

In addition to the main agricultural products already mentioned above, rice, which is the principal subject in our study, is cultivated on the alluvial soil fields located in coastal area facing the Atlantic Ocean on the East and West. The available cultivated area for rice is estimated to be 110,000 hectares but the actual figure is about 80,000 hectares, using the last five years as an average. About 50% of the rice field is available for two in a single year. Rice crop is effected on the coastal area i.e. Region 2, 3, 4, 5 & 6 (geographically administrated districts) and as it can be seen in the above Table 3, Region 5 and 6 are the main crop areas. These two Regions jointly produce about 54% of total paddy, 262,000 tons in the annual average of the last five years.

### 2-2-3 Agriculture Policy and Development Plan

The Guyana government facilitates many policies and projects as a national policy, those which aim for the promotion of "Acceleration of Economic Growth with Increase of Export" for economic self-reliance.

During last ten years, the government has invested over 75% of public funds into production and related infrastructure fields and agriculture, in particular (including forestry and fishery) obtains about 40% of yearly total investment.

The essential purpose of these investments are as follows:

1. Increase of exporting crops' production
2. Diversification of exports
3. Production of crops to satisfy with domestic demands.

It is obviously presumed from the above that the national policy and agricultural policies are directly connected and that agriculture is the industry with the first priority.

The main industrial policies are:

1. Enlargement of rice field and increase of number of fields with capacity to produce two crops in a year.
2. Rehabilitation of old, and creation of new irrigation and drainage facilities

3. Introduction, research, production and extension of high yield varieties
4. Promotion of agricultural mechanization
5. Distribution of materials for production (Agri-chemical, fertilizer, etc.)
6. Improvement of the rice milling industry

The government exerts itself for the improvement of business enterprises, and gives its political support to financing help for farmers. The extensive efforts of the government are recognized taking into account the fact that the purposes of the above plans are to eventually realize its wishes for increased rice production and enlargement of its exports.

However, there is no way to rescue the lack of funds to those enterprises which need large amounts of money. The anticipation of double rice production expected in the end of the 70s were impossible, even in the middle of the 80s.

The government will continue its effort in its middle and long run plan, but it is not so easy to succeed in rapidly improving productivity, even though it holds promise as a future possibility.

#### (1) National Development Plan

The short and long run plan:

This is a plan to enlarge the cultivated area to increase rice production and to increase crop yield per unit square. The government stipulates to perform it in Region 5 and 6 as center of the project.

Although the expressions "short and long range" plan might seem strange, the Guyana government is well aware that the enterprises of agricultural development is usually promoted with a long-range vision.

However, the desire for a short range plan implies anticipation that increasement of rice production will lead to the effective export shortly, which subsequently results in earning foreign money.

In this plan, the following figures are targeted as eventual.

	Rice Cultivated Area	Production (Paddy)
a. Target to be accomplished	115,000 Ha	408,000 tons
b. Present	79,716 "	262,353 "
	(average in late five years)	

(2) Middle and long range plan

The available total area for rice cultivation in a year is 109,300 Ha and the actual cultivated area is 79,700 Ha (average over the last five years). On only 50% of the actual cultivated area, the double crops in a year are effected.

According to the governmental development plan, enlargement of rice cultivated area is effected in all area and especially irrigation and drainage project will be promoted in the stressed areas of Tapakuma (Region 2), Mahaica - Mahaicong - Abary (Region 5), Black Bush Polder (Region 6) in order to enlarge the cultivated area as the available field for twice crops in a year.

For the achievement of this plan, the government carries out the following plans as a supplemental project in short and long run.

The main ones among these plans are supply of agriculture machinery (four wheel tractor, combine) and the spare parts, distribution of seed, fertilizer, agri-chemicals, offer of finance and further more, development and rehabilitation of rice mills, improvement of such facilities as storage, export and so forth.

The Table 2 shows the outline of Development Plan for Rice Production Increase in a whole area of Guyana country.

Table 2 Outline of Development Plan for Rice Production

Region No.	Name of district concerned	Area (acre)	Content and outline of Projects
II	Tapalsuma: . Somerset	27,000 (10,927 Ha)	. Irrigation Project: Completing in 1988 . All area is available for double crops in a year
	. Supenaam	34,000 (13,759 Ha)	. Developed area for agricultural mechanization However lacking of spare parts supply
III	. Vreed-en-Hoop /La Jalousie	4,500 (1,821 Ha)	. Irrigation and Drainage Project: will be completed in 1990, under implementation of rehabilitation . The area of high yield per unit square
	. Vergenoegen/ Salem	2,500 (1,016 Ha)	. Irrigation and Drainage Project: will be completed in 1991, under implementation of rehabilitation
IV	. Cane Grove	7,612 (3,081 Ha)	. This region is a production area of sugar cane, roots-crop, citrus fruits and the main production area for rice is the district shown in the left. Subject to the highest yield per unit square. . Loan cooperation by IDB against the district is shown in the left in implemented.
V	. Mahaica	37,000	. This is famous as an MMA/ADA Project. A comprehensive development Project for rice production; IDB gives financial cooperation. Achievement target: 1991
	. Mahaica Abary	64,000 (25,900 Ha)	. This is an available cultivated area for rice and needs mainly the facilities of drainage . Target area for future plans
	. Black Bush Polder	18,000 (7,284 Ha)	. Irrigation and Drainage Project: will be completed in 1990, under implementation of rehabilitation
	. Block III (Lots 52-74)	22,400 (9,065 Ha)	. Requiring Irrigation and Drainage Project and Rehabilitation: - for future plan -

Remarks: Hectares = Acres x 0.40469

As shown in table 2, the Guyana government expects that the rice cultivated area will reach 270,000 acres (a little less than 110,000 hectares) in one year, due to multiplication effects of the enlargement of rice cultivated fields, and increase of available fields for twice crops in a year, those of which are implementing it. Guyana also expects it will be completed in 1991. As for production of paddy, 405,000 tons (= 240,000 tons as milled rice) is simultaneously aimed for.

However, the government states that those figures are subject to the agricultural production materials (agri-chemicals, fertilizer), agricultural mechanization, improvement of rice milling industry, etc. This statement shows that the government properly grasps the issues in the project.

It seems to be not so easy for achieve the said goals because of the experience that the government suffered, due to the lack of agri-chemicals to combat the extensive infestation of Blast in 1988. However, regarding the aimed production of paddy, the figure will not be so difficult to achieve, especially taking account into the fact that the present yield per hectare is 3.3 tons (average), compared to 3.7 tons of aimed yield per hectare.

Concerning the future possibility of Guyana, there big promising possibility to increase the productivity at a rather faster rate if certain factors are promoted. These factors are the enlargement of rice-cultivated fields and of available fields for twice crops in a year, introduction and extension of good quality seed, providing agricultural production materials in proper seasons, development of agricultural mechanization, and so forth.

Concerning the education level of farmers necessary for transference of technique, the literacy in Guyana is as high as 86%, and consequently one can expect good understanding by the farmers of technical education.

Beside that, there is no farmers without fields but there are many land-owning farmers. This fact dictates that the farmers will probably be vigorously willing to learn new techniques for the sake of production.

From the above points, Guyana has favorable conditions to prepare productivity advancements.

(3) Agricultural Development Assistance by IDB

Among foreign assistance to the agriculture field, IDB (Inter-American Development Bank)\* gives the largest financing loans to Guyana.

The Table 3 shows the present development cooperation for rice production by IDB's assistance.

Table 3 IDB's Projects for Development of Rice Production

Project Name	Commence	Area	Budget (million G\$)	Effecting Organization	Remarks
MMA/ADA Agricultural Water Control project	1986	Region 5	130	IDB/Govt.	Benefitted Area: 37,000 acres (14,974 Ha)
Black Bush Rehabilitation Project	1987	Region 6	100	IDB/Govt.	Benefitted Area: 18,000 acres (7,284 Ha)

(4) Outline of Agricultural Development Assistance by Developed Countries and Other International Organization

Regarding international cooperation between two countries, Britain, the former suzerain, has been the largest country to give assistance and has cooperated with Guyana on development projects relating to agriculture, education and infrastructure projects, etc.

As for U.S.A.'s assistance, it was active since Guyana's independence but was reduced for a time in the 70s, corresponding with progressing socialism. In recent years, socialism has calmed down, and its U.S. assistance has resumed. However, due to an increase by the U.S. of its assistance to countries in the Caribbean Sea, the assistance to Guyana seems to be taking a crablike pace.

At present, there is no conspicuous assistance to Guyana by the said British Government and the active one by I.D.B. is prominent for the agricultural sector.

Regarding Japanese assistance, there are such Grant Aid as Construction Project of Fishing Boat Base, Development Plan for Fishery, Construction Project of Power Facilities and Rehabilitation Cooperation of Rice Mill Plant (KR II) etc.

The following table shows the major projects cooperated by the Government of Japan.

A. Grant Aid (as of Dec. 1987)

(Unit: Million Yen)

Name of Project	Amount	Year
* General Grant Aid		
Versailles Power Station	628	1984
Demerara Fish Port Complex	490	1985
* Fisheries Grant Aid		
Fisheries Base Construction	340	1975
Fisheries Development	400	1978
Fisheries Promotion	600	1981
Fisheries Promotion	461	1985
Fisheries Promotion	263	1987
* Increased Food Production Aid		
Agricultural Equipment & Materials	250	1980
Agricultural Equipment & Materials	300	1983

B. Technical Cooperation (as of 1986)

(1) Receiving Trainee

Organization	1984	1985	1986	Grand Total	Sector
JICA	3	4	2	36	Agriculture, Fishery, Communication, Broadcasting
UNIDO	-	-	-	3	Industry
AOTS	1	-	-	6	Motor Car
OFCF	1	1	1	15	Fishery

(2) Dispatch of Expert

Organization	1984	1985	1986	Grand Total	Sector
JICA	6	-	-	22	Fishery, Energy

Note: Expert including survey team.

As to international organizations' assistances, there are projects of agricultural and forest development, commodity assistance (grant foreign money for procurement of equipment and materials), etc. by World Bank group, IBRD (International Bank for Reconstruction and Development), IDA (International Development Association) but there is no assistance for agricultural development at present.

Cooperation by UNDP (United Nations Development Programme) has been continued in the size of one million dollars in a year but there is nothing of assistance to agricultural sphere.

Research technical cooperation for high yielding varieties seeds of rice is under implementation by FAO.



## 2-3 Conditions of Rice Production and Marketing

### 2-3-1 Rice Production

#### (1) Summary of Production

In Guyana, the available cultivated area for rice is about 110,000 hectares, but actual cultivated area is 79,716 hectares in average over the last five years. In the meantime, production of paddy is 262,353 tons in average over last five years and then, paddy yield per hectare is 3,291 kg.

The features of Guyana rice crop are as follows. Fields are alluvial soil and fertile, plentiful precipitation through a year is available, canal and irrigation channel are maintained in better conditions than that of other developing countries. Furthermore, the cultivation field per farm is as large as about 5 hectares. There are some farmers with over 200 hectare fields and they are the ones who carry out the mechanical cultivation. The size of farm management however, is most ideal in Guyana because there is a good balance between population of farmers and area to be cultivated.

The promotion of agricultural mechanization seems to be important in expansion of the cultivation area, namely increased rice production.

Rice crop in Guyana is very stable because there are almost no extreme conditions such as flood by sudden heavy rain, severe drought, or other such conditions. However, it is very common to have 3 - 4 days submergence damage on the fields located at sea level. In these areas it will be more effective to emphasize drainage plan, when considering irrigation and drainage projects.

Due to high temperature and humidity typical in tropical forest zones, there is always the possibility of infestation by blast, and such infestation has caused damage in broad areas in recent years. As for insect damage, it is said that the protection from the rice bug is the most serious issue for rice cultivation.

Reference to the cultivated area and production in the last five years is made in Table 4.

Table 4 Paddy Production and Cultivation Area (Region wise)  
(Unit: ton/paddy, Area: ha)

Year	Region	2	3	4	5	6	Total
	Items						
1984	Production (P)	73,786	47,770	15,250	67,480	95,640	299,926
	Area (A)	20,040	13,400	4,160	26,480	27,760	91,840
1985	(P)	68,090	46,650	13,820	65,050	68,470	260,080
	(A)	18,040	12,480	3,840	20,760	21,720	76,840
1986	(P)	69,520	44,010	15,550	93,400	62,610	285,090
	(A)	18,040	12,480	4,200	29,720	17,560	83,000
1987	(P)	64,440	39,230	10,870	79,380	49,600	243,520
	(A)	18,800	11,000	2,920	24,880	16,480	74,080
1988	(P)	58,950	21,610	8,640	76,730	57,220	223,150
	(A)	18,000	7,780	2,800	26,440	17,800	72,820
Average	(P)	66,957	39,854	12,826	76,408	66,308	262,353
	(A)	18,784	11,428	3,584	25,656	20,264	79,716
Average production/ha (kg)		3,565	3,487	3,579	2,978	3,272	3,291

Rice is cultivated in Region 2, 3, 4, 5 and 6. Region 5 and 6 are main production district taking into account into not only the present cultivated area and production, but also the future possibility of development.

The Guyana government accepts the fund assistance by IDB for development of rice crop in those areas, and makes a concerted effort for the promotion of MMA/ADA Project (Region 5) and Black Bush Polder Project (Region 6).

## (2) Supply and Demand of Rice

For Guyana, rice is not only primary national food but also one of the few export cargoes.

The relation of the amount of production against supply and demand is as follows:

Domestic demand for milled rice is supposed to be 59,340 tons, equivalent to 98,900 tons of paddy. This figure takes into account the calculation of per capita consumption, i.e. 64.5kg according to the Guyana government data on the estimation of population, 920,000.

In short, Guyana's production of rice as a national staple food has already reached more than the range of self-sufficiency.

### (3) Outline of Cropping Conditions

Regarding cropping patterns, two crops of rice in a year are available in almost all fields in the rice crop area, if certain conditions are met.

In good condition areas, vegetable such as cabbage, watermelon, cucumber, eggplant, etc are cultivated accordingly.

As already mentioned in the above, fields near the coast line have often been damaged by submergence due to heavy rains although this has effected rice crop yield to only a minor extent. There is a tendency of fields that depend on rain water to have higher yields, due to plentiful precipitation throughout the year. Consequently, it seems that drainage would take a higher priority than irrigation.

The method of seeding is by direct seeding all over the area, and seeding is done by hand or by a small plane, according to the size of the farm to be managed.

The procedures of fertilization using 60 kg of nitrogen component and spreading agro-chemicals once or twice in a crop season have been implemented.

The seeding and harvesting seasons seem to be the busiest times for each procedure, but it is difficult to define the exact time. Depending on the weather each year, every growing stages of rice crop can be seen in one sight throughout a year; some fields are seeding and others are harvesting simultaneously, because seeding of the second crop in winter and harvesting run in six months intervals.

Figure 1 shows a pattern of seeding and harvesting. Figure 2 shows a harvesting season and its weather conditions. For the data for the weather in the region, please refer to Appendix-2.

Figure 1. Pattern of Seeding and Harvesting

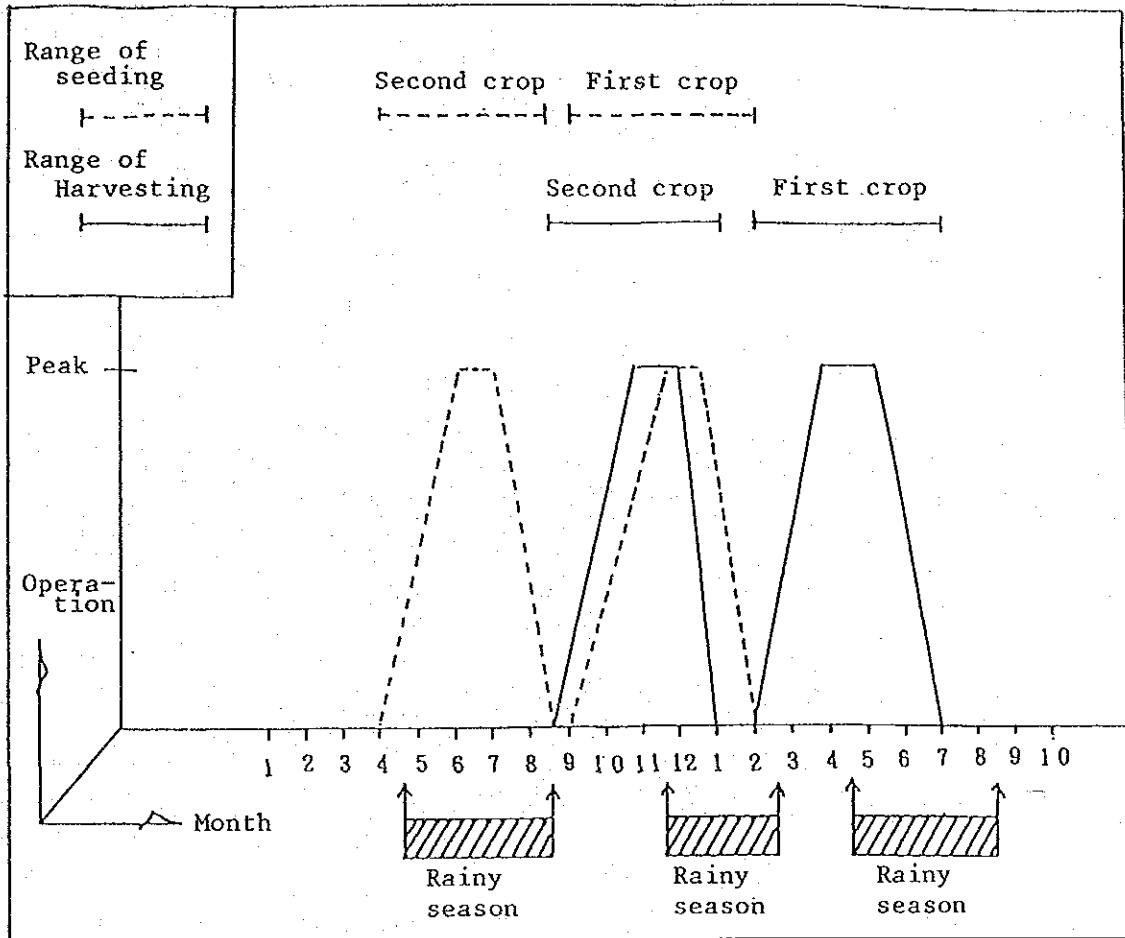
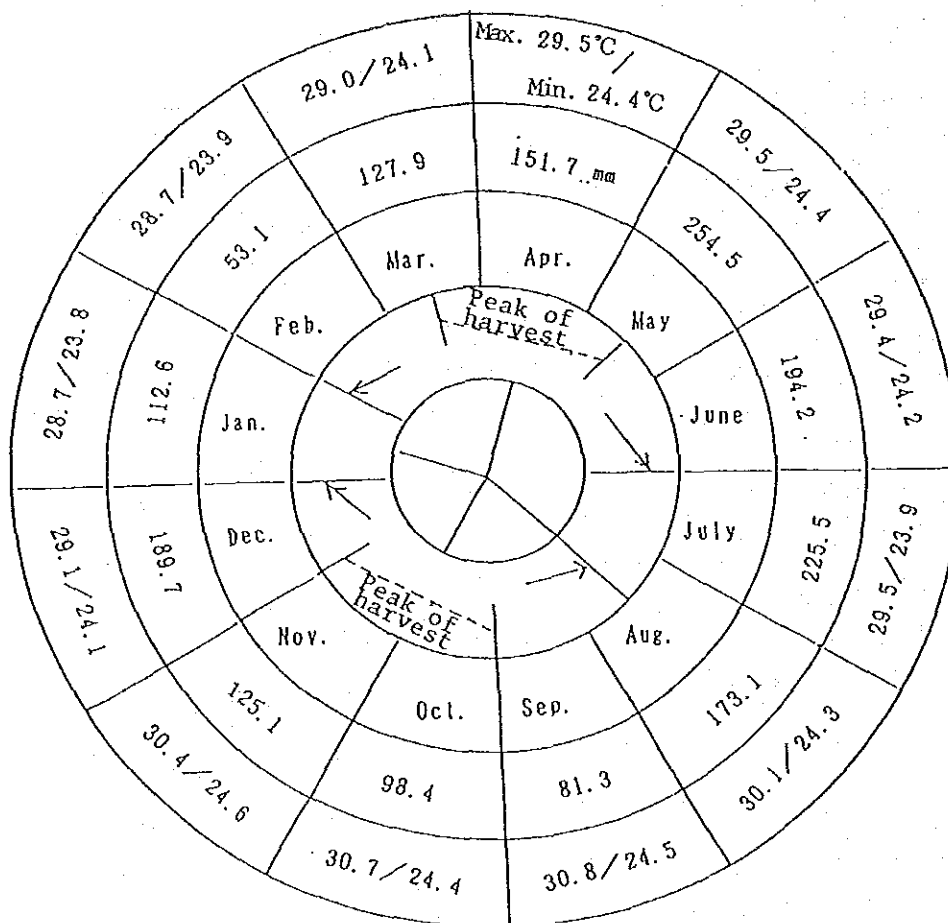


Figure 2. Weather condition and Harvesting season in MARDS area  
 (Rainfall, Max. and Min. Temperature, average of late 10 years)



Note: Total rainfall: 1,787 mm

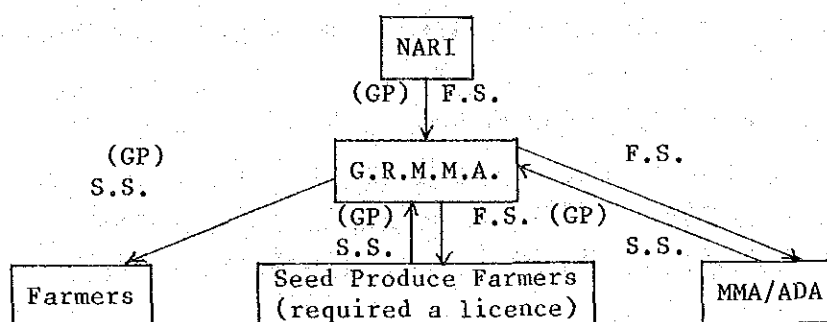
Resource: NARI, Hydrometeorological Department, Guyana

#### (4) Rice Variety

There are at present five recommended rice varieties (refer to Table 6) approved by the Ministry of Agriculture. As for rice breeding research, selection test, distribution of original and extension seeds, etc., NARI (National Agricultural Research Institute) has been the main organization to implement work relating to the above matters.

On topics of seed research, FAO has cooperated with NARI.

The following figure shows the outline of seed production and distribution.



Note: F.S. : Original Seed (Fundamental Seed)  
S.S. : Good Extension Seed (Superior Seed)

(GP) : Quality Test, Processing and Cleaning,  
Inspection Guarantee (Government Proof)

Table 5 shows the ratio between the special character of recommended varieties and cultivated areas.

Table 5 Characteristics of Recommended Rice Varieties and Cultivated Area

Variety	Length (Brown rice, mm)	Thickness (Brown rice, mm)	Width (Brown rice, mm)	* Shape (Brown rice)	Weight of grains (g/Paddy)	Yield Potential (kg/ha)	Average Yield (kg/ha)	Area Cultivated (%)
Rustic	8.21	1.71	2.00	Extra long	21.4	5,000	3,900	62
6 0 3 9	N.A.	—	—	—	—	—	—	15
Diwanl	8.30	1.76	2.28	Extra long	22.9	5,000	3,600	13
Starboanel	7.07	1.60	1.98	Long	16.5	4,000	3,100	5
N	7.21	1.75	2.13	Long	20.2	4,800	2,800	4

Remarks : ① \* FAO Standard.

② Other varieties as IR-22 and local varieties are cultivated less than 1%.

## 2-3-2 Rice Export Situation

### (1) Outline of Rice Export

In Guyana, a sufficient amount of rice is produced to respond the domestic demand as national main food. For the purpose of economic stability surplus rice is exported as one of the sources of earning income through foreign trade.

Against the production of about 262,000 tons (as paddy and equivalent to about 157,000 tons of white rice), the export of about 90,000 tons surplus after reserving about 60,000 tons for domestic demand is theoretically available. However, actual export is below the said amount.

Export results in the last five years are shown in the Table 6.

Table 6 Rice Export Result (1984 - 1988)

Year	1984	1985	1986	1987	1988
Export	47,498	29,339	38,634	68,987	55,926

- Remarks: 1. Average Export: 48,077 tons  
2. Total Export Value above and price per ton:  
G\$98,122,157  
3. Average price of rice: G\$2,041

There are some reasons why exports can not be increased. One is the considerable deterioration of the ability of the rice milling machines owned by GRMMA and private rice millers. Consequently, the quantity and quality of products can not correspond to the demands of buyers. In particular, the large amount of broken kernels produced from the above machine results in low value as commercial cargo.

During the field survey, it was observed that the quality of paddy as raw material is very low (a large quantity of mixed admixture and immature grains exists). This fact surely results in a reduced percentage available for export. In order to increase the export of rice, it is necessary to improve on the above problem.

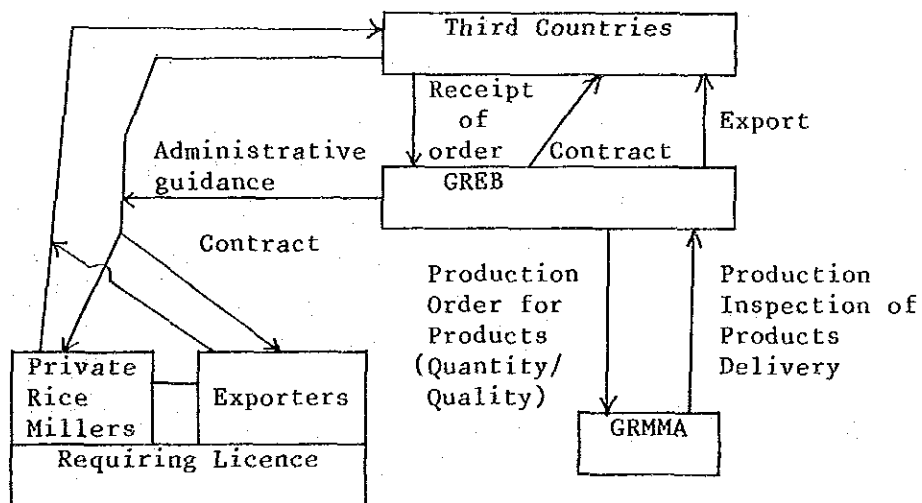
(2) Rice Export Organization

The controlling organization of rice export is GREB (Guyana Rice Export Board). This board is under the administration of the Ministry of Agriculture and a sister-organization of the GRMMA whose head office is in the GRMMA Head Quarters building.

Main activities of GREB are:

1. To promote the export development of rice and its by-products produced in Guyana.
2. To carry out the contract business for receiving orders relating to export (arrangement with foreign parties concerned) along with assuring to procure the rice for export.
3. To issue licences for rice millers and others concerned.
4. To provide exporters other than GREB with governmental guides for the relating export business, as well as quality inspection.
5. To promote the improvement of the rice milling industry for export through market research, collection and analysis of information.
6. To advise the government in respect to the rice milling industry based on anticipation of the market.

The outline of export procedures is shown in the figure below.





There seems to be changing policies as the government begins to utilize the activities of the private sector.

The current quality standard of exportation GREB are as follows:

Table 7 Quantity Specification of Milled Rice  
(for Caribbean Countries and Cuba)

Item	Maximum Limit (%)
Broken kernels	15 - 18
Chalky	6
Red kernels	2
Damaged grains	0.5
Discoloured grains	1.0
Paddy	0.5
Moisture content	14

Table 8 First Quality Cargo Rice

Item	Maximum Limit (%)
Broken kernels	8
Paddy	1.0
Red kernels	2.0
Green kernels	3.0
Chalky kernels	3.0
Discoloured grain	0.05
Damaged grains	2.0
Foreign matters	0.5
Moisture content	14

Table 9 Second Quality Cargo Rice

Item	Maximum Limit (%)
Broken kernels	8
Paddy	1
Red kernels	3
Chalky kernel	8
Discoloured grain	0.35
Damaged grains	4
Moisture content	14

Table 10 First Quality White Brokens

Item	Maximum Limit (%)
Whole grain	9(including 3/4 grains)
Brokens	91
Yellow	1 - 2
Moisture content	14

Table 11 Second Quality White Brokens

Item	Maximum Limit (%)
Whole grain	9(including 3/4 grains)
Brokens	91
Yellow	2.5 - 4
Moisture content	14

Table 12 Low Quality Milled Rice

Item	Maximum Limit (%)
Brokens	25
Discoloured	10 - 15

### (3) Development Plan of Rice Export

Guyana rice is mainly exported to countries in the Caribbean Sea and Europe. White milled rice is exported to the former countries and broken rice is exported to the latter.

According to the export results in the past five years, there has been much rice exported to Trinidad Tobago, Jamaica, Cuba, and other countries in the Caribbean Sea, but in the last two years (1987 - 1988) there has been no rice export to Trinidad Tobago.

The first processed cargo rice and broken rice (for feed and industry) are exported to European countries, and Holland is the biggest client with stable purchase every year, with Belgium, Britain, etc. following.

The price of export rice cannot accurately be calculated in a simple fashion due to the fluctuation of the value of Guyana's dollars. As for the actual price, the results in 1988 are:

To countries in the Caribbean Sea:

G\$3,274/ton .. mainly white milled rice

To Europe: G\$2,448/ton .... mainly cargo rice and broken rice

The recent tendency has been for the rate of cargo rice exports to increase; this means that it is probably difficult to keep up with international competition unless the good quality of white milled rice is produced.

Note: Foreign exchange rate to U.S. Dollars in 1988 is:

U.S.\$1.00 = G\$10.00

The Guyana government has decided that the target of export development for export rice in the coming three years shall be over 100,000 tons.

The following table shows the target.

Fig. No.12 Rice Export Programme

(Unit: ton)

Country	Item	1989	1990	1991
E.E.C.	C/go	33,400	40,000	45,000
E.E.C.	Bkns.	12,000	14,000	20,000
Cuba	Wht.	11,000	15,000	16,000
Jamaica		13,800	15,000	16,200
St. Lucia		2,400	2,400	2,400
Dominica		600	600	600
St. Kitts		600	600	600
Total		73,800	87,600	100,800

#### (4) Export Facilities and outline of Ports

There are three export ports in Guyana, and the Port of George Town is the largest of these. The following is information on various facilities relating to rice export, including packing.

##### 1) Port and warehouse

<u>Port</u>	<u>No. of warehouses</u>	<u>Capacity (ton)</u>
Georgetown	4	10,000
Corriverton	2	3,000
Anna Regina	2	5,000

Notes: 1. Warehouses belong to GRMMA

2. The facilities in Anna Regina are not used at present.

##### 2) Rice grading and blending facilities

<u>Name of port</u>	<u>No. of facility</u>	<u>Contents of machinery</u>
Georgetown	1	Silos, Remilling Machinery, Blending Tanks and Packing Machine etc.
Corriverton	1	- ditto -

##### 3) Loading facilities

<u>Name of port</u>	<u>Method of loading</u>	<u>Capacity (ton/hr.)</u>
Georgetown	Containerised, Bulk, Bagged	50
Corriverton	Bagged	25

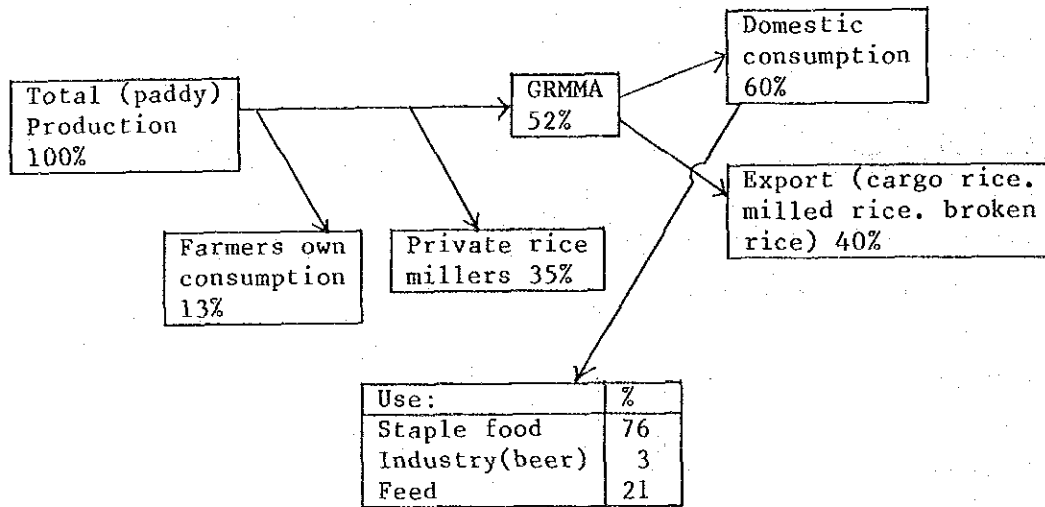
##### 4) Form of shipment (Type of packing)

<u>Packing form</u>	<u>Material</u>	<u>Unit weight(kg)</u>	<u>Way of transport and loading</u>
Bagged	Woven Polypropylene	50kg, Nett	Bags are packed into ship's hold.
Packaged	Polypropylene	30kg and 60kg, Nett	Polypropylene sacks are packed in poly bags which are then loaded and shipped in containers.
Bulkage	-	-	Contents are emptied from bags directly into the ship's hold.

2-3-3 Rice Marketing

(1) Marketing channel

The marketing channel of rice produced by farmers is shown below. GRMMA plays an important role in the marketing of rice, and it handles 52% of total production.



Middlemen's active participation in the rice marketing commonly seen in developing countries is not apparent in Guyana. However, since private trading houses and private rice millers participate in export business by license, to some degree they do seem to act as middlemen

It was observed in open market that retailers were selling milled rice in a can. From these observations, it seems that middlemen do actually exist, although the degree of participation is much different.

(2) Price and Quality Standard of Rice

The quality standards for domestic rice are not as strict as the one for export rice. The quality standard and prices for paddy and milled rice are as follows:

1) Quality Standard

Table 14 Quality Standard for Paddy

Grade	Cleaning degree (%)	Red kernel (%)	Damaged kernel (%)	Dark brown kernel (%)	Green kernel (%)
Extra A	90	2	2.5	0	2
A	90	5	4	0.1	5
B	90	8	5	0.2	8
C	90	10	10	1.0	12

Table 15 Quality Standard for Milled Rice

Grade	Sound kernel	Broken kernel	Red kernel	Damaged kernel	Dark brown kernel	Chalky kernel
Extra A	74.5	8	0.5	0	0	7
A	68.6	10	1.0	0.2	0.2	10
B	57.0	15	1.5	0.5	1.0	15
C	32.0	25	5.0	3.0	5.0	20
A Broken	-	-	1.5	0.5	-	-
B Broken	-	-	5.0	3.0	-	-

Note: Guyanese quality standards are as mentioned above.

Actually B - C are produced mostly.

2) Government price for paddy and milled rice

(Source: GRMMA)

Table 16 Price of Paddy

Grade	Price (G\$)
Extra A	1.41/kg
A	1.33/kg
B	1.25/kg
C	1.08/kg

Table 17 Price of Milled Rice

Grade	Price (G\$)
Extra A	2.95/kg
A	2.83/kg
B	2.70/kg
C	2.43/kg

Table 18 Price of Parboiled Rice

Grade	Price (G\$)
Extra Super	3.11/kg
Super	2.99/kg
Extra No.1	2.87/kg
No.1	2.60/kg

### 3) Actual Price in Free Market

Table 19 Price of Milled Rice in Free Market

Grade	Price (G\$)
Extra A	3.78/kg
A	3.62/kg
B	3.46/kg
C	3.12/kg

Table 20 Price of Parboiled Milled Rice in Fee Market

Grade	Price (G\$)
Extra Super	3.99/kg
Super	3.84/kg
Extra No.1	3.68/kg
No.1	3.33/kg

### 4) Milling Charge

Although the milling charge by the government is G\$0.30, maximum G\$0.75 is allowed by mutual agreement with the customers (farmers, etc.) if drying, feeding, bagging and stitching services are offered.



## 2-4 Present Conditions of Rice Milling Industry

### 2-4-1 Organization and Activities of Guyana Rice Milling and Marketing Authority

GRMMA is a government corporation newly established in 1985 and re-organized from GRB (Guyana Rice Board). It is under Ministry of Agriculture and works in close connection with the aforementioned GREB and NPRGC (National Paddy and Rice Groding Centre) in the export of rice and quality inspections.

As for the position of GRMMA among other organizations, Appendix-3 illustrates the relation with Ministry of Agriculture, as well as with other sister organizations.

#### (1) Functions of the GRMMA

The main functions of the GRMMA are as follows;

- 1) Coordinate with other related organizations on the development of the rice industry.
- 2) Perform purchasing and sales operations of paddy and milled rice.
- 3) Run the rice processing business.
- 4) Supply brown rice, milled rice and broken rice to the GREB for export.
- 5) Supervise marketing and processing of the paddy rice produced in Guyana.
- 6) Engage in commercial and industrial activities concerning the industrial development for the rice produced in Guyana, whenever GRMMA judges it necessary.

Note: \* Marketing and processing of the paddy rice in 5) includes production of quality seeds and its processing and distribution.

\* 6) includes meat processing and oil extraction industries.

## (2) Management and Activities of GRMMA

The outline of actual conditions of management and activities of the GRMMA are as follows:

The following five main functions constitute the operation of the GRMMA.

- 1) Engineering Division
- 2) Production Division
- 3) Finance Division
- 4) Planning Division
- 5) General Affair Division

There are division managers in each of the above divisions who assume controls of all the activities within their respective divisions. They must report their operations directly to the general manager. The division managers hold offices in the main office (Georgetown), but control the various operations in local areas and take responsibility for their proper execution. The general manager himself takes responsibilities in the operation of GRMMA against the board of directors.

For information on central control management of the GRMMA, please refer to the organization chart in Appendix 4.

The management policies of the GRMMA are decided by the management conference, whose members consist of a general manager and five division managers. Each division manager is responsible for the main management functions in his own division.

The business activities of GRMMA are divided into region 2, 3, 4, 5 and 6, which are geographical and organizational divisions. Each region is controlled by a regional manager.

In each region, the regional manager controls the business activities within his region, and is obligated to report the main functions to the division manager in charge. The regional manager must perform duties corresponding to the expert knowledge of the division managers.

The main activities of the GRMMA are procurement and milling process of paddy produced by farmers, sales of milled rice to domestic market, and supply of milled rice to GREB for export. In addition, they engage in the production, processing, distribution and storage of high-quality seeds. Among various agricultural development projects the role played by seed reproduction is important. There are 20 special extension officers engaged in the seed multiplication programme, disposed to the above-mentioned five regions.

## 2-4-2 Conditions of the Rice Milling Industry

### (1) Outline of Rice Milling Industry

The rice milling industry of Guyana is divided into public sector milling facilities which are controlled by the GRMMA and the private rice mills. The rice milling capacity of the public sector is about 35% of the total.

The rice milling in Guyana is characterized by few huller mills, as compared to the main rice producing countries in Asia and Africa, where there are many hullers (Engelberg type hullers). As for the function of rice milling machines in the rice processes, it is a well-accepted opinion that the huller type produces a higher percentage of broken rice, and a lower yield of total milled rice. In addition there are some problems in the quality of milled rice. In Guyana, the main rice milling machines are either Japanese plant type (multi-stage type) or European cone type machines. Some are 20 - 25 years old and some are about 10 years old, but there was a time when foreign currency was in extremely short supply, and imports of parts were restricted, resulting in poor maintenance. Generally, these machines are badly worn out.

There are some bright prospects. Import restrictions for promising industries were alleviated and the door is now open for imported parts. Purchase of machinery for rice milling facilities with funds provided by IDB became possible, and the desire of private rice millers to renew their facilities is being stimulated.

This survey mission visited a private rice miller (also agriculturist with 150 ha. of farm land) who told us that with newly arrived wooden cases containing 2 tons per hour plant type rice milling unit, he would start installation work on the next day with a big smile on his face.

The mission obtained information on the actual condition of rice milling industry in Guyana from GRMMA. They are rearranged and shown below:

Table 20 Number of Rice Mills and Their Capacity in All Guyana

Region	No. of Rice Mill in the Country	Presently operating			Suspend operation
		No. of Rice Mill	Actual Milling Cap.(tph)	Rated Milling Cap.(tph)	
Region 2	15	10(3)	22.5	28	5
3	24	24(2)	2.75	5.5	0
4	5	2(0)	1	5	3
5	31	29(1)	31	47	2
6	35	32(2)	22.75	46	2
Total	110	98(8)	80	131.5	12

(Source: GRMMA 1988)

Note: ( ) shows rice mills belonging to GRMMA.

Table 21 Actual Conditions of Rice Mills Owned by GRMMA

Region	Place	Actual Capacity (tph)	Rated Capacity (tph)	Conditions
2	Somerset & Berks	1	1	Rehabilitated in 1988
	Anna Ragina	10	10	"
	Anna Ragina	4	4	"
3	Wakenaam	1	1	Rehabilitated in 1988
	ruimeight	1	2	Need rehabilitation or remodeling
5	MARDS	9	20	Applied JICA for rehabilitation
6	Black Bush Polder	3	6	Need rehabilitation
	"	1	2	"
Total		29	46	

Note: Actual milling capacity of MARDS is lowered to about 40% of the rated capacity

Table 22 Number of Rice Milling Machines in Guyana by Make  
(in operation)

Capacity Make	1/2	1	1.5	2	3	6	10	Total
Satake	11	29		5	2	1	2	50
Kyowa		3						3
Engelberg	4	4						8
Blackstone		1		1				2
Grantex	5	12		3				21
East Germany (Maker unknown)				2				2
West Germany (Maker unknown)		1					1	2
Schule		2		2				4
Olmia		2	2	1				5
Perkins		3						3
L. Grant	1	1						2
Total	21	59	2	14	2	1	3	102

Remarks: In GRMMA data, some make names are expressed by country name, without the manufacturer's name.

Note: Table 20 shows number of rice mills as 98.102. Table 22 shows the number of machines installed in these mills.

As for the power source for rice mills, electric supply conditions in Guyana are not very good. Power failures are frequent, and they last for long periods. The government's policy is to supply the electricity preferentially to important industries, and the rice mills owned by GRMMA are benefited by this policy. However, the electricity supply is often not sufficient to extend this policy to all private rice mills.

The power source for rice mills in Guyana is as follows:

GRMMA Rice Mills		Private Rice Mills	
Engine driven	Public Electricity & Generator	Engine driven	Generator
3	6	99	2

Fuel: Diesel oil is inexpensive, about 15.4 yen per litre.

(Converted as 1 gallon=4.546 litre, G\$11.45=6.12 yen).

Therefore, a majority of the rice mills are run by diesel oil and the counter shaft drive system.

## 2-5 Background and Content of the Request for the Project

### 2-5-1 Background for the Request

The government of Guyana regards agriculture as its most important industry and pays utmost effort to increase rice production. Rice is important to Guyana, not only as staple food its her people, but also as one of the few export products together with bauxite, sugar and shrimp, a marine product that supports the national economy.

In recent years, increase of rice field size and yield per unit of land were planned by extending the irrigation and drainage system; the increase of rice production is therefore expected. However, the lack of rice milling facilities that handle the postharvest processes, and the poor condition of existing rice mills are becoming bottlenecks for rice production and rice export. At present, rice milling capacity of the nation has reduced to 61% of the rated original capacity. This reduction is principally due to worn out facilities. In particulars, the GRMMA - the government organization who handles paddy procurement, rice milling and marketing - has eight rice mills all over Guyana and their milling capacity makes up about 35% of the nation. Their main rice mill, MARDS (about 43% of all GRMMA milling capacity and 15% of all nation's capacity) is in very bad condition. Their actual capacity has been reduced to about 40% of the rated capacity. The MARDS rice mill has two 10 tph units. The paddy, procured from farmers every year regularly, gradually

remained there as stock as the milling capacity decreased. The stock of old rice results in lowering of quality and quantity in the milling process and the MARDS is suffering a considerable economical loss.

Region 5, where MARDS rice mill exists, is a main rice producing area in Guyana, inhabited by nearly 70,000 people, which is about 1/12 of all Guyanese population. The majority of the population in this area are engaged in rice growing. The procurement of the paddy brought in by farmers is not handled smoothly, and there is a fear of lower quality affecting the buying price of paddy. All these factors may discourage the farmers' production efforts. In this area, a certain important project is going on in the rice development area. The government of Guyana requested financial assistance from the Japanese government for rehabilitation of MARDS rice mill because they regard it a most urgent matter for national economic policy.

#### 2-5-2 The Content of the Request

The content of the request relating to this project submitted by the government of Guyana is as follows;

##### (1) The purpose of the project

- 1) To increase rice milling capacity (improve milling yield and prevent losses), produce quality milled rice and supply it to Guyana's people, as well as to increase export of rice after raising its value.
- 2) To encourage the promotion of the areal rice development project.
- 3) To raise the technical level of the officers concerned with the GRMMA and MARDS.
  - 1 Technical training on operation and handling at the time of installation of machinery and test operations.
  - 2 Technical training on quality control and inspections.

##### (2) Conditions for the execution of the project

- 1) The government of Guyana will completely evacuate the existing rice milling machinery and bears the material, labour and expenses for

floor works, etc. necessary for the installation of the new rice milling machinery.

- 2) Both countries, Japan and Guyana, strictly observe the agreement on the share of expenses and work.

(3) Installation site

Inside the building of the existing MARDS rice mill in the region 5, Burma area, Guyana

(4) Executing Agency

GRMMA (Guyana Rice Milling and Marketing Authority)

(5) Machinery & equipments

- 1) Rice Milling Machinery

Rated capacity = 10 tph plant type ... 2 lines

- 2) Quality Inspection Equipment ..... 1 set

(6) Technical guidance

- 1) Technical training on machines installation, test operation and operation techniques.

3 persons, short period (total about 5 months)

- 2) Technical training on the operation and recording techniques of quality inspection equipment

1 person, short period (total about 2 months)





**CHAPTER 3**

**CONTENT OF THE PROJECT**



## Chapter 3 Content of the Project

### 3-1 Purpose

This project aims at realizing the improvement in quantity and quality of the milled rice produced, thereby contributing to the management of MARDS rice mill and to stabilize the national economy by the increase of exports.

### 3-2 Examination of the content of the request

#### 3-2-1 The role and organization of MARDS rice mill

##### (1) Outline and activities of MARDS rice mill

The MARDS rice mill is the largest of all 8 rice mills owned by GRMMA, and accounts for 43% of total rice milling capacity. Region 5, where MARDS exists, is the main rice producing area in Guyana, and it procures and processes the paddy grown not only in region 5, but also the paddy grown in region 4 and 6. It has the record of purchasing and processing about 79,000 tons (average of 3 years, 1986 - 1988) against the total paddy produced in these areas, about 151,000 tons (same 3 years average). In 1987, about 18,000 tons of milled rice was exported by MARDS. The existence of this rice mill is important to Guyana's socio-economic well-being.

In MARDS, a branch manager's office controls not only the paddy procurement, rice milling and marketing by the MARDS rice mill, but also the various activities in region 5 by GRMMA. The function of the branch office is, as with the GRMMA head office, separated into five divisions. It is the duty of each department in charge to report the daily activities to the branch manager. Note: Organizational chart of MARDS is shown in Appendix 5.

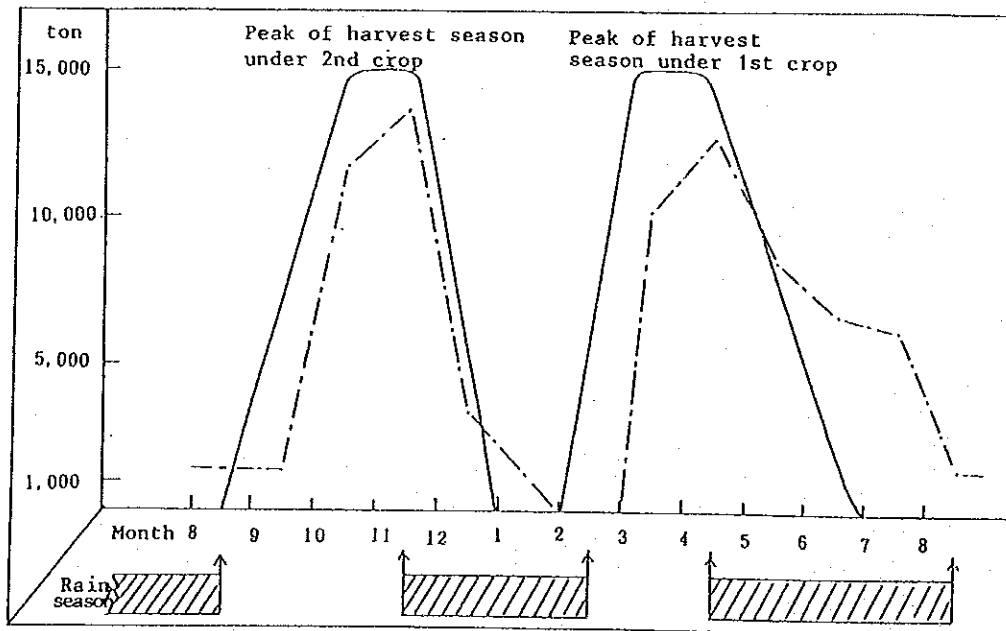
The MARDS, as a branch office of GRMMA, participates in the rice development program of the MMA/ADA agricultural development project in region 5. They are engaged in quality seeds production program, quality inspection, seeds processing, storage and distributions. In region 5, three extension specialists under direct control of GRMMA head office are stationed and work hand in hand with the engineers from Ministry of agriculture. Annual paddy procurement by MARDS is shown below:

Table 24 Actual record of procurement of paddy in 3 regions  
(region 4, 5 and 6)

Month	Paddy procured (ton)	%
1	1,726	2.2
2	0	0
3	10,268	13.0
4	12,850	16.3
5	8,557	10.9
6	6,845	8.7
7	5,134	6.5
8	1,696	2.2
9	1,682	2.1
10	12,820	16.3
11	13,691	17.4
12	3,424	4.4
Total	78,693	100.0

Harvesting season and the change in procured quantity are shown below:

Fig. 3 Harvesting season of paddy and change in the quantity procured by MARDS



- Remark: 1 Procured quantity transition curve
- 2 February is a procurement cessation period, the time for general maintenance and repair work for the machinery and equipment.

### 3-2-2 Examination of the Scale of Requested Facilities

#### (1) Future plan

As mentioned before, the Ministry of Agriculture now carries on many projects to increase rice production such as arranging irrigation and drainage facilities on arable land that suit rice growing. They plan to extend the rice growing field to 110,000 ha. by 1991 and produce over 400,000 tons of paddy. As for the region 4, 5 and 6 covered by MARDS, the plan is to extend the rice growing field to 80,000 ha. and produce 280,000 tons of paddy by 1991.

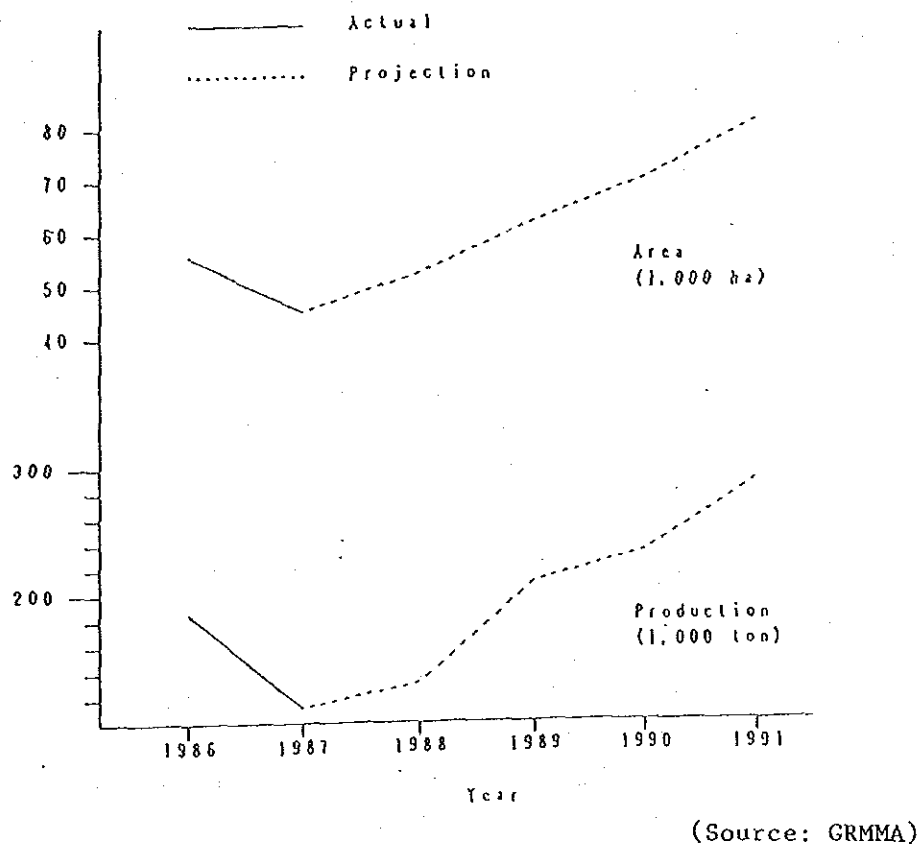


Fig. 4 Area harvested and paddy production in three regions (4, 5, 6)

(2) Present condition

According to GRMMA, the actual record of paddy production procured quantity and quantity of paddy milled for three years of 1986 - 1988 in the three regions are as follows.

Paddy production      151,331 ton  
Paddy procured        78,693 ton

However, the actual operating conditions of MARDS rice mill estimated by the data collected by the survey, such as the actual capacity of the mill, annual operating hours, records of actually processed quantity, etc., are as follows:

Table 27 Operating Conditions of MARDS rice mill (1988)

Capacity of facility	8 tons per hour
Operating hours	6,912 hours/year 24 hours/day (3 shifts)  288 days/year, 24 days/month
Quantity of paddy processed	44,258 tons/year
Quantity of average daily process	$44,258 \div 288 = 153.7$ ton/day
Average daily operation hour	$153.7 \div 8 = 19.2$ hour/day
Average loss	$24 - 19.2 = 4.8$ hours/day

At the time the mission surveyed this rice mill, inquired about the daily working conditions. It was discovered that the plant stops operation for about 2 hours everyday for maintenance work. Although they work 24 hours, 3 shifts a day, the content of the abovementioned average loss of 4.8 hours is reported to be as follows:

- Plant operation ceases (Daily maintenance) 2 hours

- Loss at the start and end 1 hour

After plant is switched on and the grain is fed, time is required for adjusting the machinery until good grains starts to discharge. At the end, time is required after the feeding is stopped to the time machine stops discharging the milled rice.

- Other losses 1.8 hours

Switching the lot of rice (15 min. at a time). Switching to generator when there is power failure (about one hour). Parts replacement such as rubber rollers, repairs, etc.

As for the annual operation of 288 days, if one day every week and one week every year is spent for general maintenance work, it may be said that the plant is in full operation. Further, this assumption is a result calculated by annually processed quantity, which means the same quantity is processed every month. In actual operation however there must be some fluctuations in the processing quantity. If in a certain month, more than average quantity is to be processed, it would not be possible to stop the machine even one day in a week nor stop the machine for 2 hours/day. Because of this situation, the plant may experience excessive wear of parts, increase in broken rice, and lower milling yield.

On the other hand, GRMMA owns a Black Bush Polder rice mill in region 6. This rice mill is worn out to the same degree as the MARDS rice mill. The rice mill consists of one Japanese made plant (6 tph) and one Italian made plant (2 tph). Actual capacity of the mill is lowered to 4 tph. The operating conditions of this mill were estimated to be similar to those of the MARDS rice mill.



Table 28 Operating Conditions of Black Bush Polder Rice Mill  
(estimated)

Capacity of facility	4 tons per hour
Operating hours	6,912 hours/year 24 hours/day (3 shifts)  288 days/year, 24 days/month average
Quantity of paddy processed	21,018 tons/year
Quantity of average daily process	76 tons/day
Average daily operation hour	19 hours/day
Average loss hour	5 hours/day

\* Average loss was 0.2 hour/day more than the MARDS rice mill because of the higher degree of senescence at the Black Bush Polder rice mill.

At the time of visiting Black Bush Polder rice mill, daily processing quantity was said to be 72 tons. A similar figure appeared in the above list. The above table 28 is judged to represent more or less the actual conditions of the mill. Consequently, the annual maximum processing quantity of this rice mill at the present is supposed to be about 20,000 tons.

From the abovementioned, 80,000 tons of paddy procured by GRMMA in these 3 regions are judged to be processed as follows:

----- 80,000 tons -----		
MARDS rice mill processes 45,000 tons	Black Bush Polder rice mill processes 20,000 tons	Stock 15,000 tons

Thus, in spite of the full and hard operations of both rice mills, MARDS and Black Bush Polder, 15,000 tons of paddy still remained unprocessed. As far as the mission surveyed, it would not be possible for both rice mills to improve the situation, even though spare parts, repair parts, etc. are adequately supplied.

Further, when we consider that the efforts for increasing rice production is forwarded as national policy, it is clear that the remodeling of both rice mills and increasing of the milling capacity are urgently needed.

### (3) Scale of the plan

As mentioned before, the government of Guyana, by the rice production increasing plan, aims to produce 280,000 tons in the 3 regions by 1991. Judging from the present marketing conditions, it is estimated that the GRMMA would purchase 52% of this amount, 146,000 tons. However, it is likely that the GRMMA will be required to purchase more because the paddy production of 280,000 tons in 1991 is about 67% more than the production in 1987, and the farmers consumption and private rice mills can not take such a large increased portion. In this background, the government of Guyana made a plan to approve the private rice mills to process the export rice by a registration and licence system. This handling of export rice by private rice mills is also not likely to increase rapidly enough to cope with the 67% increase.

Therefore, if the production increase plan is achieved, it is anticipated that GRMMA would have to procure more than 146,000 tons of paddy from the 3 regions.

With the abovementioned in mind, let us make some case studies.

#### Operating Conditions

i) Operation hour	24 hours/day (3 shifts)	
ii) Actual operation	19.5 hour/day	
time	Stop for maintenance	2 hours
	Loss at start/end	1 hour
	Lot change/parts replacement, etc.	1.5 hour

iii) Operation days                    24 days/month  
    282 days/year  
    Once a year (6 days) general maintenance

Conditions of Cases

Case A    Present scale

GRMMA procures    75,000 tons  
    20,000 tons - processed by  
Annual process 55,000 tons Black Bush Polder  
Monthly fluctuations 38.9%  
(past 3 years)

Case B    Scale based on government plan for 1991

GRMMA procures    146,000 tons  
    20,000 tons  
Annual process    126,000 tons  
Monthly fluctuations 38.9%

Case C    Scale based on government plan for 1991

GRMMA procures  
Annual process    same as Case B  
Monthly fluctuations 5% (safety factor)

Basically the operation is based on  
average figure of production plan.

\* Maximum operation ratio against the monthly average process quantity, based on the actual record of monthly processed quantity for the last three(3) years.

Based on the abovementioned conditions, calculations were made to work out the necessary capacity of the facilities. The result is as follows:

Table 29 Case study for required processing capacity of the facilities

Case	A	B	C
Yearly process	55,000 tons	126,000 tons	126,000 tons
Average monthly process	4,580 tons	10,500 tons	10,500 tons
Max. monthly process	6,366 tons	14,585 tons	11,025 tons
Required capacity of facilities	13.6 ton/hr.	31.2 ton/hr.	23.6 ton/hr.

From the above, the scale of the facilities requested by the Guyanese government in this project, which is 20 tons per hour, is not enough in view of the government production increase plan.

However, GRMMA has another rice mill in Black Bush Polder. It is operating at reduced capacity of 4 tons per hour due to the worn out facilities similar to those of the MARDS rice mill. GRMMA has not decided the concrete date of enforcement, but they have a remodeling plan to build a 10 tons per hour rice mill. If this rice mill was actually built, the possible milling capacity by both rice mills would be as follows:

Capacity of the facilities	30 tons per hour
Maximum monthly process q'ty	14,040 tons
Average monthly process q'ty	13,371 tons
Possible annual process q'ty	160,457 ton > 146,000 ton

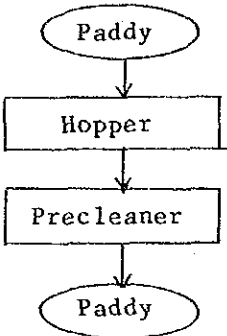
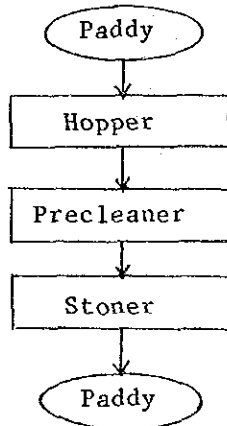
Note: Operating conditions: Same as the case studies.  
Covers 5% monthly fluctuation

If both rice mills keep regular operation time according to the planned production schedule, they are capable of milling 160,000 tons of paddy annually. It is judged reasonable for the government of Guyana to have produced a remodeling plan for rice mills at MARDS and Black Bush Polder, and have decided the scale of these mills will be 20 tph and 10 tph each, in order to cope with the increasing production planned for the 3 regions.

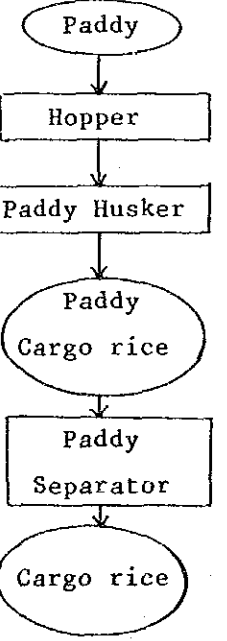
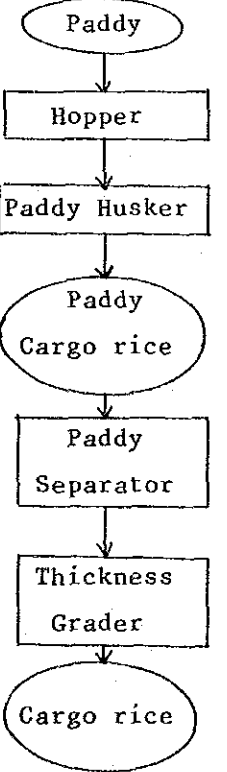
### 3-2-3 Examination of the Requested Machinery and Equipments

The contents of machinery and equipments requested by Guyanese government were discussed, mutually examined, and confirmed during the survey works. They are arranged in comparison with the existing machinery.

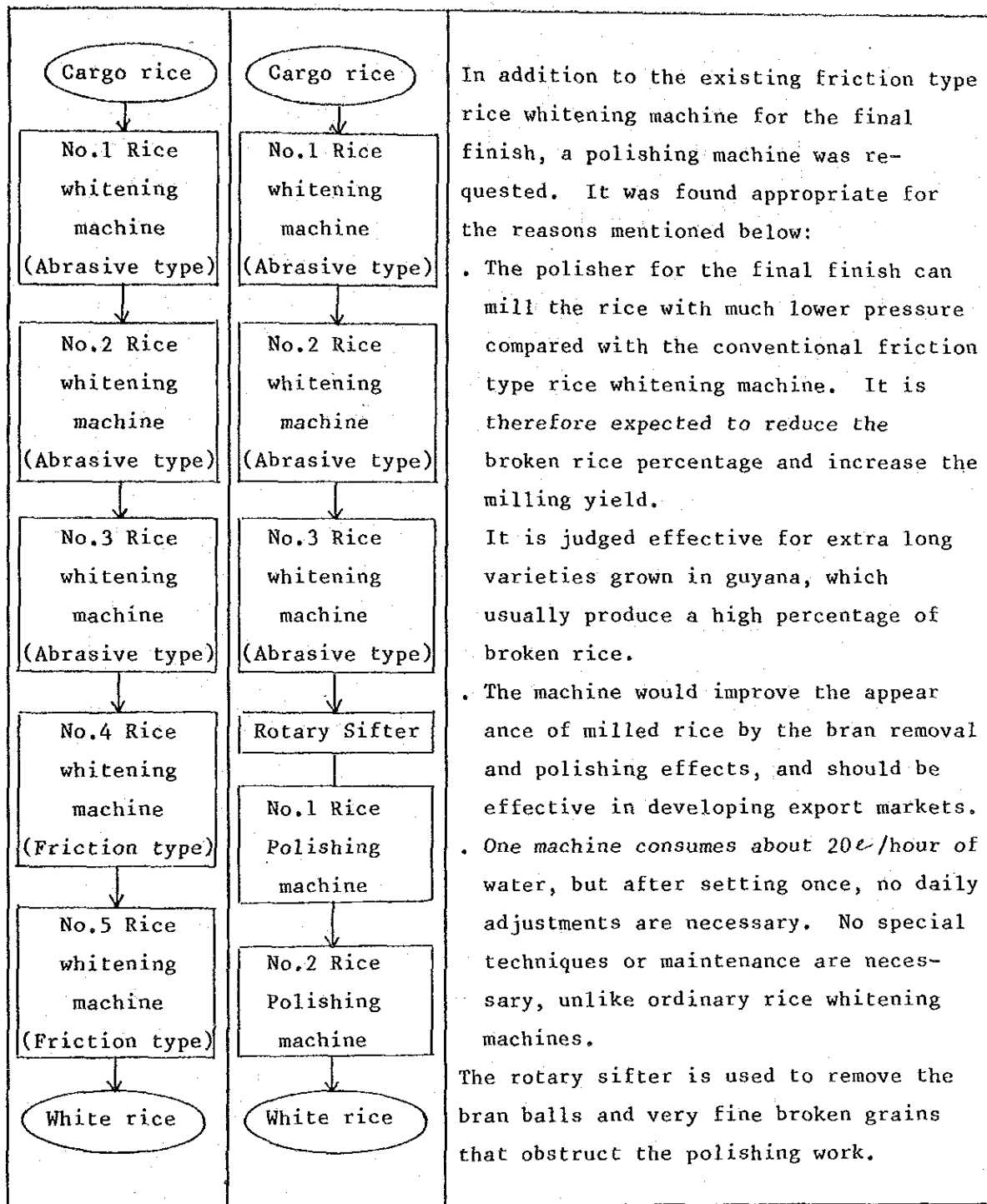
#### (1) Receiving, Cleaning Section

Existing Facilities	Requested Facilities	Comment
 <pre> graph TD     P1([Paddy]) --&gt; H1[Hopper]     H1 --&gt; P1[Precleaner]     P1 --&gt; P2([Paddy])             </pre>	 <pre> graph TD     P1([Paddy]) --&gt; H1[Hopper]     H1 --&gt; P1[Precleaner]     P1 --&gt; S1[Stoner]     S1 --&gt; P2([Paddy])             </pre>	<p>Existing cleaners are the type that are combined with a stoner. The paddy in this area is usually sun-dried in an open yard and contains many impurities such as stones, sand dung, branches, etc. Therefore, it is desirable to install a higher performance independent type in which maintenance work can be performed easily.</p>

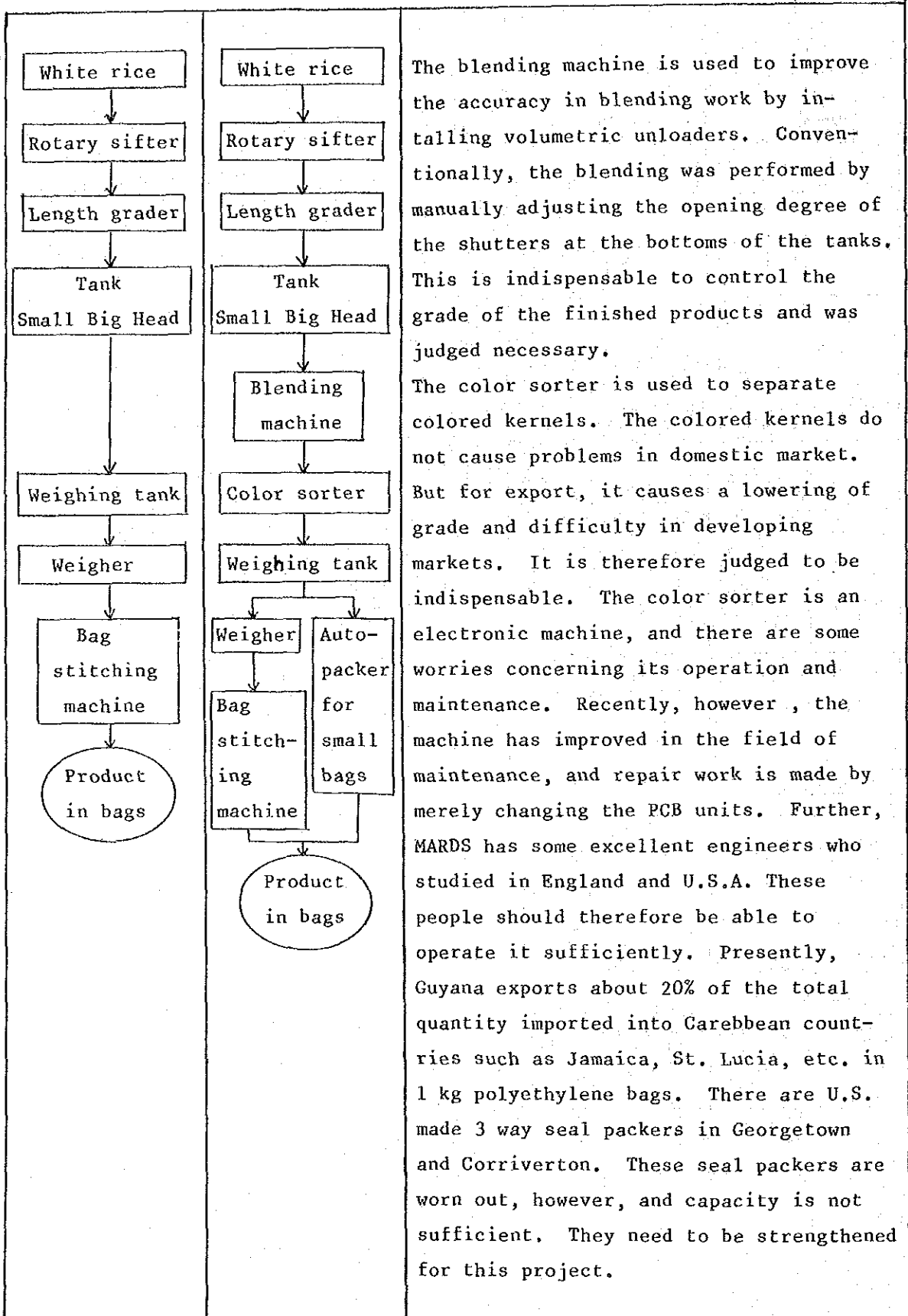
#### (2) Paddy Husking Section

 <pre> graph TD     P1([Paddy]) --&gt; H1[Hopper]     H1 --&gt; PH1[Paddy Husker]     PH1 --&gt; CR1([Paddy Cargo rice])     CR1 --&gt; PS1[Paddy Separator]     PS1 --&gt; CR2([Cargo rice])             </pre>	 <pre> graph TD     P1([Paddy]) --&gt; H1[Hopper]     H1 --&gt; PH1[Paddy Husker]     PH1 --&gt; CR1([Paddy Cargo rice])     CR1 --&gt; PS1[Paddy Separator]     PS1 --&gt; TG1[Thickness Grader]     TG1 --&gt; CR2([Cargo rice])             </pre>	<p>The thickness grader that is not in the existing mill is used to separate immature grains from husked rice. It has the are following advantages: To separate the immature grains that have been crushed and discharged mixed with the bran. If such immature grains are milled separately, they can be sold at a mush higher price than the price of bran that is used as material for industrial processing similar to broken rice. It can clean the cargo rice for export purpose.</p>
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(3) Rice Whitening Section



(4) Grading and Packing Section



(5) Others

<p>&lt;Cargo rice grading &amp; packing&gt;</p>	<p>No mention in the request</p>	<p>A quality standard, such as broken rice percentage, applies to the cargo rice exported to EEC and the vicinities. In order to produce the cargo rice according to this standard, some additional processes and facilities would be necessary, just same as in the case for white rice.</p>
<p>&lt;Laboratory equipments&gt;</p>	<p>No mention in the request</p>	<p>It is indispensable for promoting the export of Guyanese rice to establish a system by which it is possible to control the quality of the rice. Needless to say, the preparation of quality inspection equipment is a prerequisite.</p> <p>At rice mills, quality inspections incoming paddy and on finished milled rice are carried out as routine work. But as with the other machinery/equipment the testing equipment is insufficient and old. It has been requested during the survey work to substantiate the testing as equipment as far as the budget allows. The production of the best possible products by the new rice milling facility could be ensured only if equipment and system existed to judge whether the product is good or bad.</p> <p>It is judged right to emphasize the shortage among existing inspection equipment within the scope of this project. It would also be important good to maximize the effect of the equipment to be given under this project.</p>



Present Conditions of the MARDS Rice Mill

Rice milling machines now in operation were installed in 1977. In 1982, foreign currency was in extremely short supply, and most of the spare parts needed for the maintenance work were not imported. This accelerated the deterioration of the facility.

The mission confirmed during the survey that the rice milling plant was, on the whole very worn out. In particular, half of the important rice whitening machines were inoperable. Naturally, the rated original capacity of the plant, 10 ton/hour, was lowered to less than half, 40%. Ducts for dust collection and bran suction are broken all over the plant, and spreading of this dust and bran has caused fears for the health of the employers. As the milling capacity decreased, carry-over stock of procured paddy is also causing problems. The plant was partially milling the paddy produced in 1985. There was a large amount of grains of deteriorated quality, as well as discolored grains because of long storage period. In addition a large amount of broken rice, caused by the reduced performance of each machine, is also presenting the problems of low head rice ratio and low overall quality. This problem requires urgent countermeasures.

The mission's opinion is that the degree of deterioration is far greater than the degree at which it can be improved by rehabilitation efforts. The replacement of the entire plant is necessary. The mission places a high degree of propriety in cooperation to replace the rice milling facility.

Deterioration and operation stoppage are generally brought about by inadequate maintenance. This is more a matter of the management system and a sense of responsibility than of technical matters. Compared with private enterprises, such problems are more common in governmental operations. With this idea in mind, the mission asked various questions directly to engineers in charge of operation. The answers obtained were sufficient to eliminate any doubts. Appendix-6 shows the items of daily inspection, weekly inspection and general inspection conducted in MARDS rice mill. The mission can not determine whether all items are performed perfectly according to these lists. But the fact that they exist as a part of their system indicates that the personnel in charge, including operators, are notified of their importance and are charged with the responsibility.

Since 1988, new regulations were applied and GRMMA can now spend up to 15% of its operating profit for maintenance work.

### 3-2-4 Operation Budget of MARDS

Although execution of this project will be supervised by the GRMMA, personnel and budget plans for the MARDS, which actually performs the operation, must be clearly set up. Table 25 shows the operation budget of the MARDS, actual records of past 3 years and budget planned for next 3 years. According to the list, the budget allocated for 1990 - 1992 is more than double the actual budget in the past 3 years. As for the future prospect of the budget, it is not easy to judge the authenticity of the plan. The mission believes that this large increase is due to the fact that the Guyanese government places a great deal of hope in increased production and export, by replacing the rice milling facility as they are shown by the GRMMA headquarters.

In Guyana, there are none of the delayed payments to government officers which are often observed in developing countries. Although domestic funds are not ample, the execution of the budget seemed punctual. The mission was told that this budget is guaranteed because of the importance and high priority of this project in the national economy. The attitude of the personnel was also decided to be strengthened after examining the operation reinforcement measures as follows:

<u>Production Division</u>	<u>Present</u>	<u>Plan for improvement</u>
1) Chief of production	0	1
2) Rice Mill Manager	1	13
3) Operator	12	18

<u>Maintenance Division</u>	<u>Present</u>	<u>Plan for improvement</u>
1) Assistant Engineer	0	1
2) Chief Mechanic	1	3
3) Welder	0	1

Note: Increased persons are 13.

PROJECTED EXPENSES BUDGET

New Rice Mill at M.A.R.D.S (10 metric tonnes/hour x 2 units)

(Unit: 1,000 G\$)

Item	New Rice Mill						
	Year	1987	1988	1989	1990	1991	1992
Raw Materials (Paddy)		33,261	33,261	39,272	74,529	111,376	111,376
Packaging Materials		1,997	1,997	2,400	3,096	3,822	3,822
Spares and Stores		285	285	681	1,238	1,834	1,834
Fuels and Lubricants		1,659	1,659	2,987	3,255	3,423	3,423
Electricity		937	937	1,281	2,328	2,448	3,448
Direct Labour		1,319	1,319	1,152	2,094	3,101	3,101
Maintenance		452	452	620	1,123	1,663	1,663
Transport and Freight		3,094	3,094	2,840	3,100	3,100	3,100
Cost of Rice Inputs		450	450	615	1,110	1,656	1,656
Total Variable Expenses		43,454	43,454	51,758	91,881	133,433	133,433
Administrative Salaries		917	917	424	579	579	579
N.I.S.		123	123	78	133	184	184
Stationery		118	118	120	125	125	125
Rates and Taxes		71	71	71	71	71	71
Insurance		45	45	75	75	75	75
Interest charges		752	752	-	-	-	-
Miscellaneous		576	576	600	600	600	600
Total Fixed Expenses		2,603	2,603	1,388	1,583	1,634	1,634
<b>TOTAL EXPENSES</b>		<b>46,056</b>	<b>46,056</b>	<b>53,146</b>	<b>93,464</b>	<b>135,057</b>	<b>135,067</b>

### 3-2-5 Examination of the Request and Summary

The mission examined the request from the Government of Guyana referring to the actual conditions of the site surveyed by the mission and wishes to state the followings:

(1) The project of replacing the MARDS rice mill is urgently required for the socio-economic well-being of Guyana, and is expected to play an important role in earning foreign currency.

(2) There is no problem in the purpose and goals of the project. The targets and plans to reach the goal are practical and realistic, and the program is thoroughly feasible.

(3) After Japan's cooperation in the project is completed, the measures that will be taken by GRMMA and MARDS for necessary management of budget and the personnel arrangement are the improved measures in which past problems were taken into consideration, and includes the means to cope with the problems.

(4) The attitude of Guyanese government in the apportionment of the share of work showed that they are determined to do the utmost to help their own country.

(5) At the back of MARDS rice mill, such rice development schemes as irrigation drainage projects by MMA/ADA and Black Bush Polder, etc. are going on as national projects. It is expected that the efforts of the farmers to increase production, the will of the private rice millers to improve facilities, and for better management would be stimulated as the combined effects of such projects.

The mission judges that this project should be enforced, because cooperation in this project meets with the purposes of the grant aid of Japan. In addition, the practicality and executing ability of the recipient country have been confirmed by the abovementioned analysis. Consequently, the outline of the project shall be examined here, and the basic design work shall be started on the assumption that the grant aid cooperation from Japan will be approved. However, as already mentioned in above 3-2-3, some changes in the original request would be appropriate, as would some additional requests.

### 3-3 Outline of the Project

#### 3-3-1 Executing Organization and the Management System

The executing organization of this project is the GRMMA. The object of enforcement in their operational scheme is the MARDS rice mill. MARDS is one branch of GRMMA. The MARDS's own work and activities independent from GRMMA are outlined in 3-2.

##### (1) Organization of GRAMMA

It is as mentioned in 2-4-1 and the organizational chart is as shown in Appendix-4.

(2) MARDS is under a branch manager and has the five departments, identical to the GRMMA headquarters (engineering, Production, Accounts, Administration and Industry-Planning Monitoring) and Quality Control Section is attached. All departments and section are interrelated to each other. The departments directly involved in this project of rice milling and processing business are:

##### 1) Production department

This is the main department that handles paddy procurement, drying, cleaning, storage, milling process, as well as sales activities.

##### 2) Engineering department

This department is responsible for the maintenance of machinery and equipment (rice milling plant, silo, boiler, conveyors, etc.), electrical equipment, building, carpentry, etc. These activities are closely related with the production department.

##### 3) Industry-planning monitoring department

This department collects information on the rice production trend and development programs and promotes the improvement of the industry. It also performs planning and monitoring in these areas. In addition, fire prevention for the building and safety measures are handled by this department. Purchasing and storage of machinery, tools and other materials are also covered by this department.

#### 4) Quality control section

This section conducts quality inspection and grading of the paddy purchased by MARDS (aforementioned quality standard Table 14 and 15) and the product (cargo rice and white rice). Inspected lots of paddy are piled according to the grade and then sent to the production line. For the organizational chart of MARDS, please refer to Appendix-5.

#### (3) Man-power plan

The number of personnel related to the operation of MARDS rice mill is 68 persons at present. This figure is out of our appraisal because it relates to labour cost, policy and the customs of Guyana. However, it is necessary to allocate personnel to the important posts related with the management of rice mill and control of the products. In accordance with the recommendations of the mission, GRMMA understood the importance very well and presented a personnel reinforcement plant showing appointments of production controller, mill manager, chief mechanic, etc. Ability of personnel at MARDS rice mill including the comparison of present and future improvement plan are shown in Table 26. The mission sees no problems in terms of ability and experience of the main sections. However, there are some new machines which are not in the existing mill included in the project, and also new machines in the request from the Guyanese government. Hence, technical training will be conducted for the handling, operation and maintenance of such equipment as well as for the quality inspection equipment. It follows that this technical training will be conducted from the time of installation to the time of test operation by the supervisor from machine supplying company and the supervisor from the consulting company. In the actual planning of the training, it is most desirable to conduct it economically and efficiently after coordinating both parties. The training work, therefore will be an excessive burden.

Table 26 Personnel Organization for MARDS Rice Mill Complex

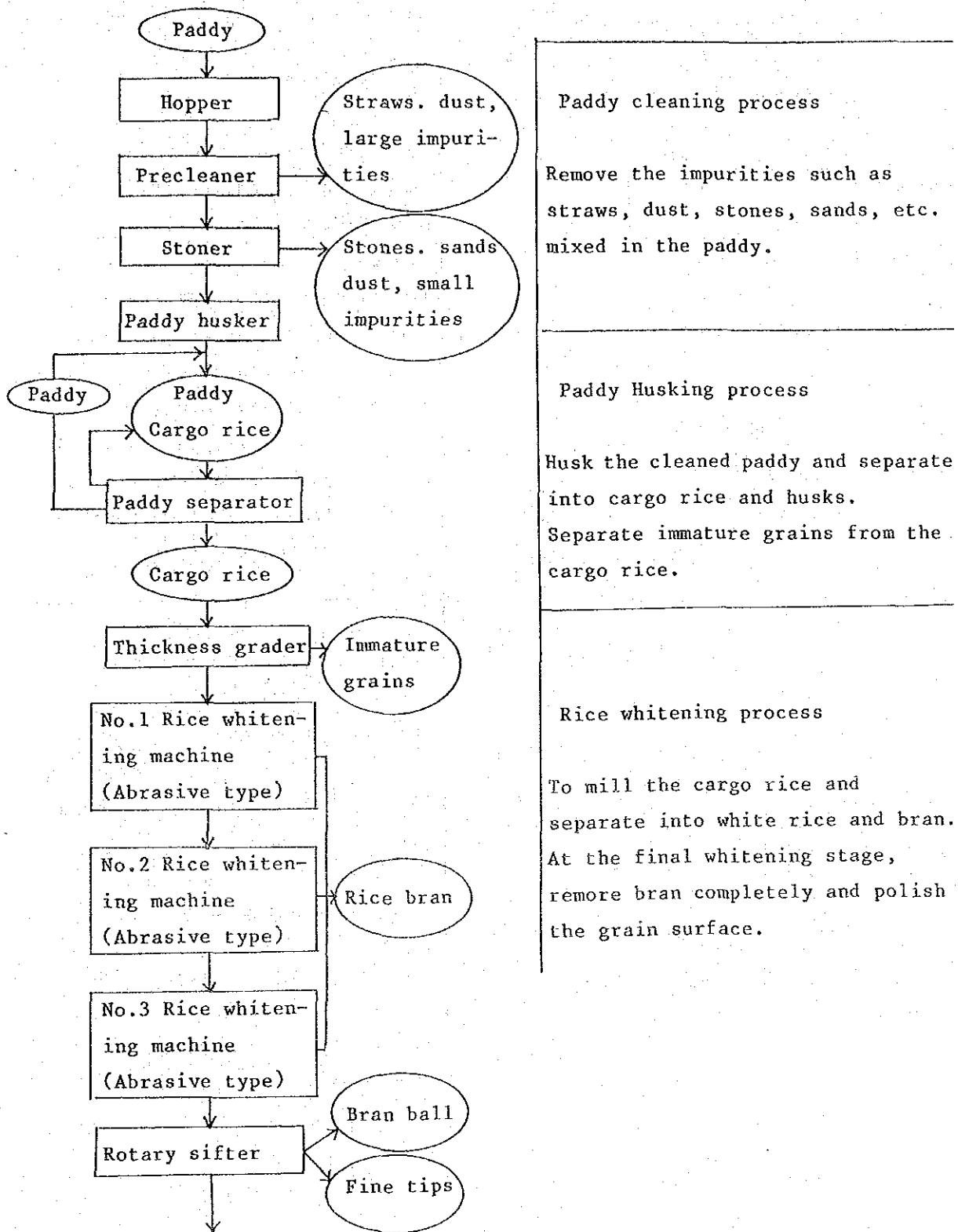
Type of Occupation	Age (Average)	Average Service Period	Sex	No. of Personnel	Remarks
Manager	41	24.5	M	2	* 1 person (Production supervisor)
Administration	40	9	M	4	
Receiving Section	36	1	M	9	3 ps.
Husking Section	28	5	M	6	All * 6 ps.
Rice Whitening Section	32	9	M	6	All
Grading, Bending & Packing Section	36	3	M	16	All
Products delivery Section	29	3	M	1	All
			F	15	
Dust, Bran collection Section	30	1	M	10	All
Products Control	-	-	M		* 2 ps.
Mechanical Engineer	48	19	M	1	
Assist. Engineer	-	-	M	-	* 1 p.
Foreman	-	-	M	-	* 2 ps.
Electrical Engineer	31	8	M	1	
Mechanic	38	10	M	11	9 ps.
Welder	-	-	M	1	* 1 p.
Electrical Technician	29	3	M	3	
Other Helper	27	1	M	6	
	5	5	F	6	
Total			M 67 F 21	88	

Note: 1 ..... Personnel directly concerned to Rice Mill operation (Presently) = 68 person

2 \* ..... Manpower reinforcement = 81 person (increase the staff 12 person)

3-3-2 Outline of the machines and equipment

The outline of the machines and equipments supplied under this rice milling plant replacement project is explained here, along with a flow chart.



Paddy cleaning process

Remove the impurities such as straws, dust, stones, sands, etc. mixed in the paddy.

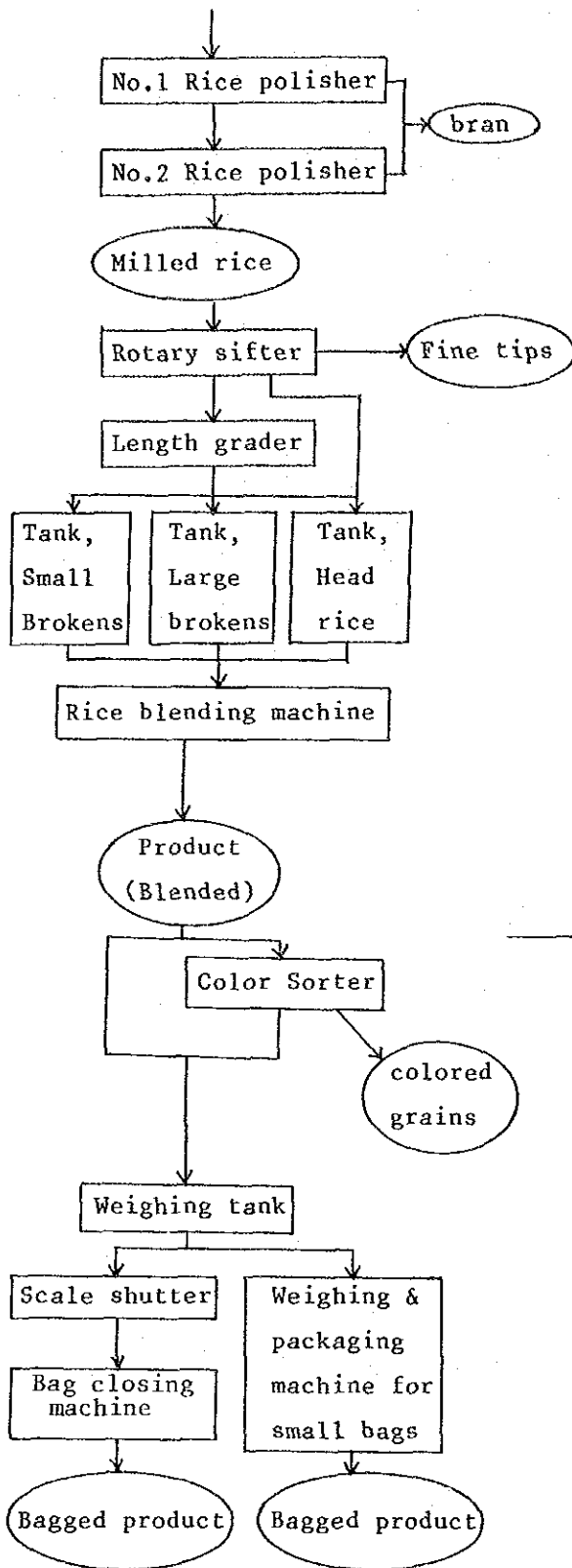
Paddy Husking process

Husk the cleaned paddy and separate into cargo rice and husks. Separate immature grains from the cargo rice.

Rice whitening process

To mill the cargo rice and separate into white rice and bran. At the final whitening stage, remove bran completely and polish the grain surface.



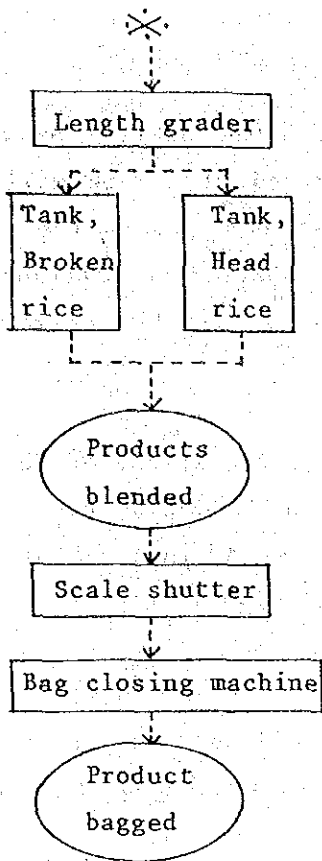


<Grading Process>

Very fine tips close to bran are separated. Then, separate into head rice (Whole rice) large broken rice and small broken rice according to the length and put them each into separate tanks. According to the standard, mixing ratio of large broken grains and small broken grains are decided. Then, head rice and the broken rice portions are mixed together to produce the final product.

<Weighing and Packing process>

The rice is weighed and packed into the polypropylene woven bags (40 - 50kg), polypropylene bags (1kg) and others. For export rice, color grain are removed by color sorter before weighing.



### Cargo rice process

Bypass pipes are provided to skip the whitening process to produce cargo rice for export. As with white rice, after mixing the broken rice according to the standard, the rice is weighed and packed into bags.

### 3-3-3 Outline of the Site of Installation

#### (1) Location of the installation site

MARDS rice mill is planned as the replacement of the existing rice milling facility at the same site. It is located on the national highway about halfway between Georgetown, the capital of Guyana, and New Amsterdam the second largest city. This highway extends towards the southeast, visible to the Atlantic ocean on the left. The MARDS rice mill exists about 9 km away from the highway, after crossing the Mahaica river and the Mahaicony river, about 70 km from the Georgetown, and after changing direction towards the inland. This road that branches inland is in a vast rice field, and there are seed multiplication and storage facilities here. Also, the area containing the central agricultural experiment station and workshop (completed in 1982), built with the aid from north Korea.

## (2) Outline of MARDS complex

This complex is quite large, as can be seen in the outline drawing attached to the beginning of this report. It is composed of a rice mill, a parboiling facility, a drying facility, flat bottom silos, etc. on the vast 1 km<sup>2</sup> of land. They were built by the former Mahaicony/Abary Rice Development Scheme. The fact that all such facilities were systematically operating before must be kept in mind in this basic design work.

After completion, from about 1982, foreign currency conditions of Guyana were aggravated, and parts for replacement or repair could not be procured. Deterioration proceeded quickly as capable human resources drained out of the country. All these resulted in the present condition of plant.

The parboiling facility and a part of drying facility are incapable of operation. There is talk that they might be repaired and put into operation in the future. However, from the present condition, it is judged that many parts are either beyond repair, or replacement is more economical.

In the above mentioned outworn conditions of all facilities, including rice mill, present basic factors for the designing of the rice milling facility are as follows:

Paddy storage capacity	Flat warehouse	35,000 tons
	Silo	10,000 tons
	Total:	45,000 tons

## (3) Utility

### 1) Electricity

In Guyana, Guyana Electricity Corporation generates electricity with diesel oil and supplies electricity nationwide. As with as the MARDS complex, their generators are outworn because of poor maintenance in the past. The Japanese government has replaced some of the generators by their grant aid program and is conducting further surveys for the master plan.

During the mission's stay in Guyana, the mission observed frequent power cut-off in dwelling houses in the town. It is clear that the supply capacity of the Guyana Electricity Corporation does not meet the demand. In the city of Guyana, some houses, restaurants or government facilities are equipped with supplementary diesel generators to cope with the situation. The GEC, when they have to cut the electricity supply due to the imbalance of demand and supply, set the priority order and give considerable priority to the sugar and bauxite industries, including rice mills.

From the abovementioned, in Guyana, the project and investment for radical improvement of electricity conditions such as building of power stations, etc. are much desired not only for the development of rice milling industry but also for other industries.

The MARDS complex receives electricity from GEC by power transmission lines. 1.320 KVA is allocated to the rice mill. This capacity should be sufficient, even after replacing the present facility with a new one.

As mentioned before the rice mill is equipped with 2 units of diesel generators to prepare for the unstable electric conditions. They are supposed to be used in case of power cut-off. (see fig. 5)

Main Generator	1,500 KVA
Sub Generator	500 KVA

It is the mission's understanding that the electric supply is secured by the effort of Guyana, in spite of the severe general environment.

## 2) Water

Rice polishers planned in this project consume water. The mission checked the availability of water. In MARDS rice mill, water from wells are pumped up and offered for drinking purpose. Also a quantity of water has been used for the parboiling process. The mission judges that there is no problem in the quantity and quality of the water.

SKETCH ON ELECTRICAL SYSTEM

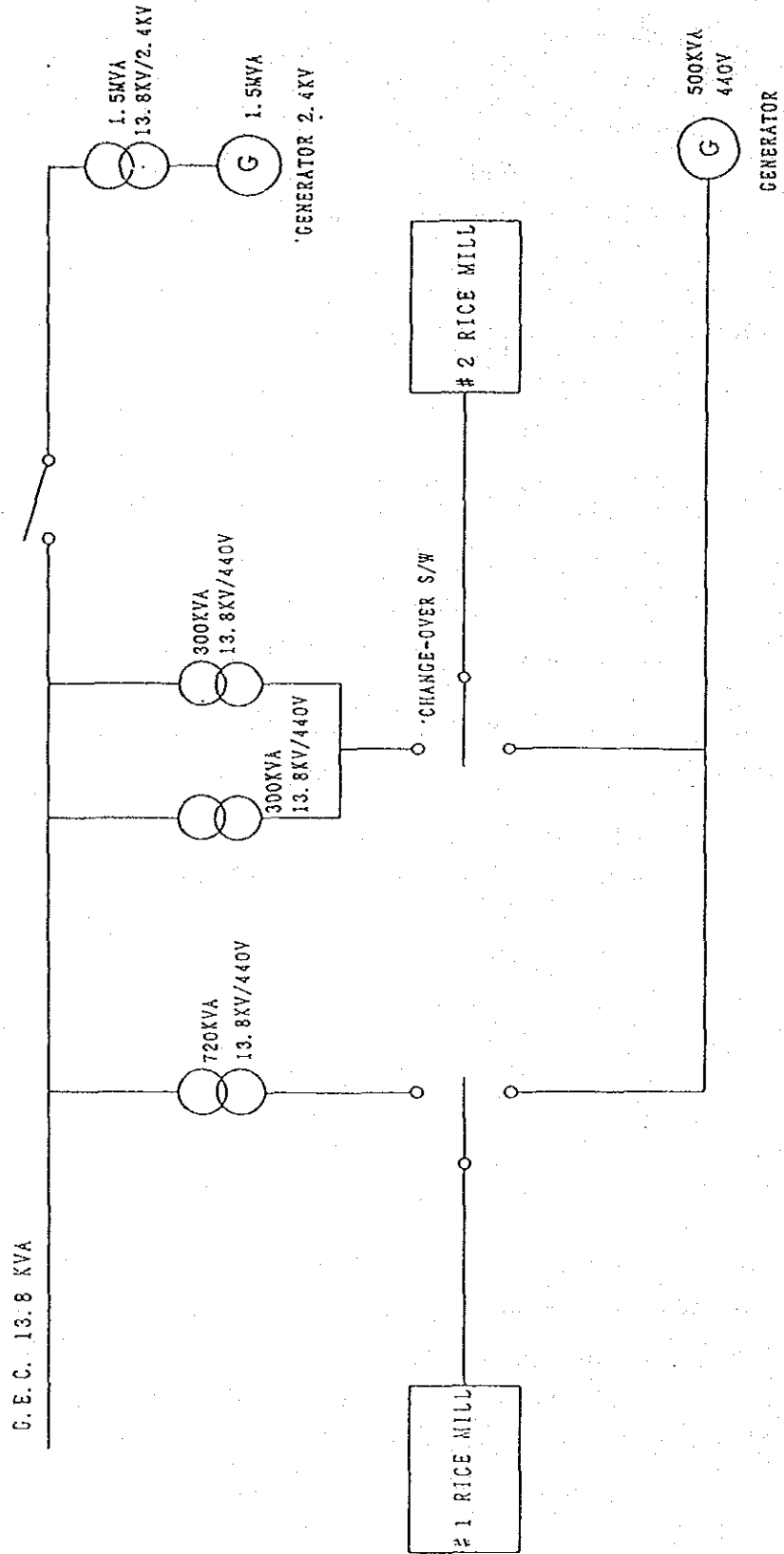


Figure 5 Electrical System

**CHAPTER 4**

**BASIC DESIGN**



## CHAPTER 4 BASIC DESIGN

### 4-1 Basic policy for designing

The following was taken into consideration in the design of this rice milling facility for replacement.

- 1) It is used for replacing the existing mill.
- 2) This rice mill is ranked as the central rice mill of the GRMMA, under the Ministry of Agriculture, who controls rice milling industry of Guyana. Therefore, the facility must be appropriate to support the development of rice milling industry of Guyana, in accordance with the national plan.
- 3) The plant must be the one that fits the economic conditions and technical level of Guyana. Further details of the design policy will be explained in the items of [machine/equipment plan] and [machine layout plan].

### 4-2 Decision of plant scale

Based on the content of the item [Examination on the scale of requested plant], the scale of the facility shall be follows:

Rice milling capacity	20 tons/hour (paddy)
Composition of facility	10 tons/hour plant, 2 sets
Standard process capacity	
per (day) * <sup>1</sup>	390 tons (paddy)
per (month) * <sup>2</sup>	9,360 tons (paddy)
per (year) * <sup>3</sup>	112,320 tons (paddy)

\*<sup>1</sup> 19.5 hours/day operation

Content of cease time	Maintenance :	2 hours
	Loss at start and end:	1 hour
	Change of lot, power	
	cutout, parts	
	replacement, etc. :	1.5 hours

\*<sup>2</sup> 24 days/hour operation

\*<sup>3</sup> 288 days/year operation



#### 4-3 Decision of plant functions

As for the functions of the plant supplied under this project, the results of the examination work on the decision of the plant scale and on the studies on machines/equipment are summarized as follows:

1) Guarantee of the functions of the existing mill.

The existing mill is conspicuously deteriorating and lowering in function. But the functions of the existing mill when it was new are guaranteed by the functions of the new plant to be supplied.

2) Guarantee of the functions of standard rice milling facility.

The existing mill was built more than 10 years ago. If some parts are judged inadequate as compared with the modern layout of the machinery, they shall be improved in the design.

3) Introduction of the function suited to extra long grain.

The machines and equipment of the plant shall be suitable for milling extra long grain varieties grown in Guyana.

4) Introduction of the functions needed for producing export rice.

The plant shall be able to produce a product quality suitable for export.

5) Introduction of some of the laboratory equipments.

Laboratory equipment necessary to produce the products which will meet with the market requirements, both domestic and international, shall be amplified and reinforced.

The above policies shall be enforced as per the ability of the recipient country to perform maintenance functions.

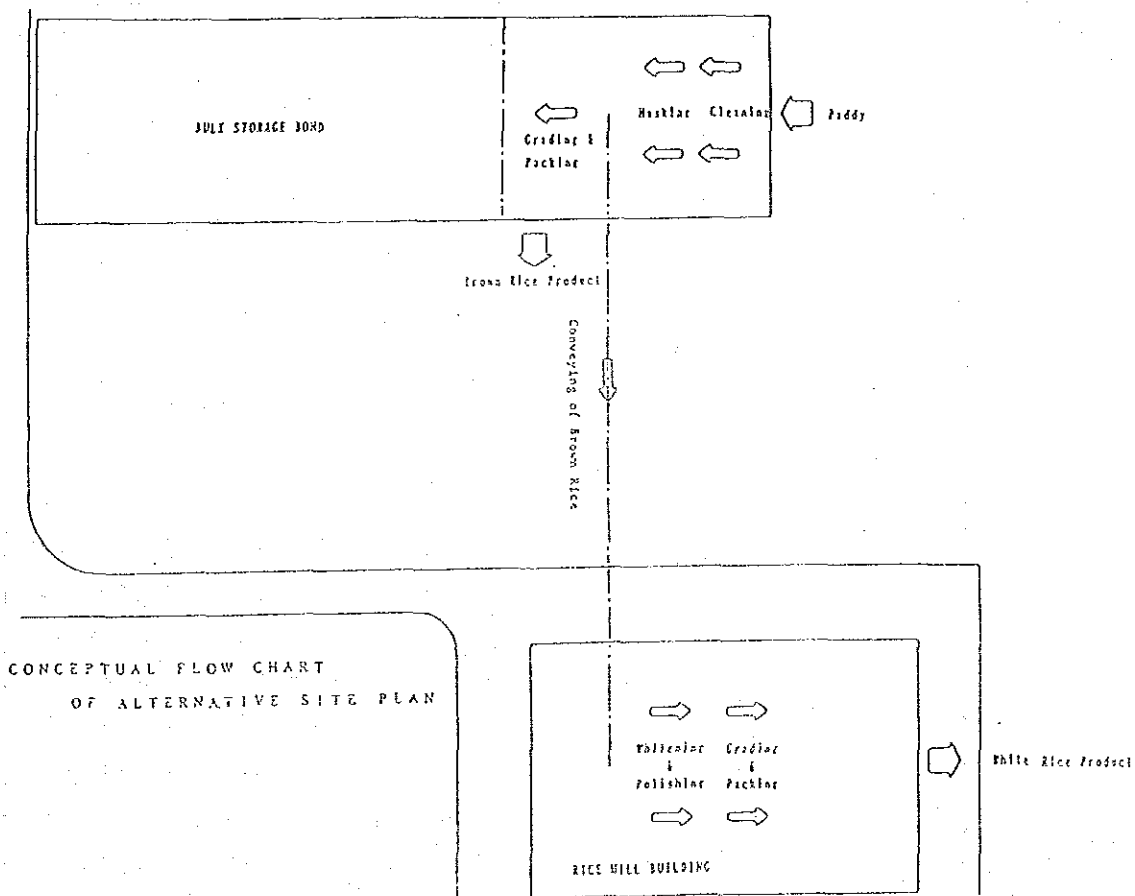
4-4 Decision of installation site

(1) Decision of installation site.

The plant to be offered has been requested for installation inside the building of existing mill after the existing machinery are completely evacuated. Through on site surveys, the mission judges that there will be no problems to install the new plant in the said building, although partial modification and extension are necessary. However, as an alternative plan, Guyanese government requested the mission to investigate the possibility to install the paddy cleaning and husking sections only inside the flat warehouse for bulk storage of paddy about 50m away from the rice mill building in order to avoid the dust from the feeding hopper and paddy cleaners. Conceptual drawing for this plan is as shown in Fig. 6. (see photo on beginning of this report).

The survey mission has made comparison studies on the original plan, in which all machinery are installed in the existing building and the alternative plan for the actual machines/equipments and works needed for construction.

Figure 6 Alternative Plan of Processing System



	Original plan	Alternative plan
Dust	<p>Majority of dust generated at the feeding hopper and precleaning section. Therefore, the dust can be avoided and shut out by installing the feeding hopper outside the building. (refer 4-5-2)</p> <p>The dust from the precleaner will not obstruct the operator's work. There will be no problems if faily cleaning is performed regularly.</p>	<p>There will be no problems in the process after the rice whitening section, but the paddy processing section installed in the warehouse will suffer from the effects of dust.</p> <p>The ventilation inside the warehouse is especially bad. Even if the hopper is placed outside the building, in order to keep working conditions of the cargo rice processing section appropriate, remodeling of the building and setting of the ventilation fan would be necessary.</p>
Operation	Same as before	<p>As long as the basic design consists of one line for export rice, the other for domestic market, the conveyor line from the paddy processing section to the cargo rice processing section shall be 2 lines, and therefore uneconomical. Operation will be also troublesome.</p> <p>On the other hand, if a separate 2 line system is applied in the stage after the rice whitening process, and only one conveyor line is equipped, a sufficient quantity of husked rice tanks is necessary to run whitening</p>

	Original plan	Alternative plan
		<p>lines, one for export rice the other for domestic rice. Also, because the paddy processing section and the cargo rice processing section will be completely independent, it would require a higher degree of planning and management, depending on the number and capacity of the brown rice tanks. Generally the operation will be troublesome. It would also mean that the new idea of brown rice storage, not existing in other mills in Guyana, shall be introduced</p>
Additional machine & equipment	None	<ul style="list-style-type: none"> <li>* Belt conveyer (warehouse to mill)</li> <li>* Belt conveyer (from existing silo to rice mill shall be changed or extended to warehouse.</li> <li>* Brown rice tank</li> <li>* Separate control panel</li> <li>* Additional power transmission system to warehouse (Electric supply linked with generator</li> </ul>

	Original plan	Alternative plan
Building reconstruction	Extending the eave for the feeding hopper outside the building	<ul style="list-style-type: none"> <li>* Partition between paddy processing section and warehouse section in the warehouse.</li> <li>* Extension of eave in case feeding hopper is placed outside the building, or dust proof partition, if it is equipped inside.</li> <li>* Brown rice outlet at the warehouse.</li> <li>* Dust prevention and lighting for brown rice grading, packing and control panel sections.</li> </ul>

## (2) Decision of installation place

From the abovementioned, installation of the paddy processing section among the rice milling facility, separate from the main mill building, seems to be a good plan at first view because the rice whitening section will be protected from the dust, and there will be more ample space. However, if the plan is examined comprehensively and realistically, there are many drawbacks to it, both demerits economically and technically, and it is judged appropriate to add dust proof measures on the original plan.

### 4-5 Basic Plan

#### 4-5-1 Machine/equipment plan

Selection of the machinery was made, after sufficiently understanding the functions of the machinery and roles they play, after discussion with the Guyanese executing organizations, and in accordance with the conditions set forth for scale and functions mentioned in 4-2 and 4-3.

List of machinery and equipment

o : Included in the request

x : Included in the request but  
some changes were made.

: Was not included in the request

No.	Machine	Compa- rison	Q'ty	Specifications & remarks
(1) Receiving and cleaning section capacity: Over 10.5 tons/hour per set				
1.	Precleaner	o	2 sets	Remove impurities larger than paddy (stones, straws, branches, etc.) and impurities smaller than paddy grains (dust, sands, pebbles, etc.)
2.	Stoner	o	2 sets	Remove impurities of the size similar to paddy grains, but heavier in specific weight (stone, metals, et c.)
3.	Weigher	o	2 sets	Hopper scale type with counter
(2) Paddy husking section capacity: Over 10 tons/hour per set				
1.	Paddy husker	o	2 sets	Rubber roller type. Separate the paddy into husks and brown rice. Husks are removed by aspirator.
2.	Paddy separator	o	2 sets	Oscillation type. Separate into three groups: paddy, mixture of paddy and brown rice, and pure brown rice.
3.	Thickness grader	o	2 sets	Rotary drum type with perforated steel plate.

No.	Machine	Compa- rison	Q'ty	Specifications & remarks
(3) Rice whitening section capacity: Over 8 tons/hour per set				
1.	Rice whitening machine	o	2 sets	Abrasive roller type rice whitening machine with air jet system.
2.	Rotary sifter	o	2 sets	Rotary oscillation sieve type. Separation into 3 kinds; remove bran balls and fine broken rice.
3.	Rice polishing machine		2 sets	Friction type polisher. Function as a finish whitening machine.
(4) Grading section Capacity: Over 7 tons/hour per set				
1.	Rotary sifter	o	2 sets	Rotary oscillation sieve type. Separation into 3 kinds. Remove fine tips and a part of head rice.
2.	Length grader	o	2 sets	Indented cylinder type. Separation into 3 kinds. Milled rice is separated into large brokens, small brokens and head rice.
3.	Rice blending machine	o	2 sets	Volumetric unloaders to be attached to the bottoms of tanks. Blend head rice and broken at the desired preset ratio.

No.	Machine	Comparison	Q'ty	Specifications & remarks
4.	Grain color		1 set	Capacity over 7 tons hour (at colored grain ratio of 0.2%) * to be included in one line for processing export rice. * with secondary sorting pipe arrangement. * removes colored grain from the product. * take measures for effective operation in dusty and highly humid places.
(5) Weighing and packaging section:				
1.	Scale shutter	o	2 sets	Capacity: over 7 tons/hour per set. Weighing range: 30 - 60 kg at a time. Preset quantity is discharged from the tank each time for bagging.
2.	Bag closing machine	o	2 sets	Capacity: over 180 bags/hour (40 - 60 kg bag) per set. Bag material: polypropylene woven bag and jute bag. Semi-automatic type with belt conveyor. The close the bags weighed and filled by the scale shutter.
3.	Weighing and packaging machine for small bags	o	1 set	Capacity: Weighing range: 1 - 3 kg per bag. Fully automatic weighing packer. Bag material: polyethylene tube or sheet.



No.	Machine	Comparison	Q'ty	Specifications & remarks
(6) Cargo rice grading & packing section:				
1.	Length grader	x	1 set	Capacity: Over 8 tons/hr. In the export of cargo rice, separate broken rice to meet with the needs and standards of the importing countries.
2.	Scale shutter	x	1 set	Capacity: Over 7 tons/hr. Weighing range : 30 ~ 60 kg at a time to discharge fixed quantity each time for bagging.
3.	Bag closing machine	x	1 set	Capacity: Over 180 bags/hour. (40 - 60 kg bag) Bag materials: Polypropylene woven bag and jute bag. Semi-automatic type with belt conveyor. To close the bags weighed and filed by the scale shutter.
(7) Laboratory equipment				
1.	Quality inspection equipment such as Testing winnower, Testing huserk, Testing mill, Whiteness meter, etc.	x	1 lot	Minimum required set of quality inspection equipments.

#### 4-5-2 Basic layout plan

##### (1) Basic plan

The plant to be offered under this project is going to be installed in the same location as the old rice milling plant, after the old one is evacuated. In this regard, the mission expressed following facts. The new plant includes more machines, occupies more space, and the space of the existing rice mill is clearly not sufficient, especially when the space requirements for the operators and maintenance work were considered. The machine layout would be naturally different from the present layout, which makes it necessary to bury and close all existing pits, and dig new ones. The mission discussed these matters with Guyanese government. The results are as follows:

- \* The Guyanese government is ready to extend the building up to the range shown in Fig. 8.
- \* The Guyanese government requested that the mission design the plant so that it will not require pits. They stated that they will close all the existing pits, except the one for feeding hopper. If, for the this reason, the roof must be made higher, they said that they would perform, the work.

If the plant is designed so that no pits are necessary, it will relieve the difficult work performed in the pits, such as work done at the bottom of elevators, etc. Recently in Japan, the tendency in design is to avoid the use of pits wherever possible. Consequently, it is judged appropriate to comply with this request from Guyana side as much as possible. The transportation route of incoming paddy is shown in Fig. 7.

From the above, the machine layout plan shall be made, close to the planning of the new plant in the new building, with following policies and considerations:

- 1) Keep ample space for maintenance work. Especially, around the rice whitening machines, bottoms of elevators, etc. that absolutely require inspections when starting operations after power cut-off.
- 2) Consider placing feeding hoppers outside the building in order to avoid the dust generated by feeding work as shown in Fig. 9.

- 3) As much as possible, install fans, cyclones, etc. in a single place in order to avoid the generation of noise and dust. By this, reverse flow of pipes and crossing of pipes shall be avoided.
- 4) There shall be no reverse flow or crossing flow of grains in the main flow direction of grains from paddy to white rice.
- 5) The central control panel shall be placed in a isolated room.
- 6) Consider sharing and dividing the work with parties in the surrounding facilities (paddy warehouse, silos, husk yard, bran room, etc.)

(2) Basic layout pattern

The machine layout plan based on the above basic plan shall be decided after the models the of machines are decided. However, basic layout of the machinery in order of the flow of rice is as follows:

FACILITIES LAYOUT OF M. A. R. D. S. RICE COMPLEX

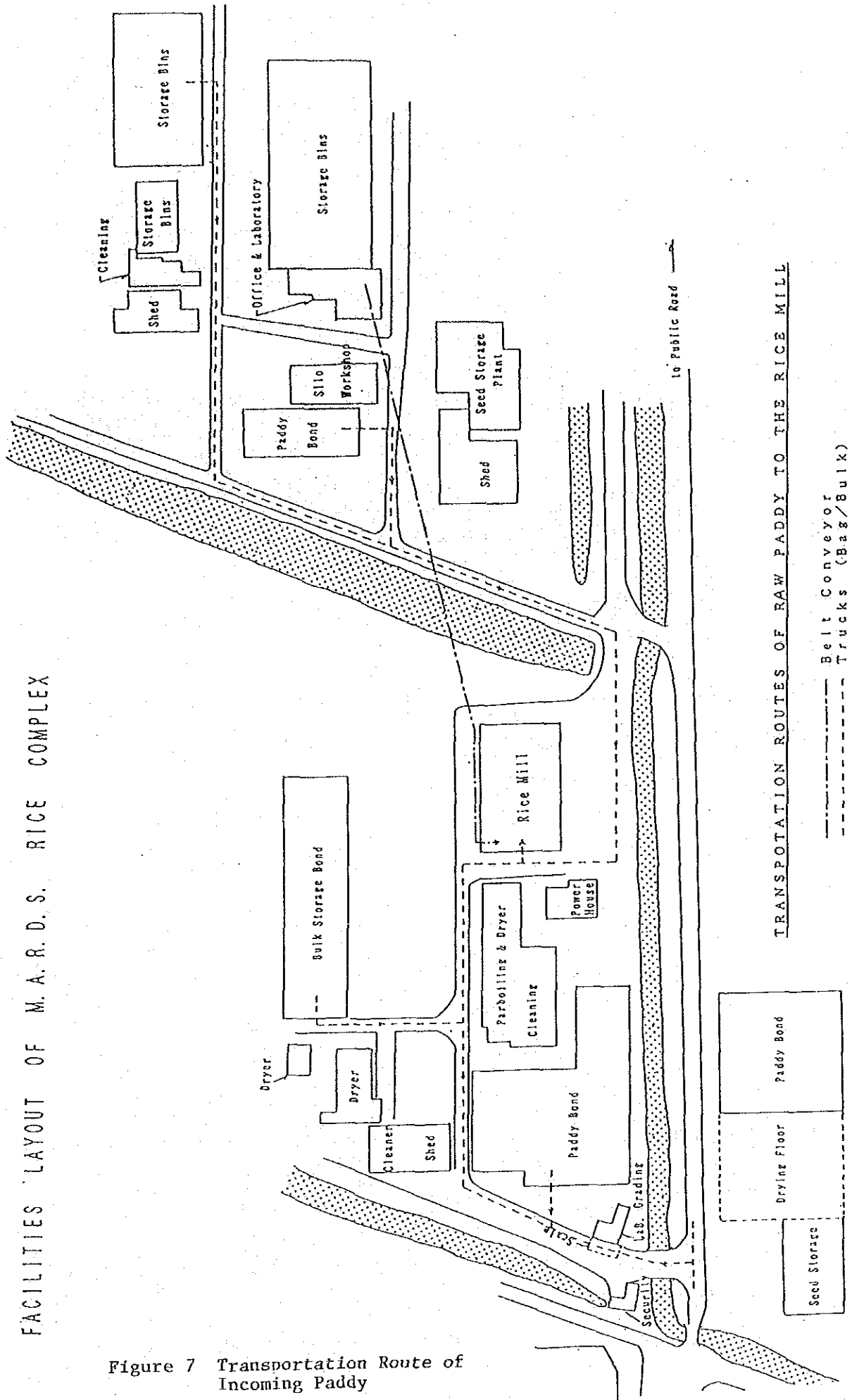


Figure 7 Transportation Route of Incoming Paddy

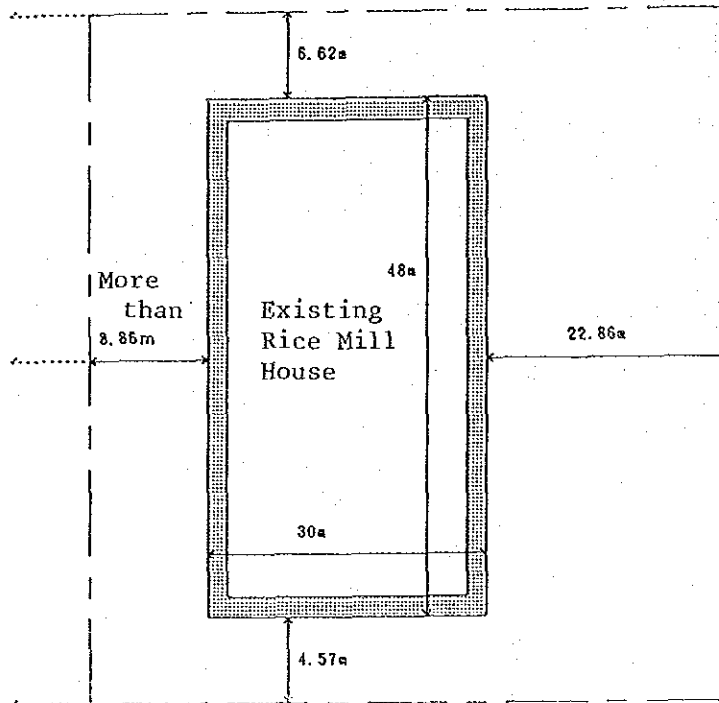


Figure 8 Range of building Expansion

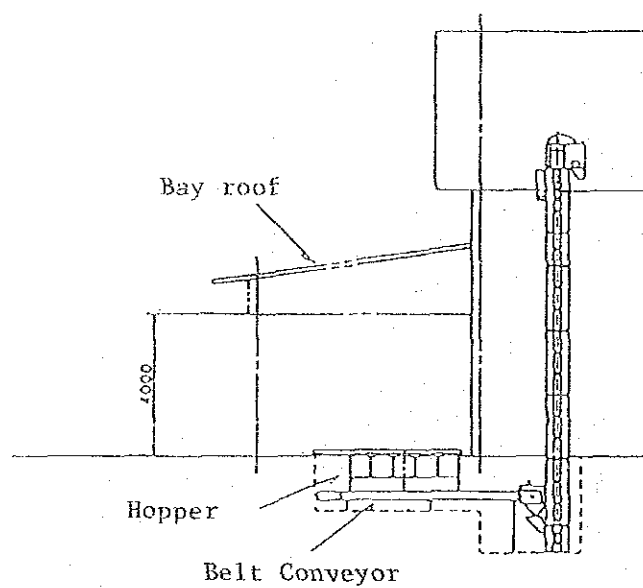
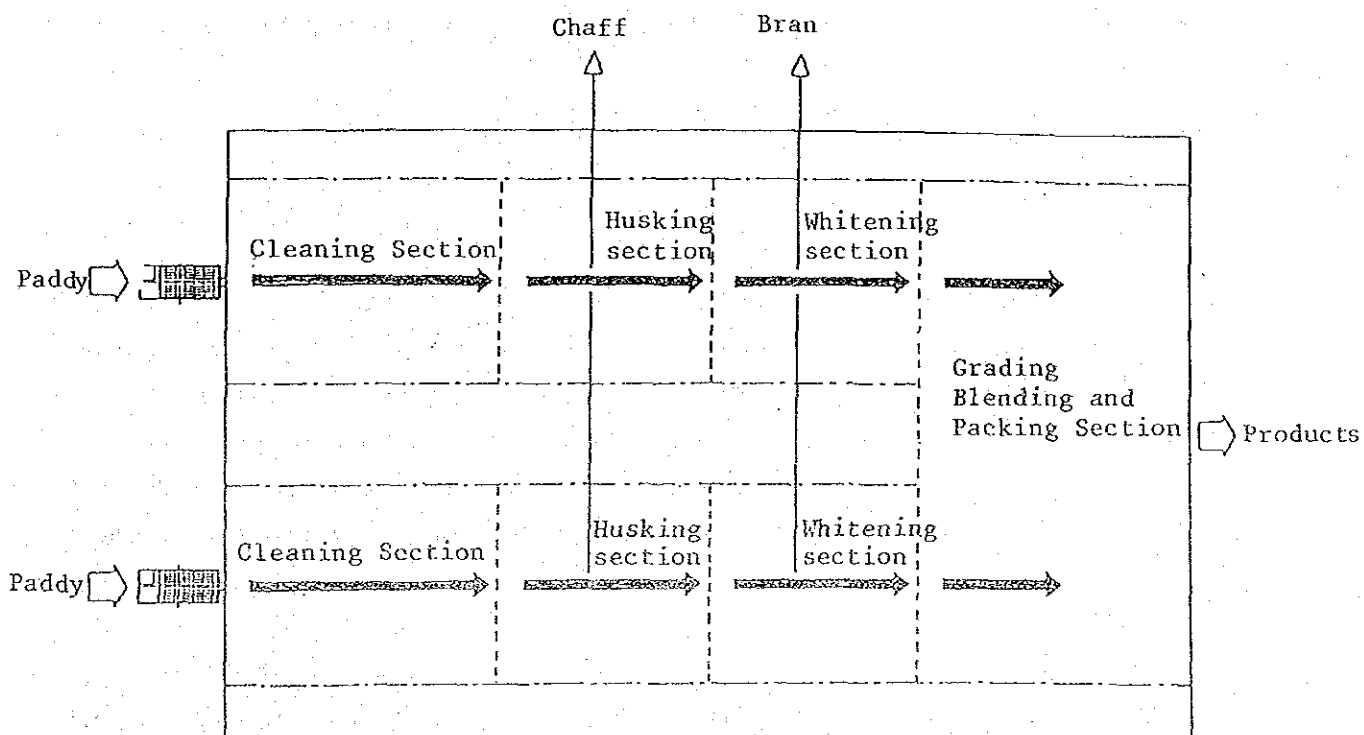


Figure 9 An example of Outdoor Hopper for receiving of Paddy

- 3) Install fans, cyclones, etc. in one place as much possible in order to avoid the generation of noise and dust. By this, reverse flow pipes and crossing pipes shall be avoided.
- 4) There shall be no reverse flow and crossing flow of grains in the main flow directions of grains from paddy to white rice.
- 5) Central control panel shall be placed in a isolated room.
- 6) Consider shares and divisions of works by both parties in the surrounding facilities (paddy warehouse, silos, huskyard, bran room, etc.)

(2) Basic layout pattern

Machine layout plan based on the above basic plan shall be decided after the models of machines are decided. However, basic layout of the machinery in order of the flow of rice is as follows:



#### 4-6 Project execution plan

##### 4-6-1 Project executing system

###### 1) Main body for executing the project

Executing organization of this project in Guyana is the GRMMA, Ministry of Agriculture. The DIEC (Department of International Economic Co-operation), who handles all international aid on behalf of Guyana government will be in charge of the procedures and formalities between the two countries.

###### 2) Consultant

In the execution stage, a Japanese consultant will perform the following activities in accordance with the consulting agreement, and through mutual discussion with the executing organization of Guyana.

a. Actual design work.

b. Tender and contract works on behalf of the executing organization.

c. Supervision of construction work.

###### 3) Contrator

A Japanese contractor, selected by the open tender in accordance with the system of grant-aid cooperation program of the Japanese government, will supply and install the machinery and equipment. The contractor should understand the system of grant-aid cooperation, keep close contact with the executing organization of Guyana side and make every effort to complete the work within the period set forth.

##### 4-6-2 Share of work

After mutual discussion with Guyana government, the range of works covered by Japanese side and Guyanese side are confirmed to be as Follows:

Major Undertaking to be taken by Each Government on the Project for Replacement of Rice Mills in the Cooperative Republic of Guyana

No.	Items	To be covered by Grant Aid	To be covered by Guyana side
1.	Facilities		
	1) Project machinery and equipment 2) General furniture	o	o
2.	To remove the existing rice mill plants		o
3.	To undertake necessary improvement work of the existing building and floor.		o
4.	To provide facilities for distribution of electricity, water supply and other incidental facilities		
	1) Electricity distributing line to the operation pannels, including necessary meter and safety device 2) City water distribution to the rice polishing machines, including necessary meter 3) Other incidental facilities		o o o
5.	To undertake installation work of the machinery and equipment purchased under the Grant Aid		o
6.	To undertake piping, wiring and ducting work from, to and between the machinery and equipment under the Grant Aid.		o
7.	To dispatch the experts who supervise the installation, piping, wiring and ducting works for the machinery and equipment under the Grant Aid, carried out by the Guyana side.	o	
8.	To dispatch the experts who undertake adjustment and test operation of the machinery and equipment under the Grant Aid.	o	
9.	To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the B/A		
	1) Advising commission of A/P 2) Payment commission		o o



10.	To ensure unloading and customs clearance at port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country 2) Tax exemption and custom clearance of the products at the port of disembarkation 3) Internal transportation from the port of disembarkation to the project site	o  o	o
11.	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.		o
12.	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.		o
13.	To maintain and use properly and effectively the machinery and equipment provided under the Grant.		o
14.	To bear all the expenses, other than those to be borne by the Grant, necessary for the transportation and installation of the machinery and equipment		o

#### 4-6-3 Machine procurement plan

The Machines and equipment are planned to be imported from Japan. However, due to considerations of machine supply capacity, processing ease, cost, maintener ease, etc. it would be desirable to consider whether to procure in Guyana or a third country, or to import semi-processed good form Japan and complete processing in Guyana, etc.

\* Stand or base for machinery and equipments

\* Tanks

\* Conveyors

As for the import regulations of machinery and equipment, there will not be a problem as the Guyana government is fully aware of the contents of their share of the work that is necessary for grant-aid cooperation from Japan.

Transportation method from Japan is by ship and within the land of Guyana, trucks will be used. Special care is required in the packing and transportations of the goods that are weak in withstanding impact, humidity and high temperautre. In order to prepare for the transportation in the tropics, humid- proof packings are planned for some of the machinery.

#### 4-6-4 Construction and supervision plan

##### 1) Construction plan

The construction work and supervision of construction are made according to the provisions of the contract and through discussions with the executing organization of the Guyana government. The following items need special attention; the executing organization, consultant and contractor should understand the contents of the following, sufficiently discuss and examine them, and then decide the actual processes before starting the construction work.

1 Natural conditions

2 Labour conditions and technical level

3 Scope of work of both countries

4 Procurement of machine/equipment form Japan, transportation, into the place of installation and method of installations.

5 Method of test operation

Guyana should carry out all the work listed in 4-6-2 on schedule so that the entire construction project proceeds smoothly. A detailed work plan should be made.

## 2) Supervision plan

According to the Japanese government's policy on grant-aid cooperation, and the content of the basic design, the consultant should form a coherent project execution team to implement the design work and supervision work, coordinate the opinions of various organizations concerned and aim to ensure smooth completion of the facility.

In this project especially, from the time the contents of machinery and equipments are decided to the time they are transported to the site of installation, there is a great deal of work to be completed by Guyana. The consultant should initiate the exchange of information between the contractor and the Guyana side so that the work handled by Guyana proceeds correctly and on time.

For this reason, the consultant should dispatch a specialist whenever necessary during the construction work in Guyana, in order to promote and guide the work, and to serve as a witness at the inspections.

### 1 Guidelines in supervision

- \* Keep close contacts with and make reports to the organizations concerned and those directly involved in construction work in both countries and try to complete the facility without delay.
- \* When the facility is completed and the inspection and maintenance work are performed by MARDS, properly guide and advise so that management will be carried out smoothly.

### 2 Supervising work

- \* Cooperation in the purchase contract for machinery and equipment. Decision on the type of purchase contract, drafting of purchase contract, investigation of the details of the machinery and equipment, selection of machinery and equipment supplier (Notice of tender, tender, evaluation of bids, negotiation for contract, witness at contract).

- \* Inspection and approval of installation drawing.  
Inspection and approval of layout drawings, installation work drawings and machine/equipments drawings submitted by the machine/equipments supplier.
- \* Promotion of work to be done in Guyana.  
Advise, guidance and promotion for the work to be done by the Guyana side according to the drawings submitted by the machine/equipments supplier.
- \* Attendance and guidance during installation work. Attendance and guidance to carry out the installation work smoothly, which is to be done under the supervision of machine supplier.
- \* Reporting.  
Make progress reports on the work to the executing organization.
- \* Cooperation in the procedures for payment approval.  
Cooperation in procedures and inspection of bills, etc. for payment to machine/equipment supplier.
- \* Attendance at inspections  
Witness at inspections to be required during the period from shipment to final delivery.

#### 4-6-5 Schedule of execution

In case this project takes effect and is carried out by the grant aid of the government of Japan, after the signing of Exchange Note (E/N) by both governments, and the signing of consultant agreement, the plant shall be completed within the total period of seventeen months through three stages. the first stage is producing the tender documents; the second is tender and contract for the procurement of machinery/equipments; and the third is purchase of machinery/ equipment and installation work.

The Project for The Replacement of Rice Mill in The Cooperative Republic of Guyana

Tentative Implement Schedule

Item	Contents of Work	Month elapsed																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
1	Signing of E/N																		
	Consultant contract																		
2	Detailed design																		
	Tendering																		
3	Supplier Agreement																		
	Manufacturing and procurement																		
4	Transportation																		
	Construction work by Guyana side																		
5	Installation																		
	Test Operation, Training and Hand Over																		