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A STUDY OF COMMERCIAL RICE WAREHOUSES IN THE PROVINCE OF BULACAN, PHILIPPINES

by

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INTRODUCTION

The Rice Industry Situation

Rice is the most important crop in the Philippines and it is the staple food of the population. More than 70 per cent of the country's population depends on this commodity for their livelihood.

Thirty-three per cent of the country's total cropland (approximately 10 million hectares) is devoted to rice cultivation, and about 60 per cent of the total labor force is employed in the rice industry.[1]

As a component of the Filipino consumer's budget, cereals and by-products were found to constitute 38.43 per cent of the food budget of the average Filipino family.[2]

The rice industry in the Philippines is always faced with the perennial problem of meeting the consumption requirements of 43.5 million Filipinos. Of the 3.5 million hectares planted to rice, approximately 1.1 million is irrigated during the wet season and 0.6 million during the dry season. The rest are rainfed and upland areas accounting for 1.4 and 0.4 million hectares, respectively.[3] This problem of

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[1] National Grains Authority, Grain Industry Development Plan 1976-200 (Manila: National Grains Authority, 1976), p. 6.

[2] Ibid.

[3] Philippine Council for Agriculture and Resources Research, The Philippines Recommends for Rice (Los Banos, Laguna: Philippine Council for Agriculture and Resources, 1977), p. 1.

irrigation coupled with inadequate credit facilities and the lack of other farm inputs such as certified seeds, fertilizers and chemicals, etc. all contributed to the very low productivity which averaged to only 40 cavans per hectare in 1974. Moreover, the total production levels in the past years have been considerably affected by climatic conditions that prevailed in the country, particularly, typhoons and floods which contributed to large amount of losses in the field.

The government has launched several programs to increase rice production and attain self-sufficiency. These included "development of high-yielding rice varieties, supervised credit, expansion and development of irrigation facilities, massive extension and information services, and intensified marketing service. These activities were jointly sponsored by the government and the private sector to help the rice farmers."[4/]

Foremost of the national rice production programs is the Masagana 99 Rice Production Program. Its goal is to attain self-sufficiency in rice and eventually transform the country from a rice importer to a rice exporter, thus saving the dollars spent yearly for rice.

Self-sufficiency in rice was gradually attained in the Masagana 99 program. Since the program's initiation in 1973, area planted to rice increased from 3,112,000 hectares in 1972-73 to 3,539,000 hectares in 1974-75. Rice yields have

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[4] Ibid.

improved from an average of 1950 kilograms per hectare in 1972-73 to 2,222 kgms per hectare in 1974-75. With increased field yields arises the issue of marketable surplus and the need for storage and warehousing facilities; storage during peak months of harvest and distribution during the lean months of supply. In lieu of the above, a study on storage and warehousing is thus in order.

Statement of the Problem

A study of storage and warehousing is important because of the seasonal nature of rice production and the essentiality of working stocks to provide continuity in both distribution and processing to satisfy the relatively constant demand. Storage of palay or rice is therefore necessary to adjust supply and demand.[5/]

There are two major problem areas confronting rice storage: tremendous grain storage loss and underutilization of existing warehouse facilities.

Storage losses. Losses in grain storage are either quantitative or qualitative in nature. Grain losses are manifested in several ways: loss in weight, food loss, quality loss, seed loss, loss of goodwill and monetary loss as well. In the post-harvest range of grain losses, storage

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[5]Leon A. Mears, Melisa H. Agabin and Rosalinda C. Marquez, Rice Economy of the Philippines (Quezon City: University of the Philippines Press, 1974), p. 43.

accounts for 2-6 per cent.[6]

The National Grains Authority identifies the two main problems confronting commercial warehouses: (a) the lack of scientific techniques in grain storage which results in the improper storage of stocks, and (b) the problem of pest control which causes the deterioration, both in quantity and quality, of rice stocks.

The most common storage practices that contribute to losses are: (a) piling of stocks at random without proper grain classification, (b) piling of stocks up to the warehouse walls and around the supporting pillars, which is a primary cause of spillage, (c) storing of paddy and/or rice alongside other products like, fertilizers, insecticides and other chemicals which emit gases and could be potential health hazards.[7]

As to the problem of infestation, in most of the country's warehouses, rodents and insects are the most serious pest of stored grain, which in some cases reach extremely high proportions. A report of the Asian Productivity Commission shows that 48 per cent of total storage loss is due to rodent infestations, 12 per cent from insect infestation, 3 per cent from microbial organisms and the rest from moisture, heat,

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[6] E.V. Araullo, D.B. de Padua and Michael Graham, Rice: Post-Harvest Technology (Ottawa: International Development Research Centre, 1976), p. 311.

[7] National Grains Authority, p. 18.

and spillage.[8]

Rice bran, which is commonly stored side-by-side with the grain stocks, provides a good breeding place for insects and other warehouse pests. Infestations result in wastes, since they cause spoilage of stored grain. Quantitative and qualitative losses result from infestations.[9] It has been found that re-milling, which is required due to intense insect infestations, can cause an "average loss of as much as 3.995 per cent in the total weight of grains that is re-milled."[10] Furthermore, re-milling entails extra cost in terms of both labor and resources.

Studies on rice milling and storage in the Philippines by Mears and Marquez show that all regions have their peak requirements for storage capacity and utilization in the months of December or January which go with the major crop harvest. The second, but considerably lower peak months are towards the end of the second crop in May and June. The lean months were reported to be in August, September and October, immediately before the major harvest.[11]

Studies made by IRRI (International Rice Research Institute) in Central Luzon regarding rice milling and processing,

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[8]Tatsuo Tani, General Status of Rice Storage in South-East Asia (Tokyo: Asian Productivity Organization, 1970), p. 515.

[9]National Grains Authority, p. 18.

[10]Ibid.

[11]Leon A. Mears et al., p. 123.

showed the peak months of storage in the region are November, December, January, and February; while the lean months are July, August, September, and October. Out of the 27 rice mills with warehouses studied, only one mill reported full utilization of facilities, the rest reported underutilization. The primary reason given for underutilization of facilities is the irregulatiry of supply of rough rice. The second reason given was that, the warehouse facilities were used solely by the owner for his stocks. Other reasons for warehouse underutilization included NGA regulations, inadequate working capital to buy paddy, and paddy being stored in different ways.[12/]

A study conducted in southern part of Luzon regarding improved rice processing facilities indicated that small warehouses were utilized most and the large warehouses, the least. The rated capacities of small warehouses were found to be utilized at an average of almost 40 per cent during the period of study. In contrast, medium size warehouses were utilized at an average of 21 per cent and large warehouses, 17 per cent.[13/] In the study, warehouses with capacity of less than 10,000 cavans were classified as small, those between 10,000 and 20,000 cavan capacities were called medium,

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[12]Zenaida Toquero and Bart Duff, Survey of Rice Milling and Processing Practices Among Millers in Central Luzon (Los Banos, Laguna: International Rice Research Institute, 1977), p. 5-6.

[13]Ibid.

and those with greater than 20,000 cavans were classified as large warehouses.

There are several variables or factors that are related to this problem of underutilization or "of excess un-capacity." The major variable related to underutilization is the heterogeneity of the rice mill structure as exhibited by large variations in type, capacity, location, services rendered, as well as ownership of different producing costs, consequently, investment requirements, costs and return also vary over a wide range.

The normal concentration and spatial spread of paddy production coupled with the existence of a number of device processing units competing with one another, partially explains underutilization in storage and warehousing. Small service mills generally do not purchase and store paddy and thus utilization of this capacity is directly linked with normal pattern of paddy production and marketing. Milling operations for small service mills are at maximum during the brief post-harvest months and generally remains underutilized during the rest of the year.

In the case of large commercial mills, when purchasing, storing and processing, given the season and greatest choice of paddy products to take advantage of technical and economic advantages and increase the scale of operation, more funds need to be invested in paddy purchase and would have to incur additional transport and storage costs. This requires bigger working capital.

From the foregoing discussions, the present study is being initiated to study the operation and management of rice warehousing and storage facilities in the province of Bulacan. An analysis of the economical, technical, and social factors that influence existing warehousing practices could be of value in identifying the problems and some possible solutions to these problems either through government support programs or through the concerted effort of the rice millers themselves.

Bulacan was selected as the site for the study because the geographical location of the commercial warehouses in the said province offers them a comparative advantage. The proximity of Bulacan to the Greater Manila area, a major consumption center, and the availability of adequate transport and communication networks for inter-regional shipment of surpluses make this area a potential site for terminal warehouse facilities both for private and government stocks. The data that will be generated is expected to provide further information for cost analysis and evaluation of different warehouse practices and operations.

The Objectives of Study

The objectives of this study are:

(1) To determine the current storage practices of different commercial warehouses;

(2) To be able to identify the economic, technical, and social factors that influence utilization of warehouse facilities;

(3) To assess the costs of different warehouse operations, i.e., cost of drying, storage and milling.

REVIEW OF LITERATURE

Storage Environment

In a study concerning the status of grain storage in developing countries, it was reported that one of the problems of grain storage in the tropics is the storage environment which involves high temperatures and humidities that prevail over extended periods of time. This situation creates a favorable condition for infestations.[14] Insects were reported to be adapted to a fairly high temperature, 30-32° C (85-90° F), which is common in the tropics. At lower temperatures, 20° C (70° F) their growth and reproduction were found to be greatly reduced and ceases for many at about 10° C (50° F).[15] Since insects take time to develop and their growth relatively slow until they reach a critical mass, the shorter the period the grains are in storage, the less insect damage there will be.[16]

The existing climatic conditions in the Philippines create problems for storage. In the country there are two distinct seasons -- the dry and the wet, except for some parts

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[14] John R. Pedersen, Status of Grain Storage in Developing Countries (Kansas State University: Food and Feed Grain Institute, 1975), p. 13-16.

[15] Ibid.

[16] John R. Moore, S.S. Johl and A.M. Khushro, Indian Foodgrain Marketing (New Delhi: Prentice-Hall of India Private, Ltd., 1973), p. 130.

in the south where there are uniform climatic conditions. During the dry season, it is reported that temperatures could go as high as 98° F and sometimes more with either low or high humidities.[17] Temperatures and humidities are sometimes higher than that required for safe storage. During the rainy season, the temperature goes down to as low as 65° F and accompanied by higher humidities.[18] These are the factors that explain why time for safe storage of wet grain, either in sack or bulk, is only 3 to 5 days. This is reported as a guideline to follow for warehouse operators. Furthermore, under Philippine conditions, the moisture content of the rice grain should not be more than 14% if it is to be stored for 3 months. For storage period of a year, the level of moisture in the rice grain should not exceed 12%.[19] This could be explained by the rice grain's tendency to be in equilibrium with the humidity of the surrounding air.

General Status of Rice Storage

A report of the Asian Productivity Organization regarding the general status of rice storage in South-East Asia contained a summary of results for the Philippines. The study showed that the most common form of storage is through paddy rice and the type of package used is gunny or jute bags. As

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[17] National Grains Authority, p. 30.

[18] Ibid.

[19] Ibid.

to type of storage structures, 50 per cent was found to be galvanized iron sheet bin and 30 per cent to be wooden structures. The moisture content of rice grain in the central warehouse facilities was reported to be between 12-15 per cent. It was also found that 30 per cent of the storage houses employed fumigation as a preventive measure against damage due to insect pests, and practised ventilation method, preventing about 30 per cent of the possible wet damage and 80 per cent of mold damage.[20]

Education and Level of Technology

Another storage problem found in developing countries is the level of technology. "In many developing countries, the individual responsible for storing grain is not completely aware of the hazards involved."[21] It is argued that the management of stock in storage is a product of the technological knowledge of the individual responsible for storage. Type and location of storage structures combined with storage practices influence the condition of grain in storage. In the Philippines, losses were reported due to inadequate structure which do not provide protection during typhoons, from birds and rodents and also proper ventilation circulation of air inside the building. Storage must be located

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[20]Tatsuo Tani, p. 515.

[21]John R. Pedersen, p. 13-16.

sufficiently safe from flood waters. This is becoming more difficult because of flood problems during the rainy months.[22] Improper warehousing practices enumerated were: (a) piling of stocks without proper classification; (b) piling of stocks up to the warehouse walls and pillars resulting in rupture of sacks located at the bottom of the pile and thus spillage; (c) storage of other products which could be potential health hazards, as well as breeding places for warehouse pests; (d) absence of sack treatment before re-use; (e) premises are not disinfected before and after normal operations; (f) improper handling inside warehouse which leads to spillage and grains getting mixed with foreign material like dust, urine, and animal excreta; (g) lack of adequate inspection as to insect infestation or mold attacks on the part of the warehouse operator.

To maintain the quality of rice during storage, and minimize losses, several warehousekeeping practices are recommended: proper classification of grains; knowledge of moisture contents of grain prior to storage (this could be done by using moisture testers); proper aeration for circulation of air inside the warehouse; treatment of sacks after use; recirculation of rice in storage; regular inspection for infestation and moisture damage; spraying and fumigation for pest control; keeping the warehouse premises clean.[23]

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[22] National Grains Authority.

[23] Ibid.

Grain Distribution and Marketing System

The rice industry experiences inefficiencies in the distribution system which results in severe price fluctuations. It is said that marketing problems increase when farm size is small. In the Philippines, more than 50 per cent of the total rice farms is under 3 hectares.[24] Many small traders, or local village assemblers are involved in the collection and assembly of small quantities of surpluses from rice farmers, to be sold to other private channels. The number of times the product changes ownership was found to be 10 or more times.[25] The components of the distribution channels shown in Figure 1, could be categorized into three general levels. The first is the local assembly market, which functions in the immediate areas of production. The second level is the transit market, located in the principal market towns of producing areas. The third is the terminal market and is referred to as those markets in large cities or areas of consumer concentration, which usually are deficit areas.

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[24] Leon A. Mears, et al., p. 43

[25] Ibid.

METHODOLOGY

Mathematical Model and Estimation Procedure

For this study four approaches will be used in the analysis of the data to be gathered. The first is directed towards the estimation of physical quantities such as level of stocks in warehouses during the months covered in the study and effective rated capacities of rice mills. The second is directed towards the analysis of the efficiency of warehousing and other associated facilities. The third approach will involve analysis of different variables that would be influencing the utilization of warehouse facilities. The fourth approach will be the estimation of cost requirements for different storage operations.

A. For driers. Drying facilities are very important prior to storage of paddy. The level of moisture content of rice after harvesting is rather high and should be reduced to a level for safe storage. Drying not only improves the quality of rice and prolongs the length of safe storage period, but also influence the rate of milling recovery. When harvesting is done during the dry season, concrete floors are the most popular facilities for solar drying. During wet season harvests, solar driers may not be functional and thus mechanical driers would be needed.

For this type of facility the following estimation will be performed:

1. For Mechanical Driers: Notations and symbols;

D_M = per cent monthly utilization

D_C = manufacturer's rated capacity in kilograms per hour[26/]

V_M = total volume of paddy dried for the month expressed in 50 kilograms

A = average volume of paddy per shift expressed in 50 kilograms

S = number of shifts per day

D = number of days in operation per month

$$D_M = \frac{V_M}{D_C} \times 100\%$$

where:

$$V_M = A \times S \times D$$

2. For Solar Driers:

D_S = per cent monthly utilization

S_T = total available space for drying

T_H = thickness of layer of paddy dried in concrete floor

V_T = total paddy dried for the month

$$D_S = \frac{V_T}{S_T \times T_H} \times 100$$

B. For rice mills. In Central Luzon, majority of warehouses are integrated with rice milling operations.

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[26]One cavan is equal to 50 kilograms.

Warehouse facility is either in the same building as the rice milling equipment and/or adjoining the rice mill building. Commercial mills are engaged in paddy procurements for continuous, normal operations. Commercial mill operators exercise different trading practices. Some purchase paddy stocks from farmers and/or other traders to be sold later in the same form, without any processing performed.

Notations and symbols:

1. Rate of Utilization per year

M_Y = rate of utilization per year

M_C = manufacturer's rated capacity in kgs./hour

Q_Y = total volume of paddy milled for the year expressed in 50 kilograms

D_Y = number of days in operation for the year

A = average number of cavans milled per day

$$M_Y = \frac{Q_Y}{M_C} \times 100\%$$

where:

$$Q_Y = D_Y \times A$$

2. Rate of Utilization per month

M_M = monthly per cent rate of utilization expressed in per cent

C_M = manufacturer's rated capacity

Q_M = total number of cavans milled for the month

D_M = number of days in operation per month

A = average number of cavans of paddy milled per day

$$M_M = \frac{Q_M}{C_M} \times 100$$

where:

$$Q_M = D_M \times A$$

C. Storage and Warehouse Facilities. To determine the capacity utilization of warehouses, weekly stock reports of millers and warehouse operators will be obtained from the National Grains Authority. From survey results, capacity utilization on a monthly basis will be determined as follows:

Notations and symbols:

Q_M = stock level at end of month M expressed in cavans

EI_{M-1} = ending inventory of stocks for the month previous to M

R_M = volume of receipt of stocks for the month M expressed in 50 kilograms

I_M = volume of stocks issued during the month M expressed in 50 kilograms

The actual volume of stock or ending inventory for the month M is given by the formula:

$$Q_M = EI_{M-1} + R_M - I_M$$

This means that the total volume in storage at the end of month M is equal to the carry-over stock from the previous month plus the volume starting for the month less volume issued for the month.

To determine the per cent utilization of the warehouse

capacity, the following equations will be used:

Notations and symbols:

W_M = monthly utilization expressed in per cent

Q_M = stock level during the month M expressed in 50 kilograms

$$W_M = \frac{Q_M}{C_T} \times 100$$

To estimate the annual storage capacity turnover, the following formula will be used:

Notations and symbols:

ATO = annual turnover of the warehouse capacity

Q_Y = total volume of receipts for the year expressed in 50 kilogram bags

C_T = total warehouse capacity expressed in 50 kilogram bags

$$ATO = \frac{Q_Y}{C_T}$$

Annual storage turnover ratio is used to determine the number of times actual capacity is filled, or the total volume of stocks that passed through the warehouse. If ATO is found to be 2.0, this means that actual warehouse capacity was filled two times a year. The average utilization efficiency and annual storage turnover ratio are relevant in determining the available capacity for future increases in production.

D. Two-way cross tabulation and chi-square statistic.

Cross tabulation is a valuable step in the analysis of association between variables, since it enables one to see the data arrayed with respect to the variables used and to form a judgment about the degree of association present. But the cross-tabulation procedure does not provide the necessary degree of assurance, so for this study additional analytical technique will be used, the chi-square test. This is to determine the degree of association of variables in the two-way table.

The value of chi-square is computed using the following formula:

$$X^2 = \sum_{i=1}^{c} \frac{(O_i - E_i)^2}{E_i} \qquad \text{for } a = .05$$

where:

X^2 = chi-square value used to determine the probability of the differences in the observed and expected values

i = refers to the i^{th} cell

c = total number of cells

O_i = observed value for cell i

E_i = expected value for cell i

a = statistical level of significance

This test will be used to determine if there is an association between warehouse capacity and the practice of pest control measures in the commercial warehouses to be included in this study. The study intends to find out if pest control

practice is independent of warehouse capacity.

The linear regression model will be used to analyze some of the variables influencing the average rate of warehouse utilization. It can be expected that there will be differences in the performance of warehouses to be selected for this study. The primary reason could be the heterogeneity of the rice mill industry in the country.

Production and marketing organization in the area of operation are very significant factors in the selection of warehouse and rice mill capacities. Milling operations are most active during harvest months. This could be attributed to the seasonal and spatial distribution of paddy. Since large volume of working capital is tied-up with paddy purchases, some millers may prefer to install high capacity mills and process their paddy instead of incurring storage costs. In this type of practice rice millers aim to have a faster turnover of capital. In areas where there are more than one harvest season per year, it can be expected that mill capacity may be relatively smaller. In some localities with available irrigation water the whole year, monthly milling operations may not exhibit large variability and warehouse facilities can be expected to have higher average monthly utilization.

The purchase cost of rough rice is significant in milling operations. The volume of working capital is directly related to the volume of operations. There are numerous trade channels in the rice market and ownership was found to change more than ten times. In this case, it is expected that

sources and outlets of paddy and milled rice would influence the operations of rice mills.

There are other factors that have direct or indirect bearing to utilization of warehouse facilities, but for this study, only selected variables will be analyzed. The following equation will be listed as a first step in determining the influence of selected variables to the dependent variables average percentage monthly utilization of warehouse capacity.

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9 + E$$

where:

Y = percent average monthly warehouse utilization
X_1 = "optimum" storage capacity
X_2 = theoretical percent average storage utilization
X_3 = percent utilization of milling capacity
X_4 = warehouse capacity as percentage of milling capacity
X_5 = working capital as percentage of milling volume
X_6 = number of sources of rough rice
X_7 = number of outlets for milled rice
X_8 = annual milling capacity
X_9 = drying capacity as percentage of peak monthly harvest
E = random error

Sampling Procedure

The sampling technique to be used is stratified random sampling. To initiate the selection of respondents, a complete

enumeration of all warehouses in the province of Bulacan will be made. The National Grains Authority will be the primary source of the complete list of registered warehouses. Stratification will be based on capacity of warehouses. The first classification would be those with capacities of 10,000 cavans and below, the second classification will be those warehouses with a capacity in between 10,000 and 20,000 cavans, and the third level will be those with capacities above 20,000 cavans.

Random sampling will be performed after stratification. Those that will be drawn will serve as sample observations. For this study the target number of respondents is 10 per cent of total number of commercial warehouses in the province. A report of studies on warehouses in Central Luzon in 1971 revealed a total of 290 warehouse establishments in the province of Bulacan.

Types of Data to be Used and Possible Sources

For this study, both secondary and primary data will be used. The possible sources of secondary information would be government agencies like, National Grains Authority, Bureau of Agricultural Economics, Bureau of Agricultural Extension and the Department of Agrarian Reform Provincial Office. The basic data to be gathered from secondary sources are:
(a) complete listing of commercial warehouses in the province of Bulacan, the names of the owner, capacity and location;
(b) rice production reports in the province on a monthly basis as well as monthly pattern of harvest from June, 1977 to

May, 1978; (c) monthly price levels.

Primary data will be obtained from personal interviews of selected respondents, which in this study, will be warehouse operators. Questionnaires will be prepared to facilitate the collection of needed information.

Scope and Location of the Study

The proposed area of study is the province of Bulacan, which has a total of 24 municipalities. This is one of the most progressive areas in Central Luzon because of its immediate proximity to Manila, the nation's capital and considered as the most important market in the country today.

The information to be gathered will include warehouse operations from June, 1977 to May, 1978. The whole study is designed to last for six months. The first month will be spent for preparatory activities. Two-and-a-half months will be allotted for field survey, one-and-a-half months will be for processing and analysis of data. The last month will be used for compilation and presentation of final report on the study. Analysis and processing will be done in the University of the Philippines at Los Banos.

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BIBLIOGRAPHY

Abboth, J.C., Baster, P.G.H., and Spinks, V.R. Rice Marketing. Rome: Food and Agriculture Organization, 1973.

Alkuino, Jose M. Jr. "Utilization of Improved Rice Processing Facilities in Camarines Sur". M.S. Thesis, University of the Philippines at Los Banos, 1974.

Anden, T.L., and Palacpac, A.C. Data Series on Rice Statistics Philippines. Manila: Philippine Council for Agriculture and Resources Research, 1976.

Araullo, E.V., De Padua, D.B., and Graham, M. Rice Post-Harvest Technology. Canada: International Development Centre, 1976.

Food and Agriculture Organization. Meeting of Experts on the Mechanization of Rice Production and Processing, Paramaribo, Surinam. Rome: Food and Agriculture Organization, 1971.

Food and Agriculture Organization. National Grain Policies. Rome: Food and Agriculture Organization, 1972.

Food and Agriculture Organization. Bigger Crops and Bigger Storage in World Food Supplies. Rome: Food and Agriculture Organization, 1969.

Hall, D.W. Handling and Storage of Food Grains in Tropical and Subtropical Areas. Rome: Food and Agriculture Organization, 1970.

Lele, Uma J. Foodgrain Marketing in India: Private Performance and Public Policy. Ithaca: Cornell University Press, 1971.

Mears, Leon A., Agabin, M.H., and Marquez, Ric. Rice Economy of the Philippines. Quezon City: University of the Philippines Press, 1974.

Moore, John R., Johl, S.S., and Khushro, A.M. Indian Foodgrain Marketing. New Delhi: Prentice-Hall of India Private Limited, 1973.

National Grains Authority. Grain Industry Development Plan 1976-2000. Manila: National Grains Authority, 1976.

National Grains Authority. Food Storage and Handling Practices. Manila: National Grains Authority, 1975.

Pedersen, John R. Status of Grain Storage in Developing Countries. Kansas State University: Food and Feedgrain Institute, 1975.

Toquero, Zenaida and Duff, Bart. Survey of Rice Milling And Processing Practices Among Millers in Central Luzon.

APPENDIX

TABLE 1

Distribution of Farm Size in the Philippines
(May, 1960)

Hectares	All Farms		Rice Farms	
	No. (000)	%	No. (000)	%
Under 0.5	89	4.1	26	2.5
0.5 to under 1	161	7.5	69	6.6
1 to under 2	642	29.6	331	31.8
2 to under 3	459	21.2	249	23.9
3 to under 5	405	18.7	207	19.9
5 to under 10	290	13.4	121	11.6
10 to under 20	100	4.6	34	3.2
20 to under 50	16	0.7	4	0.4
60 and above	5	0.2	1	0.1
Total	2,167	100.0	1,042	100.0

Source: Bureau of Census and Statistics, Census of the Philippines, 1960.

TABLE 2

Available Commercial Storage Capacity and Percentage Utilization by Region, FY 1969-70
(in 000 cavans)

	July	Aug.	Sept.	Oct.
Philippines (51,494)				
Storage required:				
Rice	13,909	8,419	5,994	5,994
Corn	2,776	3,078	4,148	4,962
Total	16,675	11,497	10,142	10,292
Percent utilization	32.4	22.3	19.7	20.0
Luzon (32,156)				
Storage required:				
Rice	11,664	8,027	5,083	3,899
Corn	409	363	954	1,567
Total	12,073	8,390	6,037	5,466
Percent utilization	37.6	26.1	18.8	17.0
Eastern Visayas (3,485)				
Storage required:				
Rice	241	212	212	212
Corn	904	902	1,064	1,064
Total	1,145	1,114	1,276	1,276
Percent utilization	32.8	32.0	36.6	36.6
Western Visayas (3.296)				
Storage required:				
Rice	548	548	548	548
Corn	106	172	470	532
Total	654	720	1,018	1,080
Percent utilization	19.8	21.8	30.9	32.8
Mindanao (12,556)				
Storage required:				
Rice	1,768	1,146	1,146	1,146
Corn	1,361	1,681	1,637	1,311
Total	3,129	2,827	2,783	2,457
Percent utilization	24.9	22.5	22.2	19.6

TABLE 2 (Continued)

	Nov.	Dec.	Jan.	Feb.
Philippines (51,494)				
Storage required:				
Rice	14,828	24,449	32,919	28,364
Corn	4,962	5,089	5,385	5,178
Total	19,790	29,458	38,304	33,542
Percent utilization	38.4	57.2	74.4	65.1
Luzon (32,156)				
Storage required:				
Rice	7,874	13,816	20,901	18,195
Corn	1,397	1,062	756	900
Total	9,271	14,878	21,657	19,095
Percent utilization	28.8	46.3	67.3	59.4
Eastern Visayas (3,485)				
Storage required:				
Rice	370	896	787	575
Corn	1,080	1,058	1,135	1,055
Total	1,450	1,954	1,922	1,630
Percent utilization	41.6	56.1	55.2	46.8
Western Visayas (3,296)				
Storage required:				
Rice	2,347	2,822	4,088	3,694
Corn	446	406	476	479
Total	2,793	3,228	4,564	4,173
Percent utilization	84.7	97.9	138.5	126.6
Mindanao (12,556)				
Storage required:				
Rice	1,994	4,989	5,976	4,840
Corn	2,192	2,566	2,927	2,823
Total	4,186	7,555	8,903	7,663
Percent utilization	33.3	60.2	70.9	61.0

TABLE 2 (Continued)

	Mar.	Apr.	May	June
Philippines (51,494)				
Storage required:				
Rice	24,529	22,133	22,544	21,507
Corn	5,610	5,607	7,472	6,911
Total	30,139	27,740	30,016	28,498
Percent utilization	58.5	53.9	58.3	55.3
Luzon (32,156)				
Storage required:				
Rice	16,078	15,081	14,500	13,702
Corn	1,108	1,273	1,777	1,540
Total	17,186	16,354	16,277	15,242
Percent utilization	53.4	50.9	50.6	47.4
Eastern Visayas (3,485)				
Storage required:				
Rice	363	221	1,030	1,104
Corn	1,059	996	1,199	1,126
Total	1,422	1,217	2,229	2,230
Percent utilization	40.8	34.9	64.0	64.0
Western Visayas (3,296)				
Storage required:				
Rice	3,370	3,278	3,178	2,672
Corn	465	397	587	570
Total	3,835	3,675	3,765	3,242
Percent utilization	116.5	111.5	114.2	98.4
Mindanao (12,556)				
Storage required:				
Rice	3,762	2,740	2,529	2,918
Corn	3,164	3,153	4,080	3,855
Total	6,926	3,893	6,609	6,773
Percent utilization	55.2	46.9	52.6	53.9

TABLE 3

Warehouse Facilities by Ownership and by Province, 1971
(in 000 cavans)

Regions	FaCoMa		RCA		PRIVATE		TOTAL	
	No.	Capacity	No.	Capacity	No.	Capacity	No.	Capacity
Philippines	193	4,672	88	3,482	3,119	41,379	3,405	49,538
Illocos	1	20	9	144	23	266	33	430
Abra			1	6			1	5
Batanes			1	3	1	1	2	4
Benguct			1	10	8	13	9	23
Ilocos Norte			1	20	7	-	8	6
Ilocos Sur			1	10	1	-	2	10
La Union			4	95	6	267	11	382
Cagayan Valley	35	1,115	3	109	146	2,385	184	3,609
Cagayan	15	430	2	76	18	320	35	826
Isabela	14	520	1	33	67	1,315	82	1,868
Apayao-Kaligna	1	40			12	195	13	235
Nueva Vizcaya	5	125			49	555	54	680
Central Luzon	69	1,706	9	463	1,122	15,015	1,200	17,184
Bataan					67	816	67	816
Bulacan	14	303	1	100	275	4,452	290	4,855
Nueva Ecija	23	655	2	240	601	4,173	626	5,068
Pampanga	5	155	1	15	62	2,655	68	2,825
Pangasinan	16	335	4	88	26	689	46	1,112

TABLE 3 (Continued)

Regions	FaCoMa		RCA		PRIVATE		TOTAI	
	No.	Capacity	No.	Capacity	No.	Capacity	No.	Capacity
Tarlac	10	243	1	20	58	2,010	69	2,273
Nambales	1	15			33	220	34	235
Southern Tagalog	17	307	19	803	403	4,682	439	5,792
Manila			8	474	38	467	46	941
Batangas			1	22	45	274	46	296
Cavite	1	10	3	90	76	759	80	859
Laguna	5	85	2	70	38	317	45	472
Marinduque			1	6	22	10	23	16
Mindoro Occidental	1	15	1	10	60	1,443	62	1,468
Mindoro Oriental	1	17	1	50	33	275	35	342
Quezon			1	40	58	252	59	292
Rizal	9	180			27	856	36	1,036
Palawan			1	41	6	29	7	70
Bicol	14	263	11	314	203	1,472	228	2,049
Albay	3	55	5	230	47	132	55	417
Camarines Norte			1	7	13	18	14	25
Camarines Sur	9	180	1	50	73	1,091	83	1,321
Catanduanes			2	7	6	23	8	30
Masbate			1	5	29	107	30	112
Sorsogoa	2	28	1	15	35	101	38	144

TABLE 3 (Continued)

Regions	FaCoMa		RCA		PRIVATE		TOTAL	
	No.	Capacity	No.	Capacity	No.	Capacity	No.	Capacity
Eastern Visayas	7	120	9	231	291	3,114	307	3,465
Bohol	1	20			27	48	28	68
Cebu			3	135	56	2,729	59	2,864
Leyte	6	100	2	35	147	129	155	264
Southern Leyte			1	10	10	-	11	3
Northern Samar			1	13	23	167	24	180
Eastern Samar			1	8	13	33	14	41
Western Samar			1	30	15	15	16	45

TABLE 4

Monthly Percentage Distribution of Palay Harvest
By Region, Crop 1969-70

Region/Month	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Philippines	0.7	2.6	4.4	20.6	21.7	20.1	2.0	3.0	5.0	8.9	7.0	4.0
Ilocos	0.2	0.2	0.1	10.2	47.5	23.8	a	a	a	1.7	10.4	5.9
Cagayan Valley	1.8	10.6	8.4	7.1	7.8	6.1	10.4	15.3	18.5	6.0	6.6	1.4
Central Luzon	0.1	0.4	1.5	8.3	23.3	42.6	0.9	2.6	6.4	5.3	2.8	5.9
Southern Tagalog	1.2	1.1	5.3	18.5	25.1	14.6	3.0	1.7	2.9	8.6	13.9	4.1
Bicol	0.1	0.4	2.8	51.0	15.0	3.9	0.4	0.7	1.4	14.2	7.7	2.4
Eastern Visayas	a	0.1	0.6	13.7	27.3	3.8	a	a	2.6	37.8	10.6	3.5
Western Visayas	0.2	0.9	5.8	33.5	14.6	25.9	2.2	3.2	6.5	6.4	0.6	0.2
Northeastern Mindanao	1.3	5.2	8.5	13.7	19.6	23.5	a	0.7	1.1	16.9	5.2	4.3
Southwestern Mindanao	1.8	6.1	7.9	14.3	33.0	12.0	0.1	0.4	0.8	2.8	13.0	7.8

a Less than 0.1 percent

TABLE 5

Palay (Rough Rice): Production By Type of Crop, Lowland 1st, Lowland 2nd, and Upland for Crop Years Ending June 30, 1948 to 1975

(000 cavans of 44 kgs)

Crop Year	Central Luzon			
	Lowland		Upland kaingin	Total all palay
	1st Crop	2nd Crop		
1947-48	11,807	1,807	4,033	17,647
1948-49				19,384
1949-50				20,374
1950-51				19,617
1951-52				17,170
1952-53				21,703
1953-54				19,220
1954-55				19,605
1955-56	18,905	1,150	1,439	21,494
1956-57				21,985
1957-58				22,433
1958-59	24,004	1,501	928	26,433
1959-60	16,362	2,729		21,552
1960-61	16,362	2,729	427	19,518
1961-62	17,921	2,527	520	20,968
1962-63	20,073	1,247	259	21,580
1963-64	17,587	2,933	460	20,980
1964-65	17,713	2,952	422	21,087
1965-66	21,904	1,438	80	23,422
1966-67	20,394	3,070	160	23,624
1967-68	19,248	6,866	253	26,367
1968-69	19,308	6,120	239	25,667
1969-70	25,376	6,396	313	32,085
1970-71	25,996	6,994	301	33,291
1971-72	18,984	4,699	156	23,839
1972-73	11,670	6,170	14	17,854
1973-74	16,433	8,477	41	24,951
1974-75	12,952	9,658	192	22,802

TABLE 5 (Continued)

(000 cavans of 44 kgs)

Crop Year	Southern Tagalog			
	Lowland		Upland kaingin	Total all palay
	1st Crop	2nd Crop		
1947-48	1,914	523	2,617	5,054
1948-49				5,756
1949-50				5,907
1950-51				6,505
1951-52				7,600
1952-53				8,137
1953-54				8,937
1954-55				8,292
1955-56	4,522	807	2,745	8,074
1956-57				8,432
1957-58				8,821
1958-59	6,336	1,498	3,175	11,009
1959-60				9,097
1960-61	5,720	1,024	1,934	8,678
1961-62	6,506	1,756	2,746	11,008
1962-63	5,544	2,418	2,296	10,258
1963-64	6,869	1,230	2,322	10,241
1964-65	7,139	1,276	2,402	10,817
1965-66	7,541	2,254	2,779	12,574
1966-67	7,452	4,782	1,458	13,692
1967-68	8,404	5,220	1,609	15,233
1968-69	8,112	4,431	1,552	14,094
1969-70	6,825	4,332	2,824	13,981
1970-71	6,798	5,062	2,714	14,574
1971-72	6,360	4,798	2,124	13,282
1972-73	7,051	4,633	2,415	14,099
1973-74	7,974	5,323	2,834	16,131
1974-75	7,488	5,198	2,290	16,465

TABLE 5 (Continued)

(000 cavans of 44 kgs)

Crop Year	Bicol			
	Lowland		Upland kaingin	Total all palay
	1st Crop	2nd Crop		
1947-48	1,566	697	1,454	3,717
1948-49				4,396
1949-50				4,659
1950-51				4,409
1951-52				4,423
1952-53				3,590
1953-54				6,010
1954-55				5,446
1955-56	2,423	1,554	1,183	5,160
1956-57				5,190
1957-58				5,560
1958-59	3,944	1,553	1,212	6,709
1959-60				6,035
1960-61	3,677	2,460	1,265	2,402
1961-62	3,875	2,257	1,113	7,245
1962-63	4,427	2,466	1,795	8,688
1963-64	4,171	2,791	1,435	8,397
1964-65	4,158	2,744	1,414	8,316
1965-66	6,831	3,452	2,232	12,515
1966-67	5,134	3,103	835	9,072
1967-68	4,424	4,669	768	9,861
1968-69	5,754	3,882	581	10,217
1969-70	6,569	4,857	1,193	12,619
1970-71	3,791	3,968	828	8,587
1971-72	6,059	5,770	558	12,387
1972-73	6,037	3,323	587	9,947
1973-74	7,056	4,419	969	12,444
1974-75	7,118	5,077	1,078	13,273

Source: T.L. Anden, A.C. Palacpac, Data Series on Rice Statistics, Philippines

TABLE 6

Palay (Rough Rice): Production by Type of Crop, Irrigated and Non-Irrigated, Philippines and by Region for Crop Years Ending June 30, 1948 to 1975

(000 cavans of 44 kgs)

Crop Year	Philippines			Ilocos		
	Irrigated	Non-Irrigated	All Palay	Irrigated	Non-Irrigated	All Palay
1947-48	26,759	24,169	50,928	2,546	722	3,268
1948-49			56,620			3,355
1949-50			59,229			3,375
1950-51			59,463			2,761
1951-52			64,335			3,530
1952-53			71,458			3,734
1953-54			72,328			1,834
1954-55			72,793			2,580
1955-56	22,728	51,666	74,394	1,312	1,155	2,467
1956-57			76,044			2,773
1957-58			72,806			2,334
1958-59	27,371	56,360	83,739	1,361	1,274	2,635
1959-60			84,989			2,379
1960-61	32,949	51,250	84,199	1,224	1,989	3,213
1961-62	34,303	54,562	80,865	1,589	1,583	3,172
1962-63	36,111	54,048	90,159	1,330	2,089	3,419
1963-64	34,670	52,668	87,338	1,260	2,046	3,306
1964-65	35,814	54,924	90,738	1,412	21305	3.717
1965-66	39,415	53,145	92,560	2,521	2,247	4,768
1966-67	46,871	46,175	93,046	1,646	2,977	4,623
1967-68	51,602	52,050	103,652	3,623	2,092	5,715
1968-69	57,850	43,165	101,015	3,086	2,664	5,750
1969-70	62,750	56,191	118,941	2,919	2,298	5,217
1970-71	66,610	54,820	121,430	3,141	1,431	4,572
1971-72	59,463	56,448	115,911	4,031	1,979	6,010
1972-73	53,263	47,069	100,332	4,878	4,899	9,777
1973-74	68,525	58,614	127,139	5,591	6,686	12,277
1974-75	68,953	59,685	128,637	4,285	6,306	9,591

TABLE 6 (Continued)

(000 cavans of 44 kgs)

Crop Year	Cagayan Valley			Central Luzon		
	Irrigated	Non-Irrigated	All Palay	Irrigated	Non-Irrigated	All Palay
1947-48	1,694	2,024	3,718	6,240	11,407	17,647
1948-49			4,295			19,384
1949-50			4,504			20,374
1950-51			4,027			19,617
1951-52			6,269			17,170
1952-53			6,817			21,703
1953-54			7,824			19,220
1954-55			7,040			19,605
1955-56	2,360	4,200	6,640	11,377	10,117	21,494
1956-57			6,720			21,895
1957-58			6,107			22,433
1958-59	2,881	4,690	7,571	14,720	11,713	26,433
1959-60			10,802			21,552
1960-61	3,935	7,233	11,210	10,764	8,754	19,518
1961-62	4,325	5,812	10,197	9,085	11,883	20,968
1962-63	4,783	4,356	9,139	10,777	10,803	21,580
1963-64	2,651	4,812	7,463	11,570	9,410	20,980
1964-65	3,398	6,042	9,440	11,598	9,489	21,087
1965-66	6,459	5,755	12,214	10,664	12,758	23,422
1966-67	4,659	3,841	8,500	15,360	8,264	23,624
1967-68	5,418	5,513	10,931	16,175	10,102	26,367
1968-69	5,177	2,935	8,112	17,609	8,058	25,667
1969-70	8,757	2,915	11,672	18,153	13,932	32,085
1970-71	9,852	6,068	15,920	19,368	13,923	33,291
1971-72	9,229	6,184	15,413	11,505	12,334	23,839
1972-73	8,755	4,332	13,087	11,307	6,547	17,854
1973-74	10,137	5,064	15,201	16,673	8,278	24,951
1974-75	10,037	6,159	16,196	15,620	7,182	22,802

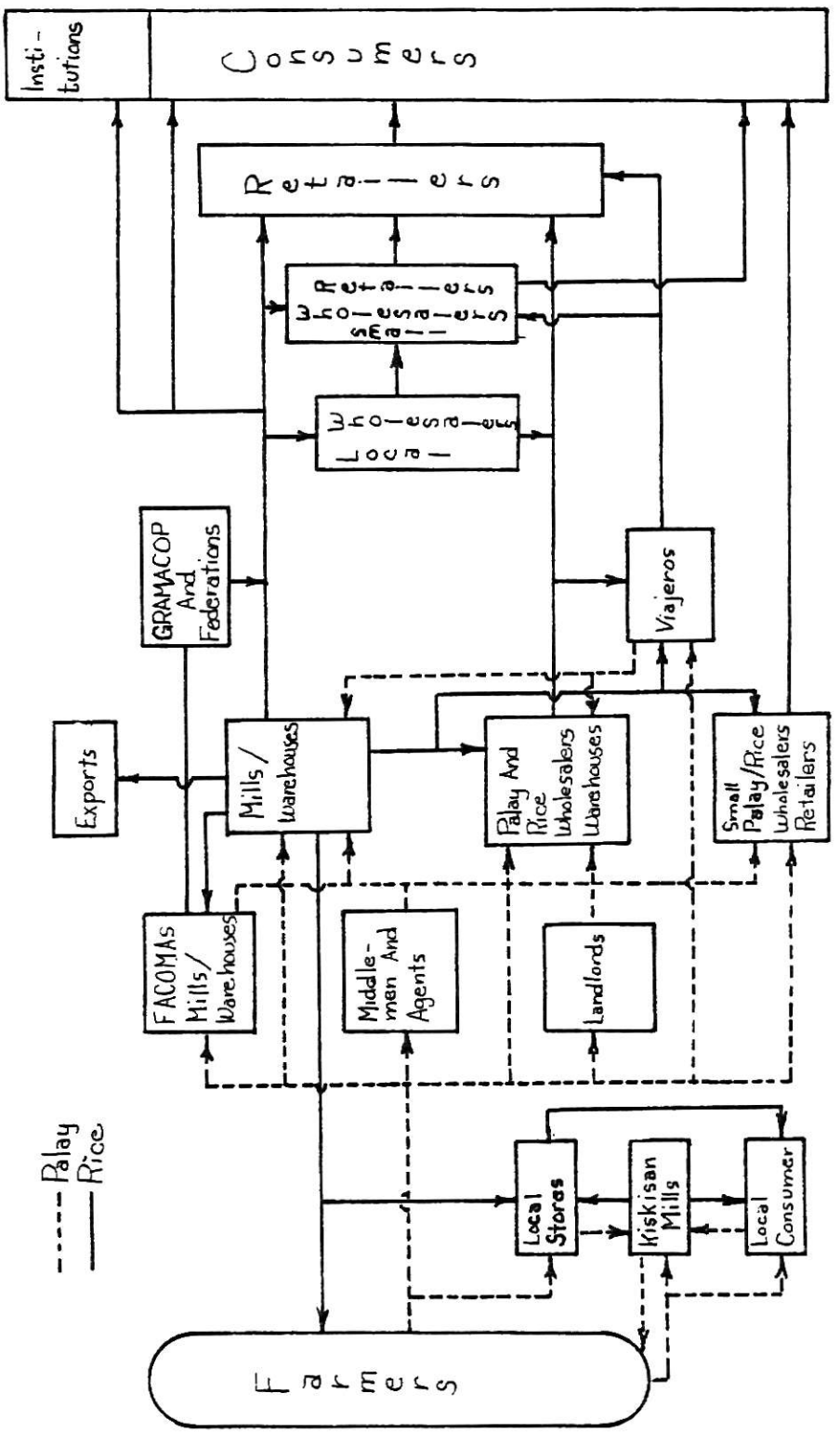

FIG. 1 PRIVATE CHANNEL FOR PALAY AND RICE

Source: Leon A. Mears, Melisa Agabin and R.C. Marquez, Rice Economy of the Philippines.

QUESTIONNAIRE I

TITLE: CHARACTERISTICS OF WAREHOUSE FACILITIES

Record No._____ Date of Interview_____

Sample No._____

Name of Respondent_____ Province_____

Occupation_____ Municipality_____

Educational Attainment_____ Barrio/Village_____

I. STORAGE FACILITIES

A. Classification of Warehouse

_____Small
_____Medium
_____Large

Rated Warehouse Capacity_____
NGA Record_____

B. As To Ownership

_____Owner-Operated
_____Leased or Rented
_____Cooperative-Owned
_____Government Operated
_____Others

C. Type of License

_____Bonded
_____Non-Bonded

D. Storage Integrated With Rice Mill (Or Corn Mill)

_____Yes
_____No

Rated Mill Size_____
NGA Record_____

E. Age of Warehouse

1. Year constructed _____
2. Cost _____

Rehabilitated:

_____Yes
_____No

Year When Rehabilitated_____

Number of Years Operator is in Business_____

II. OTHER FACILITIES

A. Drying Facilities

_____Mechanical:

_____Batch Type

_____Continuous Type

_____Solar

Purchase Cost of Dryer _____

Year When Purchased_____

New or Used_____

Brand Name of Dryer_____

Model_____

Year Manufactured_____

MONTHLY SCHEDULE OF OPERATIONS (DRYING)

Months	Sundrying				Mechanical Drying				Total	Remarks
	Number of Hours Per Day	Number of Days Per Week	Number of Weeks Per Month	Subtotal	Number of Hours Per Day	Number of Days Per Week	Number of Weeks Per Month	Subtotal		
June										
July										
August										
September										
October										
November										
December										
January										
February										
March										
April										
May										
TOTAL										

MONTHLY VOLUME OF STOCKS DRIED BY DRYING SYSTEM AND BY OWNERSHIP AND TYPE OF DRIER (CAVANS)

Months	Sundrying			Mechanical Drying			Total	Remarks
	Owner's Stocks	Customer's Stocks	Subtotal	Owner's Stocks	Customer's Stocks	Subtotal		
June								
July								
August								
September								
October								
November								
December								
January								
February								
March								
April								
May								
TOTAL								

1. Drying Capacity

	Sun Drying	Mechanical Drying
Rated capacity (cavans of 50 kg.)		
Actual capacity (cavans of 50 kg.)		
Capacity/Load (cavans)		
Number of loads		
Number of shifts/ day		

2. Cost of Drying

Item	Date of Payment	Mode of Payment[1]	Remarks[2]
Sun-drying			
a) Labor cost			
Loading/ spreading			
Stirring			
Collecting/ bagging			
Weighing			
Others (specify)			
Mechanical drying			
a) Labor cost			
Weighing (before drying)			

Item	Date of Payment	Mode of Payment[1/]	Remarks[2/]
Loading (to the dryer)			
Unloading (to sacks)			
Bagging			
Weighing (after drying)			
Others (specify)			

b) Fuel/Power Cost

1. Diesel

Consumption rate

(day, hr, wk)

Total Consumption (Qty)

Price/unit (indicate if liter, cavan, etc.) (₱)

Total value (₱)

2. Gasoline

Consumption rate

(hr, wk, day)

Total Consumption (Qty)

Price/unit (₱)

Total value

Item	Date of Payment	Mode of Payment[1]	Remarks[2]
3. Oil/grease			
Consumption rate (hr, wk, mo)			
Total Consumption (Qty)			
Price/unit (₱)			
Total value (₱)			
4. Others (specify)			
Other Drying Costs			
Sack			
Labels			
Others (specify)			

[1] Include how expense is paid by indicating time and unit of measurement involved.

[2] Include other pertinent information to clarify how the different expenses are paid.

QUESTIONNAIRE II

MONTHLY SCHEDULE OF MILLING OPERATION

Rated Capacity of Mill_____

Months	Number of Hrs/ Day	Number of Days/ Month	Number of Weeks/ Month	Total	Remarks	Volume of Stocks Milled (50 KG)		Total	Remarks
						Owner's Stocks	Customer's Stocks		
June									
July									
August									
September									
October									
November									
December									
January									
February									
March									
April									
May									
TOTAL									

QUESTIONNAIRE II (continued)

MODE OF PAYMENT:

CASH_____

IN KIND_____

OTHERS_____

TOTAL COST OF MILL EQUIPMENT
(INCLUDING INSTALLATION) _____

YEAR INSTALLED_____

QUESTIONNAIRE III

MONTHLY RECEIPTS AND DISPOSAL OF STOCKS AS TO TYPE OF CUSTOMER
(EXPRESSED IN 50 KILOGRAM BAGS)

Months	Sources						Others	Total
	Owner's Stocks	Local Assembler	Rice Agents	Whole-salers	Viajeros	Farmers		
June								
July								
Aug.								
Sept.								
Oct.								
Nov.								
Dec.								
Jan.								
Feb.								
March								
April								
May								
TOTAL								

QUESTIONNAIRE III (Continued)

Months	Outlets						Others	Total	Remarks
	Local Wholesaler	Retailer	Viajeros	Other Wholesaler	Institutions	Others			
June									
July									
Aug.									
Sept.									
Oct.									
Nov.									
Dec.									
Jan.									
Feb.									
March									
April									
May									
TOTAL									

QUESTIONNAIRE III (Continued)

Cost of Storage

Items	Number of Employees	Daily/ Wage (P/Day)	Volume Required	Price Per Unit (₱)	Others	Total	Remarks
Manpower:							
Storage Supervisor							
Classifier							
Sack Mender							
Stock Oiler							
Supplies:							
Sacks							
Threads							
Labels							
Chemicals							
Others							
Repairs:							
Insurance:							

QUESTIONNAIRE III (Continued)

Items	Number of Employees	Daily/ Wage (₱/Day)	Volume Required	Price Per Unit (₱)	Others	Total	Remarks
Others:							
TOTAL							

Mode of Payment:

Cash_____

In Kind_____

Others (Specify)_____

QUESTIONNAIRE IV

I. MILLING EXPENSES

A. Variable Costs

1. Labor

Job Description	Peak Month				Lean Month			
	No.	Wage Rate	Fringe Benefits	Remarks[1]	No.	Wage Rate	Fringe Benefits	Remarks[1]
Mill Operator								
Asst. Mill Operator								
Truck Driver								
Laborers: Mechanic								
Scaler								
Hauler/loader								
Rice Agent								
Security Guard								
Sack Venders								
Others (specify)								

[1] Includes information such as regularity of work (ex. haulers are paid on per cavan or per piece basis) and other mode of payment.

2. Fuel and Power

Source of Power	Peak Month		Lean Month	
	Mill Apparatus & Engine	Transportation	Mill Apparatus & Engine	Transportation
1. Diesel: Consumption/ (day, wk, mo)				
Total consumption				
Cost per liter				
Total Cost				
2. Gasoline Consumption/ (day, wk, mo)				
Total consumption				
Cost per liter				
Total Cost				
3. Lubricant Consumption/ (day, wk, mo)				
Total consumption				
Cost per liter				
Total Cost				
4. Grease (others) Consumption/ (day, wk, mo)				
Total Consumption				
Cost per liter				
Total Cost				

3. Supplies

Item	Beginning Inventory			Ending Inventory		
	Number	Cost/ Unit	Value	Number	Cost/ Unit	Value
Sacks						
Labels						
Threads						
Chemicals						
Rodenticides						
Fumigation						
Insecticide						
Other (specify)						

B. Fixed Expenses

Item	Date of Payment	Mode of Payment	Remarks
1. Administrative personnel			
General Manager			
Asst. Gen. Mgr.			
Foreman			
Bookkeeper			
Secretary			
Other (specify)			
2. Licenses and Fees			
NGA license			
NGA fee			
Municipal license			

Item	Date of Payment	Mode of Payment	Remarks
Municipal tax			
Land tax			
Other taxes (specify)			
3. Insurance			
4. Interest on capital			
5. Office costs (specify)			
6. Depreciation			
7. Others (specify)			

II. CAPITAL INVESTMENT

1. Land

Mill site_____sq. m.

If Owned:

Purchase Price ₱_____ Date purchased_____ (Year)

Assessed Value ₱_____

Market Value (197__) ₱_____

If Leased/Rented:

Amount of lease ₱_____

Time duration (no. of years)_____

2. Buildings

Services	Year Constructed	Construction Cost (₱) (include materials and labor)	Years to Date	Repairs and Maintenance (197_ to 197_)	Remarks[1/]
a) Milling					
b) Storage/Warehousing Facilities Warehouse 1					
Warehouse 2					
Warehouse 3					
c) Drying Mechanical					
Sun-drying					
Concrete Pavement					
Earthen Floor (indicate measurements)					

1/ Include any comment or information related to the cost or value of any of the buildings.

Note: If all above-mentioned services are housed in one building, roughly estimate (through respondent's help) relative percentage use of the building for each of the services (e.g. milling - 50%, drying 15%, etc.).

3. Equipment and Facilities

Item	Number	Year Purchased	Acquisition Cost (₱)	Rental Fee (if leased)	Years More to Last	Repairs & Maintenance (197_ to 197_)	Relative % Use[1/]		
							Milling	Storage	Dry
1. Mill engine									
2. Mill apparatus									
3. Transportation Trucks									
Jeep									
Forklift									
Grain cart									
Others (specify)									
4. Weighing Scales Platform scale									

Item	Number	Year Purchased	Acquisition Cost (₱)	Rental Fee (if leased)	Years More to Last	Repairs & Maintenance (197_ to 197_)	Relative % Use[1/]		
							Milling	Storage	Dry
Beam balance									
Panega									
Cans									
Others (specify)									
5. Sprayer									
6. Other milling equipment									
Moisture meter									
Probe									
Others (specify)									
7. Office Equipment									
Table									

Item	Number	Year Purchased	Acquisition Cost (₱)	Rental Fee (if leased)	Years More to Last	Repairs & Maintenance (197_ to 197_)	Relative % Use[1/]		
							Milling	Storage	Dry
Filing cabinet									
Desk									
Typewriter									
Safe									
Others (specify)									
8. Rake									

[1/] If equipment and/or facilities is used for multi-purposes, indicate relative % use.

4. Working Capital

AMOUNT OF WORKING CAPITAL

Items	(₱)	Remarks
1. Amount loaned to other traders		
2. Rough rice/milled rice inventory		
3. Accounts receivable		
4. Supplies on hand		
5. Cash Balance		
6. Pre-paid expenses		
7. Others (specify)		
TOTAL		

QUESTIONNAIRE V

TITLE: STATUS OF RICE STORAGE

Record No._____ Date of Interview_____

Sample No._____ Date Interview Completed_____

Name of Respondent_____ Province_____

Occupation_____ Municipality_____

Educational Attainment_____ Barrio/Village_____

A. Form of Storage

_____Paddy
_____Husked/Brown Rice
_____Parboiled
_____Milled or Whitened
_____Polished
_____Combination of Above (Specify)_____

B. Duration of Storage

_____Two Weeks or Less
_____Three-Four Weeks
_____One-Two Months
_____Three-Four Months
_____Six Months
_____More than Six Months
_____Combination of Above (Specify)_____

C. Type of Packaging and Storage

_____Jute/Gunny Sack
_____Plastic
_____Bulk
_____Combination
_____Others (Specify)_____

D. Piling/Stacking System Followed

_____Conventional
_____Japanese Method
_____Others (Specify)_____

Number of Piles Per Column _____

E. Structure of Storage Facilities

_____Wooden
_____Galvanized Iron Sheet Bin
_____Concrete and Brick
_____Silo Type
_____Others (Specify)_____

F. Type of Pallet Used (If Any)

_____Wooden 'Teremas'
_____Canvas
_____Layers of Rice Straws
_____Others (Specify)_____

G. Products Stored in Warehouse Other Than Paddy or Milled Rice

_____Rice Bran
_____Other Grain Crops
_____Fertilizers and Other Chemicals
_____Others (Specify)_____

H. Pest Control Measures

1. Pre-Storage:
   _____Cleaning of Inside or Premises of Warehouse
   _____Sampling Prior to Storage
   _____Classification of Stocks
   _____Change of Sacks
   _____Drying
   _____Others (Specify)_____
   _____None of Above
2. Storage
   _____Personal Inspection of Stocks

_____Fumigation
_____Ventilation/Aeration
_____Spraying
_____Fogging
_____Use of Rodenticides
_____Use of Baits
_____Recirculation of Rice in Storage
_____Sack Treatment Before and After Use
_____Others (Specify)_____

I. Equipments/Instruments For Pest Control

_____Sprayers
_____Fogging Machines
_____Thermometers
_____Hygrometers
_____Samplers
_____Moisture Testers
_____Ventilator

J. Additional Information

1. Most Serious Pest Problems Encountered_____
_____
_____

2. Most Serious Causal Factors_____
_____
_____

3. Specific Measures of Pest Control Practiced in Previous Years_____
_____
_____

4. Suggested Measures for Improvement of Storage Practices
_____
_____
_____

A STUDY OF SELECTED COMMERCIAL WAREHOUSES IN THE PROVINCE OF BULACAN

by

EMMANUEL S. SANTIAGO

B.S.A., University of The Philippines

at Los Banos, 1976

AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Agricultural Economics

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1978

Santiago, Emmanuel S., Kansas State University, January, 1978, A Study of Selected Commercial Rice Warehouses in the Province of Bulacan. Major Professor: Dr. Leonard Schruben.

The study involves commercial rice warehouses integrated with milling operations. There exists a complementary relationship between storage and milling functions in the province. Rice mill operators procure rice during harvest time and store some of them for use during months when supply is limited. Warehousing operations will not survive independent of milling, while mill operations depend on a continuous supply of rough rice.

During the study, information will be gathered regarding present status of rice storage in commercial warehouses, storage practices in relation to milling operations, as well as costs of these operations. Both primary and secondary types of data will be used. The secondary data will come from government agencies involved in the rice industry.

The estimated sample size is ten percent of the total commercial rice warehouses in the province of Bulacan. The warehouses will be stratified according to capacity; systematic random sampling will be used in the selection of samples. From the data to be gathered, the utilization rates of warehouse facilities will be estimated. The Chi-Square test and multiple linear regression will be used for analysis.

The study will cover the dry and wet season operations from June, 1977 to May, 1978. The whole work is expected to last for six months.