CHALLENGES TO AGRICULTURAL DIVERSIFICATION- *SANITARY AND PHYTOSANITARY STANDARDS AS BARRIERS TO NON-TRADITIONAL AGRICULTURAL EXPORTS FROM GUYANA*

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February 2010

ABSTRACT

This paper employs gravity models to quantify the current impact of SPSMs on bilateral trade between Guyana and three of its major trading partners; the United States of America (US), the Caribbean Community and the European Union (EU) for two product groups; fish and fish preparations (FFP) (03) and fruits and vegetables (F&V) (05) at the two digit level of (Rev 1) classification. The models are augmented with a measure of stringency which is based on a comparison of the countries' standards to a benchmark of Codex standards between 1970 and 2008. The results reveal a mixed, though largely negative and insignificant, impact of SPSMs on bilateral exports highlighting the fact that other non-standard factors may have played a more prominent role in influencing the level and direction of exports of these products from Guyana.

Key words: Non-traditional exports; Sanitary and Phytosanitary measures; gravity model,

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ACRONYMS

CAC	CODEX Alimentarius Commission
CARICOM	Caribbean Community
CFR	Code of Federal regulations
CSME	CARICOM Single Market and Economy
EEC/EC	European (Economic) Community
EU	European Union
FFP	Fish and Fish Preparations
F&V	Fruits and Vegetables
FDA	Food and Drug Administration (USA)
MRLs	Maximum Residue Limits
SPSMs	Sanitary and Phytosanitary Measures
SPS	Sanitary and Phytosanitary
US	United States

1. INTRODUCTION

The current context of global trade in agricultural commodities is defined by a paradigm shift in regulatory focus from quantitative restrictions (tariffs and quotas) to such measures as sanitary and phytosanitary standards (SPS) and technical barriers to trade. SPSMs are fundamentally different from quantitative restrictions. The latter are deliberate instruments used to distort trade (resource allocation) and welfare by taxing import commodities. SPSMs however, are at the nucleus of consumer/ producer protection from pests and diseases associated with imported agricultural commodities (Wilson and Otsuki 2001; Achterbosch and van Tongeren 2002). This is reflected in their definition under Annex A of the SPS agreement, which states that SPSMs are any measure designed by importing countries:

- "to protect animal or plant life or health within the territory of the Member from risks arising from the entry, establishment or spread of pests, diseases, disease-carrying organisms or disease-causing organisms" (paragraph 1.a);
- "to protect human or animal life or health…from risks arising from additives, contaminants, toxins or disease-causing organisms in foods, beverages or feedstuffs" (paragraph 1.b);
- "to protect human life or health…from risks arising from diseases carried by animals, plants or products thereof, or from the entry, establishment or spread of pests" (paragraph 1.c); and
- "to prevent or limit other damage… from the entry, establishment or spread of pests" (paragraph 1.d)

Increased consumer demand for safer foods has perhaps been the greatest factor influencing the increased importance of SPSMs in global food trade, and has further sought to distinguish regulations designed to protect human health among the consortium of regulatory measures. This is related to the concomitant increase in food safety risks in developed countries correlated with increased international food trade (Roberts and Unnevehr 2003).

Other factors influencing the increased importance of SPSMs in agricultural trade include: the nature of the globalized economy which has a low tolerance for 'system frictions' and, as a consequence, has tended to amplify the importance of remaining barriers to trade (Iacovone 2003); further, the globalization of transportation systems and the development of integrated global food chains have tended to compound the prospects of disease outbreaks assuming a global scale; scientific and technological advancements are also increasing awareness of the health risks from diseases associated with imports and are therefore scientific regulation of imports (Buzby 2003).

Consequently, regulators are instituting stricter regulatory regimes for SPSMs (World Bank 2005, Achterbosch & van Tongeren 2002; Iacovone 2003; Baldwin 2000), either by increasing the number of regulations or tightening the intensity of their requirements.

These developments are of significant importance to developing-country exporters of agricultural commodities, such as Guyana. Guyana is seeking agricultural diversification into non-traditional products such as fruits and vegetables (F&V), as a strategic approach to cushioning the economic volatility associated with primary exports, such as rice and sugar. However, unlike traditional export commodities, competitiveness of non-traditional (high-value) agricultural commodities is entrenched in product and process quality. Compliance with such measures is therefore of considerable importance to achieving international competitiveness (World Bank 2005). SPSMs can therefore affect exports of such products, either by acting as barriers or catalysts to trade.

This paper undertakes an econometric analysis of the impact of SPSMs on trade between and Guyana three of its major trading partners: the US, EU and CARICOM for two non-traditional product groups; fish and fish preparations (FFP) (03) and fruits and vegetables (F&V) (05) at the two digit level of (Rev 1) classification. A gravity model is constructed and augmented with a measure of stringency of standards to capture the impact of standards on trade between the countries over 1970 to 2008.

2. RESEARCH OBJECTIVES

The aim of this paper is to undertake a quantitative assessment of the stringency of the SPS regimes of three of Guyana's major export markets for F&V and FFP: USA; EU and CARICOM; to ascertain the magnitude of the current impact of SPSMs on exports and hence extrapolate the implications for expanding exports of non-traditional commodities.

The specific research objectives are:

1. To examine the theoretical impact of SPSMs on trade between developing and developed countries.
2. To employ a gravity model to quantify the impact of SPSMs on the level and direction of exports of F&V and FFP from Guyana to the US, EU and CARICOM.
3. To ascertain the importance of such regulations for further expansion in trade of these and other non-traditional agricultural products.

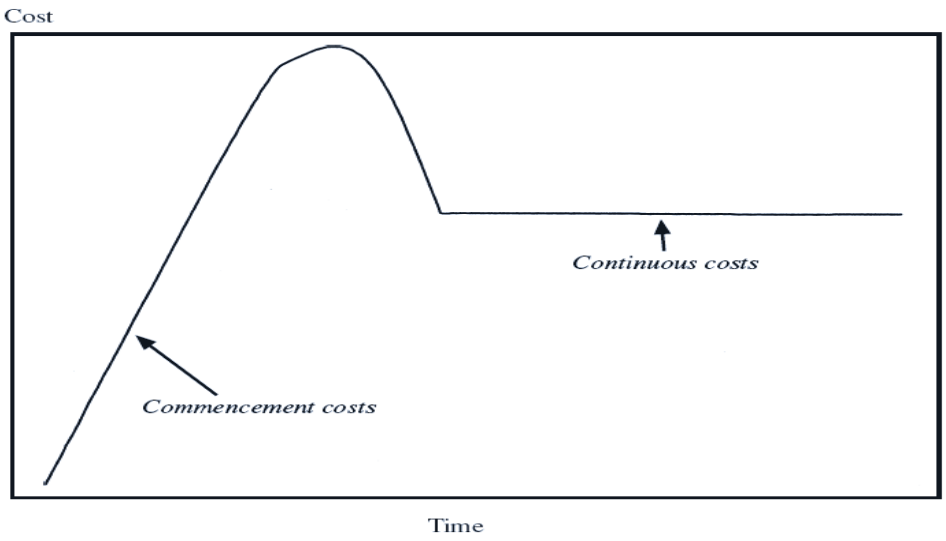
3. THEORETICAL FOUNDATIONS

The impact of SPSMs can be examined from two perspectives. On the one hand, SPSMs, like tariffs and other frictional measures, can act as barriers to trade, curtailing the export capacity of developing countries and eroding market share in favour of domestic or other developed country suppliers. On the other hand, SPSMs can catalyze competitiveness changes in developing countries providing the wherewithal for long run sustainable trade. The precise impact is *a priori* uncertain.

SPSMs can inadvertently/ deliberately affect trade. Deliberate restrictions present clear violations of international trade rules as set forth by the WTO's SPS agreement and are difficult to ascertain. Derogations from the requirements of the SPS agreement are justifiable under the harmonization provision of the agreement which permits countries to adopt stricter standards providing there is scientific justification for doing so or if the

level of protection afforded by the Codex standard is inconsistent with the level of protection generally applied and deemed appropriate by the country concerned (SPS Agreement- Article 3; Paragraph 3).

Primarily, the mechanism through which SPSMs negatively affect trade is through compliance costs. Exporters may incur fixed and variable costs to modify their product or production process to demonstrate compliance with standards (see figure 2). These costs arise from conformity assessments, including testing and certification procedures to ascertain whether a commodity conforms to standard requirements (Wilson 2001). As figure 1 illustrates, these costs are usually very high in the initial stages of compliance as exporters are forced to undertake upfront investments, and therefore, may not have any impact on export supply in the short run. However, in the long run, as exporters invest in new or safer production techniques and move up their standards compliance 'learning curve' costs begin to decline and then eventually stabilize as exporters face only recurrent costs of compliance such as regular testing (Buzby 2003; Oyejide et al. 2000). During this period of cost adjustment export supply and price adjust.



Source: Baldwin 2000

Figure 1 Cost of compliance with Standards

The absolute cost element of Standards is exacerbated where heterogeneity[1] exists, either in design or application, as is the case with the CARICOM, US and EU markets. A series of studies by the World Bank (Otsuki et al 2001; Otsuki & Wilson 2001) has found that SPSMs hinder exports of agricultural and food products from developing countries by their stringency and heterogeneity across export markets. For instance, Waite and Gascoine (2003 p. 5) argue that if the EU applied the CODEX international standard for residues of the pesticide rather than the more stringent EU standard, developing countries could boost their banana exports to the EU by US $5 billion.

With heterogeneous food safety systems, testing and certification requirements become varied and complex and can therefore involve high costs (Wilson 2000b). These costs may affect the long run and short run cost function of exporters (Baldwin 2000; Buzby 2003), with implications for export supply in the short run (Buzby 2003; Oyejide et al 2000) and may result in higher costs to consumers (Wilson 2001), with economic and social implications for developing countries.

This can result in standards becoming a governing factor in the choice of export markets facing developing countries. Specifically, with varying standards in export markets, exporters face three (3) strategic options for profit maximization: *first,* export to the market with the least stringent gamut of regulations in order to avoid significant compliance costs, possibly resulting in export concentration[2]; *second,* export to the market where the potential economic gains significantly outweigh the anticipated costs after compliance; and *third,* export to the market that provide distance- related cost advantages.

[1] Differences in the level of scientific knowledge among countries, more so between developed and developing countries, especially since the latter continues to face institutional deficits and scientific handicaps; differences in risk factors; differences in the degree of uncertainty or ambiguity about risk factors; and differences in risk tolerances (associated with such factors as differences in income, technology level, past experiences, loss function and ambiguity aversion) (Leebron 1996 in: Stephenson 1997) give rise to heterogeneous food safety systems.

[2] The idea put forward here is that where standards significantly influence trade flows they can limit the number of market choices facing developing countries for export of high-value agricultural commodities, resulting in developing countries exporting to possibly only one to three developed country markets.

In addition to compliance costs, firms also face costs (trade reduction) associated with non-compliance and delays because standards increase the elasticity of substitution in demand for similar products (Wilson 2001, Oyejide et al 2000). During time lags consumers can switch to substitute goods and exporters would have to incur substantial costs to re-establish market presence and re-gain lost market share (Baldwin 2000; Iacovone 2003).

The 'standards-as-catalyst' perspective of SPSMs emphasize that they provide potential opportunities that developing countries can use to stimulate competitiveness and result in more sustainable and profitable trade over the long term (World Bank, 2005) since they already possess a comparative advantage in the production of high-value agricultural commodities. This is premised on the assumption that competitiveness in agricultural markets for high- value commodities is defined by quality rather than price.

Competitiveness gains can occur because food safety standards resolve information asymmetry between consumers and exporters (which worsens with distance) regarding the quality and safety of imports (Baller 2007). This is referred to as 'the avoidance of the lemons problem' since the regulations eliminate the externality that is causing the under-provision of safety and is more readily attained through modernization of the production/ export supply chain which can contribute to continued and/or greater market access, whether at the country, industry or firm level.

They therefore provide an economic service (public good-information asymmetry, transaction costs) that would otherwise be under- provided by the ordinary functioning of the market mechanism and are welfare enhancing.

Table 1- Summary of Potential Benefits of Standards Compliance

Direct Benefits	Indirect Benefits
1. Enhancement of capacity of production/ supply chain	1. Crisis containment
2. Enhanced efficiency	2. Improved reputation of firm/or country

3. Trade creation	3. Technology diffusion
4. Reduced level of inspection/ detention	4. Development of niche markets
5. Restructuring/modernization of production supply/chain	5. Increased productivity
6. Quality improvement	6. Enhanced domestic food safety
7. Increased export market share (demand)	7. Enhanced competition
8. Increased competitiveness	8. Enhanced occupational safety
	9. Enhancement of rural livelihoods
	9. Greater clarity to the SPS management functions of government
Source: *Author's assessment based on literature review*	

Further, spillover benefits such as: increased capacity-building for the domestic food safety system (World Bank 2005); increased agricultural productivity (Simeon 2006) and worker safety and rural development (World Bank 2005) can also be attained (See tTable 1).

However, the extent to which these benefits may be realized is affected by institutional capacity deficits in developing countries. This is corroborated by Anders and Caswell (2006) who point to a gap between growing standards requirements in developed countries and the development of modernized supply chain structures for many export industries in developing countries that remains to be bridged.

4. METHODOLOGICAL APPROACH

The gravity model was used to estimate the magnitude of the current impact of SPSMs on exports of non-traditional exports from Guyana to the US, CARICOM and EU over a 39 year period, 1970-2008.

The gravity model is based on Isaac Newton's "law of Universal Gravitation" (Newton's Apple 1867):

$$F_{ij} = G*M_iM_j / D^2_{ij.}$$

Where; F_{ij} is the attractive force; M_i and M_j are the masses; D_{ij} is the distance between the two objects and G is a gravitational constant (Kuratani 2004; Head 2003). According to this physics principle "the force between any two bodies is directly proportional to the product of their masses and inversely proportional to the square of the distance between them" (Kuratani 2004).

In its application to international trade,[3] pioneered by Tinbergen (1962), Polyhonnen (1963), Pullianinen (1963) and Linneman (1966), the parameter F is defined as the flow of goods between two countries; M_i and M_j as the economic size of the countries, measured by GDP[4] and D_{ij} as the distance between them (Head 2003). The model therefore describes trade between two countries as being positively related to their size and inversely related to their distance.

The gravity model used in this paper is a single-country fixed-effects model that follows a log-linear[5] econometric time-series specification in order to be able to interpret the

[3]Several theorists were able to successfully formally derive the gravity model from different theories of international trade such as, monopolistic competition (Dixit & Stiglitz's 1977); increasing returns to scale in production (Helpman & Krugman 1985) and more recently the Heckscher-Ohlin theorem (Evenett & Keller 1985; Deardorff 1995). Deardorff (1995) proved the validity of the gravity equation in trade by linking it to a perfect specialization Heckscher-Ohlin (H-O) model; assuming both frictionless and impeded trade in homogenous products. In each case, the analysis was based on the most common assumptions of models of international trade, that of homothetic and identical preferences across countries.

[4]Population was later added by Linneman as a supplementary measure of country size (Aguillar 2007).

[5] The log-linear transformation of the variables allows reduces the absolute error in the residual variable, that is it makes the residuals more uniform by normalizing the data over time.

estimated coefficient as the elasticity of the variables and to avoid omitted variable bias as well as to capture the temporal dynamics of trade. It has the following specification:

$$Ln\ X_{it/ji} = \beta_0 + \beta_1\ ln\ PGDP_{it} + \beta_2\ ln\ PGDP_{jt} - \beta_3\ ln\ Dist_{it/jt} + \beta_4\ ln\ STRJ_{it/jt} + \beta_5\ INT_{CBI/LOME/CARICOM} + U_{ijt}$$

Where;

Ln $X_{it/ji}$ is the natural log of real exports of FFP and FV from Guyana to the each of its trading partners valued at US $'000 at 2004 prices. Export data were obtained from the United Nations Commodity Trade Statistics (COMTRADE) database and the Bureau of Statistics, Guyana. The data was used at the 2 digit level of dis-aggregation based on revision 1 of the standard industrial trade classification system (S.I.T.C). Time series averages were used to fill missing gaps in the data set for the years 1993 and 1995.

Ln $PGDP_{it}$ and ***Ln $PGDP_{jt}$*** are, respectively, the natural log of Guyana's real Per Capita GDP and the Per Capita GDP of its trading partners, measured in US$'000 at 2004 prices. Data were obtained from the National Accounts Main Agrregate Database, United Nations Statistics Division[6].

The Per Capita GDP variables were used to measure the effect of income on trade relations between Guyana and the USA. Income measures the economic size of countries and respectively reflects purchasing and output capacity of the importing and exporting country. For the importing country, a larger per capita GDP translates into a larger purchasing capacity, and hence a greater demand for imported goods (Kalbasi 2001). Per capita GDP is also an indication of the level of development of a country. Based on the specialization hypothesis proffered by the H-O theorem and theories of economies of scale and product differentiation, economically larger countries are expected to produce a variety of goods and trade more (Evenett & Keller 1998; Deardorff 1995).

The ceteris paribus effect of the per capita GDP is therefore assumed to be positive.

[6] http://unstats.un.org/unsd/snaama/selectionbasicFast.asp

Ln Dist$_{it/jt}$ is the Natural log of distance between Guyana and each of its trading partners. It is measured as '000 Kilometres and was obtained from the CEPII database, which calculates distance as a weighted average of the distance between the economic centers[7] of the countries, which may or may not include the capital, using the geodesic approach.

Distance is used as a proxy for several cost factors that separately affect trade (Head 2003) such as: transport costs; time elapsed during shipment; synchronization costs; communication costs and transaction costs. These costs increase with distance. Therefore, ceteris paribus, the coefficient distance is expected to be negative.

Ln STRJ$_{it/jt}$ is an index used to capture the stringency of each country's food safety standard. It was constructed based on the inventory approach and determined by the following criteria:

$$I = \sum_t \text{CUM } Std_i \,/\, \text{CUM } Std_{codex}$$

That is, I is a cumulative comparison of the regulation of each country against CODEX recommended guidelines.

Where I $\geq 0 \sim \geq 1$

I ≥ 1, country $_{i's}$ standards are on par with or are more stringent than the recommended Codex guideline.

I ≤ 1, country $_{i's}$ standards are more lax than the recommended Codex guideline.

The following criterion is used to determine Std_i

$Std_{it} = Tol^j_i \geq Tol^j_c$

[7] This is based on the geographic distribution of the population (2004) within each state. The distance formula used is a generalized mean of city-to-city bilateral distances, weighted by population developed by Head and Mayer (2002): $d_{ij} = (\sum_{k \in i} (pop_k/pop_i) \sum_{e \in j} (pop_e/popj)\, d^{\theta}_{ke})^{1/\theta}$
Where: pop_k, is the population of agglomeration k belonging to country i and θ, measures the sensitivity of trade flows to bilateral distance.

Where: Std_j Tol_i is the tolerance level of $country_i$ for standard j that is greater than or equal to the guideline of the CAC for the same standard at time t.

Four categories of regulations were chosen for FFP and three for FV based on data availability. These respectively include: labeling, contaminants, veterinary drug residue and additives and; labeling, pesticide residues and additives.

Data for standards were obtained from the national regulations of the country: title 21 of the code of federal regulations (CFR) and documents from the compliance policy programme for the US, EU Directives and the CAC Documents repository (See Appendix 3 for main regulations used).

INT $_{CBI/LOME/CARICOM}$ is a dummy variable that measures the impact of the free trade arrangement (FTA) on trade flows between Guyana and each of its trading partners. *A priori,* a FTA can have either a negative or a positive impact on bilateral trade.

The term U_{ijt} is the error term and is assumed to be normally distributed with mean zero.

The gravity model is the ideal methodological framework for the estimation of the impact of food safety standards on exports of non-traditional products. The gravity model allows for a direct indication of the direction and impact of the imposition of a standard on trade flows, as opposed to other approaches such as surveys and case studies and partial equilibrium approaches (Beghin & Bureau 2001; Iacovone 2003). Further, the model also allows for a comparison of how diverging standards promote or inhibit trade between an exporting country and several of its importing country partners (Wilson & Otsuki 2000; Beghin & Bureau 2000). Also, the gravity model because it is constructed on time series data provide an indication of trends and dynamics unlike other approaches, such as surveys that are usually one time occurrences (Iacovone 2003).

5. EMPIRICAL ANALYSIS

5.1 Summary of Results

The impact of SPSMs on non-traditional exports from Guyana was investigated using two (2) commodity groupings at the two digit level of dis-aggreation (SITC Rev 1): fruits and vegetables (05); and fish and fish preparations (03). Single country gravity models were used to estimate the impact of such measures on exports of FFP and F&V to the US, EU and CARICOM, three (3) of the country's largest trading partners.[8] The models were used to normalize exports from Guyana to each of the country grouping using factors affecting trade, as given by Newton's gravity equation. The models were further augmented with stringency variables to capture the impact of standards on trade flows (see appendix 1 for results of estimation).

The models generally do not violate the key classical assumptions of linearity, multicollinearity, autocorrelation, unit root and heteroscedasticity and are statistically significant at both the 5% and 10% levels of significance (See appendix 1). The estimates are therefore unbiased and somewhat reliable.

The fit of the models (that ranges from 50-85%) indicate that a significant proportion of Guyana's exports of FFP and F&V to the US, EU and CARICOM can indeed be explained by the economic size of the countries, their geographical distance and the impact of food safety standards (see appendix 1 for R^2 value for individual models).

5.1 Analysis of Results

5.1.1 Impact of SPSMs on Exports of FFP to the US, EU and CARICOM Markets

The elasticity of the coefficient of the estimate of stringency of FFP regulations is negative for the US and CARICOM models but positive for the EU model. The coefficients of the standards variables are very low, less than 1% in each case. Further,

[8] Six models were estimated, one for each country and commodity grouping.

only for the US model is the stringency variable statistically significant. Generally, therefore the models divulge a weak and insignificant correlation between export flows of FFP and the standards regime of the countries.

Specifically, the results can be interpreted to mean that a 1% tightening in the stringency of standards in the US and CARICOM markets, whether through the intensity of their requirements or the number of established regulations, relative to CODEX guidelines, can lead to a marginal reduction in exports of FFP from Guyana to the countries. The reduction may respectively, be in the vicinity of 1.4% for the US and 0.6% for the EU. On the other hand, a 1% tightening of F&V regulations in the EU market can result in an increase in exports of FFP of about 0.2%.

The direction of the impact of the stringency variables reinforces the view postulated by Thilmany & Barret (1997) (in Oyejide et al (2000)), a view also held by Achterbosch & van Tongeren (2002), that the *a priori* impact of standards is ambiguous.

In the EU model, though the correlation is weak, the fact that the coefficient is positive[9] indicates that standards, despite being stringent and heterogeneous, can be a positive force for instigating competitiveness changes in exports from developing countries and contributing to more sustainable and profitable trade over the long run (World Bank 2005). This is premised on the assumption that competitiveness in agricultural markets for high- value commodities is defined by quality rather than price.

Despite being positive, the elasticity of the stringency coefficient for the EU model is the lowest for all three models at 0.2%. Incidentally, the value of exports to this market, though still positive and growing, is lower than export values to the US and CARICOM markets (see figure 1). An important deduction that can be made from this is that the impact of standards is likely to be larger, or easier to trace, the larger is the volume/value of exports to a particular market.

[9] It is important to note that 'positive', as interpreted here, refers only to the sign of the variable since a statistically insignificant variable , where or not the sign is negative or positive, indicates that the variable has no impact on the dependent variable.

For the US model, the elasticity of the stringency coefficient of 1.4% reveals that standards have had a greater negative impact on exports of fish to the US, Guyana's main fish export market, compared to the other markets. This can be corroborated by the steady decline in trade flows to the US over the 39 year period (See figure 1). The US's share of fish exported from Guyana has fallen consistently from about 75% of total exports in the 1990s to about 55% in 2006, despite remaining the most important trade partner for FFP.

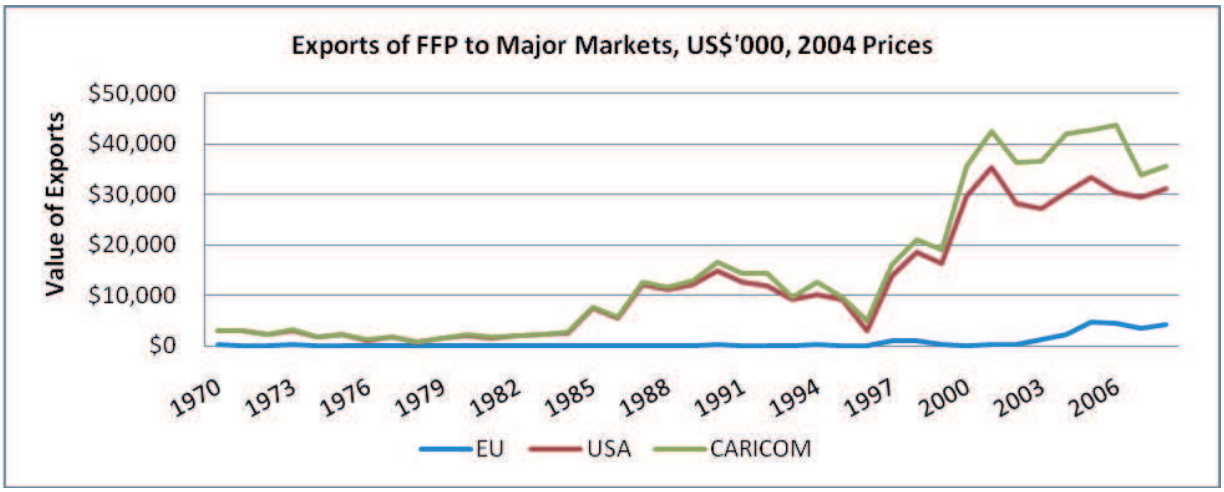


Figure 2 Exports of FFP to Major Markets

The negative coefficient of elasticity for standards in the CARICOM model may reflect the interplay of non-standard factors and standards on trade flows. Undoubtedly, the food safety regime in CARICOM is less stringent than that of the US and EU, providing exporters with an incentive to increase exports to this market as the intensity of requirements increase in the markets of developed countries. An example that corroborates this is the fact that exporters prefer to sell whole fish in Jamaica or produce basic fillets for the US rather than process (cut and package) to the sizes required by supermarket chains in the USA (Zweig 2004). Also, nutrition labeling is a mandatory requirement of the US that became effective with the enactment of the Nutrition Labeling and Education Act of 1990. However, nutrition labeling is voluntary for most commodities exported to CARICOM and only becomes necessary where a health claim is made.

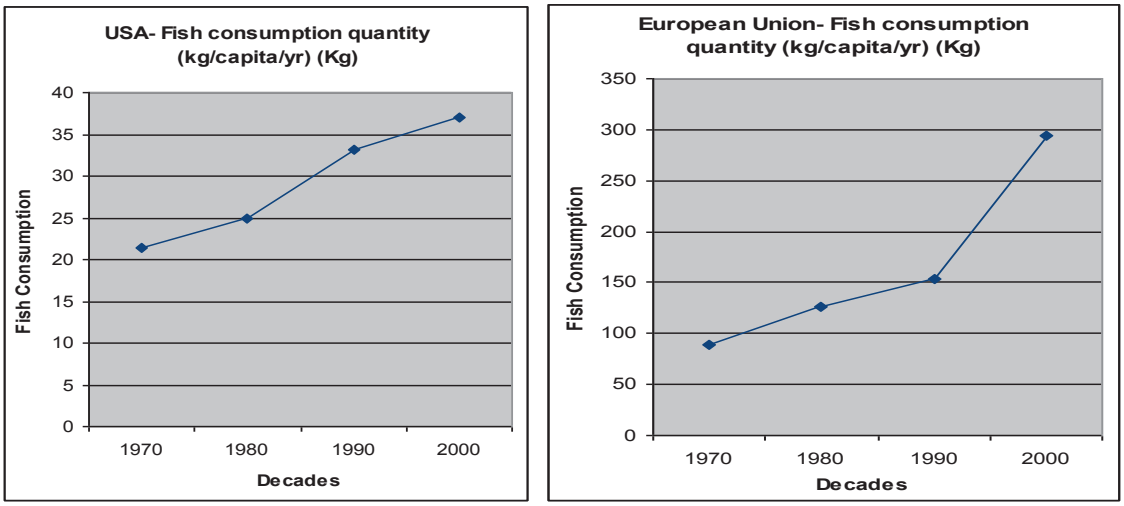
Additionally, in contrast to the US and EU models, the negative elasticity of the coefficient for CARICOM SPSMs is not in keeping with patterns of export flows. Export flows of FFP to the CARICOM market has been consistently increasing since 1970.

The weak and largely insignificant correlation between export flows and the standards regime of the countries, as revealed by the estimation, highlights that, notwithstanding, the voluminous literature concentrated on analyzing the negative impact of standards, the costs is often less than assumed and rather, a multiplicity of factors affects trade. Therefore, the impact of SPSMs should not be over-emphasized on exports. Rather, due cognizance must be given to other factors as these influence how exporters respond to stringent and heterogeneous standards and therefore the cost they incur. Indeed, the insignificance of the stringency coefficients coupled with the statistical significance of other variables somewhat reveals this. Gandslant and Markusen (2001) also allude to the impact of non-standard factors on export flows. According to Gandslant & Markusen (2001) where food safety regimes are heterogeneous across countries, market size and distance-related cost advantages become important factors influencing the pattern of trade flows. As argued by Gandslant & Markusen (2001) “the minimum exclusionary standard is a non-increasing function of the relative size of the market.”

For all the models, exports are significantly affected by the Per capita GDP of the countries as all the variables are statistically significant at the 5% level of significance. Further, for each model, the direction of the impact is positive, revealing that as incomes increase in the countries their demand for imports of FFP from Guyana will increase. The magnitude of the impact exceeds 2% in each model and is the greatest for the EU model at 4.5%. Thus, increased incomes across the three blocks would lead to comparatively higher import demand for fish from Guyana in the EU market. This may be related to the current under-exploitation of this market.

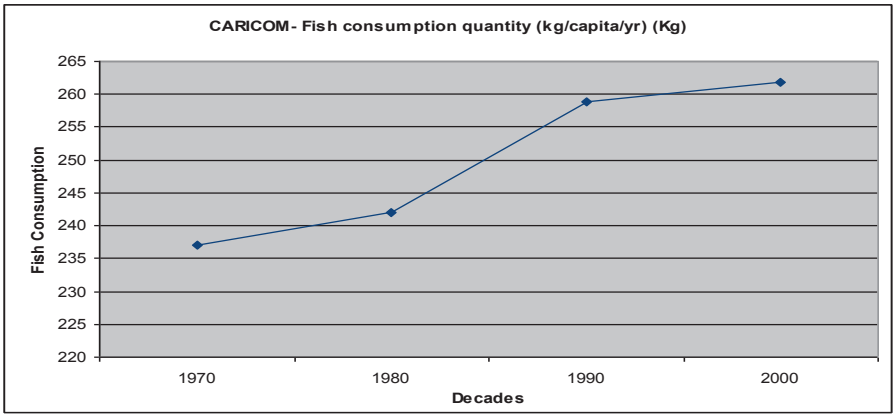
These results reinforce the positive income elasticity of demand for high value agricultural commodities, such as fruits and vegetables, fresh fish and horticultural products, more so in high- income countries such as the US and EU. Therefore,

increased incomes in these countries would lead to increased consumption and imports of FFP. This is supported by consumption patterns of fish by the three blocks of countries. Figures 3 and 4 divulge that per capita consumption of fish has been increasing on an annual basis in the US, CARICOM and EU blocks over the last three decades. The increase has been more consistent in the US market.



(a) **(b)**

Figure 3- US and EU Per capita consumption of fish



Source: author's calculation based on data obtained from the FAO Fishery database

Figure 4- CARICOM per capita consumption of fish

The results of the Per capita GDP variables are also largely in keeping with seminal work by Deardorff (1995) and Evenett & Keller (1985), both of whom used the Heckscher-Ohlin model, assuming homothetic preferences (such that national income would also be the budget constraint facing imported commodities), to prove that the larger is national income the greater would be the amount spent on imports.

Distance also affects trade flows. According to Head (2003), distance is an estimate for several cost factors that separately affect trade such as: transport costs; time elapsed during shipment which is very important to highly perishable commodities where the degree of deterioration is directly linked to the time spent during shipment; synchronization costs, which measures the cost of combining several inputs into the production process; communication costs; transaction costs, which pertains to the cost of finding and establishing a relationship with prospective trading partners; and cultural differences.

According to the Newtonian gravity equation, distance negatively affects trade. In its application to trade, larger distances are a penalty on trade flows as larger costs are incurred. This is supported by Gandslant & Markusen (2001). Therefore, where the exporting and importing countries are geographically close so that exporting firms have a distance-related marginal cost advantage compared to other firms further away, where the advantage is large enough, exporting firms may choose to sell to the market closer to them (Gandslant & Markusen 2001).

The elasticity of the coefficients do reveal that trade is larger given the geographical proximity of trading partners as all the variables are negative, except in the CARICOM model. But nevertheless, the results do generally highlight that Guyana does indeed have distance-related cost advantages in exporting FFP to the US and CARICOM markets relative to the EU; and the CARICOM market relative to both the US and EU markets.

The positive outcome for the distance variable in the CARICOM model reflects deviations from the generally accepted movement of distance variables in empirical

econometric studies and may be linked to errors in the estimation technique but is nevertheless in line with recent trends in distance coefficients in some econometric studies. According to Foldvari (1976) in empirical estimations, distance has generally been moving contrary to expectations. The reasons offered by Foldvari (1976) may also explain the outcome of the CARICOM model. Foldvari (1976) firstly notes that the gravity model omits important determinants of trade and secondly, that the log linear specification format may not be the most appropriate specification for estimating distance coefficients. Other approaches such as the Poisson model may generate better estimates.

The integration coefficients reveal a negative and significant impact on trade in the case of the US and EU models but a positive and significant impact in the case of the CARICOM model as a result of the creation of free trade arrangement.

Preferential benefits from the CARICOM customs union have therefore had a positive and significant impact on exports of fish to that market. The customs union offers 13 developing country members in the Anglophone Caribbean free movement of goods embedded in article 79 of the Revised Treaty of Chaguaramas and protection from third party competition through the implementation of the common external tariff (CET).

The elasticity of the coefficient revealing the change in trade brought about by implementation of the CET under the integration arrangement is 1.4% over the 39 year period. This is corroborated by increasing exports of FFP to this market (see figure 1). Notably, around 1984, approximately 10 years after the ratification of the treaty of Chaguaramas (in 1973), exports of FFP to the CARICOM market began to increase considerably.

In contrast, duty free access to the US and EU markets from the implementation of the Caribbean Basin Intiaitive (CBI) and the Lome agreements has had a negative impact on exports of FFP. The percentage trade reduction under these arrangements is equivalent to 0.8% in the case of the CBI arrangement and 3.1%, respectively in the case of the Lome agreement

5.1.2 Impact of SPSMs on Exports of F&V to the US, EU and CARICOM Markets

The elasticity of the coefficient of the estimate of stringency for F&V is negative for each country model. Further, in each case, the magnitude of the impact is less than 2%: 0.4% in the US market; 0.7% in the EU market; and 1.4% in the CARICOM market. This indicates that a 1% tightening in the stringency of standards in the US market can lead to a reduction in F&V exports to that market equivalent to 0.4%; while a 1% increase in the standards requirements of the EU and CARICOM markets, relative to guidelines established by the CAC can lead, respectively, to a 0.7% and 1.4% reduction in exports of F&V to the markets.

Therefore, an increase in standards across all three trading partners will have a greater impact on exports to the CARICOM market relative to the US and EU. An important factor explaining the impact of CARICOM standards on trade flows is the current state of standards regimes in countries comprising this trade block compared to the US and EU. Undoubtedly, food safety regimes of these countries are less stringent[10] than that of the US and EU, providing exporters with an incentive to increase exports to this market as the intensity of requirements increase in the markets of developed countries. However, given the impact of other factors on export flows such as more favourable economic conditions (price and demand) in developed countries, increased stringency of standards in CARICOM relative to codex guidelines, may somewhat erode the advantage the current less stringent food safety regime offers; such that there is likely to be a larger reduction of trade in this market if standards were to tighten relative to the US and EU. This is reinforced by the statistical significance of the non-standard variables in the three models that normalizes trade flows between Guyana and each of its trading partners.

Notably, the Per capita GDP coefficients are statistically significant only in the US and EU markets and also has a positive impact on trade. This highlights that the income

[10] Two theoretical arguments can be advanced to explain this. Firstly, for developing countries access to food assumes greater priority than quality. Secondly, there is a gap in the implementation of guidelines that may be established by the CAC to reflect growing health risks.

elasticity of demand for F&V is greater in the US and EU and underscores that increased incomes in these countries will lead to increased consumption and imports of F&V. Therefore, the income earning potential from exporting F&V to these markets, compared with the CARICOM market is greater.

Distance also has an impact on the pattern of trade flows between Guyana and its trading partners. The *a priori* assumption is that trade increases with the geographical proximity of trading partners, such that exporters have distance-related cost advantages in exporting F&V to the US and CARICOM markets, where cultural ties are stronger and transport costs lower, relative to the EU. However, by and large, the results are not in keeping with expectations, as in the case of the FFP models.

Regional trade arrangements involving Guyana and each of its trade partners also affect bilateral trade flows and the impact of standards on exports of F&V. Notably, the CET implemented under the CARICOM arrangement has had a positive and statistically significant impact of exports of F&V to the block. The elasticity of the CARICOM coefficient is 1.8%. In contrast, implementation of the CBI and Lome arrangements have had a negative and significant impact on exports to the US (-2.6%) and; a negative and insignificant impact on exports to the EU (-0.8%).

Clearly, therefore preferences afforded by CARICOM have been more facilitative of exports of non-traditional commodities. This is corroborated by increasing exports to the market (see figure 4). The US and EU preferences have been primarily directed at traditional exports commodities such as sugar and rice.

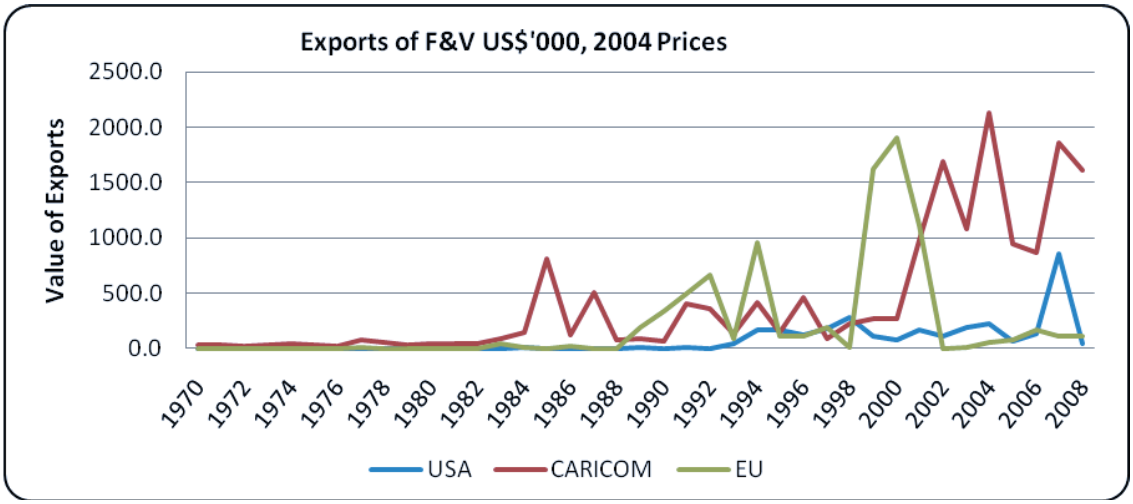


Figure 5- Exports of F&V to the US, EU and CARICOM

Arguably, therefore, the existence of this free trade arrangement along with a comparatively less stringent food safety regime in CARICOM, together explains a significant proportion of increasing exports to this market compared to the markets of the US and EU.

6. CONCLUSION

Guyana is seeking to expand exports of non-traditional agricultural products to placate instabilities in the agriculture sector associated with a changing external trade policy environment, notably, reforms in EU trade policy and the emerging 'spaghetti bowl' of WTO- compatible regional trading arrangements; and declining terms of trade for primary commodities.

Key non-traditional exports of economic interest to the country are fruits and vegetables such as pineapple, pepper (wiri wiri), papaya and plaintain as well as aquaculture.

Indeed, agricultural diversification into non-traditional exports, such as F&V, presents promising prospects for income generation. Such products have a high income elasticity of demand and lower price volatility than many traditional export commodities (World

Bank 2005). However, they face a gamut of food safety standards that are important to accessing developed countries' markets. It is therefore important that their impact on competitiveness is given due recognition and situated among the broader set of competitiveness factors in order to ensure long-term sustainability and profitability of non-traditional exports.

This necessitates a strategic approach to standards compliance, one that aptly manages the costs and benefits of compliance with SPSMs. This is corroborated by the World Bank (2005) which argues that:

"[a]lthough developing countries face increasingly strict sanitary and phytosanitary standards in their export markets, they can maintain and improve market access by adopting a strategic approach to food safety, agricultural health and trade."

Further, recent studies (Henson & Jaffee 2006) have shown that there exists a gamut of strategy options that, if combined in the right proportions, would allow developing countries to realize competitive gains from compliance with stringent standards.

This approach, as the World Bank (2005 p.35) deliberates, can entail "identifying the emerging set of requirements and opportunities, weighing the available options to address them, and effectively managing the chosen processes of adjustment". Inevitably, this requires improvements in the capacity of domestic food safety system to support flexibility in compliance with standards by exporters. This is under the assumption that the adequacy of the domestic food safety regime to address SPS-related problems, affects a country's ability to comply with the SPSMs of its trading partners. This was empirically substantiated by Dong & Jensen (2004) who found that the SPS problems associated with Chinese products- pesticide residues, low food hygiene, unsafe additives, contamination and misuse of veterinary drugs- were reflective of the ineffectiveness of the domestic SPS regulatory framework in regulating the use of pesticides and chemicals by producers.

Key to managing the costs and benefits associated with SPSMs is an understanding of the market access implications. Given heterogeneous standards across countries,

standards that have a negative impact on exports can alter trade flows such that developing countries are coerced into becoming more engaged in south-south trade as compared to north-south trade. This is premised on the assumption that developing countries, because of differences in risk tolerance, and gaps in the implementation of CODEX guidelines, have food safety regimes that do not reflect growing health risks as may be the case in developed countries. Further, given the global economic geography, developing countries are more likely to have distance-related cost advantages with other developing countries, as is the case in CARICOM.

This can be seen as a strategy to cope with food safety measures of developed countries that are too costly to comply with in the short run. This is particularly, the case where there is a free trade arrangement among developing countries that provides both unfettered access to an enlarged market and distance-related cost advantages, as the intensification of exports to CARICOM reveals. For Guyana, therefore, given the impact of heterogeneous food safety regimes, distance-related cost advantages and the impact of preferential access, the CARICOM market is an appealing option for expanding exports of non-traditional products in the short run. However, sustainable and profitable trade over the long run necessitates developing the flexibility for effective compliance with the standards of important developed- country trading partners where demand patterns and price trends remain favourable.

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8. APPENDICES

Appendix 1- Results of Estimation FFP (03)

Variables	USA		CARICOM		EU	
	Coefficient	T- Statistic	Coefficient	T- Statistic	Coefficient	T- Statistic
A	23		2.6		10.6	
*ln P*GDP$_{it}$	-1.5	6.6 [a]	-.976	-1.3	2.3	1.9 [b]
ln PGDP$_{jt}$	2.6	-3.3 [a]	2.3	6.1 [a]	4.5	2.0 [a]
ln DST$_{ijt}$	-13.4	-0.7	1.5	2.4 [a]	-5.8	-0.5
ln STRJ$_{ijt}$	-1.4	-1.8 [b]	-.59	-1.3	0.2	0.5
D$_{CARICOM}$			1.4	2.3 [a]		
D$_{CBI}$	-0.8	-1.9 [b]				
D$_{LOME}$					-3.1	-3.5 [a]
R- Squared	81%		84%		57%	
Adj R-Squared	77%		81%		50%	
F- Statistic	27		35.2		8.7	
Number of Observations	39		39		39	

Source: Author's Calculation

[a] 5% level of Significance using a two-tailed distribution

[b] 10% level of Significance using a two-tailed distribution

Appendix 2- Results of Estimation F&V (05)

Variables	USA		CARICOM		EU	
	Coefficient	T- Statistic	Coefficient	T- Statistic	Coefficient	T- Statistic
A	16.0		4.3		-14.5	
*ln P*GDP$_{it}$	2.4	1.7[a]	0.6	0.9	1.6	1.1
ln PGDP$_{jt}$	3.3	2.7[a]	0.6	1.6	0.7	4.1[a]
ln DST$_{ijt}$	-12.1	-0.10	0.9	0.9	9.1	2.4[a]
ln STRJ$_{ijt}$	-0.4	-0.76	-1.4	-2.4[a]	-0.7	-0.4
D$_{CARICOM}$			1.1	1.8[b]		
D$_{CBI}$	-2.6	-2.1[a]				
D$_{LOME}$					-0.8	-0.4
R- Squared	68%		74%		61%	
Adj R-Squared	63%		71%		55%	
F- Statistic	13.9		19.1		10.1	
Number of Observations	39		39		39	

Source: Author's Calculation

[a] 5% level of Significance using a two-tailed distribution

[b] 10% level of Significance using a two-tailed distribution

Appendix 3- Main Regulations Used for Country Comparison

Main Regulations Used for Country Comparison	
Country	**Regulations**
US	Code of Federal Regulations (CFR) Title 21- Food and Drugs (volume 2), 'Chapter 1- Food and Drug Administration,' Department of Health and Human Services. Revised 2003. 1. part 101- Food Labeling, date viewed September 2007 2. part 170-199- Food Additives 3. part 123- Fish and Fishery Products CFR Title 40- Protection of environment (volume 2), Chapter 1- Environmental Protection Agency (EPA), part 180- Tolerances and Exemptions from Tolerances for Pesticide Chemicals in Food, Revised 2003 Other Sources: 1. Brans, H, 2007, 'EU-27 Food and Agricultural Import Regulations and Standards European

	Union Report,' Global Agriculture Information Network (GAIN) Report, United States Department of Agriculture Foreign Agricultural Service 2. Food and agricultural import regulations and standards report (FAIRS) United States of America, 2001, 3. Fish and Fisheries Products Hazards and Controls Guidance (3rd Edition), 2001, US Food and Drug Administration- Center for Food Safety and Applied Nutrition 4. FDA/ORA Compliance Policy Guide Sections 555.300, 556.660 US Food and Drug Administration, Office of regulatory Affairs
EU	1. 91/493/EEC- laying down the health conditions for the production and the placing on the market of fishery products 2. 95/408/EEC- on the conditions for drawing up, for an interim period, provisional lists of third country establishments from which Member States are authorised to import certain products of animal origin, fishery products or live bivalve molluscs 3. 2002/99/EC- laying down the animal health rules governing the production, processing, distribution and introduction of products of animal origin for human consumption 4. 91/493/EEC- laying down the health conditions for the production and the placing on the market of fishery products 5. 93/51/EEC- establishing rules for movements of certain plants, plant products or other objects through a protected zone, and for movements of such plants, plant products or other objects originating in and moving within such a protected zone 6. 852/2004- on the hygiene of foodstuffs – Corrigendum 7. 853/2004- laying down specific hygiene rules for on the hygiene of foodstuffs 8. 854/2004- laying down specific rules for the organisation of official controls on products of animal origin intended for human consumption 9. 882/2004- on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules.
CARICOM	1. Barbados National Standard (BNS CP 1: 2004) 'Code of Practice for General Principles of food Hygiene Part 1: Food Production and Processing,' 2004, Barbados National Standard Institution, Culloden Road, Saint Michael, Barbados 2. National Standard (BNS 5: Part 7: 2004) 'Specification for the Labeling of Prepackaged Meat and Poultry Parts/Cuts and Fish and Fishery Products (Revised),' 2004, Barbados National Standard Institution, Culloden Road, Saint Michael, Barbados 3. Barbados National Standard (BNS 5: Part 2: 2004) 'Specification for Labeling of Prepackaged Foods (Second Revision),' 2004, Barbados National Standard Institution, Culloden Road, Saint Michael, Barbados
CODEX	1. CODEX General Standard for Contaminants and Toxins in Foods, CODEX STAN 193-1995, Rev.2-2006,

	2. CODEX General Standard for Food Additives, CODEX STAN 192-1995, 3. Codex MRLs for pesticides
Web sources: USA- http://www.access.gpo.gov/nara/cfr/waisidx_03/21cfr101_03.html, http://www.fda.gov/ora/compliance_ref/cpg/cpgfod/default.htm#sc555, http://www.cfsan.fda.gov/~comm/haccp4a.html; EU- http://ec.europa.eu/food/food/foodlaw/index_en.htm; Codex- , http://www.codexalimentarius.net/mrls/pestdes/jsp/pest_q-e.jsp	