & supervision services	1,267,000 (170,000)	171,000 (23,000)	1,078,000 (144,700	57,000 (7,600)
	Subtotal	20,856,000 (2,799,500)	38,580,000 (5,178,500)	16,007,000 (2,148,600)	14,828,000 (1,990,300)
8	Contingency (10%)	2,086,000 (280,000)	3,858,000 (517,800)	1,600,000 (214,800)	1,483,000 (199,100)
9	Engineering consulting fee	1,018,000 (136,600)	1,359,000 (182,500)	778,000 (104,500)	455,000 (61,100)
	Total	(a) 23,960,000 (3,216,100) (35.4%)	(b) 43,797,000 (5,878,800) (64.6%)	(c) 18,385,000 (2,467,900) (52.3%)	(d) 16,766,000 (2,250,500) (47.7%)
	Grand total (F.C. + L.C.)		67,757,000 (9,094,900)		35,151,000 (4,718,200)

F.C. (a) + (c)	₱ 42,345,000	US$ 5,684,000	41.1%
L.C. (b) + (d)	₱ 60,563,000	US$ 8,129,300	58.9%
Total	₱102,908,000	US$13,813,100	100.0%

Cebu

Note: Figures in ( ) are equivalents in U.S.$

No.	Items	Step I Construction Cost ₱ (F. C.)	Step I Construction Cost ₱ (L. C.)	Step II Construction Cost ₱ (F. C.)	Step II Construction Cost ₱ (L. C.)
1	Silo structure	250,000 (33,600)	11,955,000 (1,604,700)		3,673,000 (493,000)
2	Corn mill structure	53,000 (7,100)	1,161,000 (155,800)		
3	Other buildings (except silo & corn mill)		2,208,000 (296,400)		
4	Mechanical equipment of silo	8,019,000 (1,076,400)	1,467,000 (196,900)	250,000 (83,600)	93,000 (12,500)
5	Electrical equipment of silo	1,929,000 (258,900)	923,000 (123,900)	167,000 (22,400)	125,000 (16,800)
6	Mechanical equipment of corn mill	3,566,000 (478,700)	730,000 (98,000)		
7	Electrical equipment of corn mill	1,507,000 (202,300)	653,000 (87,700)		
8	Accessory facilities	108,000 (14,500)	1,833,000 (246,600)		15,000 (2,000)
9	Spare parts	400,000 (53,700)			
10	Design & supervision services	1,458,000 (195,700)	80,000 (10,700)	63,000 (8,500)	
	Subtotal	17,290,000 (2,320,800)	21,010,000 (2,820,000)	480,000 (64,400)	3,906,000 (524,300)
11	Contingency (10%)	1,729,000 (232,100)	2,101,000 (282,000)	48,000 (6,400)	391,000 (52,500)
12	Engineering consulting fee	1,137,000 (152,600)	778,000 (104,400)	35,000 (4,700)	184,000 (24,700)
	Total	(a) 20,156,000 (2,705,500) (45.8%)	(b) 23,889,000 (3,206,600) (54.2%)	(c) 563,000 (75,500) (11.2%)	(d) 4,481,000 (601,500) (88.8%)
	Grand total (F.C. + L.C.)		44,045,000 (5,912,100)		5,044,000 (677,000)

F.C. (a) + (c)	₱20,719,000	US$2,781,000	42.2%
L.C. (b) + (d)	₱28,370,000	US$3,808,100	57.8%
Total	₱49,089,000	US$6,589,100	100.0%

ABBREVIATIONS

BAECON	Bureau of Agricultural Economics
FAO	Food and Agriculture Organization of the United Nations
JICA	Japan International Cooperation Agency
NCSO	National Census and Statistics Office
NEDA	National Economic and Development Authority
NFAC	National Food & Agriculture Council
NGA	National Grains Authority
PAFMI	Philippine Association of Feed Millers
PNR	Philippine National Railway
IBRD	International Bank for Reconstruction and Development
ADB	Asian Development Bank

CONVERSION RATE

Currency Equivalent

₱ : Peso ₱ 1.00 = ¥40.00 = US$ 0.1342

$: US$ $ 1.00 = ₱ 7.45 = ¥ 298.0

¥ : YEN ¥ 1.00 = ₱ 2.50 = US$0.3356

Weights and Measures

Cavan : 1 cavan = 50 kg except particular indication

Long ton : 1 long ton = 1016 kg

Bushel : 1 Bu. = 25.4 kg

Kilo ton : 1 KT = 1000 metric ton

MEMBER LIST OF SURVEY TEAM

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Grain Terminal Construction Project in the Philippines.
Japan International Cooperation Agency (JICA)

MEMBER LIST OF PHILIPPINE GOVERNMENT COUNTER PARTS

Name	Position	Scope of Responsibility
Galo B. Garchitorena	Director Corporate Planning Group National Grains Authority	General coordination of Philippine counterpart in the whole study
Francisco Duban	Director Grains Infrastructure Directorate	Coordination of Philippines engineering counterpart and administrative support
Antonio dela Cruz	Senior Planning Officer Corporate Planning Group National Grains Authority	Distribution aspect
Veronica S. Ibay	Planning Officer II Corporate Planning Group National Grains Authority	Financial and economic analysis
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Nelson N. Magno	Civil Engineer Grains Infrastructure Directorate	Engineering aspect
Octavio A. Kalalo	Consulting Engineer O. A. Kalalo & Associates	Civil Engineering and architectural design
Emil Morales	Consulting Engineer O. A. Kalalo & Associates	Civil Engineering and architectural design

I INTRODUCTION

II PRODUCTION, DISTRIBUTION, PROCESSING AND CONSUMPTION OF THE GRAINS IN THE PHILIPPINES

I. Introduction

1.1 Background and Purpose of the Study

In the Philippines, a higher priority is given to agricultural development. Particular importance is laid on increasing rice and corn production, on which the people lives depend. Various steps are being taken aimed at multiple cropping, farmland expansion and increasing the yield per acreage.

In recent years, production of principal grains has been growing at a satisfactory pace, and there are definite prospects for self-sufficiency in the near future. On the other hand, the development of a distribution system presently lags behind increased production, and loss of materials is conspicuous at each stage after harvesting.

(1) Because of regional and seasonal unbalance between supply and demand grain, prices rise sharply due to shortages in consuming areas while they takes a sudden drop when there is a surplus in producing areas.

(2) A great deal of loss arises at each stage of distribution due to deficiency in facilities or methods of drying, handling, transport, storage and milling.

The Government of the Republic of the Philippines has been tackling those problems from a general viewpoint, taking every possible means toward solution. As a part of the governmental program, the National Grain Authority (N G A) has planned construction of large grain terminals for storage at eleven main ports throughout the country. The purposes are as follows:

(1) To increase the efficiency of grain distribution systems and stabilization of grain supply and prices by buffer stock.

(2) Buffer stock of emergencies.

(3) Minimizing loss by improving the efficiency of unloading and storage methods.

(4) Utilization of facilities for grain export.

With the perspective plan for construction of eleven grain terminals a preliminary survey (for a feasibility study) was previously conducted by N G A for the grain terminal projects in Manila and Cebu, which are noted as large consuming areas.

In conjunction with promoting these projects, the Government of the Philippines requested the Japanese Government to extend technical cooperation in making a feasibility study on the prospects of realization of the projects. In response to the request, the Japanese Government decided to enter into the feasibility study of the grain terminal projects in Manila and Cebu. The Japan International Cooperation Agency (JICA) dispatched its feasibility study team to the Philippines for the purpose of field survey for a period of 40 days from November 14 to December 23, 1976.

The purpose of this survey was to gain a definite understanding of future grain distribution following construction of the grain terminals in Manila and Cebu; to make sure of feasibility for the project from technical, financial and economic standpoints; and to design the optimum size of silo and its accompanying facilities.

1.2 Scope and Items of the Study

In accordance with the memorandum, as mutually agreed by both Governments the scope of work conducted by the team is defined as itemized hereunder:

(A) Local survey work

i) Present status and future prospect of production, marketing and distribution of principal grains in the Philippines.

ii) General understanding of the grain processing industry in the project areas and their environs.

iii) Investigation of consumption trends and international trade activities in Manila and the role of the Cebu area in the production and distribution of grains.

iv) Collection and analysis of basic data and information related to marketing, consumption, processing and distribution of principal grains.

v) General understanding on existing grain silos and warehouses in the project areas and their environs.

vi) General understanding of existing port facilities and present status of freight handling.

vii) General understanding of the present status of ground and marine transportation of principal grains.

viii) General understanding of the condition of the proposed site for construction of grain terminals in Manila and Cebu.

ix) Drilling tests and geological surveys of the proposed sites above.

x) Collection and analysis of basic data and information related to construction.

xi) Outlining construction plans.

xii) Estimation of construction costs and evaluation of economic benefits and effects.

(B) Homework

i) Preparation of the project plan and layout for construction and operation of grain terminal, which is well matched with local marketing needs in Manila and Cebu.

ii) Preparation of preliminary designs and flow-sheets for silo construction.

iii) Preparation of preliminary designs and specifications for mechanical, electrical and control systems.

iv) Cost estimation for construction, operation and maintenance.

v) Economic and financial analysis of grain terminal construction projects.

vi) Recommendations concerning project management and operation of the grain terminals.

The results of studies aforementioned are summarized in the Report, Annexes and Drawing Set.

II. PRODUCTION, DISTRIBUTION, PROCESSING AND CONSUMPTION OF GRAINS IN PHILIPPINES

2.1 Present Status and Forecast for Production Importation and Consumption of Staple Grains

2.1.1 Present status

Table 2-1

	Production				Importation			
	Palay	Corn	Soybeans	Grain Sorgum	Milled rice	Corn	Wheat	Grain sorgum
1971	5,343	2,005	1	17	369	83	588	0
1972	5,100	2,013	1	7	458	167	711	0
1973	4,415	1,831	1	7	306	100	531	0
1974	5,594	2,289	2	3	168	110	457	20
1975	5,660	2,568	1	2	152	121	442	41
1976	6,159	2,767		3			665	

(Unit: 1,000 Mt Source: NGA, BEACON NCSD)

(1) Rice

Because of typhoon damage and long drought experienced in 1972, chronic tendency of shortage in self-supply of rice turned worse and import of rice finally reached its peak of 450,000 Mt. Rice was imported mainly from Thailand, Taiwan and Pakistan.

The Government of the Republic of Philippines has so far been exerting its utmost effort toward increase of rice production. The achieved result is evidenced by the fact that rice production has been increased in recent years with resultant decrease in rice import. Therefore, self-sufficiency of rice is near at hand.

About 80 % of total population lives on rice. In 1975, milled rice consumption per capita was recorded at about 90 kilos. This is, however, a rather suppressive figure affected by various restraint factors. It is estimated to reach more than 110 kilos if the situation is eased. (See Annex 2-4, Annex 2-5 and 3-1, Table 2-1.)

(2) Corn

In Philippines, about 20 % of total population lives on corn by processing into corn grits. Those inhabitants are localized in some regions; conspicuously in Central Visayas around Cebu, followed by Mindanao and Eastern Visayas.

About 60 % of corn being produced nationwide is consumed as corn grits for staple food. Out of the remainder about 12 to 15 % is consumed as feed direct to livestock at farms, 10 to 12 % for formula feed at feed plants and 6 to 8 % for starch and glucose.

White corn accounts for 90 % of nation's total corn production and is processed into corn grits. Yellow corn is preferentially used for formula feed. Total corn import constitutes yellow corn to be used for feed to livestock.

Consumption of corn grits per capita is averaged at 22.4 kilos annually (34.5 kilos at recovery rate of 65 % when converted into corn grains). Contrary to the case of rice consumption, it is estimated that future consumption of corn grits may be decreased as per capita income increases or consumer price of rice becomes stabilized. (See Annex 2-4, Annex 2-5 and 4-1, Table 3-1.)

In the early half of the 1970's corn production was showing a stagnant trend. However, like in the case of increasing rice production, by the governmental strenuous effort the fruitful result is being achieved steadily. Consequently, there will be no more need for corn import in the near future.

(3) Wheat

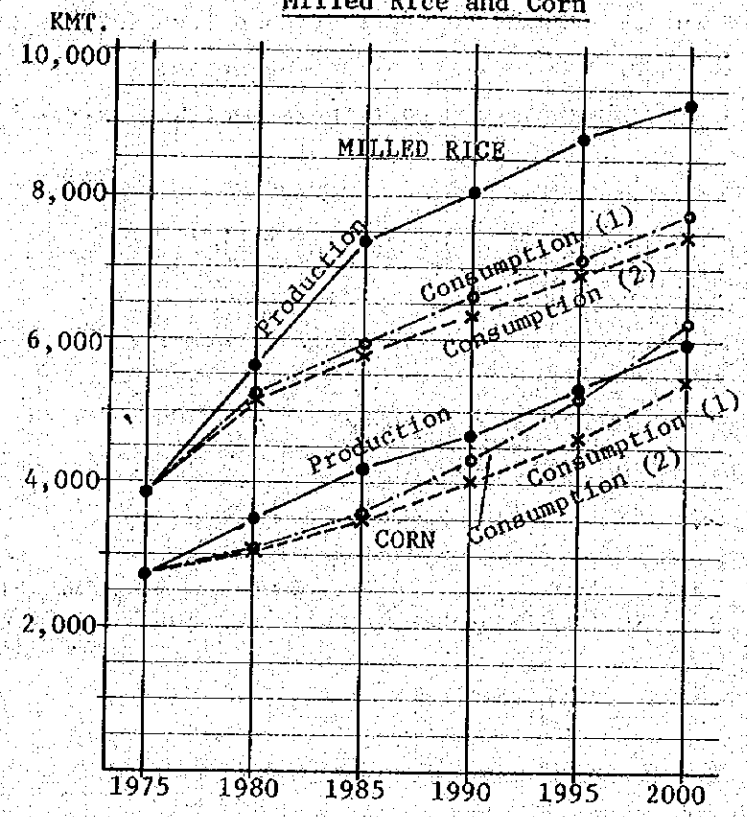
Wheat is scarecely produced locally in Philippines and is mostly imported from the U.S.A. and Canada. Total wheat import constitutes 70 % hard wheat and 30 % soft wheat. Annual consumption of wheat per capita exceeds about 10 kilos throughout the country while it reaches nearly double as much as the nationwide average in and around Manila (Annex 2-3). Demand for wheat is showing a gradually increasing tendency with income increases, and its import is under governmental control

(See 3.1 and Annex 2-5.)

2.1.2 Forecasts

The Government is striving for increased production of rice and corn, on which the people live, by implementation of various possible measures, and the achieved result has become remarkable in recent years.

Fig. 2-1 Forecast on Supply and Demand of Milled Rice and Corn



Production forecast of milled rice: Annex 2-1, Population forecast: Annex 1-5

Milled rice consumption (1): 110 kg per capita per annum

Milled rice consumption (2): 106 kg per capita per annum

Production forecast of corn: Annex 2-2

Corn consumption (1): Corn Grits, 22.4 kg per capita per annum. 4 % increase rate per annum for industrial and feed use

Corn consumption (2): Corn Grits, 20.0 kg per capita per annum. 5 % increase rate per annum for industrial and feed use

Fig. 2-1 above indicates forecast for future production and consumption of milled rice and corn. Difference between production and consumption as forecasted above may be indicated as a surplus for export.

When the goal for increased production of rice and corn is achieved as envisaged by the Government, it is estimated that future surplus at about 1,500,000 Mts of rice and at about 500,000 Mts of corn will become exportable.

However, in a future attempt to try to export such surplus products on a full-scale, there will not always be bright prospect with regard to whether there will be countries to export to and whether prices will be competitive.

2.1.3 Forecast on future demand and supply by regions and grain terminals proposed at 11 ports

The calculated result from production and consumption of rice and corn by regions for a model year of '85 is as shown in Annex 2-6 and summarized as shown in Table 2-2 below.

Table 2-2

	Rice		Corn		Proposed sites for 11 grain terminals
	Shortage	Surplus	Shortage	Surplus	
I ILocos					
II Cagayan Vally		***		**	Aparri
III Central Luzon		**			Mariveles
IV S. Tagalog M. Manila	***		**		Manila
V Bicol		*		*	Tabaco
VI W. Visayas		**			ILoilo
VII C. Visayas			**		Cebu
VIII E. Visayas					Tacloban
IX W. Mindanao			*		Zamboanga
X N.E. Mindanao		*	*		Cagayan D'Oro
XI S.E. Mindanao		**		***	Davao, G. Santos
XII S. Mindanao		*		**	

* : 50 ~ 250 KMT/year
** : 250 ~ 500 KMT/year
***: 500 KMT/year and over
Calculation for corn includes corn used for formula feed and starch glucose.
Characteristics of grain terminals at 11 ports can be made clear distinctly.

2.2 Present Status of Grain Processing and Marketing

2.2.1 Rice

(1) Rice crop drying

Rice has normally water content of 24 to 28 % at the time of harvest. Therefore, within 48 hours after being harvested, it must be dried to reduce moisture content down to about 18 % or so. It is furthermore, necessary for preservationof quality to dry immediately before storage or milling process until moisture content is reduced down to 14 % or so. In Philippines, nearly 95 % of total crop is spread over straw-mat, concrete floor or asphalt surface of road for solar drying. However, this may result in a greater percentage of loss or breakage. If cloudy weather continues, moisture contained in grain may cause it to be germinated and sometimes fermented thereafter. Spreading of grain on mats or the like can lead to over-drying and large losses through insects, rodents and birds, and sometimes a loss caused by wind or unexpected shower.

Once before, the Government encouraged use of a mechanical method instead of such solar drying method and, for this purpose, entrusted research and development of the small-sized indoor-type drier to the research institutes of universities. After completion of the machine, the Government appealed to the farmers the wide use of it among them all, but the effort did not bear fruit as expected. The reasons are as follows:

1) High fuel cost
2) The utilization of machine throughout the year is inevitably low because harvest season is limited only to a short period concentedly in a year.

3) Improved grade of palay may not necessarily insure saleability at correspondingly higher rate.

4) Difficulty for farmer to maintain and repair the machine.

After all, it is likely to be considered most efficient and economic to install a large-size drier machine at such a rice mill as may be capable of handling massive product. However, even in the case where the rice mill may be equipped with the machine, it would become difficult to introduce it especially into the region where the harvest period coincides with the dry season. Besides this, since people generally believe that natural drying method in the sun will surely help milling of rice into whiter, effort to prevail wide use of driers among farmers should require an incentive deal with them by saying that 'due premium may be payable to rice of superior quality'.

(2) Rice milling

Palay is composed of, in terms of percentage by weight at average endosperm of 71 to 72 %, rice bran of 7 to 8 % and husk of 20 to 22 %. Various machines can be used for rice milling to screen finally endosperm. In Philippines, there are four (4) different methods adopted for rice milling as follows:

1) Premitive method by manual handling

2) Use of Kiskisan Mill

3) Use of Cono Mill

4) Milling by use of modernized machine of large size

Statistical data below shows changing trend of milling methods for the '54 ~ '68 period in Philippines.

Table 2-3

	Manual handling	Kiskisan	Cono
'54 ~ '55	22,2 %	30,4 %	47,4 %
'60 ~ '61	12,8 %	29,7 %	57,5 %
'67 ~ '68	4,7 %	31,4 %	63,9 %

Source : Leonard Mears 'Rice economy of the Philippines' P. 127

Manual handling method is most simplified and of non-productivity. Recovery rate of milling is estimated only at about 50 %. This method was used by 20 % of total farmers throughout the nation in 1954 but gradually decreased to less than 4 % at present.

Today, rice is mostly milled by use of Kiskisan or Cono. Kiskisan is available only for one step process, by which recovery rate is estimated normally at 60 % or so. The mill is capable of milling 150 kg palay per hour at average. Total number of mills of this type in service for the '74 ~ '75 year amounts to 10,216 nationwide. Total milling capacity is estimated at 370,272 cavans (about 18,500 tons) every 12 hours. (See Annex 2-7).

Cono mill is diversified into various types depending upon appurtenants attached thereto. As compared with Kiskisan mill, it is of somewhat larger size because of its mechanism for 2-step process operation and it can improve recovery rate up to about 65 to 70 %, producing rice bran of better quality as by-produce from milling. Total number of Cono mills in operation amounts to 2,762 nationwide for the '74 ~ '75 period. Total milling capacity is estimated at 375,420 cavans (about 18,800 tons) every 12 hours. Normally, the machines of this type are concentrated for use, in the transit spot of grain assembling for the producing area or in the collecting or processing center for the consuming area. Milling capacity may be varied depending types of machines, ranging from 300 kg to 2,000 kg per hour but averaged at 570 kg, which is quite incomparable to Kiskisan.

The mill plant equipped with the machine of Cono type, in many instances, does not depend simply upon the income from the processing charge but rather makes good use of its milling performance efficiency as a advantageous medium in the distribution system for marketing. In other words, the plant is managed in pursuit of more profit through business activities as wholesaler or retailer, taking advantage of its functional requirement to collect palay for milling and deliver milled rice for consumption.

Besides Cono type mills, the large modernized rice-milling machines are imported but numbered only at about 20 units in total across the country. In fact, however, the regional system of distribution is not so adequately developed as to enable those large mills to be operated to their fullest capacity; most of the machines are being operated in undercapacity.

At present, it is said that the rice mill plants are in shortage in capacity throughout Philippines. Here is data available from NGA (See Annex 2-8) as an useful guiding index suggesting whether or not total rice milling capacity for the '74 ~ '75 period does fully meet total rice production in the corresponding period. According to the data, there are 25 areas in shortage of milling capacity, corresponding to 65,962 cavans (about 3,300 tons) per day on the 12-hour operation basis while there exist 61 areas with surplus capacity estimated at 440,375 cavans (about 22,000 tons) per day on the same operation hour basis. In reality, however, it is told that total milling capacity is still in shortage when viewed from nationwide aspect. This is evidenced by the fact that the Government encourages switching from Kiskisan to Cono of improved efficiency.

There are several reasons to justify such discrepancy between statistical outcome and actual situation. They are as follows:

1) Small villages still remain heavily dependent upon Kiskisan type mills. Furthermore, the machine is extremely timeworn and low efficient.

2) Even though they may be switched to Cono type mills, many of them may be allocated to unsuitable areas for collection of grain cargo. They may not be fully utilized for concentrated operation.

Incidentally, the following facts are pointed out as evidences to justify the general trend of mill shortage. Demand for rice mill operation should reach its highest peak during the harvest season. The real shortage of milling capacity is covered in such situations as evidenced by the following facts:

1) There is transfer of palay crop in a large quantity for milling from one area to its neighboring area with certain time lag in harvest season.

2) Palay produced in one remote area is transferred to another producing area situated on the way to the consuming area and milled there while it is in leisure season. For example, the surplus beyond milling capacity in the area of Cagayan Valley is transferred to the area in Central Luzon situated on the way to Manila and milled there.

(3) Distribution

Rice is left out of a farmer's hand when purchased in palay by trader called "middleman" in the producing area. Those traders may be classified into varied categories; some work for their own commercial purpose while the others act as agents on behalf of NGA or private millers. (See Annex 2-25.)

As a normal practice, rice is stocked in palay in the producing area until milled immediately before distributed to the consuming area. However, when the busiest harvest season comes in the region, because of shortage in milling capacity in one area, palay may often be transported over a long distance to another producing area, where there is a certain time lag for harvest, on the way to the consuming area. There are many cases being reported that palay is transported for milling between the producing area such as Cagayan Valley to some area of Central Luzon.

Therefore, it is in the consuming area that milled rice is kept in storage. From the viewpoint of keeping better quality, however, the shorter period for storage is preferable.

There is an customary practice on trade between the farmer and the middleman. The important check point on quality lies in moisture content. No moisture meters were being used among buyer and seller; only "biting" appeared to be a mutually accepted method of moisture determination.

Then, moisture content as agreed is taken into account for calculation of basic weight, for which payment is made at current market price. The Government sets the support price for palay at 1.10 Pesos per kilo. This level is guaranteed by NGA as the floor price and, therefore, serves as the basic standard for purchase price, strengthening farmer bargaining position to the trader.

However, in the case where a farmer is in so weak a position that he can not reserve so much crop in his hands or in the area, for example, like Mindanao where the NGA's procurement activities is not extensively carried on, it is told that rice is often purchased from a farmer at a lower price than the floor price.

According to standard grade set forth by NGA, it provides classification of palay into three grades; "Fancy" (equivalent to special grade), "Special" (fair average grade) and "Ordinary". Besides those, there is off grade named "Inferior". They are generally divided into five (5) different ranks depending upon foreign matters, moisture content and purity each grain contains. As a normal practice applicable to the NGA's purchasing activities, purchase price is calculated on the basis of basic weight as determined from purity and moisture content. (See Annex 2-9, Annex 2-17 and Annex 2-18.)

2.2.2 Corn

(1) White corn and yellow corn

About 20% of total population lives on corn at nationwide average and more than 70% lives on it in some specific areas. (See Annex 2-11.) When corn is used for food, it is finely milled into grits. White corn is suitable for this purpose, accounting for about 90% of total domestic production.

On the other hand, yellow corn is used for formula feed to livestock and poultry - especially, food for poultry feed because of its effect upon yolky color of egg.

Besides that, in view of high recovery rate it is of favorite use as material for starch processing, though it is industrialized only just

on a small scale. Domestic production of yellow corn does not cover total demand. Its shortage in supply depends upon import every year but such shortage still remains as a matter of fact.

After all, a large quantity of domestic white corn is used for feed to make up for shortage of yellow corn. The import trend of yellow corn in the past 5 years is as follows:

Table 2-4

	Quantity	Import from
1971	82,600 ton	THAILAND/U.S.A.
1972	167,611 ton	U.S.A.
1973	100,346 ton	U.S.A./THAILAND
1974	110,000 ton	U.S.A.
1975	121,231 ton	U.S.A./THAILAND

(Source: NGA)

(2) Grits processing of corn

Consumed percentage by uses of domestic corn product is estimated at 60% for food, 12 ~ 15% for livestock feed on farm, 10 ~ 12% for formula feed, 6 ~ 8% for starch and glucose and 5 ~ 12% for seed or others.

Corn is produced mainly in the south district of Mindanao. Cebu is the center of corn grits processing industry because people who live on corn are concentrated in Central Visayas, in which Cebu is situated, and the city has a long historical background as the marine base for commercial trade with the other districts.

Today, corn produced in Mindanao is transported by inter-island vessel to Cebu where most of the cargo is unloaded for the consumption or some are transshipped to other districts. The most noteworthy fact is that even from Mindanao the product is shipped by barge to Manila, where it is processed into formula feed. (See Annex 2-26.)

Corn is normally composed of kernel, peel and germ at the ratio of 70, 20 and 10% respectively at average. Corn grits process starts from peeling and then goes into grinding. Peel is utilized as corn bran for feed. In case of coarse grinding, germ is not separated from the other materials.

In this case, since it contains oil, the quality of the product may be deteriorated by rapid progress of oxidation therefrom. Normally, germ is seggregated for edible corn oil extraction. Then, processed product of corn may be divided into corn grits, fine bran, coarse bran and germ. When this is compared to rice crop as may be divided into milled rice, rice bran and husk, more attention should be paid to recovery rate of rice, since husk is not salable.

Furthermore, corn processing can not be done by hand pounding as is used for rice milling. It is, therefore, processed only by use of either 1-step grinder or 2-step roller. In 1975, 2,222 units of grinder and 980 units of roller are in service in the private sector throughout the country. Capacity of each grinder and roller is estimated, at average, to be 190 kg per hour for the former and 465 kg per hour for the latter. Recovery rate for the roller is estimated at 65% for grits, 11% for fine bran and 21% for coarse bran.

Corn grits is sold by mesh sizes. Mesh size has its significant influence upon regional market sales. Namely, people in each consuming area take their own favorite choice for mesh size. For instance, there are five (5) different mesh sizes ranging from 8 to 16. Choice of mesh size is varied by regions, such as 8 mesh in Manila, 10 mesh in Negros and 12 mesh in Cebu. Fine granular grits beyond 16 mesh is not served for food but sold for livestock feed by names such as "TIKTIK", "TAHOP" and "SUNGO", etc. (See Annex 2-10.)

(3) Feed processing of corn

Feed millers are divided largely into the small and medium-sized group processing formula feed made mainly of imported yellow corn with domestic corn, corn bran and rice bran, and the large-sized group processing formula feed made of imported corn, imported soybean meal, fish

meal and various animal protein feed.

Large-sized millers organize the Philippine Association of Feed Millers (PAFMI). Of all 11 member firms, 7 firms are situated in Manila. 10 out of the total 11 have their mill plants in Manila and Central Luzon. The main activity of the association is to advice or suggest the Government on the required import quota of yellow corn and to apply for the desired allotment of the quota combined with a report on actual status. Market share as agreed among the members is as per Annex 2-13.

Non-members of PAFMI are numbered at 75 firms throughout the country. 49 firms out of them all are situated in Manila or Central Luzon. NCA is prepared to allocate 20%, at maximum, of total corn import quotas for them, if it is deemed necessary, after taking into account their demand, and depending upon crop condition of domestic corn. Concentration of feed millers mainly in Manila or Central Luzon is because many of livestock raisers get together in and around Manila. In fact, 77% of the nation's total feed mill plants is operated in Manila and Central Luzon. (See Annex 2-12.)

Some of the PAFMI members, such as RFM, LFM, URC and GFM, operate flour mill as well as feed processing of corn. Most of the material depends solely upon import. Industry is endeavoring to rationalize its plant operation through mass production system; raw material, white corn grain, is procured in bulk from Mindanao by barge and, besides, each firm has its own silo for the storage of their own material. Those large-scaled feed suppliers are, therefore, of in entirely different position from small and medium-sized feed suppliers and cron grits millers. They are several large-scaled firms which are rather resembled closely to the flour milling industry as referred to in the following paragraph. Please see Annex 2-13 for producing capacity and material consumption of each member firm.

Since, at the present time, there are no bulk storage facilities for grain except warehouses at most of the mills of PAFMI members, imported corn in bulk are unloaded from ocean-going vessels into barges berthed alongside. The loaded barges carry corn to the major feed mill,

RFM, on the Pasig River, where they are pneumatically unloaded into storage silos. In this case, agreement exists between NGA and RFM on handling charges and methods. Imported corn, like that from Thailand, shipped in bag from the place of origin is mostly transported from the pier direct to the plant of each firm. (See Annex 2-10.)

(4) Distribution

Distribution of corn is resembled closely to the case of rice. Most of corn crop is stored originally on farms. According to Stock Position published in 1975, 44% of total corn and 41% of total rice crop is stored respectively on farms. (See Annex 2-15, Annex 2-16.)

Wholesalers and/or millers act as core players in the whole distribution system; many of them play dual roles of wholesaler and miller. Number of NGA-registered wholesalers dealing solely with corn totals to 376 as of December, 1974, most of which is operating their business mainly in Manila or Cebu, same as is the case of feed millers. (See Annex 2-19.)

Their most important business activity is, same as in the case of rice, to procure as much corn product as available in the producing area. They are endeavoring to procure it as much as they can through their own local buying station or local assembly agent. Those local assemblers are varied in their business function, same as stated earlier in case of rice; some do their business on behalf of private wholesale firms and the others act as the local agents for NGA. The point most peculiar to corn distribution system, as compared with rice distribution, lies in the fact that there exist specific distribution routes for feed processing in both Manila and Cebu. (See Annex 2-26.)

The firms of combined functions of both wholesaler and miller gain more advantage over the others, since they can make full use of their assembly network and storage facilities combined with their mill plants.

2.2.3 Wheat

Wheat depends entirely upon import. Yearly import of wheat is as follows:

Table 2-5

1969	552,546 MT	1973	530,558 MT
1970	494,857	1974	478,166
1971	588,160	1975	456,969
1972	711,788	1976*	665,671

* Including the amount of 101,250 LT due to arrive not later than December, 1976.

Source: 1969 ~ 1972 FIGURES FROM FOREIGN TRADE STATISTICS, NCSO
1973 ~ 1976 FIGURES FROM DGE, NGA, Nov., 1976

According to the Presidential Decree No. 726 dated June 5, 1975, import of required quantity of wheat was switched from the hand of the private miller to the Government. This means that NGA was authorized to make its own decision exclusively for annual import requirement of wheat. The reason behind this change was because of necessity for the government to control directly, the price of imported wheat which is able to substitute for rice and corn, so that major domestic grain, such as rice and corn, could be stabilized accordingly. At that time, interntional market prices on grain were so widely fluctuated, depending upon crop condition, that the private miller was not capable of running the risk to buy their wheat. Besides that, there was a demand for full import control by the Government so that the price stabilization policy of wheat flour could be implemented.

When the share of wheat flour is compared with that of other main foods such as rice or corn, the consumption of the product at annual average per capita is estimated at 11.1 kg, corresponding to nearly half as much as corn consumption and one-tenth of rice consumption. The share of wheat flour consumed in Manila district is overwhelmingly, greater; about one-fifth of that of rice and far greater than that of corn. This trend is likely to exercise its influence, more or less, over Central and Southern Luzon closer to Manila City. (See Annex 2-3.)

Bread ranks the top in all products of wheat flour. However, "loaf bread" takes only a very small share, nearly equal to cake or

noodle. (See Annex 2-20.)

There are eight (8) large millers across the nation which can supply total consumption of wheat flour. Import quota of wheat is assigned to each of them by NGA. The result of survey conducted by hearing about the sizes of their facilities is as summarized in the following Table 2-6.

Table 2-6

Company	Plant location	**Milling capacity/ month	***NGA's quotas/month			Share (%)
			HARD	SOFT	TTL	
RFM	MANILA	*24,000LT	8,000LT	2,000LT	10,000LT	(20.4)
GMC	CEBU	12,000	6,000	2,000	8,000	(16.3)
LFM	MANILA	12,000	3,500	1,500	5,000	(10.2)
WIM	MANILA	12,000	3,500	1,500	5,000	(10.2)
PMF	ILIGAN	12,000	5,000	2,000	7,000	(14.3)
PFM	HONDAGUA	12,000	3,000	1,000	4,000	(8.1)
URC	MANILA	12,000	5,000	2,000	7,000	(14.3)
PAFM	BATANGAS	10,000	2,000	1,000	3,000	(6.2)
Total		106,000	36,000	13,000	49,000	(100 %)

Note: * New plant capacity of 30,000 MT, not included.
** Estimated
*** Estimated

Abb. RFM = REPUBLIC FLOUR MILL CORP.
GMC = GENERAL MILLING CORP.
LFM = LIBERTY FLOUR MILLS
WIM = WELLINGTON INVESTMENT MFG CORP.
PMF = PILSBURY MINDANAO FLOUR MILLING CORP.
PFM = PHILIPPINE FLOUR MILLS
URC = UNIVERSAL ROBINA CORP.
PAFM = PACIFIC FLOUR MILLS

Import quotas of wheat are determined by NGA, depending upon the prevailing supply demand and situation. Therefore, the quotas are varied year after year. However, normally the ratio between soft and hard wheat is 1 to 3. Quota to be alloted to each miller is determined from actual record of import for the provious allocation and milling capacity installed at each plant after review of application by each miller for his required quantity. Usually, the share of such quota among those firms is nearly fixed each year. RFM and PMF of all listed above produce not only flour but also its bakery and noodle products like cake and macaroni. Major market for sales of wheat flour products is, needless to mention, in and around Manila. It is for this reason that the majority of producers operate their business in Manila. On the other hand, however, all the rest operating in other districts do not necessarily make it their major line of business to sell their product out into each local region. For instance, GMC in Cebu has its sales territory as shared by 40% in Manila, 40% in Visayas and 20% in Mindanao. Sales activities are still contered in Manila.

GMC, LFM, RFM and URC are producing livestock feed as well as wheat flour products. The flour mill companies in the Philippines initiated their business operation in 1959 and they are still historically new. Although wheat is interrelated to rice or corn in the category of main foods when viewed on consumption side, its industrial structure as a processing industry is quite different from that of rice and corn. Namely, the flour mill industry is one of the modernized plant industries making use of its independent facilities and sales system on a large scale, depending entirely upon import for procurement of raw material. Therefore, the industry is beyond comparison with the other processing industries for rice and corn. The features of flour mills in the Philippines are pointed out as follows:

(1) Each company is provided with a silo which is capable of storing 2 to 3-month material of its milling capacity. This storage capacity is bigger than that of the typical mills in Japan. This may be because of difference in the existing material purchasing system between the two nations.

(2) Stock of raw material in silo is fluctuated largely from full to nearly empty mainly because the arrival of the vessel carrying wheat is quite irregular, and partly because they are at one time forced to slow down and at another time fully engaged in their milling operation depending upon the market situation.

(3) The size of main silo bin is larger than 1,000 Mt without exception.

(4) Only few brands of wheat flour are available with each miller in the Philippines unlike the case in Japan that the mill of similar size has 40 to 50 different types of varieties for every use by purpose.

(5) For plant equipment the first-class machineries imported from European countries are used.

2.3 Present Status of Domestic Transport

2.3.1 Marine transport

Marine transport is of vital importance to economic and social activities of the inhabitants, especially in the country like the Philippines consisting of more than 7,000 large or small islands. As the regional pattern of production tends to be more and more specialized and the tempo in regional development is accelerated there is higher demand for improvement of the inter-archipelago transport system. To meet this demand, improvements must be planned at one time for interconnection between islands by ferry connection, including port and storage facilities and land access in the hinterland to ports. For transportation of local products over a short distance and at a low cost the wooden boat named Banca is very often utilized. Barges are widely used for transportation of sugar, grains, and other processed product.

In spite of importance in marine transportation, the existing system of coastal line transportation does not as yet reach the satisfactory level. One of those reasons is because of incompleteness of port facilities available for marine transportation on domestic coastal service. Indeed, in recent years the Government endeavored to improve some of the port facilities, such as Cagayan De Oro, General Santos, Davao and Cotabato, by financed funds available from either IBRD or ADB.

In fact, however, most of the existing ports are encountered with many problems; for instance, insufficiency of working area, time-worn function of cargo handling equipment, unorganized labor work and lack of maintenance. Most of noteworthy is the fact that the private-run port facilities are operated at more than 500 ports, where about two-third in tonnage of total cargo is handled at such facilities. Many private industries as exporters of sugar, copra, pineapple and mineral products own large piers or modernized wharfs equipped with capable handling system and handle the cargo more efficiently at cheaper cost as compared with the government-operated port facilities and warfs.

Total number of vessels as recorded in 1973 amounts to 1,851 of 183,531 gross tonnage. Of them all, commercial ships account for 24.6%, or 455 vessels, non-commercial ships for 15.1%, or 279 vessels and fishery boats for 60.3%, or 1,117 vessels. 11 vessels out of total commercial ships, or of 39,357 tonnage, are engaged in foreign service, and the remaining 444 vessels of 86,973 total tonnage are on domestic transport service. Ships on foreign service are sized at 5,000 to 10,000 tons while those on domestic line are varied largely from less than 100 tons to 3,000 tons at maximum.

According to the record on cargo in 1972, the total 7,150 thousand tons of cargo was shipped out through domestic line. The recorded maxium was shipments from the ports of Manila and Cebu as recorded at 656 thousand tons (9.18%) and 649 thousand tons (9.08%) respectively. The port of Cebu ranks the top in volume of unloaded cargo amounting to 1,241 thousand tons (17.36%), followed by the Iloilo Port recorded at 1,130 thousand tons (15.80%) and the Manila Port at 1,084 thousand tons (15.16%).

In all other small ports the total volume of unloading amounts to 2,737 thousand tons (38.28%), in addition to 296 thousand tons (4.15%) in the Zamboanga Port and 152 thousand tons (2.12%) in the Tacloban Port. The fact that the incoming cargo exceeds the outgoing in volume of cargo in all major ports explains well kind and nature of the goods transported on the domestic line. Most of the goods are farm products moving from the rural part to the urban center where most of major ports are situated.

In line with future increase of agricultural production and industrial specialization in regional areas, the marine transport system for domestic service will add more importance. The growing need for food in deficit areas has to be met by increased production in surplus areas such as Mindanao. As a result, this should require efficient operation of marine transportation for both input and output of farm products. In fact, however, about 40% of total vessels is aged over 25 years and many of small-sized vessels are of converted use from naval or military ships. Those vessels which have been playing principal roles are LSTs and other boats released from the U.S. Army and their sizes range from 500 tons to 1,000 tons.

Under the present situation, those vessels are noticeably characteristic of overloading and excessively long-time cruising. As the accumulated result of such deteriorated efficiency, both congestion and confusion are seen everywhere, restricting the movement cargo as well as slowing stevedoring and hampering rotation of vessels. Especially, this phenomenon is very after observed at the port where loading and unloading of cargo must be carried out offshore.

From the port development program formulated by the Philippine Government it is understood that its main purpose is to reduce transportation cost and make maximum use of the port facilities. The Government takes a forward-looking attitude toward solution of today's and tomorrow's problems by various improvement projects, such as construction of wharfs and storage facilities and dredging, embankment and reclamation works.

2.3.2 Inland transportation

It goes without saying that the efficient network of transport should be required for growth of national economy and improvement of people's living. In order to accomplish agricultural development and increased foods production as aimed at by the Government, it is absolutely necessary to establish the transportation system available for supply of fertilizer, seeds and other necessary material to the producing area and transportation of surplus farm products to the consuming

market.

In fact, however, in this country comprised of many isolated islands it may be extremely difficult to establish such efficient network. This is the main reason to justify the present insufficiency of transport service across the country, which results in cost increase to farm products, weakness in competitive power for export, furthermore, lagging in the progress of regional development.

With full recognition of importance involved in the transport problem, the Government naturally attaches special importance to the transport division of the total infrastructural development program. On this basis, development and construction are now under way for implementation of major traffic network projects which are likely to stimulate export and sightseeing industries.

Railway

The railway running in Luzon is operated by Philippine National Railway (PNR). The other one is Philippine Railway Corporation, a private company, operating the 117 kilometers railway between Iloilo and Roxas in Ponay Island. Since this is the privately owned line, it is not included in the governmental 4-year development plan. The 1,028 kilometers line operated by PNR is of single track, narrow gauge (42 inches), the 740 kilometers section of which is now in service. As of January 31, 1973, PNR holds 73 locomotives, 62 passenger cars, 29 diesel cars and 1,124 freight cars. According to the record of transportation in '72, total number of passengers amounts to 4.5 million persons and total freight amounts to 350,000 tons.

Besides the above, PNR owns and operates 24 passenger buses and 5 trucks. PNR suffered deficits of account in 1971 and 1972, due mainly to damages from collision, derailing accident and typhoon.

The plan aiming at improvement and rationalization of PNR is set up for the '74 ~ '77 period, envisaging introduction of new cars, improvement of security facilities and betterment of customers' service. The total investment fund is already budgeted with 42.73 million U.S.

dollars for foreign currency loan and 219.57 million Pesos for local currency portion, 3 million Pesos out of which will be financed from Japan in terms of material supplies.

The present extension plan envisages track extension to Cagayan and Sorsogon and extension of the commuting line between Manila and its neighboring localities. The 4-year development plan proposes construction of a 83 kilometers track route available for 12,500 to 150,000 commuters per day.

Road

Road transport take a major part of land transportation in the Philippines. At least, 80% of total cargo and 60% of total passengers depend upon traffic on the road. However, the pace of road improvement is still lagging behind increasing tempo of vehicles and demand for road traffic.

The annual extension rate of highway for the '62 ~ '71 period is averaged only at 4.0% of the total road network; 9.1% of the paved and 3.4% of the unpaved.

However, such rate of annual extension has been turning to upward tendency in recent years. For instance, the annual rate for the '67 ~ '69 period was increased at 4.0% while the same for the '69 ~ '71 period was stretched to 6.7%. It can be, therefore, said that the highway extension has been showing a much quicker tempo as compared with the rate, or only 2.0% or so, in a decade ago.

Total length of nationwide highway network, as of June 30, 1971, reaches 72,979 kilometers. However, a greater portion of the total network, or 79% of the total, constitutes of poorly laid gravel or soil road. Paved road accounts for 21% of the total but requires further improvement.

From the nationwide viewpoint, the density of road is only 1/4 kilometers per square kilometers in the plain areas across the country. Road distribution is unbalanced by regions; most densely distributed in

the developed region, especially in the metropolitan area of Manila while very sparsely distributed in the less developed region like Mindanao. The suburban area is in shortage of trafficable roads while the urban center like Manila is confronted conspicuously with traffic jams. Traffic capacity of road network must be expanded at this time to meet the increasing traffic volume.

Increase of transportation cost may arise as a result of influence of road conditions upon the agricultural sector of national economy. Freight rates are officially fixed by the Bureau of Transportation but they are not so orderly followed by people involved.

In the area, under improved and well-equipped traffic condition, like Cagayan Valley, the applicable freight rates are lower than the officially fixed while in other areas the prevailing rates exceed the official rates in many instances. Fertilizer, insectcides and seeds are highly priced in the area of poor road condition, and distribution of products is being hampered by such road condition.

The new road plan envisages, first of all, improvement and pavement of the existing roads for improvement of traffic efficiency and then new construction of highway network in conjunction with the agricultural and industrial development program so that efficient investment can be accomplished for development of port facilities.

For example, the target for the 4-year road development plan (1974 ~ 1977) includes improvement of the existing highway of 4,538 kilometers length, graded at the 2nd class, construction of graveled road and highway over 20,150 kilometers length and construction of bridges over 20,245 meters in total span.

There are large construction and development projects now under way on the nationwide scale, being assisted with financing by U.S. AID, IBRD, ADB and from Japan in terms of commodity loan. One example among them is the construction project of Pan Philippine Highway to run, north to south, from Cagayan to Southern Davao.

2.4 Governmental Role in Grain Storage and Distribution

2.4.1 Grain supply and price stabilization

Since grain harvest is seasonal while consumption is relatively constant with almost stabilized market demand. Ex-farm price tends to dip during harvest season and retail price tends to soar up during off-harvest season. Such seasonal price fluctuations has to be controlled as it is disincentive to farm productivity and economic burden on consumers, especially the people of low-income. From this point of view, it can be said that the NGA's planning for distribution of domestic and imported grain as well as its procurement activity is geared towards solving uch socio-economic problems.

The NGA's purchasing items in the domestic market cover rice, corn, grain sorghum and soybean available through its purchasing stations branched in every part of the country. Such governmental procurement is needed to carry out especially during the harvest season to insure farmers with a ready market for their produce at support prices. Besides that, locally procured and imported grains complementarily build up sufficient buffer stocks which must be injected into the market at the right time, place and volume.

Further effective measures are taken by implementation of the financing system under "Masagana 99" Plan and "Masaganang Maisan" Plan. The farmers who borrow this loan can have their optional choice either to request the Government to buy, at the supporting price, their crop previously offered as the deposit for the loan they borrowed or to make cash repayment for the loan by selling commercially with ordinary buyers. Therefore, the Government should establish their own grain procurement system so as to meet, at least, their farmer option as stated above. For implementation of the purchase plan either private rice mill or warehouse company is designated as the NGA's buying agents.

The NGA's support price on palay is P1.10 per kg while the ceiling price of milled rice is P2.10 per kg at retails for which quality standard is based upon "special", or fair average grade.

For corn, the support price is P0.9 per kg while for corn grits the retail ceiling price is P1.60 per kg. Both of support price and retail ceiling price for rice and corn have been raised four times since establishment of this control system in 1972. (See Annex 2-21, Annex 2-22.)

In case of institutional credit, the farmer is requested to deliver some portion of their produce equivalent to their production loan to the warehouse designated by NGA. In return to this delivery, he may receive, Quedan, warehouse receipt issued by the government (Negotiable Warehouse Receipt) and then have a cash payment in a rural bank. Through this transaction, the farmer has an obligation only to the money he borrowed for his grain deposit and has an option to sell his grain to the NGA or the commercial market at the government support price or prevailing market price whichever is higher. In other words, farmers are guaranteed, at least, at the support price level by the Government.

NGA, grain procurement agent of the Government, is responsible for storage and distribution of the purchased grain by use of the governmental fund. NGA will act as a sort of control valve to adjust the balance between supply and demand by effective intervention into market from time to time. In order to stabilize the consumer's price, NGA sets the retail ceiling price as a guideline of consumer price, below which release of NGA's stock is done into market. Under the conditions which NGA's intervention works in order, the ceiling price system can contribute to the stabilization of the general market. Actual selling prices from NGA to retailers for the '73 ~ '76 period are recorded as indicated in the attached Table. (See Annex 2-22.)

Besides the above, NGA's latent function of promoting the integrated growth and development of the grain industry is the authority to formulate and enforce appropriate rules and regulations. This power of authority was granted to NGA as the result of the powerful control by the Government over the rice and corn mill industry based on Republic Act No. 3013 (Nationalization of the rice and corn).

NGA is authorized to formulate rules and regulations pertaining to general management of the industry, supervise observation of those rules

and regulations and, if necessary, prosecute any violators. Formulated rules of conduct in the industry are zealously enforced, such as those on support and ceiling prices, weight and quality standards, price tags, milling grade, etc.

Besides, all the grain dealers are required to be registered to NGA, and all the persons engaged in grain trade are licensed by NGA, and registration and licensing is annually renewed.

As of 1974, the registered dealers amounts to 35,564 persons in nationwide total, of which wholesalers are numbered at 3,122 persons and retailers, at 27,811 persons. Corn dealers are composed of 1,137 wholesalers and 3,044 retailers. (See Annex 2-19, Annex 2-24.)

2.4.2 Import control

NGA imports grains, if necessary, to keep the demand and supply situation in balance. Efforts are being made, as the first and important goal, toward accomplishment of self-sufficiency in rice production, so that import of rice can be terminated as soonest as possible.

Once before 1970 self-sufficiency in rice was attained in this country but was failed due to flood damages experienced twice in 1971 and 1972. Since then, a large quantity of rice remained imported. More than 150,000 tons is still imported annually.

However, with progress of flood prevention measures being taken in every part of the country and expansion of irrigation system the self-sufficiency ratio in rice crop is being improved year after year. And, because of favorable weather in 1976 bumper crop can be expected for rice.

Major role of NGA in connection with import of grain may be classified into the following three (3) points:

(1) to decide when and how much, to import grain from foreign countries to cover the shortage of domestic supply.

(2) to distribute imported grain to the private millers according to the allotment prepared in advance.

(3) to collect information from all millers, as the data for checking current supply-demand situation, regarding the volume of grain for processing, production and sales record, inventory of both raw grain and its products, etc.

Import of wheat is expected to continue at a steady increase since wheat flour becomes very popular and takes root in people's eating habit. However, the rate of increase is really hard to estimate, in view of the fact that it at one time competes with domestic rice and is at another time correlated with each other mutually to cover shortage. In fact, the quantity of wheat imported in the past is showing irregular trend in its increase rate.

Until 1974, wheat was imported directly by Philippine Association of Flour Mill, which is organized by all flour millers, at its own timely decision on international grains market. However, the great amount of heavy buying for the U.S. grain by Russia, as a result of poor crop in the country, leads to widely-fluctuated international grain market. The private millers, therefore, found themselves financially incapable of buying wheat under such a situation, especially in the case of international skyrocketing grain market repeatedly happened after oil crisis. In addition to this, in the midst of lively arguement which demands for stockpile of farm products on worldwide scale, the Government of Philippines came to recognize the necessity that grain import should be shifted to the governmental control and, since that time, NGA as the governmental agency became responsible for buying grain on the international competitive basis by holding the open tender from time to time. Such purchase is made every month periodically by one tender for purchase of 40,000 to 50,000 tons. In many cases, it is purchased from either the U.S.A. or Canada, but rarely from Australia. Through the governmental control system, selling price to the millers is constantly fixed (₱1,705 = US$207 per long ton C&F, FO basis), even if world market price of wheat fluctuate frequently. For instance, the best offer from a trading company was at $138.00 per long ton, at time of the survey, on C&F, FO basis.

On the other hand, wholesale price of wheat in domestic market is also fixed by NGA as an ceiling one. (i.e. P66.00 per bag of 25 kg and current market price was P62.00 at time of the survey.) When market remains inactive and the price level comes down, it might be said that profitability of the miller should turn out to be unfavorable. The millers who have the plant operated on an inferior site condition, on the plant newly invested may be handicapped in many market respects, especially in prices. In fact, however, it appears that the gentlemen's agreement might be confidentially existed among the millers since there seldom occurs keen competition within the sales territory of the same product.

Imported corn is chiefly yellow corn for livestock feed and imported mostly from the U.S. and Thailand. Except in 1972, the annual total import has been on the slight increase showing the nearly stable trend. However, the final goal of the Government still remains unchanged toward accomplishment of self-sufficiency. (See 2.2.2.)

2.4.3 Post-harvest facilities program

With gradual increase of rice production as aimed at by various political measures, the next urgent need is to expand various facilities in the field of "post-harvest" of grain.

The post-harvest plan is added as a new part of the NGA's function, aiming at modernization processing and storage facilities, and distribution systems. Quantitative losses incurred during post-harvest operation is estimated roughly at 10 ~ 30%. Various studies are being made in search for most accurate loss ratio, but generally the range of losses are as follows; harvesting 1 ~ 3%; handling 2%; threshing 3 ~ 6%; drying 1 ~ 5%; storage 2 ~ 6%; milling 2 ~ 10%; or a total 10 ~ 30%.
Based on CY '74 ~ '75, palay production figure of 113 million cavans, it means on the low range of a nation's loss of 11.3 million cavans amounting to 562 million pesos. Same extent of effort as is being used for increased production of rice and corn will be necessary to minimize such big loss. Every possible means must be considered at each different stage during post-harvest operation.

From this point of view, introduction of mechanical threshers and driers to minimize losses at farm stage, the first stage prior to milling and storage operation, is imperative. On top of this, the success of the "High Yield Variety" (HYV) has all the more highlighted the crucial need to mechanize these operations. (Note: Growing period of HYV rice is shorter than that of ordinary one. Therefore, it may very often have to be harvested before dry season comes, so each grain contains comparatively more moisture than ordinary one owing to the shorter period for being solar dried.) Under the present condition that most of the farmers rely upon solar drying, it is inevitably sure that quality should get deteriorated in several months until the product reaches the consuming stage so much so that introduction of mechanical driers should be widely promoted among farmers in order to keep quality of grain good enough to be less deteriorated during the period of distribution.

In order to achieve this purpose, NGA has planned its long-term program (1976 ~ 1985) for encouraging the use of mechanical driers among farmers. This plans for achievement of the total 9,137 units of mechanical drier in use on farms and ultimately to meet the estimated requirements of 1,000 units in 1985.

2.4.4 Warehouse program

Accelerating production of rice in the recent years urge NGA to take prompt action for expansion of warehouse facilities. This is really an important plan for adjustment of demand and supply by carrying old crop stock over to off-crop season, as well as for stabilization of farm price of grain. In view of the fact that the existing capacity of warehouses cannot cope with the volume of locally procured grain and many of those are really antiquated and poorly maintained, NGA is now implementing the projects for new and additional construction of warehouses.

Total production of rice and corn for the '75 ~ '76 period is estimated at 194 million cavans, and that for the year 1985 is likely to reach 366 million cavans. On the other hand, accommodating capacity in the nation's total, even including the miller's private warehouses in addition to all commercial ones, is no more than 48.4 million cavans

(about 2.42 million tons) with only 4,258 warehouses in total. According to the data available from NGA, the warehouses of NGA's property are numbered at 63 capable of 3.5 million cavans (175,000 tons) and that on the rental basis but under substantial control of NGA is numbered at 322 with total capacity of 8.7 million cavans (about 435,000 tons). Privately owned warehouses are numbered at 3,481 in nationwide total capable of accommodating 25.9 million cavans (about 1.30 million tons). It is rather reasonable, however, to consider that the total number of private warehouse should not naturally include that of miller's and farmer's own warehouses but mainly count the commercial warehouses registered by NGA. Among them all, the number of warehouses actually serving for the NGA's activities is limited only to 10% of the total, or 19% of total capacity. (See Annex 2-23)

To make the matter worse, the warehouses available for NGA's purpose are not strategically located to effect economical operation. Circumstances forced NGA to rent warehouses located away from procurement or distribution center. As the result, transportation cost has been increased by 10 to 15% in general. Futhermore, storage fee is also showing an upward trend because of increasing requirement of storage space for other agricultural products such as sugar, copra, etc. NGA is now making effort for implementation of the 3-year warehouse construction plan, in order to increase the warehouse facilities whereever deemed effective for its operation. The plan is based upon assumption that NGA shall limit itself to own 10% only of total warehouse requirement would be adequate enough for price control operation. NGA has set the following three year warehousing target: FY 1975 ~'76 - 1.2 million cavans storage capacity; 1976 ~'77 - 1.7 million cavans of capacity; FY 1977 ~'78 - 1.5 million cavans of capacity. These sum up to 4.4 to 7.0 million cavans of additional storage capacity. Total sum of 140.4 million Pesos is budgeted for this construction project.

The initial year's goal was planned for construction of 30 warehouses, but actually 32 were constructed in nationwide total with total capacity of 1.33 million cavans (about 66,500 tons). The project is going on, therefore, at satisfactory paces. All those newly built warehouses are equipped with ventilation system to eliminate any damage and

loss caused by heat and mold and, at the same time, designed for complete protection from flood, bird and rat infestation.

Construction of such new warehouses will contribute greatly toward improvement of the present unfavourable condition in some area, in which NGA have to store their grain in schoolhouses, barracks, basements and even in the open field on several occasions.

Besides the above, NGA established Grains Center at five (5) local districts as well as the eight (8) main districts of the country. This is a sort of model center to promote modernization of all sectors of grain industry, collecting most ideal equipment and facilities. They are meant to spur the private sector to adopt similar modern facilities for storage, milling, drying, threshing, grading and research and laboratory equipment.

The Center is provided with a complete modernized system, in addition to the conventional flat type warehouse building, including Butler silo, Danish drier, milling machine, truck scale, conveyer system, various devices to prevent from insect infestation, and grading equipments, etc. The Center also serve as the technical information center for encouraging purpose of the private industry besides other experimental and reserach activities for its own purpose. Those facilities are not only for mere purpose as showcase for modern post-harvest processes which would minimize grains losses, but also for the purpose of building up the cornerstone for modernization of distribution system with the development of infrastructure in the future.

Note: "Butler silo" installed in the Grains Center is now built in 19 places throughout the country, with the total storage capacity of 28,500 tons. The silo is built up with steel plate and, therefore, can minimize both time and cost for construction. It is named after its inventor, Mr. Butler, an American. From structural and material aspects, it can be said that many of the Butler silo in the grains center is basically used for short-term storage prior to processing, and they are entirely different from the conventional terminal silo to be built for long-term storage purpose.

2.4.5 Present status of grain terminal silo

NGA does not own any other silo than the Butler silo (capable of storing 28,500 tons of grain in total) installed inside the Grains Center as stated earlier. However, NGA places its priority on construction of grain terminal silo as an important part of the post-harvest facilities program as well as the 3-year warehouse construction plan.

This plan has the following purposes:

(1) To even out unbalance in market supply brought about by inter-regional differences in production scale and harvest patterns.

(2) To prevent depression of market price in harvest season.

(3) To secure buffer stock to meet, production shortfall as may be occasioned by typhoon, drought, disease and insect infestation, etc.

In order to achieve the above purposes NGA contemplates construction of terminal silo at 11 major ports of the nation, which will be rationalized in handling and storage in good condition and distribution in bulk. The proposed sites and capacity area as follows:

Table 2-7

Manila	25,000 ton
Mariveles	25,000
Cebu	10,000
Aparri	10,000
Tabaco	10,000
Tacloban	10,000
Iloilo	10,000
Zamboanga	10,000
General Santos	10,000
Davao	10,000
Cagayan de Oro	10,000
Total	140,000 ton

Besides those proposed for construction under the governmental plan, there already exist a certain number of privately operated silo, mostly owned by flour mill.

Although they are used for storage of imported grain, such as wheat or yellow corn, for processing at each own plant, which is not apparently for common purpose with the NGA's proposed silo, they still play an important role through their contribution to storage of NGA's imported grain and to distribution of grain in bulk. Capacity of the private silo as classified by purposes is as follows:

Table 2-8

	Company name 5/	Capacity 1/
Mill company	RFM 2/	48,000 LT
	GMC	29,800
	LFM	12,850
	WIF	12,800
	PMF	25,000
	PFM	25,000
	URC	26,600
	PAFM	16,000
	Sub total	196,050 LT
Feed company		Nil 3/
Other processing company	LUDO 4/	10,000 LT
	Grand total	206,050 LT

Note: 1/ Including capacity of interstice bin in addition to that of main bin.

2/ Including newly-expanded capacity.

3/ Feed company has no silo. It has only warehouses.
i.e. SMC: 600,000 bags of 50 kilos
Vitarich: 450,000 bags of 50 kilos

4/ Large wet milling company in Cebu producing starch as main product and inversion sugar, having an extraction process plant for corn oil and plam oil.

5/ Abbreviation of company name is referred to in Table 2-6 of 2.2.3.

2.5 Status and Priority of the Project

On the basis of the present situation in which increased production of rice is making steady headway and production of feed grain, such as corn and others, is entering into the "intake-off" stage, the post-harvest plan is being carried out, as stated earlier, under the powerful administrative authority of the Government.

Needless to say, the immediate purpose of the plan is to minimize physical loss at each post-harvest stage. At the same time, the above-mentioned purpose is based on the government's objective to try to pave the way for improvement of agricultural productivity by upgrading the conventional distribution system through introduction of new facilities.

Therefore, when further consideration is given to priority investment, the decisive factor will be not only the direct benefit from the invested capital but also the possibility of whether the effect of the investment can be expected to spread far and wide other the associated fields. In this regard, the Project is considered to become the appropriate incentive for wide spreading of the investment result.

The most efficient and modernized pattern of grain distribution including rice is represented by the total bulk handling system. In the leading producing country, the grain is harvested by combine, and moved in bulk by truck into country silo, the nearby storage facilities with bulk handling equipment.

And, according to demand forecast as well as shipping schedule, it will be transported again in bulk by rail, truck, barge, etc. to the much larger terminal silo.

The terminal silo is usually located along the seaboard as a strategic base for distirbution, and is capable of receiving, storing and shipping out pneumatically both for milling and for export a large quantity of grain.

The same may apply to the case of importing country. It is the most advanced pattern to handle grain in bulk directly from the ocean-going vessel into a silo for bulk storage and distribution to the domestic market, by means of bulk transportation.

Advantages of the bulk handling system include many items such as elimination of packing cost, manpower saving for packing, maximum use of storage space, time saving for handling of large quantity through mechanization, easier control of quality by chemical treatment and long storage period by improved storage condition.

In order to make such bulk handling system of great advantages available for a wide range of distribution and storage system, infrastructural improvement must first be made including railway, road and port facilities as well as construction of handling and transport facilities directly required for this purpose. Further, grade, quality and brand of the grain must be unified.

Effort must be made to select and develop the grade that can withstand bulk handling. Furthermore, grading and inspection systems must be improved and the possible market where premium for the higher quality of grain is paid must be established.

Training must be provided for education of engineers to quality for operation of modernized handling facilities. As mentioned above, improved economic and social foundation is prerequisite to the establishment of the bulk handling system.

However, even if such foundation still remains inadequate, it could act as a trigger to promote earliest achievement of the prerequisition, when even a part of the new handling system is introduced and spread into appropriate fields and in the strategic manners.

As mentioned earlier, most of the existing distribution system in the Philippines seems to be still lagging behind. However, at each stage of the system effective steps are being taken toward improvement.

As the result, the incentive effect is expected near at hand. With the aforementioned matters in mind, a study was made on each kind of grain to cope with the present condition.

With regard to grains produced in the Philippines, such as rice and white corn, there are several possible base facilities for bulk handling of such grain; naemly, country silo in the producing area, terminal silo, storage silo in the consuming area and seaboard terminal silo for export.

With regard to the country silo it must be built in the proximity of farm in large numbers but in small size.

In view of localized investment at the initial stage toward modernization, it may be more realistic to place priority on the terminal silo construction in or near the consuming area and to consider its requirements.

From this point of view, a study was made to determine feasibility of the grain terminal construction for use both for storage of rice for domestic consumption and export at Manila.

As will be mentioned later, the conclusion was reached that in spite of environmental inadequacies, small-sized pilot facilities could be operated effectively if supported by carrying out appropriate measures. However, the problem for keeping milled rice from breakage which may arise from delivery into silo through storage therein, and preservation of quality, remains still to be clarified by further research and experimental studies, since technical solution for the problem is not as yet fully established even at the international level.

As regards white corn, suggestion as a phase of the Project, was made in this report that it would be most effective to construct the grain terminal combined with the grits plant in Cebu, the second largest city for its consumption and distribution.

As regards wheat, total dependence upon import will further continue in future as well. Production in large quantity of corn is expected in Mindanao. From this point of view, the products will be transfered by marine transport to Manila and its surrounding areas in which 70% of total feed millers in this country are operated, feasibility of the water-front silo handling those purposes together was found valid after the study.

As stated earlier, the flour mill or feed mill industry has already achieved industrial rationalization and modernization. However, in anticipation of steady increase in its handling volume, it is certain that each industry will reach its limit in catching up with further advanced modernization. Especially, in Manila there is a problem of vital importance involved in utilization of the Pasig River which becomes unnavigable, in case of flood, for barges. The present condition requires immediate improvement in Metro Manila area as the major consuming center.

Finally, it may be concluded as a suggestion that the most modernized terminal silo should be constructed in Manila and Cebu. It is also suggested that the base points for construction of waterfront silo should be extended far and wide on the nationwide scale, as planned by NGA for instance, toward further modernization when adequate environmental requirements are achieved. The Project will certainly act as a pioneer for the future development plan, as the result of which many useful know-hows will be utilized for future projects.

The Project is planned with a view to well match with future projects to be planned in step with further improvement of the distribution system and commercial profitability of each private industry.

III GRAIN TERMINAL PROJECT IN MANILA

IV SPECIFICATIONS OF THE GRAIN TERMINAL FACILITIES IN MANILA

V FINANCIAL AND ECONOMIC ANALYSES OF THE GRAIN TERMINAL IN MANILA

III. GRAIN TERMINAL PROJECT IN MANILA

3.1 Present Status and Prospects of Grain Market in Manila

Manila is the largest city in the Philippines. The population of the Greater Manila is approximately 5 million, which exceeds 10% of the total population of the Philippines. The city is also the largest grain consuming area in the Philippines.

According to NFAC data, the annual per capita grain consumption of the Greater Manila comprises 103.0 kg of milled rice (including milled rice products), 1.5 kg of corn (including corn products) and 21.7 kg of wheat products, to a total of 126.2 kg, of which rice consumption is predominant and corn consumption for food is negligible.

The grain consumption pattern of the Philippines varies with regions. Rice is the majority of grain consumption in Luzon; as well as corn in Central Visayas Region. Rice and corn are consumed in equal volumes in Mindanao. The characteristic pattern of these regions corresponds with the region's grain production and is based on long time habits. It seems, therefore, that the pattern will not undergo a substantial change.

The grain consumption pattern of the entire Philippines by income bracket is as shown in the following table.

Table 3-1 Annual consumption per capita by income bracket (kg)

Annual income per capita	Below P400	P400 ~ P799	P800 ~ P1,499	Above P1,500	Average
Rice and products	94.5	101.9	111.7	116.8	106.1
Corn and products	35.3	25.0	15.6	13.2	22.4
Wheat products	5.6	9.4	13.3	20.5	11.1
Rice-corn mix	-	0.3	0.3	-	-
Total	135.4	136.6	140.9	150.5	139.6

Source: Calculated from "Regional Consumption Patterns" and "Income and Food Consumption" (NFAC).

According to the above table, consumption of milled rice and wheat products increases and that of corn products decreases as income rises. Therefore, with the rise of income in the future, it is expected that the grain consumption in the Philippines will show a pattern in which rice and wheat products increase and corn decreases. However, it is hardly conceivable that the gross annual consumption per capita of the entire grain will increase substantially, and especially with improvement of eating habit, the consumption of rice is considered rather to decrease.

The grain consumption in the Greater Manila follows a similar pattern and the gross consumption of wheat is expected to increase at least as much as the population increase of the Greater Manila.

3.2 Present Status of Physical Distribution of Grain in Manila

3.2.1 Rice

Rice consumption in the Greater Manila exceeds 500,0000 tons per year and most of the consumed rice is transported either by trucks or freight cars from the places of production in Luzon. Palay is temporarily stored in the warehouses at the place of harvest and milled there depending on its demand at the place of consumption such as Manila Area etc. Milled rice is bagged in synthetic fiber bags and transported to the place of consumption where it is temporarily stored in the warehouses to be distributed to retailers.

The problem involved in the distribution of rice is the so-called "Post Harvest" losses. These losses are said to amount to as much as 10 to 30% of the rice production which arises from poor reaping techniques and shortage in such equipment and facilities as thrashers, dryers, mills and warehouses. The losses at the warehouses amounts to as much as 2 to 6% with damages from insects and rodents due to the shortage of modern warehouses, and poor technology in handling and storage are also the causes of the loss. Therefore, in order to reduce these losses, the Government of the Republic of the Philippines has prepared various programs for expansion of post-harvest facilities, including 3-Year Warehouse Construction Program, all of which are now

being intensively carried out. For streamlining distribution mechanism, bulk handling of palay and milled rice is now being studied and Butler type silos for bulk storage of palay have already been built. In view of the present situation in which most of the rice is milled at the place of production in the Philippines, introduction of bulk handling system, that is, the transportation of milled rice from the place of production by truck, freight car, or barge, and building of bulk storage facilities at the place of consumption are also being studied. For example, NGA is entertaining an idea in which silos will be constructed at Apari Port in northern Luzon. Milled rice collected from the main rice production area of Cagayan Valley will be brought by freight cars or trucks to Apari Port and then, transported in bulk by boats to Manila wharf where the silos would be built as bulk storage place for consumers. However, in view of the quality problem of milled rice involved in bulk distribution, technical problems have not yet been solved and future study and research will be required.

3.2.2 Wheat

The climate is not suitable for whaet cropping in Philippine Islands. A feasibility study on wheat cultivation was made by flour milling industry in the past and it reached to the conclusion that it would be impossible to produce wheat with a competitive price in the international market. Therefore, all wheat must be imported.

The historical wheat import volumes is as follows:

Table 3-2

CY	Imports (1,000 MT)
1969	553
1970	495
1971	588
1972	712
1973	531
1974	478
1975	457
1976 a/	666

a/ Including imports scheduled to arrive by December, 1976.

Source: 1969 ~ 1972 Foreign Trade Statistics, NCSO
1973 ~ 1976 DGE, NGA, November, 1976

A large increase in 1972 was due to a sharp reduction of domestic production caused by large flood. Little correlation is seen between the time sequence and import transition. This is because the wheat import is decided upon depending on the demand and supply of domestic rice and corn for food. It is expected that the wheat import will steadily increase after self-sufficiency of rice and corn for food is attained in the future.

There are eight flour milling companies and their combined maximum production capacity is 106,000 long tons/month. The flour milling companies in Manila area are located along the Pasig River and their maximum milling capacity is 60,000 long tons/month, which occupies 60% of the entire production in the Philippines. The flour milling companies are as listed below:

Table 3-3 List of Flour Milling Companies

Name of Company	Location of Mill	Max. Milling Capacity L.ton/month	Average Wheat Allocation by NGA L.ton/month
REPUBLIC FLOUR MILL	Manila	24,000	HARD 6 ~ 8,000 SOFT 2,000
GENERAL MILLING	Lapu Lapu	12,000	HARD 6,000 SOFT 2,000
LIBERTY FLOUR MILLS	Manila	12,000	HARD 3,500 SOFT 1,500
WELLINGTON FLOUR MILLS	Manila	12,000	HARD 3,500 SOFT 1,500
PILISBURY MINDANAO F.M.	Irigan	12,000	HARD 5,000 SOFT 2,000
PHILIPPINE F.M.	Hondagua	12,000	HARD 3,000 SOFT 1,000
UNIVERSAL ROBINA	Manila	12,000	HARD 5,000 SOFT 2,000
PACIFIC FLOUR MILL	Batangas	10,000	HARD 2,000 SOFT 1,000
Total		106,000	HARD 34,000 ~ 36,000 SOFT 13,000

Source: NGA

Only Republic Flour Mill has a milling capacity twice that of other companies, and the rest have similar capacities. At present the milling capacity exceeds the demand and the operation rate is estimated to be about 60%. The varieties of the imported wheat are WW, DNS of U.S.A. and CW of Canada, and the kind of product coming from one company numbers 10 at the most. That means the classifications of flour by grades are very few and the so-called straight flour comprises the majority.

The import of wheat has been controlled by NGA since 1975, which receives report from each flour milling company on its demand and decides the amount of annual import of wheat depending on the size of the demand for rice and corn for food.

The amount of monthly purchase of wheat from exporting countries is determined based on the annual imports mentioned above, taking into consideration the trend of monthly demand and supply of wheat and flour by the flour milling companies. The purchase is made by trading companies on C&F or FO basis.

The selling prices to the milling companies are determined politically by NGA independently from the import price. The selling price was 1,705 P/L.ton in November 1976. The C&F price of the Canadian CW purchased by NGA in October, 1976 was US$159.95/L.ton. The above mentioned selling price, when converted at a rate of US$1 = P7.45, equals US$228.86 /L.ton, which is considerably above the import price.

The ceiling price of the wheat flour is also determined by NGA and is P66/25 kg at present. The quantity of wheat to be sold to the flour milling companies is based on the allocation calculated according to the production capacity and sales record of the previous year of each company.

Therefore, competition among the flour milling companies exists only in the field of production improvement, strengthening of sales channels and reduction in handling charges.

The unloading process of the imported wheat at Manila Harbor is as follows:

A 20,000 to 30,000 ton class ocean going vessel is moored at the anchorage in Manila Harbor and wheat is loaded onto a 300 to 1,800 ton class barge by means of a grab bucket of the freighter or a vacuvator owned by stevedoring company. The barge is pulled by a tug boat and sails up the Pasig River to a flour mill. The wheat is then discharged by a pneumatic unloader of the flour mill (most of the unloaders have rated discharging capacity of 100 tons/h and practical operating capacity of 50 tons/hr) to be stored in silos of the flour mill. The handling costs from the vessel to the silos are all charged to the milling company. From the above process of unloading, the following problems are pointed out.

a) There are only three anchorages for large vessels in Manila Harbor so that the vessels are likely to be kept waiting.

b) Unloading from the vessel is carried out by the grab bucket of the vessel (average capacity: 500 tons/day) and vacuvator (capacity per unit: 10 tons/h. 6 units are usually available) with a low efficiency of merely 1,000 to 2,000 tons per day.

c) It is possible that the clearance of the bridge from the surface of the Pasig River is reduced by a rise of the river water level, making barges unable to pass under the bridge and in return keep the vessel waiting at the anchorage. The barges are made impassable for about 15 days in rainy season and for about a week by typhoons.

d) Because of the above reasons, the unloading rate per day can be established at only 1,000 L.tons in a vessel charter contract, inevitably making the ocean freight comparatively high. If the loading rate per day reaches as much as 2,000 L.tons, the ocean freight may be reduced by about US$2/L.ton.

When the ocean freight from the Pacific coast of the U.S.A. to the Philippines is compared with that to Japan, the freight to the Philippines is $1/ton higher due to the difference in the number of days of voyage (4 to 5 days longer to the Philippines), $1.50/ton higher due to the difference in the unloading rate (1,500 ton/day in Japan), $1.50/ton cheaper due to the difference

in the freighter tonnage (25,000 ton class for the Philippines vs 15,000 tons class for Japan) and is $3/ton higher because of small cargo on the return voyage from the Philippines. In total the ocean freight to the Philippines is $1.50 to $2.00/ton higher than that to Japan.

e) Due to the use of grab buckets for unloading, a spillage occurs. Although the amount of spillage is not exactly known, it is estimated to occupy about 0.7% of the total import.

f) Silos are entirely owned by the flour milling companies. With a total storage capacity of about 80,000 tons, these silos are capable of holding two months' demand. However, because of the need for storage of feed grain and NGA can not control the use of the silos, occasional shortage of wheat supply is noticed in certain situations, such as harbor strikes in exporting countries.

3.2.3 Feed grain

The demand for feed grain in the Philippines is increasing year after year correspondingly with the increase in the livestock products consumption. Although self-sufficiency of feed grain has not yet been attained, the Government of the Republic of the Philippines has already established its 5-year plan for feed grain self-sufficiency. At present, shortage is covered by imports in the following amounts:

	Corn	Sorghum
1975	121,000 ton	31,000 ton
1976	96,000 ton	11,000 ton

Source: NGA

Almost all the imported feed grain is unloaded at Manila, the feed grain in bulk in a manner similar to that of wheat and the bagged feed grain unloaded on the wharf of Manila Harbor. Like wheat, the import of feed grain is entirely controlled by NGA. The feed grain in bulk is sold to feed millers at the silos owned by Republic Flour Mill and therefore, the handling and miscellaneous charge from vessel to RFM (P52/ton

at present) is borne by NGA. From the standpoint of distribution, problems similar to those involved in unloading the wheat mentioned above are present and as for bagged feed, spillage during unloading should be noted.

Domestic feed corn is transported to the Manila area from the places of production either by inland or marine transportation. The marine transportation is carried out by barge or coaster. Some of the large feed millers situated along the Pasig River transport the feed grain from the places of production and unload it in bulk, while medium and small sized feed millers transport the feed grain in bagged form with other cargos and unload it at the wharf of Manila, where it is further transported to the mills by turck. Unloading by this process results in a large loss. It is estimated that a monthly demand for feed grain in Manila area is 11,000 tons.

3.2.4 Corn for food

The demand for corn for food in Manila is so small that little discussion is needed in terms of physical distribution.

3.3 Basic Assumptions and Functions of the Project

The proposed site of the Grain Terminal Project in Manila is located at the wharf with water depth of 13.7 m at Manila Port. This site has a large center of consumption as a hinterland and can be served by railway sidings. The site is considered to be in a very favorable location. The following is the basic consumptions of the project and the functions required.

3.3.1 Basic assumptions

(1) Rice shall not be taken up as a handling grain in this Project because the technical problems regarding distribution and storage of milled rice in bulk have not yet been solved.

(2) The import of wheat and feed grain is to be continuously controlled by NGA. The amount of import is to be judged and determined by NGA based on the overall demand for grain including rice and corn for food.

(3) The proposed site of the Project is to be located in Area A of Manila International Port designated by NGA.

(4) The year 1987 has been decided upon as a target year for the study of this project. This is because the new five year economic plan of the Philippine Government will follow the present 4-year program ending in 1977, and it is felt necessary that the construction of silos should be based on the situation envisaged 10 years from hence.

3.3.2 Functions

Taking into consideration the points mentioned above, the functions required of this Project have been established as follows:

(1) Handling function

This Project is based on the building of a modern grain terminal in a large consuming center. Its major function is a grain handling. This grain terminal can berth large vessel, shorten the period of anchorage by large capacity unloader and load grains onto barges and trucks.

(2) Storage function for price stabilization

This Project plans to construct the only bulk handling silo on the wharf and the first modern facilities to be used exclusively as a grain terminal of NGA. NGA plans to increase its intervention in rice distribution upto 20% to stabilize the market price. Similarly, as to wheat and feed grain it is necessary for NGA to have a storage facility for market price stability to a limited extent and this is expected to have a large pshychological effect on the distribution market.

(3) Buffer stock function for stable supply

NGA controls the wheat importation and thus, it is the responsibility of NGA to maintain stable supply of wheat. It is necessary to secure domestic stockpile to cope with harbor strikes in exporting countires. NGA needs to have a stockpile equivalent at least to one month's demand. It is also considered necessary that the Philippines should have as much as 3 months' domestic reserves including that in private sectors in the future in view of the fact that food stockpiling has become a worldwide

discussion.

Although this Project takes care of the wheat stockpile to meet the demand in the Manila area, it is necessary to plan stockpiling for the entire demand of the Philippines. Since it is desirable to have storage facilities at other ports for demands other than that of the Manila area, this report only covers the demand in the Manila area.

3.4 Capacity of the Proposed Facilities

3.4.1 Storage capacity

(1) As buffer stock, wheat import at Manila Port for 1987 will be estimated and one month's volume of this import will be stored at this terminal silo. Since the privately owned silos are capable of storing two months' supply, a total of three months' storage is possible.

Since the wheat import in 1987 is estimated to be 370 thousand tons per year, 30,000 tons, or one month's equivalent of this yearly import, will be the target quantity of the storage. However, in view of the present annual import of 250,000 tons, construction of silos to hold 30,000 tons of wheat seems excessive.

Therefore, silos of 15,000 ton capacity will first be built and the silos for the remaining 15,000 tons will be constructed by the end of 1986 under the second plan. See Annex 3-2.

(2) Unloaded from the vessel, the wheat is loaded onto barges. For this type of handling operation, 6,000 ton capacity holding silo bins will be required. See Annex 3-3.

(3) Fundamentally imported feed grain and domestic feed grain are distributed through this grain terminal. However, in view of the existing facilities into which large feed millers have made investments, 5,000 ton capacity silos will be constructed to store the feed grains for the small and medium feed millers for 10 days' stockpile in 1987. See Annex 3-4.

(4) In short, the required capacity mentioned above can be shown as follows:

Table 3-4

Unit: ton

	1st Plan	2nd Plan	Total
For buffer stock of wheat	15,000	15,000	30,000
For handling of wheat	6,000	-	6,000
Fore feed grain stockpile	5,000	-	5,000
Total	26,000	15,000	41,000

(5) In order to make the required capacity mentioned above available at all times, capacity of the silos to be constructed will have to be determined with 80% storage efficiency since "dead space" is inevitable.

Therefore, the capacity of the silos to be constructed under Step I will be 32,500 tons and 18,750 tons under Step II with a total of 51,250 tons. However, for determining the size of each bin from engineering viewpoint, 33,976 tons for Step I, 17,248 tons for Step II with a total of 51,224 tons will be constructed.

3.4.2 Handling capacities

(1) Unloading equipment

The unloading equipment from the oceangoing vessel will be comprised of pneumatic unloader. For the time being one 300 tons/h unloader will be installed and an additional unloader of the same capacity will be built at the end of 1986 for the Step II construction. (See Annex 3-5.)

(2) Intake equipment to the silo bins

The intake equipment complying with the unloader will be installed.

(3) Loading equipment to the barge

For the time being, one 300 tons/H loading equipment will be installed. An additional loader of the same capacity will be built for the Step II construction, totalling to two units finally. Two lines for loading into barges will be installed. One is the system which passes through the silo tower but not through the silo bins. The other is the system which loads into barges after discharging from the silo

bins. These two systems will not be operated at the same time. (See Annex 3-6.)

(4) Conveying equipment for truck loading and bagging

Discharging capacity from the silo bins for the both equipment will be 100 tons/H x 3 lines (namely, 300 tons/H) for the time being. The capacity will be doubled at the Step II construction totalling to 100 tons/H x 6 lines (namely 600 tons/H). These 3 lines (6 lines after extension) will be connected with the equipment for loading into bulk trucks, bagging and loading into barges. (See Annex 3-6.)

(5) Bagging equipment

In regard to feed grain, one 20 tons/hr bagging equipment will be installed for bagging. At the same time, a warehouse for storing 360 tons of feed grain will be built. No extension will be arranged for the Step II construction. (See Annex 3-6.)

3.5 Operations of the Grain Terminal

3.5.1 Operation

The operations of the proposed grain terminal will be under the direct supervision of NGA, and its executives will be employees of NGA or persons nominated by NGA. For budgetary and accounting purposes, the terminal will be treated as a separate entity and its accounts will be maintained on a commercial basis. NGA's approval will be required for the terminal's annual capital and operating budgets, but the terminal executives will be responsible for managing the daily transactions of the terminal within the policy and operating guidelines provided by NGA.

3.5.2 Organization

As shown in Annex 3-7, the organization of the terminal silo will comprise a Plant Manager, General Affair and Accounting Department, Engineering Works Department and Silo-Bagging Department. The General Affairs and Accounting Department is in charge of accounting, intendance and administration business. Engineering Works Department is in charge of facility maintenance and grain quality control. The Silo-Bagging

Department is in charge of unloading, storage, bagging and delivery of grain.

3.5.3 Personnel and wages

The number of personnel in administrative affairs including security guards will be 14 and that for the Silo-Packing Department 25 to a total of 39 persons. An extention of the facilities will be made at the end of 1986 and the personnel in the operating division will be increased by 3 persons from 1987. The wages shown in Annex 3-9 in detail.

3.5.4 Employment and training

The grain stock control officer must be experienced in his field. If he has insufficient experience, on-the-job training will be required at private silo in the Philippines or at grain terminal in foreign country.

For the operating workers, the foremen at least should have experiences in their field. Other workers will have to be trained upon completion of the construction of the facilities.

3.5.5 Revenues

Tariffs should be established for receiving, storing, delivering and bagging charges. And these charges should be so determined that the payers may be less disadvantageous than the conventional process through the use of this silo. For this reason P15/ton has been set as a handling charge including storage. As an actual charge for packing, P1.66/ton has also been established.

In view of this terminal silo being used for buffer stock, an import fee will be imposed on imported wheat according to the quantity used by milling companies (including those outside of Manila) to appropriate to operating expenses of the terminal. The import fee has been set at 1.3% of the selling price to the milling companies by NGA. See Annex 3-8.

3.5.6 Expenditures

The operating cost of the terminal silo consists of personnel expense, repair cost, electricity cost, insurance premium, land rent, hatch working cost and miscellaneous expenses. The details are shown in Annex 3-9.

3.6 Future Extension

As mentioned in Chapter 3.4, the silos and the unloaders will be constructed under Step I and II Schemes. The Step II construction will be completed at the end of 1986.

3.7 Study of Alternative Plan

Taking into consideration the problems involved in the grain distribution in Manila and the required functions of this grain terminal mentioned in Chapters 3.2 and 3.3, the following alternative plan has been studied.

3.7.1 Unloading by floating elevators

The floating elevators are used in Europe and U.S.A. which is a 100 ton/h to 300 ton/h capacity unloader mounted on a large floating stage. It can transfer bulk grain from the vessel to the barge on the side of floating stage. The floating elevator is usually pulled by a tug boat.

However, use of floating elevators is considerably restricted in Manila Port. As mentioned above, there are a few anchorages available for ocean-going vessels and the use of floating elevators will not be a solution to the shortage of anchorages. Neither will its use be a solution to unnavigable condition of the Pasig River during rainy seasons. More over that the floating elevators have shortcomings of not being operable on rough seas.

It is estimated that a floating elevator with 100 ton/h capacity costs 7.5 million pesos, but this is rather high when compared with an unloader constructed on the coast which costs 3 million pesos. Therefore, it is not effective to use floating elevators in Manila Port.

3.7.2 Construction of warehouse

Construction of warehouses for buffer stock of grain may be considered. However, packing the wheat imported in bulk for storage and unpacking for use are unefficient from handling viewpoint. The construction cost of the warehouse which is well built to enable the long term storage without spoilage is estimated to be similar to that of silos.

Also the need of renewal of stored grain at least once a year means the huge cost of bagging and unbagging. Therefore, the supremacy of silo is quite certain.

3.7.3 Unloading facilities other than pneumatic unloaders

As mentioned in Chapter 4.4.1, the comparison between the pneumatic unloaders and grab buckets and marine leg elevators revealed the supremacy of the pneumatic unloaders. Therefore, it has been decided to use pneumatic unloaders.

3.7.4 Others

For the most efficient unloading, unloading by unloaders from the vessel simultaneously with direct loading onto barge is contempleted.

However, taking into consideration the use of the existing vacuvators, discharging into barges on the ocean side of a vessel is possible by which berthing time of the vessel can be reduced. This may lead to reduction of freight. These matters should be taken into consideration in the operation of the terminal silo. Bulk loading facilities from silo bins to barge are required because without these the shipping from silo is limited to truck transportation only which is evidently unefficient.

IV. SPECIFICATIONS OF THE GRAIN TERMINAL FACILITIES IN MANILA

4.1 Outline

4.1.1 Foreword

A system will be designed with the latest engineering technology for the grain terminal to insure the function, safety, dependability and economy of the system, fully taking into consideration geographical conditions.

4.1.2 Location

The grain terminal will be constructed in Area A (approx. 2.8 hectares) at the tip of the International Port which is being reclaimed at present between the southern end of Manila North Harbor and the mouth of the Pasig River.

4.1.3 Outline

Grain in bulk is unloaded from a ocean-going vessel alongside the pier with a travelling pneumatic unloader (300 T/H, 1 unit) on the pier and transferred with chain conveyors to the silo tower, where the grain is roughly cleaned, weighed and divided into two flows with a 2-way chute valve, one flow to be led to the barge and the other to the silo bins (capacity: 33,976 T) for storage. The grain stored is kept at a constant temperature and fumigated, when necessary. The grain stored is discharged out of the silo bins and transferred with chain conveyor and bucket elevator (capacity: 100 T/H x 3 lines) and after being weighed, a part of the grain is loaded onto trucks or barges, and the other bagged and stored in the warehouse. (max. cap. 600 T)

The Grain Terminal Facilities consists of silo bins, a silo tower, a warehouse and an administration building and includes foundation of the structures, an unloading equipment, intake equipment, discharging equipment, dust collecting equipment, automatic sampling equipment, electrical equipment, grain temperature measuring instruments, test equipment and accessory facilities.

4.2 Capacity

4.2.1 Basis of capacity

The majority of grains handled are imported wheat and corn, and each capacity of the equipment is measured in terms of wheat.

4.2.2 Storage capacity of the silo

There will be 24 round bins with 1,264 ton-capacity each and 14 interstice bins with 260 ton-capacity each, totalling 33,976 tons in maximum capacity (Practical capacity: 26,000 tons).

4.2.3 Unloading capacity

Unloading capacity of one unit will be 300 T/H (max. 330 T/H). The maximum displacement of ocean-going vessels will be 30,000 DWT. (Water depth at the quaywall: 13.7 M).

4.2.4 Intake capacity

Intake capacity to the silo bins after unloading will be 300 T/H (max. 330 T/H) by one line.

4.2.5 Discharging capacity

Capacity of discharge from the silo bins will be 100 T/H (max. 110 T/H) by one line.

4.2.6 Bulk loading capacity

The bulk loading capacity will be 300 T/H (max. 330 T/H), via 1 line to the barge, and 100 T/H (max. 110 T/H), for each of 3 lines to trucks.

4.2.7 Bagging capacity

The capacity of bagging corn in 50 kg bags will be 20 T/H.

4.2.8 Storage capacity of the warehouse

Excluding passages, the maximum storage capacity of the warehouse will be 600 tons. Practical capacity is generally about 60% (efficiency

of stacking) of the maximum capacity and thus will be 360 tons.

4.3 Specifications of the Structures

4.3.1 Geological conditions

The composition of the earth's crust of the Luzon Island consists of an alluvial bed thinly surrounding the Manila Bay and extending towards the Lingayen Gulf located north-northwest of Manila Bay and diluvial formation belonging to the Pliocene of the Tertiary period flanking the alluvial bed and stretching towards the mountainous region of Luzon Island. (See Drawing Plate No. 2)

The geological conditions of the proposed site are derived from data furnished by the reclaiming companies at the International Port from the data of penetration tests carried out at the adjoining container yard.

The reclaimed fill at the proposed site has been completed as far as the end of the mooring pier on the North Harbor side. However, the reclamation work has not yet been completed towards the Pasig River side. The reclaimed land is filled with dredged materials. The materials from ground level to -5 M consist of loose clay and gravelly silt sand which includes sedimentary deposit (decayed plants) carried down by the Pasig River. The N-values ranges from 2 to 4.

The materials from -5 M to -15 M are composed of very soft silty clay with N-values of 1 to 4. From -15 M to -25 M, the ground consists of somewhat hard sandy silt with N-values of 20 to 45. The materials below -25 M are composed of very dense sand and gravel layers with N-values of more than 200 and partially include very hard sandy silt.

The bearing layer at the proposed site is hard silty clay of grayish-brown color existing between -15 M and -25 M and thus requires foundation piles of 24 M in length to support the structures.

4.3.2 Silo bins

The silo bins will be made of reinforced concrete which can withstand earthquakes, fire, water, heat, and dampness. Emphasis will be so placed on perspective that the silo will be an appropriate structure standing at the end of Manila International Port.

The size and the arrangement of the silo bins are such that 8 units each of the 24 round bins with an inside diameter of 8.5 M, a wall with thickness of 0.25 M and height of 37.5 M are located in 3 rows with 14 interstice bins among them. Three rows of 4 round bins are planned for extension. The foundations of these structures will consists of 666 steel pipe piles (ϕ508.85 mm, L = 24 M), driven into the bearing layer.

4.3.3 Shed on silo bins

The shed on silo bins will be so constructed that the tops of the silo bins are connected with one another. The shed will be made of reinforced concrete of rigid construction and is 20 M wide, 70.75 M long and 1,415 M^2 in area.

4.3.4 Silo tower

The Silo Tower to be constructed at one end of the silo bins will also be made of reinforced concrete of rigid construction with 9 floors having a total floor area of 2,731.641 M^2. It will be provided with an elevator with passenger capacity of 6 persons.

An intake surge bin with a 75 ton capacity made of reinforced concrete, a central control room, a power room, a control center room, a laboratory, etc., will be provided in the silo tower.

4.3.5 Warehouse

For reasons of reduction of the weight of the structure in consideration of economy, the warehouse will be constructed of steel frame without a pile foundation. The roof will be finished with corrugated slates of large corrugation and the walls with corrugated slates of small corrugation.

The 1-storied warehouse with a concrete floor slab 0.2 M thick has an area of 874 M^2. A 10 M-long pent roof will be provided over the entrance of the warehouse to permit cargo handling in all kinds of weather. The warehouse will be provided with a resting room and a machine room, where ventilating equipment will be installed. Two bagging surge bins each with 30 ton capacity will also be provided in the warehouse.

4.3.6 Administration building

The 1-storied administration building will be made of reinforced concrete with a floor area of 375 M^2. An office, a reception room, a conference room, a locker room, a hot water service room, lavatories, shower rooms, a dining room and a kitchen will be provided in the administration building.

4.3.7 Work shop

The 1-storied work shop will be built of steel frame with a roof finished with corrugated slates of large corrugation and the walls with corrugated slates of small corrugation. The concrete floor slab will be 0.1 M thick with a floor area of 50 M^2.

4.3.8 Guard house

Built of reinforced concrete, the 1-storied guard house with a floor area of 16 M^2 will have a chekup room, a resting room, and lavatories.

4.3.9 Exterior works and accessory facilities

The premises will be surrounded by steel net fences with steel sliding gates. The access roads will be paved with concrete. Sodding and tree planting will be provided around the buildings and structures. Water supply and drainage will also be provided in the premises. In addition, parking, outdoor fire hydrants, outdoor lights, and lightning rods will be provided.

4.4 Specifications of Mechanical Equipment

4.4.1 Unloading equipment

(1) Reasons for selection of pneumatic unloader

The equipment for unloading grain from a ocean-going vessel is roughly classified into pneumatic unloaders and mechanical unloaders. The mechanical unloaders are further divided into grab type and conveyor type. The grab type unloaders include bridge-type and W-link type, while the conveyor type unloaders (sometimes called marine legs) include bucket elevator type, chain conveyor type and screw conveyor type.

Each type of unloaders has its own advantages and short-comings. they are as follows:

Table 4-1

Type of Equipment	Pneumatic Unloader	Grab		Marine Leg	
		Bridge Type	W-link Type	Bucket Elevator	Chain or Screw Conveyor
Workability	Excellent	Ordinary	Ordinary	Orindary	Ordinary
Scrape off efficiency	Excellent	Poor	Poor	Fair	Fair
Power consumption	Large	Small	Small	Medium	Medium
Noise	Large	Small	Small	Medium	Somewhat large
Dust	Negligible	Much	Much	Medium	Medium
Maintenance	Somewhat difficult	Easy	Somewhat difficult	Somewhat difficult	Somewhat difficult
Capacity	0 ~ 600 T/H	100 ~ 1,500 T/H	0 ~ 1,000 T/H	100 ~ 1,500 T/H	100 ~ 1,000 T/H
Vessel	Optional	More than 20,000DWT	More than 10,000DWT	More than 10,000DWT or exclusive vessel	More than 10,000DWT or exclusive vessel
Price	Ordinary	Ordinary	Somewhat expensive	Expensive	Somewhat expensive

* Prices are for 300 T/H capacity for a vessel of max. 30,000 DWT.

For this project, it has been decided to adopt pneumatic unloaders, taking into account their advantages in operational performance, emptying efficiency, sizes and types of vessels.

(2) Specifications

Since the maximum displacement of the vessel from which grain is unloaded is 30,000 DWT, the pneumatic unloader will be a travelling gantry type with a travelling distance of 150 M. A two-nozzle system will be introduced to improve operational efficiency. The horizontal and vertical pipes will be telescopic.

This pneumatic unloader will suck up bulk grain from the vessel and discharge it onto the chain conveyor on the pier. One pneumatic unloader with 300 T/H capacity (max. 330 T/H) will be provided.

4.4.2 Intake equipment

Grain in bulk drawn by pneumatic unloader and discharged on the conveyor on the pier will then be transferred to the silo tower with chain conveyors. The grain passing through the intake bucket elevator will be cleaned by a rubble separator and after passing through the surge bin will be weighed by an intake hopper scale (4 tons/batch). Intake quantity will be recorded by this scale.

After having been weighed, the grain can be channeled into either of the two flows by a 2-way chute valve, one flow going to the designated silo bin through bucket elevator, chain conveyor on the silo bins and the slide gate, and the other loaded onto a barge with chain conveyors.

The capacity of this intake equipment will be 300 T/H. (Max. 330 T/H)

4.4.3 Discharging equipment

Grain stored in silo bins will be discharged through the remote-controlled slide gate at the bottom of the bin and after passing through the bucket elevator and surge bin (capacity: 8 tons) will be weighed by a discharge hopper scale (1 ton/batch). The discharge quantity will be

recorded by this scale. The grain, after having been weighed, can be channeled into any one of the 5 flows by a 5-way distributor.

One flow goes to a barge by chain conveyor to be loaded in bulk.

A 2nd flow goes directly to trucks by chute to be loaded in bulk.

A 3rd flow goes to surge bins for bagging (capacity: 30 tons x 2 bins) by means of chain conveyors.

A 4th flow returns to the silo bins by way of the return conveyor and the bucket elevator to the silo bins.

A 5th flow is reserved for extension of the equipment for barge loading.

The capacity of the discharging equipment is 100 T/H (max. 110 T/H) x 3 lines.

However, if grain is being unloaded from a vessel by means of the intake line, the 1st flow mentioned above cannot be used. When grain is not being unloaded from a vessel by use of the intake line, three delivery lines can be used, which permits loading onto barges to a maximum of 300 T/H.

4.4.4 Silo bin rotation equipment

This equipment is used to empty the grain out of a silo bin into another.

Grain taken out of the silo bins with discharging equipment will be divided by a 5-way distributor located under the discharge hopper scale and then discharged onto the return chain conveyor to be transported to the bucket elevator and will be carried to the silo bins.

Since this capacity is governed by discharge efficiency of the silo bins, it will be 100 T/H. (Max. 110 T/H)

Because of infrequent use of this equipment, a part of the intake equipment will also be used effectively in rotation. This equipment will

be used only when grain is not being transported. This equipment will also be used when the grain in the surge bin above the hopper scale is returned to silo bins.

4.4.5 Bagging equipment

Bulk grain (corn) packed by bagging equipment under the surge bin for bagging (capacity: 30 tons x 2 units) is loaded on the conveyor to the sewing machine. After the bags are sewn closed by the sewing machine they are transported to the warehouse by belt conveyors.

The bagging capacity with two units is 20 T/H, or 120 tons/day.

4.4.6 Loading equipment in the warehouse

50 kg bags of corn are loaded onto a pallet from the belt conveyor mentioned above and will then be stacked in the warehouse by forklift trucks (2 ton capacity).

Bagged corn stacked on pallets in the warehouse is transported by another forklift truck to be loaded onto trucks for delivery.

Two forklift trucks, one for stacking in the warehouse, the other for truck loading, will be provided.

For loading onto pallets, an automatic palletizer will not be provided. The reason for not providing an automatic palletizer is that while the capability of the equipment is 2,000 bags per hour, the daily handling is only 2,400 bags.

4.4.7 Dust collecting equipment

The dust collecting equipment is provided to prevent accumulation of dust and to maintain sanitary environment. Prevention of dust explosion is another purpose of providing this equipment.

This equipment draws in dust with a turbo fan, and after filtering off the dust from the air, the dust is collected, while the air is discharged outdoors.

Dust collecting equipment consists of one unit for the intake equipment, three for the discharging equipment and one for the bagging equipment.

4.4.8 Fumigation

Fumigation will be carried out by use of phostoxin tablets. A tablet feeder will be installed to mix the tablets in the grain and by sealing the bin tightly, fumigation will be conducted.

The manholes, chutes and gates attached to the top and bottom of the silo bin will be made air-tight.

4.4.9 Automatic sampling equipment

This equipment is provided to carry out automatic sampling of the grain, and the grain will be analysed in the laboratory.

Sampling is carried out at regular intervals from above the rubble separator on the intake line. After passing the sample divider, small portion of the grain is conveyed to the laboratory as sample. And remaining large amount is returned to the intake bucket elevator.

4.4.10 Test equipment

Grain is tested for quality, foreign matter and water content. The testing equipment comprises an automatic moisture tester, a laboratory grain scale, a trip balance scale, a grain sampler, a dockage tester, etc.

4.4.11 Grain temperature measuring instruments

By using instruments at the central control room this equipment allows direct reading and typing out of the record of grain temperature measured by temperature resistors provided in the silo bins. The temperature resistors will be provided at the top, midpoint, and the bottom of each silo bin. Since a rise in grain temperature means that the grain is deteriorated by excessive water content or by worms, the grain must be discharged immediately from the bin or rotated.

4.5 Specifications of Electrical Equipment

4.5.1 Power supply

For the grain terminal facilities, power will be supplied from the power cable of the Manila Electric Company (MERALCO).

The power cable will be branched at the Azuncion Corner C.M. Recto (Point "A" shown in Annex 4-5) located in the North end of M. Roxas, and thus, power will be supplied to the grain terminal.

This power supply will be 34.5 kV, 3-phase, 4-wire, 60 Hz. Up to this Azuncion Corner C.M. Recto, 34.5 kV power is being supplied from North Port Sub-station and Binondo Sub-station in the form of a loop.

4.5.2 Power receiving/transforming equipment

The 34.5 kV, 3-phase, 4-wire, 60 Hz power supplied by MERALCO in a single channel will be received at a pole within the premises of the grain terminal. Thereafter, the received 34.5 kV will be transformed to 3.3 kV, and this 3.3 kV will be further transformed to 440V and 220V, respectively, for motors and lighting as shown in the skeleton diagram. (See Drawing Plate No. 18.)

For power-factor improvement, a power condenser will be installed so that power-factor can be regulated in response to load conditions.

The power required for the grain terminal will be as indicated below:

Equipment	Power Demand	
	Phase I	Phase II
(1) Pneumatic unloader	350 KW	350 KW
(2) Power equipment for silo	800	660
(3) Miscellaneous power facilities (Maintenance equipment, etc.)	100	
(4) Lighting and outlet	50	10
Total	1,300 KW	1,020 KW

As for the equipment for this power receiving/transforming equipment, the power transforming equipment and control equipment will be installed respectively on the first and second floors. As for an emergency power supply, a diesel engine power generator will be installed so that the minimum lighting and various important loads required in securing the facilities can be operated.

4.5.3 Control system

It is generally suitable to employ a computer system for the silo control when: (1) Capacity of the silo is more than about 100,000 tons, (2) Quantities handled are extremely large and stock control is very difficult, and (3) Number of types of items handled is very large. For the grain terminal, the cost of a computer system is too high, and there is no reason for employment of such an expensive system. Thus, a central remote control system will be employed.

The overall silo operation will be controlled from the control room on the first floor of the silo tower, and it will be so constructed that all the necessary controls can be done with the central operation panel and delivery command panel installed in this room. To be a little more specific, operations such as intake from a ocean-going vessel to the silo, various deliveries and rotations will be remotely controlled.

Moreover, the central operation panel will be equipped with a graphic panel on its face so that operating conditions, status of the system, occurrence of a trouble, etc. can be monitored and interlocking operations can be controlled on the table. (See Drawing Plate No. 20 and 21.)

As for the operating system, both individual and interlocking devices can be performed. The term "individual operation" refers to the operation of a machine controlled by the switches installed beside the machine at the time of test running or restoring from a trouble.

The term "interlocking operation" refers to a totally sequential operation including various block operations such as intkae, discharge, delivery and each rotation by the individual processes controlled at the central operation panel.

4.5.4 Wiring work

Wiring will consist of cable pit, conduit pipe, cable rack and duct, and it will be so executed that the equipment in the grain terminal will fully display their performances and functions.

4.5.5 Lighting equipment

Lighting equipment will be of a illuminance required in performing work and operations at the electric room, control room, machine room, administration building and road. For the lighting, fluorescent lamps, mercury arc lamps and incandescent lamps will be used, and necessary places will be equipped with outlet. (See Annex 4-4.)

4.5.6 Internal communication equipment

The communication equipment will be of such a type that mutual inter/intra premises communications can be accomplished simply for the terminal operations. It will also be provided with functions for general calling, mutual communication and generation of emergency signals.

The communication equipment will include a loudspeaker unit to be used for the announcement of time, calling a truck driver, overall premises calling or announcement, etc.

4.5.7 Air conditioning equipment

The air conditioning equipment will be suited for the electric room, control room and administration building so that the plant operations and the office work can be smoothly accomplished.

4.6 Layout of the Proposed Site (See Drawing Plate No. 8 and 9.)

The proposed site covers an area of approximately 2.8 hectares. The pneumatic unloader will be installed either along the new pier on the northwest side of the north side wharf, which are outside the premises.

The existing railroad branch is located on the west side of the premises and the silo will be located along the west side wharf, just

east of the rail tracks. The silo tower is located on the north side of the silo bins. The warehouse is located on the east side of the silo. On the east side of the warehouse, truck access is provided.

On the south side of the premises, a gate is located. Near the gate, in the southeastern part of the premises the administration building is built.

As to the location of the dock the following two plans are proposed.

4.6.1 Plan A (See Drawing Plate No. 8)

A pier is to be provided at the place of the existing breakwater. On the north side of the pier, an ocean-going vessel and on the south side a barge will be moored and unloading and loading will be carried out on the pier. This plan does not require use of the adjoining Area B and the wharf of the container yard. There is no problem in the operation of the vessel. From the viewpoint of efficiency, this plan is better than the following Plan B (4.6.2). However, the construction cost of the pier may be more expensive than the Plan B.

4.6.2 Plan B (See Drawing Plate No. 9)

For the operation of the vessel, the existing breakwater must either be removed or relocated. The north side of the wharf requires reinforcement. The travelling unloader should be used as far as the front of Area B.

Loading onto barges will be carried out on the west wharf. However the present water depth does not permit mooring of barges and it will be necessary to construct a pier.

For this plan, the front of Area B must be made available for mooring vessels and for the travelling unloader.

Since the pier construction under Plan A (4.6.1), warf reinforcement, removal or relocation of the breakwater and construction of the pier for barges under Plan B (4.6.2) are under the jurisdication of the Port Authorities, sufficient discussion with the Authorities must be made.

4.7 Extension Plan (Operational at the beginning of 1987)

4.7.1 Silo bins

Twelve round bins and eight interstice bins of the same size as those under Step I construction with a total storage capacity of 17,248 tons will be built. The shed on the silo bins will also be extended.

4.7.2 Unloading equipment

A pneumatic unloader of 300 T/H (max. 330 T/H) capacity will be added. The total capacity will therefore become 600 T/H (max. 660 T/H).

4.7.3 Intake equipment

One line with 300 T/H (max. 330 T/H) will be added, making a total of 2 lines.

4.7.4 Discharging and bulk loading equipment

Three lines with a capacity of 100 T/H (max. 110 T/H) each will be added, making a total of 6 lines.

As for bulk loading, one line with 300 T/H (max. 330 T/H) capacity for barge loading will be added, making a total of 2 lines. Three lines with 100 T/H (max. 110 T/H) capacity each will be added for truck loading, making a total of 6 lines.

4.7.5 Others

Together with the extension of the equipment mentioned above, dust collecting equipment, automatic sampling equipment, grain temperature measuring instruments and electrical equipment will also be extended.

Bagging equipment, warehouse, test equipment, administration building and accessory facilities will not be extended.

4.8 Cost Estimate for Construction

4.8.1 Cost estimate

Based on the available data and the general conditions of the site, a cost estimate for the grain terminal has been prepared. The total cost including engineering consulting fee for the Step I construction works with a storage capacity of 33,976 tons is 67,757,000 pesos, of which 23,960,000 pesos, or 35.4% of the total cost, is paid in foreign currency and 43,797,000 pesos, or 64.6% of the total cost, will be paid in local currency.

The 17,248 tons extension under the Step II construction requires 35,151,000 pesos, of which 52.3% is to be paid in foreign currency and the remaining 47.7% in local currency. The breakdown of the cost estimate is shown on the Table 4-2.

4.8.2 Estimate conditions

Estimate conditions are as follows:

(1) The price is as of the end of 1976. Contingency both in foreign and local currencies is equivalent to 10% of the total cost.

(2) Imported equipment and materials are import-duty exempt. They are to be imported from Japan.

(3) Cost of unfinished reclamation is not included in the cost estimate. Cost of roads, water supply and drainage outside of the premises is not included in the cost estimate.

(4) Cost of pier construction, and wharf reinforcement is not included in the cost estimate.

(5) Cosf of mechanical and electrical equipment have been estimated according to Plan A (4.6.1). If Plan B (4.6.2) is adopted the cost will be reduced to some degree because of the change in the length of conveyors.

(6) Engineering consulting fee varies with the scopes and the types of services involved. However, under this project, it has been calculated as follows;

i) As for the civil engineering, 4.5% of the cost for the local currency of the construction cost in the following table, items (A) to (E) and (H) is accounted for the engineering consulting fee, divided into costs for the local currency, items (J) and (L).

ii) As for the mechanical and electrical equipment, 4% of the cost for foreign currency of the construction cost in the following table, items (A) to (J) and the cost for local currency, items(F) and (G) is accounted for the engineering consulting fee.

(7) As for the classification of estimate in foreign or local currencies for the cost of equipment of the project, they are, as a rule, estimated in local currency for the civil part and in foreign currency for the electrical and mechanical equipment, further taking the contraband items etc. into consideration.

4.9 Implementation of the Project (See Drawing Plate No. 37)

For implementation of the project, an engineering consultant and a construction contractor must be selected.

(1) First a general engineering consultant (local consultant for civil engineering part) must be selected, who will be charged with preparation of the working design and construction planning, selection of the construction contractor, supervision of the work and direction of the test running. Therefore, it is necessary that this consultant be well versed and experienced in this field of work.

(2) Only experienced and capable contractors must be invited for bidding under the direction of the consultant and a contractor must be selected after careful analysis of his bid and technical capability. (The civil engineering part of the project is to be performed by local contractor.)

This project requires at least 27 months broken down as follows:

(1) From the start of engineering service to the completion of tender document ..... 6 months

(2) From opening of bids to selection of contractor and conclusion of a contract ..... 4 months

(3) From start of construction to its completion .... 15 months

(4) Test running ..... 2 months

Table 4-2 Cost Estimate of Manila Grain Terminal Project

	Step I Construction		Step II Construction	
	Local currency (₱)	Foreign currency (₱)	Local currency (₱)	Foreign currency (₱)
A Silo	29,014,000	250,000	11,359,000	
B Warehouse	1,633,000	23,000		
C Administration building	1,007,000			
D Guard house	34,000			
E Work shop	84,000			
F Mechanical equipment of silo	2,665,000	14,650,000	2,332,000	13,503,000
G Electrical equipment of silo	1,755,000	4,058,000	1,064,000	1,426,000
H Accessory facilities	2,217,000	108,000	16,000	
I Spare parts		500,000		
J Design and supervision services	171,000	1,267,000	57,000	1,078,000
Sub-total	38,580,000	20,856,000	14,828,000	16,007,000
K Contingency	3,858,000	2,086,000	1,483,000	1,600,000
L Engineering consulting fee	1,359,000	1,018,000	455,000	778,000
Total A to K	42,438,000	22,942,000	16,311,000	17,607,000
Total A to L	43,797,000	23,960,000	16,766,000	18,385,000
Grand total	67,757,000		35,151,000	

V. FINANCIAL AND ECONOMIC ANALYSES OF THE GRAIN TERMINAL IN MANILA

5.1 Introduction

The analysis covers the period of thirty years from 1978 based on the durable years for tax purposes of the comparable facilities in the Philippines and Japan and also its economic life estimated by the technical study.

The durable years are assumed to be 50 and 20 years for the building and the machinery, respectively.

The aspect of loan, which is to be provided for the total amount of the construction cost of grain terminal, has not been taken into account in the report at there still exist a number of uncertain factors.

All the price quotation in this report has been made based on the price as of December, 1976.

5.2 Financial Analysis

5.2.1 Revenues

Total revenues for the period of thirty years (See Annex 3, Annex 5-1 (1/3).):

Handling charge (wheat, corn)	₱ 271 million
Import fee (₱21.88/T)	₱ 264 million
Bagging charge	₱ 2 million
Total	₱ 537 million

5.2.2 Expenditures

Total expenditure for the period of thirty years (See Annex 3-9, Annex 5-1 (3/2)):

	Local currency	Foreign currency	Total
Construction cost	₱ 59 million	₱ 44 million	₱103 million
Personnel expense	₱ 8 million	-	₱ 8 million
Hatch work	₱ 2 million	-	₱ 2 million
Repair and replacement	₱ 42 million	₱ 29 million	₱ 71 million
Electricity	₱ 16 million	-	₱ 16 million
Insurance	₱ 22 million	-	₱ 22 million
Land-rent	₱ 3 million	-	₱ 3 million
Miscellaneous	₱ 7 million	-	₱ 7 million
Total	₱159 million	₱ 73 million	₱232 million

5.2.3 Net cash flow

The cash flow is shown in the Annex 5-1 (3/3), which indicates the net cash flow of ₱305 million and surpluses are expected from 1988 onward.

5.2.4 Net present value and internal rate of return

Internal rate of return is 14.4 percent and net present value is ₱27 million with a discount rate at 10 percent per annum (See Annex 5-2).

5.2.5 Sensitivity analysis

Sensitivity analysis has been made on the import fee and construction cost which may substantially influence the evaluation, the result thereof are shown below (Annex 5-2):

Case	Internal rate of return
In case of an increase of import fee by one-third, with other conditions kept unchanged.	17.8%
In case of a decrease of construction cost by 10 percent, with other conditions kept unchanged.	16.1%
In case of an increase of construction cost by 10 percent, with other conditions kept unchanged.	12.9%
In case of an increase of import fee by one-third and, at the same time, a decrease of construction cost by 10 percent, with other conditions kept unchanged.	20.4%
In case of an increase of both import fee by one-third and construction cost by 10 percent, with other conditions kept unchanged.	15.7%

5.3 Economic Analysis

5.3.1 Economic benefits

Procuring the silo bins for wheat storage as a buffer stock would produce substantial benefits, both tangible and intangible. Some benefits could not be defined in a quantitative manner, and venturesome quantification may lead to considerable errors and destroy the reliability of the analysis. This report lays down only what can be numerically substantiated with certainty such as handling facilities. (cf: Annex 5-3 and Annex 5-4 (1/2))

Reduction in spoilage	₱ 17 million
Reduction in spillage	₱132 million
Saving on ocean freight	₱133 million
Saving on barge	₱ 50 million
Saving on stevedoring	₱127 million
Total	₱459 million

5.3.2 Economic cost

The following items of cost are involved in the project. (cf: Annex 5-3, Annex 5-4 (2/2))

Construction cost	₱103 million
Personnel expense	₱ 8 million
Hatch work	₱ 2 million
Repair and replacement	₱ 71 million
Electricity	₱ 11 million
Insurance	₱ 22 million
Land-rent	₱ 3 million
Miscellaneous	₱ 6 million
Total	₱226 million

5.3.3 Net cash flow

The cash flow is shown in the Annex 5-4 (1/2) & (2/2), which will give a surplus from 1990 onward.

5.3.4 Internal rate of return

As is shown in the Annex 5-5, internal rate of return is estimated, excluding non-quantifiable benefits, to be 11.7 percent. The feasibility of this project can sufficiently be proved from an economic standpoint taking into consideration of such aspects as enhancement of social welfare, including stabilization of the people's confidence ensured by a stable food supply, planned operation of flour mills, efficient procurement of wheat, efficient distribution promoted by an increased storage capacity, saving on bagging and materials required in storage in a one-story warehouse and all other intangible benefits.

VI GRAIN TERMINAL PROJECT IN CEBU

VII SPECIFICATIONS OF THE GRAIN TERMINAL FACILITIES IN CEBU

VIII FINANCIAL AND ECONOMIC ANALYSES OF THE GRAIN TERMINAL IN CEBU

VI. GRAIN TERMINAL PROJECT IN CEBU

6.1 Present Status and Prospects of Grain Market in Cebu

6.1.1 Present status

The city of Cebu is located almost in the middle of the Republic of the Philippines which is made up of nearly 7,000 small and large islands. The second largest city in the republic, Cebu has a population of about 500,000 which accounts for almost 30% of the total population of the Province of Cebu formed by the entire island of Cebu. The city is the capital of Central Visayas Region.

As shown in Annex 2-3, Central Visayas Region centering around the city of Cebu is a center of corn grits consumption and about 70% of the population live on corn grits. The percentage reaches 80% in the Province of Cebu.

Cebu is also the center of corn milling. Central Visayas Region has a nearly 30% concentration of corn mills in the Philippines.

As far as modern corn mills employing the roller system are concerned, almost 40% of the nation's total mills are found in the region, with the greater majority of the modern mills concentrated in Cebu and its vicinity.

Table 6-1 Roller Type Corn Mill in Cebu

Capacity T/12 hrs.	Number of Mills
100	3
90	1
75	3
50	7
40	2
less than 40	13

Nearly two-thirds of corn grits produced in Cebu are consumed in the Province and the rest are shipped to Eastern Visayas and remote areas including Manila as can be seen from Annex 6-6.

Cebu has large modern mills producing, besides corn grits, corn oil, corn starch and formula feed and these mills use corn in an annual quantity of nearly 70,000 metric tons for their productive activities.

Corn production in the Province of Cebu (Island of Cebu) amounts to no more than 70,000 metric tons per year. The bulk of corn for processing in mills, comes from Mindanao except import yellow corn for feed grain.

As shown in Annex 6-4, about 85% of home-grown corn supplied to Cebu from domestic sources is shipped out from the three ports of General Santos, Davao and Cagayan De Oro. About 85% of the corn shipment from Mindanao are destined for Cebu and some 10% for Manila.

Rice consumption per capita in the Province of Cebu is low, with nearly one half of its annual rice consumption of 120,000 metric tons supplied from other domestic sources. Cebu has no major rice mills and rice supplied from the outside is milled rice.

As indicated in Annex 6-2, cereal cargoes arriving at Cebu amount to over 500,000 metric tons per year with corn accounting for nearly 75% of the cereal shipments. About 70% of the cereal shipments from Cebu are corn grits.

Cebu's annual wheat imports are nearly 80,000 metric tons, and the imported wheat is processed in the city's only flour milling company, General Milling Corporation.

6.1.2 Prospects

Cebu's position as a grain market is likely to be maintained in the future. According to a population forecast shown in Annex 1-5, the population growth rate estimated for Central Visaya with Cebu as the pivotal city during the 1975 ~ 1985 period is 17% against 27% forecast for the entire nation.

As noted from Annex 2-5, the consumption elasticity of corn grits shows a slight minus value as compared with the positive values calculated for rice and wheat. These data indicate that the outlook for the

corn milling industry in Cebu is not rosy.

On the other hand, there is an argument that grain, whether rice or corn, should be milled at the producing center. The concept underlying this argument is that it is absurd to transport byproducts to the consumption centers at a high cost.

The argument does hold true with rice. Husk produced in rice milling is of little value. In addition, its apparent specific gravity is about 0.60 as contrasted with some 0.85 for milled rice and it is not economical to transport the palay to remote destinations.

However, it is not necessarily justifiable to assert that corn should be processed into grits at the producing center. Byproducts obtained from milling can be used in making feedstuff and oils and as such are marketed at a good price. Further corn milling may well promote related industries, such as feed mill, livestock and oil. In the Philippines where the transport system is not well developed, the livestock industry is located primarily in the vicinity of cities.

As shown in Annex 6-3, Cebu ships out a large quantity of corn grits to other parts of the island, but the province receives corn germ and brans, in greater quantities than the province delivers.

Industries like corn oil, corn starch and feedstuff in Cebu are likely to grow at a faster tempo than its population in future years. For the reasons explained above the status of Cebu as a major grain market in the Philippines will likely be maintained in the future.

6.1.3 Relation with governmental programs

The Government of the Philippines is pushing ahead with a series of food programs, such as increased food production and rationalization of grain distribution and storage. Successful implementation of these programs is expected to improve in a great measure the demand and supply situation for rice and corn and to change the existing grain distribution pattern in the country.

Annex 2-6 presents the results of calculations for grain demand and supply situation in 1985 based on some available data. From the results, the following may be predicted for Central Visayas centering around Cebu.

Rice: At present rice is in short supply, but in 1985 Central Visayas will be self-sufficient in rice.

Corn: In 1985, the region will still be suffering from a shortage of corn for stable food to much the same extent as at the present time.

By contrast, rice and corn production in South and Central Mindanao will be increased substantially. Then, as concerned with G. Santos and Davao, the percentage of corn shipments for Cebu may relatively go down, while Cebu's dependence on the two ports for the grain supply is not likely to decrease.

NGA's terminal silo plan calls for the construction of grain terminals in General Santos and Davao in the wake of the silo construction in Cebu. This will result in closer relations between Cebu and the ports of General Santos and Davao in the corn trade.

Cebu's present grain imports consist of rice, yellow corn and wheat. In coming years, the government's increased grain production program will induce Cebu to stop its rice and yellow corn imports. However, the import of wheat is expected to increase with the growth of Cebu's population and its income in future years.

6.2 Present Status of Grain Physical Distribution in Cebu

6.2.1 Port of Cebu

The domestic trade cargoes handled by the port of Cebu amount to nearly 2,000,000 metric tons per year, the Philippines' largest internal trade cargo volume which is equivalent to some 15% of the nation's total. Of this cargo volume, grain represents nearly 500,000 metric tons, or about 25%.

With respect foreign trade, Cebu is the third biggest port after Manila and Iloilo in terms of seaborne cargo tonnage handled. The port

handles nearly 1,000,000 metric tons a year, of which volume some 150,000 metric tons are accounted for by grain.

Enlarged to a great extent by reclamation in mid-1960's, Cebu's port facilities for domestic trade vessels include 20 berths. The wharf is almost in straight line and faces the island of Mactan. It is backed by a wide unused space. General Milling Co. and Ludo & Luyn Co., major grain users, own and operate wharfs outside the confines of the public port zone.

The site of the proposed grain terminal is located at the northeastern end of the wharf serving domestic trade vessels, where a water depth of about 7.4 M is enough to allow 5,000 tonners to berth.

Corn shipments are transported to Cebu by cargo vessels, passenger-cargo ships and barges ranging in size from 10 to 3,000 tons. In most cases, corn shipments are carried on board these vessels along with other cargoes. Given below is the distribution of tonnages per lot for NGA corn shipments in recent years.

Table 6-2

0 ~ 50 T	13%
51 ~ 100	24
101 ~ 200	18
201 ~ 500	33
500 ~ 1,000	8
Over 1,000	4

The above tonnage distribution is applicable to commercial corn shipments. The voyage time to Cebu from the major corn loading ports is 2.5 to 3 days from Davao, 2 to 2.5 days from General Santos and about 10 hours from Cagayan De Oro.

6.2.2 Grain handling in port

In the port of Cebu, different methods of handling grain shipments are employed, where cargo vessels or passenger-cargo ships are equipped with derrick cranes and where smaller ships or barges are not equipped

with derrick cranes. Cargo vessels and passenger-cargo ships take case of about 80% of the grain shipments handled in the port of Cebu.

In unloading grain shipments by means of derrick cranes aboard the ship, pallets are used only when the unloaded grain is carried into nearly warehouses on the wharf. If the ships do not have derrick cranes, dock workers carry bags of corn climbing footing the board connects the ship with the wharf. Cranes or other cargo handling equipment are not provided on the wharf for grain.

When discharged from the vessel, bagged corn is stacked temporarily on the wharf. If it rains, the cargo is covered with protective sheets. When pickup trucks arrive, the bagged corn is loaded into them by hands.

The lowest unloading efficiency is 250 bags per hour (12.5 metric tons). An unloading rate of 1,000 metric tons per day and night can be achieved if the vessel is equipped with two or more derrick cranes, an adequate number of dock workers are available and pickup trucks take the cargo promptly as it is lowered to the wharf.

6.2.3 Warehouse

Commercial corn is transported by truck to corn mill warehouses from the dockside. Major corn mills have warehouses with a capacity for a sufficient quantity to meet three months' running stock. During harvest season, the mill warehouses are filled to capacity and other warehouses have to be used to store surplus bagged corn. The largest stocks during August as shown in Annex 6-8 are accounted for by the fact that during the month warehouses other than those owned by corn mills are deluged with bagged corn which cannot be accommodated by the corn mills.

NGA's corn are transported to NGA-owned warehouses from the dockside for storage. NGA has one warehouse of its own and 11 others held on lease in Cebu. The combined capacity of these NGA warehouses is 41,000 metric tons. The NGA warehouses store milled rice, corn and corn grits. The largest stock ever held by NGA in Cebu in the past has been 48,600 tons.

6.2.4 Tariff of grain handling

Grain handling charges paid by NGA are as listed below:

Table 6-3

Unloading	Stevedore	P0.55/100 kg
	Arrastre	P0.28/ 50 kg
Loading onto truck		P0.07/ 50 kg
Truckage (within 10 km)		P0.27/ 50 kg
Weighing (authorized truck scale station)		P0.40/T
Unloading from truck and receiving into warehouse		P0.07/ 50 kg
Harbor dues		P1.00/T
Lease of warehouse		
Good location and accommodation (max.)		P6.00/M^2·month
Bad location and accommodation (min.)		P4.00/M^2·month
Ocean freight (rice and corn)		
From Cebu to Manila		P2.25/ 50 kg
" Iloilo		P1.28/ 50 kg
" Davao		P3.45/ 50 kg
" Cagayan De Oro		P1.15/ 50 kg
" General Santos		P3.09/ 50 kg

Inter-island shipping firms with their head offices in Cebu, have organized the Cebu Inter-island Ship Owners and Operators Association and have a tariff agreement among them.

Grits processing	P3.50/ 50 kg

The above processing charge includes trnsport between the NGA warehouses to corn mills. The corn millers are now strongly demanding a raise in the processing charge.

6.2.5 Existing storage condition

NGA must maintain large stocks of grain in order to stabilize its supply and price levels. However, NGA has only one warehouse of its own and holds 11 other warehouses on lease. The existing combined warehouse

capacity does not keep pace with increasing stock requirements. The warehouses held by NGA on lease are inconveniently located and poorly furnished, which is responsible for higher transport cost and heavier damages from insects and rodents. Efficient methods are not employed for handling NGA grain shipments, bringing about higher handling costs and heavy losses from spillage.

6.3 Basic Assumptions and Functions of the Project

6.3.1 Purpose and function

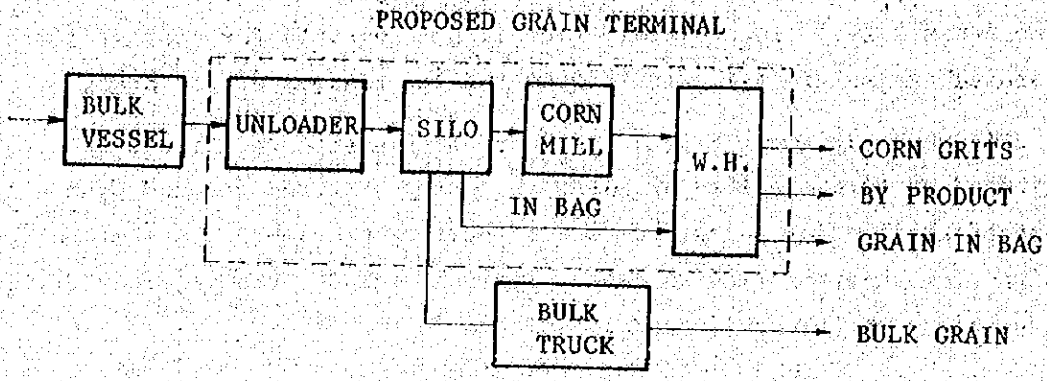
The proposed grain terminal is to be constructed in the port zone of Cebu with a view to contributing toward the stabilization of NGA's grain supply, the success of its price stabilization policy and improvement of the grain storage and handling methods employed in the port. The proposed terminal facilities must be modern and highly efficient as befits a national project.

A concrete silo with a practical capacity of 10,000 metric tons will be constructed for storage of grain. Since some dead space is required in the silo in its actual operation, the maximum silo capacity will be 12,276 metric tons with a storage efficiency of 81%. A pneumatic unloader with a capacity of 150 tons/hour will be installed for handling grain shipments. A corn mill with a monthly input of 2,000 metric tons in terms of corn will be built to reduce transport costs.

The proposed grain terminal will also permit unloading and temporary storage in the silo of bulk grain for private companies which will contribute to the improvement of the handling of their port cargos, the extra capacity of the proposed pneumatic unloader will be utilized for unloading bulk grain destined for the private mills.

This will result in a more profitable management of the facilities.

Fig. 6-1



6.3.2 Preference of solo

(1) Currently, NGA is suffering from the lack of strategic storage facilities and from the inadequancy of its existing facilities needed for stabilization of grain prices (see 6.2.5).

A silo has better storage performance than a warehouse in tropical areas where grain is exposed to damage from insects and rodents as well as deterioration. In tropical regions, such losses sustained during storage of grain in a warehouse range 2 to 6% and, according to other data, the percentage is as high as 10%. Silos can reduce the grain losses substantially.

(2) The Philippine Government plans to construct terminal silos at 11 major ports in the country. If this plan is fully implemented, the greater majority of corn shipments for Cebu can be hauled in bulk, thereby curtailing transport costs.

(3) In the Philippines, losses arising during transportation of grain are reported to be 2 to 7%. The losses are caused primarily by improper grain handling, defective bags, etc. If grain is shipped in bulk upon construction of terminal silos, the losses in transit can be reduced substantially.

6.3.3 Grain to be handled

The proposed grain terminal will handle bulk corn shipments only, and not rice or wheat.

(1) Rice

Rice is not fit for storage in a silo because of quality troubles. (See Annex 2-27.) In addition, rice is not suitable for storage in the proposed grain terminal silo in Cebu for the reasons stated below.

As shown in Annex 6-5, domestic rice shipments reaching Cebu are shipped out from the loading ports that are scattered far and wide. In most of the loading ports, it is difficult to provde the facilities required for shipping rice in bulk. For this reason, the majoirty of the rice shipments to Cebu is packed in bags.

The Government's increased rice production programs will ultimately permit Central Visayas to attain self-sufficiency in rice (see 6.1.3). Needless to say, the region will cease to import rice. More than half of the NGA-supplied rice arriving at the port of Cebu is destined for supply to other islands. If the islands receiving rice supplies can be self-sufficient thanks to the Goernment programs, there will be a substantial reduction in the NGA rice shipments arriving at Cebu as a relay port.

Generally, rice is stored for a long period in the form of palay in order to preserve its quality. For reducing transport costs, palay is milled at the producing center and the storage period at the consuming center is short. For these reasons, the advantage of storing milled rice in a silo to prevent spoilage is not very great.

For reasons of the above circumstances, in Cebu it is advisable to store bagged rice in warehouses instead of unpacking it for reception into a silo and taking it out after a brief period for repacking to be reforwarded to other islands. Moreover, it is better to store other kinds of grain in the proposed silo in Cebu, because of their limited capacity.

(2) Wheat

The proposed silos will not store wheat, which is an imported item. The water depth alongside the wharf of the proposed grain terminal will not be sufficient to permit wheat carriers to berth alongside.

General Milling Co., is the only user of imported wheat in Cebu, and this firm has its own wharf, where efficient grain handling operations are performed.

(3) Corn

The proposed grain terminal will be devoted exclusively to the storage of corn for the reasons explained below:

Corn accounts for nearly 75% of the grain shipments arriving at the port of Cebu, which amount to about 500,000 metric tons annually. This situation is expected to continue into the future, and the improvement of the method of handling such a large quantity of corn is of great significance.

Under the NGA plan, grain terminals will be cosnstructed in General Santos, Davao and Cagayan De Oro after the construction in Cebu. Corn shipments arriving at Cebu from the three ports represent 85% of the total corn cargo. This situation will remain unchanged for some time. The provision of a grain terminal in General Santos, Davao and Cagayan De Oro will give increased importance to the proposed grain terminal in Cebu.

The techniques of handling and storage in silo of bulk corn have been firmly established, and no technical problems are foreseen for the new grain terminal.

6.3.4 Necessity of corn mill

A corn mill will be built in the proposed grain terminal in Cebu for the reasons as stated below:

NGA corn shipments arriving at the port of Cebu are transported to the NGA warehouses through the following channel.

Port - NGA warehouse - Corn mill - NGA warehouse

The construction of a corn mill in the new grain terminal will eliminate the necessity of such transportation system.

NGA ships out corn grits from Cebu to other islands in an annual volume of nearly 10,000 metric tons. The proposed corn grits mill in the new grain terminal will eliminate the need for the transportation of grits within the island of Cebu.

6.3.5 Handling of commercial corn

The proposed grain terminal will be used primarily for handling NGA corn shipments. However, if the terminal is to be devoted exclusively to NGA corn shipments, the pneumatic unloader and the wharf will remain idle most of the year.

It is planned, therefore, to handle commercial corn at the new grain terminal in order to achieve efficient utilization of this new costly facilities.

Under the present plan, it is assumed that handling of commercial corn shipments will be started two years after (1982) the grain terminal operation has started (1980), and that the volume to be handled will be 12,000 metric tons for 1982 with an annual growth rate of 5%.

Annex 6-9 describes in some detail the various problems involved in utilization of the proposed grain terminal for handling corn shipments destined for private traders.

6.3.6 Estimate of handling volume

The volume of corn shipments to be handled by the proposed grain terminal has been estimated in the following way. Details of the estimation are given in Annex 6-10.

(1) The total volume of corn shipments arriving at Cebu in 1976 is estimated to be 412,000 metric tons and the total volume of NGA corn shipments destined for grits arriving at the port during the same year to be 36,000 metric tons.

(2) Of the commercial corn shipments, those used for manufacture of starch and feedstuff are estimated to be 72,000 metric tons. The total volume of NGA and private corn shipments for grits is estimated to be 340,000 metric tons.

(3) From the estimates in (1) and (2) above, the percentage of NGA corn shipments to the total shipments destined for grits is determined to be 10.6% (36 ÷ 340). This percentage is assumed to be maintained in future years.

(4) The quantity of corn destined for grits reaching the port of Cebu is assumed to be in proportion to the population of Central Visayas. Population forecasts are based on the low assumption of NCSO shown in Annex 1-5.

(5) Of the NGA corn shipments arriving at the port of Cebu, 90% are assumed to be changeable into bulk cargo and the remaining 10% will be in bags and not be handled by the proposed grain terminal.

(6) Private corn shipments will start to be shipped in bulk in 1982. In that year, the bulk cargo is estimated to reach 12,000 metric tons and grow at the rate of 5% per year.

(7) Based on the assumptions (1) to (6) above, the following forecast has been made for the 1980 ~ 2000 period.

Table 6-4

(Unit: 1,000 metric tons)

Year	NGA Bulk Shipments	Comm'l Bulk Shipments	Total
1980	34.0	0	34.0
1985	37.1	13.9	51.0
1990	39.6	17.7	57.3
1995	42.5	22.6	65.1
2000	45.0	28.8	73.8

6.3.7 Delivery of NGA's corn

As shown in Annex 6-11, it is assumed that NGA makes grits destribution equivalent to 55% of the total destribution (13.75% per month) during the March-June period and the remaining 45% (5.625% per month) over the July-February period in an effort to stabilize the grits price.

Shown below are corn deliveries by period to cope with the grits deliveries:

Table 6-5

	Period	No. of Months	Delivery (%)	Delivery (%) per month
Large delivery	Feb.[1/] to June	5 months	60.6	12.125
Small delivery	July to Jan.	7 months	39.4	5.625

1/ Grits have to be milled and stored in large quantities at least one month before they are to be destributed.

6.4 Capacity Required of the Proposed Facilities

6.4.1 Storage capacity

As stated in 6.3.1 and 6.3.5, the proposed grain terminal will be used for storage of NGA corn shipments and temporary storage of commercial bulk corn shipments. The required silo capacity must therefore be such that it adequately accommodates the total of the two kinds of cargo.

(1) NGA's corn

The minimum stock required by NGA for stabilization of corn supply and prices is the equivalent of two months' large delivery of corn. NGA needs a silo at Cebu which can store this two months' delivery. This requirement is based on NGA's past experiences and is necessary in allowing the NGA grain terminal in Cebu, to perform a strategic function as the supply base serving Visayas, Bicol and Northeastern Mindanao.

According to the model described in 6.3.7, the delivery percentage of the large delivery month for milling of grits is 12.1% of the annual volume handled. Therefore, the required silo capacity for NGA corn shipments is 24.2% (12.1 x 2) of the annual volume handled. The volumes to be handled for the principal years are as shown in 6.3.6. The necessary silo capacities for the principal years as determined from the volumes to be handled are given in paragraph (3) below.

(2) Commercial corn for temporary storage

Silos for temporary storage are necessary as loading into trucks does not keep pace with discharging from the vessel. The silo capacity required for this purpose is assumed to be that which meets one-third of

a month's stock. The required silo capacities for temporary storage for the principal years are shown in paragraph (3) below.

(3) Determination of silo capacity

The required silo capacity is the combined sum of NGA silo capacity for long storage and commercial silo capacity for temporary storage. The required capacity is expected to grow year after year. The required capacity for the principal years is shown in the table below:

Table 6-6

(Unit: 1,000 T)

Year	Annual volume to be handled		Required silo capacity		
	NGA	Comm'l	NGA	Comm'l	Total
1980	34.0	0	8.23	0	8.23
1985	37.1	13.9	8.98	0.38	9.36
1990	39.6	17.7	9.58	0.49	10.07
1995	42.6	22.6	10.29	0.63	10.92
2000	45.0	28.8	10.89	0.80	11.69

From the above data, the installed capacity of the proposed grain terminal is determined to be 10,000 metric tons to meet the requirements of a period of nearly 10 years. Needless to say, additional silos can be provided as the need arises. (See Annex 6-12.)

6.4.2 Unloading capacity

Unlike silos, pneumatic unloader, once installed, is difficult to have its capacity increased. For this reason, it is natural to install an unloader with a capacity that is larger than the initial requirements. As to the capacity requirements in the 15th year of installation, the proposed unloader should have sufficient capacity to handle NGA corn shipmnets in an estimated annual volume of 42,500 metric tons. For storage of NGA corn shipments, priority should be given to the proposed silos having high performance. For better utilization of the silos, they must be supplied with corn immediately after each delivery. As mentioned in 6.3.7, the large delivery months correspond to the months when NGA corn

shipments are unloaded in larger quantities. The amount unloaded in these months is equal to 12.125% of the annual volume handled. Therefore, the pneumatic unloading in the 15th year of the unloader installation will amount to 42,500 T x 0.12125 = 5,150 T per month.

On the other hand, the average monthly quantity of commercial corn to be handled in the 15th year (1995) will be 1,880 T. The combined volumes of the NGA and commercial corn is 7,000 T per month. Assuming the net days available for discharging to be 10 days a month, the daily volume to be handled is 700 T. Further, assuming 7 hours in the daytime available for unloading operations with an unloader efficiency of 70%;

$$700 \text{ T} \div 7 \div 0.70 = 143 \text{ T/hour}$$

Thus, it is proposed to install an unloader with a 150 T/hour capacity. If unloading operations are carried out in the nighttime, a greater quantity of corn can be unloaded.

6.4.3 Milling capacity

To improve the operating efficiency of the corn grits mill, the proposed mill will be capable of operating at full capacity even during the small delivery months (refer to 6.3.7).

The monthly delivery during the small delivery months is euqal to 5.63% of the annual delivery. Assuming the monthly processing capacity of the NGA corn grits mill to be 2,000 T, the annual volume handled to keep the mill operating at full capacity during the small delivery month is 2,000 T ÷ 0.0563 = 35,600 T. This annual volume will be attained in the third year of operation of the proposed grain terminal. That portion of the volume which cannot be processed by the corn grits mill will be sent out to private mills for processing as in the past. Thus, the monthly milling capacity of the NGA-owned corn grits mill set at 2,000 T is considered adequate.

The monthly milling capacity of 2,000 T refers to the volume of corn to be milled per month. The grits output amounts to 1,360 T per month assuming a recovery rate to be 68% and mill operation to be for 24 hours.

The hourly milling capacity of the NGA-owned mill is calculated as below assuming an operating efficiency of 90% and 23 operating days per month.

2,000 T/mth ÷ 0.90 ÷ 23 days/mth ÷ 24 hours/day = 4 T/hour

6.4.4 Warehouse

A warehouse of 720 M^2 in floor area without partition walls will be built to receive a total of 930 T as broken down below:

Corn	300 T
Grits	500 T
By products	130 T
Total	930 T

6.4.5 Other equipments

The proposed grain terminal will be equipped with a cooling and aeration system but not with a dryer. The reason for not providing a dryer is that corn should be dried in the silos at the producing center. Should it be necessary to dry corn shipments immediately upon unloading at the Cebu Grain Terminal, they can be sent to the NGA corn grits mill for processing.

6.5 Operation of the Grain Terminal

6.5.1 Organization and operation

The proposed grain terminal in Cebu will be managed and operated under the control of NGA Regional Director for Central Visayas. The post of Manager of the terminal will be assumed by a NGA staffer or a person appointed by NGA.

The operational policy and regulations will be laid down by NGA and the terminal managers will be responsible for management and operation of the temrinal within the framework of NGA policy and regulations.

The terminal will be run as an independent business concern and annual fund requirements and working budget must be approved by NGA.

As shown in Annex 6-13, the internal organization of the grain terminal is composed of three departments: General Affairs and Accounting, Corn Milling and Engineering, and Silo and Warehouse.

(1) General Affairs and Accounting Department

This department takes charge of administration, accounting and finances.

(2) Corn Milling and Engineering Department

This department is responsible for milling, packing and stacking of corn grits. These operations will be carried at all hours and night shifts will be supervised by foreman.

The department also takes upon itself the solution of technical problems associated with the silos, pneumatic unloader and other terminal equipment.

(3) Silo and Warehouse Department

This department is responsible for unloading, storage and delivery of corn shipments and storage and delivery of grits and by products.

6.5.2 Personnel and wages

The permanent staff will consist of a total of 58 personnel: a manager, 10 in the General Affairs and Accounting Department, 31 in the Milling and Engineering Department and 16 in the Silo and Warehouse Department. Salary and wage breakdown is shown in Annex 6-14.

Extra workers are hired during large-delivery months (February to July) to help payroll staff in packing and delivery of corn.

6.5.3 Employment and training

Plant engineers having adequate experiences in corn milling must be employed. Foremen in the corn milling department must have adequate practical experience with corn mill or flour mill or modern feed mill. Likewise, persons well experienced in work at privately-owned grain terminals need to be appointed foremen in the silo and warehouse

department. Persons will adequate practical knowledge of corn and grits are needed to be in charge of quality control.

The personnel manager must prepare a detail employment plan as well as a thorough training program.

6.5.4 Revenues

Revenues of the new grain terminal will consist of handling, storage and grits processing charges.

The charges are as shown below and the bases for their calculation is given in Annex 6-15.

Handling charges	P18.0/T
Storage charges	P23.5/T
Processing charges	P110.0/T (in terms of corn)

The charges will be paid by NGA when NGA-owned corn in handled, and private grain dealers (sometimes corn mill owners concurrently) who are consigners of their corn handling.

6.5.5 Expenditures

Major items of the operating cost are personnel cost, repairs, maintenance, electricity, fuel, insurance premiums and other costs and charges. Annex 6-17 gives a breakdown of the operating cost.

6.6 Future Extension

From the silo capacities for the principal years shown in 6.4.1, it is observed that the initial installed capacity will become inadequate in 1990. The required additional silo capacity for that year is assumed to be 4,000 T. Details of this additional capacity are shown in Annex 6-12. The time for installation of the additional silo may vary depending on the actual volume of commercial corn to be handled.

No additional pneumatic unloaders are planned for installation, since, as explained in 6.4.2, proposed handling operations during the nighttime is expected to allow a substantial increase in the volume of unloading.

Construction of an additional corn mill is considered unnecessary. The reason is that no further business should be taken away from private corn mills.

No additional warehouse will be needed, since an increase in the volume of corn handled will be represented by bulk corn.

6.7 Study of Alternative Plan

Evaluation was made of the alternative plan detailed in 6.7.1 below for the present Cebu Grain Terminal Project.

Financial analysis of this alternative make it clear that its internal rate of return is lower than the 6.8% of the present project. (See Annex 6-18.)

Therefore, the proposed grain terminal is superior over the alternative plan.

6.7.1 Plan of alternative

(1) A grain warehouse with a capacity of 10,000 T will be built to receive bagged corn and rice.

(2) Unloading from vessel will be undertaken by private stevedoring firms as hitherto. The proposed grain terminal will pick up the cargoes from the wharf and will be responsible for subsequent handling.

(3) Forklifts will be used for haulage from the wharf to the warehouse.

(4) Before stacking in the warehouse, the grain shipments will be weighed by forklift scales.

(5) Pallets will be used for stacking in the warehouses.

(6) A corn mill with 2,000 T capacity per month in terms of corn will be built in the grain terminal.

(7) Commercial cereals will not be handled by the grain terminal.

(8) No additional warehouse will be constructed.

6.7.2 Major equipment replacing silo and pneumatic unloader

Warehouse (9,100 M^2 in area) @P0.9/M^2		P8,190,000
Pallet (1.25 T in hoisting capacity) @P85	800 ea.	P68,000
Forklift (2 T in capacity) @P100,000	3	P300,000
Forklift scale	1	P80,000