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THE POTENTIAL FOR EXPORTING BELIZE RICE TO CARIBBEAN COMMON MARKET COUNTRIES

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A Mayan Milpa Rice Field

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1.0 EXECUTIVE SUMMARY

Belize joined the ranks of rice exporters for the first time in the late 1970s when the Big Falls Ranch brought over 2,000 acres into production. In 1981 the Ranch accounted for 55 percent of the national rice crop, but by the end of 1984 financial problems forced termination and Belize once again became an importer. In 1988 Belize imported an all-time high of 1.36 million pounds while production remained stagnant.

The temporary success achieved by the BFR has inspired government interest in renewing rice exports--particularly to the Caribbean Common Market (CARICOM) to which Belize belongs. The apparent competitive advantages within this market are (1) the common external tariff of 15 percent on rice, (2) ability to pay in domestic currencies instead of US dollars, and (3) proximity, which could result in advantageous freight rates.

This study endeavors to answer the questions (1) can Belize produce rice for export?, and (2) should Belize attempt to export rice to CARICOM countries? There are thirteen countries in the Caribbean Common Market (CARICOM), including:

Antigua & Barbuda	Dominica	Monserrat
Bahamas	Grenada	St. Kitts & Nevis
Barbados	Guyana	St. Lucia
Belize	Jamaica	St. Vincent
		Trinidad & Tobago

Of these countries, Guyana is currently the only rice exporter and Belize the only potential exporter. Due to poor quality rice and economic distress, Guyana lost most of its CARICOM market to the USA in the mid-1980s, but there is some chance of a resurgence by the Guyanese private sector in the 1990s.

The remaining eleven countries import approximately 130,000 metric tons of rice annually, 80 percent of which is accounted for by Jamaica and Trinidad. Jamaica obtains all of its rice from the United States on concessionary programs such as PL480 and is unlikely to purchase higher-priced Belize rice. Trinidad purchases most of its rice from the United States in bulk, getting extremely low freight rates with which Belize cannot compete. Most of the remaining CARICOM countries demand parboiled rice and/or shipment in bulk, neither of which Belize can provide. Furthermore, CARICOM consumers demand high quality rice, which Belize cannot currently provide to its own population.

Although CARICOM buyers are empathetic towards Belize, they give first priority to the welfare of their people and businesses by shopping for the best price. At present, Belize is not price-competitive. Belize can produce rice for about US$0.07/lb with mechanized production systems, whereas the USA can produce for US$0.05 to US$0.06/lb. There is some uncertainty about postharvest costs in Belize, but it appears that Belize rice would be priced higher FOB Belize City than comparable rice at US ports. High shipping rates for containers from Belize to CARICOM ports indicate that Belize will have difficulty competing even if production and postharvest costs are reduced to levels comparable to the USA.

Belize could bring enough new rice land into production to produce up to 3,000 metric tons for export (after meeting domestic demand), but not necessarily at a competitive price. If Belize is determined to export rice at any cost, investments will have to be made in rice research and extension, port storage facilities, bulk handling facilities, parboiling equipment, and various other infrastructure. Belize can always find a market for its rice if the price is set at a competitive level, but we deem it unlikely that Belize can compete profitably against the USA and other suppliers.

If Belize proceeds with rice export strategy, the best prospects among CARICOM buyers are those who need to conserve US dollars by paying in CARICOM currencies, who accept container shipments, and who might be willing to negotiate a bilateral trade agreement. It would only take one country the size of St. Lucia to purchase all of Belize's potential export quantity.

A strategy of self-sufficiency is recommended in lieu of export. Belize can replace current imports with approximately 1,000 acres of mechanized rice production at the Big Falls Ranch or in the Orange Walk District. Yields can probably be increased in the Stann Creek and Orange Walk Districts with modest improvements in rice varieties, calibration of fertilizer input levels, and improvements in weed control.

The domestic policies required to increase rice production in Belize to achieve self-sufficiency are not analyzed in this study. However, care should be taken to preserve the cash-crop milpa rice farming practiced in Toledo District. Expansion of acreage under this system is not desirable because of the potentially negative ecological impacts, but a program could be initiated to help mitigate the labor constraint with mechanized threshers and feeder roads.

2.0 INTRODUCTION

Belize has long been a rice producer, but traditional and small-scale production enterprises did not generate export potential until the advent of the Big Falls Ranch in 1963 [Davidson]. After years of investment and ambitious development, the Big Falls Ranch (BFR) achieved a pivotal role by producing 55 percent of the national rice crop in 1981 under a mechanized system of cultivation [Midwest Universities Consortium et al.]. This success enabled Belize to export rice until 1985 when BFR financial distress forced production cutbacks and country-wide rice production problems occurred. Belize has remained a rice importer ever since.

The temporary success achieved by the BFR has inspired government interest in renewing rice exports by providing support to the rice subsector. Many questions remain, however, about productive capacity and the ability to compete in international markets. Can Belizean farmers produce the quantity and quality of rice necessary for export, given existing climatic conditions, production systems, and capital requirements? Is public infrastructure adequate to support production for export? Given the low production costs and high quantities and qualities of rice available from the United States and other competitors, can Belize compete? At the outset it is expected that the best potential market for Belizean rice would be importing nations that, like Belize, belong to the Caribbean Common Market (CARICOM). The apparent competitive advantages within this market are (1) the common external tariff of 15 percent on rice, (2) ability to pay in domestic currencies instead of US dollars, and (3) proximity of the countries, which could result in advantageous freight rates.

The issues posed for increasing Belize rice exports reflect a "supply side" approach, which involves seeking a market for a product that is already produced or known to be producible. Conversely, a "demand side" approach seeks market niches that could be filled, then works to develop the products, production levels, and production timing to meet demand. This distinction is mentioned herein only because the scope of the present study is limited to the supply side approach.

An additional limitation of the scope of this study concerns domestic rice policy. This study endeavors to answer the questions (1) can Belize produce rice for export?, and (2) should Belize attempt to export rice to CARICOM countries? The question of how Belize can best increase rice production is a domestic policy issue which could not be investigated given the time constraints of this assignment.

At the request of the Government of Belize, RDA International, Inc., was contracted by the United States Agency for International Development to conduct a study of potential for exporting Belizean rice to CARICOM nations. The study was conducted in September/October of 1989 by Dr. Loren Parks (agricultural economist) and Dr. Kenneth Cassman (agronomist). In addition, Mr. Bert Vaughan, Managing Director of the Belize Marketing Board, accompanied Dr. Parks on visits to Guyana, Trinidad, Barbados, and Jamaica. Mr. Vaughan also visited St. Vincent.

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3.0 THE CARICOM RICE MARKET

3.1 Overview

There are thirteen countries in the Caribbean Common Market (CARICOM), including:

Antigua & Barbuda	Dominica	Montserrat
Bahamas	Grenada	St. Kitts & Nevis
Barbados	Guyana	St. Lucia
Belize	Jamaica	St. Vincent
		Trinidad & Tobago

A subset of six CARICOM countries established its own political and economic entity called the Organization of Eastern Caribbean States (OECS), which includes St. Lucia, St. Vincent, Grenada, St. Kitts/Nevis, Dominica, and Antigua/Barbuda. None of these countries produce rice except in experimental plots, but St. Vincent has begun the business of importing cargo rice and reexporting milled rice, which could have implications on future trade channels. We did not investigate the OECS trade protocol.

The common external tariff on rice imports by CARICOM is 15 percent, but since rice is not included in the Agricultural Marketing Protocol, the Cabinets of member countries can and do cancel the duty if a shortage exists. Belize must therefore market rice at internationally competitive prices.

The thirteen countries have a total population of approximately 7.1 million (Table 1), 82 percent of which is concentrated in Trinidad (1.2 million), Guyana (2.2 million), and Jamaica (2.4 million). Significant rice production occurs in Guyana, Jamaica, Belize, and Trinidad, but only Guyana currently exports.

CARICOM consumers demand high quality rice; inability to sustain quality standards was the principal reason why Guyana's market share in CARICOM eroded during the 1980s. Even the parboiled[1] rice preferred by some countries must have a very low percentage of impurities.

Frequent reference is made in the text to Table 2--a summary of CARICOM rice import status. Some information is missing because of inability to find secondary sources or to make telephone contact with importers. Production and import statistics from different sources often disagree, but every effort has been made to resolve them. Rice imports by country are shown in greater detail in Appendix c.

3.2 Antigua and Barbuda

Antigua has no rice mill, hence all rice is imported milled. The principal sources are the USA and St. Vincent; the latter recently began importing cargo rice and exporting milled rice. Rice is imported in bags using a break-bulk system. Annual demand is approximately 1,200 metric tons.

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[1] Rice classification and parboiling are described in Appendix A.

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Table 1. Rice Supply and Consumption by Country

Country	Year	Metric Tons+ Production	Net Imports	Total Supply	Population	Consumption Kg/Capita
Antigua/ Barbuda	1988	0			83,000	
	1987	0	1,255	1,255	82,000	15.30
	1986	0	1,100	1,100	81,000	13.58
	1985	0	1,100	1,100	80,000	13.75
	1984	0	1,100	1,100	79,000	13.92
Bahamas	1988	0			240,000	
	1987	0			237,000	
	1986	0	4,280	4,280	233,000	18.37
	1985	0	6,500	6,500	230,000	28.26
	1984	0	5,860	5,860	229,000	25.59
Barbados	1988	0	5,788	5,788	257,000	22.52
	1987	0	9,041	9,041	256,000	35.32
	1986	0	6,000	6,000	255,000	23.53
	1985	0	7,500	7,500	253,000	29.64
	1984	0	6,670	6,670	252,000	26.47
Belize	1988	0	1,179		173,000	
	1987	4,000	1,164	5,164	170,000	30.38
	1986	4,000	141	4,141	167,000	24.80
	1985	6,000	649	6,649	163,000	40.79
	1984	6,000	-350	5,650	162,000	34.87
Dominica	1988	0	1,002	1,002	79,000	12.68
	1987	0	961	961	78,000	12.32
	1986	0	1,387	1,387	77,000	18.01
	1985	0	761	761	76,000	10.01
	1984	0	889	889	82,000	10.84
Grenada	1988	0			116,000	
	1987	0	2,270	2,270	115,000	19.74
	1986	0	1,827	1,827	114,000	16.03
	1985	0	1,955	1,955	112,000	17.46
	1984	0	1,812	1,812	111,000	16.32
Guyana	1988					
	1987	350,000	-39,000	311,000		
	1986	357,000	-21,540	335,460	971,000	345.47
	1985	265,000	-28,900	236,100	953,000	247.74
	1984	312,000	-47,450	264,550	935,000	282.94

+One metric ton = 2,205 lbs

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Table 1. Rice Supply and Consumption by Country (Continued)

Country	Year	Metric Tons: Production	Metric Tons: Net Imports	Metric Tons: Total Supply	Population	Consumption Kg/Capita
Jamaica	1988		69,834		2,444,000	
	1987	8,000	52,496	60,493	2,408,000	25.12
	1986	2,000	47,200	49,200	2,372,000	20.74
	1985	4,000	55,171	59,171	2,336,000	25.33
	1984	5,000	52,120	57,120	2,297,000	24.87
Monserrat	1988	0				
	1987	0	250	250		
	1986	0	240	240		
	1985	0	160	160		
	1984	0	160	160		
St. Kitts /Nevis	1988	0			49,000	
	1987	0	1,700	1,700	48,000	35.42
	1986	0	1,700	1,700	47,000	36.17
	1985	0	1,740	1,740	46,000	37.83
	1984	0	1,220	1,220	46,000	26.52
St. Lucia	1988	0	8,063	8,063	136,000	59.29
	1987	0	2,469	2,469	134,000	18.42
	1986	0	2,203	2,203	132,000	16.69
	1985	0	2,347	2,347	130,000	18.05
	1984	0	1,445	1,445	126,000	11.47
St. Vincent	1988	0	5,379	5,379	109,000	49.34
	1987	0	2,048	2,048	107,000	19.14
	1986	0	1,831	1,831	105,000	17.44
	1985	0	2,587	2,587	104,000	24.88
	1984	0	1,970	1,970	103,000	19.13
Trinidad/ Tobago	1988		32,970			
	1987	5,000	55,626	60,626	1,223,000	49.57
	1986	4,000	29,565	33,565	1,204,000	27.88
	1985	4,000	35,954	39,954	1,185,000	33.72
	1984	4,000	45,162	49,162	1,166,000	42.16

Sources: UNECLA, *Agricultural Statics: Caribbean*
FAO, *Trade Yearbook*

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Table 2. Summary of Rice Import Status of CARICOM Countries

Country	Estimated Annual Import Demand (Thous. M. Tons)	Product Form	Port Handling Method*	Current Principal Suppliers
Antigua/ Barbuda	1.2			USA St. Vincent+
Bahamas	6.0			
Barbados	8.0	Parboiled	Container	USA Thailand
Dominica	1.0			Thailand Guyana
Grenada	2.2	Parboiled	Bulk	USA St. Vincent
Jamaica	65.0	Cargo rice US#5	Bulk	USA
Montserrat	0.2			USA
St. Kitts/ Nevis	1.7	Parboiled	Break bulk	USA St. Vincent
St. Lucia	2.5	Parboiled	Break bulk	USA Guyana
St. Vincent	1.8	Cargo rice	Bulk	USA
Trinidad/ Tobago	40.0	Cargo rice (US#5) Parboiled (US#2)	Bulk	USA

* A "break bulk" system is one in which bags are stowed in the cargo bays of the ship and moved with cargo nets lifted by cranes.

\+ St. Vincent imports cargo rice from the USA and other sources and reexports to Caribbean countries.

3.3 Bahamas

Average annual demand for rice in the Bahamas is approximately 6,000 metric tons, but no other secondary information could be found. It is probable that, given its close proximity to the United States, US firms have control of the market. Furthermore, the Bahamas are unlikely to be short of hard currency because of the tourist and banking trade, hence there would be little need to pay for imports in CARICOM currencies. This does not appear to be a likely market for Belize rice.

3.4 Barbados

On average, Barbados imports 7,000 to 9,000 metric tons of rice annually, nearly all of which is US#1 parboiled. Importation is handled entirely by the private sector. Although about ten importers are currently licensed by the Government of Barbados, Lionel C. Hill & Company appears to have a near monopoly on rice import and storage. Mr. Hill was unwilling to reveal much about his operations, but he seems to have achieved economies of scale in importing, storing, and milling which other traders and potential importers do not find worthwhile challenging. Two other licensed importers revealed that they used to import directly, but now purchase from Hill & Co.

Rice is imported in shipping containers, primarily from the USA. In Barbados it is repackaged in consumer sizes under various brand names; Hill & Co. distributes Chefway and Valrico. Chefway is a brand of Riceland, located in Arkansas. In 1988 approximately 60 percent of imports came from the USA, but the US share has increased in 1989. Rice is imported now from a new mill in St. Vincent which imports cargo rice, mills it, and reexports to other CARICOM countries. Guyana used to supply a significant share of Barbados' demand, but quality deterioration caused a switch to other sources.

The potential for exporting Belize rice to Barbados is not favorable. Belize does not have parboiling equipment, although it could be acquired. Barbados is not under great pressure to pay in CARICOM currencies because it earns a great deal of hard currency from tourism. Its southerly location makes it more of a natural market for Guyana if that country improves the quality of its export rice. Finally, St. Vincent is endeavoring to penetrate the market with parboiled rice from its new mill, and at least one large US firm is exploring the possibility of a joint venture in a rice mill in Barbados, which could strengthen the tie to US rice imports.

3.5 Dominica

Dominica imports approximately 1,000 metric tons annually. The principal sources in 1988 were Thailand and Guyana, but St. Vincent is expected to make inroads in the future.

3.6 Grenada

The Grenada Marketing and National Importing Board has sole authority to import rice in bulk, which accounts for approximately two-thirds of the 2,200 metric tons

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demanded annually. The Marketing Board repackages in smaller sizes and distributes to wholesalers and retailers. In 1988 the Marketing Board imported 1,200 metric tons of parboiled and 300 metric tons of white rice in 50 kg bags from the USA and other sources. Some shipments have been received from the new rice mill in St. Vincent in 100 lb bags. Private sector supermarkets and wholesalers import parboiled rice in two-pound packages, mostly from the USA. The retail price of prepackaged rice is approximately 50 percent higher than repackaged bulk rice.

The Grenada Rice Mill has recently begun operation. It is a private sector group with US ownership interest--the Producers Rice Mill in Arkansas. Although the arrangement currently includes importation of parboiled US rice, there is no long-term obligation or exclusivity involved in importing US rice. The new mill is intended to meet domestic consumption; reexport is not planned. Mill capacity is 2.5 metric tons per hour. Like the Marketing Board, the mill sells to supermarkets and wholesalers who repackage in two-pound packages. The mill also sells to the Marketing Board which has its own distribution channels. The current price paid by the mill is approximately US$400 per metric ton, CIF Miami-Grenada.

At present Grenada receives rice in break-bulk form, but it will soon have bulk handling facilities. Once the new silos are operational, Grenada is expected to import rice in bulk and mill it domestically.

3.7 Guyana

Guyana is currently the only major rice producer and the only exporter in CARICOM. Although Guyana has enormous rice production potential, it lost much of its CARICOM market due to production problems and poor quality rice (Table 3). In 1980 nine CARICOM nations purchased a total of 77,000 tons of rice from Guyana, but by 1985 only four nations continued to purchase milled rice from Guyana. Of the 16,800 tons purchased, 95.5 percent was purchased by Trinidad and Tobago.

Table 3. Guyana Rice Sales to CARICOM Countries, 1980-1985

	Sales to CARICOM		Sales to Other Countries	
Year	Metric Tons	Percent of Total Sales	Metric Tons	Percent of Total Sales
1980	77,036	95	4,054	5
1981	72,342	93	5,445	7
1982	34,301	98	700	2
1983	27,235	65	14,665	35
1984	21,854	46	25,654	54
1985	16,847	57	12,709	43

Source: Henry 1986.

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Guyana lost most of the Jamaica market to PL480 and GSM 102 rice from the United States which is offered with concessionary prices and financing. Other CARICOM buyers complain about the poor quality of Guyanese rice, which is manifested by an unpleasant odor during cooking [Henry 1986]. CARICOM buyers therefore began importing rice from other sources, which fostered a taste for better quality. Demand for high quality rice was also stimulated by a real price decline in international markets after 1975.

Potentially, Guyana can cultivate 196,000 hectares of rice per year, but from 1981-1985 the cultivated area averaged 86,000 hectares [Henry 1986]. The principal reasons why Guyana has not produced up to potential include loss of markets, lack of foreign exchange to purchase inputs, deteriorating public sector infrastructure, and heavy government intervention in and mismanagement of the rice industry.

The Government of Guyana operates the Guyana Rice Milling and Marketing Authority (GRMMA), which purchases, stores, mills, and exports rice. Simultaneously, a limited number of private firms are allowed to perform these functions independently. The GRMMA operation has suffered severely from the secular economic deterioration of the country; funds are unavailable to upgrade milling, storage, and handling infrastructure. Hard currency needed to import even the simplest of replacement parts and supplies is scarce. Fuel and power shortages disrupt activity frequently; the main office and mill in Georgetown were idle during our visit because of a power outage. The St. Lucia Marketing Board--a current importer of Guyana rice--complains of failure to meet delivery schedules because Guyanese ships do not have hard currency to purchase fuel. In a sense, GRMMA cannot afford to sell to CARICOM markets if it can sell elsewhere because CARICOM sales are paid in CARICOM currencies--not international "hard currencies" such as the US dollar or European currencies. Lack of funds has also resulted in delayed payments to farmers for their rice which, in a time of high inflation and overvalued currency, creates ill will and reluctance to deal with the government. For these reasons, the public sector appears to be losing market share to the private sector.

In contrast to the public sector, the private sector shows signs of expansion. For example, the largest private producer and exporter--Kayman Sankar & Company, Ltd.--just completed a new rice mill with a capacity of 20,000 tons per year, 80 percent of which will be devoted to milling rice purchased from other farmers. This firm plans a 13,000-acre expansion of land in rice production beginning in 1990.

The private sector directs most of its export rice to the European Economic Community, which grants a concessionary quota to Africa, Caribbean, and Pacific countries ("ACP Quota"). The only countries competing to fill the 122,000-ton Caribbean quota are Guyana and Suriname. Sankar exports extra long grain (8 mm) cargo rice to Europe with the following maximum specifications:

6% broken	2% damage	0.05% discolored
2% chalky	2% green	

At present, private sector exporters receive US$350 per metric ton, FOB Guyana, for extra long grain cargo rice to Europe. Short grain rice obtains a price of US$250. Private producers/exporters emphasize the importance of receiving

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payments in US or European currency; most of their production inputs (machinery, chemicals) must be imported and paid for with "hard" currency. Since exports to CARICOM countries are paid with domestic currencies, producers tend to treat the CARICOM market as a residual.

In spite of past production and quality problems, Guyana is likely to renew its competitive effort in CARICOM. Improvements have been made in rice quality, and some major investments in productive capacity are just getting underway. Sankar & Company expects to reenter the CARICOM market once the planned expansion occurs because the ACP quota is limited and because sufficient hard currency to purchase inputs can be earned from sales to Europe and other non-CARICOM countries. Guyanese producers are fully aware that the United States is the competition in the Caribbean and that Guyanese producers will be hard pressed to beat US export prices and quality.

The challenge to Belize from Guyana is clear. Guyana is closer to the southern CARICOM nations than Belize, is capable of producing good quality rice, already has bulk shipping facilities, and has the same CARICOM member status as Belize.

3.8 Jamaica

Jamaica has been growing rice for over 100 years but has never done well [Kasconsult Jamaica]. In the 1950s domestic production contributed on average 26 percent of consumption, which fell to less than 2 percent in the 1970s. In the 1980s domestic production improved to as much as 15 percent of domestic consumption, but it appears that, in spite of ambitious rice production projects, Jamaica will continue to import the bulk of its needs [Agro 21; Kasconsult Jamaica].

Present national demand ranges from 60,000 to 70,000 metric tons of finished rice annually. Imports are treated as a residual, although in 1988 imports alone reached nearly 70,000 metric tons (Table 1). In 1987 the Jamaica Commodity Trading Corporation (JCTC)--a parastatal agency--became the sole legal importer of rice. However, a minor amount of rice imports falls outside the jurisdiction of JCTC, consisting mostly of packaged rice from St. Vincent and some cargo rice from Guyana. The JCTC imports only cargo rice in bulk, offloading at Montego Bay. All imported rice is milled there under exclusive contract with a private firm. Shipments typically cannot exceed 5,000 metric tons because of limited storage capacity.

At present, all JCTC purchases are through special commodity programs offered by the United States, including Commodity Credit Corporation (CCC) Program GSM102, and PL480. The GSM102 program is managed by the General Sales Manager of the Foreign Agricultural Service of the USDA. Under this program the JCTC issues tenders for a specified quantity and quality of rice to a list of potential US suppliers including Cargill, Continental, Riceland, Dreyfuss, Westway-Merkuri, Connell, Incotrade, and Phillip Brothers. Upon acceptance of a bid, the USDA guarantees US bank loans to the JCTC for the purchase. These loans usually carry interest rates slightly lower than the market rate.

Recently, 25 to 30 percent of Jamaican rice imports have been obtained under the PL480 program, which requires loan repayment within 20 to 30 years at interest rates of 3 to 4 percent. Annual purchases have ranged from 10 to 35 metric tons annually since 1984 (Table 4).

Table 4. US Sales of PL480 Rice to Jamaica

USA* Fiscal Year	Metric Tons	Value (US$ Million)
1984	16.3	5.0
1985	16.9	5.1
1986	30.9	8.6
1987	42.0	5.5
1988	10.3	2.7
1989+	35.5	8.0

*October 1-September 30
+As of June 16, 1989

Source: USDA Foreign Agricultural Service
1987-89: *Export Markets for US Grain and Products*
1986: *Food for Peace--1986 Annual Report of PL480*
1984-85: *Exports Under the Concessional Sales Program*

A representative of the JCTC indicated that American rice companies do not want to sell their best rice on food aid programs. As a consequence, Jamaica accepts a lower grade as follows:

> US#5 or better long grain brown rice in bulk for processing with maximum brokens 10%. Product to contain no more than 25 objectionable seeds per 500 grams including stack burn. Red rice and damaged kernels not to exceed 5%. Minimum 71% whole grain yield. Moisture 12.5% maximum.

At present the FOB price is US$260 to US$270 per metric ton at US Gulf ports, and shipping is US$22 to US$25 per metric ton. Jamaica does not intentionally subsidize the price of rice to consumers, although the price is controlled by the Ministry of Commerce.

According to the JCTC representative, the new government's policy on rice and other grains remains uncertain. In particular, the CARICOM relationship will be up for consideration. The critical issues for Belize's ability to sell rice to Jamaica will be financing, supply dependability, and quality maintenance.

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3.9 Montserrat

Montserrat imports the least amount of any CARICOM nation, with an average annual consumption estimated at 250 metric tons (Table 2). Nearly all imports are from the USA.

3.10 St. Kitts and Nevis

Rice in bulk is imported by the Central Marketing Corporation. The Marketing Corporation imports long grain white rice in 100 lb bags with a maximum of 15 percent broken grains. All rice must be imported milled because there is no domestic mill. The handling method is break-bulk. Recently, the CIF price has been US$25.50 per bag, or US$0.25 per pound, with supplies coming primarily from the USA and St. Vincent.

The Marketing Corporation used to purchase about 18,000 bags annually but has seen its share decline to 4,800 bags due to competition from the private sector and increased preference for parboiled rice. The private sector imports prepackaged parboiled rice primarily from the USA, but the new mill in St. Vincent is making inroads.

3.11 St. Lucia

The Ministry of Trade imports long grain white milled rice in 50 kg bags. The current principal supplier is Guyana, but frustration with delayed deliveries might induce the Ministry to shop elsewhere. The preferred delivery schedule is 6,000 bags (120 metric tons) every six weeks, or about 2,600 metric tons annually. The current price is $350 per metric ton, FOB Guyana.

3.12 St. Vincent

Among the CARICOM rice importers, St. Vincent is a minor participant with consumption less than 2,000 metric tons. However, a modern, new rice mill (the Eastern Caribbean Flour Mill) which began production in July 1988, processes both white milled and parboiled rice. Since this mill has much more capacity than the local market requires, the apparent objective is to import cargo rice and reexport processed rice to other Caribbean nations. Cargo rice is handled in bulk from various suppliers.

The St. Vincent Marketing Corporation (a parastatal enterprise) is the sole importer and wholesale distributor of rice. It buys on behalf of the new mill. Interest has been expressed in purchasing rice from Belize, but the problems of supply and bulk handling facilities in Belize must first be resolved.

3.13 Trinidad and Tobago

Trinidad is the second largest rice importer in CARICOM, with a population exceeding two million and an annual import demand of approximately 40,000 metric tons.

A government parastatal organization which goes by the acronym CARONI produces 8-15 percent of domestic consumption with two crops per year on 2,200 acres. CARONI plans to add about 1,800 irrigated acres and 9,000 acres of rainfed rice in five years. In the private sector, four producers control about 1,000 acres each, and the remainder of rice production is dispersed among small farms. Domestic rice production is unlikely to ever meet domestic demand because of the water constraint and the poor record of agricultural production by government.

A government parastatal organization--National Flour Mills--has the exclusive right to import rice. The managing director expresses great interest in importing from Belize if the price is competitive, but National Flour Mills only accepts bulk shipments. At present, nearly all of Trinidad's rice is #5 cargo rice or #2 parboiled from the United States. By combining commodities to fill a ship, Trinidad gets an extraordinarily low freight rate of US$15 per metric ton.

The potential for selling Belize rice to Trinidad does not appear good because Trinidad can bargain for bulk shipments, thus bringing down unit freight costs. Furthermore, Trinidad has oil which it exports for dollars and is not under great pressure to settle accounts in CARICOM currencies. Finally, Trinidad is a natural market for Guyana, which dominated the market until quality and supply problems induced Trinidad to find other sources. If Guyana improves its product, however, it could reestablish its presence in the Trinidad market.

3.14 Conclusions

The two largest markets for imported rice in CARICOM--Jamaica and Trinidad--account for 80 percent of the 130,000 annual import demand in CARICOM (Table 2). However, neither of these markets looks promising for Belize given current and foreseeable market conditions. Trinidad can pay in dollars and negotiate large volume deals with producers and shippers. Furthermore, Trinidad is the natural market of Guyana if that country reenters CARICOM with an improved product. Jamaica is too financially stressed to pass up the deals offered by the US Government. Neither Jamaica nor Trinidad is willing to accept rice in containers, which is the only way Belize can ship at present.

The remainder of the CARICOM countries require relatively small quantities of rice. Many want only parboiled rice, but Belize does not have parboiling equipment. In addition, bulk handling is required by some countries, which Belize does not have.

It appears that the most likely alternatives for exporting Belize rice at present are the small countries that accept bags in shipping containers and who need to conserve hard currency. However, Belize would have to invest in parboiling equipment to supply some of these markets.

Since new rice mills are being installed in the Caribbean, Belize could follow a strategy of direct sales to mills. However, parboiling is still necessary for some clients, and stiff competition will be encountered from the USA. To penetrate the Caribbean market, foreign rice production and marketing firms are participating in joint ventures to construct rice mills which would favor importation of US rice. This has occurred in St. Vincent and Grenada, and strong interest has been expressed in Barbados.

Interviews left us with several strong impressions. First, CARICOM buyers are empathetic toward Belize; a genuine feeling of interest in Belize's situation and potential exists. Second, buyers must necessarily give the welfare of their country or business first priority, so Belize must be competitive in spite of the willingness of buyers to consider purchasing Belize rice. Finally, Belize must have the product ready and market with a professional sales organization to compete in the CARICOM market. Buyers immediately asked for rice samples and indicated that deals could not be made without a product ready to ship.

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4.0 RICE PRODUCTION SYSTEMS IN BELIZE

4.1 Overview

Rice production systems in Belize are remarkably diverse for such a small country. This variation reflects a wide range of physical, economic, and social environments existing within the country. At one extreme the Mayan rice producers practice a traditional, labor intensive milpa (slash and burn) system in the isolated uplands of eastern Toledo District. At the other extreme is the high-input, mechanized, irrigated rice production system operated at Big Falls Ranch in Belize District. Between these extremes are the milpa systems located near infrastructure and the mechanized rainfed systems as practiced in the Stann Creek District and by the Mennonite farmers in Orange Walk District. These four production systems account for nearly all of the rice produced in Belize. Their distinguishing characteristics are presented in Table 5.

Evaluation of the potential for increasing the quantity and quality of rice production in Belize must accommodate the diversity of production systems. This study therefore includes crop management profiles and costs of production for each of the major production systems. Based on these analyses, the principal constraints on rice yield and quality are identified, and the measures required to mitigate these constraints are suggested. Recommendations are made as to which of the rice systems are most appropriate for focusing government, private, and donor investments to increase rice production.

4.2 Analysis of Rice Production Systems

4.2.1 Traditional Rainfed Milpa Systems

Milpa crop production refers to slash and burn cropping systems that produce one crop of rice and corn as separate monocrops on a burned site, followed by abandonment for a fallow period of five to ten years. Some milpa farmers plant beans after the corn harvest, but only a single rice crop is grown because weed problems preclude a second rice or bean crop on the same burn site without fallowing. During the fallow period, weedy grasses die off as the regrowth of native vegetation grows above the grasses and cuts off light penetration at the soil level. After the fallow regrowth period, the slash and burn cropping cycle is repeated.

Since production was terminated at Big Falls Ranch in Belize District, milpa rice cultivation now accounts for much of the rice produced in the country. Rice yields average about 1,500 kg/hectare on milpa farms, most of which is grown in Toledo District. All milpa rice systems are extremely labor intensive; shortage of harvest labor is a major constraint. The small size of milpa rice plantings per farm (from two to five acres) reflects both the shortage of labor and the high minimum wage.

Table 5. Distinguishing characteristics of the major rice production systems in Belize.

System	Annual rice area per farm	Consecutive rice crops same field	Mechanized operations	Material inputs	Yield range (average)	Major limiting constraints
	ac/farm				lbs/ac	
Traditional rainfed milpa rice, eastern uplands of Toledo District	2-5	1 yr only	none	herbicide	1000-2000 (1500)	transport distance to nearest road, labor for threshing, improved varieties
Rainfed milpa rice on level, well-drained soils of Toledo District	2-5	1 yr only	threshing	herbicide	1200-2500 (1700)	labor for harvest, weed control, soil fertility, improved varieties
Mechanized rainfed rice on level soils of Blue Creek area in Orange Walk District	20-400	2-3 yrs	land prep., seed drill, fertilizer and herbicide applic. by airplane, combine harvest	herbicides, N and P fertilizers	2000-4000 (3000)	weed control, soil fertility, improved varieties
Mechanized, high input flooded rice at Big Falls Ranch in Belize District	2000† to 8000	continuous	all operations	herbicides, N,P,K fertilizers, insecticides and fungicides	2800-6000 (3500)	wet season land preparation, agronomic research backstopping

† More than 4000 acres were developed for rice production at Big Falls Ranch. If two crops per year are produced in each field, this represents a potential for 8000 acres of rice annually. However, soil preparation and harvesting operations during the rainy season severely limit overall yield and raise production costs. Mr. Godwin Hulse suggests only one crop per year planted during the most favorable conditions on the best fields, which would limit annual harvested area to about 2000 acres.

International, Inc.

Total labor required for milpa rice production varies considerably, depending on the proximity of the burn site to infrastructure (Table 6) and whether or not the site is virgin forest or secondary regrowth. In this report, Labor Budgets #2, #3, and #4 presented in Table 6 are used to estimate production costs and returns. (Unit input costs used to construct the budgets are shown in Appendix Table B-1.) These budgets assume that most milpa rice is cultivated at sites with secondary regrowth rather than virgin forest. Labor Budget #5 provided by Dr. Hughes differs from the comparable Labor Budget #2 primarily in the definition of manual weeding versus land clearing operations.

Mayan farmers produce most of the milpa rice in Toledo District. Farms are located in isolated areas away from the villages. The distance from these farms to the nearest road ranges from one to four miles, which precludes access to large stationary threshers. Thus, labor for threshing by hand and transport to the nearest road represents over 25 percent of the total labor requirement (Budget #2, Table 6). In contrast, non-Mayan milpa rice growers, such as those near Big Falls in Toledo District, farm land that is close to roads. They have access to a large stationary thresher in the village. The thresher was purchased with funds obtained from a B$0.25 cents/lb check-off charge on rough rice sold to the Toledo Rice Mill. These funds are administered by the Toledo Grain Growers Association, and more threshers are to be bought for distribution in other villages near rice producing areas. Road access and mechanized threshing reduces the total labor required for rice production by about seven man-days (compare Labor Budget #2 with Labor Budget #4, Table 6).

Since few material inputs are used in milpa systems, production costs and returns largely depend on labor requirements and proximity to roads. When a value of B$20.00/man-day is assumed as the opportunity cost of labor, there is a net loss in all milpa production systems, regardless of proximity to infrastructure (Table 7). This implies that the goal of the milpa rice farmer is to generate a cash return for his own labor. Thus, return to labor provides the most appropriate indicator of economic performance. Comparison of partial budgets in Table 7 shows that return to labor increases from B$9.90 on isolated farms with manual threshing to B$14.89/man-day for milpa farmers near roads who use a mechanized thresher.

The potential to maintain or increase rice production from milpa systems will depend on the differential between the return to labor for rice versus the return to labor from other enterprises or from off-farm employment. The fact that Mayan farmers produce rice at all, given the relatively low return to labor, highlights the strong attachment to village life and culture held by these Native Americans. This attachment clearly reduces the lure of high wages offered outside their reservation land. It also suggests that if other farming enterprises were available with higher return to labor, rice production by Mayan farmers would decrease because rice is grown for cash, not consumption. Partial budgets indicate, however, that development of a feeder-road system and introduction of appropriate threshing technology would greatly increase the return to labor in Mayan rice production systems. Small, portable threshers are presently being tested by the Toledo Agriculture and Marketing Project. These developments would tend to increase the competitiveness of rice in relation to other farming options.

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Table 6. Labor requirements in man-day equivalents for traditional rainfed milpa rice systems practiced in the eastern uplands of Toledo District.†

Field operation	Farmer Estimates ††				Dr. Hughes' Estimate †††
	Virgin Forest (2 mi. to nearest road, threshed by hand) #1	Fallow Regrowth (2 mi. to nearest road, threshed by hand) #2	Fallow Regrowth (near road, threshed by hand) #3	Fallow Regrowth (near road, mechanically threshed) #4	Vegetation Unspecified (near road, threshed by hand) #5
	man-day equivalents				
Land clearing and burning	14	8	8	8	2
Planting	4	4	4	4	4
Herbicide application	1	1	1	1	0.5
Manual weeding	nil	nil	nil	nil	13.5
Harvesting	6	6	6	6	5
Threshing					
Manual	4	4	4		3
Mechanical				nil	
Transport to road	3	3	0	0	0
TOTAL	32	26	23	19	28

† All labor budgets assume a yield of 1500 lb/ac rough rice.
†† Based on information obtained from Fausto Méndez, milpa rice farmer and president of the Toledo Grain Growers Association and from two Mayan rice farmers interviewed at Mafredi village.
††† Estimates made by Dr. David C. St. John Hughes, Agronomist with the Toledo Research and Extension Center at Blue Creek.

Table 7. Partial Budgets for Traditional Rainfed Milpa Rice Production Systems in Toledo District

Return or Variable Cost	System Description		
	Fallow Regrowth (2 mi to nearest road, threshed by hand)	Fallow Regrowth (near road, threshed by hand)	Fallow Regrowth (near road, mechanically threshed)
	- - - - - - - - Belize Dollars/acre - - - - - - - -		
Gross Return (1500 lb/ac @ $0.22/lb)	330	330	330
Variable Costs			
land clearing/burning (8 man-days)	160	160	160
planting			
- seed (30 lb/ac)	*11	*11	*11
- labor (4 man-days)	80	80	80
weed control			
- 2,4-D herbicide (3 pt/ac)	*8	*8	*8
- labor (1 man-day)	20	20	20
harvesting (6 man-days)	120	120	120
threshing			
- manual (4 man-days)	80	80	--
- mechanized ($0.003/lb)	--	--	*4.5
bags ($0.30/100 lb bag)	*4.5	*4.5	*4.5
transport to nearest road			
- labor (3 man-days)	60	--	--
- horse rental	*30	--	--
transport to mill by truck	*19	*19	*19
Total Variable Costs	592.5	502.5	427.0
Net Return (Net loss)	(262.5)	(172.5)	(97.0)
Return to Farmer's Labor+ ($ per man-day labor)	9.90	12.50	14.89

*Indicates variable costs that are considered direct out-of-pocket costs.
+Calculated as the ratio of gross return minus the sum of direct out-of-pocket costs divided by the total man-days of labor as shown in Table 6.

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Rice production by non-Mayan milpa rice growers in Toledo District, who already have access to roads and threshers, will be more sensitive than Mayans to alternative enterprises with greater economic rewards. Citrus and cacao are already being introduced in these areas as potential competitors for milpa rice land. Likewise, increased return to labor from rice production will require a significant increase in yield levels and/or a reduction in labor requirements. Mechanization of land clearing, seeding, and harvesting, however, would be difficult since farm size is small. On larger farms, evolution toward a more mechanized, higher input production system such as those established in Stann Creek District and by the Mennonite farmers in Orange Walk District would be possible.

Alternative production technologies could also help increase yield levels in milpa systems, but their development and extension will require a coordinated research and on-farm testing program. For example, it is likely that introduction of improved varieties could raise yields by 10 percent or more, but it would take more than five years to initiate a program, adequately test, multiply seed, and distribute new varieties to farmers. Thus, the potential impact of new varieties is not likely to be a factor in the near future. Herbicide research should also be beneficial. Since 2,4-D herbicide is used in all milpa rice systems, research on the proper timing and rate of application should lead to better weed control and higher rice yields without increasing production costs.

The impact on rice production from other innovations being evaluated by various donor-funded projects is unclear. For example, slope stabilization using leguminous tree hedgerows on "permanent" fifty-acre parcels in conjunction with citrus, cacao, and livestock enterprises is presently under evaluation in Mayan rice farming areas. If the length of the fallow period between rice crops is shortened because of competition for land by the perennial components of the farming system, rice production might decrease.

4.2.2 Mechanized Rainfed Systems

Several groups of Belizean farmers are establishing medium- to large-scale mechanized rice production systems under rainfed conditions. These systems can be viewed as a transitional stage between the labor-intensive milpa systems and capital-and-input-intensive, continuous irrigated rice production attempted at Big Falls Ranch. Indeed, since most of the mechanized rainfed rice is produced on low-lying land near major rivers, it would be feasible at some point to consider conversion of these fields to irrigated rice systems producing one or two crops per year.

To make the investment in mechanized equipment worthwhile, mechanized rainfed systems must produce two or three consecutive rice crops in successive years on the same field. However, increasing severity of grassy weed problems and decreasing soil fertility limit the number of consecutive rice crops. In both Toledo and Orange Walk Districts, several farmers have successfully grown two rice crops on the same land with yield levels around 4,000 lb/acre in the first year, falling to about 3,000 lb/acre in the second year. Fields now in third-year rice were inspected by this author near Blue Creek in Orange Walk District. It was clear that yield levels would be low in those fields since weed problems and nitrogen deficiency were severe (Fig. 1); a fourth year in rice is not likely at those sites without improvement in weed control and fertility management.

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Mr. Andre Duquesnay, a farmer in Stann Creek District has reportedly been successful in producing continuous single rice crops each year on 400 acres. He apparently uses cultivation and herbicide application in the dry season fallow period to reduce weed pressure. This suggests that adequate weed control is possible in these systems with continuous, rainfed mechanized rice. A modest research effort on weed management in these systems would have a positive impact. For example, use of a leguminous covercrop fallow for one year followed by three consecutive rice crops was found to be a viable option for rainfed rice in Peru (Sanchez and Benites 1987).

Even with the present weed and soil fertility constraints, partial budgets for a three-year cycle of mechanized rainfed rice as practiced by the Mennonite farmers in Orange Walk District indicate a respectable net return (Table 8). It is noteworthy that some of these farmers plan to expand rice production on their farms. One grower hopes to put 500 acres/year into mechanized rainfed rice over the next few years.

Although the Mennonite farmers in Orange Walk District are extremely adept at mechanized operations, their management of rice production suffers from a considerable lack of information about fertilizer requirements and pest control guidelines. For example, the same rate and form of fertilizer is applied in each of the three consecutive rice crops (Table 8). Yet it is clear that fertilizer nutrient inputs in the second and third year are less than adequate (Fig. 1). While phosphate application levels appear to be more than sufficient for the three rice crops (as 100 lb diammonium phosphate per acre at planting), it is likely that increased nitrogen and possibly inputs of sulfur and potassium in the second and third year would help maintain yield levels.

Based on research in other areas (Sanchez et al. 1982), adding 50 lb/acre ammonia sulfate (applied preplant) along with an extra 20 lb/acre urea at late tilling to the fertilizer levels already used in the second and third year rice crops (Table 8) would increase rice yield by about 400 lb/acre each year. This increase would provide a benefit/cost ratio of four to one, lowering unit production costs while providing a higher net return.

Disease and insect problems will also tend to increase as repetitive monocropping of rice predominates on a piece of land. Apparent symptoms of hoja blanca, a virus disease transmitted by the leaf hopper Sogatodes oryzicola, was observed in several mechanized rainfed rice fields in Orange Walk District on the Bluebonnet variety. The only effective control measure for this potentially serious disease is to introduce resistant cultivars; control of the leaf hopper vector using insecticides is not economically viable (Cheaney and Jennings 1975). In contrast, the cinch bug (also called a spittlebug due to the mucus-like deposits it makes) was found in large numbers in the same fields. One farmer was considering pesticide application to control this insect, called "frog hoppers" by the Mennonite farmers. Cinch bugs, however, do not cause plant damage or a reduction in rice yield; thus, insecticide treatment would be a waste of money.

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Fig. 1. Weed Problems and Nitrogen Deficiency

Weed problems and nitrogen deficiency that are typical of third-year rice fields in the mechanized, rainfed production systems in Orange Walk District. Rice yield in these fields will be considerably reduced by the weed pressure and nitrogen deficiency, and it is not likely that a fourth-year in rice would be feasible without improved weed and fertility management.

Table 8. Partial Budgets for Mechanized Rainfed Rice Production on Level Soils Near the Blue Creek Mennonite Community in Orange Walk District+

Return or Variable Cost	First Year	Second Year	Third Year	Mean Over 3 yrs
	- - - - - - - - Belize Dollars/acre - - - - - - - -			
Gross Return ($0.21/lb) (yield)	840 (4000 lb/ac)	630 (3000 lb/ac)	420 (2000 lb/ac)	630 (3000 lb/ac)
Variable Costs				
land clearing/soil prep.	300	90	90	168
planting (seed drill, light disk)	35	35	35	35
seed (100 lb/ac)	37	37	37	37
fertilizer at planting (100 lb/ac DAP)	37	37	37	37
fertilizer at late tillering				
- 100 lb/ac urea	26	26	26	26
- aerial application	5.5	5.5	5.5	5.5
herbicide				
- 2,4-D at 3 pts/ac	8	8	8	8
- aerial application	5.5	5.5	5.5	5.5
combine harvest	110	100	90	100
transport to mill	50	37	25	37
Total Variable Costs	614	381	359	451
Net Return	226	249	61	179

+Costs for field operations estimated by Peter Rempel, John Rempel, and John Dyck who are three of the largest rice growers in Orange Walk District.

In the future, research and extension activities on improved weed control, varietal selection, and fertility management will be needed to maintain the profit levels from mechanized rainfed rice presently achieved by the Mennonite farmers in Orange Walk District and by Mr. Duquesnay in Stann Creek District. With support from the Centro International de Agricultura Tropical Rice Program in Cali, Colombia and from other regional programs, such an effort should be feasible in Belize. It is likely that a modest in-country research/extension program on these issues would increase net returns significantly above present levels.

4.2.3 High Input, Mechanized, Continuous Irrigated Systems

Besides the relatively small-scale experimental evaluation of irrigated rice systems in progress at the Blue Creek Agricultural Experiment Station, Toledo District, irrigated rice is not currently being produced in Belize. During the late 1960s, 1970s, and early 1980s, however, irrigated rice was grown on 2,000 to 4,000 acres at the Big Falls Ranch in Belize District. At peak production capacity in 1980, 5,300 acres were harvested with an average rice yield of 3,500 lb/acre for a total of 18.55 x 10^6 lb (personal communication, Godwin Hulse). Production at this level required two crops per year on much of the land. Rice was not produced at a profit at this large farm. Currently, the 4,000 acres developed for irrigated rice at Big Falls Ranch are idle, along with a state-of-the-art rice mill.

Without a detailed study of production at Big Falls Ranch and complete access to crop management logs and financial data, it is impossible to pinpoint the exact cause of the failure to make rice farming successful. Partial budgets for single and double cropped irrigated rice at Big Falls Ranch are presented in Table 9 based on information obtained from Godwin Hulse and Patrick Scott. These budgets indicate that the double crop option is considerably lower in net return than the single crop system due to lower yields and higher production costs arising from increases in the costs associated with land preparation, insect control, irrigation, and combine harvest. All of these additional costs can be attributed to the operational difficulties encountered during the rainy season in the double crop system.

Although both single and double crop irrigated rice budgets for Big Falls Ranch indicate a positive net return (Table 9), it should be noted that these partial budgets only include variable costs; they exclude the initial costs of land development, irrigation infrastructure and pumping equipment, machinery and airplanes, and road construction. These initial costs would be well over B$2,100 per acre for development of field units of 200 acres each. Fixed costs of road maintenance, machinery maintenance, and clearing and dredging of irrigation and drainage canals are also not included and would run over B$50 per acre each year. When development costs and fixed costs are considered, irrigated rice production does not appear to provide sufficient returns to justify the required investment. It is unlikely, therefore, that further development of irrigated rice systems will be made.

The prospect for irrigated rice production in Toledo District is considerably less appealing than in Belize District. Since rainfall in southern Belize is 180 inches per year, the cost of initial land development and the fixed and variable costs of irrigated rice production would be well above those at Big Falls Ranch where it rains 80 inches annually. Average yields from irrigated rice in the south would also be lower than in northern Belize due to lower incident solar radiation, a longer rainy season, and more periods of extended rainfall during which many fields could not be harvested.

Table 9. Partial Budgets for Single or Double-cropped Flooded Rice at Big Falls Ranch, Belize District

Return or Variable Cost	Single Rice+ Crop Per Year	Double-Cropped Rice++
Gross Return (@$0.21/lb) (yield)	798 (3800 lb/ac)	672 (3200 lb/ac)
Variable Costs		
wet land preparation	60	70
seed	37	37
- aerial application	15	15
fertilizer at planting		
- 75 lb/ac DAP	28	28
- 50 lb/ac ammonium sulfate	10	10
- 50 lb/ac potassium chloride	15	15
- aerial application	10	10
fertilizer at early-tillering (after propanil herbicide application)		
- 75 lb/ac urea	19.5	19.5
- aerial application	4	4
herbicide (21 days after sowing)		
- propanil @ 3 qt/ac	27	27
- aerial application	5.5	5.5
herbicide (late tillering)		
- 2,4-D @ 3 pts/ac	8	8
- aerial application	5.5	5.5
fertilizer at panicle initiation		
- 65 lb/ac urea	17	-
- 50 lb/ac urea	-	13
- aerial application	3.5	3
Insect control including insecticides & application	45	65
Irrigation/pumping		
- labor	12	14
- electricity	35	40
Combine harvest	85	100
Transport to mill	48	40
Total Variable Costs	490	529
Net Return	308	143

+ Only one rice crop in each field per year, planted Nov-Dec and harvested April-May in the dry season.

++ Two crops per year in each field. Values shown represent the average costs and returns per acre for the two crops.

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Of the various options for producing irrigated rice in Belize, the single crop system on existing developed land at Big Falls Ranch looks most viable (Table 9). Although new machinery would have to be purchased and roads and irrigation/drainage canals refurbished, these expenditures represent a relatively small portion of the initial development costs. Likewise, with only one rice crop per year, both harvest and substantial portions of the land preparation operations could be scheduled during the dry season. As in the mechanized rainfed rice systems, however, maintenance of profit levels will depend on research activities focused on developing improved weed control measures, efficient fertilization practices, and improved varieties.

4.3 Rice Quality Considerations

At present more than 50 percent of the rice produced in Belize is processed at the Toledo Rice Mill. The mill is obsolete and does not have the equipment required to separate head rice from brokens more than a quarter grain. The staff at this mill appears to do a remarkable job, given the operational constraints imposed by inadequate equipment. A major upgrading will be required to allow production of export-quality rice.

Another problem at the Toledo Mill concerns the large number of rice varieties it receives, ranging from short grain to long grain rice with different milling requirements. Jimmy Bardalez, supervisor of the Toledo Rice Mill, indicates that twelve varieties pass through in a normal year. The estimated proportions are as follows.

- Bluebonnet (long grain) 50%
- Belle Patna (long grain) 25%
- Century Patna (medium grain) 5%
- Texas Patna (long grain) 5%
- Saturn (short grain) 2%
- Nilo 49 (long grain) 1%
- Others (various grain size) 12%

Milpa rice farmers purposely plant different rice varieties with differing maturities to lengthen the harvest period and thereby reduce the peak labor demand (Fig. 2). For example, Bluebonnet is late maturing and requires five to six months from planting to harvest. In contrast, Belle Patna is an early variety requiring only four months. Milpa farmers often plant a portion of their fields to each variety so that rice can be harvested over a two- to three-month period.

Fig. 2. Typical Mayan Milpa Rice Field in Toledo District

Note the low plant density and the lack of foliar nutrient deficiency symptoms. Farmers plant at lower than optimal density due to the high labor requirements for sowing (see Table 6) and also when conditions during land clearing and burning are too wet to allow a complete burn. A poor burn leaves considerable unburned plant residue on the soil surface that restricts closer spacing between planting hills. Leaf color indicates adequate soil fertility which reflects the efficient recycling of nutrients in these single-year rice slash and burn (i.e., milpa) systems. Pictured: Mr. Alfonzo Tzul, District Agricultural Office in Toledo.

From a production perspective, use of a range of varieties makes good sense for reasons other than avoiding a harvest labor constraint. Since varieties often differ in their resistance to diseases, insects, and soil nutrient deficiencies, use of a range of plant genotypes mitigates against severe loss from any of these stresses in a single season. Indeed, it is inappropriate to rely too heavily on a narrow germplasm in crop production. It would therefore be agronomically unsound to mandate restrictions on varietal selection. Instead, research on identifying improved varieties with higher yield, better grain quality, and a range of maturities should be initiated for milpa rice systems. It should also be possible to select varieties with similar milling characteristics. This would provide milpa farmers with improved varieties and facilitate their efforts to reduce labor shortages at harvest.

Improvement of drying and storage facilities at the Toledo Rice Mill and in rice-producing villages would help improve rice quality. Variation in the moisture content of rice received at the mill is a major problem (Fig. 3). Likewise, storage capacity at the mill is inadequate, and temperature control and air flow in the dryers are poor. The IFAD-Toledo Small Farmer Development Project is considering the evaluation of smaller grain storage and drying facilities located in rice production centers. Whether such a system is economically viable is a major issue. An extension program to educate milpa rice producers about postharvest moisture and quality control would be beneficial.

The other rice mills in Belize are newer than the Toledo Mill and have the potential to produce better quality rice. Since they are located in Stann Creek District and in the northern part of the country, transport of rough rice from the Toledo area to these new mills is not feasible. These mills receive relatively more of their rough rice from mechanized rainfed production systems that harvest by combine. Grain moisture at harvest tends to be less variable than in milpa systems. It is likely that this pool of rice growers can supply rice that could be milled to export quality in the newer rice mills.

Fig. 3. Rice Drying by Mayan Women

These women are drying rice on a cement pad in front of their village house. Poor drying and storage facilities in Mayan villages influences the milling quality of their rice. Note, however, that the rice is very clear and contains little foreign matter.

4.4 Conclusions

Since termination of rice production at Big Falls Ranch, milpa rice farmers and larger mechanized operations on rainfed land in Stann Creek and Orange Walk District account for nearly all rice production. Milpa systems are extremely labor intensive, and rice is grown to generate cash--not for home consumption. Maintaining current production levels in the milpa farm sector will depend on improving the return to farmers' own labor. Feeder roads and mechanized threshing would significantly increase the return to labor in these systems.

In the large mechanized rainfed systems, rice is presently produced for B$0.15 per pound excluding storage and drying costs. Minor changes in fertilization practices would probably increase yields and lower unit production costs to B$0.14 per pound, or US$0.07. The US production cost is approximately US$0.05 per pound in California and US$0.06 in the Gulf Coast states, also excluding storage and drying costs. Higher costs in Belize are due in part to fertilizer, which costs about twice as much in Belize, and the higher costs in Belize of machinery ownership, operation, and maintenance. Despite these higher costs, mechanized rainfed rice production in Belize provides a respectable net return due to the high price paid by the Marketing Board for rough rice.

A single annual rice cropping system at Big Falls Ranch appears to be a profitable enterprise when initial development costs and fixed operating costs are not considered. Variable costs of production are estimated to be B$0.14 per pound, which includes maintenance costs for roads and irrigation/drainage infrastructure. A double crop option does not appear financially feasible, however, due to operational difficulties during the rainy season that increase production costs and reduce yields. Such difficulties would be more severe in Toledo District where rainfall is more than double the level at Big Falls Ranch. Intensive, irrigated rice production is therefore unlikely to succeed in the Toledo District.

Maintaining or increasing production in all three rice production systems will require adaptive agronomic research and extension support above present levels. A modest effort in selection of improved varieties, calibration of fertilizer input levels, and improvement of weed control methods would provide much of the information needed to increase input use efficiency, rice yield, and profitability. Without such support, rice production in Belize will become even less competitive internationally.

5.0 RICE EXPORT CONSTRAINTS AND PRECONDITIONS

5.1 Meeting Domestic Demand

Since Belize is a rice producer, its first priority should be to meet domestic demand. After the Big Falls Ranch ceased rice production, national production dropped by approximately 50 percent, forcing Belize to import to meet domestic demand (Table 10). Population and incomes continue to grow while rice production remains stagnant, which suggests a continuing trend of rising imports. Imports reached a peak of more than 1.3 million pounds in 1987-88.

Belizeans prefer imported rice because its quality is usually better than the domestic product. Complaints of foreign matter in domestic rice are commonplace. It appears that Belize's second priority should be to improve the quality of rice for domestic consumption, which would have to be achieved in any case for the export market.

Since 1981-82, annual per capita milled rice consumption has fluctuated between 36 and 57 pounds (Table 10). There is reason to believe that the lower figures reflect consumer inability to obtain the quantities and qualities they wanted, hence we estimate that 60 pounds per capita is a reasonable estimate of consumer demand if better quality rice were available. Assuming a population of 170,000, aggregate annual demand for milled rice is 10.2 million pounds. Demand will increase at approximately the rate of population growth, which averages about 2 percent per year.

Table 10. Belize Rice Production, Imports and Consumption

Year	Population	Paddy Production	Milled Rate (64%)	Imports - Exports	Total Supply	Consumption Per Capita
		Thousands of Pounds				Pounds
1980-81	148,688	23,890	15,289	-190	15,099	101.55
1981-82	151,811	17,800	11,392	-2,650	8,742	57.58
1982-83	154,998	9,200	5,888	-300	5,588	36.05
1983-84	160,967	12,500	8,000	600	8,600	53.43
1984-85	163,000	12,334	7,894	160	8,054	49.41
1985-86	165,000	9,712	6,216	379	6,595	39.97
1986-87	167,000	10,126	6,481	1,256	7,737	46.33
1987-88	169,000	12,237	7,832	1,360	9,192	54.39

Source: Belize Marketing Board

Belize currently produces nearly eight million pounds of milled rice annually, which leaves a shortfall of about two million pounds. Assuming little change in milpa rice cultivation, the shortfall will likely have to be made up with other production

systems--those found in the Orange Walk District or Big Falls Ranch. Approximately 2,000 acres of rice land is available at each location, which could yield the following production:

Location	Acres Available	Paddy Yield lb/acre	Milled Rice Production Thousand Lb
Orange Walk	2,000	3,000	3,840
Big Falls Ranch	2,000	3,800	4,860
Total	4,000		8,700

Given our yield and acreage assumptions, Belize has the potential to cover the two million pound shortfall in domestic production at either location. If all 8.7 million pounds of potential production were realized, Belize would have about 6.5 million pounds of exportable surplus.

Current Production		Potential Production		Domestic Consumption		Exportable Surplus
8,000,000 lb	+	8,700,000 lb	-	10,200,000 lb	=	6,500,000 lb

The potential exportable surplus is slightly less than 3,000 metric tons. Seven of the eleven potential CARICOM importers have annual imports of less than 3,000 metric tons (Table 2).

We conclude that Belize is physically capable of producing enough rice to meet its own consumption requirements and to export nearly 3,000 metric tons annually. Although physical capability is a precondition for export, quality and price are the ultimate deciding factors.

5.2 Export Quality and Product Form

The experience of Guyana serves as a lesson for Belize. Guyana lost its CARICOM market in large part due to a poor quality product and will have to work doubly hard to regain the confidence of buyers and displace US vendors. It would be a mistake for Belize to enter the export market and establish a reputation for poor quality. At a minimum, Belize will have to enter the market with long grain US#2 parboiled or US#2 cargo rice. Jamaica accepts a lower quality, but only because of the concessionary programs offered by the US Government.

Belize does not currently have parboiling equipment, which is required to supply some CARICOM countries. The RDA team has not investigated the cost of such an investment.

5.3 Dependable Supply

Buyers we interviewed emphasized the importance of supply dependability. They prefer familiarity and continuity with established suppliers--not intermittent suppliers. It would be to Belize's disadvantage to enter the market unpredictably; hence, if the effort is made to develop rice as an export crop, it should be sustained. Aggregate export quantities should therefore be maintained as nearly constant as possible.

5.4 Shipping and Handling

Many of the importing CARICOM countries require bulk handling and storage facilities, which Belize does not have. Investment in bulk handling facilities will be a precondition to selling to some countries. Furthermore, Belize would probably have to invest in domestic rice storage capacity for export rice.

The maximum laden draft that can be accommodated by the Belize port is seventeen feet. According to a report prepared in 1981 about the future of Big Falls Ranch, all CARICOM ships meet this requirement because Georgetown has similar problems [Unauthored 1981]. We did not confirm this statement but concur that it could be a limitation to some shippers.

5.5 Shipping Cost

Ocean transportation cost to and from Belize tends to be high because of the low volume of trade and lack of outbound freight. However, interviews with shippers revealed willingness to negotiate the listed rates on outbound freight because backhauls are nearly empty at present.

Listed rates on a twenty-foot container were obtained for examination. One container holds approximately twenty tons (40,000 lb) of cargo rice. There are currently at least three shipping companies which could haul containers of rice from Belize to CARICOM countries.

5.5.1 Tropical Shipping Co.

Tropical Shipping Company serves Antigua, Barbados, Bahamas, St. Kitts, and St. Lucia from Belize, but it does not directly serve Trinidad or Jamaica. Tropical is the only line that visits Big Creek on a regularly scheduled basis, which is made possible by banana exports. The list price of shipping a container from Belize City to Barbados is US$2,000; from Big Creek the cost is US$2,400. Tropical can interline to any other port, but transloading into other lines' containers would cost extra.

5.5.2 Hyde Shipping Co.

The agent for the Hyde Shipping Co. and Hybur Ltd. in Belize is Caribbean Shipping Agencies Ltd. Hyde serves Miami weekly and interlines to Caribbean ports. The estimated cost of shipping a container to CARICOM ports averages US$1,800-US$2,000 plus interline charges.

5.5.3 Caribbean Overseas Lines (CAROL)

The agent for CAROL in Belize is the Belize Estate and Produce Co., which also represents four other international lines. CAROL is the only line which serves Jamaica directly from Belize; it can serve other CARICOM ports by interlining in Jamaica or Puerto Rico. The estimated cost of shipping a container to Kingston, Jamaica, is US$1,572 including a US$140 port charge at Kingston and US$77 "bunker adjustment" charge. The cost to Barbados (interlined) would be $US1,940, and to Trinidad US$2,020.

5.5.4 West Indies Shipping Corporation (WISCO)

Although WISCO does not call on Belize, it calls on many other CARICOM ports. According to the Trinidad office, the list prices of shipping a twenty-foot container from Jamaica to selected CARICOM countries are:

Antigua, Barbados and Dominica	US$1,525
Grenada	1,425
St. Kitts	1,625
St. Lucia	1,485
St. Vincent and Trinidad	1,475

Addition of the WISCO rates (from Jamaica to CARICOM ports) and the CAROL rate (Belize to Jamaica) is inappropriate because of special "through rates." In general, the cost of shipping a container is approximately US$2,000 to CARICOM ports, which is equivalent to US$110 per metric ton or 5.5 US cents per pound. Clearly, this rate reflects list prices, which might be reduced by shippers eager to get backhaul out of Belize. Nevertheless, the difference between US$110 and US$15 per metric ton that Trinidad pays for bulk shipments from the United States is large. The list price of shipping a container from Belize to Jamaica is approximately US$84 per metric ton, whereas Jamaica gets bulk shipments from US gulf ports for US$25. Not all CARICOM countries have the same bargaining power as Jamaica and Trinidad, and not all can accept bulk shipments, but the relatively high shipping costs that Belize faces is a significant obstacle to achieving price competitiveness.

5.6 Competitive Price

Belize can produce rice with a mechanized system for approximately 14 Belize cents per pound at the farm gate. With processing and handling costs added, the cost FOB Belize City would be as follows:

	B$ / 100 lb
Production	14.00
Milling	0.58
Bagging	0.50
Transport	3.50 (Big Falls Ranch mill to Belize City)
Storage	0.75 (at port)
Total	B$19.33 per 100 lb, or 0.1933 per lb

At the official current exchange rate of US$1.00 = B$2.0175, the US dollar price would be 9.6 cents per pound, or $192 per metric ton, excluding drying, container loading, insurance, producer profit, and administrative costs incurred by the Belize Marketing Board. No particular quality standards are assumed, and parboiling cost is not included.

We do not have complete or accurate postharvest costs to calculate FOB prices. In the Gulf states of the United States, the farmgate cost of production is approximately US$132/metric ton, and the FOB Gulf Port price to Jamaica (#5 cargo rice) is approximately US$260. Postharvest costs are approximately equal to the cost of production, or US$130/metric ton. If the postharvest cost in Belize were the same as the US, the FOB price in Belize would be US$153 (farmgate cost) + US$130 (postharvest cost) = US$283. It appears, therefore, that Belize could be price competitive on an FOB basis--particularly if the quality is better than #5.

Shipment to Jamaica--the nearest CARICOM importer--would cost US$1,572 per container (listed rate) of 40,000 lb (18.14 metric tons). Shipment therefore adds US$87 per metric ton, excluding insurance. Delivered cost to Jamaica would be a minimum of US$370. We did not find out if Jamaica's rice purchases are subjected to the 15 percent import duty, but, if so, there would be an additional cost of US$40 per metric ton on US rice. These calculations are summarized as follows:

	US$ Per Metric Ton	
	Belize Rice	US Rice
Production cost	153	132
Postharvest cost	130	130
FOB port price	283	262
Shipping to Jamaica	87	25
15% duty		40
Total	370	327

Even with the 15 percent CARICOM duty added to US shipments, Belize rice would be US$43/metric ton more expensive than US rice. There are numerous cost uncertainties, however. In particular, complete postharvest costs in Belize are undetermined. Current milling and bagging costs reported by the Marketing Board might be subsidized. Drying costs will have to be incurred, which uses expensive fuel. In the US, drying costs approximately US$50/metric ton. In any case, Jamaica wants bulk shipments and concessionary financing.

Higher quality rice obtains higher prices; Guyana obtains US$350/metric ton from some CARICOM buyers for extra long grain, #2 quality rice. If Belize could produce such rice for under US$300 FOB Belize City there would be a good possibility of competing, even with existing freight rates. The cost of freight to the more distant CARICOM ports is formidable, however; Tropical Shipping's listed rate on a container from Belize to Barbados is US$2,000, or US$100 per metric ton.

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We conclude that Belize is not competitive in CARICOM on a price basis, but differences in assumptions about quality, production and handling costs, freight rates, and payment of import duties could tilt the balance either way. Nonprice factors could preclude sales even if Belize's price is competitive.

5.7 Terms of Financing

Payment in national currencies is an advantage to some CARICOM countries, which should act in Belize's favor. However, for countries in financial distress, the prospect of long-term financing of rice purchases could outweigh price. It is unlikely that Belize can afford to do this, but the possibility should be considered.

5.8 Sales Organization

Commodity sales is a profession which requires training, experience, and support. Belize would have to develop a professional sales organization to handle rice exports, but which might also handle other commodities. At present Belize does not have such an organization.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Belize Can Produce Rice For Export

Belize is physically capable of increasing milled rice production by approximately 8.7 million pounds (3,945 metric tons). Nearly one-fourth of that (1,000 metric tons) is needed to replace imports. The greatest potential for increased rice production is the mechanized rainfed system practiced on larger farms in Stann Creek and Orange Walk Districts. In these systems, net returns from rice appear to be good at the price currently paid by the Belize Marketing Board. In fact, if the Belize Marketing Board continues to pay B$0.21/lb for paddy rice, Belizean producers are likely to increase acreages. Sustained production over the longer term will require an increase in research and extension support to address fertility, weed control, and disease problems that will intensify as these mechanized operations tend towards continuous rice production.

Milpa rice farmers also would benefit from identification of varieties with higher yield potential, differing maturities, but with similar milling characteristics and quality. Shortage of labor, however, is the major constraint in these systems. Development of a feeder road system in existing milpa production areas and access to mechanical threshers would help reduce labor requirements significantly, especially for the Mayan farmers. Expanded rice production from the milpa farm sector should not be encouraged because increases would likely come from conversion of virgin forest areas. Instead, the goal of stabilizing present rice production by reducing labor requirements appears to be more appropriate. Since rice provides the primary link to the cash economy for Mayan farmers, such a strategy is crucial for this ethnic group.

6.2 The CARICOM Market for Belize Rice is Very Limited

The CARICOM rice market is highly diverse in its requirements and marketing channels. Twelve of the thirteen countries currently import, and of the twelve Belize is the only one with export potential. The combined aggregate annual demand for rice by the remaining eleven countries is approximately 130,000 metric tons, 80 percent of which is attributable to Jamaica and Trinidad/Tobago. Belize does not appear to be competitive in either of those markets, even taking into account the 15 percent CARICOM duty. Most of the remaining nine countries want parboiled rice, which Belize cannot currently prepare. Countries with rice mills typically want shipment in bulk, which Belize cannot do. Finally, CARICOM consumers want high quality rice, which at present Belize does not provide its own consumers. CARICOM buyers appear to be interested in Belize rice, but only if the price and quality are competitive. The principal supplier and competitor is the USA, but the Guyanese private sector could make a renewed effort. In conclusion, Belize faces formidable obstacles in the way of price, quality, product form, shipping, and financing. Belize's potential export quantity is so small, however, that it would only take one market the size of St. Lucia's to absorb the entire amount.

6.3 Belize Rice Is Not Price-Competitive

It is possible to produce an exportable surplus with acceptable quality by further expanding production in mechanized rainfed systems and by renewed production of irrigated rice at Big Falls Ranch. Production costs, however, are relatively high due to higher input costs and higher costs for machinery operation and maintenance than for US producers. The cost of production under mechanized systems could probably be reduced to US$0.07/lb with certain improvements in cultivation practices. The comparable US cost is US$0.05 to US$0.06. Even if Belize's post-harvest costs were the same as the USA, Belize would have a price disadvantage due to slightly higher production costs and much higher shipping costs.

6.4 Lack of Infrastructure Limits Ability to Compete

Lack of bulk shipping facilities and direct shipping routes, a shallow port, and high shipping costs compound Belize's difficulty of competing on a price basis. The cost of developing bulk shipping facilities probably cannot be justified by rice shipments alone. Investment in parboiling equipment, port storage facilities, and drying and milling facilities would be required to become a strong competitor in CARICOM, but it is doubtful that the investment would be financially feasible for an export potential of only 3,000 metric tons annually.

6.5 The Case for Self-Sufficiency

The international rice market has been characterized as "...thin, volatile, and risky" [Rastegari-Hennebery 1985, 16], and shows little sign of changing. One of the world's major participants, of course, is the United States, which exports approximately 55 percent of its production via highly competitive, private firms as well as concessionary sales through the government. The US grip on Caribbean rice markets will be very difficult to loosen. Given the nature of the competition, the high risk, and the low returns, we do not believe that Belize should enter the game. It is not that Belize could not sell its rice; a buyer will be found at some price. We believe, however, that Belize would lose money at current and foreseeable international rice prices.

We recommend a strategy of rice self-sufficiency. Domestic production can be increased to meet consumption needs on about 1,000 acres of mechanized rice production in Orange Walk District or Big Falls Ranch. The long-term cash cost of expansion might exceed the cost of importing rice, but foreign currency savings and domestic employment generation will help compensate.

The domestic policies required to achieve expansion of rice production are not analyzed in this study. Recent studies are leading toward a price stabilization policy, however, that will influence production of basic grains in Belize [Maxon et al. 1985; Phillips and Steele 1985; Midwest Universities Consortium 1988; and Neils 1989]. We recommend that domestic policies include the following components:

- The Ministry of Agriculture should expand its research and extension activities in rice with an emphasis on adapting existing technologies to Belizean conditions, and also on selection of improved varieties with acceptable quality characteristics.

- The quality of rice for domestic consumption should be improved.
- Milpa rice producers should be assisted in variety selection, construction of feeder roads, and access to mechanical threshers. However, expanding milpa rice acreage in virgin forests should not be encouraged without a careful evaluation of environmental impact.

6.6 We Want To Export Rice, Regardless

If Belize is determined to export rice at any cost, it should go for the high quality segment of the CARICOM market where price premiums can be obtained. The most likely purchasers are the smaller nations which are deficient in hard currency and have no rice mill. However, direct sales to the rice mills in St. Vincent and Grenada should be attempted. It is possible that bilateral trade agreements could be negotiated with some of these countries. In other words, Belize needs to segment the market and look for a niche in lieu of competing head-to-head with the USA or Guyana.

6.7 The Demand-Side Approach

As indicated in the Introduction, an alternative approach to determining export potential is the "demand-side" approach whereby market niches are searched, then production is developed to exploit them. For example, a food importer in Barbados expressed great interest in purchasing oranges, grapefruit, guavas, pineapple, and fish from Belize. We recommend that, as an alternative to "supply-side" studies conducted for tropical fish, shrimp, and rice, a reconnaissance study be made of CARICOM markets to find out what is demanded that Belize could produce, then investigate whether or not Belize could be competitive with those products. The process is an iterative one, but it is demand-driven in lieu of supply-driven.

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APPENDICES

APPENDIX A

CLASSIFICATION OF RICE

The size and shape of grain provide the basis for the most important classifying system for rice. According to this system, rice is classified as short, medium, or long grain. Of these three different types of rice, long and medium grain rice dominate the production, consumption, and trade. The short grain type is the preferred rice only in Japan, Korea, and Taiwan.

Further grading is done according to the milling yields. But before explaining this system of grading, it is important to distinguish between rough rice (the farm product) and milled rice (the traded commodity). Rough rice is the product harvested on the farm which contains the hull and the bran. Depending on the extent of the milling process, different products may result from rough rice. First, rough rice may be parboiled, a process by which paddy is steeped in water, steamed or heated, and subsequently dried. Parboiling produces a premium quality rice by forcing the nutrients in the bran to converge on the inner kernel of rice and by making the kernel stronger and less likely to break when the rice is milled. Whether the rice is parboiled or not, the next stage of milling is removing the hull. This produces a partially milled product called brown rice. The final stage of milling removes the bran, leaving regular white, milled rice.

When rice is milled, some of the kernels are broken, and the percentage of these broken kernels is a criterion in judging rice quality; the higher the percentage, the lower the quality and price. This is the standard adopted by two major exporters, the USA and Thailand.

APPENDIX B

Table B-1. Unit Costs for Labor, Material Inputs, and Production Operations Used in Partial Budget Analyses of Rice Production Systems in Belize

Inputs	Unit	Unit Cost (Belize dollars)
labor	1 man-day	20.00
2,4-D herbicide	gallon	21.00
propanil herbicide	gallon	36.00
seed	lb	0.37
urea	lb	0.26
diammonium phosphate (DAP)	lb	0.37
potassium chloride (KCL)	lb	0.30
ammonium sulfate	lb	0.20
Mechanized Operations		
land preparation (Orange Walk)		
- first year, including land clearing	acre	325.00
- subsequent years in continuous production	acre	100.00
seeding with grain drill, followed by light disking	acre	35.00
aerial fertilizer application	lb/acre	0.055
aerial herbicide application	acre	5.50
combine harvest		
- Orange Walk District	acre	110.00
- Big Falls Ranch		
dry season	acre	85.00
rainy season	acre	115.00
threshing	lb rough rice	0.003
transport		
- from isolated milpa farm to nearest road by horse	lb rough rice per mile	0.01
- from road to mill by truck	lb rough rice	0.0125

APPENDIX C - RICE IMPORTS BY CARICOM COUNTRY

Due to unresolved data discrepancies, figures for Barbados, Bahamas, and St. Kitts/nevis rice imports are not included. The information in the APPENDIX tables was provided by CARICOM headquarters in Guyana. Totals do not necessarily agree with figures provided by the United Nations or the country-statistics themselves--the sources used for Table 1 (text). Differences are noted where they are significant.

Table C-1. Antigua and Barbuda Rice Imports

Metric Tons

Form and Source	1984	1985	1986	1987	1988
In husk					
USA				14	
Subtotal				14	
Husked					
USA	7,032			719	
France	5				
Puerto Rico	30				
Netherland Antilles	4				
Guyana	17				
Canada				1	
Subtotal	7,088	NA	NA	720	NA
Semi-milled/wholly milled					
USA	24			500	
Italy				2	
Subtotal	24	NA	NA	502	NA
Broken					
USA				19	
Subtotal	NA	NA	NA	19	NA
Total	7,112	NA	NA	1,222	NA
Table 1 Total	1,100			1,255	

Table C-2. Belize Rice Imports

Metric Tons

Form and Source	1984	1985	1986	1987	1988
In Husk					
USA	0	148	139	375	5
Mexico				15	2
Colombia	1				
Guatemala	48	501			0
Subtotal	49	649	139	390	7
Semi-milled/wholly milled					
USA				638	1,110
Mexico				131	
Subtotal	NA	NA	NA	769	1,110
Broken					
USA	22	4	2	5	41
Mexico				0	21
Guatemala		127			
Subtotal	22	131	2	5	62
Total	71	780	141	1,164	1,179
Table 1 Total	50	649			

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Table C-3. Dominica Rice Imports

Form and Source	1984	1985	1986	1987	1988
	Metric Tons				
Husked					
USA	225	0	17	21	54
Suriname		300			
Spain	259				
Guyana					100
Thailand					496
St. Vincent					7
Subtotal	484	300	17	21	657
Semi-milled/wholly milled					
Suriname		259	18		
Thailand			21		
USA	251	18		0	
St. Vincent					3
Subtotal	251	277	39	0	3
Broken					
USA	100	89	42	511	39
Belgium		4	604		
Suriname	36	54	386		18
Puerto Rico	1	0	0		
Thailand			299	335	172
Guyana		17		94	110
Netherlands		20			
Curacao	17				
St. Vincent					3
Subtotal	154	184	1,331	940	342
Total	889	761	1,387	961	1,002

Table C-4. Grenada Rice Imports

Form and Source	1984	1985	1986	1987	1988
	Metric Tons				
Husked					
USA	57	1	20	154	
Suriname	1,373	1,500	600	800	
Thailand		0	1,032	1,097	
Guyana	18				
West Germany				100	
Countries not listed			6		
Subtotal	1,448	1,501	1,658	2,151	NA
Semi-milled/wholly milled					
USA	364	118	83	59	
Netherlands		0	11		
France		3	6		
Thailand		26	42	42	
Suriname		300			
Belgium		4			
Subtotal	364	451	142	101	NA
Broken					
USA		3	22	18	
Belgium			5		
Subtotal	NA	3	27	18	NA
Total	1,812	1,955	1,827	2,270	NA

Table C-5. Jamaica Rice Imports

Form and Source	1984	1985	1986	1987	1988
	Metric Tons				
In husk					
USA		1	15,534	14,443	36,144
Husked					
USA	23,808	140	25,174	23,269	0
Canada			3		
Italy			3,043		
Subtotal	23,808	140	28,220	23,269	36,144
Semi-milled/wholly milled					
Canada			0	13	9
USA	28,312	41,046	12,540	4,820	28,687
Barbados				437	
Guyana			2,911	5,086	3,742
Italy		0		2,000	
Jamaica		4,679			
Subtotal	28,312	45,725	15,451	12,356	32,438
Broken					
Canada	6	7		0	
USA	9	9,296	21	172	306
Guyana			2,518	2,256	946
Japan	0	2			
Subtotal	15	9,305	2,518	2,428	1,252
Total	52,135	55,171	61,744	52,496	69,834
Table 1 Total	52,120		47,200		

Table C-6. Monserrat Rice Imports

Form and Source	1984	1985	1986	1987	1988
			Metric Tons		
Husked					
UK			0	1	NA
USA			228	114	NA
Belgium			4		NA
Puerto Rico			7	1	NA
Total	NA	NA	239	116	NA
Table 1 Total				250	

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Table C-7. St. Lucia Rice Imports

Form and Source	1984	1985	1986	1987	1988
	Metric Tons				
Husked					
USA	516	8	321	737	29
Suriname	18	1,352			
Belgium			19		
Thailand	0	268	346	22	
Guyana	0	1	450	150	
Holland		200			
France	2	0			
St. Vincent	151				
Costa Rica	190				
Subtotal	877	1,829	1,136	909	29
Semi-milled/wholly milled					
USA	416	80	461	1,022	144
Suriname	57	334	54		
Holland			15		
Canada	8				1
Guyana	11				299
St. Vincent					9
China					1
Subtotal	492	414	530	1,022	454
Broken					
USA	76	104	456	538	5,957
Belgium			18		
Thailand			63		106
St. Vincent					34
Suriname					36
Guyana					1,248
Dominican Republic					199
Subtotal	76	104	537	538	7,580
Total	1,445	2,347	2,203	2,469	8,063

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Table C-8. St. Vincent & Grenadines Rice Imports

Metric Tons

Form and Source	1984	1985	1986	1987	1988
Husked					
USA	1,281	1,884	1,429	2,047	
Suriname	144	469			
Guyana	655	325			
Trinidad/Tobago		2			
Colombia		300			
Thailand		259	301		
Barbados			101		
Subtotal	2,080	2,539	1,831	2,047	NA
Semi-milled/wholly milled					
USA	0			162	
UK				157	
Suriname		48			
Subtotal	0	48	0	319	NA
Total	2,080	2,587	1,831	2,366	NA
Table 1 Total	1,970			2,048	

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Table C-9. Trinidad and Tobago Rice Imports

Form and Source	1984	1985	1986	1987	1988
	Metric Tons				
In husk					
Colombia			4		2
USA			4	2	
Subtotal			8	2	2
Husked					
USA			11,786		
In bulk					
Colombia			15		
Costa Rica	224	157			
Guyana	20,933	18,629	2,197		
Thailand	80	1,219	732		
USA	85	769	2,533	11,405	
Subtotal	21,322	20,774	5,477	11,405	
In retail packages					
Brazil	350	1,506	131		
Guyana	854	1,104	124		
Suriname		560	909		
Thailand	77	2,051	1,829	358	
USA	20,616	8,753	5,406		
Other	10				
Subtotal	21,907	13,974	8,399	358	
Broken					
Costa Rica		238			
Suriname		922	384		
Thailand		86			
Subtotal		1,246	384		
Other					
Guyana			855	514	2,080
St. Vincent					1,000
Thailand					1,771
USA			3,789	43,387	28,117
Subtotal			4,644	43,901	32,968
Total	43,229	35,954	30,698	55,666	32,970
Table 1 Total	45,162	35,954	29,565	55,626	

APPENDIX D - PEOPLE AND ORGANIZATIONS CONTACTED

Belize

Bardalez, Jimmy. Belize Marketing Board Rice Mill Manager, Big Falls, Toledo.
Burns, Ivor. Livestock Specialist, IFAD - Toledo Small Farmers Development Project, Toledo.
Cleland, Robert. Shipping Manager, Belize Estate & Produce Co., Shipping Agents, Belize City.
Espat, Pablo. Account Executive for Export Development, Belize Export & Investment Promotion Unit, Belize City.
Garcia, Eulalio. Cayo Dist. Agricultural Officer, Ministry of Agriculture.
Gonzalez,_____. Chief Agricultural Officer, Ministry of Agriculture, Belmopan.
Gorrez, Frank. Chief of Party, Toledo Agriculture and Marketing Project, Toledo.
Graham, Gilroy. Account Executive for Agriculture, Belize Export & Investment Promotion Unit, Belize City.
Hulse, Godwin. Manager, Big Falls Ranch, Belize District.
Hyde, Yvonne. Permanent Secretary, Ministry of Economic Development.
Longsworth, Stanley. Managing Director, Caribbean Shipping Agencies, Ltd.
Magliore, Francine. Agronomist, Central Farm, Ministry of Agriculture.
Mayan Farmers. Mafredi Village.
Mendez, Fausto. President, Toledo Grain Growers Association, and Rice Farmer, Toledo.
Neal, Rodney. Permanent Secretary, Ministry of Agriculture.
Neils, Dr. Kenneth. Agricultural Economist and Advisor to the Belize Marketing Board. Food and Feed Grains Institute, Kansas State University.
Ogborn, Timothy. Agricultural Engineer, Toledo Research and Extension Center.
Parham, Harry. Project Director, IFAD - Toledo Small Farmers Development Project, Toledo.
Parham, Wendell. Policy Analyst, Ministry of Agriculture, Belmopan.
Pyburn, James. Western Caribbean Manager. Tropical Line, Belize City.
Rai, B.K. Farming Specialist, IFAD - Toledo Small Farmers Development Project, Toledo.
Rempel, Peter, John Rempel, and John Dyck. Mennonite Farmers, Blue Creek, Orange District.
St. John Hughes, David C. Tropical Agronomist, Toledo Research and Extension Center.
Santos, Carlos. Managing Director, Belize Enterprise for Sustained Technology, Belmopan.
Scott, Patrick. Agronomist, Toledo Agriculture and Marketing Project, Toledo.
Sinha, Anil. CARDI Representative, Belmopan.
Stutzman, Daniel. Mennonite Farmer, Toledo District.
Tzul, Alfonso. District Agriculture Officer, Ministry of Agriculture, Toledo District.
Williams, Michael. Managing Director, Eurocaribe Shipping Services, Ltd.
Vaughan, Bert. Managing Director, Belize Marketing Board, Belize City.
Villanueva, Arturo, Project Officer, USAID, Belize City.
Szadek, Stephen A. Agriculture Office, USAID, Belize City.

PEOPLE AND ORGANIZATIONS CONTACTED (Continued)

Guyana

Butnin, _____. Guyana Rice Export Board, Georgetown.
Durrant, Nigel. Agricultural Economist, Agricultural Development Section, CARICOM (Caribbean Community Secretariat), Georgetown.
Kennard, Charles. General Manager, Guyana Rice Milling and Marketing Authority, Georgetown.
Mitchell, _____. Guyana Rice Export Board, Georgetown.
Sankar, Beni. Kayman Sankar & Co. (rice producers), Georgetown.
Sealey, Herman. Local Specialist (Engineering), Inter-American Development Bank, Georgetown.
Small, Leroy. Assistant General Manager, Guyana Rice Milling and Marketing Authority, Georgetown.
Smith, Dr. Jimmy. Caribbean Agricultural Research Development Institute (CARDI), Georgetown.

Trinidad

Charles, George. Managing Director, National Flour Mills Ltd.
Chesney, Dr. Arlington. Managing Director, Caribbean Food Corporation.
Menafra, Carlos. Sector Specialist, Inter-American Development Bank.
Ramnasibsingh, Ramayan. Planning Dept., CARONI.
United Nations Economic Commission for Latin America.
West Indies Shipping Company (WISCO).

Barbados

Da Silva, Leonardo. Inter-American Development Bank.
Del Mar, Frere. Interage Ltd.
Elwin, John C. Chief Project Officer, Agriculture. Caribbean Development Bank.
Greazes, _____ Mr. Barbados Ministry of Trade.
Griffith, _____ Mr. General Manager. Barbados Marketing Corp.
Hill, Lionel. Hill Milling Co., Ltd.
King, Cedric. King's Agro Food Ltd.
Owen, Peter. British Development Division.
Parris, Angela. FAO Office, Bridgetown.
Patalive, Charles. Regional Development Office, USAID.
Seale, David. R.L. Seale & Co., Ltd.
Warren, Benny. British Development Division.

Jamaica

Gunning, Yvonne, Jamaica National Commercial Bank, Kingston.
Morgan, _____. Ministry of Agriculture, Kingston.
Thompson, Anton. Commodity Manager, Jamaica Commodity Trading Co., Ltd., Kingston.

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PEOPLE AND ORGANIZATIONS CONTACTED (Continued)

St. Vincent

Allen, _____. Deputy and Senior Statistician, Statistical Unit.
Bonilley, Anita. Senior Clerk -- Planning Unit, Ministry of Agriculture.
Bowe, Kenneth. General Manager, St. Vincent Rice Mill.
Cain, _____. Senior Extension Officer, Ministry of Agriculture.
Lin, Ben. Rice Production Sector -- Team Leader, Chinese Agriculture Technical Mission.
Natti, J. Statistical Officer, Statistical Unit.
Providence, J. Manager for Special Projects, St. Vincent Rice Mill.
Rose, Leroy. General Manager, St. Vincent Marketing Coop.
Wickham, _____. Trade Officer, Ministry for Trade and Industry.