

Evaluation of the role and impact of contract farming on rice  
farming in Guyana

(ガイアナの稲作における契約農業の役割と影響の評価)

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## i. English Abstract

Rice is the main staple of Guyana and contributes 3.3% of Guyana's gross domestic product (GDP), 20.5% of agriculture GDP, and provides a living for approximately 15,933 farmers. However, despite the rice industry's importance and governmental efforts, many issues limit rice farmers' productivity and profitability. Among these issues is contract farming.

Contract farming is the oral or written agreement between farmers and other firms that specify one or more production and marketing conditions for an agricultural product. The literature indicates that contract farming is a risk-sharing mechanism, a source of secured markets, production inputs, machinery and equipment, credit, and technical knowledge. Therefore, the general conclusion on contract farming is that it improves farm income, incentivizes specialization, and that farmers will only participate if there is an expected financial gain.

However, the existing literature does not address the relationship between contract farming's role and impact and the pricing standards it uses. The pricing standard refers to the payment conditions farmers accept to deliver their products. Many pricing standards are used in contract farming; however, no study has been conducted to determine how they affect contract farming's role and impact. Since prices are connected to farmer income and are a determinant of producer incentive to produce a specific commodity, the pricing standard used may significantly affect contract farming's role and impact.

Therefore, this thesis attempts to evaluate the role and impact of contract farming under varying pricing standards, specifically focusing on the high and low-price standards.

The systematic sampling method was used to collect socio-economic, cost, and contract farming participation data from 303 farmers from Mahaica-Berbice and Essequibo Islands-West Demerara in Guyana. Data were analysed using comparative, profitability, regression analysis, and frequency distribution.

The following new points were revealed; Contract farming, when the dominant pricing standard is the high-price standard, is more profitable than independent farming. However, its profitability is limited because it is only due to higher yields, resulting from using more inputs made possible by access to fertilizer on credit.

While contract farming, when the dominant pricing standard is the low-price standard, is less profitable than independent farming because contract farming participation results in lower yields due to lower input use and selling prices, however, farmers continue to participate in contract farming because it is a production risk-sharing mechanism and a source of fertilizer and credit.

Finally, contract farming with the low-price standard results in low gross margins, influencing farmer behavior by incentivizing them to diversify their production to include more high-value farm products, such as cultivating other high-value crops and rearing livestock to supplement their low income.

## ii. 日本語要旨

ガイアナにおいて米は国民の主食であり、稲作農業は国内総生産（GDP）の 3.3%、農業総生産の 20.5%に貢献し、約 15,933 人の農家の生活を支えている。しかし、その重要性と政府の取組みにもかかわらず、多くの問題が稲作農家の生産性と収益性を制限している。その中に、契約栽培の問題がある。契約栽培とは、農家と企業との間で、農産物の生産・販売条件を指定した口頭または書面による契約のことである。

先行研究によると、契約栽培はリスク共有のメカニズムであり、安定した市場、生産投入物、機械設備、信用、技術知識の供給源であることが示されている。したがって、契約栽培に関する先行研究の一般的な結論は、農業所得を向上させ、契約作物に特化するインセンティブを与え、農家は金銭的利益が見込まれる場合にのみ参加する、というものである。

しかし、既存の研究が扱っていない論点の一つは、契約栽培の役割や影響、およびそれが用いる価格システムとの関係である。価格システムとは、農家が生産物を販売する際に受け入れる支払い条件のことを指す。契約栽培ではいくつかの価格システムが利用されているが、それらが契約栽培の役割や収益性にどのような影響を与えるかについては、これまで研究が行われてこなかった。価格は農家の収入に直結し、生産意欲を左右するため、価格システムが契約栽培の役割と収益性に大きな影響を与える可能性がある。

そこで、本論文では、異なる価格システム（高価格システムと低価格システム）の下での契約栽培の役割と収益性への影響について評価することを試みる。

そのために、ガイアナのマハイカ・バービス地区およびエセキボ島・西デメララ地区の農家 303 名を対象に、社会経済、費用、契約栽培への参加に関するデータを収集した。データは、独立標本 T 検定、ロジスティック回帰、収益性分析、度数分布等を用いた。

明らかになったのは以下の点である。

高価格システムのもとでは、契約栽培は非契約栽培よりも収益性が高い。その収益性は、肥料を信用で購入できるため、より多くの肥料を投入したことによる収量増加によるものである。

一方、低価格システムのもとでは、契約栽培への参加によって投入資材の使用量と販売価格が低下するため、非契約農家よりも収益性が低くなる。しかし契約栽培は生産リスクを共有し、肥料や信用の供給源であるため、農家は引き続き契約栽培に参加している。低価格システムの下での契約

農家には、低収益を補うために他作物への転換や家畜の飼育など、より高付加価値の農産物に生産を分散させるインセンティブが働いている。

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# 1. Chapter 1 - General Introduction

## 1.1. Problem Statement

Rice has been produced in Guyana for approximately 200 years. It is the main staple of Guyana, a significant income earner for the country, and plays a pivotal role in people's livelihood. The rice industry contributes 3.3% of Guyana's gross domestic product (GDP), 20.5% of agriculture GDP, and provides a living for approximately 15,933 farmers (Ministry of Agriculture Guyana 2019).

However, despite the rice industry's importance and government efforts, the rice industry's performance has been volatile, with the industry being affected by both global and domestic factors (Wenner et al., 2016) that limit rice farmers' productivity and profitability. Among the domestic factors affecting the rice industry is contract farming.

Contract farming is widely used in Guyana's rice industry. However, it is plagued by numerous issues, including unequal bargaining power, frequent defaults on payments for paddy supplied to millers, and unfair weights and prices offered to farmers. Despite the apparent problems, rice farmers continue to engage in contract farming. Therefore, contract farming plays an important role in Guyana's rice farming, and its impact must be clarified.

Adding to the complexity of the problem associated with contract farming is that two pricing standards are used in Guyana's rice industry: high-price and low-price. In this study, the high-price standard refers to a system in which millers offer a single buying price to farmers for all grades of paddies. While in the low-price standard, the farmers are offered set prices based on the grade of the paddy (Further description of the before-mentioned pricing standards will be given in section 1.4.4).

And it is unclear how these pricing standards affect rice farming, especially concerning the role and impact of contract farming.

## 1.2. Literature review

### 1.2.1. Definition

The literature refers to contract farming as the oral or written agreements between farmers and other firms that specify one or more production and marketing conditions for an agricultural product (Roy, 1963). Contract farming is an institutional arrangement widely adopted in agricultural production (Glover and Kusterer, 1990). Under contract farming, farmers usually agree to deliver specific commodities in predetermined quantities and to meet predetermined quality standards. In contrast, contractors agree to provide production support (e.g., the supply of input and the provision of technologies) and accept products at predetermined prices (Eaton and Shepherd, 2001).

### 1.2.4. Contract farming types

Kohls and Uhl (1985) classified agricultural contracts into 3 types according to their terms: market specification contracts, resource-providing contracts, and Management and income-guaranteeing contracts. The explanation of these types of contracts is given below.

Market specification contracts specify some product quality measures acceptable to the integrator, and some regulations are placed on the price and the payment method. Contracts are generally signed during planting time. They specify how much the contractor will buy and at what price. Little or none of the farmer's management decisions are transferred. From the producer's viewpoint, they guarantee a buyer if the specifications are met.

Resource-providing contracts are contracts where the contractors provide production inputs with certain conditions, managerial help, and supervision. Product prices are usually based on the spot markets, and income guarantees to the producers are minimal.

Management and income-guaranteeing contracts often include the production and marketing requirements of the former two types. Additionally, market and price risks are transferred from farmers to contractors in this type. On the other hand, the contractor takes a significant part of the managerial responsibility of the farmers.

Contract farming in Guyana's rice industry is the resource-providing contract type since the farmer can only obtain fertilizer through contracting; however, the contractor (mill) does not provide any managerial help or supervision. Furthermore, there are no spot markets for the farmers' paddies, and the mill is the only buyer.

### 1.2.5. Contract farming models

In addition to the beforementioned contract types, several contractual models are utilized in various situations, each of which has pros and cons. These models are the centralized model, nucleus estate model, multipartite model, informal model, and intermediary model (Eaton and Shepherd, 2001).

The centralized model is similar to a private scheme primarily used in Africa. These are often called “outgrower” schemes and are characterized by limited government involvement.

The nucleus estate model is a variation of the previous centralized model in that the contracting firm also has its own farm beside the contracted farmers.

The multipartite model is characterized by the Government or an NGO actively participating in the model and a private firm.

The informal model includes simple and informal contracts between individuals or small companies.

In the intermediary model, there are intermediaries between farmers and industry units like collectors or farmers’ committees.

However, in Guyana, the informal contracting model is used, and its success depends on the availability of support services, which, in most cases, are likely to be provided by government agencies (Eaton and Shepherd, 2001).

Generally, agricultural contracts within Guyana’s rice industry are informal, resource-providing contracts. These contracts are typically applied to crops for which the quality of the output depends on the type and quality of inputs and where inputs provision reduces production costs for farmers and, consequently, purchasing costs for the contractor (Minot, 1986)

Under the previously mentioned contract, the contractor provides a market outlet for the product and offers vital inputs. Providing inputs is a way of providing in-kind credit, the cost of which is recovered upon product delivery. Thus, farmers can reduce the costs of obtaining credit and inputs and reduce their production risk.

### 1.2.6. Role and impact of contract farming

Most of the literature on contract farming focuses on investigating two aspects: the role of contract farming and the impact of contract farming.

#### 1.2.4.1. Role of contract farming

The role and impact of contract farming have been discussed extensively in the literature (Masakure and Henson, 2005; Oya, 2012; Prowse, 2012; Winters et al., 2005; Otsuka, Nakano, and Kazushi, 2016).

A previous study on the role and constraints of contract farming in the agro-processing industry indicated that contract farming serves as a risk-sharing mechanism and a source of secured markets (Asokan and Singh, 2003). Allen and Leuck, (1995), who studied risk preferences and the economics of contracts, and Kohl and Uhl, (1985), who wrote about the marketing of agricultural products, argued that contracts could be used to manage farmers' production and marketing risks. Additionally, contract farming can reduce the insecurity of earnings from the farming business (Bolwig et al., 2009; Cai et al., 2008; Glover, 1984; Sethboonsarng, 2008). This makes contract farming particularly attractive for risk-averse subsistence farmers constrained by the absence of alternative risk-sharing strategies.

Furthermore, authors such as Mishra et al. (2016), who studied the impact of contracts in high-yielding varieties seed production on profits and yield in Nepal and Kumar et al. (2012), who looked at the characteristics and determinants of contract design of wheat seed farming in India, found that contract farming also plays a significant role in reducing post-harvest losses and easing liquidity constraints. This is likely because contract farming may allow farmers to secure stable markets for their products and possibly reduce their search costs.

Concerning production and farmer-to-market linkages, the literature generally states that through contract farming, farmers can gain access to production inputs, machinery and equipment, credit, and in some cases, technical knowledge (Sethboonsarng, 2008; Glover, 1984; Cai et al., 2008). Birthal et al. (2008), who studied improving farm-to-market linkages through contract farming, highlighted that contract farming also plays the role of being a source of technical advice and services, which contributes to increased earnings).

#### 1.2.4.2. Impact of contract farming

##### 1.2.4.2.1 Positive impact

Through contract farming, the private sector effectively offers new production technology and enables access to modern inputs and remote markets, offering better prices. Consequently, contract farming raises farmers' income by helping farmers improve production and the marketing of their products (Birthal et al., 2008, Glover

and Kusterer, 1990, Miyata et al., 2009). Indeed, farmers will only participate in contract farming if there is an expected gain in doing so (Bellemare, 2012). This incentivizes specialization in the contracted crop (Ruml and Qaim, 2020) and translates into improved incomes and a transformation from subsistence to commercial production with no financial burden to the public sector (Setboonsarng, et al., 2008).

#### 1.2.4.2.2 Negative impact

Some have argued that contract farming is exploitative when it involves a highly unequal power relationship, so contract farmers are relegated to hired hands (Little et al., 1994). Additionally, a study assessing the impact of contract farming on farmers' performance in the context of Cambodia. by Cai et al. (2008) shows that contract farming has been found to have a negative impact on farmers' income because of the contractor's power to manipulate the contract by changing the quality standards to regulate the volume of products purchased, changing prices, or cheat (Baunann, 2000 and Sivramkrishna and Jyotishi, 2008).

While some literature elaborates that contract farming is a conceptually sound institutional arrangement, lack of flexibility is one of its main liabilities, and coordination problems are faced during its implementation (Glover and Kusterer, 1990; Little and Watts, 1994). Farmers may breach the contract by diverting inputs supplied on credit to other purposes or selling outside the contract for higher prices. In contrast, contractors may breach the contract (e.g., with unfair quality standards, low-quality inputs, inadequate technical assistance, incomplete purchases, and delayed payments) because of inefficient management or marketing problems (Glover, 1984; Singh, 2002).

Contract farming may also be biased against poor farmers in remote areas while favoring better-off farmers with extensive land living in areas with good infrastructure (Setboonsarng, 2008). They are also likely to face more significant credit risks because of excessive advances, which tend to jeopardize their long-term operations' sustainability (see Glover, 1984; Glover and Kusterer, 1990).

#### 1.2.7. Gaps in the literature

The evidence shows that many studies have focused on the role of contract farming and its impact on profitability. However, one question the existing literature does not address is how contract terms such as pricing standards affect the role and impact of contract farming.

The pricing standard refers to the payment conditions farmers accept to deliver their products (Abebe, et al., 2013). Since different pricing standards may involve different risks and rewards for farmers (Hueth and Ligon, 1999), a closer look at farmers' decisions to participate in contract farming under varying pricing standards may reveal how their roles and impact may differ.

With this knowledge, smallholders' contract acceptance can eventually be improved by better aligning contract terms and provisions with farmers' preferences (Minten et al., 2009).

### 1.3. Objective

This thesis evaluates the role and impact of contract farming on rice farming in Guyana under varying pricing standards. Consequently, this study will answer the following questions:

1. What role does rice contract farming play under varying pricing standards?
2. How does contract farming's impact differ under varying pricing standards?

To answer the beforementioned questions:

- Chapter 2 will present a description of Guyana's rice industry.
- Chapter 3 will determine the role and impact of rice contract farming with the high-price standard in Guyana via a case study of Mahaica-Berbice (Region 5).
- Chapter 4 will determine the role and impact of rice contract farming with the low-price standard in Guyana via a case study of Essequibo Island-West Demerara (Region 3).
- Chapter 5 will compare the role of contract farming and its impact on rice farming with the high-price and low-price standards.

### 1.4. Methodology

Chapter 2 of this thesis utilized secondary information and data about Guyana's rice industry. These were obtained by reviewing historical literature and published reports.

While chapters 3 to 4 of this thesis employed data collectors who used an online survey questionnaire prepared by the researcher to collect data.



The systematic sampling method was used to select the number of farmers interviewed from each village. This procedure was divided into three steps.

Step 1 calculated the sample size as 15% of the total number of farmers in Mahaica Berbice.

Step 2 entailed converting the number of farmers in each village into ratios of the total number of farmers in Mahaica Berbice.

Step 3 applies the ratios calculated in step 2 to the sample from step 1 to determine the number of samples from each village.

#### 1.4.1. Chapter 2 – Description of Guyana’s rice industry

This chapter addresses the contemporary situation within the rice industry. It presents a description of the rice industry, explains the rice supply chain, discusses financing within the rice industry, describes the institutional framework, and the national strategy for agriculture development is evaluated, and the shortcomings related to the rice industry are identified.

#### 1.4.2. Chapter 3 – The role and impact of rice contract farming with the high-price standard in Guyana: A case study of Mahaica-Berbice

This chapter evaluates the role and impact of contract farming under the high-price standard with a case study of Mahaica Berbice. It does this by collecting and analysing the socio-economic, cost, and contract farming participation data of 91 contract farmers and 80 independent farmers to identify the reasons for participation in contract farming, the factors influencing contract farming participation, and determine its impact on the profitability of rice farming.

#### 1.4.3. Chapter 4 – The role and impact of rice contract farming with the low-price standard in Guyana: A case study of Essequibo Islands-West Demerara

This chapter determines the factors influencing contract farming participation and evaluates the reasons for participating in contract farming and its role under the low-price standard, with a case study of Essequibo Islands-West Demerara. For this, the socio-economic, cost, and contract farming participation data of 30 contract and 102

independent farmers were collected and analysed to identify the factors influencing contract farming participation and determine its impact on rice farming.

#### 1.4.4. Chapter 5 – Comparative study of the role of contract farming and its impact on rice farming under varying pricing standards: Mahaica-Berbice (high-price standard) and Essequibo Island-West Demerara (low-price standard)

In this chapter, The cost and contact farming participation data of 171 farmers from Mahaica-Berbice and 132 farmers from Essequibo Island-West Demerara were collected and compared to determine the difference in contract farming's role and impact under the high-price and low-price standards.

#### 1.4.5. Pricing standard

Two pricing standards are used in Guyana: the high-price and the low-price standards. The miller decides on pricing standards and selling prices for the paddy used.

The high-price standard is mainly used in Mahaica-Berbice, while the low-price standard is used in Essequibo Islands-West Demerara. This is because the most prominent mill and buyer of paddies in Mahaica-Berbice is the Hakh group of companies. The Hakh group of companies is the largest rice exporter in Guyana. Its exports account for approximately 50% of Guyana's rice production. This mill has 3 locations in or near Mahaica-Berbice and uses the high-price standard, which makes it the most attractive option for farmers to sell their paddies and allows it to out-compete other mills for acquiring paddies. On the other hand, in Essequibo Islands-West Demerara, the Hakh Group is not as dominant with only 1 location and, therefore, cannot significantly influence the pricing standard used since the influence of mills is relatively similar.

The selling price of paddy is influenced by the percentage (%) of "good" paddies supplied to the mill and the grade of the paddies depending on the pricing standard used.

The % of "good" paddies refers to the quantity of paddies remaining after the estimated quantity of "foreign materials" (straw, weed seeds, empty grains) has been calculated by the mill and subtracted from the total weight of paddies supplied by the farmer.

While the grades are classified as Extra A (Premium), A, B, and C. These grades are determined based on the % moisture content, % damaged kernels (singly or combined), % red kernels, % heat-damaged kernels, % green kernels, % chalky kernels, % head rice yield, and % total milled yield and assigned a grade. However, the difference in grade has little effect on the selling price.

Table 1.1 Criteria for the classification of paddy into grades

Factors	Moisture content	Damaged kernels	Red kernels	Heat-damaged kernels	Green kernels	Chalky kernels	Head rice yield (Minimum)	Total milled yield (Minimum)
Extra A (Premium grade) maximum %	14.0	1.0	1.0	0.1	2.0	2.0	55.0	70.0
A maximum %	14.0	2.5	2.5	0.2	3.0	3.0	50.0	67.0
B maximum %	14.0	3.5	3.5	0.6	4.0	4.0	45.0	65.0
C maximum %	14.0	4.5	5.5	1.5	6.0	6.0	40.0	63.0

Source: Guyana Rice Development Board

Figure 1.1 compares the grades and prices offered to farmers under the high-price and low-price standards. The information shown indicated that the selling price of paddy in Guyana is influenced by the percentage (%) of “good” paddies supplied to the mill and the grade of the paddies.

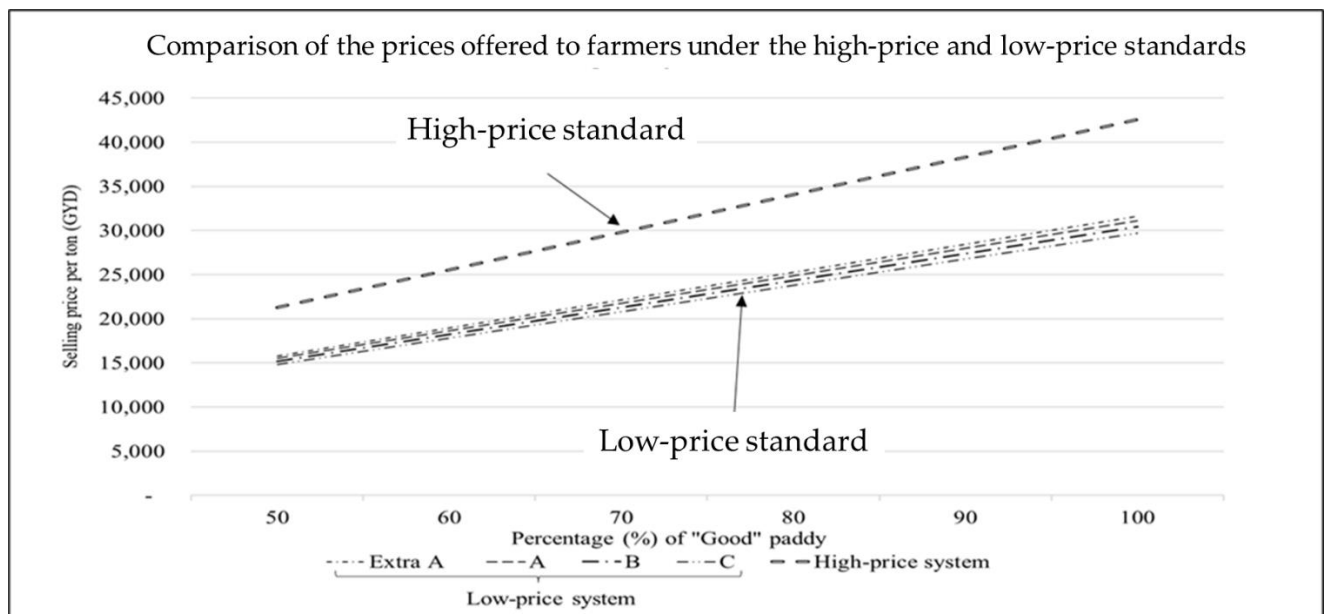


Figure 1.1 Comparison of the grades and the prices offered to farmers under the high-price and low-price standards

## 2. Chapter 2 – Description of Guyana’s rice industry

This chapter discusses Guyana’s rice industry. It presents a description of the rice industry, explains the rice supply chain, discusses financing within the rice industry, describes the institutional framework, and discusses the key trade agreements and marketing of Guyana’s rice.

### 2.1. Characteristics of the rice industry in Guyana

Figure 2.1 depicts the research location: South America, Guyana, Mahaica-Berbice, and Essequibo Islands-West Demerara. The map on the far left depicts South America, whereas the map second from the left depicts Guyana’s administrative regions. The map on the far right depicts Essequibo Islands-West Demerara, whereas the map second from the right depicts Mahaica-Berbice.

Guyana is located on South America’s northern coast. Venezuela borders it on the west, Suriname on the east, Brazil on the south, and the Atlantic Ocean on the north.

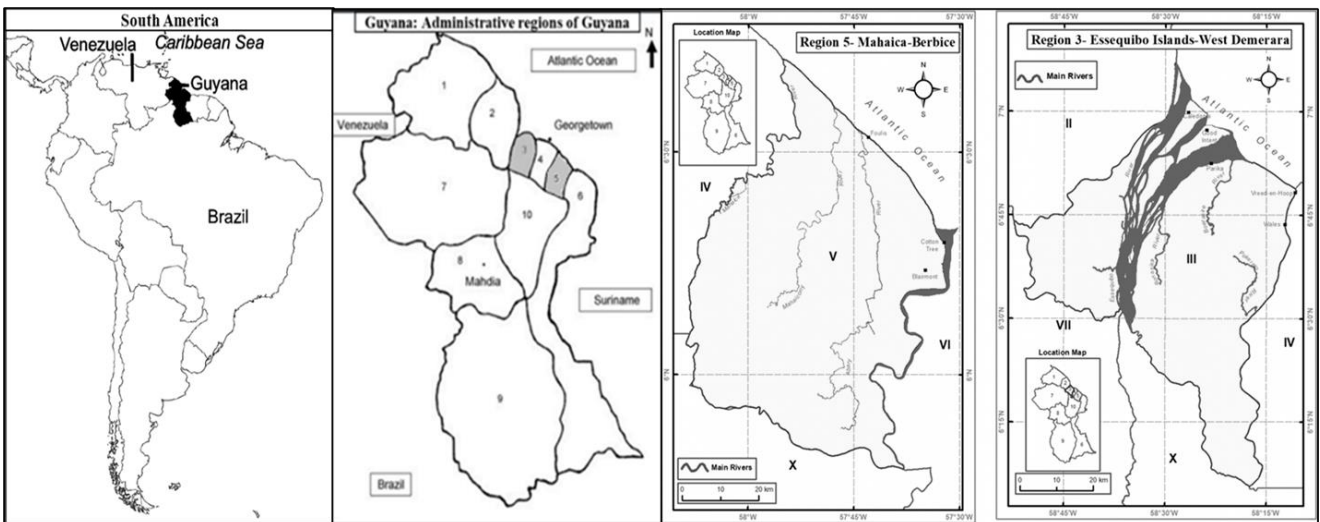


Figure 2.1 Map of the study area

Source: Guyana lands and survey commission

Guyana has an equatorial climate with slight temperature variations. The year is divided into two wet seasons: December to early February and late April to mid-August, with temperatures ranging from 16°C to 34°C. The relatively warm temperatures and abundant rain make it an ideal location for rice cultivation.

Table 2.1 shows the characteristics of the rice industry in Guyana. It shows that Guyana has a total land area of 214,999 km<sup>2</sup> and a population of 792,925 people. Rice farmland accounts for 150,224 km<sup>2</sup> of Guyana’s total land area, with approximately 15,933 farmers cultivating it. Guyana’s total paddy production in 2016 was 822,229 metric tons (mt), with a yield of about 5.5 tons per acre. And finally, a total of 53 mills operate throughout Guyana.

Table 2.1 Characteristics of the rice industry in Guyana, Mahaica-Berbice, and Essequibo Islands-West Demerara.

Description	Guyana	Mahaica-Berbice (high-price standard)	Essequibo Islands-West Demerara (low-price standard)
Total land area (sq. km)	14,999	4,190	3,770
Total population	792,925	49,723	91,328
Total rice farmland (ha)	150,224	49,196	16,465
Number of rice farmers	15,933	1,770	973
Total paddy production (tons)	822,229	201,980	60,319
Percentage (%) of Guyana's total volume of rice produced	-	25%	7%
Yield per acre (tons/ha)	~5.5	~5.3	~4.7
No. of Mills	53	13	12

Note: ~: approximately

Guyana is the largest rice producer in Caricom (Caribbean Community) and one of the Caribbean’s two rice exporting countries. Figure 2.2 shows the value of Guyana’s rice exports for the period 2009-2020. It shows that rice exports have been increasing in recent years, with the value of exports rising from US\$212,007,466 in 2016 to US\$259,088,535 in 2020, further establishing Guyana’s already promising rice industry within the country’s economy.

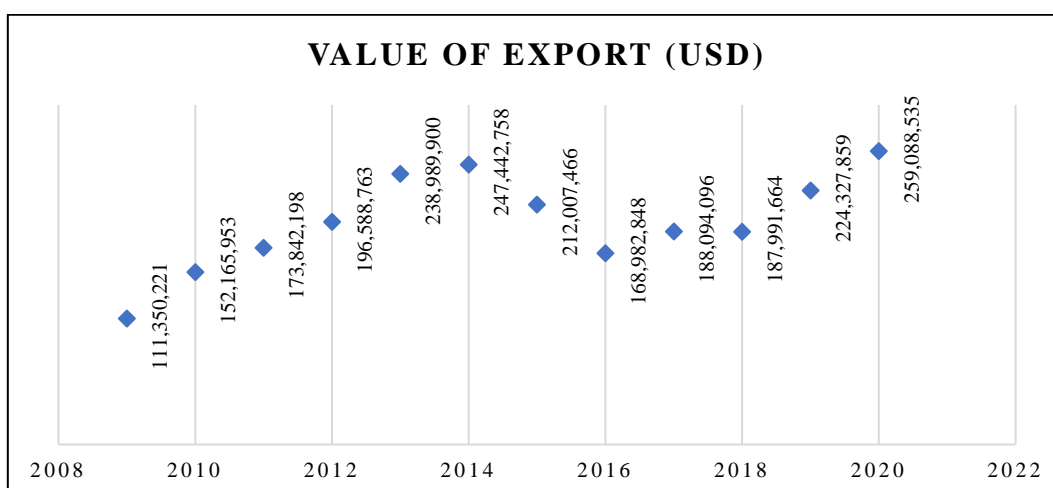


Figure 2.2 Value of Guyana's rice exports for the period 2009-2020

Source: Trendeconomy, <https://trendeconomy.com/data/h2/Guyana/1006>

Rice cultivation is done primarily on a thin strip of fertile land along Guyana's coast. This area is divided into six administrative regions, of which five regions are important rice production areas, namely, Pamaroon Supernaam (Region 2), Essequibo Islands-West Demerara (Region 3), Demerara Mahaica (Region 4), Mahaica Berbice (Region 5) and East Berbice Corentyne (Region 6).

These lands are below sea level (2m), depend on the tidal flow for drainage, and are under the constant threat of saltwater intrusion or floods during periods of extreme high tide or abnormally high rainfall. Consequently, rice cultivation is supported by an extensive drainage and irrigation network initially constructed by the Dutch over 150 years ago and is now managed by the National Drainage and Irrigation Authority (NDIA). The total length of the main drainage infrastructure is about 500 km, while the length of the secondary drainage system is 1,500 km (Food and Agriculture Organization, 2015). These structures sometimes fail (due to maintenance issues; blockages due to the infiltration of trash; excess water in the system, etc.), and since the lands are already below sea level, the failure of the drainage systems can lead to significant losses in production.

This study focuses on two of the most important rice-producing areas: Mahaica-Berbice and Essequibo Islands-West Demerara. Table 2.1 shows that Mahaica-Berbice has a total land area of 4,190 sq. km and a population of 49,723. The total rice farmland in Mahaica-Berbice is 49,196 ha cultivated by 1770 farmers. Total

paddy production as of 2016 amounted to 201,980 tons accounting for 25% of Guyana’s total volume of rice production. Mahaica-Berbice’s average yield per acre was approximately 5.3 tons per acre. Additionally, 13 rice mills located in and around Mahaica-Berbice are the main buyers of farmers’ paddies.

Essequibo Islands-West Demerara’s total land area is 3,770 sq. km, with a population of 91,328. The total rice farmland of this area is 16,465 ha. These lands are cultivated by 973 farmers. Paddy production in this area was 60,319 tons per acre, accounting for 7% of Guyana’s total volume of rice production. The yield per acre in Essequibo Islands-West Demerara was approximately 4.7 tons per acre. Additionally, the primary purchasers of farmers' paddies are 12 rice mills, all of which are situated in Mahaica-Berbice.

## 2.2. Rice Supply Chain

The rice supply chain in Guyana is characterized by a direct interaction between farmers, millers, and exporters. About 70% of the rice produced is exported, while the remaining 30% is domestically consumed.

Figure 2.3 below shows the structure of Guyana’s rice supply chain. The main participants in Guyana’s rice supply chain are farmers, millers, and exporters.

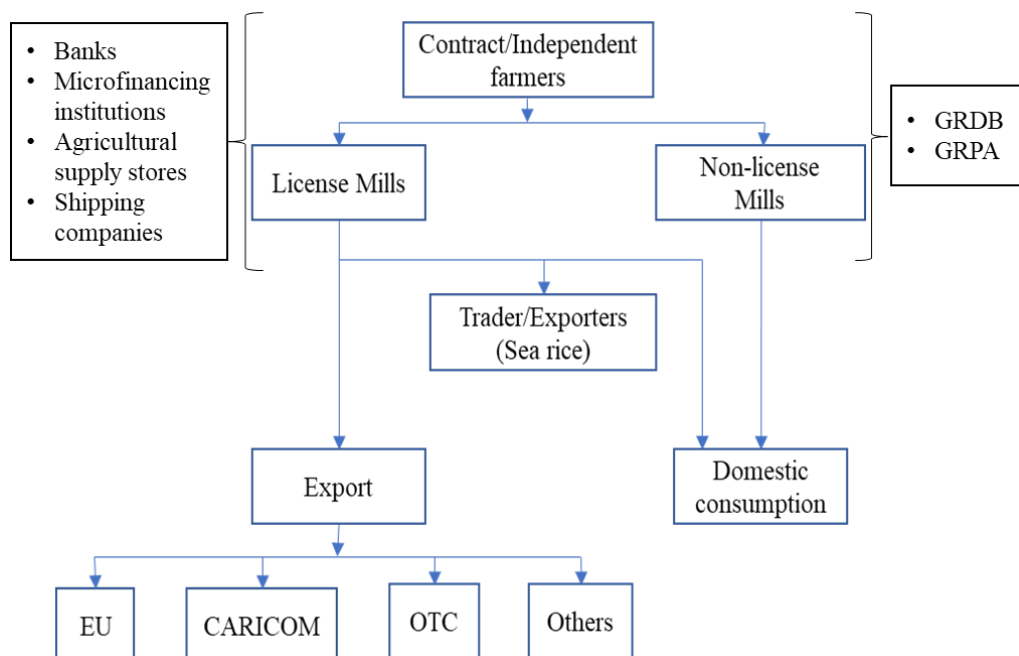


Figure 2.3 Guyana’s rice supply chain

They are supported by services provided by banks, microfinancing institutions, agricultural supply stores (seed, fertilizers, herbicides, and pesticides), and shipping companies. Additionally, government agencies like the Guyana Rice Development Board (GRDB) provide critical services such as seed at a cost, quality assurance, extension services, and monitoring. At the same time, the Guyana Rice Producers Association (GRPA) provides some extension services and seeds at a cost to rice farmers.

Finally, there are no active rice farmers' cooperatives, village-level farmers' groups, spot markets, or middlemen for farmers to market their paddy. Therefore, rice farmers must sell their paddy directly to mills, all of which are located in rural areas.

### 2.3. Financing in the rice industry

Access to financing is a major issue for farmers and mills in Guyana's rice industry. Farmers find it difficult to access financing from commercial banks who are averse to the risks in agriculture like frequent flooding, the bankruptcy of mills, default by big farmers, etc. Since banks require land as collateral, farmers who occupy leasehold lands cannot acquire financing. Large farmers are more likely to acquire financing from commercial banks, but smaller farmers source credit from alternative sources such as rice mills, input suppliers, equipment suppliers, and microfinance institutions (interest rate of 21%).

Financing is also a major issue for mills in Guyana, especially small mills requiring financing to upgrade their facilities to increase productivity. Interest rates are relatively high, with millers and exporters receiving a rate of 14% from commercial banks. Lending to rice millers declined from G\$5.9 billion in 2000 to G\$1.7 billion in 2008 (Tracey, 2009). This, in addition to doubling paddy prices, resulted in a mismatch with available financing. Millers are currently managing this constraint by either securing funds from other sources or, more commonly, by delaying payments to producers (farmers) until payment has been received from buyers, thereby directly increasing the risk of late payment or default between farmers and millers (World Bank, 2011).



## 2.4. Institutional framework

### 2.4.1. The Rice Producers Association (RPA)

The Rice Producers Association (RPA) was established by Act No.7 of 1946; this organization was a product of the industrialization of British Guyana. However, due to its capitalist structure, the organization benefited wealthy merchants and millers more than farmers who continued to live at subsistence levels (Guyana Chronicles, 2015).

Mechanization in the industry, led notably by businessman Kayman Sankar created a boom in the industry; however, this did not translate into subsequent gains for farmers because the system was said to favor the millers and merchants. Even though farmers succeeded in keeping the industry viable, they could not attain wealth due to oppression by some millers.

Until 1957, the RPA served the bureaucracy's interests instead of representing the rights of the farmers for whom it was established. This changed under the leadership of Dr. Cheddi Jagan, whose vision restored the organization to its proper mandate while regaining farmers' confidence.

### 2.4.2. Government support/control institutions

In 1946, the Guyana Rice Board (GRB) was established, bringing government officials and farmers together to develop a policy for the sub-sector (National Development Strategy, 1996). This board was soon dissolved by the Rice Regulation of Manufacturing and Marketing Act of 1985, which fostered the establishment of three new institutions, namely, the Guyana Rice Export Board (GREB), the Guyana Rice Milling and Marketing Authority (GRMMA), and the National Paddy and Rice Grading Centre (NPRGC).

#### 2.4.2.1 Guyana Rice Export Board (GREB)

GREB serves the function of regulating rice exports. It also serves to support the GRMMA by arranging the export of its rice. However, in 1985, it was given the responsibility of licensing exporters and approving the quality and price of each export transaction. This was done at a fee equivalent to 3% of the value of the export price received by the exporter.

#### 2.4.2.2 Guyana Rice Milling and Marketing Authority (GRMMA)

The GRMMA was initially intended to purchase and sell paddy and rice. This institution also had its milling facilities, supplying rice to domestic and export markets. GRMMA purchased paddy at fixed prices set by the government according to a formula based on the cost of production.

It should be noted, however, that beginning from the early 1980s, some private millers were authorized to buy and sell to the domestic market at fixed prices, and from the mid-1980s, they were allowed to export (National Development Strategy 1996).

#### 2.4.2.3 National Paddy and Rice Grading Centre (NPRGC)

The NPRGC was responsible for grading and certifying paddy and rice for domestic use and export. This institution established national grading standards and assigned mill personnel to monitor the grading process (National Development Strategy, 1996).

The high level of intervention by these institutions resulted in severe restrictions on internal trade. Farmers were constrained to sell within specific geographical areas. As a measure to combat “hoarding of paddy,” further restrictions were put in place to regulate the amount of rice or paddy a farmer could hold.

Of the many policies and institutional arrangements, the pricing formula was responsible for disincentivizing Guyana's rice farming. The Rice Regulation of Manufacturing and Marketing Act of 1985 placed the responsibility for setting the legal price for different grades of paddy under the mandate of the Ministry of Agriculture. Farmers had the option of selling either GRMMA or to the millers. These millers would then sell to wholesalers or abroad directly at prices negotiated and approved by the GREB. In cases where it was sold to wholesalers, the rice was then sold to retailers, who in turn sold to consumers at ministry-set prices.

However, these policies severely restricted farmers, and due to a lack of alternatives, many farmers continued cultivating rice. Land and production consolidation were among the most prominent side effects of these policies. Small farmers, in particular, began to abandon production, selling their lands or renting them to larger farmers, or converting them for more lucrative options. This meant that the power to produce was in fewer hands. The rapid exodus resulted in rice production reaching a low of 93,000 metric tons in 1990. Rice exports were depressed during the 1980s, falling to a low of 29,000 metric tons in 1985.

By the late 1980s, the obvious failure of the policy framework prompted the dismantling of the pricing and institutional structure. Farmers were now free to sell wherever they wanted. The government also sold all of its mills, retaining only GRMMA. This greatly improved competition and provided incentives for farmers to re-enter the industry. Thus by 1991, the area harvested increased by 46% and output by 60%, with a strong positive trend in the following years.

The 1994 Rice Act streamlined the previous institutional arrangements. The Guyana Rice Milling and Marketing Authority (GRMMA) was dissolved, and a small parastatal rice company was created to operate the Burma mills, the only remaining state-owned company. The GREB and NPRGC have been merged into the new Guyana Rice Development Board (GRDB) (National Development Strategy, 1996). The main functions of the GRDB are:

- To develop the rice industry in Guyana and to promote the expansion of exports.
- To establish facilities for the conduct of research relating to rice and extending the benefits derived from the research to the rice farmers through an established system.
- To engage in such promotional and developmental activities which the Board deemed necessary for the purpose of developing the rice industry.

## 2.5. Trade agreements and marketing of Guyana's rice

Table 2.2 shows Guyana's export quantities and percentages by export destination. The two major export markets for rice were the European Union (EU) and the Caribbean, with 52 percent of total exports going to the EU and 16.53 percent heading to CARICOM countries in 2009 (World Bank, 2011).

Table 2.2 Export quantity and percentage by destination

<u>Destination</u>	<u>Quantity (MT)</u>	<u>Total Export %</u>
CARICOM	82,526	16.53
European Union	259,825	52.01
North America	1,163	0.23
Latin America	155,630	31.18
West Africa	25	0.01
Others	23	0.01
Total	499,192	100.00

Source: GRDB annual report 2016

### 2.5.1. The EU Market

Historically, the market was primarily focused on the EU, which provided preferential market access (US400/mt for grade B rice) to other countries and territories (OCTs). However, dependence on this type of market has given farmers a false sense of security because Guyana's rice did not have to compete in the global market.

Guyana benefited from its share of the African, Caribbean, and Pacific (ACP) quota of 125,000 tons of rice and 20,000 tons of broken rice. As a result, there is a 65% levy deduction. Furthermore, in addition to the ACP "direct quota," Guyana benefited from the so-called ACP/OCT quota. The OCT quota stipulated that rice produced in an ACP state and processed in an OCT state was eligible for levy-free access to the EU. This further increased the demand for Guyana's paddy by countries desirous of exploiting this loophole to gain access to EU markets. However, due to pressure from the Italian government and other EU member states, the EU was forced to change its policy, and thus, in 1998, the Cereal Management Committee of the EU divided up the quota for rice from ACP countries to the EU into four categories. They are as follows:

1. ACP direct quota of 125,000 metric tons of husked rice equivalent.
2. ACP direct quota of 20,000 metric tons of broken rice.
3. The OCT quota of 35,000 metric tons was granted first in January, and then the unutilized amount was granted in May.

4. A combination of OCT and ACP quota. Any ACP “direct quotas” that remained unutilized at the end of each tranche could be applied for and shipped to the EU through OCT.

Guyana, as a member of the ACP group, benefited from the Cotonou agreement on preferential market access to the EU (European Commission, 2010). However, as of 2008, the agreement ended as the EU adopted trade programs more compatible with WTO programs. This change resulted in a reduction of a 2-2.5% preferential margin in relation to the WTO's Globalized System of Preferences (GSP). Furthermore, 50% of exports no longer receive preference.

### 2.5.2. Caribbean Community (CARICOM) Market

Due to declining access to EU preferential markets, exports have been shifted towards the Caribbean region. Guyana rice exports benefit from a 20% CARICOM tariff on extra-regional rice imports and lower shipping costs due to its geographic proximity to the Caribbean markets (World Bank 2011). Exports to CARICOM account for a significant portion of Guyana’s rice exports at 16.532%.

**Table 2.3 Export quantities and percentages by CARICOM destination for the period 2014-2016**

Country	2014	Export (%)	2015	Export (%)	2016	Export (%)
Antigua	1,100	0.22	812	0.15	839	0.17
Bahamas	-	-	-	-	25	-
Barbados	2,435	0.48	2,763	0.5	2,808	0.57
Belize	1,451	0.28	101	0.02	-	-
Dominica	971	0.2	1,249	0.23	1,055	0.22
Grenada	1,754	0.34	1,777	0.34	1,815	0.37
Jamaica	50,264	10.02	47,913	8.9	43,777	8.77
St. Kitts	389	0.07	343	0.07	343	0.07
St. Lucia	611	0.12	715	0.13	837	0.17
St. Vincent	3,574	0.71	4,076	0.8	3,781	0.76
Suriname	1,558	0.31	1,181	0.23	485	0.1
Trinidad	24,328	4.85	24,926	4.63	26,761	5.36
Sub-Total	88,435	17.6	85,856	16	82,526	16.56

Source: GRDB annual report 2016

Jamaica is the leading Caribbean destination for rice exports, followed by Trinidad and Tobago, accounting for 85.32% of Guyana’s Caribbean rice exports. Table 2.3 shows the Export quantities and percentages by CARICOM destination for 2014-2016, indicating that within CARICOM, Jamaica and Trinidad and Tobago are the best markets for Guyana, accounting for 8.77% and 5.36% of exports, respectively.

### 2.5.3. PetroCaribe Rice Compensation Scheme

Guyana signed the PetroCaribe agreement with Venezuela to barter rice for oil on October 21, 2019. This was a yearly renewable agreement in which the Venezuelan government purchased a set quantity of paddy to be purchased from Guyana at a premium price above the global market price. As per the agreement, the Venezuelan government would subtract the value of paddy and rice received from Guyana from the value of oil due for shipment to Guyana.

As a result of this agreement, Guyana’s overall oil import bill and public debt were effectively reduced. Through the PetroCaribe agreement, Guyana was able to conserve its valuable foreign exchange. This would have otherwise been used to pay off its oil debt. These factors, coupled with the relatively high world market price, stimulated growth in the industry. Thus, during the PetroCaribe agreement, estimated paddy yield, rice yield, and acres reaped significantly increased (Clegg, 2013).

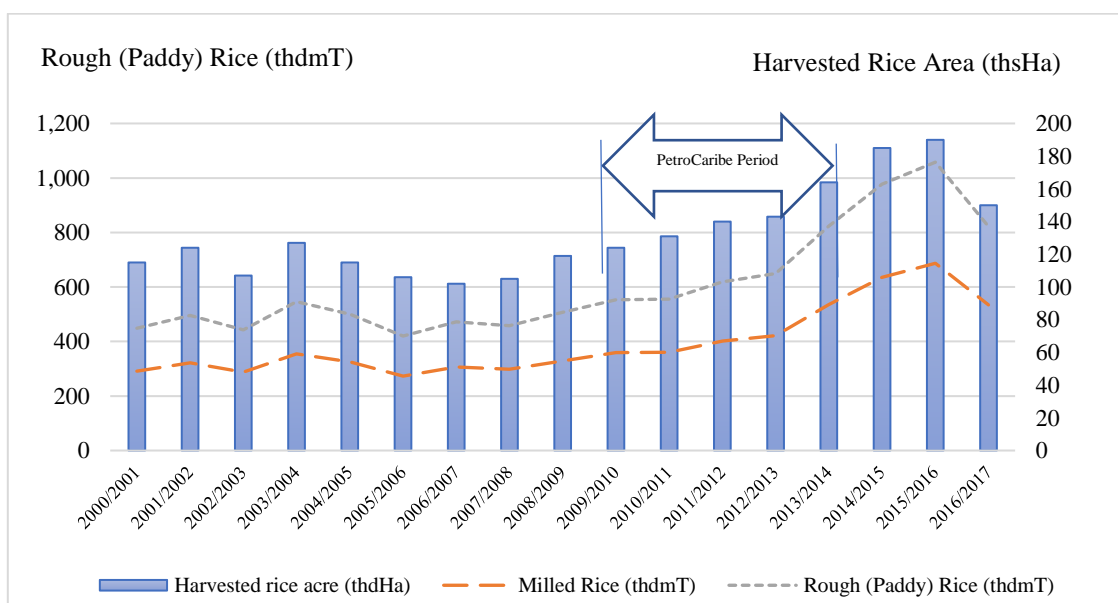


Figure 2.4 Acreage harvested, paddy yield, and rice yield in Guyana, 2000-2016

Source: Guyana Rice Development Board

Figure 2.4, which shows Acreage harvested, paddy yield, and rice yield in Guyana, 2000-2016, shows that Guyana’s estimated paddy yield increased from 533 metric tons in 2009 to 823 metric tons by mid-2013. Subsequently, Guyana exported about 267,000 metric tons of rice and 445,000 metric tons of paddy valued at US\$214 million and US\$224 million, respectively. This was accomplished under six (6) sales contracts covering 2009-2013. From figure 2.5, which shows the contribution of rice to GDP at current prices (2006-2013), it can be seen that this increase in production and exports propelled rice ahead of sugar as a contributor to GDP, with the gap being the widest by 2013.

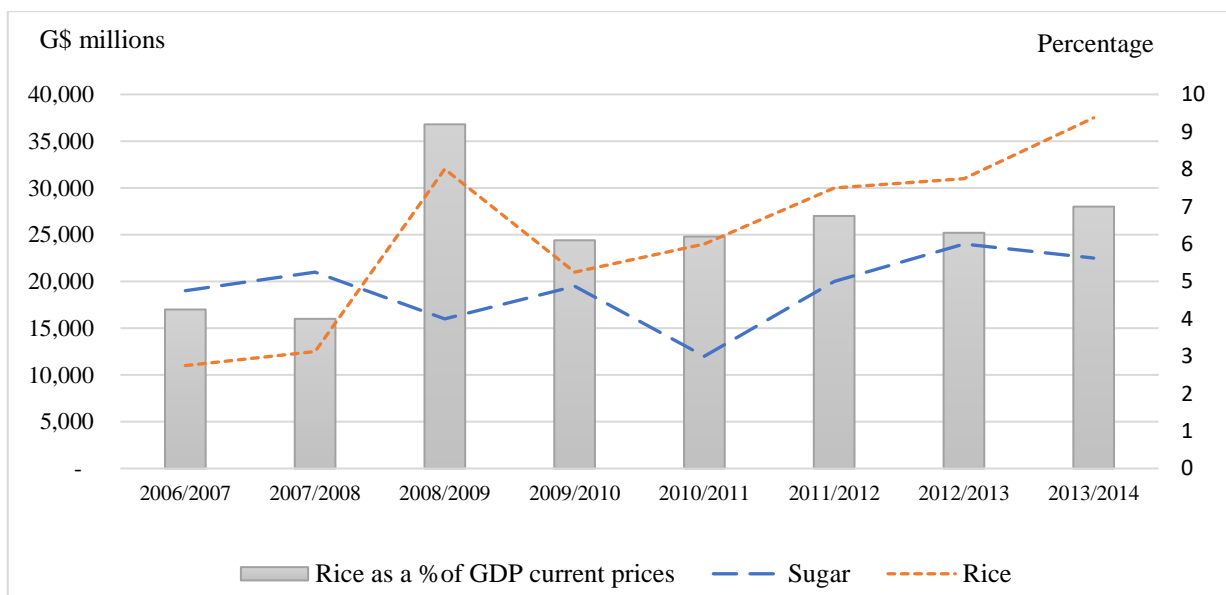


Figure 2.5 Contribution of Rice to GDP at current prices (2006-2013)

Source: Guyana Rice Development Board

The management of quota allocation to millers for the supply of rice and paddy under the PetroCaribe Agreement was placed under the purview of the Guyana Rice Development Board (GRDB). Quotas were allocated to all rice mills based on their annual production value (Wenner et al., 2016). This provided incentives for millers to purchase and produce more, while farmers benefitted from higher prices from competition among the millers. Competition to win quota rights to export to Venezuela also contributed to the discontinuation (by many mills) of the paddy grading system (A, B, and C grades). As a result, farmers supplied millers directly and earned a standard rate, regardless of destination (Clegg, 2013).

The growth in exports to Venezuela, which began in 2009, benefitted Guyana greatly; however, these benefits came at the expense of exports to other rice trade destinations. The most important were the Netherlands, Jamaica, Trinidad and Tobago, and Haiti. Exports to these destinations declined during the period 2009-2012; however, exports rebounded in 2013 when production exceeded the demands of Venezuela.

In November 2015, Venezuela announced that it would not renew the contract for 2016 and proceeded to suspend the remaining balance under the Compensation Agreement of 2015. The Compensation Agreement was viewed by observers as being under threat of either modification or cancellation for some time, given Venezuela's internal economic and political challenges (Clegg, 2013).

The effect of the loss of this market was that lower prices were being offered to farmers. This significantly reduced incentives for farmers to produce, particularly small farmers whose cost of production per acre was relatively higher. The price per bag (165lbs) fell from G\$3500 to \$1,500-\$1,800 (Wenner et al., 2016).

From figure 2.6, which shows paddy and rice production and harvested area, 2007-2017, it can be observed that both production measured as thousands of metric tons (thDmT) and the quantity of harvested rice area measured in thousands of hectares (thdHa) fell rapidly from 2015 onward as farmers attempted to adjust to the changing market situation.

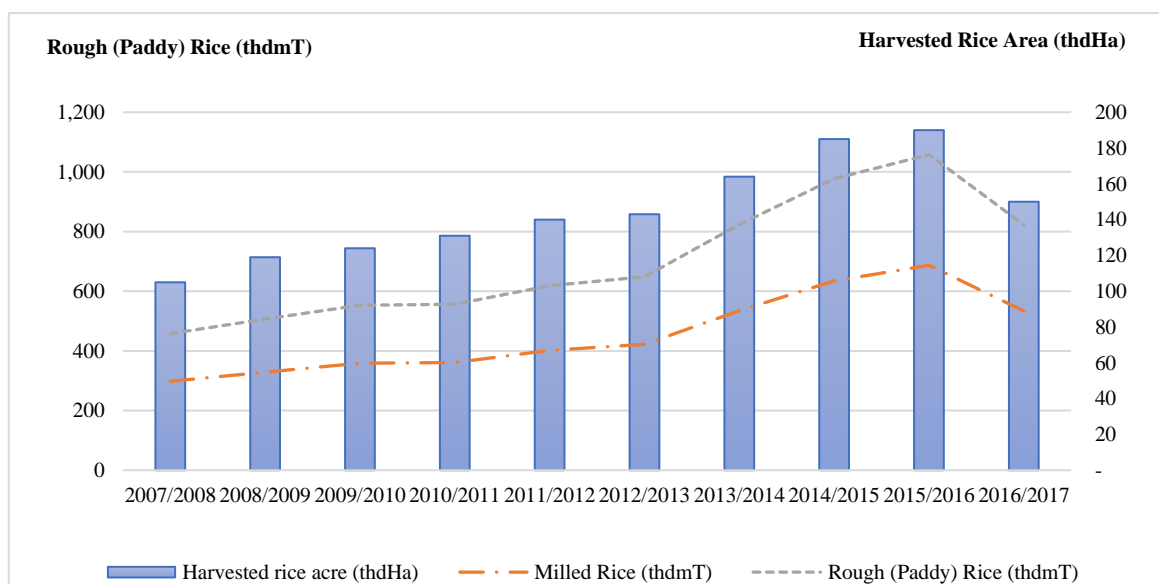


Figure 2.6 Paddy and rice production and harvested area, 2007-2017

Source: Guyana Rice Development Board 2016 annual report



The suspension of the PetroCaribe agreement also had a profound effect on millers. Due to high production costs, millers were less able to subsidize their participation in lower price markets where profit margins were low to non-existent. This mainly harmed those millers who were indebted to financial institutions. Some millers scaled back their operations while others were forced into bankruptcy.

## 2.6. Strategies for Development

In 2013 the government of Guyana formulated a national strategy for Guyana’s agricultural sector entitled “AGRICULTURE–ECONOMIC AND SOCIAL PROSPERITY.” According to the official publication on the strategy “A National Strategy for agriculture in Guyana 2013-2020,” Guyana’s vision for Agriculture 2020 seeks to change the view that agriculture is for subsistence livelihood while it also seeks to promote agriculture as a wealth generator and entrepreneurial enterprise, producing food and non-food commodities to meet local and export demand.

Unlike previous agricultural strategies like those applied shortly after independence, which focused on the 5Cs (citrus, cassava, coconut, cocoa, and cattle) or the 4Ps approach (pepper, plantain, pineapple, and pumpkin) adopted in recent years, this strategy utilizes the F-5 approach. This strategy was meant to build on strategies previously employed. Below is a brief explanation of each aspect of the F-5 approach.

- Food security- consolidating the end of hunger in Guyana, ensuring everyone in every community has enough food.
- Fiber and nutritious food accessibility for the citizens – nutrition security for all.
- Fuel production – helping develop alternative fuel sources, reducing dependence on fossil fuels, and creating a bio-energy industry in Guyana.
- Fashion and health products – an agro-processing industry that will create a new industry in Guyana.
- Furniture and crafts – an industry expected to grow in importance in Guyana.

Table 2.4 shows the 25 priority areas for success identified under Guyana’s Vision for Agriculture 2020. Under this strategy, priority area number 9, “Sustained high rice production and value-added rice products and exports,” focuses on the rice industry.

Table 2.4 Guyana's Vision for Agriculture 2020- 25 Priority Areas for Success  
Vision 2020

1	Sustaining and Expanding Guyana's Agro-Diversity Policy and Program.	2	Farming Systems and Techniques, Biotechnology and Precision Agriculture.
3	Water Security and Management (A Modern and Efficient drainage and irrigation system).	4	Infrastructure Development (Other Than drainage and irrigation system).
5	Soil Health.	6	Plant and Livestock Health and Protection.
7	Increased Livestock Production and Diversity.	8	Increased Fish Production and Diversity.
9	Sustained High Rice Production and Value-Added for Rice Products and Exports.	10	Sugar Production To > 450,000 tons and value-added exports.
11	Increased Crop Production and Diversity	12	Increased Agro-Processing and Value-Added Products for Local and Export Market.
13	Marketing of Agricultural Products Internationally.	14	Upgrading of Transportation, Packaging, Storage, And Cargo Space.
15	Human Resource Development – Improving Training and Capacity Building for Agriculture.	16	Food and Nutrition Security.
17	Developing an Agri-Fuel Industry in Guyana.	18	Environmental Sustainability.
19	Risk Reduction and Disaster Management.	20	Hydrometeorology.
21	Land Availability, Land Zoning, and Land Tenure.	22	Long Term Investment in Research and Development
23	Strengthened Organizational Structure	24	Policies and legislative Framework
25	Financing Mechanisms for Agriculture		

Source: A National Strategy for Agriculture in Guyana 2013-2020 pg. 40

Table 2.5 below shows a detailed description of the activities and indicates for priority area 9. Based on the list of activities and indicators given in Table 2.5, emphasis is mainly placed on production, improved technology, and value addition. However, there is no focus on improving the rice supply chain to change the lack of competitiveness in the industry due to the lack of adequate market players.

Table 2.5 List of activities and indicators identifies for priority area number 9

Activities		Indicators	
1	Maintain cultivation at an average of 80,000 ha per to maintain production above 500,000 tons annually.	1	Maintain average rice production greater than 500,000 tons of rice throughout the period to 2020 and cultivation of about 80,000ha per crop.
2	Continue to improve paddy yield per ha.	2	Attain paddy yield of at least 6 tons per ha by 2 020 with no region less than 5.5 tons.
3	Promote the use of precision farming methods for the rice industry, focusing on agronomic practices, including soil testing and balanced nutrition with mixed fertilizers.	3	(a) More than 40% by 2015 and 80% by 2020 farmers using the 6-point practice promoted by GRDB. (b) Rice farms conduct soil testing at least once per year. (c) fertilizers matching soil test results.
4	Promote packaged rice sales for Guyana’s rice.	4	Increase packaged rice sales to about 20% of Guyana’s rice sales by 2020.
5	Encouraged value-added rice products, including flour, cereal, and rice snacks.	5	At least 20,000 tons of rice are utilized for value-added products by 2020, with an export component in place.
6	Promote the use of agro-energy technology to produce power for the rice industry.	6	At least three rice factories utilize energy conversion technology, reducing power costs by at least 10% per year by 2020.
7	Review the Rice Factory Act to more effectively meet the needs of the rice industry.	7	The Rice Factory Act is reviewed, and recommendations for amendments made to HOD by the end of 2014 and relevant action by 2016.

Source: A National Strategy for Agriculture in Guyana 2013-2020 pg. 66-67

Furthermore, there is no emphasis on improving and promoting institutional arrangements such as contract farming which have been proven to give more significant financial incentives to farmers to continue production.

## 2.7. Summary

Guyana is the largest rice producer in Caricom and one of the Caribbean’s two rice exporting countries. It has a total land area of 214,999 km<sup>2</sup> and a population of 792,925 people. Rice farmland accounts for 150,224

km<sup>2</sup> of Guyana's total land area, with approximately 15,933 farmers cultivating it. Guyana's total paddy production in 2016 was 822,229 metric tons (mt), with a yield of about 5.5 tons per acre.

The rice supply chain in Guyana is characterized by a direct interaction between farmers, millers, and exporters. The main participants in Guyana's rice supply chain are farmers, millers, and exporters. They are supported by services provided by banks, microfinancing institutions, agricultural supply stores, and shipping companies. Additionally, government agencies like the Guyana Rice Development Board (GRDB) provide critical services such as seed at a cost, quality assurance, extension services, and monitoring. At the same time, the Guyana Rice Producers Association (GRPA) provides some extension services and seeds at a cost to rice farmers. There are no active rice farmers' cooperatives, village-level farmers' groups, spot markets, or middlemen for farmers to market their paddy. Therefore, all rice farmers must sell their paddy directly to millers located in rural areas.

Access to financing is a major issue for farmers and mills in Guyana's rice industry. Farmers find it difficult to access financing from commercial banks who are averse to the risks in agriculture like frequent flooding, the bankruptcy of mills, default by big farmers, etc. Large farmers are more likely to acquire financing from commercial banks, but smaller farmers source credit from alternative sources such as rice mills, input suppliers, equipment suppliers, and microfinance institutions (interest rate of 21%).

Financing is also a major issue for mills in Guyana, especially small mills requiring financing to upgrade their facilities to increase productivity since interest rates are relatively high, with millers and exporters receiving a rate of 14% from commercial banks. Decreased lending to rice millers and doubling paddy prices resulted in a mismatch with available financing. Therefore, mills currently manage this by either securing funds from other sources or delaying payments to producers (farmers) until payment has been received from buyers, thereby directly increasing the risk of late payment or default between farmers and millers.

In 1946, the Guyana Rice Board (GRB) was established, bringing together government officials and farmers to develop a policy for the sub-sector. However, in the subsequent years, farmer representation on the board diminished to the point where there was no representation.

The Rice Regulation of Manufacturing and Marketing Act of 1985 dissolved the GRB and, in its place, created three separate entities, namely, the Guyana Rice Export Board (GREB), the Guyana Rice Milling and Marketing Authority (GRMMA), and the National Paddy and Rice Grading Centre (NPRGC).

The 1994 Rice Act streamlined the previous institutional arrangements. The Guyana Rice Milling and Marketing Authority (GRMMA) was dissolved, and a small parastatal rice company was created to operate the Burma mills, the only remaining state-owned company. The GREB and NPRGC have been merged into the new Guyana Rice Development Board (GRDB).

Historically Guyana has depended heavily on preferential trade agreements. The most notable are those with EU markets as a member of the African, Caribbean, and Pacific (ACP) group of countries through the Cotonou, CARICOM, and the PetroCaribe agreement, which barter rice for oil.

The current strategy for developing the agriculture sector and, by extension, the rice industry is the “AGRICULTURE–ECONOMIC AND SOCIAL PROSPERITY” strategy, also known as the National Strategy for Agriculture in Guyana 2013-2020. However, this strategy focuses heavily on production, the implementation of new technologies, and value addition while neglecting the improvement of the rice supply chain and institutional arrangements such as contract farming which would create better financial incentives for farmers and aid them in the process of modernization and efficiency enhancement. Therefore, further study is needed on the role and impact of institutional arrangements, particularly contract farming, to shed light on its importance and the need for its inclusion in Guyana’s national strategy for developing the rice industry.

### **3. Chapter 3 - The role and impact of rice contract farming with a high-price standard in Guyana: A case study of Mahaica-Berbice**

#### **3.1. Introduction**

There has been some study on the rice industry in Guyana, such as that of Wenner et al. (2016), which focuses partially on the cost of rice farming. They concluded that only the most cost-efficient farmers could have incentives to maintain or expand their planted area. However, they did not evaluate the profitability of contract farming.

Additionally, there are many studies on contract farming and its effect on profitability and or cost of production, such as a study by Cai et al. (2008). They found that contract farming benefits farmers with larger land and family sizes, among other things.

However, these studies did not focus on situations with a high-price standard. Therefore, whether contract farming in the before mentioned situation increases rice farming profitability must be addressed.

As such, this chapter seeks to evaluate the role and impact of rice contract farming in Guyana, where there is a high-price standard. This will be achieved by determining the reasons for contract farming participation, the factors influencing contract farming participation, and its impact on profitability.

## 3.2. Methodology

### 3.2.1. Contract type and characteristics

Contractual agreements are made directly between millers and farmers and are usually informal and oral, lasting for at least one growing season (3 months).

When making a contract, the farmer meets the miller directly before planting and expresses their intent to enter into a contractual agreement. During the meeting, the miller and farmer discuss the possibility of entering into a contract. If the miller agrees to enter the contract, the types, quantity, date of delivery, delivery method, destination of delivery, and price of fertilizers are stated. Millers may also provide loans to farmers; however, this is usually available to medium to large farmers. The area to be planted and the expected harvest date may also be discussed.

The farmer is expected to supply all their paddies to the miller; however, the farmer is not obligated to do so. Therefore, the farmer can sell to as many millers as they want, but the farmers must cover the miller's cost of inputs provided under the contract by providing paddy at the end of the growing season. The contracted farmer faces no liability if he loses the crop due to a pest or natural disaster, thus allowing farmers to share production risk with the mill.

The miller decides the price of the paddy after harvest. Farmers have little negotiation power and are primarily price takers, mainly due to a lack of storage for their paddy and a lack of sufficient third-party representation.

The harvested paddy is transported to the miller's facility, where it is priced. However, the miller may adjust the price based on the amount of foreign material (straw, weed seeds, empty grains, etc.) in the paddy at the grading time. The miller then deducts the cost of fertilizer supplied and other services provided from the value of the paddy's actual weight before payment is made to the farmer.

There are often many conflicts between millers and farmers related to grading, weight, and timely payment. Millers often default or delay payment to farmers for extended periods after paddy is supplied (World Bank, 2011). Furthermore, many farmers complain about inconsistencies in the weight of paddy among mills

(Guyana Chronicles, 2020). Millers generally accept paddy from both contract and independent farmers. However, independent farmers tend to choose a miller with the lowest estimation of foreign materials.

### 3.2.2. Data collection

The data used in this chapter was collected through an interview by data collectors. They utilized the kobotoolbox online survey as the primary data collection tool in the field. The researcher prepared the survey questionnaire to collect socio-economic, cost, production, and contract farming participation data for 2021.

This study used the systematic sampling method to select the number of farmers interviewed from each village in the study area. This procedure was divided into three steps. Step 1 calculated the sample size as 15% of the total number of farmers in Mahaica Berbice. Step 2 entailed converting the number of farmers in each village into ratios of the total number of farmers in Mahaica Berbice. Lastly, step 3 applies the ratios calculated in step 2 to the sample from step 1 to determine the number of samples from each village. Data were collected from 171 farmers in Mahaica Berbice, including 91 contract farmers and 80 independent rice farmers.

### 3.2.3. Data analysis

This study determines the role of contract farming by applying the binary logistic regression method to identify the factors influencing farmers' decision to participate in contract farming (Contract farming status: 0 = independent farmer, 1 = contract farmer). The binary logistic regression was used to show the individual effect of each selected socio-economic characteristic (factors) on farmers' decision to participate in contract farming. Furthermore, it is suitable for a regression model where the dependent variable is binary. That is, it takes only two values, 0 or 1.

The dependent variable contract farming status (dummy) was classified as 0, representing independent farmer, and 1 for contract farmer. The following model was used to identify the effect of the selected socio-economic characteristics (factors) on contract farming participation:

$$Z_i = \ln [P(Y_i = 1)/1 - P(Y_i = 1)] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e \quad \text{Equation 3-1}$$



Where  $Z_i$  is the odds ratio of farmers' decision to participate in contract farming,  $p(Y_i = 1)$  is the probability of a farmer participating in contract farming (contract farmer).  $1 - P(Y_i = 1)$  is the probability that a farmer does not participate in contract farming (independent farmer).  $\beta_0$  is the intercept,  $\beta_1 \dots \beta_4$  represents the independent variables' regression coefficients, and  $X_1 \dots X_4$  represents the independent variables.

The independent variables included in the binary logistic regression were the farmer's total land because it was found to influence contract farming participation (Simmons, 2005); The number of family members because the household size was found to have a significantly positive effect on contract farming participation (Swain 2012); The distance to the mill because the distance to the market has been shown to have a positive effect on contract farming participation (Khanal et al. 2020) and the Percentage (%) of earnings from rice cultivation was included because there was a significant difference between contract and independent farmers.

A profitability analysis was performed to determine the impact of contract farming on profitability. This study computed gross margin using the formula:  $\text{Gross margin} = \text{Revenue} - \text{Cost of goods sold}$ .

The sale of paddy generates revenue. It was calculated using the following formula:  $\text{Revenue (GYD/acre)} = \text{Yield (tons/acre)} \times \text{Selling price (GYD/ton)}$ .

While the term "cost of goods sold" refers to the direct costs of producing the product, such as direct labor costs and any costs of materials used in paddy production and harvesting, and transportation costs. Therefore, fixed cost, such as depreciation, is treated as a separate line item in the income statement and was not included in the cost analysis.

### 3.3. Results

#### 3.3.1. Socio-economic characteristics (factors)

Table 3.1 shows the socio-economic characteristics of contract and independent farmers in Mahaica Berbice. The findings indicate that contract farmers had significantly more land for cultivation than independent farmers. In fact, contract farmers' total land was 97.84 acres compared to independent farmers' total land of 53.95 acres. Furthermore, they dedicated significantly more land to rice cultivation, that is, 91.52 acres compared to 50.04 acres for independent farmers.

Regarding machinery, tractors are the main machinery used by farmers for rice cultivation. The results show that contract farmers owned significantly more tractors. Contract farmers owned a mean of 1.34 tractors, while independent farmers owned a mean of 0.83 tractors.

When considering the farmer's household, contract farmers were observed to have significantly larger families than independent farmers. The findings in table 3.1 show that contract farmers had a mean of 1.41 family members, while independent farmers had a mean of 0.92 family members.

Contract farmers also live significantly further from the mill they supply. The findings of the comparison of means show that contract farmers live a mean distance of 4.53 miles from the mill they supply. While on the other hand, independent farmers lived a mean distance of 3.51 miles from the mill they supplied.

Concerning earnings, it was observed that contract farmers earned significantly more from rice cultivation than independent farmers. The analysis results in table 3.1 show that contract farmers earned a mean of 96.35% of their household earnings from rice cultivation, while independent farmers earned 91.88% of their earnings from rice cultivation.

Table 3.1 Socio-economic characteristics of the total group (High-price standard)

Variables	Description	Total group n=171	Contract farmers n=91		Independent farmers n=80		Test of means
		Mean	Mean	S. deviation	Mean	S. deviation	Sig.
Age (years)	Age of the farmer.	45.46	46.12	9.75	44.71	13.99	
Years of education	Years of formal education.	11.98	12.47	3.93	11.41	14.17	
Years of experience	Years of experience in rice farming.	20.29	21.55	11.44	18.86	13.63	
Total land (acre)	Total land area.	77.30	97.84	78.75	53.95	73.29	***
Rice land (acre)	The total acreage of rice land cultivated.	72.11	91.52	78.69	50.04	66.33	***
No. Tractor	The number of tractors owned.	1.10	1.34	1.15	0.83	1.29	***
No. of family members (persons)	The number of family members residing with the farmer.	1.18	1.41	1.305	0.92	1.20	**
No. of family laborers (persons)	The number of family members working on the farm.	0.66	0.57	0.93	0.76	1.00	
No. of Hired laborers (persons)	The number of hired laborers working on the farm.	6.70	6.93	5.14	6.44	4.80	
Distance from main town (miles)	Distance of the farm from the closest main town.	39.26	42.34	35.26	35.70	24.88	
Distance from mill (miles)	Distance of the farm from the miller they supply.	4.08	4.53	2.55	3.51	2.25	***
Acre of vegetables	Acres of vegetables cultivated.	0.09	0.03	0.23	0.16	0.82	
Acre of fruits	Acres of fruits cultivated.	0.00	0.00	0.00	0.00	0.00	
No. of poultry	The number of poultry reared.	29.94	52.20	421.49	4.63	24.27	
Heads of cattle	Heads of cattle reared.	14.78	13.32	52.86	16.45	89.61	
% of earnings from off-farm activities	Percentage of earnings from off-farm activities	3.95	2.97	12.89	5.10	14.97	
% of earnings from other crops	Percentage of earnings from other crops.	1.30	0.68	3.82	2.01	9.41	
% of earnings from livestock	Percentage of earnings from livestock.	2.00	1.81	5.20	2.22	7.35	
% of earnings from rice	Percentage of earnings from rice.	94.29	96.35	10.19	91.88	17.05	**

Note: 1) \*\*\*, \*\*, and \* denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

2) Total earnings = Earnings from off-farm activities + (Earnings from other crops + Earnings from livestock + Earnings from rice)

Source: The author collected

### 3.3.2. Role of contract farming.

#### 3.3.2.1 Reasons for contracting

Table 3.2 shows the reason for participating in contract farming under the high-price standard. The frequency distribution results show that farmers under the high-price standard primarily used contract farming to access fertilizer on credit. It was observed that 83.5% participated in contract farming to access credit. Additionally, farmers participate in contract farming to access stable markets and loans. However, only 48.4% and 35.2% of farmers indicated these as the reasons for participating in contract farming.

Table 3.2 Reasons for participating in contract farming under the high-price standard

Reasons	Frequency	%
Access to credit	76	83.5
Access to stable markets	44	48.4
Access to loans	32	35.2
A good relationship with the mill	9	9.9
Advance payment for paddy	6	6.6
Assistance with Harvesting	5	5.5
Recommended by other farmers	5	5.5
Access to better varieties	1	1.1
Access to machinery and equipment	1	1.1
Assistance with transportation	1	1.1
Higher paddy prices	1	1.1

Note: 1) 91 farmers = 100%

2) Farmers are allowed to give multiple responses

Source: The author collected

Contract farming allows farmers who live in rural areas far from the main town to get fertilizer on credit from their contract mill before planting and pay for them at the time of sale. This removes the need for up-front

cash to purchase fertilizer and allows farmers to allocate money to other rice cultivation-related activities and inputs.

Participating in contract farming allows the farmer to secure a market for their paddy, which is guaranteed to accept their paddy. Furthermore, contract farmers are given priority at their contract mills at the time of sale. Therefore, they do not suffer losses due to spoilage from holding undried paddy for an extended period.

Furthermore, contract farmers can access loans from their contact mill to purchase machinery and equipment, allowing them to increase their productivity. However, the availability of the loans likely depends on farm size and the farmers’ relationship with the contract mill.

### 3.3.2.2 Reasons for not contracting

Table 3.3 shows that the main reason for farmers not participating in contract farming under the high-price standard is unfair weights for paddies.

The results show that 42.5% of independent farmers identified unfair weights for the paddies they supply as their reason for not contracting. These farmers did not contract because they may lack trust in the final price calculated by the contract mill based on the “% of good paddies.” Therefore, they require the freedom to seek the mill that offers the highest “% of good paddies” and the best price.

Table 3.3 Reasons for not participating in contract farming under the high-price standard

Reasons	Frequency	%
Unfair weights for paddy	34	42.0
High input price	22	27.2
late payment for paddy	12	14.8
Farm size	11	13.6
Default on payment by mill	6	7.4
Low selling price	3	3.7

Note: 1) 80 farmers = 100%

2) Farmers are allowed to give multiple responses

Source: The author collected

### 3.3.2.3 Factors influencing contract farming participation

As mentioned earlier, a binary logistic regression analysis was conducted to determine the marginal impact of selected socio-economic characteristics on contract farming participation. The dependent variable contract farming status (dummy) was classified as 0, representing independent farmer, and 1 for contract farmer.

Table 3.4 Binary logistic regression of the factors influencing contract farming participation (High-price standard)

Independent variables	$\beta$ Coefficient	Standard Error	Odds ratio	p-value	
Constant	-3.250	1.545	0.039	0.035	**
Total land (acre)	0.011	0.003	1.011	0.001	***
No. of family members	0.393	0.186	1.481	0.034	**
Distance from mill (miles)	0.143	0.084	1.153	0.089	*
% of earnings from rice	0.019	0.016	1.019	0.232	

Dependent variable: Contract farming status

Note: 1) \*\*\*, \*\*, and \* denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

2) Model predictive accuracy: 74.7%

Source: The author collected

Table 3.4 shows the result of the binary logistic regression analysis. The results show that participation in contract farming is significantly influenced by the farmers' total land, the number (No.) of family members, and the farmers' distance from the mill.

The results show that farmers with larger farms are more likely to participate in contract farming. This is possibly because it allows farmers to access fertilizer on credit which is difficult to obtain in rural areas.

Additionally, large farmers may be more commercially oriented than small farmers and therefore require access to stable markets guaranteed to accept their paddies after harvest.

Furthermore, larger farmers may have more credibility with the mill than smaller farmers and, therefore, can access additional benefits such as loans which would otherwise be difficult to obtain at potentially higher limits for the purchasing machinery.

Farmers with larger families are more likely to be contract farmers. This is likely because contract farming requires farmers to meet quantity to maximize their earnings. Therefore, contract farming requires more labor. However, farmers with large families may be able to offset the labor needs by utilizing family laborers to carry out production-related tasks, particularly those that require care and judgment, such as pest control and seed preparation, to increase the quality and quantity of yields.

Finally, the likelihood of participating in contract farming increases as the farmers' distance from the mill increases. A greater distance from the mill results in higher transaction costs, such as search costs. Therefore, participating in contract farming allows farmers who live further away from the mill they supply to secure a stable paddy market and reduce their searching costs.

### 3.3.3. Impact of contract farming profitability

Table 3.5 shows the result of the profitability analysis of contract and independent farmers. It compares the costs and yield of contract and independent farmers. The results show that contract farming is significantly more profitable than independent farming. The higher profitability can be observed by looking at the gross margins. Contract farmers' mean gross margin/acre was GYD 43,137 compared to independent farmers' mean gross margin of GYD 33,735.

The difference in gross margin is due to contract farmers' significantly higher revenue. Contract farmers' mean revenue/acre was GYD 123,569 compared to independent farmers' GYD 117,687. The revenue was higher because contract farmers' yield was significantly higher than that of independent farmers.

Table 3.5 shows that the mean yield of contract farmers was 3.0 tons/acre, significantly more than independent farmers' mean yield of 2.7 tons/acre. Contract farmers' yield is higher because they spend significantly more on land preparation, hired laborers, seeds, and fertilizer, which implies that they may be using more of these inputs, thus increasing their yield beyond that of independent farmers. They can do this because they can get fertilizer on credit from the contract mill and pay for it at the time of sale, which allows them to reallocate money to the beforementioned production activities and inputs.

Conversely, the results also show that contract farmers' selling price is significantly lower than that of independent farmers. Contract farmers' mean selling price per ton was GYD 41,886, significantly less than

independent farmers' GYD 43,381 per ton. This was likely because contract farmers are obligated to supply their contract millers. Therefore, they cannot choose to sell to the miller offering the best price. In contrast, independent farmers can sell to the miller offering the best price.

Table 3.5 Comparison of costs and yield of contract and independent farmers (High-price standard)

Variables (GYD/Acre)	Contract farmers n=91	Independent farmers n=80	Test of means
	Mean	Mean	Sig
Revenue	123,569	117,687	**
Total cost	80,432	83,952	
Land preparation	13,827	12,008	**
Hired laborers	18,425	12,413	***
Seed	5,847	4,498	***
Fertilizer	23,538	16,911	***
Herbicide and pesticide	339	13,496	***
Harvest and transportation	8,224	8,714	
Rent	8,445	9,788	
Other	1,786	6,126	***
Gross margin	43,137	33,735	**
Yield (tons/acre)	3.0	2.7	***
Selling price per ton	41,886	43,381	***

Note: \*\*\*, \*\*, and \* denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

GYD denotes the Guyanese Dollar. 1 GYD is equal to 0.0048 United States dollars.

Source: The author collected

### 3.4. Discussion

This study examines the role and impact of contract farming of rice contract farming under the high-price standard.

The findings reveal that contract farming is a production risk-sharing mechanism since farmers are not required to pay the cost of fertilizer purchased from the contract mill if the crop is lost due to pests or natural disasters. Furthermore, it plays the role of being a source of fertilizer on credit. Thus, removing the need for up-



front cash for fertilizer and allowing farmers to reallocate cash to other production-related activities and inputs. Contract farming also serves as a way of accessing stable markets for farmers' paddy, which guarantees that farmers' paddy is accepted at the mill and reduces the likelihood of losses due to spoilage. Additionally, it is a source of finance via loans, especially for large farmers who can easily access these loans.

This study found that the socio-economic characteristics influencing contract farming participation were the farmers' total land, the number of family members, and the farmers' distance from the mill. The findings indicate that larger farms managed by farmers with larger families living far from the mill they supply are more likely to participate in contract farming. This is because contract farming allows these farmers access to fertilizer on credit, a stable market for their paddies, and loans to purchase farm machines to improve yield. Additionally, they can utilize their family members to carry out tasks that require careful judgment. Furthermore, since these farmers live far from the mill they supply, contracting reduces their transaction cost due to lower searching costs because they can access stable markets for their paddies.

This study revealed that contract farming is significantly more profitable than independent farms. Analysis indicates that contract farmers have higher gross margins than independent farmers. This is because they can obtain higher revenues resulting from higher yields. Contract farmers' yield is higher because they spend significantly more on land preparation, hired laborers, seeds, and fertilizer to increase their yield. They can do this because they can get fertilizer on credit from the contract mill and pay for it at the time of sale, allowing them to reallocate money to the beforementioned production activities and inputs.

### 3.5. Conclusion

This study revealed that contract farming plays the role of being a production risk-sharing mechanism, a source of fertilizer on credit, access to a stable market, and a means of acquiring loans.

Additionally, larger farms managed by farmers with larger families living far from the mill they supply are more likely to participate in contract farming.

Furthermore, this research proves that contract farming can be more profitable than independent farming in situations with a high price standard. However, contract farmers' profitability is limited because it is only due to higher yields, resulting from using more inputs made possible by access to fertilizer on credit.

This study is limited because it only focuses on contract farming under the single-rice system. Therefore, the question is, can contract farming under an alternative pricing standard, namely the low-price standard, also benefit farmers? Therefore, further study on the role and impact of contract farming with a low-price standard is needed to answer the before mentioned question.

## **4. Chapter 4 - The role and impact of rice contract farming with a low-price standard in Guyana: A case study of Essequibo Islands-West Demerara**

### **4.1. Introduction**

This chapter evaluates the role and impact of contract farming under the low-price standard. Consequently, this study seeks to answer the following questions in the context of Guyana: What role does contract farming play in rice farming? How does contract farming impact farmers' behavior?

This study addresses the previously mentioned questions by briefly explaining the characteristics of contract farming. Second, the socio-economic characteristics of contract and non-contract (Independent) farmers are examined. Third, we determine the role of contract farming by analysing its profitability and identifying factors influencing contract farming participation. Lastly, this study determines the impact of contract farming on farmer behavior in Guyana by analysing the factors influencing such behavior.

### **4.2. Methodology**

#### **4.2.1. Contract type and characteristics**

Contracts are typically informal and oral private agreements made directly between the farmer and miller for fertilizer supply for one growing season (4 months). Contracts are formed prior to planting, at which time the farmer and miller agree on the type, quantity, date of delivery, method of delivery, and prices of fertilizers to be supplied. Additionally, the planting area and expected harvest time are discussed.

The selling price of farmers' paddy is published at the end of the growing season. This is because the miller's export price influences the final price offered to the farmer at the end of the growing season. Therefore, farmers are unable to use contract farming as a means of hedging the market price in order to manage price risk.

However, contract farming does allow rice farmers to share production risk with the miller because contract

farmers are not required to reimburse the miller for fertilizer supplied if the crop is lost due to natural disasters or pests. This provides farmers with the opportunity to manage their production risk.

Contract farmers are expected to supply all the paddy produced to the miller; however, the farmer is not forced to do so. Therefore, contract farmers can sell to as many millers as they want, but they must cover the miller's cost of inputs provided by supplying paddy at the end of the growing season.

Paddy is sold immediately after harvesting. The harvested paddy is transported to the miller's facility, and the miller decides the selling price. However, the miller adjusts the price based on the percentage (%) of "good" paddies and, to a lesser extent, the grade of the paddies supplied.

Farmers can sell to as many millers as they want but must cover the cost of fertilizer received and pay fertilizer cost after harvest.

Before deciding on the final payment amount, the miller deducts the cost of fertilizer and other services provided from the value of the paddy supplied by the contract farmer after grading and pricing. The actual payment for the paddy is usually made later.

#### 4.2.2. Data collection

Study data were collected through an interview by data collectors. They utilized the kobotoolbox online survey as the primary data collection tool in the field. The researcher prepared the survey questionnaire to collect socio-economic, cost, production, and contract farming participation data for 2021.

This study used the systematic sampling method to select the number of farmers interviewed from each village in the study area. This procedure was divided into three steps. Step 1 calculated the sample size as 15% of the total number of farmers in Essequibo Islands-West Demerara. Step 2 entailed converting the number of farmers in each village into ratios of the total number of farmers in Essequibo Islands-West Demerara. Lastly, step 3 applies the ratios calculated in step 2 to the sample from step 1 to determine the number of samples from each village.

Data were collected from 146 farmers in Essequibo Islands-West Demerara, including 42 contract farmers and 104 independent rice farmers. However, 14 survey entries were eliminated because they were incomplete.

### 4.2.3. Data Analysis

We performed a profitability analysis to determine the impact of contract farming on profitability. This study computed gross margin using the formula: Gross margin = Revenue–Cost of goods sold.

Revenue is generated by the sale of paddy. It was calculated using the following formula: Revenue (GYD/acre) = Yield (tons/acre) x Selling price (GYD/ton).

While the term “cost of goods sold” refers to the direct costs of producing the product, such as direct labor costs and any costs of materials used in paddy production and harvesting, and transportation costs. Therefore, fixed cost, such as depreciation, is treated as a separate line item in the income statement and was not included in the cost analysis.

This study determines the role of contract farming by applying the binary logistic regression method to identify the factors that influence farmers’ decision to participate in contract farming (Contract farming status: 0 = independent farmer, 1 = contract farmer) and the factors that influence contract farmers’ behavior (decision to carry out “Non-rice farm activities”: 0 = No, 1 = Yes). The binary logistic regression was used because it shows the marginal effect of each independent variable, evaluated at the sample means, associated with the t-value and the odds ratio. It is appropriate for a regression model where the dependent variable is binary; the dependent variable takes only two values, 0 or 1 (Artetxe, 2018). Additionally, binary logistic regression is the best model when some variables are qualitative rather than quantitative (Fang, 2013).

To identify these factors influencing contract farming participation, we used the following model:

$$Z_i = \ln [P (Y_i = 1)/1- P (Y_i = 1)] = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + e \quad \text{Equation 4-1}$$

Where  $Z_i$  is the odds ratio of farmers’ decision to participate in contract farming,  $p (Y_i = 1)$  is the probability of a farmer participating in contract farming (contract farmer), and  $1 - P (Y_i = 1)$  is the probability that a farmer does not participate in contract farming (independent farmer).  $\beta_0$  is the intercept, and  $\beta_1 \dots \beta_6$  represents the independent variables’ regression coefficients. Meanwhile,  $X_1 \dots X_6$  represents the independent variables.

The independent variables included were the farmer’s age, education level, and total land because they were found to influence contract farming participation (Simmons, 2005); the number of family laborers because, as

family labor increases, so does the likelihood of contract farming participation (Rondhi, 2020). Moreover, the distance from the main town may affect the availability of inputs and consequently influence the farmer's decision to participate in contract farming. Finally, we included the percentage (%) of earnings from off-farm activities because it is expected to affect the farmer's need for credit (Sethboonsarng, 2008).

To identify these factors influencing their decision to carry out non-rice farm activities, we used the model below:

$$Z_i = \ln [P (Y_i = 1)/1 - P (Y_i = 1)] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + e \quad \text{Equation 4-2}$$

Where  $Z_i$  is the odds ratio of farmers' decision to carry out non-rice farm activities,  $P (Y_i = 1)$  is the probability that a farmer carries out non-rice farm activities, and  $1 - P (Y_i = 1)$  is the probability that a farmer is a "rice-only" farmer.  $\beta_0$  is the intercept, and  $\beta_1 \dots \beta_7$  represents the regression coefficients of the independent variables.  $X_1 \dots X_7$  represents the independent variables.

Contract farming status (dummy: 0 = independent farmer, 1 = contract farmer) was included because contract millers' pressure on farmers to produce paddy may influence farmers' willingness to diversify their production by engaging in non-rice farm activities. Age and education have been shown to have a prominent role in explaining diversification (McNamara and Weiss, 2005). Farm size increases the likelihood of product diversification (Rehima, 2013). Furthermore, farmers are more likely to diversify if they have access to labor (Culas and Mahendrarajah, 2005). Distance from the main town may affect market availability for farmers' various products, influencing their decision to diversify production by carrying out non-rice farm activities. Finally, off-farm income harmed farmers' willingness to diversify their farms (Ashfaq, 2005).

## 4.3. Results

### 4.3.1. Socio-economic Characteristics (factors)

The socio-economic characteristics of contract and independent farmers are compared in Table 4.1. The results show that contract farmers are significantly younger than independent farmers. The mean age of contract farmers was 47.40 years old, while independent farmers' mean age was 52.79.

Additionally, contract farmers were slightly more educated than independent farmers, with contract farmers

having 11.43 years of education compared to independent farmers' 10.23 years of education.

Farmers in the total group had mean years of experience of 26.73 years, with no significant difference between contract and independent farmers.

Contract farmers' total land was larger than that of independent farmers. Their total land was 34.07 acres, while independent farmers' total land was 29.55 acres. Additionally, the mean rice land of contract farmers was 33.73 acres, whereas independent farmers' mean rice land was 29.16 acres.

Regarding machinery, rice farmers in Essequibo Islands-West Demerara own 0.67 tractors. However, there was no significant difference between the number of tractors owned by contract and independent farmers.

Turning to the matter of the number of family members, contract farmers had significantly fewer family members. They had a mean of 2.33 family members, while independent farmers had 3.19 family members.

The findings also show that contract farmers had significantly fewer family laborers. Family laborers are family members besides the farmer who actively participate in rice cultivation activities on the farm. The mean number of family laborers of contract farmers was 0.50, whereas that of independent farmers was 1.12.

Conversely, contract farmers used significantly more hired labor. The mean number of hired laborers employed by contract farmers was 6.13 persons, whereas that by independent farmers was 2.52.

Contract farmers live closer to the mill that they supply. The mean distance between contract farmers and the mills they supply was 0.97 miles, whereas the mean distance between independent farmers and the mills they supply was 8.23 miles.

Moreover, contract farmers live farther away from the main town than independent farmers. They live a mean distance of 64.23 miles from the main town, whereas independent farmers live a mean distance of 22.55 miles.

Contract farmers earn less of their household income from off-farm activities than independent farmers. Their earnings were primarily derived from on-farm activities, such as crop cultivation, livestock rearing, and rice cultivation. Table 4.1 shows that contract farmers earned only 13.83% of their income from off-farm activities, 6.57% from cultivating other crops, 12.37% from livestock rearing, and 67.47% from rice cultivation.

Meanwhile, independent farmers received 28.92% of their earnings from off-farm activities, only 2.44% from other crops, 1.04% from livestock rearing, and 67.60% from rice cultivation.

Table 4.1 Comparative analysis of socio-economic characteristics of contract and independent farmers (Low-price standard)

Variables	Description	Total group n= 132		Contract farmers n=30		Independent farmers n=102		Test of means Sig
		Mean	S. deviation	Mean	S. deviation	Mean	S. deviation	
Age (years)	Age of the farmer.	51.57	11.15	47.40	13.54	52.79	10.09	**
Years of education	Years of formal education.	10.50	2.59	11.43	3.08	10.23	2.37	*
Years of experience	Years of experience in rice farming.	26.73	16.12	30.43	16.98	25.65	15.78	
Total land (acre)	Total land area.	30.58	38.44	34.07	31.55	29.55	40.32	
Rice land (acre)	The total acreage of rice land cultivated.	30.20	38.37	33.73	31.45	29.16	40.25	
No. of tractor	The number of tractors owned.	0.67	0.78	0.63	0.72	0.69	0.80	
No. of family members (persons)	The number of family members residing with the farmer.	2.99	1.62	2.33	1.30	3.19	1.66	***
No. of family laborers (persons)	The number of family members working on the farm.	0.98	1.02	0.50	0.63	1.12	1.07	***
No. of hired laborers (persons)	The number of hired laborers working on the farm.	3.34	2.32	6.13	2.42	2.52	1.51	***
Distance from the mill (miles)	Distance of the farm from the miller they supply.	6.56	10.99	0.97	1.38	8.23	12.01	***
Distance from the main town (miles)	Distance of the farm from the closest main town.	32.10	23.79	64.23	17.25	22.55	15.73	***
Acre of vegetables	Acres of vegetables cultivated.	0.16	0.77	0.07	0.37	0.19	0.85	
Acre of fruits	Acres of fruits cultivated.	0.18	1.05	0.20	0.92	0.18	1.08	
No. of poultry	The number of poultry reared.	5.28	20.48	18.07	34.09	1.52	12.14	**
Heads of cattle	Heads of cattle reared.	4.14	11.00	14.73	18.55	1.03	3.86	***
% of earnings from off-farm activities	Percentage of earnings from off-farm activities	25.49	33.74	13.83	20.12	28.92	36.17	***
% of farm earnings from other crops	Percentage of earnings from other crops.	3.38	9.02	6.57	11.72	2.44	7.89	**
% of farm earnings from livestock	Percentage of earnings from livestock.	3.61	8.74	12.37	13.38	1.04	4.28	***
% of farm earnings from rice	Percentage of earnings from rice.	67.57	33.07	67.47	25.41	67.60	35.11	

Note: 1) \*\*\*, \*\*, and \* denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

2) Total earnings = Earnings from off-farm activities + (Earnings from other crops + Earnings from livestock + Earnings from rice)

Source: Author collected



### 4.3.2. Role of contract farming in rice farming in Guyana

#### 4.3.2.1 Profitability of contract farming

Table 4.2 compares contract and independent farmers' profitability, yield, and selling price under the low-price standard. The results show that contract farming under the low-price standard is less profitable than independent farming even though the total cost of contract farmers is lower than that of independent farmers.

Table 4.2 Comparison of profitability, yield, and selling price of contract and independent farmers (Low-price standard)

Variables (GYD/Acre)	Contract farmers n=30	Independent farmers n=102	Test of means
	Mean	Mean	Sig
Revenue	79,137	114,685	***
Total cost	70,862	89,243	***
Land preparation	18,183	14,370	***
Hired laborers	8,043	9,874	***
Seed	4,997	5,238	**
Fertilizer	13,500	14,908	**
Herbicide and pesticide	3,333	5,479	***
Harvest and transportation	15,330	19,826	***
Rent	7,127	9,681	
Other	350	9,865	***
Gross margin	8,275	25,442	***
Yield (tons/acre)	2.7	3.3	***
Selling price per ton	29,940	34,878	***

Notes: 1) \*\*\*, \*\*, and \* denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

2) GYD denotes the Guyanese Dollar. 1 GYD is equal to 0.0048 United States Dollars.

Source: Author collected

The lower profitability of contract farming can be observed by examining the gross margins. In Table 4.2, contract farmers have a significantly lower gross margin of 8,275 GYD, whereas independent farmers have a gross margin of 25,442 GYD. The difference in profitability between contract and independent farmers is due to

the significantly lower revenue of contract farmers. On average, contract farmers earn 79,137 GYD/acre, whereas independent farmers earn 114,685 GYD/acre.

The lower revenue of contract farmers was influenced by their significantly lower selling price and yield. Contract farmers sell their paddy for 29,940 GYD/ton, significantly less than the 34,878 GYD/ton sold by independent farmers. Contract farmers have lower selling prices because they are bound to the miller they supply. Therefore, they cannot choose the best price, whereas independent farmers can sell to the miller who offers the best price.

The results show that contract farmers produced 2.7 tons/acre, significantly lower than independent farmers, who produced 3.3 tons/acre. Contract farmers have lower yields because they use fewer production inputs than independent farmers. Table 4.2 shows that contract farmers' mean fertilizer, seed, herbicide, and pesticide costs per acre are significantly lower than those of independent farmers, implying that contract farmers may use these inputs in smaller quantities. This may be because of their lower selling price, which forces them to invest less money in purchasing rice inputs, resulting in lower yields.

Even though contract farming is significantly less profitable than independent farming, farmers continue to participate in it. Therefore, we must investigate why farmers choose to participate in contract farming and what role it plays in rice farming in Guyana.

#### 4.3.2.2 Reasons for contract farming participation

Interviews with farmers were conducted to determine the reasons for participating in contract farming under the low-price system. Farmers were allowed to give multiple responses during the interviews. Table 4.3 shows the results of those interviews.

The findings indicate that contract farmers engage in contract farming to obtain credit. This is because contract farming allows farmers to obtain fertilizers from their contract mill before planting and pay for them at the time of sale.

Table 4.3 Reasons for participating in contract farming (Low-price standard)

Reasons	Frequency	%
Access to credit	30	100.0
Contract organization is nearby	5	16.7
Recommended by other farmers	4	13.3
A good relationship with mill	3	10.0
Access to machinery and equipment	1	3.3

Notes: 1) 30 farmers = 100%

2) Farmers are allowed to give multiple responses

Source: Author collected

#### 4.3.2.3 Reasons for not participating in contract farming

Table 4.4 shows that the main reason for farmers not participating in contract farming under the low-price standard is low prices for paddy.

Table 4.4 Reasons for not participating in contract farming (Low-price standard)

Reasons	Total Group	
	Frequency	%
<b>Low price for paddy</b>	<b>42</b>	<b>41.2</b>
High input price	39	38.2
Late payment	32	31.4
None available	18	17.6
Farm size	9	8.8
Freedom to sell to the best buyer	5	4.9
Not Interested	4	3.9
Unfair weights	3	2.9
Default on payment	1	1.0
Do not know	1	1.0
New farmer	1	1.0

Notes: 1) 102 farmers = 100%

2) Farmers are allowed to give multiple responses

Source: Author collected

Contract farming participation results in significantly lower selling pricing. The lower selling price causes the gross margin to be significantly reduced. Therefore, farmers are better off if they remain independent.

#### 4.3.2.3 Factors influencing contract farming participation.

To understand the role of contract farming, we must understand how each selected socio-economic characteristic contributes to contract farming participation. Table 4.5 shows the binary logistic regression results of contract farming participation factors. The dependent variable contract farming status (dummy) was classified as 0, representing independent farmer, and 1 for contract farmer.

These results include the  $\beta$  coefficient, standard error, odds ratios, and probability values (p-value) of the independent variables used in the model.

Table 4.5 Binary logistic regression of the factors influencing contract farming participation (Low-price standard)

Independent variables	$\beta$ Coefficient	Standard Error	Odds Ratio	p-value	
Constant	-5.387	2.609	0.005	0.039	**
Age	-0.042	0.022	0.959	0.056	*
Years of education	0.097	0.103	1.102	0.347	
Total land	0.008	0.008	1.008	0.307	
No. of family laborers	-0.740	0.384	0.477	0.054	*
ln (Distance from main town)	1.732	0.521	5.652	0.001	***
% of earnings from off-farm activities	-0.021	0.009	0.979	0.029	**

Note: 1) Dependent variable: Contract farming status

2) \*\*\*, \*\*, and \* denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

3) Model predictive accuracy: 85.5%

Source: Author collected

The findings indicate that age, the number of family laborers, the distance from the main town, and the percentage (%) of earnings from off-farm activities have a statistically significant impact on farmers' decision to participate in contract farming. In contrast, years of education and total land did not significantly influence farmers' decision to participate in contract farming.

The results indicate that age negatively influenced the farmer's decision to participate in contract farming,

implying that younger farmers are more likely to participate in contract farming. Young farmers may be less productive than older, more experienced farmers. Consequently, they have lower gross margins and cannot afford to buy fertilizer. Therefore, they participate in contract farming to obtain fertilizer for cultivation on credit.

Furthermore, the findings showed that the number of family laborers negatively influences contract farming participation. This is likely because farmers with fewer dependents (small households) are less productive, need to hire more laborers, and spend more money on land preparation to maintain adequate production levels. However, this results in an increased cost of production; therefore, these farmers participate in contract farming to access credit, removing the need for up-front cash for fertilizer. This allows the farmer to reallocate cash towards hiring more laborers and land preparation.

The distance from the main town influenced contract farming participation positively. Moreover, the likelihood of contract farming participation increases as the farmers' distance from the main town increases. This is most likely because all agricultural supply stores are in the main town, and there are no stores in rural areas; as a result, rural farmers cannot purchase fertilizer, herbicide, pesticide, and other inputs. Therefore, farmers who live far from the main town have difficulty purchasing fertilizer and must enter into contracts with millers to obtain it. On the other hand, those who live close to the main towns can purchase fertilizers from agricultural supply stores and do not need to enter into contracts with mills to obtain them.

The percentage (%) of earnings from off-farm activities negatively influenced contract farming participation. Farmers who earn a lower percentage of their earnings from off-farm activities are more likely to engage in contract farming. Because these farmers do not have a stable monthly income, they must rely on contract farming to obtain fertilizer and pay for it after harvest. However, farmers who earn a higher percentage of their earnings from off-farm activities have stable monthly incomes, which allows them to have more cash available to pay for fertilizer; therefore, they do not need to rely on contract farming to obtain it.

#### 4.3.3. Impact of contract farming on farmer's behavior

Table 4.6 depicts the frequency distribution of contract and independent farmers' non-rice farm activities. Contract farmers diversify their production by cultivating other crops and rearing livestock in addition to rice farming. Meanwhile, independent farmers rarely engage in non-rice farming activities. This suggests that contract

farmers are less focused on rice than independent farmers.

Table 4.1 shows that other crops cultivated were vegetables and fruits. Additionally, it shows that poultry and cattle were the livestock commonly reared. However, this phenomenon can be caused by many factors. Therefore, we want to know “What factors decide whether farmers diversify their production by carrying out non-rice farm activities?” and “Why?”

Table 4.6 Frequency distribution of contract and independent farmers’ non-rice farm activities (Low-price standard)

Farm activity	Frequency		%	
	Contract farmers n=30	Independent farmers n=102	Contract farmers n=30	Independent farmers n=102
Non-rice farm activity	29	22	96.7	21.6
Cultivate other crops	16	14	53.3	13.7
Rear livestock	28	13	93.3	12.7

Note: 1) Contract farmers - 30 farmers = 100%

2) Independent farmers - 102 farmers = 100%

Source: Author collected

Table 4.7 shows the binary logistic regression results of the factors influencing farmers’ decisions to engage in non-rice farm activities. The dependent variable, “Non-rice farm activity (dummy),” was classified as 0=No, and 1=Yes.

The results show that contract farming status significantly influences whether a farmer engages in non-rice farm activity (Diversify). When farmers participate in contract farming, their likelihood of carrying out non-rice farm activities increases significantly.

Contract farming participation may positively affect farmers’ likelihood of engaging in non-rice farm activities because contract farming significantly reduces revenue due to significantly lower selling prices and yield. To increase farm earnings, contract farmers diversify their farm production by cultivating other crops and rearing livestock.

Table 4.7 Binary logistic regression of the factors influencing farmers' decision to carry out non-rice farm activities (Low-price standard)

Independent variables	$\beta$ Coefficient	Standard Error	Odds Ratio	p-value	
Constant	-4.468	2.206	0.011	0.043	**
Contract farming status	4.364	1.103	78.562	0.000	***
Age	0.015	0.025	1.015	0.546	
Years of education	0.127	0.115	1.135	0.273	
Total land	0.009	0.007	1.009	0.195	
No. of family laborers	0.053	0.238	1.054	0.824	
ln (Distance from main town)	0.323	0.342	1.381	0.344	
% of earnings from off-farm activities	-0.010	0.008	0.990	0.220	

Note: 1) Dependent variable: Non-rice farm activity

2) \*\*\*, \*\*, and \* denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

3) Model predictive accuracy: 84.7%

Source: Author collected

#### 4.4. Discussion

This study determines the role of contract farming in rice farming and its impact on farmer behavior in the context of Guyana.

Some research indicates that contract farming increases profitability, whereas others do not. However, Table 2 indicates that contract farming in Guyana is significantly less profitable than independent farming because contract farming participation results in lower yields due to lower input use and selling prices.

However, farmers continue to engage in contract farming because it serves as a risk-sharing mechanism allowing them to manage their production risk since they are not required to refund the cost of fertilizers purchased from contract millers if the crop is lost due to natural disasters or pests. Contract farming also serves as a source of credit and fertilizer for younger farmers with few family laborers. Access to credit may allow these farmers to obtain the fertilizer they need and reallocate cash to hiring laborers and more land preparation to maintain adequate production levels. Moreover, access to credit and fertilizer is difficult for these farmers to

obtain from other sources due to their distance.

Although contract farming incentivizes specialization in the contracted crop in Africa, Table 5 shows that contract farmers in Guyana diversify their production by engaging in non-rice farm activities. These include cultivating other high-value crops and rearing livestock to supplement their income. This is because contract farming participation reduces rice farming revenue significantly, resulting in a significantly lower gross margin when compared to independent farming. As a result of the lower gross margin, resources such as land, labor, capital, and time may be reallocated to non-rice farm activities, thereby reducing the quantity of paddy supplied.

#### 4.5. Conclusion

Finally, contract farming reduces profitability due to lower yield and selling prices. However, farmers continue to participate in contract farming because it serves as a production risk-sharing mechanism and is a source of credit and fertilizer needed for cultivation.

Additionally, contract farming participation influences farmer behavior by incentivizing them to diversify their production to include more high-value farm products. Better prices for contract farmers' paddy supplied to millers may encourage specialization in the contract product and thus increase quantities supplied to millers.

In closing, contract farming is not suitable for increasing farmers' gross margin. Furthermore, additional policy measures are needed to assist farmers with production risk and increase their access to credit.

A possible policy measure to manage production risk is establishing crop insurance to protect farmers if their crop is lost due to natural disasters or pests.

Moreover, to increase access to credit, the government should facilitate the establishment of a credit scheme to provide the farmer with greater access to credit. The beforementioned measure would reduce farmers' need to participate in contract farming.



## **5. Chapter 5 - Comparative study of the role of contract farming and its impact on rice farming under varying pricing standards: A case study of Mahaica-Berbice and Essequibo Island-West Demerara**

### **5.1. Introduction**

Chapter 1 refers to the pricing standard as the payment conditions farmers accept to deliver their products. Furthermore, it states that two pricing standards are used in Guyana's rice industry: "high-price" and "low-price."

Chapter 3 of this thesis concludes that contract farming under the high-price standard increases farmers' income, while chapter 4 concludes that contract farming under the low-price standard decreases farmers' income. However, it is unclear how these pricing standards affect rice farming, especially concerning the role and impact of contract farming.

Since contract farmers' income may differ substantially depending on the pricing standard under which they contract, a closer look at the impact of contract farming participation may disclose the economic and behavioral impact.

Consequently, this chapter seeks to answer the following questions: How does contract farming's role differ under varying pricing standards? How does contract farming's impact differ under varying pricing standards?

Based on the analysis in chapters 3 and 4, it will compare the role and impact of contract farming when the high-price standard is the dominant pricing standard to when the low-price standard is the dominant pricing standard to identify differences in contract farming's role, factors that influence contract farming participation, its economic impact and its behavioral impact.

### **5.2. Characteristics (attributes) of contract farming**

The following section compares and explains the attributes of contract farming. Contract farming contracts throughout Guyana's rice industry are generally similar. However, the criteria used for calculating the final price of paddies supplied by farmers may differ depending on the dominant pricing standard used in the area.

Contract farming contracts are typically informal and oral private agreements made directly between the farmer and miller for one growing season (3-4 months) to provide fertilizer.

Contracts are made before planting when the farmer and miller agree on the type, quantity, delivery date, method of delivery, and prices of fertilizers to be supplied. Additionally, the planting area and expected harvest time are discussed. Notably, the miller may also provide loans to farmers; however, this usually depends on the farm size and the farmer's relationship with the mill.

Contract farmers are expected to supply all their paddies to the miller; however, they can sell to as many millers as they want but must cover the cost of fertilizer received and pay fertilizer cost after harvest.

Paddy is sold immediately after harvesting. The harvested paddy is transported to the miller's facility, and the miller decides the selling price. However, the miller adjusts the price based on the percentage (%) of "good" paddies and, to a lesser extent, the grade of the paddies supplied.

Before deciding on the final payment amount, the miller deducts the cost of the fertilizer and other services provided from the value of the "good" paddies supplied by the contract farmer. The actual payment for the paddy is usually made later.

The selling price of farmers' paddy is published at the end of the growing season. This is because the miller's export price influences the final price offered to the farmer at the end of the growing season. Therefore, farmers are unable to use contract farming as a means of hedging the market price in order to manage price risk.

However, contract farming does allow rice farmers to share production risk with the miller because contract farmers are not required to refund the miller for fertilizer supplied if the crop is lost due to natural disasters or pests. At the same time, the miller does not take on the total cost of producing the paddies themselves.

### 5.3. Comparison of contract farming under the high-price and low-price standard.

This section discusses how socioeconomic factors and contract farming's role influence contract farming participation. It also explains the economic and behavioral impact of contract farming participation under the high-price and low-price standards. Figure 5.1 shows the Comparison of contract farming under the high-price and low-price standard.

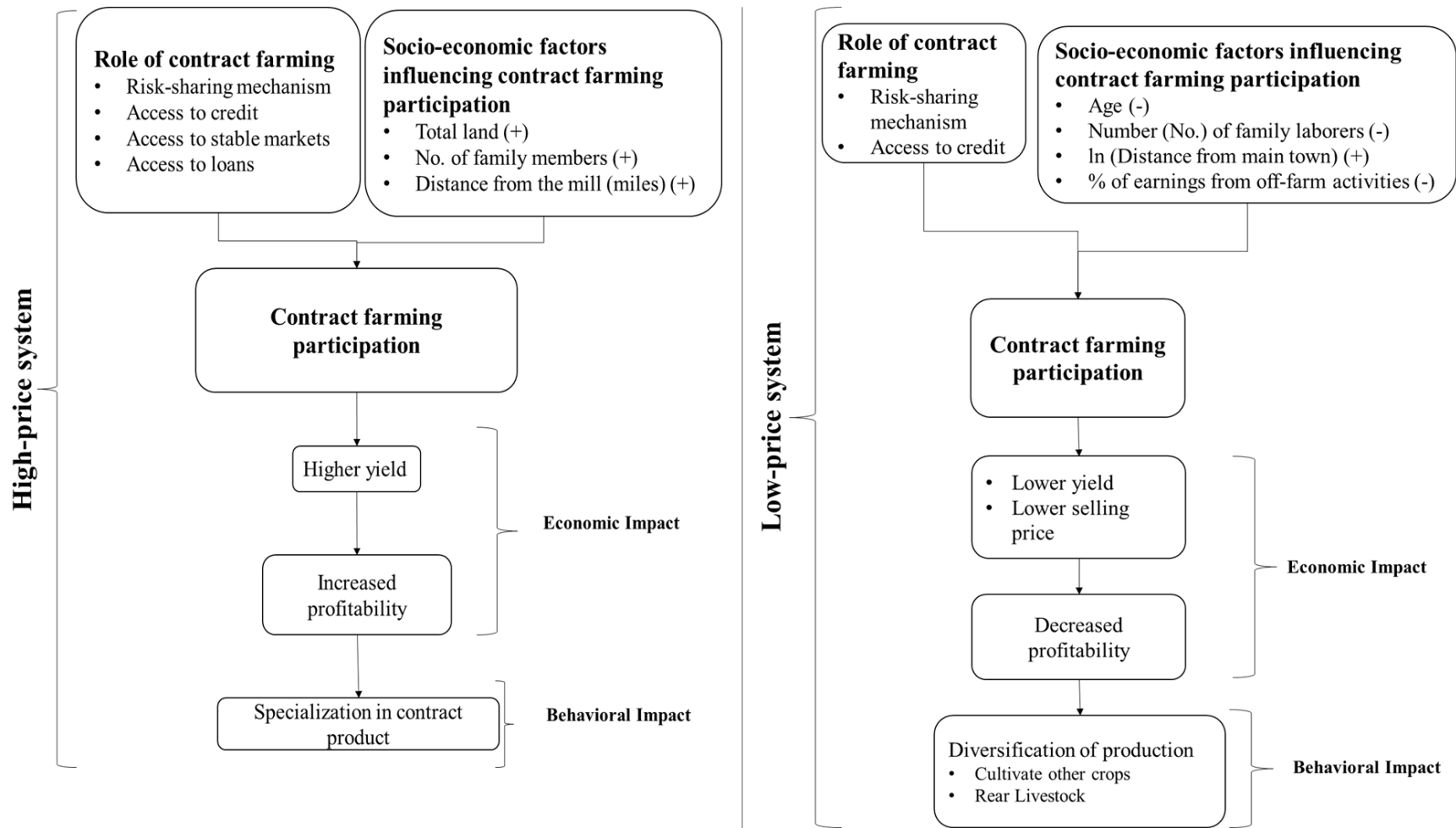


Figure 5.1 Comparison of contract farming where the high-price standard is the dominant pricing standard (left) and the low-price standard is the dominant pricing standard (right)

Note- +: Denotes a positive influence, -: Denotes a negative influence

### 5.3.1. The factors influencing contract farming participation.

The results in Figure 5.1 of this thesis show differences in the factors influencing contract farming participation in areas where the high-price and low-price standards are used.

#### 5.3.1.1. Factors influencing contract farming participation with the high-price standard.

Based on figure 5.1, the variables number (No.) of family members, total land, and distance from the mill (miles) positively influenced contract farming participation.

In areas where the high-price standard is dominant, farmers with larger families are more likely to be contract farmers. This is likely because contract farming requires farmers to meet quantity to maximize their earnings. Therefore, contract farming requires more labor. However, farmers with large families may be able to offset the labor needs by utilizing family laborers to carry out production-related tasks, particularly those that require care and judgment, such as pest control and seed preparation, to increase the quality and quantity of yields.

The results show that farmers with larger farms are more likely to participate in contract farming. This is possibly because it allows farmers to access fertilizer on credit which is difficult to obtain in rural areas. Additionally, large farmers may be more commercially oriented than small farmers and therefore require access to stable markets guaranteed to accept their paddies after harvest.

Furthermore, larger farmers may have more credibility with the mill than smaller farmers and, therefore, can access additional benefits such as loans which would otherwise be difficult to obtain at potentially higher limits for the purchasing machinery.

Finally, the likelihood of participating in contract farming increases as the farmers' distance from the mill increases. A greater distance from the mill results in higher transaction costs, such as search costs. Therefore, participating in contract farming allows farmers who live further away from the mill they supply to secure a stable paddy market and reduce their searching costs.

#### 5.3.1.2. Factors influencing contract farming participation with the low-price standard.

Under the low-price standard, the variables influencing contract farming participation were age, number (No.) of family laborers, distance from the main town, and % of earnings from off-farm activities.

Table 5.1 shows that variable age, number (No.) of family laborers, and % of earnings from off-farm activities negatively influenced contract farming participation. While the variable distance from the main town positively influences contract farming participation.

The variable number of family laborers negatively influences contract farming participation. This is likely because farmers with fewer dependents (small households) are less productive, need to hire more laborers, and spend more money on land preparation to maintain adequate production levels. However, this results in an increased cost of production; therefore, these farmers participate in contract farming to access credit, removing the need for up-front cash for fertilizer. This allows the farmer to reallocate cash towards hiring more laborers and land preparation.

The results indicate that age negatively influenced the farmer's decision to participate in contract farming, implying that younger farmers are more likely to participate in contract farming. Young farmers may be less productive than older, more experienced farmers. Consequently, they have lower gross margins and cannot afford to buy fertilizer. Therefore, they participate in contract farming to obtain fertilizer for cultivation on credit.

The distance from the main town influenced contract farming participation positively. Moreover, the likelihood of contract farming participation increases as the farmers' distance from the main town increases. This is most likely because all agricultural supply stores are in the main town, and there are no stores in rural areas; as a result, rural farmers cannot purchase fertilizer. Therefore, farmers who live far from the main town have difficulty purchasing fertilizer and must enter into contracts with millers to obtain it. On the other hand, those who live close to the main towns can purchase fertilizers from agricultural supply stores and do not need to enter into contracts with mills to obtain them.

The percentage (%) of earnings from off-farm activities negatively influenced contract farming participation. Farmers who earn a lower percentage of their earnings from off-farm activities are more likely to engage in contract farming. Because these farmers do not have a stable monthly income, they must rely on contract farming to obtain fertilizer and pay for it after harvest. However, farmers who earn a higher percentage of their earnings from off-farm activities have stable monthly incomes, which allows them to have more cash available to pay for fertilizer; therefore, they do not need to rely on contract farming to obtain it.

### 5.3.2. Role of contract farming

Table 5.1 compares the reasons for participating in contract farming in areas where high-price and low-price standards are dominant. The results show that there are both similarities and differences in the reason for participating in contract farming with the high-price standard and the low-price standard.

#### 5.3.2.1. Similarities in the role of contract farming

The similarities are as follows; contract farming generally plays the role of risk-sharing since if the farmer's crop is lost due to pests, or natural disasters, the price of inputs supplied is waived. Furthermore, contract farmers are prioritized by their contract mill at the time of the paddy intake. Therefore, contract farmers do not face the risk of losses resulting from spoilage because of holding undried paddy for an extended period.

Additionally, contract farming is a source of fertilizer and credit for farmers who live in rural areas far from main towns and where there are no agricultural supply stores. Therefore, these farmers cannot buy the fertilizer they need due to their distance and need to contract to obtain it.

Table 5.1 show that 83.5% of contract farmer operating where the high-price standard is used indicated that gaining access to credit is their reason for participating in contract farming, and 100% of farmers operating where the low-price standard is used indicated that gaining access to credit is their reason for participating in contract farming. Contract farmers can get fertilizer on credit from their contract mill before planting and pay for them at the time of sale. This removes the need for up-front cash to purchase fertilizer, allowing for the reallocation of cash to other production activities.

#### 5.3.2.2. Differences in the role of contract farming

##### 5.3.2.2.1. High-price standard

However, farmers operating where the high-price standard is dominant also indicated that they participate to access stable paddy markets and loans.

The results show that 48.4% of contract farmers operating where the high-price standard is dominant participate in contract farming to secure access to a stable market guaranteed to accept their paddies. Contract farmers are prioritized by their contract mill at the time of sale; therefore, contract farmers do not suffer losses due to spoilage from holding undried paddy for an extended period.

Table 5.1 Comparison of the reasons for contracting where the high-price and low-price standards are dominant

Reasons	High-price standard		Low-price standard	
	Frequency	%	Frequency	%
Access to credit	76	83.5	30	100
Access to stable markets	44	48.4	0	0
Access to loans	32	35.2	0	0
A good relationship with the mill	9	9.9	3	10
Advance payment for paddy	6	6.6	0	0
Assistance with Harvesting	5	5.5	0	0
Recommended by other farmers	5	5.5	4	13.3
Access to better varieties	1	1.1	0	0
Access to machinery and equipment	1	1.1	1	3.3
Assistance with transportation	1	1.1	0	0
Higher paddy prices	1	1.1	0	0
Contract organization is nearby	0	0	5	16.7

Note: 1) High-price standard: 91 farmers = 100%, Low-price standard: 30 farmers =100%

2) Farmers are allowed to give multiple responses

Source: The author collected

Furthermore, 35.2% of contract farmers operating where the high-price standard is used participate in contract farming to secure access loans. Contract farmers can obtain loans from their contact mill to purchase machinery and equipment, consequently increasing their productivity. However, the farmer's likelihood of acquiring the loan depends on farm size and the farmer's relationship with the contract mill.

#### 5.3.2.2.2. Low-price standard

Although all contract farmers benefit from access to stable markets and the possibility of getting loans, contract farmers did not indicate that these were very important to them.

### 5.3.3 The economic impact of contract farming

Contract farming's impact on profitability differs significantly depending on the dominant pricing standard.

Below is a description of its impact under the high-price standard and the low-price standard:

#### 5.3.3.1 High-price standard

Contract farming participation in an area where the high-price standard is dominant, is more profitable than independent farming. Contract farmers' mean gross margin was GYD 43,137 per acre compared to independent farmers' mean gross margin of GYD 33,735. However, contract farmers' profitability in this situation is limited because it is only due to their higher yields of 3.0 tons/acre compared to independent farmers' yield of 2.7 tons/acre, resulting from using more inputs made possible by access to fertilizer on credit.

#### 5.3.3.2. Low-price standard

Contract farming participation in an area where the low-price standard is dominant is less profitable than independent farming. This is because contract farming participation results in significantly lower yields of 2.7 tons/acres compared to independent farmers' yield of 3.3 tons/acre due to lower input use and significantly lower selling prices of GYD 29,940 per ton compared to independent farmers' selling price of GYD 34,878 per ton.

### 5.3.4 Behavioral impact

#### 5.3.4.1 Low-price standard

Contract farmers operating where the high-price standard is the dominant pricing standard earned significantly more from rice cultivation than independent farmers. The results of the analysis displayed in table 3.2 show that contract farmers earned a mean of 96.35% of their household earnings from rice cultivation, indicating that these farmers are greatly specialized in rice cultivation.

#### 5.3.4.2. Low-price standard

On the other hand, contract farmers operating where the low-price standard is dominant diversify their production by cultivating other crops such as vegetables and fruits and rearing livestock such as poultry and cattle in addition to rice farming. This suggests that these contract farmers are less focused on rice cultivation. Contract farming participation may positively affect farmers' likelihood of engaging in non-rice farm activities because



contract farming significantly reduces revenue due to significantly lower selling prices and yield. To increase farm earnings, these contract farmers diversify their farm production by cultivating other crops and rearing livestock.

#### 5.4. General conclusion

##### 5.4.1. Role of contract farming (high-price and low-price standards)

The findings show that contract farming reduces farmers' production risk because the cost of fertilizer received from the mill is waived if the farmers' crop is lost due to pests or natural disasters. Furthermore, contract farmers are prioritized by their contract mill at the time of paddy intake. Therefore, they do not face the risk of losses resulting from spoilage because of holding undried paddy for an extended period. Additionally, contract farming participation is a means of accessing fertilizer and credit. This is consistent with the findings of previous research.

**However, findings also revealed the following new points;**

##### 5.4.2. Impact of contract farming (high-price standard)

Contract farming is more profitable than independent farming, where the high-price standard is the dominant pricing standard. This is because they can obtain higher revenues resulting from **higher yields**. Contract farmers' yield is higher because they spend significantly more on land preparation, hired laborers, seeds, and fertilizer to increase their yield. They can do this because they can get fertilizer on credit from the contract mill and pay for it at the time of sale, allowing them to reallocate money to the beforementioned production activities and inputs.

##### 5.4.3. Impact of contract farming (low-price standard)

While contract farming, where the low-price standard is the dominant pricing standard, is significantly less profitable than independent farming because contract farming participation results in lower yields due to lower input use and selling prices.

However, farmers continue to engage in contract farming because of its role as a risk-sharing mechanism allowing them to manage their production risk and a source of fertilizer and credit.

Finally, contract farming with a low-price standard influences farmer behavior by incentivizing them to diversify their production to include more high-value farm products, such as cultivating other high-value crops and rearing livestock to supplement their low income. This is because contract farming participation reduces rice farming revenue significantly due to lower selling prices and yield, resulting in a significantly lower gross margin when compared to independent farming. As a result, the amount of rice collected by the mills also decreased.

#### 5.4.4. Policy implications

Mills should adopt the high-prices system as the main pricing standard because it results in higher farm yields, making more paddy available for the mill.

However, if this is not done, crop insurance should be established in areas where the low-price standard is dominant to protect farmers if their crop is lost due to natural disasters or pests.

Moreover, to increase access to credit in areas where the low-price standard is dominant, the government should facilitate the establishment of a credit scheme to provide the farmer with greater access to credit. These measures would reduce farmers' need to participate in contract farming.

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