The Effects of DR-CAFTA on Dominican Rice Sector

Winston E. Marte*, Teruaki Nanseki**, Kazuhiko Hotta**, and Shoji Shinkai**
(* Graduate School of Bioresource and Bioenvironmental Sciences, Kyushu University,
  **Faculty of Agriculture, Kyushu University)

I Introduction

The agricultural sector has always been one of the most important components of the Dominican Republic’s economy. In the 1990s, this sector accounted for about 12.5% of the gross domestic product (GDP) and provided around 18.3% of overall employment. Even though, agricultural sector’s contribution to the economy has been decreasing recently, it is still an important component of it. For instance, in 2007, agriculture accounted for 7.7% of the GDP and provided over 14% of the total employment (Ministry of Agriculture, 2002; Central Bank, 2008). Within the agricultural sector, rice is the most important basic crop with more than 30,000 farmers generating around 250,000 direct and indirect employments in this sector and other related industries (Moquete, 2004). In addition, rice is the main staple food in the Dominican Republic (DR). Therefore, rice sector has a great importance from both viewpoints producers and consumers.

On the other hand, the country has been exporting many agricultural products—fruits and vegetables—to the United States (US) market with almost permanent duty-free access since the 1960s under the Generalized System of Preferences (GSP) and since the 1980s, under the Caribbean Basin Initiative (CBI). However, these initiatives are nonreciprocal to the US and were scheduled to be available until September, 2008. Therefore, the DR has been compelled to negotiate and take part of the Dominican Republic-Central America and the United States Free Trade Agreement (DR-CAFTA) in order to keep and get better access to the US market not only for agricultural products but also for other goods.

Even though, Dominican rice sector is protected for 20 years under this agreement, the US is one of the worldwide rice export leaders; for instance, in 2007 the US accounted for as much as 2.3% of the overall global rice export (USDA, 2007). In addition, it is well known that the US has been heavily subsidizing rice farmers. In 2003, American rice farmers received subsidies and benefits amounting US$1.279 billion, which represents 7.7% of the Dominican GDP for that year (Oxfam, 2004). Under such as circumstances, it is expected that the DR-CAFTA would have big impacts on the Dominican rice farming. Therefore, the main objective of this paper is to estimate the effects of this FTA on rice sector to adopt farm management strategies aimed to improve farmers’ competitiveness.
II The DR-CAFTA

The country members of this agreement are Costa Rica, El Salvador, Guatemala, Nicaragua, Honduras, the United States of America, and the Dominican Republic. The main objective of this agreement is to help enhance economic growth in the region by reducing and eliminating barriers to trade and investment. From the US viewpoint, the essence of this agreement is to open up markets to greater access for the US farmers and other producers and economic sectors. Whilst from the DR viewpoint, the objectives of DR-CAFTA are to consolidate the benefits granted under the GSP and the CBI as well as to obtain greater access not only for agricultural products but also for other products. Under this agreement negotiation, rice sector is protected for 20 years, first 10 years there will not be import tariff reductions, but last 10 years, it will phase out 100%. The export quota for the United States is 10,000 metric tons (MT), 8,000 of milled rice and 2,000 of paddy rice, and it is increasing each year in 700 MT since 2007 until 2025, but in 2026 the quota will be eliminated as a result of trade liberalization (Figure 1). The tariff rate within-quota is 0%, but out of this quota it is 99% (Ministry of Commerce and Industry, 2005).

![Figure 1 Rice import quota and tariff phase out](image)

III Model specification

To estimate the quantitative welfare effects on rice producers, consumers and governmental budget, the Consumer Producer Surplus model is used. To do so, the following trade scenarios are adopted: 1) partial liberalization, 40% rice import tariff reduction, and 2) free trade, abolishment of import quota and import tariff.

According to the USDA (2007), the world market rice price is likely to rise about 2% per year for the next 10 years due to an increase of the global rice trade, and high fuel and fertilizer prices as well as the strong return on competitive crops such as soybean and feed grains in the US. Therefore, the model adopts this fact by using a 25% and 30% higher free on board (FOB) price compared to the baseline in the calculation for the alternative trade scenarios. The Dominican rice price is assumed to be the wholesale level price because it is likely to take place at that level. Since rice ending stocks have been about 38,810 tons per year for the period 1990-2005, the model adopts this amount as a desired level of rice stocks for the 2 scenarios. Since the elasticities of supply and
demand are two of the main features of this model, both of them will be estimated using the ordinary least squared (OLS) method.

Economic theory suggests that the market supply of a commodity will depend on its price, the prices of competing products as well as the prices of resources that are used while producing a commodity. Another factor that strongly affects rice supply is the state of technology, causing shift of the supply curve throughout its improvements overtime. Therefore, in our model rice supply is a function of its price, price of competing commodities (cassava price, plantain price), price of rice production resources such as fertilizers, pesticides, seed, labor, and so forth; as well as the technological changes that take place overtime (Eq. 1).

On the other hand, it is assumed that a representative consumer maximizes utility given a fixed income and the demand schedule can be derived by maximizing the consumer’s utility. However, the consumer’s choice is constrained by his or her income, and will be influenced by the prices of other goods available. Usually, Dominicans eat rice accompanied with red beans because they are two of the main components of the traditional diet. Therefore, in our model, rice demand is a function of own price, per capita income, and red beans price (Eq. 2).

\[
\ln R_s = c_0 + c_1 \ln P_n + c_2 \ln P_{ci} + c_3 \ln P_{P} + c_4 \ln UC_{RT} + c_5 T + V_i
\]  

(1)

\[
\ln C_t = a_0 + a_1 \ln P_n + a_2 \ln P_{ci} + a_3 \ln P_{P} + a_4 \ln M_t + e_t
\]  

(2)

Where \(R_s\): rice supply; \(P_n\): farm gate rice price; \(P_{ci}\): farm gate cassava price; \(P_{P}\): farm gate plantain price; \(UC_{RT}\): resources price; \(T\): technological progress expressed in Christian era; \(V\): disturbance term; \(c_i\) (i is 0, 1…n) are parameters; \(C_t\) is annual total rice demand, \(P_r\) is rice price at retailer level, \(P_{kr}\) is red beans price at retailer level, \(M_t\) is annual per capita income, \(e\) is an error term, \(ln\) is the natural logarithm, and \(t\) is a time subscript.

The changes on welfare are calculated based on the estimated elasticities of supply and demand, and assuming that the world market rice price will rise by 25% and 30% under partial liberalization and free trade scenarios, respectively (Eq. 3-6) 1). Import quota and tariff levels are assumed as stated in DR-CAFTA; prices and quantities in the baseline scenario correspond to the year, 2006. Data are obtained from the Dominican Ministry of Agriculture and FAOSTAT sources.

\[
\Delta CS = \Delta Pd \times Qd0 \times [1 - 0.5 \times \varepsilon d \times (\frac{\Delta Pd}{Pd0})]
\]  

\[
\Delta PS = \Delta Ps \times Qs0 \times [1 - 0.5 \times \varepsilon s \times (\frac{\Delta Ps}{Ps0})]
\]  

\[
\Delta GR = GRI - GR0
\]  

\[
\Delta TS = \Delta GR + \Delta CS + \Delta PS
\]  

(3)  

(4)  

(5)  

(6)

Where \(\Delta CS\): Change on consumer surplus, \(\Delta Pd\): Change on price of demand, \(Qd0\): Quantity demand 0, \(I\) and \(0.5\): two constants, \(\varepsilon d\): Elasticity of demand, \(\Delta PS\): Change on producer surplus, \(\Delta Ps\): Change on price of supply, \(Qs0\): Quantity supply 0, \(\varepsilon s\): Elasticity of supply, \(\Delta GR\): Change on government revenue, and \(\Delta TS\):
Change on total surplus.

IV Results and discussion

Regarding rice supply estimation function, plantain price parameter estimate is not statistically different from zero at 10% significance level, therefore it was deleted from the model and the final estimation result is presented in equation (7). The supply of rice is positively related to own price and technological progress, and is negatively related to cassava price and rice unit production resources price as expected. All parameter estimates are different from zero at 10% significance level. Rice own price elasticity is 0.239, supply elasticity of rice for cassava price is $-0.227$, resources price elasticity is $-0.278$, and the rate of technological progress is 6.6 % per year. The coefficient of determination is 0.772, while the coefficient of determination for adjusted degree of freedom is 0.690, and the Durbin-Watson statistic is 2.272. It is worth to point out that unlike in Japan, in the DR rice farmers can have at least two cultivation seasons in a year. This is due to a shorter cultivation period—lasting for about five months—than that in Japan and the good climatic conditions that allow farmers to grow rice the whole year.

On the other hand, regarding rice demand estimation function, bean price parameter estimate is not statistically different from zero at 10%, hence it was deleted and the final estimation result is shown in equation (8). The demand for rice is negatively related to own price and positively to income. This implies that rice is a normal good in the DR. All parameter estimates are different from zero at 10% significance level. Rice own price elasticity is $-0.442$, while income elasticity is 0.483. The coefficient of determination is 0.669, while the coefficient of determination for adjusted degree of freedom is 0.618, and the Durbin-Watson statistic is 1.901. Values in parenthesis denote t-statistic.

\[
\begin{align*}
\ln R_{s} &= -118.726 + 0.239 \ln P_{n} - 0.227 \ln P_{m} - 0.278 \ln UC_{n} + 0.066 T \\
& (-3.723) (1.742) (-2.138) (-2.416) (4.187) \\
& n=16 \quad R^2 = 0.772 \quad \text{Adjusted } R^2 = 0.690 \quad D.W. = 2.272
\end{align*}
\]

\[
\begin{align*}
\ln C_{r} &= 2.038 - 0.442 \ln P_{n} + 0.483 \ln M_{r} \\
& (0.875) (1.618) (2.573) \\
& n=16 \quad R^2 = 0.669 \quad \text{Adjusted } R^2 = 0.618 \quad D.W. = 1.901
\end{align*}
\]

In table 1, welfare calculation for both partial and free trade scenarios are presented. The free trade scenario assumes the abolishment of import quota and import tariff and a 30% higher FOB price compared to the baseline. While the partial liberalization scenario assumes a 40% tariff reduction and a 25% higher FOB price compared to the baseline in the calculation. Under the free trade scenario, rice production is expected to slightly increase from 0.38 million tons (Mt) in 2006 to about 0.41 Mt in 2025. This is partially due to some technological progress such as planting and sowing methods enhancements, and land leveling improvements as well as to phase out tariff gradually overtime. Meanwhile, domestic consumption is estimated to increase from 0.50 Mt to about 0.97 Mt, leading to an increase of imports of 0.60 Mt. Consequently, causing a drastic drop of the
self-sufficient rate from around 77% in 2006 to about 42% in 2025. At the same time, producer losses amount to US$344.4 million compared to the baseline. Due to slightly growing demand and lower internal prices, the change on consumer surplus (CS) is about US$487.5 million per year, and the government losses are about to US$8.9 million per year. The total welfare changes amount to US$134.1 million, equal to 0.41% of Dominican GDP in 2006.

For the *partial liberalization scenario*, the model predicts that the domestic supply of rice will slightly increase from 0.38 Mt in 2006 to about 0.41 Mt in 2020. At the same time, consumption is expected to increase about 0.79 Mt, yielding to an increase of imports of 0.43 Mt. Hence, causing a significant drop of the self-sufficient rate to 52%. In addition, producer losses are estimated to amount US$221.3 million per year. However, the model calculates the changes on CS around US$302.5 million and government income to amount to US$23.6 million. While the total welfare changes amount to US$104.9 million, representing 0.32% of the GDP in the baseline year. These results indicate that the FTA will have heavy impacts on rice farmers; although, small gains for the Dominican economy are expected. Producer losses under the *free trade scenario* are US$11.9 million greater than rice total production value in 2006, which was US$332.5 million. On the other hand, under the *partial liberalization scenario*, producer losses account for 66.5% of rice total production value in 2006. Moreover, around 45% of the Dominican farmers have an area less than 4 ha and therefore are considered as small scale farmers. Due to this, we can conclude that both scenarios will put significant pressure on Dominican rice farmers.

<table>
<thead>
<tr>
<th>Table 1 Welfare calculation for the Dominican rice sector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Situation 2006 (Milled basis)</strong></td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>Quantity Domestic Output (Mt)</td>
</tr>
<tr>
<td>Quantity Domestic Consumption (Mt)</td>
</tr>
<tr>
<td>Imports without Tariff (Mt)</td>
</tr>
<tr>
<td>Imports with Tariff of 20% (Mt)</td>
</tr>
<tr>
<td>Imports with Tariff of 99% (Mt)</td>
</tr>
<tr>
<td>Imports with Tariff of 60% (Mt)</td>
</tr>
<tr>
<td>Change on government budget (US$ M)</td>
</tr>
<tr>
<td>Change on producer surplus (US$ M)</td>
</tr>
<tr>
<td>Change on consumer surplus (US$ M)</td>
</tr>
<tr>
<td>Total net welfare changes (US$ M)</td>
</tr>
<tr>
<td>Total net welfare changes (RD$ B)</td>
</tr>
<tr>
<td>Total net welfare changes (% GDP)</td>
</tr>
</tbody>
</table>

Source: Own calculation

V Conclusion

The main objective of this paper was to estimate the effects of DR-CAFTA on the Dominican rice sector. To
perform the analysis, both supply and demand functions have been estimated and then using the Consumers Producers Surplus model, the effects of this FTA on the Dominican rice sector has been examined. The results of the rice supply function suggest that rice supply is not appreciably responsive to price fluctuations, cassava could be a substitute of rice, and the sign and size of the technological progress parameter estimate (0.066) implies that there have been infrastructure improvements in the rice sector overtime. On the other hand, rice demand is found to be positively related to income, indicating that rice is a normal good in the DR.

The results derived from the welfare calculation indicate that this FTA will have significant effect on the Dominican rice producers; whereas domestic rice consumers are expected to be better off under both scenarios compared to the baseline. Moreover, the expected effects from rice trade liberalization on government budget are insignificant. Nonetheless, overall net welfare changes are predicted to be small, less than 1% of Dominican GDP in 2006. Since this FTA will put significant pressure on Dominican rice farmers, a structural reform of this sector, including research efforts directed toward the generation of high-yielding rice varieties, integrated pest management technologies; providing better access to managerial assistance and to information as a means to improve efficiency levels, and shifting to new crops such as banana and taro—which are exportable crops that can be easily grown on rice fields —, is required to overcome the forthcoming situation.

Notes
1) For more details on equilibrium trade models and welfare changes calculation procedures see Gaisford and Kerr, 2001.

References