12-2013

Sugar and Rice Trade between the United States and Cuba Trade Potential and Welfare Analysis

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A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Agriculture Economics

By

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Bachelor of Agricultural Science, 2008

December 2013
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This thesis is approved for recommendation to the Graduate Council.

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ABSTRACT

After the resignation of President Fidel Castro and forty-five years of the U.S.-trade embargo, the political environment between Cuba and the United States is expected to change. With the Trade Sanction Reform and Export Enhancement Act in 2000, trade sanctions were eased for a while. Future trade between both countries would increase the welfare in both countries. This Thesis has the approach to look at the impacts on the commodities of rice and sugar, and the trade sanctions between the United States and Cuba.

Cuba is a net importer of its food supply; therefore, agriculture and food trade is an interesting business for states closely located to Cuba. Cuba also has a high consumption of rice, and the US is a net exporter of rice; the gains from trade are obvious. On the other hand, Cuba has an enormous potential in sugar cane production. Cuba was once the world's largest sugar producer with over 8 million metric tons (USDA, 2008). With increasing demand in the United States, sugar cane from Cuba could supply the United States market.

The trade analysis from the United States International Trade Commission shows that the agriculture trade between the United States and Cuba could increase by $661 million. Without an embargo, US rice producers and Cuban sugar could benefit from trade. Welfare analysis shows that the protection policy harms producers and consumers on both sides.

Given its proximity to the U.S., Cuba could benefit similarly as Mexico and Canada under the North American Free Trade Agreement (NAFTA). These countries show that free trade increases investments, imports, and exports. It is also proven that the overall welfare increases with the removal of protectionism (Stern, 2001). It is time to open the trade embargo between the United States and Cuba on behalf of the welfare of the people in both countries.

Hypothesis

Does trade liberalization have an impact on the sugar and rice trade between Cuba and the United States?

H_0 = Trade liberalization has no impact

H_1 = Trade Liberalization has an impact

ACKNOWLEDGEMENTS

The research work was carried out under the EU-US Double Degree Master program in Rural Development and Agriculture economics (IMRD ATLANTIS). As first thesis advisor served Professor Eric Wailes, located at University of Arkansas, and as second thesis advisor served Professor Harald von Witzke, located at Humboldt University to Berlin. Most of the thesis research was carried out at the University of Arkansas.

The publication to a scientific audience will be carried out by the University of Arkansas. The IMRD ATLANTIS office in Gent receives an exemplar, and proves the accreditation for the EU-US Double Degree in Rural Development and Agriculture Economics.

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LIST OF ABBREVIATIONS

BBC	British Broadcasting Corporation
CCS	Cooperatives of Credit and Services
CIA	Central Intelligence Agency
COMECON	Council for Mutual Economic Assistance of the Eastern Bloc
CPA	Cooperatives of Agriculture Production
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Statistical Division of the Food and Agriculture Organization
FAS	Foreign Agriculture Service of the United States Department of Agriculture
GDP	Gross Domestic Product
Kcal	Kilocalorie
MINAG	Ministerio de la Agricultura de Cuba/ Ministry for Agriculture Cuba
MMT	Million Metric Tons
MT	Metric Tones
ONE	Oficina Nacional de Estadísticas de Cuba, National Statistics Office of Cuba
PSD	Production Supply and Distribution Database Foreign Agriculture Service
TSRA	Trade Sanction Reform and Export Enhancement Act
UBPC	Basic Unit of Cooperative Production
UN	United Nations
UNICEF	United Nations Children's Fund
US	United States
USDA	United States Department of Agriculture
USITC	United States International Trade Commission
WTO	World Trade Organization
WWF	World Wide Fund for Nature

CHAPTER 1 Introduction

Cuba is one of the most interesting countries in the Western World, as it differs economically and politically from most countries in the Americas. For some, Cuba is a relic of the old world order, and for others it is a leading example for other developing nations. The fact that real-socialism has been implemented in Cuba, has led to the dominance of most of its resources and workforces by the state sector.

Since real-socialism was implemented in Cuba, the United States set an embargo against Cuban products in 1960. Therefore, the relations between the United States and Cuba have been strained since that time, especially in political and economic terms. The United States trade embargo against Cuba has existed for 45 years, and is therefore one of the longest running embargos. The United States policy towards Cuba also changed with its Presidents; under Bill Clinton, the Trade Enhancement Act was implemented, easing the embargo; George W. Bush tightened the embargo, and set up the payment-in-advance policy; and President Barack Obama offered a "new beginning and equal partnership" (BBC, 2009) in 2009, with a new policy towards Cuba, ushering in a new period of United States-Cuban relations.

The economic position of both countries is also distorted, as Cuba is a country where the government organizes the market and plans the economy. The United States is the largest national economy in the world, and its economic system is market-oriented. These two very different economic systems find each other in close proximity, as they are separated by only 90 miles of sea. Today's diplomatic situation between both countries still reminds one of the cold war times. For example, there are numerous cases of spying accusations between both countries.

However, this bilateral condemnation between the United States and Cuba is expected to change. It has been twenty-two years since the end of the cold war.

For forty-five years Cuba has called for an end of the embargo, and has asked for the allowance to buy products from the United States. The moment for the US to open the embargo could probably not be better than the second term of US President Barack Obama. The United States industry also supports the end of the embargo, and supports the setting up of a new trade partnership. Especially the rice industry of the United States, which is important in Arkansas, calls for "relaxing the sanctions against Cuba" (USARICE, 2012).

Cuba has a domestic rice deficit; therefore, Cuba purchases rice from other countries. The main trade partners of Cuba are China, Thailand and Vietnam. Due to their location these countries have high shipping costs and less flexible shipments. Rice from the south of the United States could substitute Cuban imports from Asia. The United States would profit, and Cuba would purchase its staple food regionally with faster and more flexible cargos.

On the other hand, Cuba could export sugar cane to the United States market. In the 1980s Cuba was the biggest sugar producer with over 8 million metric tons; today the amount hovers around 2.2 million metric tons. The growing sugar market in the United States, and the demand from the industry for cheap sugar could be met by Cuban sugar. In the near future, the United States will need to reallocate their quotas among the current countries who export sugar to the US.

With open trade between Cuba and the United States, the allocation of resources can be used more efficiently, and overall welfare could increase in both countries. The theory is that the welfare will increase while Cuba exports its sugar to the United States, and the United States

exports its rice to Cuba. Since prices for both products are allocated differently because of market-distorting measures, the welfare is also distorted. This Thesis focuses on the potential welfare, increasing the trade of sugar and rice between Cuba and the United States.

1.1. Organization of the Thesis

Chapter 1 provides an introduction to the problem; it introduces the thesis issue, and introduces information of current United States-Cuban relations. Chapter 2 explains the thesis scope, review of literature, and the methodical framework. It provides an overview of the methodical background, and the accessed sources. Chapter 3 gives an historical overview of the United States-Cuban relations. Data about former US investment and US property in Cuba show the formerly close integration of the United States and Cuba.

Chapter 4 provides an analysis of the Cuban rice sector. Figures show domestic consumption, production, and imports of Cuban rice. The chapter also introduces the results of previous studies, the effect of removing the trade ban, and analyses the potential trade increases. Chapter 5 analyzes the United States sugar sector. Estimates of domestic consumption, trade, and future trade potential for United States sugar are provided. The results of the study by Alvarez (1998) are analyzed and interpreted. Chapter 6 gives the welfare analysis for Cuban rice and United States sugar. It explains the effects of protectionism on consumer surplus, producer surplus, and welfare. Chapters 7 discuss the results of the thesis and gives future recommendations for US-Cuban rice and sugar trade.

Chapter 2 Study Background and Methods

2.1. Purpose and Scope of the Thesis

The thesis analyzes the rice and sugar trade between the United States and Cuba, and therefore gives an assessment for future trade potential. It also takes related topics into account, for example, policy, law, and history.

Thesis scope:

Historical relations between the United States and Cuba

Rice sector in Cuba

Sugar sector in the United States

Future trade potential for rice and sugar between the United States and Cuba

Welfare analysis of rice and sugar including the trade distorting effects of protectionism

2.2. Literature Review

The sources of information for this research are books, digital articles, and internet databases. With the help of the University of Arkansas Interlibrary Loan Department, books from different Universities were obtained. Also literature from the *United States Department of Agriculture*, the *Foreign Agriculture Service*, and the *United States International Trade Commission* were used.

The most comprehensive source of reports on US-Cuban trade is *United States International Trade Commission, Report on The Economic Impact of U.S. Sanction with Respect*

to Cuba, 2001, and the *United States International Trade Commission, Report on U.S. Agricultural sales to Cuba in 2007*. Both reports were conducted to analyze the agriculture trade between both countries. The latter report includes detailed estimations for US agricultural sales to Cuba. In three scenarios – lifting financial restrictions, lifting travel restrictions, and lifting financial and travel restrictions – the potential exports for agricultural products (wheat, corn, rice, soybeans, poultry, pork, and fish) were analyzed. The report found that the trade between Cuba and the United States could gain over $ 661 million. For rice, it is estimated that the US market share in Cuba could increase from 32 percent (pessimistic) up to 52 percent (optimistic).

The *Cuba Country Report Cuba 2008*, provided by the United States Department of Agriculture, provides an excellent outline for a country analysis. The report stated that before 1950, the United States had major shares in the Cuban industry, and in the agriculture, and service sector. Seventy-five percent of the arable land was owned by US enterprises. The USA Rice Federation and the United States Sugar Cooperation also provided useful information about the current trade negotiation. The US rice rent seeking sector is looking forward to end the embargo, and open trade with Cuba.

Databases that contributed to the work were the *United Nations Food and Agriculture Organization Statistical Database* (*FAOSTAT*), *United States Department for Agriculture, Foreign Agriculture Service, Production Supply and Distribution online Database* (*PSD Database*), and the *United Nations Commodity Trade Statistics Database* (*UN Comtrade*). Data from the Cuban Ministry of Statistics (*Oficina Nacional de Estadísticas Cuba*) were also used.

Jose Alvarez from the University of Florida has conducted research on the Cuban sugar sector (Alvarez 1995, 2000). He said that it is generally difficult for Cuba to recover the production amounts of 7-8 million metric tons, due to the lack of loans, agriculture inputs, and

energy. While the embargo is still standing, Cuba cannot be supplied the input factors from the United Sates. Also Cuba would need to respect US import law (quota) to deliver sugar on the US market. *Parr Rosson, Center for North American Studies, Texas A&M University* researched the future potential of US rice trade to Cuba (Rosson 2010). He analyzed the possible export gains from the US to Cuba for different US states. Rosson determined that an embargo lifting would increase the trade by $365 million, and would create 6,000 new jobs. Also the Arkansas agriculture exports could increase by $36 million annually.

Different political papers were used, such as *Mark Sullivan's Report Cuba, Issues for the 112th Congress* available at the *Library of Congress* or the *Report on US-Cuban relations in the 21st Century* sponsored by the *Council on Foreign Relations*. The national Cuban politics are described in *Los Lineamentos*, the resolution of the Sixth Congress of the Communist Party of Cuba. Unfortunately, information from the Cuban Agriculture Ministry (*Ministerio de la Agricultura MINAG*) could not be accessed.

Information was also broadly used from different news agencies, including: *Reuters, Radio Rebelde*, *Radio Habana Cuba, British Broadcasting Corporation*, and the news channel *Russia Today.*

2.3. Methodical Framework

The research for this work can be classified as a market policy analysis using partial equilibrium framework. The thesis focuses on the trade between Cuba and the United Sates for the products of rice and sugar. The analyses are carried out by using different resources for the respective topic. The different resources are introduced in the following section.

2.3.1. Policy analysis

The policy analysis begins with a review of the historical United States-Cuban relations. Prior to 1950, the United States had a major impact on Cuban policy. Therefore it is important to investigate this time period. The embargo conflict, the main obstacle of trade between Cuba and the United States, is also discussed in the frame of the policy analysis. The current Cuban policy towards agriculture production and rice production is also discussed. The policy analysis is mainly a literature review, for which different books were used.

2.3.2. Market analysis

The market analysis is developed for the two markets of Cuban rice, and United States sugar. For these two groups, the trends in consumption, production, and trade are discussed. Databases including the *United States Department for Agriculture, Foreign Agriculture Service, Production Supply and Distribution online Database* (*PSD Database*), and the *United Nations Commodity Trade Statistics Database* (*UN Comtrade*) were used. The results are reproduced in charts and slides, to present full and comprehensive data sets transparently. For the trade potential analysis, the literature of the *United States International Trade Commission, Report on The Economic Impact of U.S. Sanction with Respect to Cuba, 2001,* and research work of *Jose Alvarez, Department of Food and Resource Economics, University Florida* were studied. Both works deal with the possible trade expansion with Cuba.

2.3.3. Partial equilibrium analysis

The partial equilibrium analysis of rice and sugar is included in the two-country frame for Cuba and the United States. In the two-country frame, Cuba and the United States are analyzed: the potential rice exports from the United Sates to Cuba, and the potential sugar exports from

Cuba to the United Sates. These additional exports have impact on producers, consumers, and the overall welfare in both countries. It is expected that from increasing rice exports, the US producers will gain, and due to an increasing price, the US consumers will lose. In the case of sugar, it is expected that Cuban producers gain from additional exports, and US consumers gain because of a decreasing price. To identify the welfare effects, it is necessary to determine the factors of total budget, cost, and foreign exchange. The formula to calculate the welfare includes the supply, demand, and equilibrium price.

$W(p,p^w) = TB(p) - C(p) + FE(p,p^w)$

with *W* welfare

TB *Total Budget*

C cost

FE foreign exchange

The partial equilibrium model has two cases: The first scenario is the current case based on the most recent trade data; the second case is the scenario with the potential increases based on the estimates from *Alvarez 1998* and the *United States International Trade Commission 2007*. For both cases, the producer surplus, consumer surplus, and welfare are calculated. The calculations are based on the theoretical microeconomic market, and policy models of *Kurt Jechlitschka et al* published in the book *Microeconomics Using Excel*, 2007.

In contrast to a general equilibrium model, which includes the whole economy, the two sectors of rice and sugar are chosen for the partial equilibrium analysis. Since rice is one of the

most important crops in Arkansas, and sugar has potentials in Cuba, these products were seen as important for the author.

Chapter 3 United States - Cuba relations

Cuba is the largest Caribbean country with 11,087,330 inhabitants, and a gross domestic product of $5,565 per capita (World Bank, 2012). The United States population is 311,050,977, and has a GDP of $47,199 per capita.

The United Nations reported that Cuba has a 99.8 percent literacy rate (UN MDGI, 2012), and the infant death rate is lower than in other developing countries (CIA, 2010). The average life expectancy is 78 years in Cuba, and in the United States it is 77 years (UN, POPIN, 2012). As reported from the *World Wide Fund For Nature*, Cuba ranks high on the ecological footprint. In 2006 the footprint was less than 1.8 hectare per capita (WWF, 2006). In 2010 Cuba ranked with a Human Development Index of over 0.7 in the world list (UNDP, 2012). Cuba is located south of the state of Florida, just 90 miles from the United States. Its neighboring countries are Mexico to the west, Jamaica to the south, and Haiti and the Dominican Republic to the east.

3.1. Climate Change

Located in the Gulf of Mexico, Cuba has a tropical climate with moderate trade winds (USDA, 2008). The hurricane season takes place from August to November, and can be very destructive. The last devastating hurricane, especially for the agriculture production, was in 2008 (cubahurricanes.org). Other years with devastating hurricanes were in 2002, 2005, and 2010 (cubahurricanes.org).

Climate change has also brought about a complex impact on Cuba's farming sector. In the last four decades, the mean annual temperature increased by almost 0.5°C (Centella, 1999). Cuba's official reaction to the changing climate has been diversifying Cuba's crop varieties.

Research is currently carried out to adapt Cuba's cash crops to droughts and hurricanes. For example research has developed special breeds of sweet potatoes and squash, to reduce the impact of wind, and with yucca and platano burro, a local plant, breeds also adapted to minimize crop losses caused by drought (Havana Times, 2009).

3.2. Rice and Sugar Cane in Cuba

In India, the first evidence of the cultivation of sugar cane and rice was found. With the establishment of trade routes, these plants arrived at the Arabian Peninsula. From the Arabian Peninsula, these plants were cultivated further, and traded to Europe.

With Alexander the Great (300 B.C.) and the Arabic invasion in southern Europe, sugar cane and rice was brought to Sicily and southern Spain. Italy, southern Spain, and Portugal are climatically suitable to grow rice, and sugar cane in Europe. Today, Valencia in Spain and the Po Valley in Italy are important rice growing regions in Europe.

With Christopher Columbus, sugar cane arrived in the western hemisphere. On his second voyage in 1494, Columbus brought sugar cane, *Saccarum robustum*, to Cuba (Pérez-López, 2005). Since that time, Cuba became a Spanish colony ruled by a Spanish governor in Havana. For the Spanish Imperators, sugar cane was more suitable for the long distance shipping from the Caribbean to Europe. For this reason, the Spanish crown preferred to grow sugar cane and tobacco on Cuba. When the Spanish crown also forbade the planting of cotton, wheat, and rice, the agriculture production in the Caribbean was mainly focused on sugar cane (O. Echevarría, 2002). A year-round growing season and climatic advantages, made sugar cane a success in the Caribbean. With this huge success, European farmers also spread across southern America and began to experiment in farming.

Rice was established in Cuba approximately around 1750 (Rodríguez, 2010). It reached its highest economic importance in the second half of the twentieth century. In 1996 the revolutionary government began to increase the potential of rice production. It was a reaction to increase the grain production and to lower the price on the world market (Rodríguez, 2010).

3.3. Plantation System

The plantation system is a farming system where cash crops are grown on a large scale. This system was built to grow food for distant markets in Europe and North America. Agriculture plantation systems rely on flexible and cheap labor, and produce cheap raw materials. In the seventeenth century, Europeans began to establish plantation systems in America. Since the conquest by the Spanish crown, the plantation system was in Caribbean agriculture, and in Cuba. In the eighteenth century, with the beginning of the Industrial Revolution, the demand of raw products, such as cotton or raw sugar, also increased, and lead to an expansion of the plantation system.

Economies based on plantation systems are sometimes characterized as primary economies. Plantation-based economies, however, could compete with industrial economies. According to *Eltis, 1999*, Cuba had the same economic growth rate as the United Kingdom or the United States of America. The value of exports and the income per capita were actually higher in the Caribbean. With 2.808 million Pound Sterling, the thirteen British North American continental colonies were exporting slightly more than the Caribbean colonies, which generated 2.669 million Pound Sterling (McCusker, 1991). Yet, one has to take into consideration that the population in North America was four times greater than in the Caribbean (Eltis, 1999). This also underlines Cuba's important role as an exporter for raw products, such as raw sugar.

3.4. Slavery

Since 1500 over 15 million enslaved Africans were forced to cross the Atlantic. About 95 percent of the slaves landed in tropical and subtropical regions (Eltis, 2005). They worked mainly on plantations for sugar and tobacco in the Caribbean, or on cotton plantations in the southern United States. Therefore, slaves played an important role in economic development in America.

In Cuba, the plantation system began primarily after the Haitian Revolution in 1804. Slaves in Haiti began to strike to abolish slavery. After the Haitian case, cane production began to grow on Cuba. With the abolishment of slavery in the nineteenth century in the British and French colonies, slavery in the Spanish Caribbean colonies increased (Ayala, 1999). According to Williams in *Capitalism and Slavery,* British capitalism was responsible for the shattering of the West-Indian slavery, and the shift to Brazilian, Cuban, and American Slavery. With the increase of mechanization and industrial systems, the demand for raw materials, such as cotton and raw sugar, increased. Thus, the production on the plantations led to the "second slavery." Once again, due to an increasing demand of raw products, slavery in plantation regions, as for example Cuba, the southern United States, and Brazil, expanded (Williams, 1944).

3.5. United States Expansion

With the War of Independence in Cuba (1895–1898), the agriculture production, especially the sugar production, stagnated. By 1868, with the beginning of the independence conflict, the sugar production never exceeded 1 million metric tons. Yet, after the Spanish dominance ended in 1889, sugar production increased significantly.

With the end of the Spanish–American war, the United States gained political domination in the Caribbean, and the trade preference of sugar shifted from the Spanish empire to the U.S. market, triggering a booming period for Cuban agriculture production. In 1901, the U.S. government released two important decrees that affected their political and economic activities in Cuba.

The first political act was the Platt Amendment, reorganizing the United States' interests in Cuba. The aim was to preserve Cuba's independence, liberty, and private property (The National Archive, 2012). This act gave the United States legal standing to claim Cuban territories, and to install United States interests in Cuba.

The second important treaty was the Reciprocity Treaty of 1903. The United States Congress passed this agreement specifically with the focus to increase trade between Cuba and the United States. The treaty granted Cuba's agriculture sector access to the U.S. market, and a sugar quota for Cuba. Cuba's sugar producers received a 20 percent preference on the full duty for sugar exports to the United Sates. In exchange, the United States gained a reduction on Cuban tariffs for their exports to Cuba. The Reciprocity Treaty had a major impact on Cuba's overall economy (Dye, 1998).

After the agreement, U.S. companies significantly increased their investments in Cuba. Foreign investment in Cuba increased from 308 million U.S. dollars in 1913 to 1,195 million U.S. dollars by 1929 (Dye, 1998). Large investments were made into the sugar and railroad sectors. In 1927, the sum of 629 million U.S. dollars was invested in the sugar sector, and 126 million U.S. dollar in the railway transport. Large investments were made by establishing new sugar mills (Dye, 1998).

3.6. First Sugar Peak

Resulting from the large U.S. investment and the improved access to the U.S. market, Cuban sugar production rose significantly. The yearly production increased from 0.5 million metric tons in 1900, up to 4 million metric tons in 1920. The peak of production was reached in 1925 with a yearly raw sugar production of 5.5 million metric tons.

The main share of the Cuban sugar production was exported to the United States (Dye, 1998). After the Cuban War of Independence, this export period ended the lean period, and provided wealth on the island. This time was also known as the years of the fat cows "*las vacas gordas*" (Dye, 1998). At this time, sugar and tobacco were Cuba's main leading export products. In the decades between 1903 and 1929, Cuba became the main sugar supplier for the United Sates. The Cuban share rose from 15 percent up to more than 65 percent (Dye, 1998). The prospering period ended with the Great Depression in 1929.

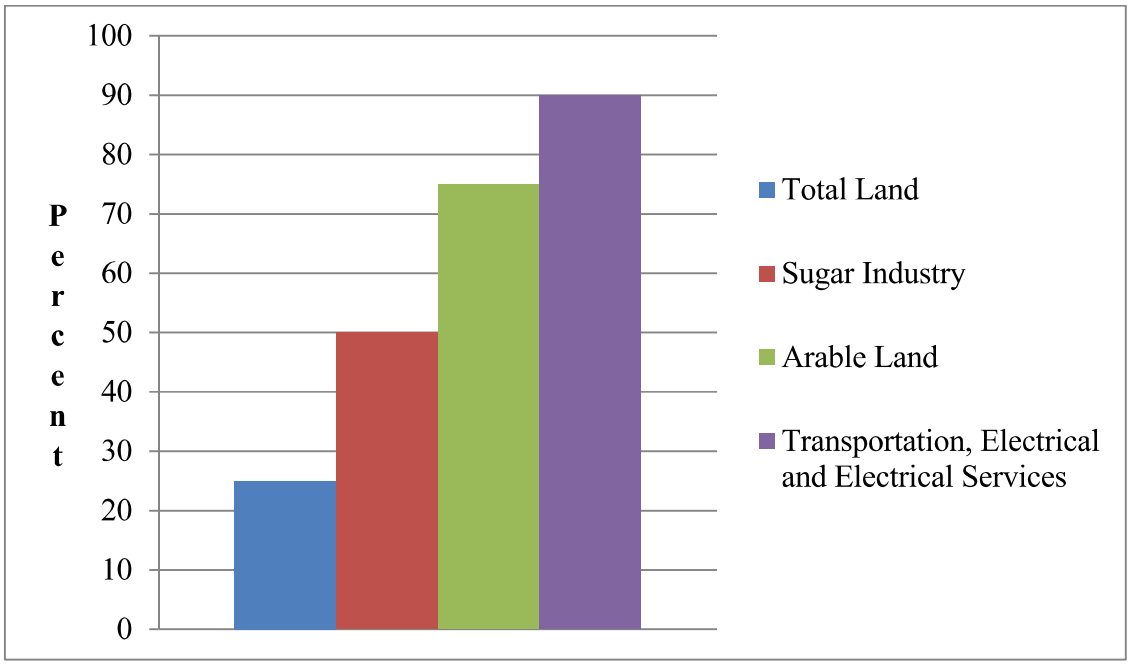
3.7. United States Investments

The United States' legal system led to an increased investment in Cuba. By the late 1950s, U.S. companies and investors owned a significant share of Cuban property: 25 percent of Cuba's land (75 percent of the arable land), 50 percent of the sugar and rum industry, and 90 percent of the transportation and electrical services (Figure 1). The banking sector was also largely controlled by United States banks, and a large portion of the petroleum and mining sector was owned by United States enterprises (FAS, 2008).

Most significantly for Cuban agriculture was the U.S. investment in the sugar sector. By 1913, there existed 172 sugar mills in Cuba; the yearly sugar production was 2.7 million metric tons. 67 mills were owned by Cubans; 23 mills were owned by US investors. All US mills

together had more output (1.0 million metric tons) than the Cuban mills (918 thousand metric tons). The US mills had a higher output mainly because they were better equipped and mechanized. Therefore, sugar production in Cuba was largely dominated by US companies.

Figure 1: Percent of U.S. ownership in Cuba by 1950



Data source: FAS, Situation Report, 2008

3.8. Revolutionary Agrarian Reform

When Cuba exceeded the production of 5 million metric tons of raw sugar, most of the production was exported to the United States. Until 1960, Cuba exported more than one-third of its sugar production to the United States (Dye, 1998). The increasing exports were a result of the expanding U.S. policy since the beginning of the twentieth century.

With a governmental amendment to the Sugar Act in 1951, Cuba received even more market share in the U.S. Cuba's import quota equaled 98.64 percent of the difference between U.S. supplies, and the amount of fixed tonnage quotas for the domestic market. Therefore, the U.S. surplus, resulting from growth, was given completely to the Cuban producers. Five years later, however, Cuba lost this privilege through a reform of the Sugar Act. After the reform, 50 percent of the growth was given to domestic producers, and 45 percent to foreign markets (Alvarez, 2000).

In 1959, Fidel Castro's Marxist principles were introduced in Cuba. This caused a diplomatic conflict with the United States, bringing about Cuba's loss of access to the US market. The Cuban agriculture sector was confronted with the transformation into a planned economy. Privatization, nationalization, and collectivization of enterprises and agriculture companies were enforced by the government, and began in 1960.

Castro's government was very critical of private property, and initiated the expropriation of large farms. The first Agrarian Reform was immediately implemented after 1959. The reform resulted in large scale farms, with estates larger than 1,000 acres, made into state farms. By then, the property was distributed to landless peasants, yet the bulk of expropriated land was organized into state-controlled production cooperatives. Over 3.1 million hectares of sugar land, which was controlled by the sugar mills, were expropriated, and distributed to small farmers and production cooperatives. In response, the U.S. removed Cuba's sugar quota, and therefore ceased the Cuban sugar imports. A trade embargo was also set up by the U.S. against Cuba. With the beginning of the U.S. embargo, Cuba began to nationalize all thirty-six American sugar mills, telephone, electric, and petroleum companies. In August of 1960, the state had control over 40 percent of

the land, 38 percent of the sugar industry, and the key sectors, such as transportation, electricity, and petroleum (Perez-Lopez, 1991, p.9).

With the second Agrarian reform in 1963, farms with more than 164 acres were expropriated (Alvarez, 1992). Hence, the state nearly doubled its owned property between 1960 and 1963 from 40 percent up to 70 percent (Perez-Lopez, 1991, p.9). The banking sector, insurance companies, cooperatives, factories, and warehouses were nationalized as well. After the revolution, agriculture production was organized into two forms in Cuba: the state sector which included large state farms and cooperatives, and the private sector of integrated private small farms and service cooperatives (Alvarez, 1992).

3.9. Soviet Influence

As Cuba turned to Socialism, the country became a partner of the Soviet Union. Under a new trade partnership, Cuba shipped its raw sugar to the Soviet Union, and received cheap oil, machinery, and credits in return. Before 1960, the Soviet Union purchased less than 5 percent of the Cuban sugar production. In percentage, the USSR rose from 0.27 million metric tons in 1959 up to 3.11 million metric tons by 1970. Therefore, their share rose from 5.5 percent in 1959 up to 46.2% by 1970. Cuba's main export commodity was now purchased by the socialistic bloc. The Soviet Union acquired nearly the full former U.S. quota.

Other socialistic countries were also interested in trading with Cuba. China, for example, had nearly no imports of Cuban sugar in the beginning of the 1950s, but after 1960 China bought 8 percent of its raw sugar from Cuba. The Eastern European counties increased their share up to 12 percent in the late 1960s (Alvarez, 2000). Countries such as Canada and or Japan, imported a small amount of Cuban sugar.

3.10. Planned Economy

In 1960 Cuba joined the Socialist world's Council for Mutual Economic Assistance (COMECON). Within the COMECON, Cuba gained access to individual socialistic markets, but had also production obligations towards the COMECON. Cuba could only maintain its level of production with subsidies for energy, agriculture, and machines from the Soviet Union (O. Echevarría). Due to inadequate resource reallocation and no cost oriented production, the efficiency decreased. Cuban sugar was sold to the Soviet partners for prices that were far above the world market price (Buzzanell and Alonso, 1989). At this point, Cuba lost its competitiveness on the world market, and was more and more depending on subsidies.

The 1960s were characterized by irregular performance in the sugar production (O. Echevarría). Reasons for this included an exodus of many experienced managers, and skilled field workers from the sugar sector. Also, the transformation of the production model into a socialistic model brought irregularities in production (O. Echevarría).

In the 1970s, Cuba began to expand its sugar production with the goal of producing more than 10 million tons of sugar per year (O. Echevarría). The socialistically planned production was well implemented, and political targets were met. In 1970, the first harvest lasting over 217 days had been accomplished (O. Echevarría). The so called "long harvest" was established with the focus on increasing the production with all national available physical and human capital.

From the late 1980s, Cuba was the world's leading exporter of sugar. As a member of the COMECON, Cuba was mostly pressed to meet its targets, and was determined to produce enough sugar to sell it for hard currency on the world market. A performance break came in 1987 and 1988 because of poor crops and export over-commitments. This led Cuba to mortgage its

future exports. In 1989, Cuba was forced to repay a part in a deal of over 1 million tons of sugar, borrowed from the major international trade house Sucre et Denre, Sucden (Buzzanell, 1989).

3.11. Agrarian Crisis

Cuba lost its position as the leading sugar exporter with the political changes at the end of the 1980s. Glasnost and Perestroika threw Cuba's entire economy into disorder. After the collapse of the Soviet Union, Cuba lost its main trade partner, and major market for its goods and services. The Soviet Union stopped delivering cheap oil, and ceased its foreign assistance to Cuba. As a consequence, Cuba's real GDP fell by one-third in 1990 (FAS/USDA, 2008).

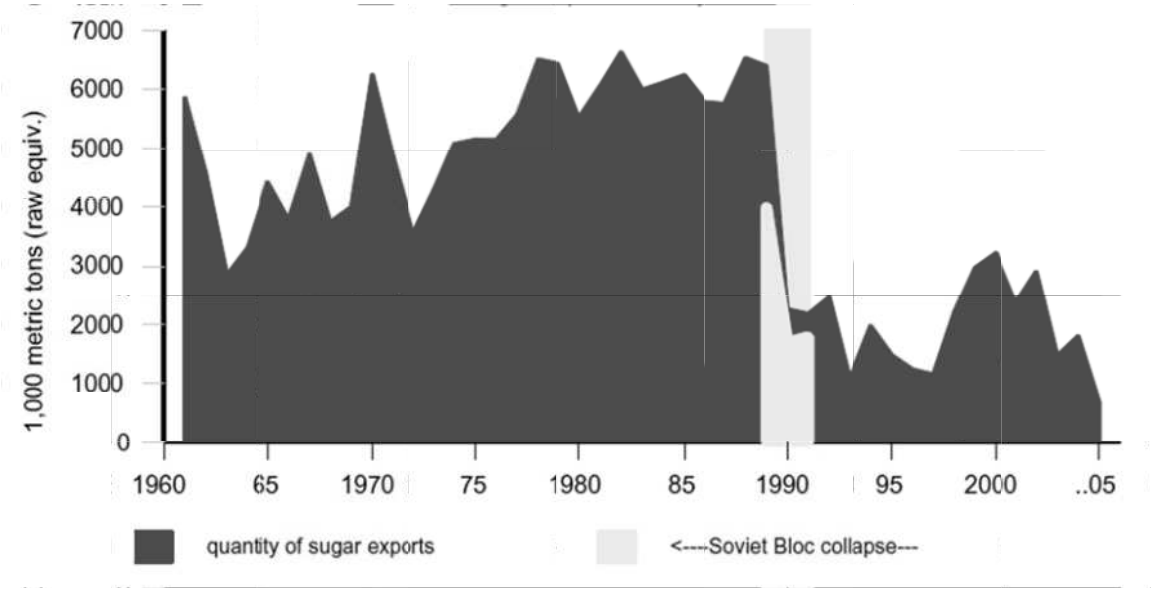
With the modernisation and the opening of the markets in the former communist countries (e.g. East Germany, Hungary, Poland, except Russia), these countries did not require sugar from international markets. In addition, Cuba's traditional non-Communist trade partners, Canada and Japan, had less demand for sugar too (O. Echevarría, p. 367). The losses of important sales markets, and the end of subsidies, lead to the collapse of the sugar exports (Figure 2). The inflated domestic sugar price made Cuba less competitive relative to other producers (O. Echevarría, p. 367). A collapse of the system was unavoidable.

In 1995, Jose Alvarez reported that the production expense for one ton of sugar in the years from 1986 to 1990 amounted to 448 Cuban pesos. Therefore, the Cuban price was 90 percent above the world market price by the official exchange rate of 1 peso = 1 US dollar, and an average world market price of 236 U.S. dollar per metric ton, 1980-1994 (Jose Alvarez, 1995).

Furthermore, new exporting countries, such as Thailand, Brazil, Guatemala, and Australia, came to the world market with production costs under the world market price level (O.

Echevarría, p. 367). Cuba was not able to compete with these cheaper competitors. The sugar export quantity decreased from 6.8 million tons to 1.3 million tons in 1993.

Figure 2: Cuban Sugar Export Quantity [1960 - 2005]



Source: FAS/USDA: Cuba's Food and Agriculture Situation Report, 2008

In 1995, Cuba's sugar production fell to a level of only 2 million tons per year (O. Echevarría, p. 365). Other agriculture export commodities were affected in the same way: the citrus production (e.g. oranges, grapefruits, and lemons) fell by about 45 percent in the first half of the 1990s, and the entire agriculture production fell by 54 percent (FAS/USDA: Cuba, 2008). The Agriculture exports fell by more than one-half, and imports by nearly more than one third (FAS/USDA: Cuba, 2008). Cuba started to feel the negative effect of unilateral trade, and the peculiarities of planned economy.

With the trade crisis also came an energy crisis to Cuba. Oil supplies from the Soviet Union ceased, and Cuba's energy system failed. As a consequence, Cuba closed down, or reorganised its sectors which were heavily dependent on petroleum.

A financial crisis affected the country in the 1990s as well. The loss of subsidies from the Soviet Union brought a financial crisis on the whole island. The end of subsidies on which the sugar industry depended, forced harsh shortages for financial, energy, and trade prospects. The dissolution of the COMECON brought a trade break to its socialistic partners.

In 1993, Cuba began to respond with a period of reform, called "Special Period in Peacetime" (O. Echevarría). These reforms included small market liberalising elements, and a financial reform. Now, the U.S. Dollar was not forbidden anymore. One of the effects of these changes was that exiled Cubans could send remittances to their families. The tourist sector became highly important due to the dollar revenue from tourists.

The agricultural sector was reformed by transforming state farms into smaller cooperative units, the so-called Basic Unit of Cooperative Production (Unidades Basicas de Producción Cooperativas). With the reform, farmers were also allowed to grow for their self-consumption on their own plots. The food supply was reformed, and the government implemented farmers markets, called *Mercados Agropecuarios*. Farmers could sell their surplus directly on the market. As a consequence, a shadow price above the state price for agriculture products came into existence in Cuba.

3.12. Nutrition Crisis

With the beginning of the 1990's, Cuba's people suffered shortages in food consumption. The daily calorie consumption fell from 3,052 calories per day in 1989 to 2,099 calories per day

in 1993 (FAS, 2008). Other reports indicate caloric consumption fell to an even lower level of 1,863 calories per day/ person (Perez, 2011). Also, the supply of animal products was very critically reduced. With the Special Period, the policy program could increase the calorie consumption (FAS, 2008). The Hurricane season in 2008, together with the economic crisis, brought back food shortages to Cuba. For some Cubans it was the "Second Crisis of the 90s" (Perez, 2011).

Cuba could not recover its sugar production of 8 million metric tons; the reasons are lack of machinery, energy and loans. Since 1990 Cuba became a successful exporter of tropical fruits. Cuba could increase its citrus production from 500 thousand tonnes by 300 thousand tones up 800 thousand tones. In Cuba, Israeli and Spanish joint venture businesses are operating successfully to produce citrus fruits (FAS, 2008). Due to the energy problem urban agriculture became more important in Cuba. In large cities many residents are growing vegetables and food crops for their self-consumption. The Cuban agriculture department provides also an extension service to urban farmers (Pinderhughes, 2000).

Because of the lack of input, Cuba's agriculture production is nearly 100 percent organic (Zinn, 2012). The fuel problem brought mechanisation to a halt. While the rationing of inputs is not by choice, Cubans are not really aware of their high organic production. However, this makes Cuba an interesting trade partner for organic products.

Today, Cuba's daily food supply is back to 3,200 calories per day (FAO, 2012), covering the same amount prior to the crisis. Nowadays, Cuba is a leading example for child nutrition. In 2010, UNICEF confirmed that Cuba has zero percent child malnutrition (Krapova, 2010).

CHAPTER 4 Cuban Rice Sector

The Cuban rice production in 2010 accounted for 176,400 hectares (FAO, 2012). Cuba's rice production had a hard recovery after 1990 (Alvarez, 1992), and it was devastated by several hurricanes between 2001 and 2006 (cubahurricanes.org). However, Cuba has been working to boost agricultural production: Cuba increased the rice production notably by 127 thousand metric tons up to 563 thousand metric tons in 2009 (Reuters, 2010).

In Cuba, rice production is carried out by the state as well as the non-state sector. The state sector is comprised mainly by state farms, while the non-state sector includes the Basic Unit of Cooperative Production (UBPC), Cooperatives of Agriculture Production (CPA), and Cooperatives of Credit and Services (CCS) (ONE, 2012). Additionally, rice production takes place in the private sector. In 2007, rice production was produced on 48 percent state farms, 29 percent UBPC's, 16 percent CPA-s, and 8 percent CCS-s, and the private sector (ONE, 2012).

Eighty percent of the rice area is under irrigation in Cuba (FAO, 2002). Poor land leveling and degradation of irrigation systems, downgraded the production assets (FAO, 2002). Since 1990 the Cuban Rice suffers on limits on input from fertilizer and modern agriculture technology. In Cuba yields per hectare in rice production are significant lower than in other Caribbean countries (FAO, 2002). Also Cuba's rice industry remains at standards, which make Cuban rice exports not competitive on the world market. The rice milling industry holds 27 rice mills and 5 parboiled rice plans on very old standards. Today Cuba prefers to import milled rice for immediate consumption (USITC, 2007).

4.1. Rice Market

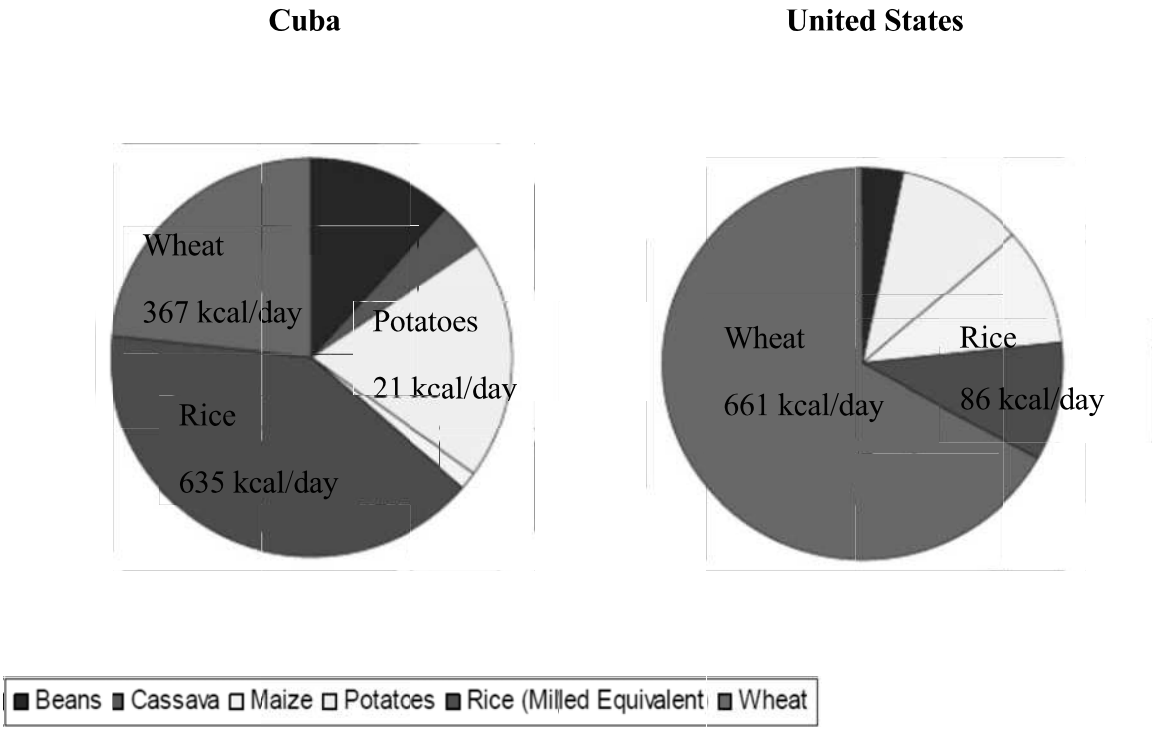
In 2011, Cuba imported 60 percent of its rice consumption (MercoPress, 2011). The most important trade partners are China, Vietnam, Thailand, the United States, and Brazil (UNComtrade, 2012). Cubans consume 64.0 kilogram of rice per year, the highest rice consumption among all Caribbean countries (FAOSTAT, 2012). Citizens receive government-issued ration cards which allow them to purchase their monthly rice at a subsidized price (MercoPress, 2011).

4.1.1 Food Supply

Rice has always been the most important grain of the Cuban diet (Alvarez, 1992). In 2007, rice consumption per person was 64.0 kilogram, by comparison, in the United States only 8.2 kilograms of rice are consumed per person (FAOSTAT, 2012). Therefore, rice is eight times more consumed in Cuba than in the United States.

The intake of carbohydrates, based on cereals, amounts to 1310 kilocalories per day per capita in Cuba, and to 892 kilocalories per day per capita in the United States. Thus, the carbohydrate intake from cereals is larger in Cuba than in the United States. The share of rice in the daily consumption amounts in Cuba to 635 kilocalories, and in the United States to 86 kilocalories (Figure 3).

Figure 3: Food Staple Intake of Cuba versus United States



Data source: United Nations, Food and Agriculture Organization (2012).

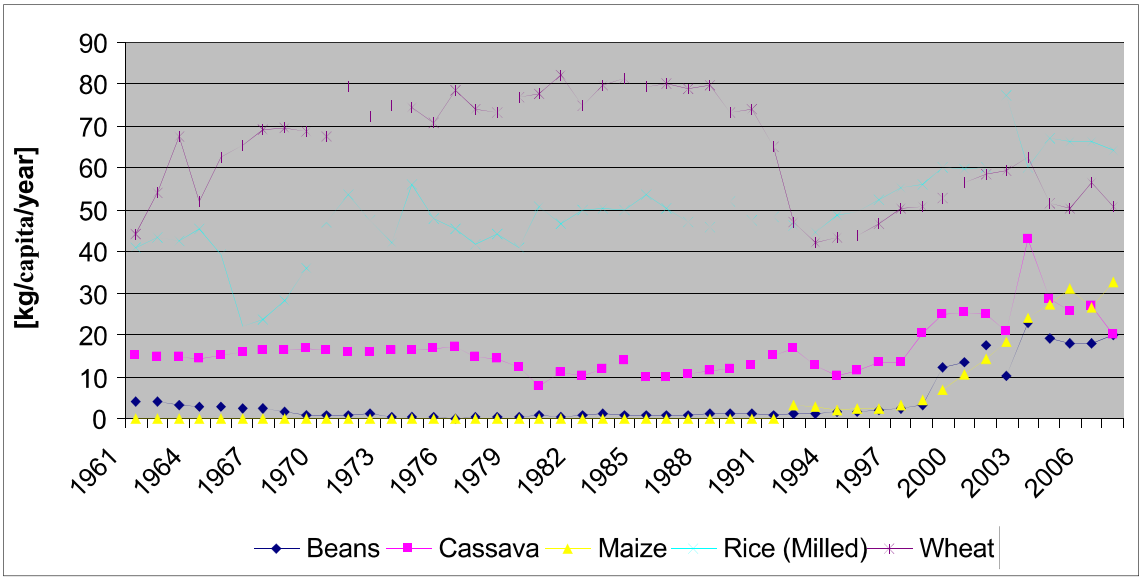
4.1.2. Trend in Food Supply

Since the 1990s, Cuban rice consumption increased significantly. In 1990 per capita rice consumed was 47.5 kilogram, and in 2007, Cubans consumed 64.0 kilograms of rice per capita. At the same time, the wheat consumption decreased from 74.1 kilograms in 1990 to 50.8 kilograms in 2007. Hence, rice became more important as a staple food than wheat.

Also, the consumption of maize increased from 3.0 kilograms in 1992 to 32.6 kilograms in 2007. The consumption of cassava increased from 12.7 kilograms in 1990 to 26.8 kilograms in 2006. Bean consumption increased from 1.0 kilograms to 19.9 kilograms in 2007 (Figure 4).

An economic break in 2001/2002 also impacted the food supply, causing a higher consumption of cassava, maize, and beans in 2003. Three hurricanes, decline of tourism, and low world prices for sugar and nickel, caused hard times in Cuba (World press, 2002). Therefore, Cuba was very vulnerable to changes on the world market.

igure 4: Trend Cuba Food supply [1961-2007]



Data source: United Nations, Food and Agriculture Organization (2012).

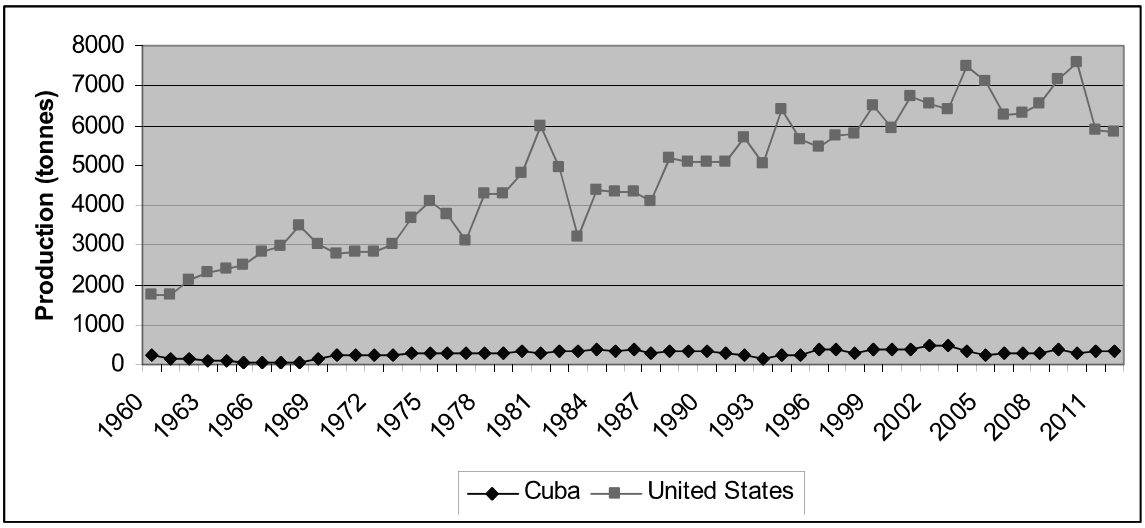
4.1.3. Rice Production

China is the world's leading rice producer with 140,500 thousand metric tons in 2011/2012. (USDA, 2012) The second largest rice producer is India with 102,000 thousand metric tons in 2011/2012. Both countries also have the highest demand, with 138,500 thousand metric tons (China), and 94,000 metric tons (India) (PSD, 2012).

The U.S. rice production amounted to 5,874 thousand metric tons in 2011/2012, ranking the United States' as 14th among the largest rice producing nations. United States rice is mainly produced in Arkansas and the Gulf States (USITC, 2007).

Depicted in Figure 5, in 2011/2012 Cuban rice production amounted to 338 thousand metric tons, and ranked 44th out of 89 countries (USDA, 2012). Cuba's rice production is mainly located along the west coast, in Granma, Pinar del Rio, Sancti Spíritus, and Camaguey (FAO, 2002).

Figure 5: Milled rice production in 1961-2012



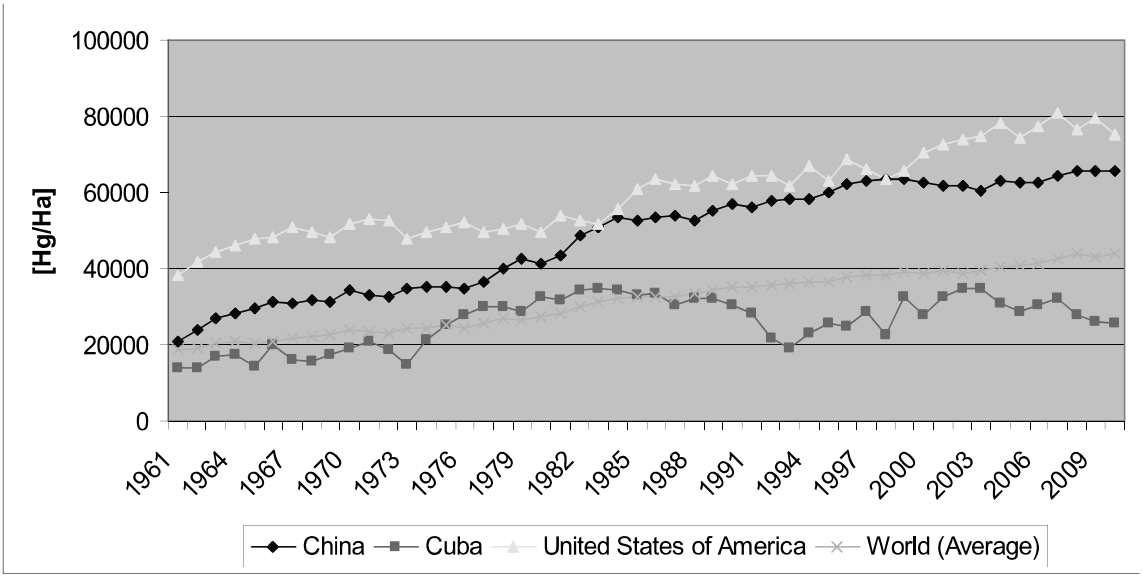
Data: U.S. Department of Agriculture, Foreign Agricultural Service, PS&D Database, 2003.

4.1.4. Yield

Cuban rice productivity declined from 3.0580 metric tons per Ha in 1990 to 2.5756 metric tons per Ha in 2010 (FAO; 2012). At the same time, the world average yield of rice increased from 3.5286 metric tons per Ha to 4.3737 metric tons per Ha. Therefore, the Cuban rice yield is below the world's average yield (Figure 6).

The United States increased their rice yield from 6.1975 metric tons per Ha in 1990 up to 7.5375 metric tons per Ha in 2010. Hence, the United States are well above the world average yield, and produce more rice per hectare than China, India, and Cuba (FAOSTAT, 2012).

Figure 6: Comparative yield of Cuba Rice paddy [1961-2010]



Data: United Nations, Food and Agriculture Organization, FAOSTAT, 2012.

4.2. Rice Trade

Cuban rice production cannot meet the domestic demand, and therefore Cuba relies on imports of rice (Figure 7). Rice production also had a large decline after 1990. With the losses of subsidies, the production decreased from 50 percent domestic self-sufficiency in 1990 down to 23 percent in 1993. At the same time, the imports increased from 43 percent in 1990 to 76 percent in 1993. In 2012, more rice is imported than produced in Cuba.

4.2.1. Production versus Imports

The 1990s were also driven by the loss of preferential trading partners, such as the Soviet Union, Eastern Europe, and the COMECON (Council for Mutual Economic Assistance – the former Soviet trading network). The decrease in agricultural imports and declining domestic production caused food shortages to become almost catastrophic in 1994 (FAS/USDA, 2008). That became known as the "rafters" crisis of the summer of 1994. The word rafter comes from the word raft or small boats which are used by Cuban citizens who flee to the US. The year 2005 was marked by a large hurricane, which devastated primary agriculture production in the south of Cuba (cubahurricanes.org). This also caused a large decline in agriculture production.

Figure 7: Food Balance Sheet for Rice

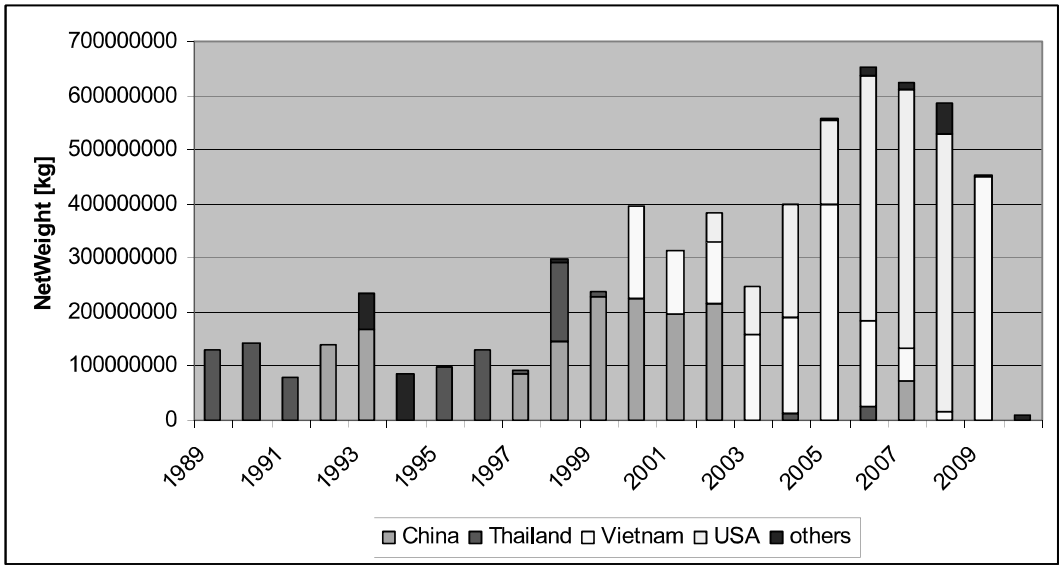
Data: United Nations, Food and Agriculture Organization, FAOSTAT, 2012.

4.2.2. Cuban Rice Imports

In the 1990s, China and Thailand were the largest suppliers of rice to Cuba. Between 1990 and 2000, China and Thailand delivered an average 130 thousand metric tons per year each. Vietnam began to export into the Cuban market in 2000 with 168 thousand metric tons (UN Comtrade, 2012). In 2005, the Vietnamese exports reached 399 thousand tons, and replaced China as the main exporter (Figure 8).

After the Trade Sanctions Reform and Export Enhancement Act of 2000, the United States began to export to the Cuban market. Between 2000 and 2005, the United States exported an average of 181 thousand tons yearly, a significant share on the Cuban rice exports. In 2011, Cuba had to import almost double of its rice consumption which calculated to be more than 600,000 tons (MercoPress, 2012).

Figure 8: Cuban source of Rice Imports



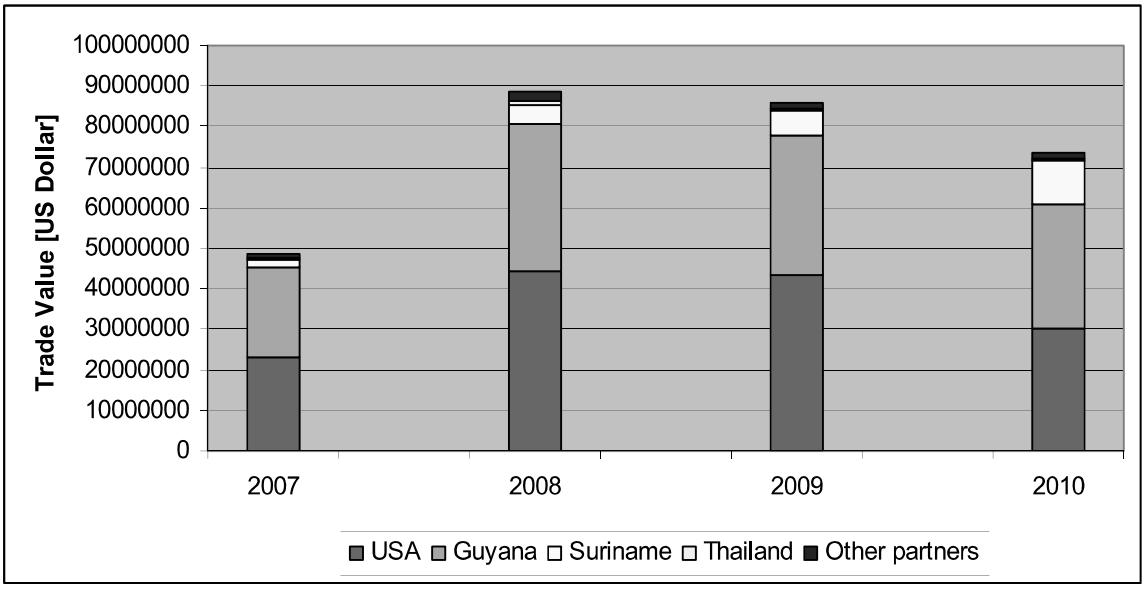
Data: United Nations, United Nations Commodity Trade Statistics Database, 2012.

4.2.3. Caribbean Rice Imports

The Caribbean countries obtain their rice mainly from Guyana and the United States (Figure 9). Guyana supplied the Caribbean countries with 30 thousand metric tons in 2010. The United States supplied 300 thousand metric tons in 2010 to the Caribbean states.

The U.S. rice exports to the Caribbean are significantly higher than the U.S. rice exports to Cuba. The Caribbean market also enjoys a close proximity to the United States. Due to the low shipping costs, the United States is highly competitive with the Asian exporters. U.S. rice can be shipped promptly, at about 24 hour sailing time from New Orleans ports, and in smaller ocean vessels (USITC, 2007). Only Cuba cannot gain from the proximity to the U.S. market due to the standing economic embargo against Cuba.

Figure 9: Caribbean source of Rice Imports



Data: United Nations, United Nations Commodity Trade Statistics Database, 2012.

4.3. Trade Potentials

The United States prohibits all US trade with Cuba under the authority of the Foreign Assistance Act of 1961 (USITC, 2001). With the Trade Sanctions Reform and Export Enhancement Act of 2000 altered the U.S.-Cuban trade relationship by rewarding trade exceptions to several agricultural and medical exports (USDA, 2012).

However, U.S. traders who want to trade with Cuba need to apply for a standard export license at the U.S. Department of Commerce, Bureau of Industry and Security (BIS, 2012).

The United States International Trade Commission estimated in 2001 that if the embargo would be absent, the exports from the United States to Cuba would have been approximately $658 million to $1.0 billion annually (USITC, 2001). The estimated imports from Cuba to the United States would have accounted for $69 million to $146 million annually (USITC, 2001).

The calculations are based on trade data from 1996-1998, and exclude sugar as an import good (USITC, 2001).

In 2007 the United States International Trade Commission estimated that all agricultural commodity sectors would likely benefit from lifting the embargo. The United States would largely gain from the following exports to Cuba: fruits and vegetables ($34 million - $65 million annually), milk powder ($14 million - $41 million), processed foods ($18 million - $34 million), wheat ($17 million to $33 million) (USITC, 2001).

The Cuban government itself estimated the costs of the U.S. economic sanctions has cost the Cuban economy $67 billion till 1998. This includes the negative costs of reduced trade, less tourism, higher shipping costs, frozen bank accounts and emigration of skilled workers (USITC, 2001).

4.3.1 United States Level

The U.S. is one of the main efficient rice producing nations in the world; in 2010, it was the third largest rice exporter in the world market (Western Farm Press, 2010). Main export competitor markets of the U.S. are Vietnam, Thailand, India, and Pakistan (PSD, 2012).

Over the period 1955 – 1958, Cuba was the leading market for U.S. rice exports. Cuba's purchases amounted to about 25 percent of the US rice exports (USITC, 2007). The loss of the Cuban marked had a significant impact on the U.S. rice industry (USITC, 2007). Overtime the US rice industry was able to export to other countries, but frequently only with official US export assistance (USITC, 2007).

The current import sanctions have a significant effect on the U.S. rice industry as well (USITC, 2007). Therefore, the US rice industry has lobbied for 15 years to remove the trade restrictions on Cuba (ricefarming.com) The USA Rice Federation lobbies actively for direct fund transfers between U.S. and Cuban banks, lifting travel restrictions and easing trade relations (westernfarmpress.com, 2009). According to *Bill Reed* from USA Rice Federation "all economic sanctions and restrictions regarding Cuba should be removed" (USITC, 2007, p. D-6). The USA rice leaders and Cuban officials maintain a good business relationship, in which both agree that the embargo should be lifted (ricefarming.com, 2010). Between 2005 and 2011 the USA Rice Federations held several rice talks with Cuban officials.

In 2007, the United States International Trade Commission analyzed the free trade impact, between the US and Cuba (Table 1). The analysis was carried out for sixteen agricultural products: wheat, rice, corn, animal feed, soybeans, fats/oils, dry beans, poultry, beef, pork, dairy, foods/beverages, fish, forest products, and other food products. The study was divided into three scenarios: (1) lifting financial restrictions, (2) lifting travel restrictions, (3) lifting financial and travel restrictions (USITC, 2007. pp 4-7 – p. 4-9).

Lifting the financial restrictions (scenario 1) would have a significantly positive effect on U.S. rice exports to Cuba. The US rice exports would increase between $14 million and $43 million. Therefore the US share of Cuban rice imports would increase by 33 percent and 53 percent (USITC, 2007, p. 4-8). The removal of travel restrictions (scenario 2) would increase the US rice exports between $300,000 and $900,000, compared to the trade level of 2006. The reason for the relatively small increase is that most rice is consumed by Cuban citizens (USITC, 2007, p. 4-8). By removing financial and travel restrictions (scenario 3), US rice exports would increase between $15 million and $44 million (USITC, 2007, p. 4-9).

Table 1 Analysis about removing financing and travel restrictions on Cuba

Scenario	With restrictions	Without restrictions	Change
Lifting financing restrictions (scenario 1):			
Total Cuban imports ($ million)	166.3	157.3 - 163.4	-9.0 - -2.9
Total Cuban imports (1,000 MT)	698.0	703.2 - 713.7	5.2 - 15.7
U.S. share of Cuban imports (%)	23.8	32.8 - 52.7	9.0 - 28.9
Cuban imports from the United States ($ million)	39.5	53.6 - 82.9	14.1 - 43.4
Lifting travel restrictions (scenario 2):			
Total Cuban imports ($ million)	166.3	167.5 - 169.9	1.2 - 3.6
Total Cuban imports (1,000 MT)	689.0	703.1 - 713.2	5.1 - 15.2
U.S. share of Cuban imports (%)	23.8	23,8	0,0
Cuban imports from the United States ($ million)	39.5	39.8 - 40.4	0.3 - 0.9
Lifting financing and travel restrictions (scenario 3):			
Total Cuban imports ($ million)	166.3	160.6 - 165.7	-5.7 - -0.6
Total Cuban imports (1,000 MT)	689.0	713.2 - 728.9	15.2 - 30.9
U.S. share of Cuban imports (%)	23.8	32.7 - 52.1	8.9 - 28.3
Cuban imports from the United States ($ million)	39.5	54.2 - 83.7	14.6 - 44.2

Source: United States International Trade Commission, Publication 3932, 2007, p. 4.

4.3.2. U.S. State Level

A study in 2010, conducted by Parr Rosson from Texas A&M, analyzed the trade impact for individual US states. Some economic estimates of his study are based on the USITC 2007 report. Rosson's study was carried out to analyze the impact on export products (mainly agriculture products), supporting sector (business, financial and real estate service) and the employment sector (gains of jobs). The agriculture products comprise grains (rice, wheat, and corn), poultry, pork, beef, dairy, processed food, and lumber. Base estimates were carried out for exports, indirect/induced activity, and total activity. In this study, rice was not treated separately. The major export crops, wheat, rice, and corn, were aggregated to a group of grains.

Rosson found out that by lifting travel and financial restrictions, the total US exports could gain additionally up to $365 million per year, obliged $1.1 billion in business activity and 6,000 new jobs. One of the main net-beneficiaries would be the U.S. agriculture sector with poultry meat, dairy and processed food (Rosson, 2010. p. 1). Therefore, US states, primarily with their large agricultural sectors, would benefit from free trade with Cuba.

In total, the grain sector would require an additional $87 million in business activity, and would create 767 new jobs in the United States. Milk and processed milk products would gain $40.3 million, followed by poultry ($30.9 million), forestry products ($23.2 million), beef and pork ($20 million), and processed food ($246.6 million). The major job growth is estimated for the agriculture sector (641 new jobs), followed by the business service (250 new jobs), health care (145 new jobs), and food, drink and retail (133 new jobs). At the state level, the surpluses in grain exports (wheat, rice and corn) would be: Arkansas ($29,876,700), California ($20,670,900), Louisiana ($8,898,500), Missouri ($5,522,500), Illinois ($3,329,500), Nebraska

($2,789,600) Wisconsin ($828,400), Virginia ($512,200), and New York ($479,800) (Rosson, 2010, brief 08-20).

4.3.3 Arkansas Level

Arkansas has the highest business gains from additional cereal exports to Cuba (Table 2). Arkansas' additional business activity in grains of $29,876,700 is followed by poultry meat ($3,946,800), cotton ($1,582,500), lumber ($649,400), soya ($373,100), and planting seeds and fruits ($104,200). For Arkansas it is estimated a gain of $50.5 million for all economic and service sectors. About 60 percent of these surpluses would take place in the grain sector; in Arkansas, the rice industry would be the primary beneficiary. Therefore, Arkansas' rice industry would largely gain from open trade with Cuba.

Table 2 Economic Impacts on Arkansas

	Exports	Indirect and Induced Activity	Total Business Activity
Exports		*-Thousand Dollars-*	
Grains (*Rice, Wheat*)	$29,757.0	$119.7	$29,876.7
Poultry Meats	$3,554.7	$392.1	$3,946.8
Cotton	$1,498.1	$84.4	$1,582.5
Wood Products (*Lumber*)	$605.2	$44.2	$649.4
Soy Complex	$337.6	$35.5	$373.1
Other Crops (*Seeds, Fruit, Misc*)	$84.8	$18.7	$103.5
All Other Exports	$104.2	$269.0	$373.2
Supporting Sectors			
Real Estate	N/A	$2,297.6	$2,297.6
Other Ag Related	N/A	$2,149.3	$2,149.3
Financial Services	N/A	$1,425.3	$1,425.3
Wholesale Trade	N/A	$984.1	$984.1
Business Services	N/A	$948.7	$948.7
Health Care	N/A	$833.1	$833.1
All Other Sectors	N/A	$4,908.2	$4,908.2
Total Estimated Impacts			
Business Activity	$35,941.7	$14,509.9	$50,451.6
Employment (# of Jobs)	354	125	479

Source: Parr Rosson, Texas A&M University, 2010, p.2.

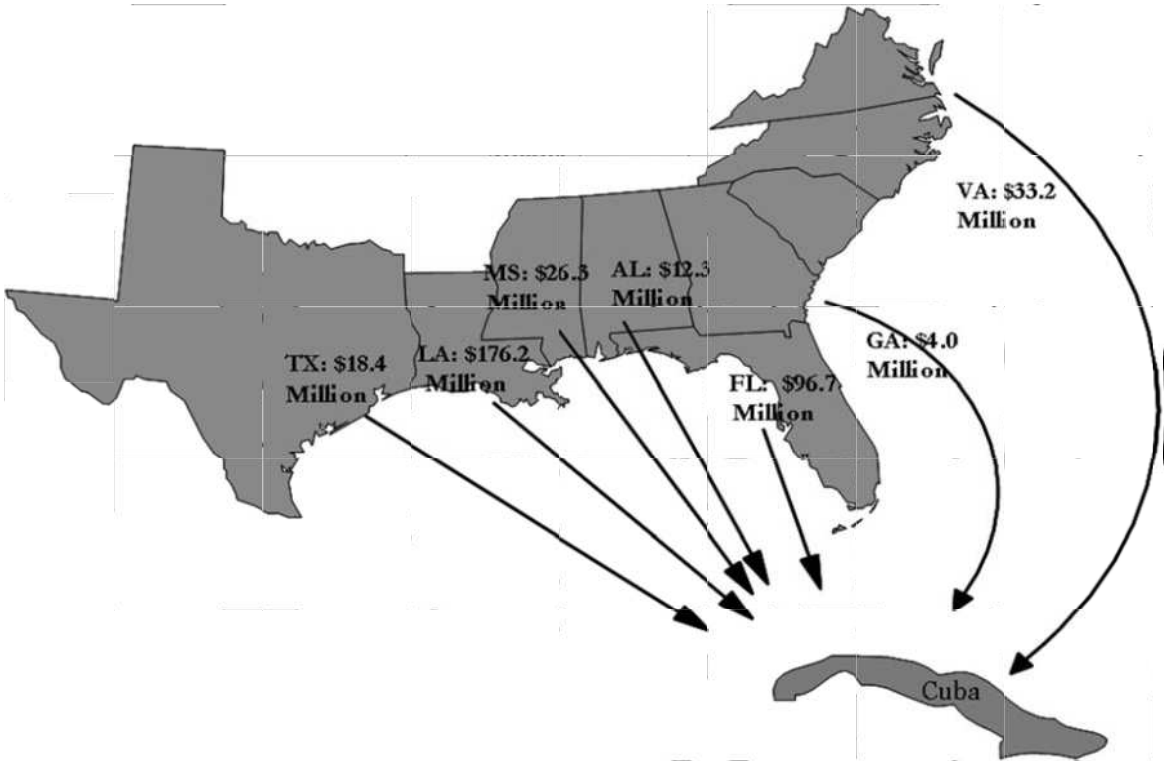
4.3.4. Southern United States

Nearly all U.S. exports are shipped from southern U.S. ports to Cuba. The total southern exports to Cuba were estimated with $125.5 million during 2010 (Adcock, 2012); a decrease by 32 percent compared to 2009, due to the implementation of the Travel Restriction Reform and Export Enhancement Act

The trade amounts for the single southern ports were estimated as: Louisiana ($176.2 million), Florida ($96.7 million), Virginia ($33.2 million), Missouri (26.3 million), Texas (18.4 million), Alabama (12.3 million), and Georgia (4.0 million). Therefore, Louisiana's ports account for nearly half of all U.S. exports to Cuba, and Florida accounts for more than one quarter in 2010 (Figure 10).

At the Public Hearing *U.S. Agricultural Sales to Cuba* in 2007, Ruben Bonilla, a representative of the Port Authority of Corpus Christi, Texas, testified that there is space for increasing exports to Cuba. Mr. Bonilla said: "*Alimport* pledged a doubling of exports through Corpus Christi" (USITC, 2007).

Figure 10: Exports to Cuba by Port State, 2010



Source: Flynn Adcock and Parr Rosson, Texas A&M University, 2012

4.3.5. Cuban Agricultural Policy

Cuban officials have often stated a desire to reduce Cuba's dependency on food imports. In January 2012, Vice President Esteban Lazo said "Cuba should reduce its increasing food imports" (Xinhua, 2012). President Raul Castro is trying to reduce Cuba's dependence on food imports by revitalizing the farming sector (BBC, 2011). Since he took over power from his brother Fidel Castro, he has made the increase of food production one of Cuba's priorities (Frank, 2012). Reform steps taken under Raul Castro included: decentralization of decision making, food sales directly to consumers, and leasing plots from fallow state land to private farmers (Frank, 2012).

The Sixth Congress of the Communist Party of Cuba, held in April 2012, also debated about Cuba's future agricultural policy. *Los Lineamentos* (The Guidelines) were a bundle of policy strategies approved for the future Cuban policy. The sugar sector should be revitalized, and fulfill requirements for the international market. Production programs for rice, beans, maize, and soya etc. should help to push forward the production, and decrease import dependency. Food imports should be reduced. The agriculture sector is calling for more contribution to the country's economic balance, and the financial dependency should shrink.

The Guidelines is a broad and ample document that puts forward 291 propositions for improving the functioning of the Cuban economy (Ritter, 2010). It covers twelve important Cuban policy fields.

4.3.6. Cuban Investment Program

In August 2011, the Cuban News Agency *Agencia de Información Nacional* (AIN) reported that Cuba has an official governmental program to increase rice production. The

program has the intention to increase the grain production, and should reduce Cuba's expenditures on food imports.

The investment program runs until 2016, and is expected to have a serious investment impact on the grain sector, that is to encourage, to stimulate, to stabilize, and to develop production of cereals. The program should substitute the costs of $1700 million which are currently spent on food imports. The program keeps funds of more than $400 million which are available for investments, improvements, and modernization of technology in the four rice growing regions of Granma, Camaguey, Santi Spiritus, and Pinar del Rio. This includes the purchase of modern and expensive harvest machines, and land preparation equipment. In 2011, Cuban rice farmers received support with 74 harvesters and new tractors (Redacción Central, 2012). For the future, repair and maintenance of the irrigation system as well as a drainage system are planned.

The new equipment is allowed not only for use by the Agro industrial Complex, but it can also be used by the private sector. The technology can be rented by non-state farmers with contracts in advance (José Cabrera Peinado, 2012).

4.3.7. Cuban Joint Venture

Radio Haciendo reported in December 2011 that the program includes the introduction of new technologies with Japanese, Chinese and Vietnamese expert advice. The radio reported that the Cuban-Vietnam Joint Venture Project is expected to produce over 40, 000 hectares of rice. The bilateral cooperation in this field started in 2002, primarily in the eastern province of Granma, and then expanded to other areas of the island. A Vietnamese representative said that

the project has concrete results in the demonstration areas, and in consulting production (Rafaela Manso, 2011).

CHAPTER 5 United States Sugar Sector

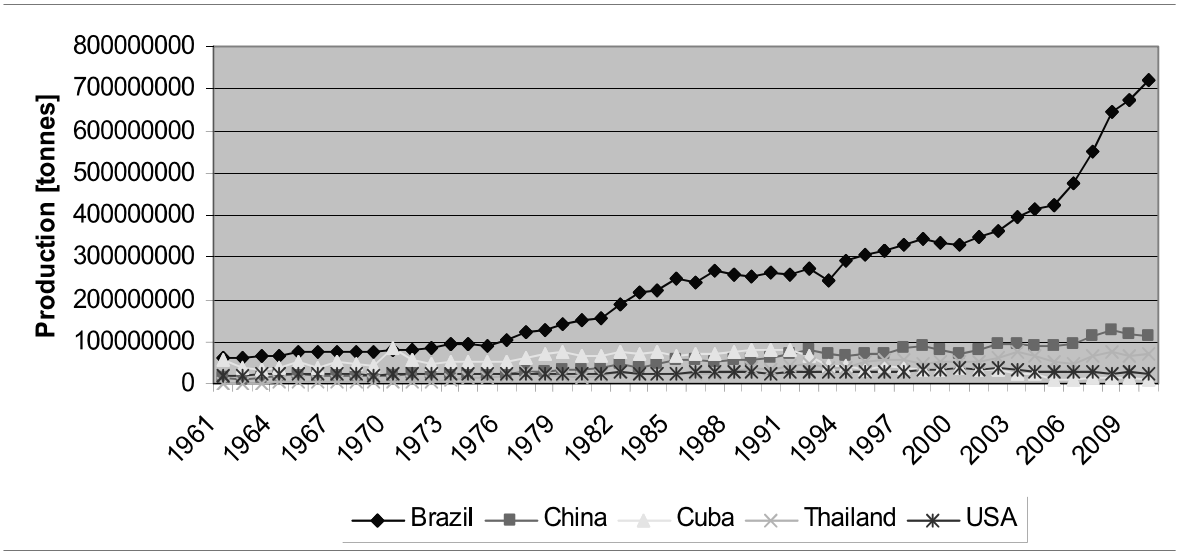
In the United States, sugar cane is grown commercially in Florida, Louisiana, Texas, and Hawaii. The 2010 sugar cane production amounted to 27.9 million tons, and was valued at more than $991 million (Huntrods, 2011).

5.1. Sugar Market

Florida is the top producing sugar cane state with more than 13.7 million tons. The Floridian production contributes about half of the total U.S. cane sugar crop (Huntrods, 2011). Other important sugar cane producers are Louisiana and Texas: Louisiana produced more than 11.3 million tons of sugar cane, and Texas more than 1.6 million tons. The number of sugar cane farms dropped from 953 in 2002 to 692 in 2007, while the average area harvest grew from 1,027 in 2002 to 1,224 acres per farm in 2007 (Huntrods, 2011).

In 2010, the world sugar production amounted to 161,900 metric tons. Brazil is by far the world's largest producer of sugar cane (Figure 11). The main Asian sugar producers are China (second largest), India (fourth largest) and Thailand (eight largest) (FAO, 2012). Cost of production for sugar cane increased in recent years, due to increase in input e.g. fuel and chemical (Huntrods, 2011).

Figure 11: World Sugar Production.



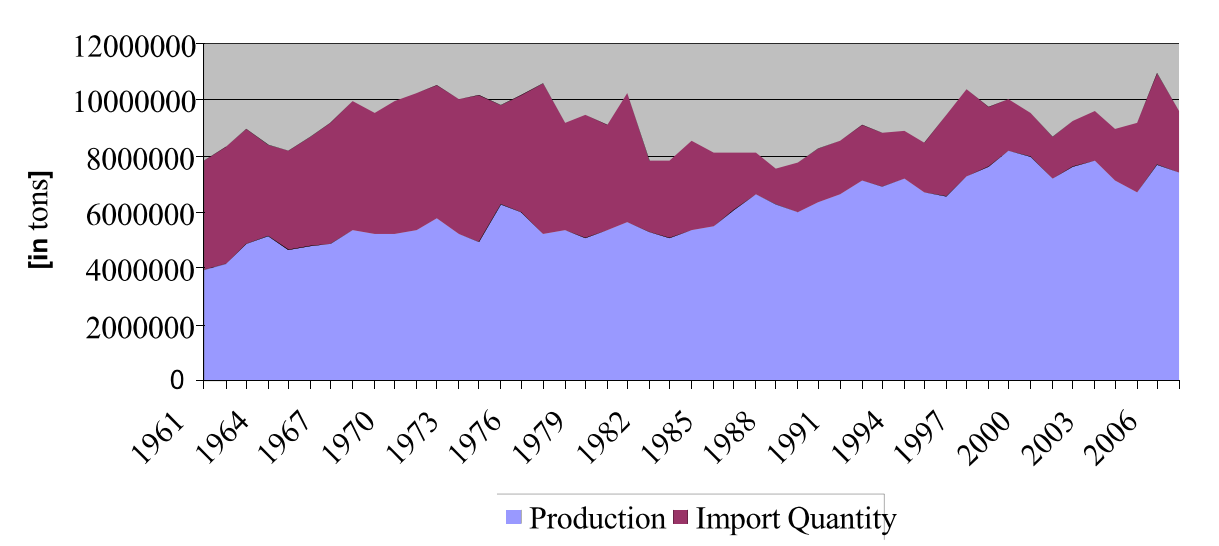
Data: United Nations, Food and Agriculture Organization, FAOSTAT, 2012.

5.1.2 Consumption and Industrial Use of Sugar in the US

1972 was the peak in refined sugar consumption in the US with 102 pounds per person and year. Since then, the sugar consumption has decreased. Today, the yearly refined sugar consumption amounts to 66 pounds per person (USDA, 2008). The annual consumption of sugar from other sources: 68.3 pounds corn sugar, 1.5 pounds honey and syrup (Huntrods, 2011).

The domestic sugar use is mainly dedicated to the production of food and processed food in the United States. In 2010, nearly 5.6 million tons of refined sugar was delivered to the food and beverage industry (Huntrods, 2011). This corresponds to an increase of 0.2 million tons compare to 2009. The main customers for refined sugar in the U.S. are the baking and cereal industry, beverage producers and also confectionery makers. The demand of such food industry sectors decreased in recent years (Huntrods, 2011). According to the USDA, sugar cane's share of combined sweetener production rose from 70 percent in 2000 to 79 percent in 2009.

Figure 12: United States Raw Sugar Production and Imports [1961-2007]



United Nations, Food and Agriculture Organization, FAOSTAT, 2012.

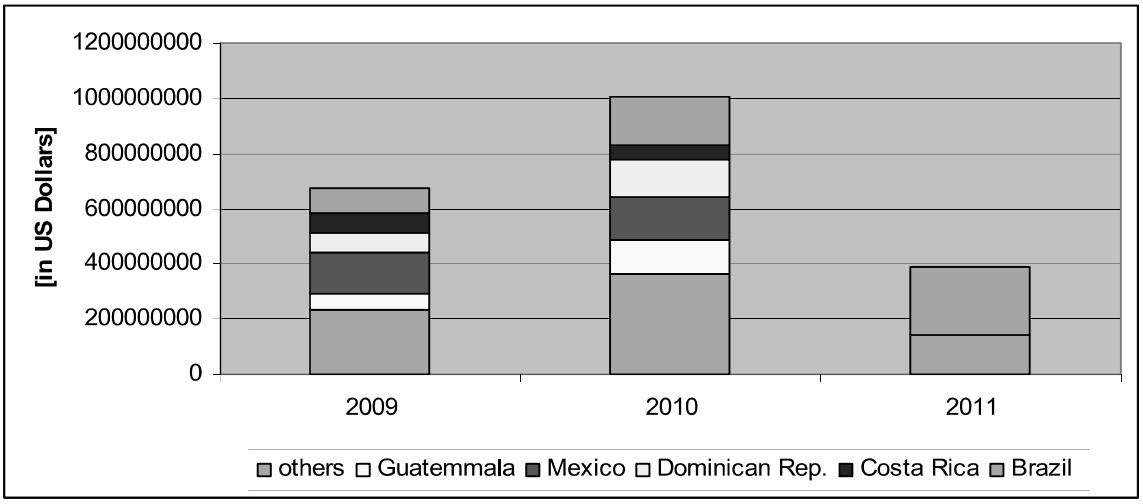
5.2. Sugar Trade

A large amount of U.S. sugar imports are raw cane sugar imports (Figure 12). The United States have an import quota system which allows several states to supply the United States with sugar products. The import quota system has the effect of protecting U.S. sugar producers from dumping imports from third countries. In the world there are 40 countries which are given a certain quota to supply sugar on to the US market. US import quotas for sugar are set for a certain time period and can be removed or resupplied (Huntrods, 2011).

In 2010, more than 2.8 million metric tons of sugar (including beet sugar) was imported, with nearly 1.2 million metric tons, or 43 percent, coming from Mexico. The second largest source of sugar, also totalling nearly 1.2 million metric tons, entered under tariff-rate quotas (TRQ).

The tariff-rate quotas for the fiscal year can also be extended or new announced. For example in spring 2010 the Department for Agriculture set an additional amount to the tariff-rate quotas by 181 thousand metric tons. The total sugar tariff-rate quota for the fiscal year 2010 is estimated with nearly 1.4 million metric tons. In 2010, more than 49,000 metric tons of sugar cane, a 46 percent increase, was imported primarily from Mexico. The main suppliers in 2011 were Brazil and other countries (Figure 13).

Figure 13: United States Sugar Imports [2009-2011]



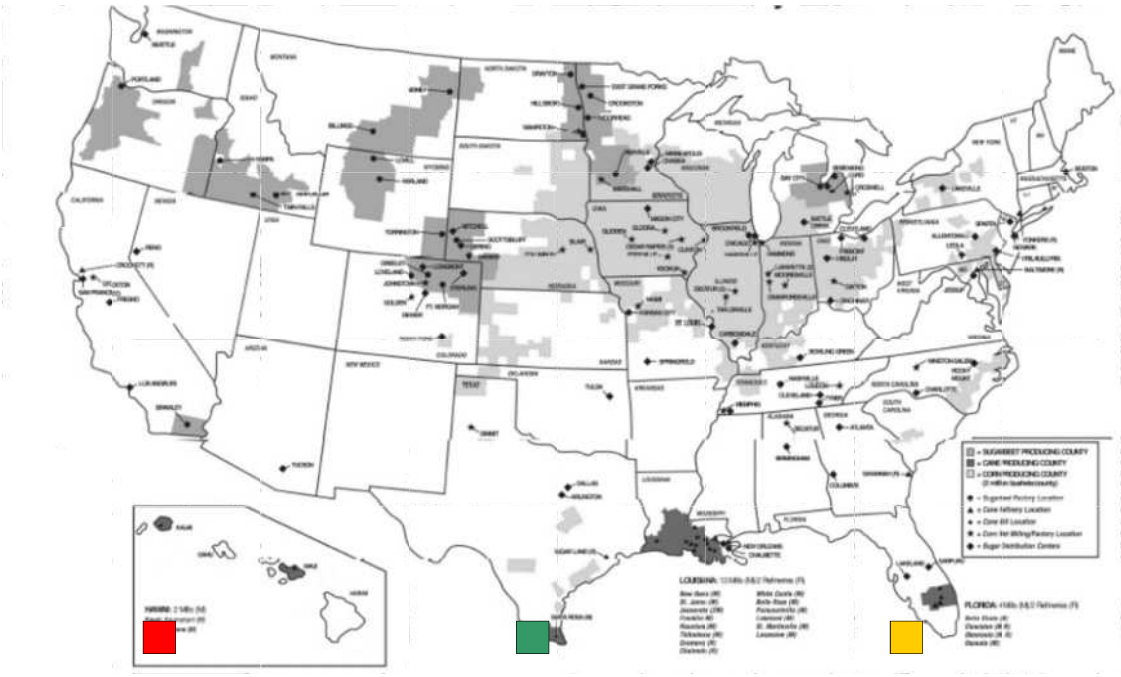
Source: United Nations, United Nations Commodity Trade Statistics Database, 2012.

5.2.1. Environmental Constraints

U.S. sugar cane production also faces constraints and restrictions. The cane production takes place in highly populated regions where conflicts between the environment and production are expected (Figure 14). Especially Florida, with the largest, has had to find a balance between production and environmental issues. There are mainly three reasons that limit the expansion of the United Sates sugar production.

First, there is the scarcity of arable land for sugar cane cultivation. Muck land, the preferable soil for sugar cane production, has becomes rarer in Florida (Jose Alvarez, 2000). Therefore, an increase in the acreage of sugar production will be unlikely. Muck land is less and less available for farmers. Expansion on sand soil is a remote possibility because of the non-suitability of the location factors. Due to this fact, Florida's sugar industry is also not expected to grow more (Jose Alvarez, 2000). Analyses say that they may have reached their peak with 1.1 million tons of raw sugar output.

Figure 14: Sugar Production in the United States



Sugar cane Sugar Beets Corn

Source: American Sugar Alliance, Arlington, 2009

Secondly, water and environmental constraints have become progressively crucial. The government sets more and more environmental regulations and taxes on the sugar production.

Florida's sugar cane growers have to pay a water tax depending on the area, and an additional water fee in special areas. The water tax amounts 3.50 U.S. Dollar per acre. In protection districts, such as the Everglades, the tax amounts to 25 U.S. Dollar per acre (Jose Alvarez, 2000). The government is extending the water protection areas. With the program "Agricultural Best Management Practices" (BMP's) farmers were restricted in their use of inputs. It also imposes a water fee of 10 U.S. dollar per acre for a period of five years (Jose Alvarez, 2000). With the increasing environmental restrictions, we can see that the expansion of sugar cane production becomes more and more difficult in the south of the United States.

Thirdly, there are decreasing support and trade distortion from U. S. Policy, and an increasing pressure from international agreements to reduce subsidies. U.S. policy is not likely to increase the sugar cane loan. Currently, the loan rate for sugar cane is frozen at 18 cents per pound (Jose Alvarez, 2000). Under the current U.S. budget deficit, it does not seem likely that the loan for sugar cane growers will increase. In regard to world trade negotiations, it appears unlikely that the United States will enlarge their subvention for sugar cane growers. Pressure is given from states, such as Brazil, South Africa, India, and Russia, to the U.S. to reduce their subvention for their sugar industry (Knapp, 2004).

The restricted availability of muck land, the increase of environmental requirements, and the declining policy, underline support for the limited possibilities of expansion for the U.S. sugar industry. It emphasizes the fact that by increasing demand on the U.S. market (Jose Alvarez, 2000), the additional charges need to be covered by imports. The proximity to the U.S. market makes fast and cheap shipment of sugar from Cuban ports possible. It does not appear prudent to assume the existence of an export market above six million tons. Thereby, under the assumption of a no embargo, Cuba could increase its exports by six million tons per year. The

hypothesis in the following will be that Cuba could increase its exports without trade barriers to the U.S. market.

5.3. Trade Potentials

While discussing the potential of a complementary sugar trade between Cuba and the United States, we need to consider the sugar quota. When the high price sugar period started in the early 1970s, the U.S. lifted their quota for twelve years. Yet, when the world sugar price began to fall in May 1982, the United States re-imposed its quota. The United States Department of Agriculture (USDA) gives country-specific quota shares in line with diplomatic considerations (Skully, 1998). Since 1960, Cuba has had no quota to deliver sugar on the U.S. market. Without an embargo, Cuba would need to obtain a sugar quota to deliver sugar on the U.S. market. In the following section, we hypothetically examine which policy options could exist in future U.S.-Cuban sugar trade.

5.3.1. New Quota

The most recent idea is to give Cuba a new quota share in order for it to deliver sugar on the U.S. market (Figure 15). This policy option implies that the USDA would reallocate quotas from other countries, and provide them to Cuba. This option could represent approximately 48 000 tons per year (Jose Alvarez, 2000). However, the countries from which the quota is taken would be disadvantaged, as they could deliver less to the U.S. market. This would have more effects on U.S. foreign affairs than on its agriculture policy. Countries from which quota would be taken will protest against cutting them.

5.3.2. Quota Based on Difference of Delivered Imports

A second option is imposing a quota based on the difference of current quota and actual delivered imports. We take the accounted difference from the announced quota and the real landed imports (Jose Alvarez, 2000). From 1992 to 1995, 24, 794 tons were the yearly difference and 95, 565 tons were the yearly difference from 1995 to 1996 (ERS, 2007). Therefore, the yearly amount will result in 59 174 tons. A potential quota share for Cuba could be levelled out between 60 000 and 70 000 tons per year.

5.3.3. Quota Based on Increased Consumption

The third quota option is based on an increasing consumption in the United States. Increasing demand in the U.S. would allow distributing this amount as a quota to Cuba since U.S. domestic production is limited. The USDA has projected a rise in the U.S. sugar consumption of about 100 000 tons per year from 1994 to 2000 (Jose Alvarez, 2000). This amount could be given to Cuba as an export quota. This would bring advantages for both sides: the consumer surplus in the U.S. will lower the sugar price, and the Cuban producer surplus will mean higher supply. Not touching the quota from other countries makes this policy option interesting in terms of foreign policy.

5.3.4. Sugar to be Re-Exported Program

In 1982 the program “Sugar to be Re-Exported in Refined Form” was established in the United States. The refiners who participated in this program can import raw sugar exempt from the quota, and process this sugar for exports (Lynn Garrett, 1996). Most refiners in the northeast of the United States mostly rely on imported raw sugar from sugar cane. Interesting is that the refiner can choose the country from which he would like to receive the raw material (Jose

Alvarez, 2000). Those refiners would be good partners for Cuba because they would allow Cuba to deliver its sugar to the U.S. market exempt from the quota. This would also be a better option in terms of free trade. Past participants were countries such as Guatemala and Columbia. They delivered 3,860,000 tons raw sugar in a six year period from 1990 until 1996 (Lynn Garrett, 1996). The average value over the six years would be 600 000 tons per year. Guatemala and Columbia are relatively far from the U.S. market; Cuba, however, could benefit from its proximity to the United States. The cost for shipping would be lower than in those countries further away, and Cuba could capture their export quantity.

5.3.5. Polyhydric Alcohol

Another option would be that Cuba enters the U.S. market through the polyhydric alcohol sector. Ten U.S. firms buy sugar at world market price to produce polyhydric alcohol for their non-food products (Lynn Garrett, 1996). Industrial branches which produce foam cushions, bowling balls, and car bumpers are interested in using polyhydric alcohol. The quota exemption will be permitted by the United States Department of Agriculture (USDA). The demand from these branches can be described as relatively small. Between 1990 and 1996, only 11 000 tons raw sugar per year were demanded by the United States (Jose Alvarez, 2000).

5.3.6. Oxygenated Fuels

A third non-quota base alternative could be oxygenated fuels. With the Clean Air Act of 1990, President Bush set strict clean fuel provisions that were expected to increase the requirements for oxygenated fuels and ethanol. Here, raw sugar can play an important role as an input base. Yet, due to tax advantages, corn producers are still the main suppliers (Jose Alvarez, 2000). An expected increase in the production by 500 million gallons per year would increase the

demand for corn by 200 million bushels per year (J. Hrubovcak, USDA). Some sugar buyers have entertained the idea of granting Cuba the tax advantages that corn producers now receive for ethanol production under a post-sanctions scenario. But concrete actions, or quantities of potential raw sugar demand, cannot be given. Thereby, we exclude the last option in the following analysis. In the impact analysis we will concentrate on the first five options.

5.3.7. Impact on Cuba

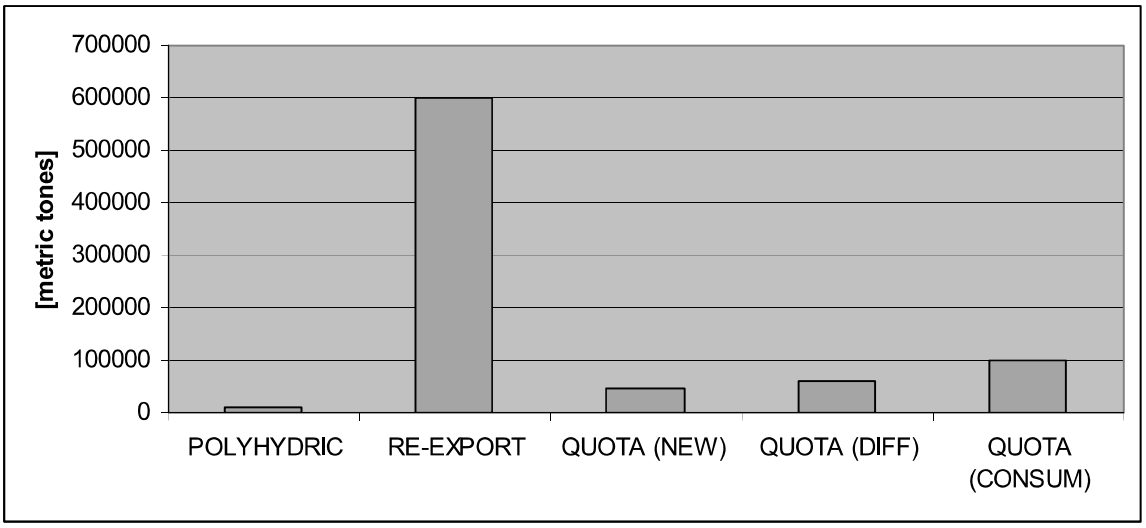
In the following paragraph are comparisons of the different policy options. The average purchasing surplus of all five policy options is 163 000 tons, which is very small. The hypothetical export options do not even reach the mark of 1 million tons.

The highest surplus can be found in the Re-Export program were raw sugar is import exempt from the quota, and processed for export purposes. The problem here was that Alvarez has not specified how high the share of Cuba from the total import volume could be. With 600 000 tons, we analysed the total amount as potential quantity. It seems difficult for an outsider to estimate a potential share for Cuba on his amount. Therefore, and with consideration of the transportation costs advantage, we assume that Cuba will replace suppliers such as Guatemala and Columbia fully. By looking at the following figures, we need to take this assumption into account.

The lowest purchasing potential is found in the polyhydric alcohol option. Only 11 000 tons of raw sugar would be needed. Due to the relatively small sector for synthetic alcohol, it is by now the least interesting option. But with increasing production, as expected by the U.S. Agricultural Department, this market could be significant in the future.

The three quota considerations have an average purchasing quantity of 70 000 tons. With 100 000 tons, the quota option based on increasing consumption has the highest surplus among all the quota ideas.

Figure 15: Potential purchasing surplus of five options

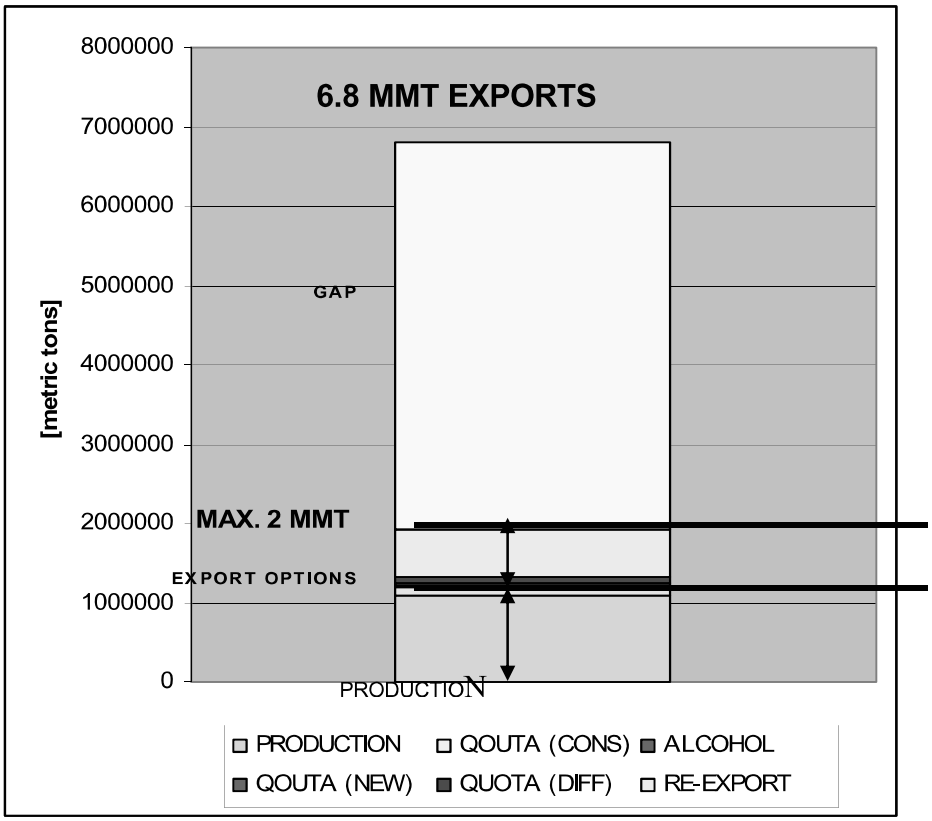


Source: Own investigation, data: Jose Alvarez, 2000

The trend of decreasing Cuban sugar exports is continuing. The quantity of raw sugar exports decreased by more than 2.5 million tons over 2000 - 2009. Hence, Cuba's export share has been declining since the Soviet Union dissolution. Cuba lost its largest market. With the assumption that Cuba could deliver to the U.S., we assumed Cuba would have a large sales market, and could increase its exports. But by showing the hypothetical exports to the US, it turns out that the exports cannot even exceed the mark of one million tons. Cuba's current raw sugar production amounts to 1.100 thousand metric tons. The highest possible surplus has the Re-export program with 600 thousand tons. But there is still a gap of over 4.8 million metric tons to reach 6.8 million metric tons (Figure 16). The export increases deals with the assumption that Cuba can increase its production with increasing excess demand.

The assumption that Cuba can recover its previous export volume of 6.8 million tons from 1980 must be rejected.

Figure 16: Possible Impact of Sugar Exports to the US



Source: Own investigation, data: FAO STAT, Jose Alvarez, 2000

The research has shown that the option can only minimally increase the Cuban exports. With an average surplus of 163 000 tons, the export volume can only rise by 950 000 tons. The export quantity from 1980 of 6.8 million tons can therefore not be reached. The quota system still restricts free trade, and prohibits U.S. enterprises to buy sugar in Cuba. If Cuba would be assigned a new quota, the export volume could still only increase by 48, 000 tons. The total volume under the quota would not increase, and quota shares for Cuba would have to be taken

from other countries. This would have an effect on the U.S. trade policy towards other countries. The U.S. would need to lower quota shares from U.S. friendly countries in order to give it to Cuba. With the option based on a quota assignment on consumption, Cuba could also only allocate around 100, 000 tons. Therefore, the increase of U.S. sugar consumption is too low to push Cuba's exports over 6.8 million tons.

The largest surplus can be found in the Re-Export program. With 600 000 tons, it clearly stands out from the other possibilities. But due to the political restriction, it would imply that Cuba will replace all other delivering countries, which is unlikely. Therefore, the amount of 600 000 tons must be seen as biased. However, this single policy instrument is also not able to lift the Cuban sugar exports above the level of 1980. The purchasing power of all refiners in the north of the U.S. is simply too small.

The quota idea, based on the difference between quota allocations and actually delivered imports, is too small as well. The amount of 60, 000 tons ranges in between the other two other quota options. That would definitely change if the quota system would be removed. Subsequently the Cuban producers would gain from expanding exports, and U.S. consumers would gain from a lower price under the quota. This idea, however, will bring about a political discussion concerning state intervention which is not the object of this paper.

The oxygenated fuel program is affected by political interventions as well. Because of the subvention to U.S. corn producers, Cuban raw sugar has an advantage over the U.S. market. But with the politically imposed tax advantage, it is not economically feasible for fuel producers to use raw sugar. As in the previous example here, we have the dilemma between policy interventions and free trade. With subventions, taxes, embargos, and sanctions, politicians want

to satisfy their voters, and distort the market equilibrium. The producers and consumers cannot fully gain when the market equilibrium is unbalanced, especially in the case of Cuba with four interventions: the U.S. trade embargo, the U.S. sugar quota, the Advance Payments Act, and the socialistically planned economy. This means we have a conglomeration of state interventions.

Even if we would count all five options together, which would mean that Cuba could deliver raw sugar to the United States via five ways, the sum would still only add to 818 000 tons. This would mean that the quota with the volume of 48,000 tons would be subtracted from America-friendly states and given to Cuba: the total annual increase of 100,000 tons would be given to Cuba; the sum of 60,000 tons would be shifted to Cuba; all sugar refiners in the north of the United States would be obliged to buy 600,000 tons sugar from Cuba, and the entire polyhydric alcohol industry would need to purchase their 11,000 tons of raw sugar from a socialistic state. This very hypothetical assumption would place Cuba as a high referenced trade partner for the United States.

As a result, Cuba could increase its export volume by 818 000 tons. However, even if Cuba could capture all delivery options for the U.S. market, they would not touch the export volume of 6.8 million tons.

In the outlook to remain on this export level, we have analysed that the comparative advantages with the U.S. are the largest. Markets such as Europe, Asia, Canada, or Japan have a declining or stagnant demand for Cuban sugar. The most favoured market would be the United States. The U.S. has limits in expanding sugar cane area, increasing consumption, and more environmental restrictions. The proximity to the United Sates lowers Cuba’s transportation costs, and gives Cuba an advantage in supplying sugar on the North American market. But political

boundaries between both countries still hinder the trade, and the increase of welfare. The US quota limits access for Cuban sugar suppliers, and the embargo forbids the trade between both countries in general. It is rather a political issue that needs be solved than an economic problem.

CHAPTER 6 Partial Equilibrium Analyses

6.1. Median - Rice Data

The following chapter deals with the trade potentials based on increasing population and increasing demand for the products rice and sugar. In the United States and Cuba the population increased in the past 50 years, therefore demand for food is growing. The following compounded medians will give an overview about the average consumption in the past 50 years. Based on this medians further consumption potentials will be calculated.

The chapter begins with a data panel of Cuba's rice consumption beginning from the 1960s. In the 60s the rice consumption amounted to 39 kilogram per person per year, 40 years later the consumption increased by 61% to 63 kilogram per person and year. The data are grouped into decades (Table 3).

Table 3 Historical Rice consumption and population Data Cuba

	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009
Consumption (Milled Rice)					
Average [kg/capita/year]	39.2	46.3	50.1	49.2	63.0
change [kg/capita/year]	-	+7.1	+3.85	-0.95	+13.8
change [%/capita/year]	-	+18.1	+8.3	-1.9	+28.0
Population					
Average	7,777,606	9,229,714	9,975,320	10,819,264	11,221,500
change [in capita]	-	+1,452,108	+745,606	+843,945	+402,236
change [in %]	-	+18.7	+8.1	+8.5	+3.7

Sources: PS&D Database and UN POPIN, 2013.

6.1.1. Theory of Median

In probability theory, the median depicts the numerical value sorting out the higher half of a sample, a population, or a probability distribution, from the lower half. The median of a list of numbers can be created by arranging all the observations from lowest half to highest half and picking the middle one. Also the median can be described as the mean of the two middle values (Weisstein, 2010).

$$\sum_{i=1}^{n} |\tilde{x} - x_i| \leq \sum_{i=1}^{n} |x - x_i|.$$

The following medians of consumption and population are based on the previous table; with the data: {39.2; 46.3; 50.1; 49.2; 63.0}. The same procedure for exchange in consumption and change in population applies. The average rice consumption from 1960 to 2009 was 49.2 kg per capita (Table 4). The consumption of milled rice increased on average by +5.48 kilogram (+13.2 percent) from 1970 – 2009.

Table 4 Calculated Median for Consumption and Population Data, Cuba

Consumption			Population		
Median [kg/capita/year]	change [kg/capita/year]	Change [%/capita/year]	In 2009	Change	change [%]
49.2	+5.48[1]	+13.2[2]	11,266,905	+794,775[3]	+8.2[4]

1 Consumption change (kg/capita/year): {7.1; 3.8; -0.9; 13.8}, USDA, PSD online, 2012.

2 Median of consumption percent change (%/capita/year): {18.1; 8.3; -1.9; 28.0}

3 Population change (capita): {1,452,108; 745,606; 843,945; 402,236}, UN Pop Stat, 2012.

4 Median of population percent change (in %): {18.7; 8.1; 8.5; 3.7}.

In order to find potential increases, consumption gains based on population growth are calculated as the follow. The population in Cuba increased, by 8.2 percent, from 1969 to 2009. To compare, the growth rate the whole Caribbean were 13.4 percent according to Mortimer, 2006. The whole region has a dynamic population growth with potential growth on food products.

6.1.2. Potential Amounts

Table 5 uses the data from 2009 to 2005. It presents additional consumption by 0.2% increase of population. For consumption it is considered to grow by 0.2%[2], by additional growth every 3rd year. As a result food supply of milled rice could increase from 701,928 tons up to 718,106 tons, by an increase of population by 0.2 percent and an slight increase in consumption by 0.2 percent every 3rd year. Tons would increase by +1,040 tons from 2010 to 2012; by +1,420 tons from 2013 to 2015 and +1,434 tons from 2016 to 2018. In total the consumption would increase by +9,606 tons in seven years.

Table 5 Potential Increasing Amounts of Cuban Populations and Rice Consumption

	2009	2010	2011	2012	2013	2014	2015
Population increase (2%)[1] (thousands)	11,266	11,289	11,312	11,334	11,357	11,380	11,402
Total Amount[2] (tons)	701,928	703,332	704,739	706,148	708,696	710,114	711,534
Additional tons[3] (compared to 2009)		1,404	2,811	4,220	6,768	8,185	9,606

1 Median of population for the most recent ten years 2001 till 2010: {0.3; 0.3; 0.3; 0.3; 0.2; 0.2; 0.1; 0.0; 0.0}, UN Population statistics, 2013.

2 Median of increasing consumption of the most recent ten years 2001 till 2010 {0.3; 28.5; -22.5; 12.1; -1.6; 0.3; -3.5; -4.2; 22.6}, P&S online 2013.

3 Additional tons: current year – previous year.

The assumptions are limited to the growth of population (2% per year) and consumption growth (2% every third year) and all other economic factors e.g. consumption behavior. It should be noted that the Cuban market works under imperfect competition e.g. planned economy. The market equilibrium is distorted due to governmental interventions. An assumption of increasing demand may not meet an increasing supply in a planned economy.

6.2 Median - Sugar Data

Table 6 shows the historical data of sugar production in the United States. The table includes the average consumption and changes for raw sugar in the United States for the years from 1960 to 2009 by decade. The consumption per capita per year decreased by -0.22 kilogram. In the same time the population increased by +10 percent. Therefore sugar is slightly less consumed compared to the past forty years.

Table 6 Historical Sugar Consumption and Population Data, United States

Consumption (Sugar Raw)	1960-69	1970-79	1980-89	1990-99	2000-09
Average [kg/capita/year]	87.9	87.15	59.8	60.1	63.55
change [kg/capita/year]	-	-0.75	-27.35	0.3	3.45
change [%/capita/year]	-	-0.9	-31.4	0.5	5.7
Population					
Pop. average (000)	194,303	214,913	236,874	264,702	294,1610
change [per capita]	-	20,610	21,961	27,827	29,459
change [in %]	-	10.6	10.2	11.7	11.1

Source: PS&D Database and UN POPIN, 2013.

Table 7 shows the medians of the historical data. The average annual change in consumption is –0.18 percent per capita. Therefore the consumption of raw sugar in the United States is decreasing since 1960.

Table 7 Calculated Medians from Historical Data for Sugar

Consumption			Population		
Median [kg/capita/year]	change [kg/capita/year]	change [%/capita/year]	Median	change	change [%]
63.55[1]	-0.22	-0.18	236,874,500[2]	24,894,250	10.9

1 Median from data (kg/capita/year): {87.9; 87.1; 59.8; 60.1; 63.5}; P&S online, 2012.

2 Median from data (population): {194,303,000; 214,913,500; 264,702,000; 294,160,949}, UN pop statistics, 2013.

Table 8 shows the consumption for the recent period from 2000 till 2009. During this period the consumption increased by +5.7 percent per capita per year. The reason is the increase of added sugar in food. Over the last ten years the consumption of added sugar increased in all age groups (Wang, 2011). The recent data also is used to calculate future consumption potentials.

Table 8 Calculated Median from Historical Data; (short run 2000-2009).

Consumption		
Median [kg/capita/year]	change [kg/capita/year]	change [%/capita/year]
63.55[1]	+ 3.45[2]	+ 5.7[3]

1 Median from the data (Average kg/capita/year): {59.9; 58.7; 59.8; 62.4; 63.2; 64.9; 65.3; 64.9; 64.2; 63.5}

2 Change in kilogram: 60.1 (amount previous decade) – 63.55 = 3.45 kilogram

3 Change in percent: 3.5 percent * 100 / 60.1 kilogram = +5.7 percent

6.2.1. Potential Amounts

Table 9 shows increasing consumption amounts based on increasing population. Population is assumed to grow by +0.9 % annually and consumption of sugar is assumed to change by +3.4 kilogram. The sugar consumption might rise from 19.941.883 tons in 2011 to 20.855.566 tons in 2016. That quantifies a total increase of 913,683 tons till 2016. Table 9 takes a population growth estimate for the United Sates of +0.9 % into account. Other sources e.g. World Bank forecasts a growth rate of +1.1% (World Bank, 2012).

Table 9 Potential Increasing Amounts of U.S. Populations and Sugar Consumption

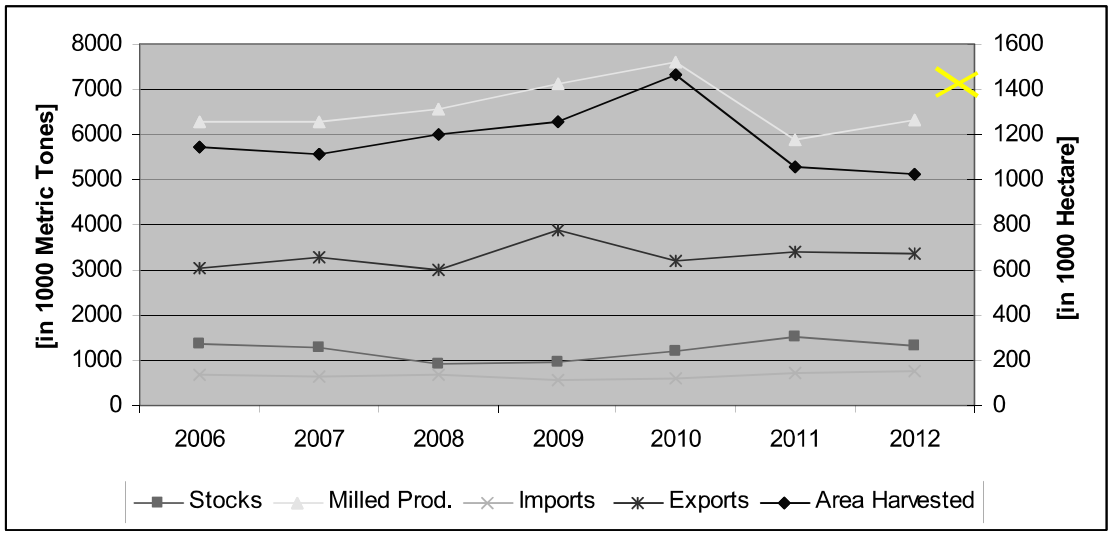
	2011	2012	2013	2014	2015
Population increase (0.9%)[1]	311,591,917	314,396,244	317,225,810	320,080,843	322,961,570
Total Amount[2] (tons)	19,941,883	20,121,360	20,302,452	20,485,174	20,669,541
Additional tons[3] (compared to 2011)		179,477	360,569	543,291	727,658

6.3. Indicators for United States Rice and Cuban Sugar

The following paragraph describes the development in US rice and Cuban sugar. The demand potentials for rice (+4,220 tons) are shown with the X cross at the end of the production curve (milled production) (Figure 17). This would be the potential increase for 2012 developed from the most recent data. For rice the increase seems minimal with +4,220 tons, within the total

production. Since the Cuban population is not that large, it seems the potential increase of US production could increase minimally, compared to the total output.

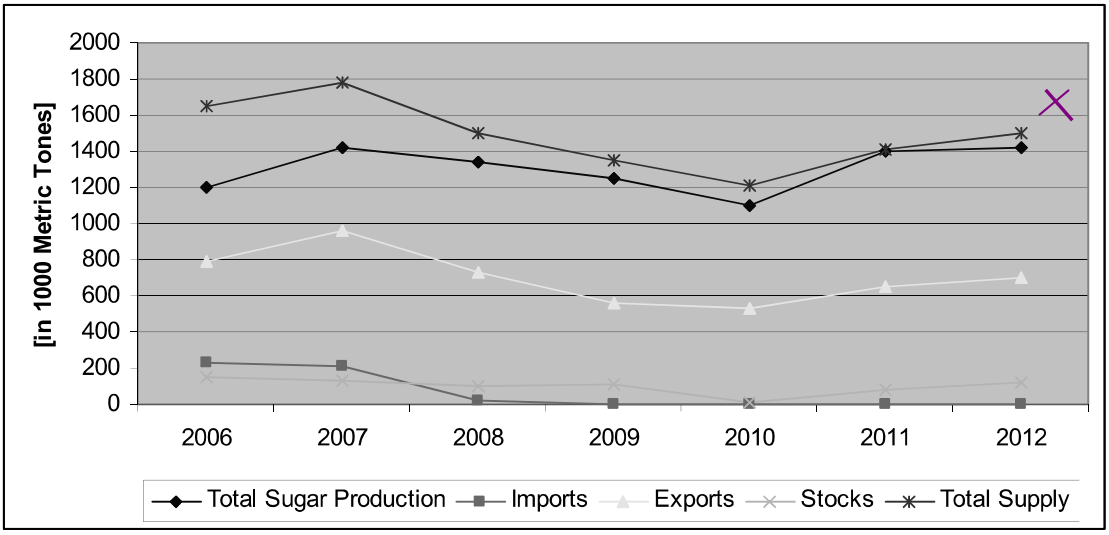
Figure 17: United States Rice Sector



Source: USDA, PSD online, 2012.

Figure 18 shows also the development of the recent years and marked an increase based on population growth in the United States. The case of sugar consumption in the United States could increase by +179,477 tons. Even if the demand in the United States decreases the population growth will demand in total more sugar. The additional demand based on population growth in the United States is given with X cross, on the curve of total Cuban production. The amount is developed from the most recent data (Table 9).

Figure 18: Cuban Sugar Sector



Source: USDA, PSD online, 2012.

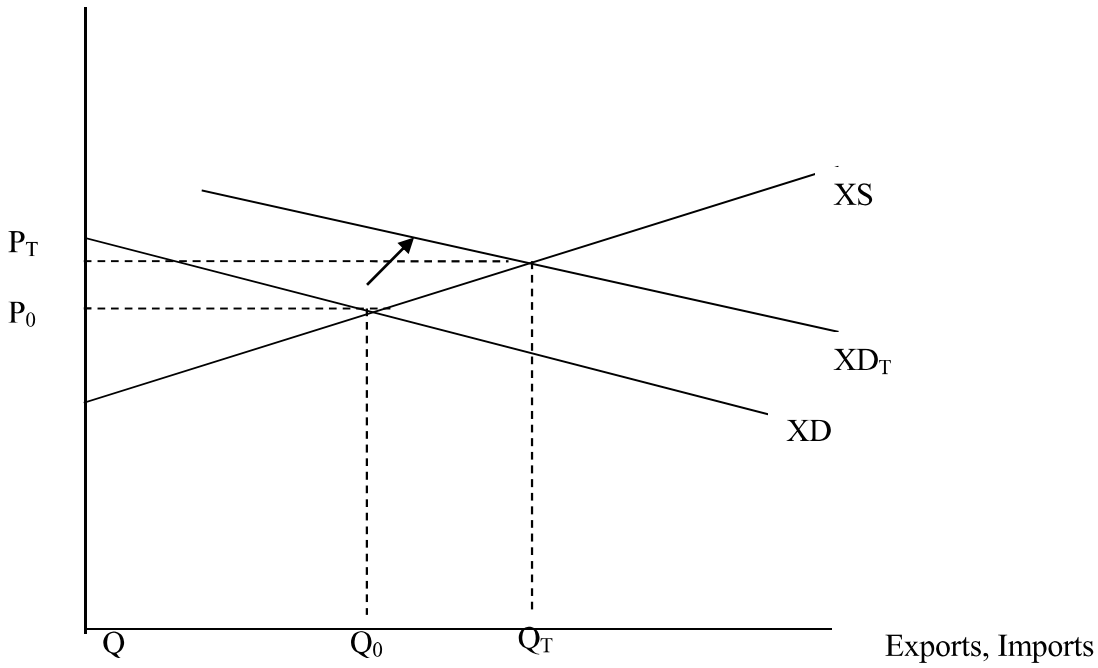
After trade potentials are calculated for the US sugar and rice the focus is in the following chapter on the effects of increasing excess demand. The differences of demanded and supplied quantities are described as the concept of increasing excess demand.

6.4. Concept of Increasing Excess Demand

This section deals with increasing excess supply and demand for US rice and Cuban sugar. The concept of increasing excess demand is based on the principles of the difference between the quantity demanded and the quantity supplied. With increasing excess demand, trade quantity and price changes lead to marked effects. Figure 19 shows the domestic linear export market with excess supply and the difference between linear supply and demand. At an observed price P_0 the export level is Q_0. The analysis derives supply and demand from elasticities, production, consumption and observed price P_0 and export level Q_0 (Thomson, 2010).

An embargo removal will result into P_T and Q_T; this is the market equilibrium of total excess demand XD_T. The market equilibrium equals the sum of importer excess demand XD and Cuban excess demand XD_c.

Figure 19: Concept of Increasing Excess Demand



Source: Jechlitschka, 2007.

6.5. Analysis - US Rice

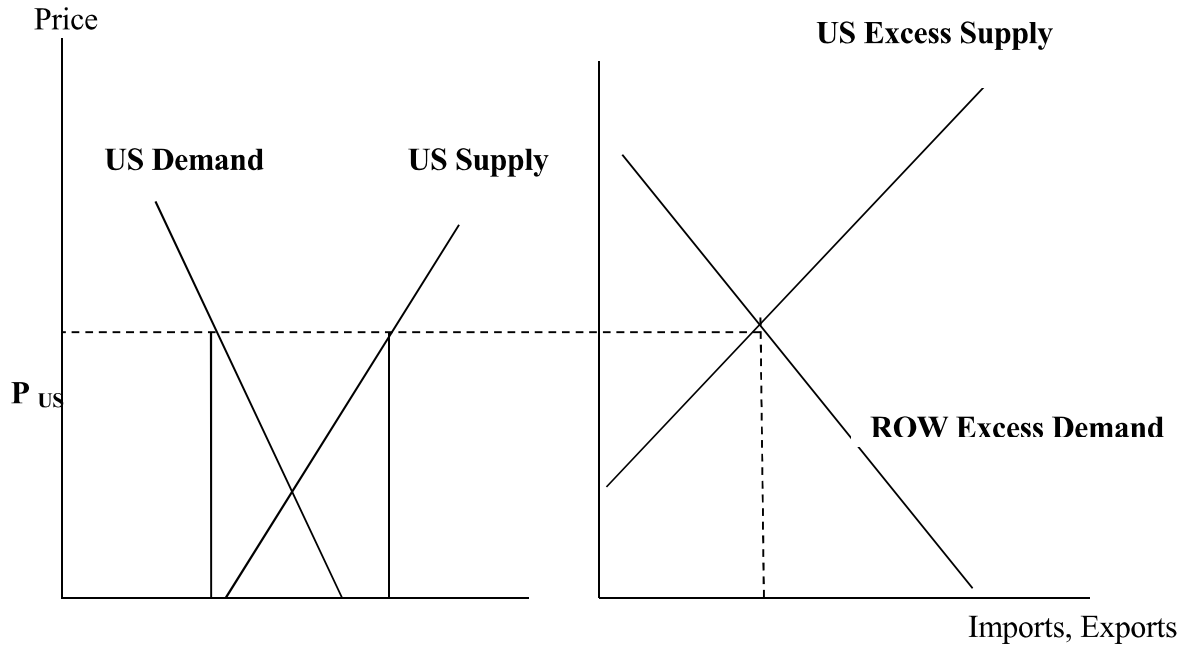
In 2012 the US rice supply was over 8,259 thousand metric tons of milled rice (Table 10). Figure 20 provides the trade graph for US rice with the rice export ban. Including 6,337 thousand metric tons from production, 1,303 thousand metric tons of stocks and 750 thousand metric tons of imports (PSD online, 2012). The US rice exports amounted to 3,186 thousand metric tons (USDA, 2012). The US domestic milled rice price was by $565 per metric tons in 2012 (USDA, 2013).

Table 10 US and Cuban Rice Trade

	P_{US}	Q_{US}	S_{US}	P_{Cuba}	Q_{Cuba}	ST_{Cuba}	CU_{Cuba}
US Rice	$565	3,350	8,259	$500	525	863	863

P_{US} = Average US rice price, $/mt, 2012, long grain milled 5% broken, USDA, ERS.
Q_{US} = US exports, 000 mt, 2012 long grain milled, USDA PSD online, 2012.
S_{US} = Total US rice output, 000 mt, 2012 long grain milled, USDA PSD online, 2012.
P_{Cuba} = Average Cuban autarky price, Thomson, 2012.
Q_{Cuba} = Cuban imports, 000 mt, Thomson, 2012.
ST_{Cuba} = Cuban total supply, 000 mt, USDA PSD online, 2012.
CU_{Cuba} = Cuban consumption, 000 mt, USDA PSD online, 2012.

Figure 20: US Rice Sector without Cuban Exports



6.5.1. Population Growth

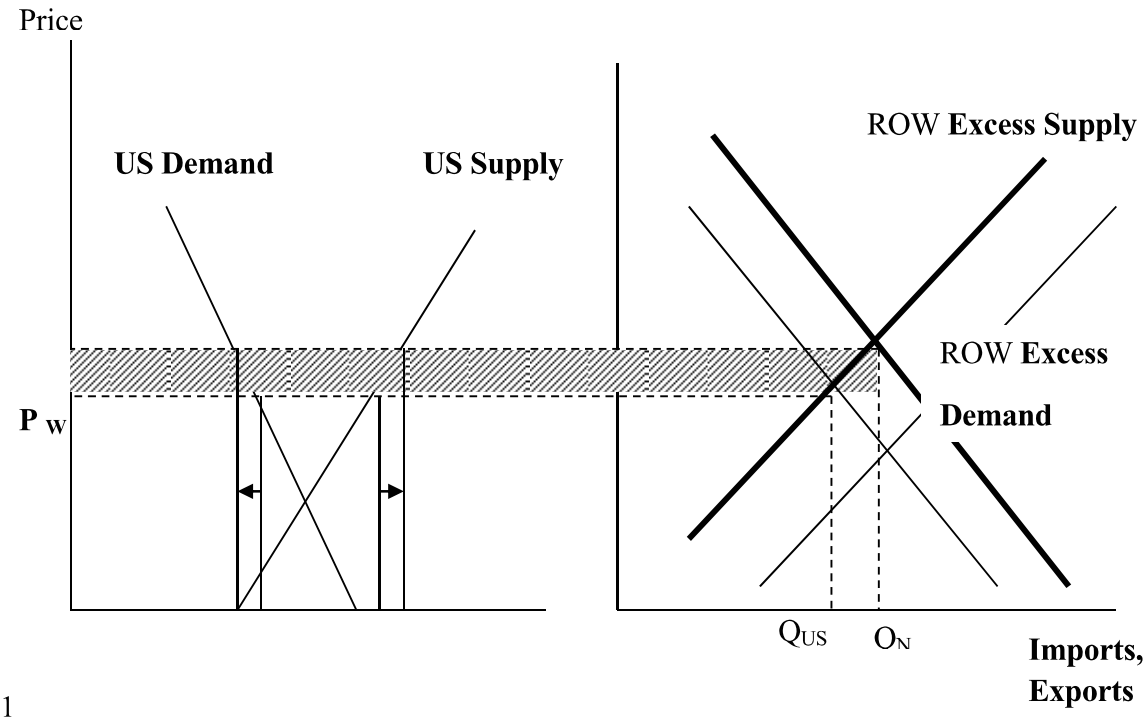
The impact of population growth in Cuba on excess demand on rice is presented in Table 11 and Figure 21. The additional trade amount is very small with 1 000 metric tons. The additional amount is based on the population growth of +0.2% in Cuba. The additional US demand would be a minimal shift from Q_{US} to Q_{New}. The price would minimal increase by 0.01 %.

Table 11 US Rice Trade

	P_{US}	Q_{US}	ΔQ	Q_{New}	$\%\Delta Q$	$\%\Delta P$
US Rice	$565	3,350	1	3,351	+0.02	+0.01

P_{US} = Average US price, $ / metric ton, long grain milled, 5% broken, USDA, PSD online, 2012.
Q_{US} = US exports, 000 metric tons, in 2012, long grain milled, USDA, PSD online.
ΔQ = Change of Export quantity, in 000 metric tons, additional amount increases to 2013, see table: Potential Amounts Cuban rice.
Q_{New} = New Export quantity, $Q_{US} + \Delta Q$.
$\%\Delta Q$ = Percentage change in Quantity: $\Delta Q/Q_{US}$*100; 1/3,350*100 = 0.02 percent.
$\%\Delta P$ = Percentage change in Price: $\%\Delta P$/eS US; 0.02/1.5 = 0.01 percent.

Figure 21: US Rice Sector with Cuban Exports



1 eS US (1.5) = Elasticity of supply for rice, US, see table: Price Elasticity of Supply and Demand.

6.5.2. USITC Report

In 2012 US rice exports, long grain milled, 5% broken, amounted 3,350 tons. The USITC report by the United Sates International Trade Commission in 2007, gives the following data: with removal of US trade restrictions, the US expects an import market share in the range between 32.7 percent and 52.1 percent (Table 12). This would be in tons: 73 thousand metric tons (32.7 percent) in the pessimistic case and 193 thousands metric tons (52.1 percent) for the optimistic case. The US supply could increase by 73/193 thousand metric tons. The price would increase by +1.4/+3.8 percent.

Table 12 US Rice Trade

	P_{US}	Q_{US}	ΔQ	Q_{New}	$\%\Delta Q$	$\%\Delta P$
US Rice (pessimistic)	$565	3,350	73	3,423	+2.1	+1.4
US Rice (optimistic)	$566	3,350	193	3,423	+5.7	+3.8

P_{US} = Average US price, $/metric ton, long grain milled, 5% broken, USDA, PSD online, 2012.
Q_{US} = US exports, 000 metric tons, in 2012, long grain milled, USDA, PSD online.
ΔQ = Change of Export quantity, in 000 metric tons, pessimistic and optimistic cases, (USITC 2000).
Q_{New} = New Export quantity, $Q_{US} + \Delta_{Q}$.
$\%\Delta Q$ = Percentage change in Quantity
$\%\Delta P$ = Percentage change in Price

6.6. Analysis - Cuban Sugar

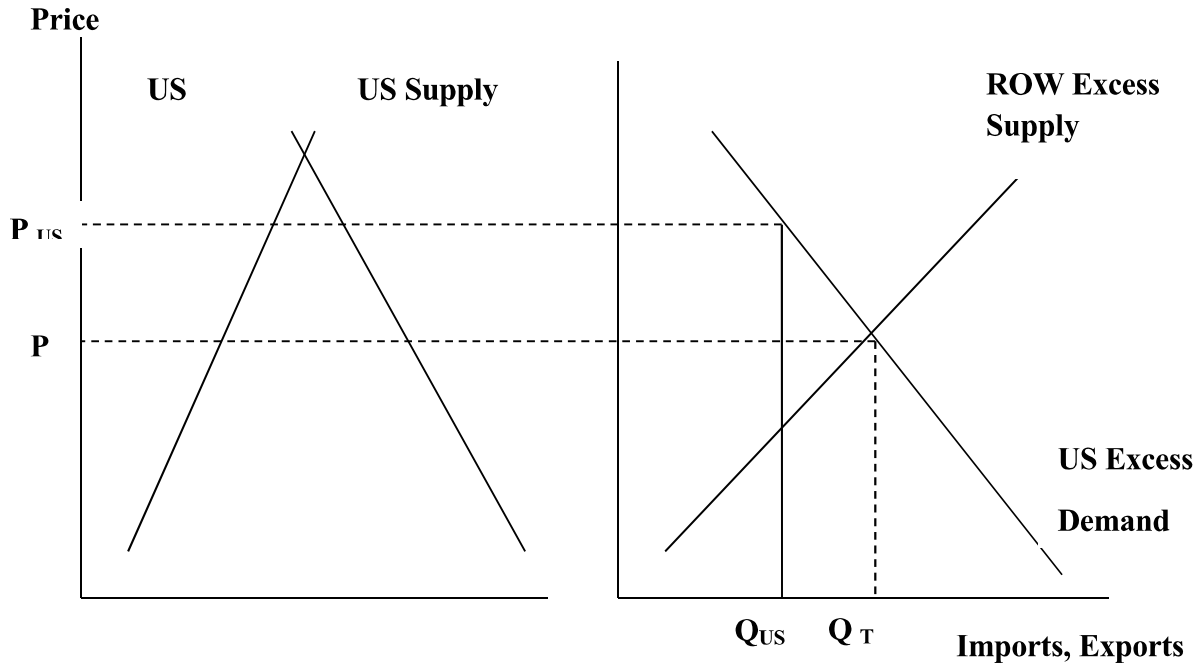
In 2012 the total US supply amounted 11,889 thousand metric tons; including the US production with 7,779 thousand metric tons, 2,180 thousand metric tons of imports and 1,107 thousand metric tons of stocks (Table 13). The US domestic sugar price is averaged for the year 2012 with $480, taken from the report on *Sugar and Sweetener Policy*, *USDA* in 2012.

Table 13 Cuban Sugar Trade

	P_{US}	Q_{US}	ST_{US}	CU_{US}	P_{Cuba}	Q_{Cuba}	S_{Cuba}
sugar	$330	2,186	11,889	10,364	$295	700	1,499

P_{US} = average import price; tariff price: 15.36 cents per pound, USDA, Sugar and Sweetner Policy, 2012
Q_{US} = Us imports, 000 metric tons, USDA, PSD online; 2012
ST_{US} = US total supply , 000 metric tons, USDA, PSD online; 2012
CU_{US} = US consumption, 000 metric tons, USDA, PSD online; 2012
P_{Cuba} = average Cuban price, $/metric tons; Thomson; 2010
Q_{Cuba} = Cuban exports, 000 metric tons; PSD online; 2012
S_{Cuba} = total Cuban output; 000 metric tons; PSD online; 2012

Figure 22: US Sugar Sector without Cuban Imports



6.6.1. Population Growth

This section deals with increasing US import and supply based on US population growth. The compounded median gave a growth rate of 0.9 percent. Thus the consumption of raw sugar

rises from 2,186 thousand tons to 2,365 thousand tons. The additional consumption rate of the US could be given as an import quota to Cuba (Table 14). The US imports changed from Q_{US} to Q_{New}.

Table 14 Cuban Sugar Trade

	P_{US}	Q_{US}	P_T	Δ_Q	Q_{New}	$\%_{\Delta Q}$	$\%_{\Delta P}$
Cuban sugar	$330	2,186	$308	179	2,365	+8.1	-32.4

P_{US} = Average US import price, tariff price: 15.36 cents per pound; USDA, Sugar and Sweetener Policy, 2012.

Q_{US} = US imports, 000 metric tons, in 2012, USDA, PSD online.

P_T = Average world sugar price, $/ metric ton USDA, PSD online.

Δ_Q = Change of Import quantity, in 000 metric tons, additional amount increases to 2012, see table: Potential Increasing Amounts US.

Q_{New} = New Export quantity, $Q_{US} + \Delta_Q$; 2,186 + 179 = 2,365 tons.

$\%_{\Delta Q}$ = Percentage change in Quantity: $\Delta_Q / Q_{US} * 100$; 179/2,186*100 = +8.1 percent.

$\%_{\Delta P}$ = Percentage change in Price: $\%_{\Delta Q} / eS_{US}$; 8.1/-0.25 = -32.4 percent.

1)

6.6.2. Alvarez

Table 15 shows additional US supply based on the estimates from Jose Alvarez. He proposed extending the US quota by 48 thousand metric tons. The additional US import volume, based on a world market price of $308, would amount $14 million. The following change in price would be -5.8 percent and +3.1 percent the change in quantity. The US imports would change from Q_{US} to Q_{New}.

Table 15 Cuban Sugar Trade

	P_{US}	Q_{US}	P_T	ΔQ	Q_{New}	$\%_{\Delta Q}$	$\%_{\Delta P}$
Cuban sugar	$330	2,186	$308	48	2234	+2.1	-8.4

P_{US} = Average US import price, tariff price: 15.36 cents per pound; USDA, Sugar and Sweetener Policy, 2012.

Q_{US} = US imports, 000 metric tons, in 2012, USDA, PSD online.

P_T = Average world sugar price, $/ metric ton USDA, PSD online.

ΔQ = Change of Import quantity, in 000 metric tons, assumption of Jose Alvarez: Cuba's sugar Industry, 1998.

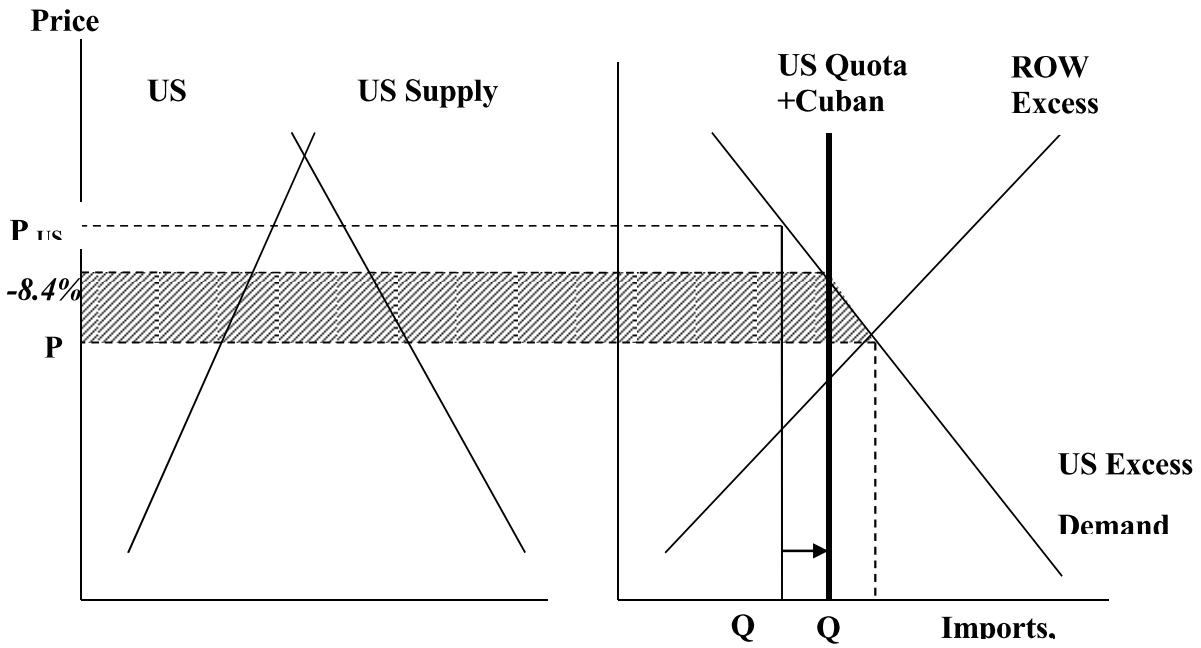
Q_{New} = New US Import quantity, $Q_{US} + \Delta Q$; 2,186 + 48 = 2,234 tons.

$\%_{\Delta Q}$ = Percentage change in Quantity: $\Delta Q / Q_{US} * 100$; 48/2,186*100 = +2.1 percent.

$\%_{\Delta P}$ = Percentage change in Price: $\%_{\Delta Q} / eD_{US}$; 2.1/-0.25 = -8.4 percent.

ΔP ΔP 1)

Figure 23: US Sugar Sector with Cuban Imports



1 eD US (-0.25) = Elasticity of Demand for sugar, US, see table: Price Elasticity of Supply and Demand.

6.7. Welfare Concept

The following section provide the estimation of economic welfare effects. Since it is known that under free trade also the welfare increases it should be also shown in this case for the liberalization of US and Cuban trade. The concept and calculations in the following part are based on the framework of Kurt Jechlitschka et al. (2007).

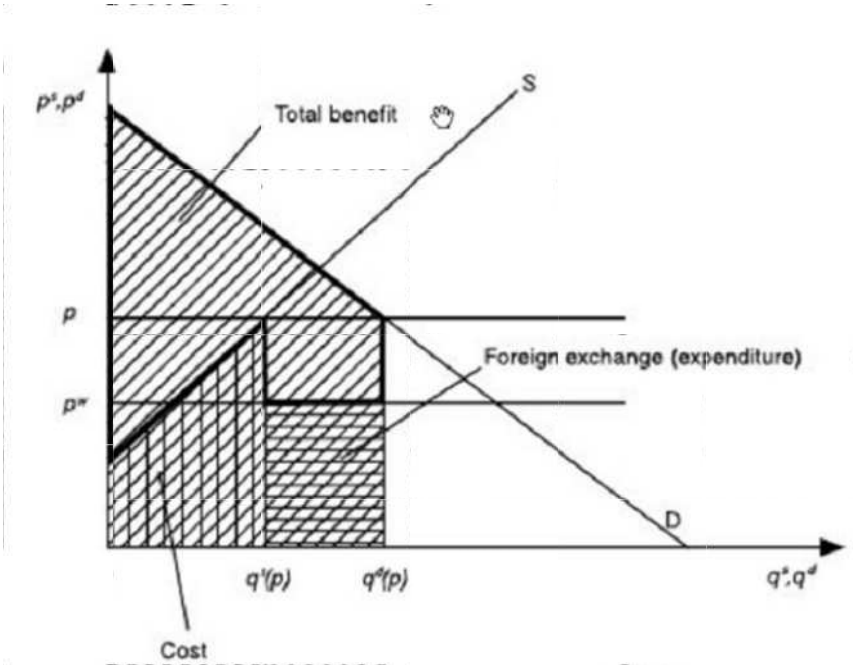
Welfare in microeconomics is calculated out of cost, total benefit, and foreign exchange. Total benefit can also be shown as the area under the demand curve. The variable costs (also benefit foregone or opportunity cost) need to be included as second variable. The variable cost

can be shown as the area under the supply curve, up to the quantity supplied (Figure 24). Also the foreign exchange from exports influences the welfare, as the revenue maybe seen as potential demand of foreign goods, which can lead to additional satisfaction (Jechlitschka, 2007)

$W(p; p^w) = TB(p) - C(p) + FE(p; p^w)$

W	*Welfare*	
TB	*Total Benefit*	$TB(p) = {}_0\int^{qd} p^d(v)\,dv$; *v= integration of variable*
C	*Cost*	$C(p) = {}_0\int^{qs}(p)\, p^s(v)\,dv$
FE	*Foreign Exchange*	$FB(p, p^w) = (q(p) - q^d(p))\, p^w$
p	*domestic price*	
p^w	*world market price*	

Figure 24: Welfare Concept of Economic Activities



Source: Jechlitschka et al., 2007.

For the calculation of the welfare the following seven factors need to be considered: cost, total benefit, welfare, revenue, expenditure, producer surplus, and consumer surplus.

The cost function can also be described as the forgone benefit or opportunity cost. The variable cost of producing a product is a measure of the reduced willingness to pay on other markets, because factors can-not be used to produce other goods either can-not create benefit on other markets. The cost can be seen as the area under the supply curve up to the quantity supplied.

Costs

$C(p) = {}_0\int^{qs}(p)\, p^s(v)\, dv$

C *Cost*

v *integration variable, here* p^s

In microeconomics the maximum willingness to pay can also serve a welfare indicator for consumers. Willingness to pay is the maximum amount that consumers are willing to pay for its product or service. Hence the total Benefit is an indicator of the satisfaction of consuming a good. It can be shown as the area under the demand curve up to the quantity demanded.

$TB(p)\ {}_0\int^{qd}(p)(v)\, dv$

TB *Total Benefit*

V *integration variable*

The producer revenue needs also to be considered. Free trade is not always given, some governments still intervene using market or price policies which lead to overall loses in welfare. The results of taxation or subsidization are reflected in supply and prices (Jechlitschka et al., 2007).

$R\,(p) = q^s\,(p) * p$

R *Revenue*

q^s *quantity supplied*

p *price supplied*

The consumer expenditure will give information about the costs for the consumer. It can be defined easily by multiplying the demand quantity by the demand price.

$E\,(p) = q^d\,(p) * p$

E *Consumer expenditure*

q^d *quantity demanded*

p *demand price*

Producer surplus

Producer revenue is defined as the ability of producers to demand goods and deliver benefit from their consumption. The cost for variable factors can reduce the ability to consume goods. Therefore for the producer, relevant is the difference in producer revenue and costs. The difference can also be called the producer surplus.

$PS\ (p) = q^s\ (p)\ p - \int p^s\ (v)\ dv$

Consumer surplus

The consumer surplus can be described as the ability of consumers to consume goods and benefit from their consumption. It is an indicator of the welfare of the consumer side, it can also be described as the consumer revenue. It can be visualized as the area under the demand curve and above the price line at the quantity actually demanded.

$CS\ (p) = {}_0\int^{qd} p^d\ (v)\ dv - q^d\ (p)\ q$

6.8. Welfare Effects of Removing Embargo on Rice in Cuba

Out of the following estimates are calculated costs, total benefit and foreign exchange. It is assumed that demand, supply and world price the same. The quantity supplied and demanded are the same with 868 thousand metric tons, long grain milled rice, 5% broken. Further processed the demand and supply of rice with 73 thousand tones (pessimistic case) and +193 thousand tons (optimistic case) from the United States International Trade Commission Report in 2007. The consumption gain out of population increase (+0.2%) was with +1 thousand metric tons too small to be further calculated. In the following paragraph the steps to calculate the welfare are listed.

p^s, p^d p^w, 500 Dollar/per met rice ton; Average Cuban Autarky price, long grain milled Thomson, 2012.

q^s 863 thousand metric tons; Supply and demand are set both, long grain rice milled, USDA, PSD online, 2012.

q^d 863 thousand metric tons; Supply and demand are set both, long grain rice milled, USDA, PSD online, 2012.

Δ 32% 73 thousand tones, change without embargo; USITC Report, 2007.

Δ 52 %193 thousand tones, change without embargo; USITC Report, 2007.

The costs under the embargo are 143 million dollars. While considering the embargo will be lifted the cost would increase by 8.5% and 22.4% Cost needs to be considered as the reduced willingness to pay (Table 16).

Table 16 Costs [Rice in Cuba]

	WITH EMBARGO	WITHOUT EMBARGO (+32%)	WITHOUT EMBARGO (+52%)
Cost ($ in thousand)	143.833	156.000	176.000
change in absolute		12.167	32.166
change in percentage		+8.5	+22.4

The total benefit will be 203 million dollars (Table 17). After lifting the embargo the total benefit would increase by +17 percent and +47 percent. The total benefit would increase because of increasing demand from the production.

Table 17 Total Benefit [Rice in Cuba]

	WITH EMBARGO	WITHOUT EMBARGO (+32%)	WITHOUT EMBARGO (+52%)
Total Benefit ($ in thousand)	203.575	239.890	299.614
change in absolute		36.315	96.039
change in percentage		+17.8	+47.2

The producer surplus under the embargo will be 287 million dollar (Table 18). After removing the embargo the producer surplus would increase by +8.5% and +22.4% for the pessimistic and optimistic cases, respectively. Hence, rice producers in the United States will gain from the removed embargo.

Table 18 Producer Surpluses [Rice in Cuba]

	WITH EMBARGO	WITHOUT EMBARGO (+32%)	WITHOUT EMBARGO (+52%)
Producer Surplus($ in thousand)	287.667	312.000	352.000
change in absolute		24.333	64.333
change in percentage		+8.5	+22.4

Consumers in the US will lose slightly, since their expenditure increases (Table 19). Expenditure (demand divided with demand price) - is an indicator for the cost to the consumer. That means that consumers do not gain from that trade deal, but still the gains are positive with +0.1 and +0.2 percent.

Table 19 Consumer Surplus [Rice in Cuba]

	WITH EMBARGO	WITHOUT EMBARGO (+32%)	WITHOUT EMBARGO (+52%)
Consumer Surplus ($ in thousand)	-227.925	-228.110	-228.386
change in absolute		-185	-460
change in percentage		+0.1	+0.2

But even if consumer surplus is low the overall welfare is increasing. The net welfare is 58 million under embargo and will increase up to 83 million dollars and 123 million dollar without embargo (Table 20). That means that overall society will grain from rice trade between Cuba and the United Sates.

Table 20 Welfare [Rice in Cuba]

	WITH EMBARGO	WITHOUT EMBARGO (+32%)	WITHOUT EMBARGO (+52%)
Welfare ($ in thousand)	59.742	83.890	123.614
change in absolute		24.148	63.873
change in percentage		+40.4	+106.9

6.9. Welfare Effects of Removing Embargo on Sugar in United States

The following figures are used to calculate welfare effects from the sugar trade from Cuba to the United States. The world market is in equilibrium at 330 dollars per metric ton. The price is the US tariff price (15.36 cents) which importers have to pay. The supply and demand are 11,889 thousand tons, which are taken from the USDA, PSD data source. The potential increase is 179 thousand tons, taken from the hypothetical increase out of population growth (+0.9%).

p^s, p^d p^w, *330 Dollar/per metric ton; Average US import price, tariff price: 15.36 cents per pound; USDA, Sugar and Sweetener Policy, 2012.*

q^s *11,889 thousand metric tons; USDA, PSD online 2012.*

q^d *11,889 thousand metric tons; USDA, PSD online 2012.*

Δ *32% 179 thousand tones, change without embargo; own calculation based on population growth in Cuba by 0.9 percent.*

The costs under the embargo are 481 million $ estimated-without embargo (Table 21). This benefit would increase by +1.5 percent to $ 489 compared to $ 481 million. The costs are increasing due to increasing supply. The cost is important to consider as the forgone benefit.

Table 21 Cost [Sugar in United States]

	WITH EMBARGO	WITHOUT EMBARGO
Cost ($ in thousand)	481.817	489.072
change in absolute		7.254
change in percentage		+1.5

The total benefit under the embargo will be $ 3.654 million and after the embargo it will be $ 3,223 million (Table 22). It decreases due to increasing demand. The total benefit is important to the overall welfare.

Table 22 Total Benefit [Sugar in United States]

	WITH EMBARGO	WITHOUT EMBARGO
Total Benefit ($ in thousand)	3.654.027	3.223.018
change in absolute		431.009
change in percentage		-11.8

The producer surplus will increase by +1.5% will increase under the assumption of free trade and population growth by 0.9%. This is due to increasing revenue due to increasing supply and price. Hence Cuban producers gain from trade sugar trade between Cuba and the United Sates (Table 23).

Table 23 Producer Surpluses [Sugar in Cuba]

	WITH EMBARGO	WITHOUT EMBARGO
Producer surplus ($ in thousand)	3.441.553	3.493.368
change in absolute		51.816
change in percentage		+1.5

The consumer surplus decreases by -0.4 from $ -269 million to -270 million. This is due to lower total benefit and increasing expenditures. Therefore consumers lose by 0.4 percent from sugar trade (Table 24).

Table 24 Consumer Surpluses [Sugar in United States]

	WITH EMBARGO	WITHOUT EMBARGO
Consumer surplus ($ in thousand)	-269.343	-270.351
change in absolute		-1.008
change in percentage		-0.4

The overall welfare increases from 3,172 million dollars to 3.223 million dollars (Table 25). The overall welfare increases mainly to higher total benefit.

Table 25 Welfare [Sugar in United States]

	WITH EMBARGO	WITHOUT EMBARGO
Welfare ($ in thousand)	3.172.210	3.223.018
change in absolute		50.808
change in percentage		+1.6

6.10. Price Elasticity of Supply and Demand

The supply and demand elasticity's for US sugar and rice and Cuban sugar and rice are given in the table below. The derived elasticity for the excess supply (εXS) is derived from the price elasticity of demand (εD US), the Imports from the United States and the total US supply.

$$\varepsilon XS\ Derived = \ \varepsilon S\ US\ \frac{US_{\ SC}}{US_{IM}} - \varepsilon S\ US \frac{US_{SY}}{US_{IM}}$$

$$\varepsilon XS\ Derived = \ -1.30\ \frac{91{,}111}{1{,}487} - 0.55\ \frac{10{,}697}{1{,}478}$$

$$\varepsilon XS\ Derived = (-8.01) - (-3.98)$$

$$\varepsilon XS = \ -4.03$$

US $_{SC}$ = US sugar consumption, in 000 metric tons, USDA, 2007.

US $_{SY}$ = US sugar supply, in 000 metric tons, USDA 2007.

US $_{IM}$ = US Imports in 000 metric tons, USDA 2007.

Table 26 Agricultural Commodity Price Elasticities of Supply and Demand

	εS US	εD US	εXS Derived	εD Cuba	εS Cuba
Rice	0.55**	-1.30*	7.55**	-0.34*	0.50**
Sugar	0.14 ***	-0.25***	-4.03	-0.09 ***	0.50 ***

εS = price elasticity of supply for the product
εD = price elasticity of demand for the product
εXS = derived elasticity of excess supply
Sources: * USDA (2008b); Thomson, 2010; ** Askari-Cummings (1977); Thomson, 2010
*** FAPRI Elasticity Database, 2012

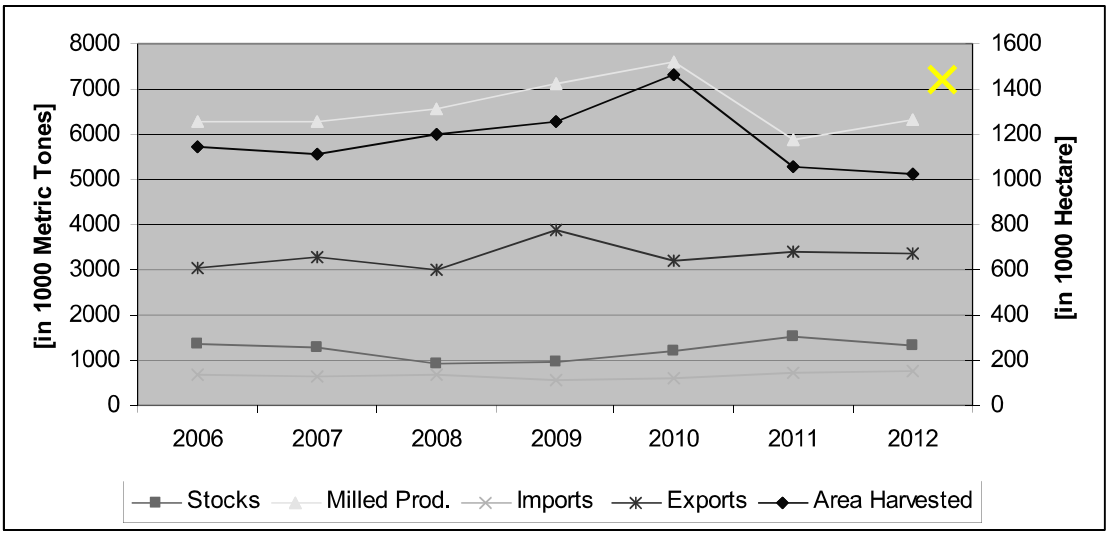
CHAPTER 7 Conclusions

After the 1990s Cuba did not gain a new partner to help to restore their economy. The economic losses and food shortages were harsh for the whole population. The Cuban population itself tried to arrange themselves with the situation of which urban agriculture, and energy savings are just two examples. Due to the embargo, many products could not be purchased from the United Sates. The blockade, lasting for 45 years, is a relic of the cold war. In order to increase welfare and benefits for consumers and producers politicians on both sides need to eliminate trade sanctions.

With the Trade Sanctions and Export Enhancement Act, the blockade of Cuba was relaxed between 2000 and 2005. But by introducing the payment in advance terms, the US exports ceased. Hurricane disasters and increasing energy prices brought additional problems to the island. The government is forced to import many products from other countries, for example 64 percent of the Cuban rice supply was imported in 2009. At the same, US rice producers' lobby call their government to open the embargo to Cuba.

The United Sates rice industry or the US tourism sector is already anticipating of the case that the trade blockade will end. The United States International Trade Commission estimated that the US rice industry could gain between 32 percent and 52 percent on the Cuban market share. This study estimated net gains for both countries from the relaxation of trade barriers on the rice sector (Figure 25). Many other agriculture sectors, such as poultry, grain, or soybean, would also like gain.

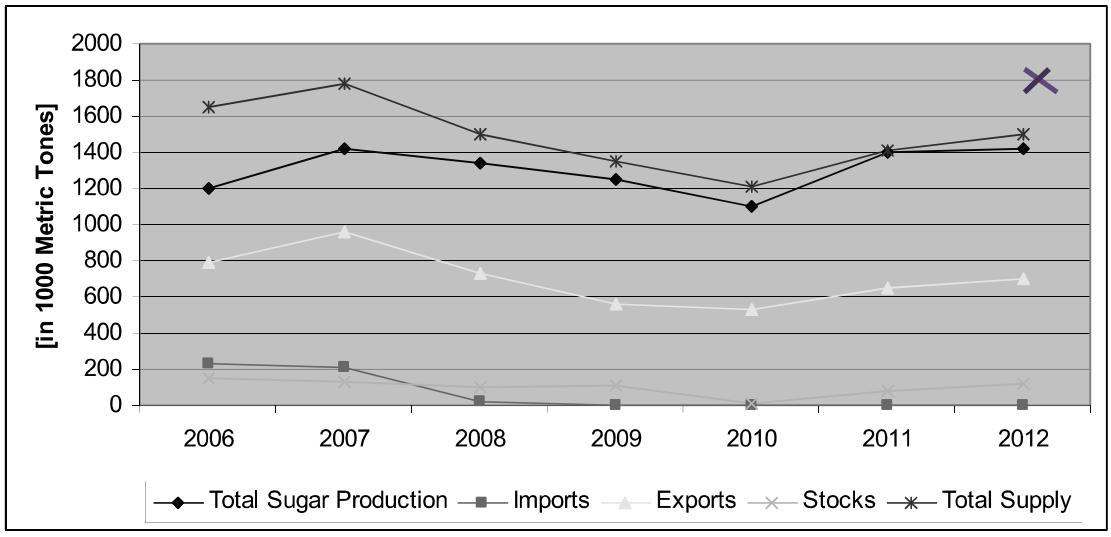
Figure 25: Possible Increase of US Rice Production (milled)



Source: Own Calculation.

With intensification of sugar production in the United States, environmental protection and measures need also to increase. At the moment Florida sugar industry has difficulties to increase their production due to high regulations on the environment, water and soil. Therefore Cuba as an advanced sugar grower can reclaim production. From once 6.8 million metric tons of exports, in 1990 the country came down to nearly 500 thousand metric tons. With allowing Cuba to access the US market, a new quota could amount to 48 thousand tons. This, however, needs to be approved by the politicians. The thesis shows market distorting measurements are changing the possible producer, and consumer surpluses as well as the overall welfare on both sides (Figure 26).

Figure 26: Cuban Sugar Sector



Source: Own Calculation.

Since Cuba has an increasing rice demand, and the United States' rice sector is looking for new export markets, the opportunity of trade should not be denied by the policy. Cuba has the reserve to supply raw sugar, whereas the United States has an increasing demand, and could absorb Cuba's sugar production. The decision to increase the quota, and to remove the trade distortion, lies in the hands of politicians. The welfare analysis of this Thesis demonstrates the possible benefits for both sides.

With increasing trade between the United States and Cuba, consumers and producers in both countries could benefit. In the case of rice, Cuban consumers would gain +22.4%, the welfare would increase positively by +106 percent by allowing US companies to sell their rice to Cuba.

Also if Cuba would be allowed to sell their sugar on the US market, it is calculated that the welfare would increase by +1.6 percent. Cuban producers would benefit by +1.5 percent. For the US consumers, the surplus would increase by +0.10 percent, but US producers would lose

producer surplus. These numbers are relatively small due to the large size of the total US market. But still, the overall welfare will increase positively.

The welfare analysis shows that producers and consumers on both sides benefit from increasing trade. While US consumers gain from the Cuban sugar supply, Cuban consumers gain from the US rice supply. US producers gain from the increasing excess demand of rice, and Cuban sugar producers gain from the increasing excess demand of sugar. Figure 27 depicts the estimated losses and benefit for producers and consumers and net welfare gains.

Figure 27: Losses and Benefits

RICE IN CUBA	**SUGAR IN US**
U. S. PRODUCERS ++ (+22.4%)	U. S. CONSUMERS + (+0.4 %)
CUBA CONSUMERS + (+0.2%)	CUBA PRODUCERS ++ (+1.5%)
TOTAL WELFARE + + + (+ 106 %)	TOTAL WELFARE + + + (+1.6%)

Source: Own Investigation.

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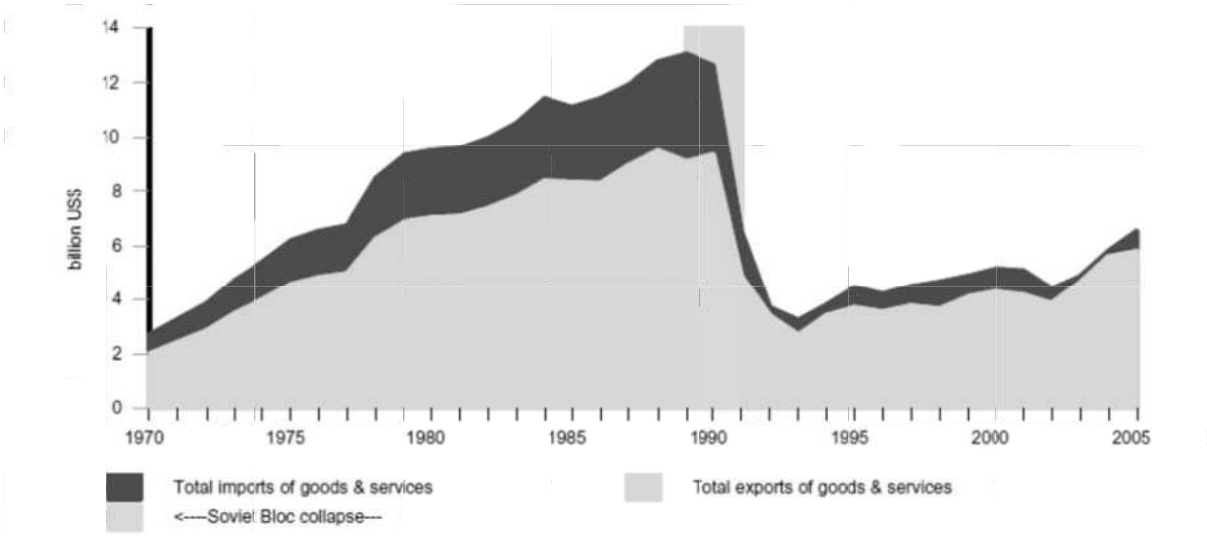
APPENDIX 1

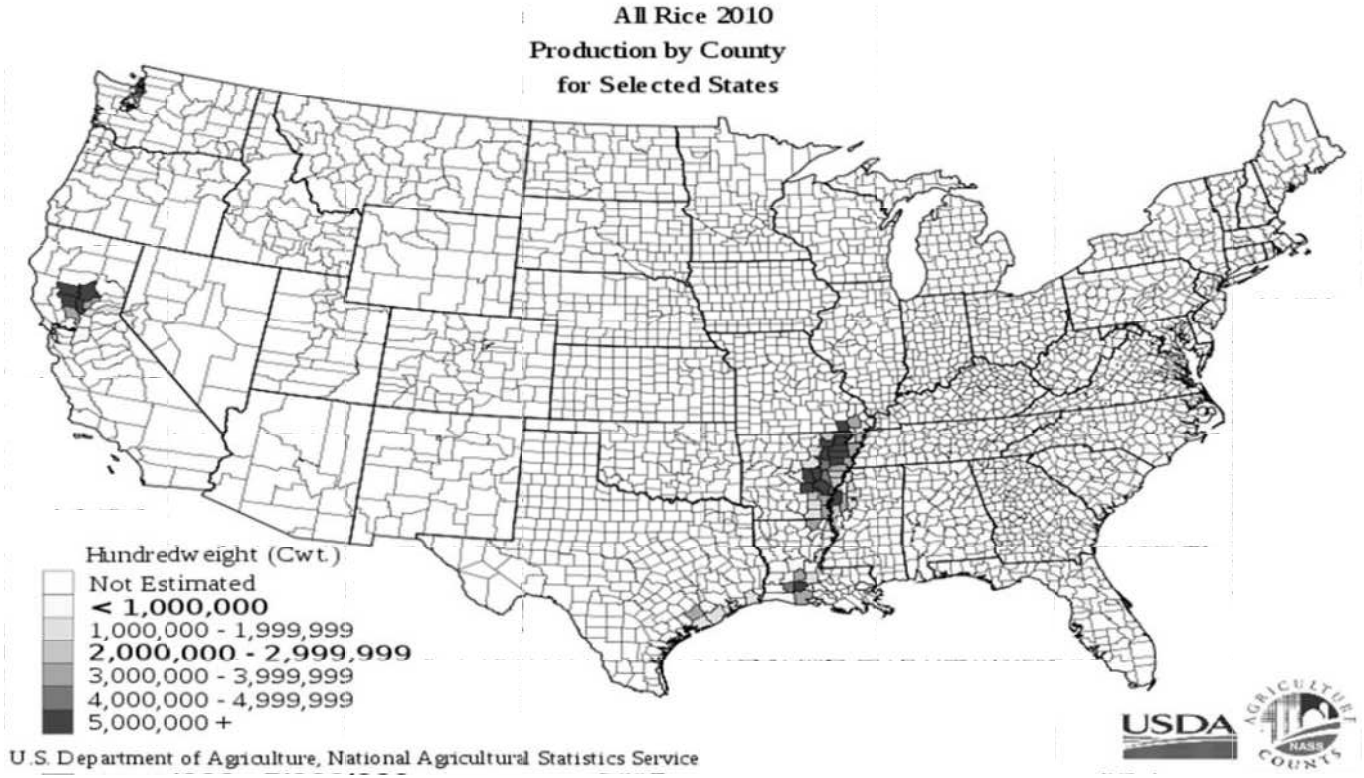
Cuba's Total Goods and Services Trade [1970 - 2005]



Source: FAS/USDA: Cuba's Food and Agriculture Situation Report, 2008.

Appendix 2

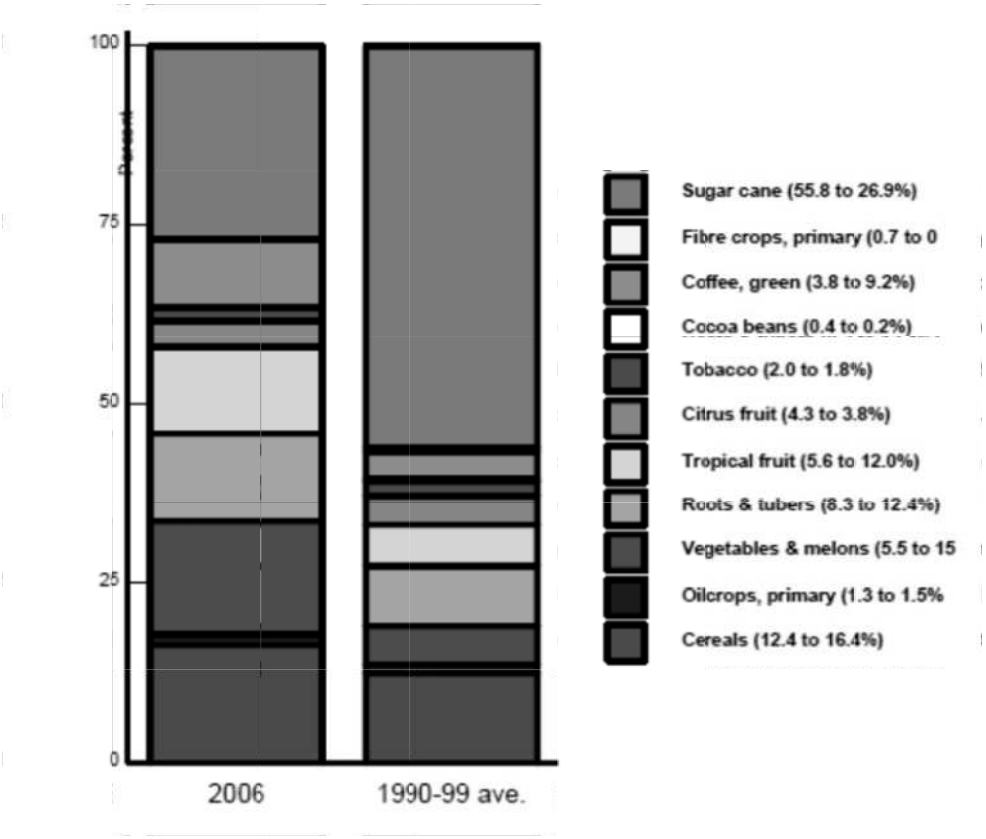
Rice Production in the United Sates



Source: United Sates Department for Agriculture, 2008

APPENDIX 3

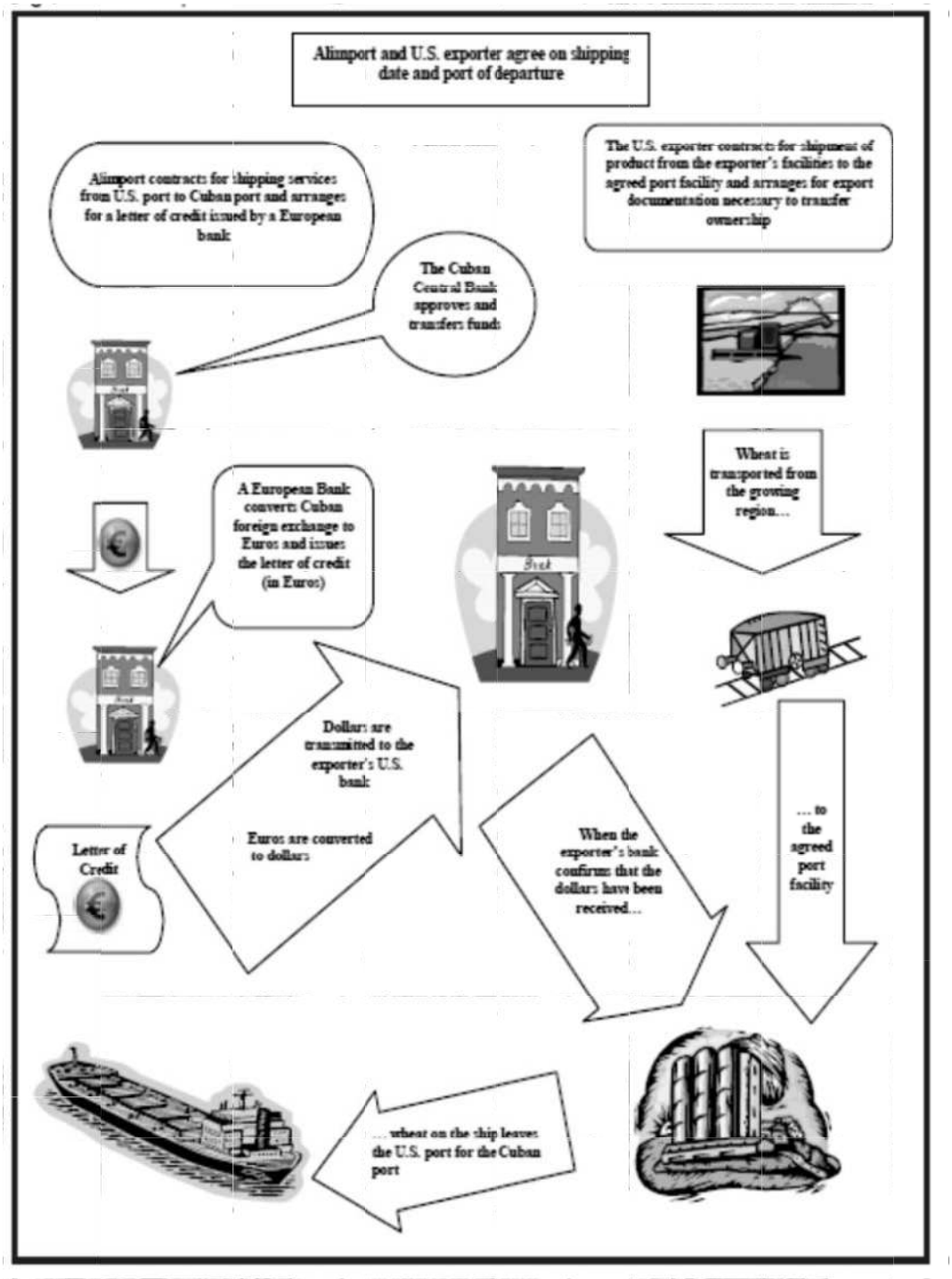
Cubas Agriculture Land Crop Share



Source: USDA, Cuba Situation, Report, page 14

APPENDIX 4

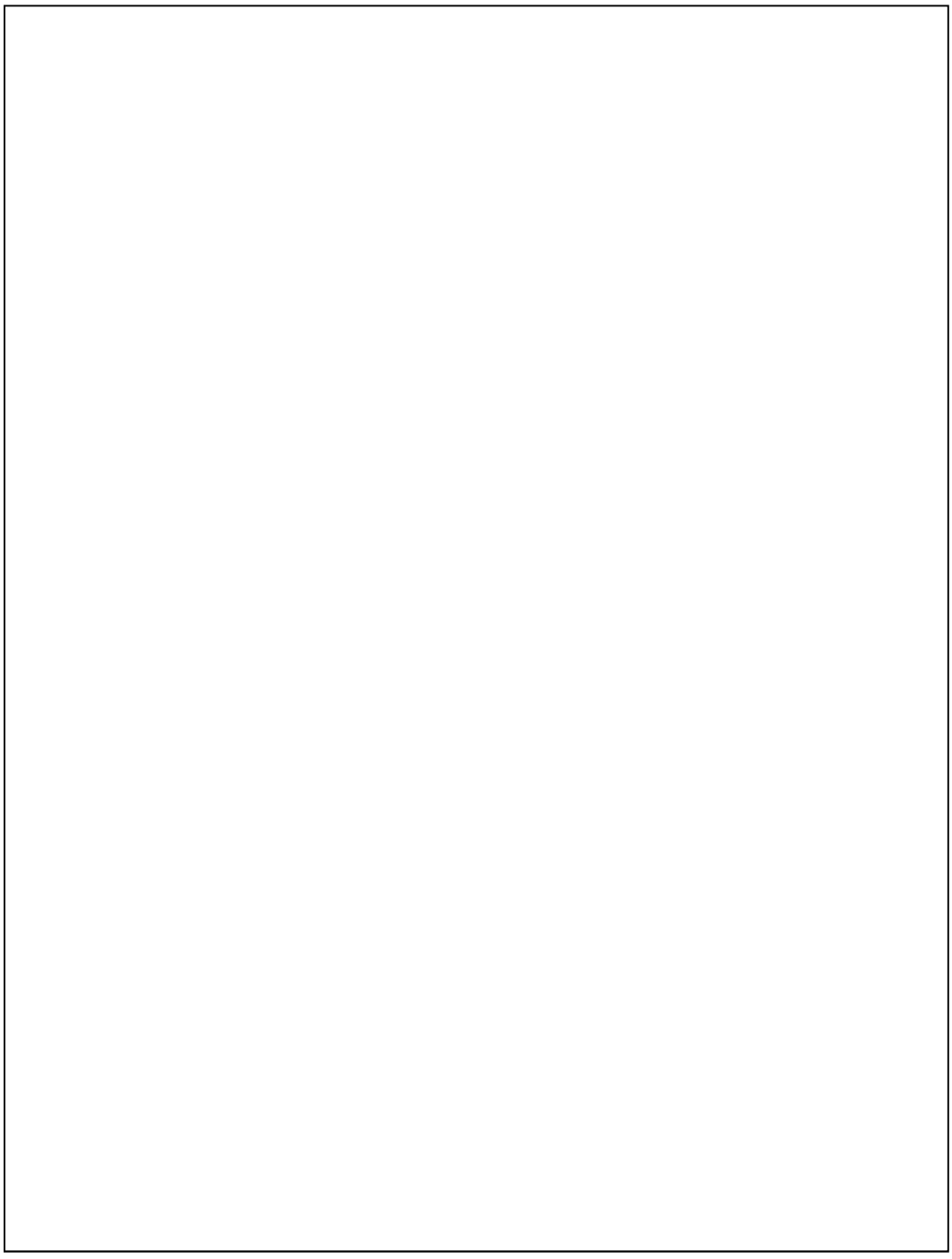
Institutions for trade between Cuba and the U.S.



Source: United States International Trade Comission, reoprt 2007.

APPENDIX 5

Guidelines of the Economic and Social Policy of the Party and the Revolution



APPENDIX 6

Cuban Imports from the U.S.

Table 2.3 Cuban agricultural, fish, and forestry imports from the United States, by commodity, 2000–06

Commodity	2000	2001	2002	2003	2004	2005	2006
	U.S. dollars (millions)						
Grains	(*)	2	52	83	180	145	136
Wheat	0	0	23	37	58	51	51
Flour	0	0	0	(*)	(*)	0	3
Corn	0	2	23	36	58	55	43
Rice	(*)	0	6	11	64	39	40
Other grains	0	0	0	0	0	0	0
Animal feed	0	0	19	26	36	24	42
Soybeans	0	0	21	34	28	33	32
Fats and oils	0	0	22	52	24	28	22
Dry beans	0	0	(*)	1	8	12	20
Meats	0	2	23	37	63	66	59
Poultry	0	2	23	37	61	58	45
Beef	0	0	(*)	0	(*)	0	(*)
Pork	0	0	(*)	0	2	8	14
Other meats	0	0	0	(*)	0	0	(*)
Eggs	0	0	(*)	(*)	(*)	(*)	0
Dairy products	0	0	(*)	(*)	27	30	13
Sugar, Cane or Beet	0	0	0	0	0	0	0
Processed food	0	0	(*)	12	10	2	1
Fish and seafood	0	0	0	(*)	(*)	(*)	(*)
Paper and wood	0	0	(*)	5	10	6	10
Other	0	0	(*)	3	5	5	2
Total	(*)	4	140	254	392	351	337

Source: Global Trade Atlas.

Note: Data are unavailable for Vietnam, however, Vietnam is believed to be the leading source of Cuba's rice imports.

*Less than $1 million.

Source: United States International Trade Commission, The Economic Impact of U.S. Sanctions with Respect to Cuba, report 2007.