Quantifying the Trade Effect of Sanitary and Phytosanitary Regulations of OECD Countries on South African Food Exports

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Abstract

Stringent sanitary and phytosanitary standards (SPS) have proliferated in the aftermath of the Uruguay Round Agreement on Agriculture (URAA). These standards are currently becoming a major stumbling block in agricultural trade for developing countries. Limited by inadequate resources and expertise, among other things, these countries also have poor participation rate in discussions related to SPS that impedes the representation of their interests and concerns in setting international standards for agricultural products. Using a gravity model, this paper estimates the trade effect of total aflatoxin level set by five OECD countries (Ireland, Italy, Sweden, Germany and USA), on South African food exports. The findings support the hypotheses that stringent SPS standards are limiting trade markedly. The trade elasticity of aflatoxin standard is 0.41 and statistically significant. Moreover, the simulation result based on the assumption that these five OECD countries adopt the total aflatoxin level recommended by CODEX, shows that South Africa would have gained an estimated additional amount of US$ 69 million per year from food exports to these countries from 1995 to 1999.

1. Introduction

The SPS agreement under the Uruguay Round Agreement on Agriculture (URAA) defined Sanitary and Phytosanitary (SPS) standards as measures taken to protect human, animal or plant life or health from risks associated with imported agricultural commodities (WTO, 1995). To prevent the use of SPS standards as a trade obstacle, the agreement stipulates that countries should base their SPS standards on international guidelines and recommendations. It also permits for a country to establish its own SPS standard, above the international level, on a non-discriminatory basis, as long as it can provide a "scientifically justifiable" reason to do so, which should be supported by a risk assessment study. In addition, the agreement allows

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banning of imports as a precautionary step, until an exporting country confirms its product and place are free from any potential risks that may affect the safety and health of consumers, animals and plants.

The eroding power of nations to use tariff as an agricultural trade barrier, as posited in the URAA, has proliferated the adoption of stringent SPS standards, which are becoming a formidable challenge for developing countries' agricultural trade. As a result, many African countries are experiencing a considerable loss of export revenue due to a failure of compliance to these standards (Wilson and Otsuki, 2002; Wilson, et.al, 2001). This loss could be a significant setback for the promotion of the agricultural sector, which is the backbone of the economy for many countries of the continent.

Quantifying the trade impact of these SPS regulations is important to "solve disputes and serve as a basis for calculating compensation claims" (Beghin and Bureau, 2001). Moreover, it is helpful for devising informed policy measures, which could include decisions regarding the compliance with SPS regulations. As Otsuki, et.al, (2001) noted, the major issue in trade policy debate is to compare the compliance costs of exporters with its possible gains achieved through complying with the standards. Estimating the trade impact of the SPS standards, therefore, assists in resolving the policy dilemma, by measuring the possible gains that could be attained from conforming to the SPS standard. This study attempts to estimate the trade forgone from food exports[1] of South Africa due to the aflatoxin standard set by five OECD countries.

The rest of the paper is organized as follows. Developing countries' participation in the SPS agreement will be briefly reviewed in the next section. The impacts of SPS standards on developing countries agricultural exports are reviewed in section 3. Section 4 discusses the model specification and the source of the data. The results of the analysis, the discussion and the simulation are presented in section 5 and 6. Conclusion of the study is given in section 7.

2. Developing countries' participation in the SPS agreement

Active participation of developing countries in any SPS matters, international standard setting organizations and SPS committees is important to maintain and present their interests. Various studies suggest that developing countries could realize the potential benefits of the SPS agreement if they are actively involved on the SPS agreement and its institutions (Henson and Loader, 2001; Zarrilli, 1999; WTO, 2000). There is, however, very low participation of

developing countries on SPS related issues since the agreement has been put in to operation (Henson, et.al, 2000).

At the end of July 1999, for example, it was only 62 percent of low and lower middle-income countries that are members of the WTO (Henson and Loader, 2001). The membership rate for low and lower-middle income countries on Office International des Epizooties (OIE), which is responsible for harmonization of healthy requirements for international trade in animals and animal products, and CODEX Alimentarius Commission (CODEX), an international body for developing standards for specific food or classes of food, is above 70 percent, which can be regarded as representative. In International Plant Protection Convention (IPPC), which is responsible for phytosanitary standard setting and the harmonization of phytosanitary measures affecting trade, developing countries are poorly represented, which is a membership proportion below 50 percent. Only 30 percent of all low and lower middle income countries belong to the WTO and the other three international standard setting organizations. The relatively low participation rate of low-income countries in these organizations implies that the SPS agreement is largely driven by the interests of developed countries (Zarrilli, 1999).

The relative low participation rate of least developing countries in international organizations has been exacerbated by the lack of institutions, which are responsible for facilitating communication in SPS related issues. Table 1 presents the number of countries that have so far established an enquiry point and national notification authority, which are the two institutions, which are in charge of consultation regarding SPS matters within the country and other members of the WTO. As shown in Table 1, only four least developed countries among 29 countries and less than 50 percent of low-income countries have both enquiry point and notification authority.

Table 1: Implementation of transparency obligations by WTO members by income group, June 1999[a]

Income Group[a]	Number of Members[b]	Enquiry point	National Notification Authority	Both
Low	40	18	15	13
Lower middle	34	30	29	29
Upper middle	24	21	20	20
High	35	33	32	32
Total	133	102	96	94
Least developed	29	8	6	4

Source: WTO (1998)

[a]Based on the published World Trade Organization documentation income groups defined by World Bank.

[b]Individual country member excluding European Communities.

All SADC countries are members of WTO, OIE and CODEX, except Seychelles, which is currently acceding to become member of WTO. Seychelles is also not a member of OIE. So far nine countries out of fourteen SADC members are not members of IPPC (SADC, 2000a). Among SADC countries, Botswana, Malawi, Mauritius, Namibia, South Africa, Tanzania, Zambia and Zimbabwe have established both a national notification authority and an enquiry point. They are, however, severely faced with lack of facilities, expertise and coordination (SADC, 2000b). Establishing a national notification authority and an enquiry point are part of WTO obligations that are useful for providing information to other trading partners. Moreover, they enhance effective communication and understanding of SPS issues with domestic producers and exporters by informing to any proposed changes in the SPS of their export markets. They also engage in requesting copies of the relevant legislation and changes being considered from other members and channelling questions and comments from the domestic producers to other members (WTO, 2000).

The other indicator of developing countries low participation in SPS agreement is the attendance rate in the meetings of SPS committees. From November 1995 to September 1998 (when 12 meetings were held) more than 50 percent of the countries never participated in any SPS committee meeting. There were only three countries that participated in all the SPS committee meetings (WTO, 1998). This poor attendance rate exacerbates the problems of developing countries in addressing their concerns to SPS committees.

3. Impact of SPS standards on developing countries agricultural exports

As noted in various studies (Henson, Saqib and Rajasenan, 2004; Henson and Loader, 2001; Oyejide, et.al, 2000; Hooker, 1999; Unnevehr, 1999), the stringent SPS standards set by developed countries, coupled with the lack of technical and economic resources of developing countries to participate in standard-setting process, has limited access to developed countries markets. Many developing countries have, as a result, experienced adverse repercussions on their economies as a result of failure to comply with the SPS standards. This resulted in a considerable loss of export revenue, employment and income (Noor, 2000; Ndaba, 2000; Waniala, 2000).

The broad indication of the impact of SPS standards on developing countries exports is demonstrated by the border rejection rate of exports from developing countries. Of all developed countries, the import detention data is only made available by USA. The detention rate of commodities due to

various standard requirements from June 1996 to June 1997, as shown in Table 2, indicates that the main reason for the high detention rate for Africa, Latin America and Caribbean and Asia is filth, microbiological contamination and decomposition. The failure to comply with these relatively less costly safety standards like food hygiene, by developing countries is an indication that compliance with standards that require more sophisticated techniques, which are very costly like maximum pesticide residual limits and heavy metals, would be tremendously challenging (Henson and Loader, 2001). The total cost of rejection at the importing countries border for developing countries exporters also includes the loss of product value, transport cost and other related costs.

Table 2: Number of contravention's cited for US Food and Drug Administration import detentions, June 1996-June 1997.

Reasons for contravention	Africa	Latin America and the Caribbean	Europe	Asia	Total
Food additives	2 (0.7%)	57 (1.5%)	69 (5.8%)	426 (7.4%)	554 (5 %)
Pesticide residues	0 (0.0%)	821 (21.1%)	20 (1.7%)	23 (0.4%)	864 (7.7%)
Heavy metals	1 (0.3 %)	426 (10.9%)	26 (2.2%)	84 (1.5%)	537 (94.8 %)
Mould	19 (6.3%)	475 (12.2%)	27 (2.3%)	49 (0.8%)	570 (5.1%)
Microbiological contamination	125 (41.3%)	246 (6.3%)	159 (13.4%)	895 (15.5%)	1425 (12.8%)
Decomposition	9 (3%)	206 (5.3%)	7 (0.6%)	668 (11.5%)	890 (8.0%)
Filth	54 (17.8%)	1253 (32.2%)	175 (14.8%)	2037 (35.2%)	3519 (31.5%)
Low acid canned foods	4 (1.3%)	142 (3.6%)	425 (35.9%)	829 (14.3%)	1400 (12.5%)
Labeling	38 (12.5%)	201 (5.2%)	237 (20%)	622 (10.8%)	1098 (9.8%)
Other	51 (16.8%)	68 (1.7%)	39 (3.3%)	151 (2.6%)	309 (2.8%)
Total	303 (100%)	3895 (100%)	1184 (100%)	5784 (100%)	11166 (100%)

Source:: FAO (1999)

A survey conducted by Henson and Loader (2001) on ten developing countries, regarding the role of SPS standards as an agricultural export barrier in various developed countries, demonstrated that the EU, followed by

Australia and USA, were considered to have the most stringent SPS standards. As most agricultural commodities are enjoying a duty free access in the EU and USA, the survey suggests that failure to comply with the stringent SPS standards established by EU and USA will greatly undermine the preference given to African countries by EU in the Everything But Arms (EBA) initiative and by USA in the African Growth Opportunity Act (AGOA).

A similar survey conducted by Henson and Loader (2001) on the major agricultural export barriers to EU market indicates that the SPS requirements remain the major obstacle followed by other technical requirements. Tariffs and quantitative restrictions are the less important impediments to agricultural exports. As many studies suggest, compliance to SPS requirement is the major prerequisite and challenge for developing countries in the 21st century to access the market of developed countries (Unnevehr, 1999; Henson and Loader, 2001, Wilson and Otsuki, 2003).

A recent Citrus Black Spot (CBS) standard established by EU and USA resulted in the banning of exports of citrus form some parts of South Africa. This entailed a loss of export revenue and increased the cost of compliance. Citrus fruit exporters in South Africa have to comply with either the requirements of HACCP or its similar component, the Integrated Crop Management (ICM). The main focus of ICM, among others, lies in environmental management, responsible agricultural practices and socio aspects.

Exporters are also confronted with conforming to European Retailers Produce on Good Agricultural Practice (EUREPGAP) protocol, which is perceived as a major challenge for citrus exporters as it include issues that are not related to maintaining the quality of the citrus. Among others, EUREPGAP require farms to prepare washing facilities and portable toilets for every 600 meters in the orchard (Grieb, 2002 as cited in Jooste, et.al, 2003).

Jooste, *et.al.*, (2003) estimated the cost of compliance with the new CBS under the EUREPGAP regulations based on feedback received from three different citrus companies in Eastern Cape, South Africa. As shown in Table 3, the average revenue lost due to cost incurred in compliance with the new CBS and EUREPGAP regulations is 4% of the total revenue. The estimated forgone earnings per year owing to the cost of US CBS regulations for Patensie Citrus Company was found to be as high as 10 million Rand (10% of the total revenue). The cost of complying with the two-certification system (EUREPGAP and HACCP) is also estimated at 1.29 million Rand. So far, only

one grower in Kirkwood has upgraded his farm to comply with this two-certification system (Jooste, *et.al,* 2003).

Table 3: Estimated cost of compliance on selected farms in South Africa with selected standards currently being applied externally to citrus exports

Costs and Other Details	Whyte Citrus	Riverside Enterprises	Patensie Citrus	Average
Tons of citrus grown (2001)	2700	11000	15000	9567
Hectares used	40	150	200	130
Revenue received per ton (2001) rand	2520	1675	1525	1907
Per year costs of compliance per ton (2001-2002) with CBS-rand	19	68	27	38
Per year costs of compliance per ton (2001-2002) with EUREP GAP regulations-rand	37	9	47	31
Percentage of Revenue lost due to costs incurred in compliance with CBNS and EUREP GAP regulations	2.2 %	4.6 %	4.9 %	3.9 %
A foregone earnings per year estimate of the cost of US CBS regulations (Percentage of total revenue)	-	-	R 10 million (10 %)	-

Source:: Jooste, et al., (2003)

Risk analysis using latest scientific techniques undertaken by experts shows that CBS cannot spread to EU member counties, since fruit exported to EU reaches when unfavorable climate prevails for the disease to germinate (SADC, 2000a). Fruits have been exported to EU since 1925. However, there has never been the occurrence of black spot on European orchards. Hence the recent phytosanitary standard could be perceived as a disguised means of protection, which is not based on scientific justifications (Cook, 2002).

In an attempt to rebalance the debate on the negative impact of standards on developing countries, Jaffee and Henson (2004) reviewed recent studies to assess the benefits accrued to developing countries when complying with standards set by importers. According to the review, developing countries should be less pessimistic about the widely held view of standards-as-barriers, since standards can also be helpful to accentuate the underlying strength and weakness of the supply chain. Thus, complying with standards enhance the competitive position of the industry and secure access to the developed countries market.

In this study, the trade effect of the total aflatoxin level set on food products of South Africa by five OECD countries is estimated. Aflatoxins are a group of

structurally related toxic compounds, which contaminate certain foods and result in the production of acute liver carcinogens in the human body (Otsuki *et al.*, 2001). The major aflatoxins of concern are designated as B1, B2, G1, and G2, which are usually found together in foods. Total aflatoxin level refers to the sum total of elements B1 + B2 + G1 + G2 in parts per billion (ppb). So far there is no evidence explaining the cause and effect relationship between liver cancer incidence and the aflatoxin content of the diet. However, a study undertaken by the Joint Expert Committee on Food Additives (JECFA) analysed the potential impact of aflatoxin on human health by hypothetically reducing the level of aflatoxin from 20 ppb to 10 ppb, under the assumption of the percentage of carriers of hepatitis B1 is around one percent. The result suggested that the reduction will drop the risk of approximately two cancer deaths a year per billion people (Otsuki *et al.*, 2001).

4. Model specification and source data

In their survey of the methodologies for quantifying the SPS and TBT impacts on trade, Beghin and Bureau (2001) noted that estimating the trade forgone as a result of strict SPS regulation is an alternative approach to capture the trade impacts of NTBs. Hence, gravity models are well suited to be used for capturing the trade effects of NTBs. Moenius (1999) and Mahe (1997) also stated that the model is one of the most successful and therefore widely used frameworks for empirical analysis of trade flows between countries.

The gravity model has some advantage over the other similar methods in estimating the trade flows among countries. Firstly, it requires relatively limited amount of data; hence, it is conducive for application where data is scarce and costly to acquire. Secondly, as Head (2000) noted, theoretical considerations are now fully elaborated and developed for the gravity model. Thus, the model has the advantage over other approaches in estimating the effects of protection on the volume of trade. Thirdly, the gravity model is able to contain the trade-enhancing effect of regulations' and the distinct forms of NTBs in estimating the trade flows (Beghin and Bureau, 2001).

Regression variables that are mostly incorporated in a standard gravity equation applied for estimating the impacts of SPS measures on agricultural export are included in the specified model used in this study. The specification of the gravity model, which is applied in this study, holds the following functional form.

$$ln\ Tij = \mu_i + \gamma\ lnGDP\ i + \varphi\ lnGDP\ j + \beta\ ln\mathrm{D}ij + \delta\ ln\ Pi + \lambda\ ln\ Pj + \xi\ TAFj + \varepsilon_{ij}$$

Table 4: Variables used in the Model

Independent Variables	Abbreviations
Natural log of South Africa's population	*ln P i*
Natural log of importing country's population	*ln P j*
Natural log of real South Africa's GDP	*ln GDP i*
Natural log of real importing county's GDP	*ln GDP j*
Natural log of distance between both countries	*ln D ij*
Natural log of the total aflatoxin standard of importing country	*ln TAFj*

Gross Domestic Product (GDP): Like the mass of the two bodies, as stated in the law of gravity that determines the force of attraction between them, GDP of the trading countries represents both the productive and consumption capacity that determines largely the trade flow among them. It is expected that an importing country's GDP play a significant role in determining the trade flow originating from exporting countries. This is because the importing country's GDP, like the income of the consumer, plays a significant role in determining the demand for the goods originating from exporting countries. An exporting country's GDP also plays a role in determining the productive capacity of the exporting country, i.e. the amount of the goods that could be supplied. In the gravity model, it is expected that an exporting country's GDP will play relatively less significant role than that of the importing country's in determining the trade flow of goods originated from exporting country.

Population: The impact of population on trade flow is inconclusive. Population may increase trade flow due to an enlarged market size. On the other hand, large population may also imply low per capita income of the population; hence, it may affect the trade flow between two countries negatively.

Distance is another important variable, which is used to capture the proxy for the trade cost between countries. Countries with short distance between each other are expected to trade more than those who are wide apart due to a lower transaction cost. Distance can also be used as a proxy for the risks associated with the quality of some of the perishable goods and the cost of the personal contact between managers and customers. SPS measures can be either captured through dummy variables or directly using the levels of the specific element used to regulate the trade flow of agricultural commodities. It is generally expected that stringent regulations would limit the flow of trade between countries.

Data for GDP and population of all countries is obtained from the World Development Indicators 2002 CD-ROM. All values of GDP are expressed in real terms and expressed in US$. The trade flow of food from South Africa to

the five countries is obtained from the database of Trade and Production 2001 CD ROM. The International Standard Industrial Classification (ISIC) at 3-digit level, which is referred to as "food products", is used by aggregating the detailed 4-digit level food classification. The data were deflated using the OECD countries CPI, which was obtained from World Development Indicators 2002 CD-ROM. Distance is measured between the capital cities of each country, which was obtained from the web site www.indo.com/distance distance. Data on the level of total aflatoxin levels are obtained from FAO and all the data for all variables included in the study are from 1995-1999. Due to the data availability problem on the total aflatoxin level adopted by main trading partners of South Africa, only five OECD countries are covered in this study.

5. Results and discussion

Panel data are used to estimate the trade effect of aflatoxin level set by five OECD countries on South African food export. Since both the cross sectional and time series data are combined, the poolability of the data would need to be tested using the F-test to choose the appropriate model for the panel data.

The null and alternative hypotheses of the F-test are the following.

$\mathbf{H_O}$: $\mu_1 = \mu_2 = \mu_3 = \mu_4$ (No individual effects; same intercept for all cross section).

$\mathbf{H_1}$: Not all are equal, i.e (Fixed effects or 'within' estimation, in which each country has a country specific effects on the regressor; hence, it has unique intercept for each countries).

The F-test is applied by combining the residual sum of squares of the regression both with constraints (under the null) and without (under the alternative).

$$\mathbf{F = \frac{(RRSS - URSS) / (N-1)}{URSS / (NT - N - K)} \sim F(N-1), (NT - N - K)}$$

Regression with constraint refers to an ordinary least square estimation, since individual effects (that may arise due to the country specific factors, like language, colonial ties and the like) on the trade flow are not considered in the estimation. Unconstrained regression, on the other hand, is estimated using the 'within' estimation or fixed effect model, which allows to capture the impact of the country specific factors on trade flow.

$$F = \frac{(0.333-0.306) / (5-1)}{0.306 / (30 - 5 - 6)}$$

F = 0.4 which is evaluated against the critical value which is distributed as **F (N-1), (NT-N-K)**

F critical = F (4, 29) = 2.69 at 5 % and 2.14 at 10 % (From the F distribution table).

As the computed F value is less than the critical F value, we fail to reject the null hypothesis that states the poolability of the data across the cross section. As a result, a pooled model is chosen in this study to undertake the analysis of the panel data. The result of the model is given in Table 5.

Table 5: The result of the estimation

Dependent Variable: ***ln TVij***		
Variable	Coefficient	Std. Error
μ	17.23	19.56
ln GDP j	1.5	0.73**
ln GDP i	6.06	5.68
ln P j	-0.2	0.73
ln P i	-9.9	6.87
ln D ij	-4.94	0.78***
ln TAF j	0.41	0.17**
R-squared 0.988	Durbin-Watson 2.19	
Adj R-square 0.984	F stat. 258***	

Source:: own calculation

Note ***, **, * are respectively level of significant at 1 %, 5 % and 10 %.

Classical econometric problems of the model have been tested. Serial correlation is not found in the model, as indicated by the value of Durbin Watson, which is 2.19, showing that the null hypotheses of the absence of serial correlation falls within the acceptance region. White heteroskedasticity-consistent standard errors and covariance have also been used in the model to consider the presence of heteroskedasticity. The result of the estimation also shows that importing countries GDP, distance and total aflatoxin level adopted by the importing countries are significant factors that affect the food trade flows. The elasticity of the total aflatoxin level is 0.41 implying that a 1 percent increase in the level of the total aflatoxin would decrease the food trade flow by 0.41 percent.

The robustness of the result of the model is also tested against multicollinearity that may exist between the GDP and population variables. Hence, the population variables were omitted in the second model to mitigate the collinearity between GDP and population variables. As the result shows in

the Table 8, the coefficient of the total aflatoxin level, importing countries GDP and distance is robust, i.e. they are still positive and significant. The coefficient of the exporting GDP, though its sign is changed, it is still insignificant like the first model.

Table 6: The result of the pooled model excluding population variables

Dependent Variable: *ln TVij*		
Variable	Coefficient	Std. Error
μ	28.28	15.18
Ln GDPj	1.29	0.03***
ln GDPi	-1.68	1.34
ln D ij	-4.73	0.24***
ln TAf	0.37	0.6***
R-squared 0.987	Durbin-Watson 2	
Adj R-square 0.984	F stat. 391.75***	

Source: own calculation

Note ***, **, * are respectively level of significant at 1 %, 5 % and 10 %.

6. Simulation results of applying CODEX recommended standard by OECD countries on South African food exports

The CODEX have set total aflatoxin level which is more lenient than most EU countries and a bit more stringent compared to two of the countries included in the study, namely USA and Ireland. To estimate the food trade flow that would have occurred if the countries considered in the study were adopting the CODEX standard, a simulation was done on the model. The simulation methodology helps to assess the difference between the food trade flow that would have occurred by adopting the total aflatoxin level recommended by CODEX and the actual level of food trade flow using their own standards.

The adoption of total aflatoxin level standard by these five OECD countries would have increased the total food trade flow of South Africa in aggregate. As shown in Table 7, the trade volume with Germany in particular would increase significantly due to the removal of the highly stringent aflatoxin standard (2 ppb) used compared to the more lenient standard recommended by CODEX (15ppb). It is anticipated that the total food trade flow would have increased by US$ 65.2 million. Among the food products exported to Germany, it is expected that this large gain would have been largely from the increase in the export of fruits, vegetables, meat and fish products, which constitute a large portion of South Africa's food exports to Germany.

Table 7: Simulation result of adopting CODEX recommendation by OECD countries and its impact on the trade value of South African food export (in US $ million).

Year	GER	ITA	IRL	SWE	USA	TOTAL	AVERAGE/ YEAR
1995	66.04	15.36	-0.31	1.90	-11.58	71.41	69.73
1996	69.94	16.35	-0.37	2.02	-12.76	75.18	69.73
1997	68.69	16.21	-0.41	2.00	-13.08	73.41	69.73
1998	61.78	14.52	-0.41	1.84	-12.14	65.59	69.73
1999	59.80	14.06	-0.44	1.85	-12.19	63.07	69.73
Total	**326.26**	**76.52**	**-1.96**	**9.63**	**-61.77**	**348.68**	
Average	65.25	15.30	-0.39	1.92	-12.35		
% change from the actual level.	72.1 %	18.27 %	-25 %	57.5 %	-11 %		

Source: own calculation

The other two countries that are using more stringent standard than the recommended CODEX level, Sweden and Italy, would also have experienced an increase in food trade flow from South Africa. The estimated increase in food trade flow to Sweden and Italy is respectively US$ 15.3 million and US$ 1.9 million. The main food products, which are expected to increase to Italy due to the CODEX standard, are meat and fish products and to Sweden the main food products expected to increase are fruits, vegetables and meat. Food trade flow to USA and Ireland, however, would have been reduced due to the relatively more stringent CODEX standard as compared to each country's requirement. The simulation result shows that food trade flow to both USA and Ireland is estimated to be decreased by US$ 12.35 and US$ 0.39 million respectively. For Ireland the main products, which are expected to be reduced due to the introduction of the CODEX standard are fruits, vegetables and sugar products and for USA, the main products, which are expected to be reduced, are fish, sugar, fruits and vegetables that accounted for the larger portion of South African food exports to both countries.

The aggregated simulation result indicates that, on average each year more than US$ 69 million is forgone due to the stringent aflatoxin standard imposed by OECD countries. Among the five countries included in the study, food trade flow to Germany, Sweden and Italy, would have increased by 72 percent, 57.5 percent and 18.2 percent respectively and trade flow to Ireland and USA, on the other hand, would have decreased by 25 percent and 11.23 percent respectively.

7. Conclusion

The result of the study shows that, if all the five OECD countries included in the study were to apply the aflatoxin level recommended by CODEX, South Africa would have gained an estimated additional US$ 69 million from food exports to these countries annually from 1995 to 1999. Due to the stringent standards applied by some of these countries, however, this amount (US$ 69 million) represents the forgone export revenue for South Africa. Thus, the study concludes that stringent SPS standards set by developed countries have a potential to offset the perceived gain of liberalizing agricultural trade.

The conclusion of the study has the following major policy implications and recommendations. Active participation by developing countries, including South Africa, in international organizations that are responsible for setting SPS standards is important to present their interest and concern regarding SPS matters.

- Appointing a representative for the regional block (SADC, for example) as a whole or for different products or commodity groupings of the region would also partly alleviate the problems that hinder active participation of these countries.
- Research and policy analysis networks should also invest in research programmes aimed at estimating the trade effects of various SPS standards. This would enable informed decision-making by governments to request compensation claims, where applicable, as stated in the SPS agreement.

The finding of the study, however, should be interpreted with the following limitations in mind. As total aflatoxin level is composed of four components called B1, B2, G1 and G2, despite complying with the total aflatoxin standard, food exports may still be protected due to the failure of complying with the standard of each component of the total aflatoxin elements. Moreover, for some food components, the level of each aflatoxin element could play a more significant role in determining the trade flow than the total aflatoxin level and in this study it is largely envisaged that the total aflatoxin level is applied for all food trade. Therefore, a better estimate of the trade impact should further investigate the impact of these particular elements of the total aflatoxin standard on the affected food commodities.

Note

1. *The food export comprises the ISIC 4 digit classification.*

Reference

Beghin, J.C and Bureau, J (2001). Quantification of Sanitary, Phytosanitary, and Technical Barriers to Trade for Trade Policy Analysis. Centre for Agricultural and Rural Development, Iowa State University. Working Paper 01-WWWP 291.

Cook, L. (2002). "*SA Citrus Growers Blame Spain for Ban.*" Business Day article from
website. http://allafrica.com/publishers.html.

FAO (1999). Importance of food quality and safety for developing countries. Committee on World Food Security 25th Session. Rome: FAO.

Henson, S. and Loader, R. (2001). Barriers to Agricultural Exports from Developing Countries: The Role of Sanitary and Phytosanitary Requirements. *World Development*, 29(1): 85-102.

Henson, S., Loader, R. Swinbank, A. Bredahl, M., and Lux, N. (2000). *Impact of Sanitary and Phytosanitary Measures on Developing Countries.* Department of Agricultural and Food Economics, University of Reading.

Henson, S., Saquib, M and Rajasenan, D. (2004). *Impact of Sanitary Measures on Exports of Fishery Products from India: The Case of Kerala*. Agriculture and Rural Development Discussion Paper, World Bank.

Hooker, N.H (1999). Food Safety Regulation and Trade in Food Products. *Food Policy*, 24(1): 653-668.

Head, K. (2000). Gravity for Beginners. *Presented at Rethinking the Line: The Canada- US Border Conferenc*e, Vancouver, British Columbia.

Jaffee, S. and Henson, S. (2004). *Standards and Agro-food Exports from Developing Countries: Rebalancing the Debate*. World Bank Policy Research Working Paper 3348.

Jooste, A., Kruger, E. & Kotze, F. (2003). Standards and trade in South Africa: Paving pathways for increased market access and competitiveness, Chapter 4:

235-370. In Wilson, J.S. & Abiola, V.O. (eds). *Standards and global Trade: A voice for Africa.* The World Bank, Washington DC. ISBN 0-8213-5473-6.

Mahe, L.P (1997). Environment and Quantity Standards in the WTO: New Protectionism in Agricultural Trade, A European Perspective. *European Review of Agricultural Economic*s, 24: 480-503.

Moeniws, J. (1999). *Information versus Product Adaptation: The Role of Standards in Trade.* Working paper, University of California, San Diego.

Ndaba, M. (2000). *Impact of SPS on fish and horticultural products from East African Countries, The case of Tanzania.* Ministry of Agriculture and Food Security, Dares Salaam.

Noor, H. (2000). *Sanitary and Phytosanitary Measures and their Impact on Kenya.* EconNews Africa.

Otsuki, T, Wilson, J.S and Sewadeh, M (2001). Saving two in a billion: Quantifying the Trade Effect of European Food Safety Standards on African exports. *Food Policy*, 26:495-514.

Oyejide, T.A, Ogunkola, E.O, Bankole, S.A (2000). Quantifying the Trade Impact of Sanitary and Phytosanitary Standards: What is Known and Issues of Importance for Sub- Saharan Africa. Paper presented for the workshop on "Quantifying the Trade Effect of Standards and Regulatory Barriers: Is It Possible? Holding at the World Bank, Washington, D.C.

SADC, (2000a). Country paper: South Africa. Paper Presented at the SADC Conference on SPS/ Food Safety held in Windhoek, Namibia.

SADC, (2000b). SADC SPS and Food safety Issues: An Agenda for Action, Proceedings of the Windhoek Workshop of SPS/Food Safety, November 20-22, 2000.

Unnevehr, L. J. (1999). Food safety issues and fresh food product exports from LDCs. Paper presented at the conference: Agro-Industrialisation, Globalisation and Development, Nashville, August.

Waniala, N. (2000). Impact Of SPS Measures On Uganda Fish Exports. PSF/Trade Policy Capacity Building Project.

Wilson, J.S, Sewadeh, M and Otsuki, T. (2001). Dirty Exports and Environmental Regulations: Do Standards Matter? World Bank.

Wilson, J.S and Otsuki, T. (2002). To Spray or Not to Spray: Pesticides, Banana Exports, and Food Safety. World Bank.

Wilson, J.S and T. Otsuki, T. (2003) "Balancing Risk Reduction and Benefits from Trade in Setting Standards", in Food Safety in Food Security and Food Trade, L. Unnevehr (editor), International Food Policy Research Institute, Washington, D.C.

WTO (1995). Agreement On Sanitary And Phytosanitary Measures. Geneva: World Trade Organisation.

WTO, (1998). Implementation of the Transparency Obligations. Committee on Sanitary and Phytosanitary Measures. World Trade Organization, Geneva.

WTO, (2000). The SPS Agreement – Matters of Particular Interest to African Countries.
Background document, MM/LIB/WS6/3.

Zarrilli, S. (1999). WTO Sanitary And Phytosanitary Agreement: Issues For Developing Countries. Geneva; The South Centre.