



Impacts of Application of Zero Tariffs by the EU under the EPA on the Sudan Production, and Trade of Agricultural Export Crops.

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ABSTRACT

The purpose of this study was to evaluate the potential implications of the Economic Partnership Agreement (EPA) between the European Union (EU) and the African, Caribbean, and Pacific Countries (ACP) on the agricultural production and trade between Sudan and the EU countries. The study depended on secondary data obtained from relevant institutions in the country. Data obtained cover the production and trade of the Sudan in the major agricultural export crops with EU and the rest of the world during 2004 - 2014. Agricultural production and trade relations in the major export crops, cotton, sesame, gum Arabic, and groundnuts were analyzed to show the situation before signing the EPA. Armington model was then used to estimate the potential implications on the production, domestic consumption and trade of these crops after signing the EPA. The average production, domestic consumption and exports of the selected crops during 2004- 2014 is assumed to represent the base year for the implementation of the EPA. The paper results showed that application of the EPA has positive impacts on Sudan's agricultural output, exports and foreign exchange earnings. Also, the implementation of the EPA will redirect agricultural exports of the Sudan towards the EU markets, rather than the rest of the world. Sudan needs to look at any expected negative impacts of the EPA on the domestic markets.

INTRODUCTION

Economic relations between the developed and under-developed countries have been a subject of varying theoretical postures between those who viewed the relationship as beneficial and reinforcing and those who conceive such relationships as essentially asymmetric and predatory. While the former reflects the position of liberal economists, the latter reflects those of realists, Marxists, and structuralisms. Implicit in both arguments, though, is the consensus that politics is at the root of economic relations between developed and undeveloped nations (Gilpin, 2000). In the post-world war II, liberalism, especially as embodied in classical and neo-classical economics has been the dominant theory of the prevailing international economic system (Spero and Hart, 2010). Following David Ricardo's laws of comparative advantage, liberalism and its other variants of neo-liberal ideologies argued and continue to argue that free trade and complete openness or liberalization of domestic economies hold the key to economic development (Meier, 1984; Bhagwati, 1985). Sachs and Warner (1995) in their studies of openness and growth presented empirical evidence of a positive correlation between economic growth and openness. From the perspectives of these authors, over the past fifty years, countries that have done well, economically, are those like the newly industrializing countries of South East Asia that have pursued export led industrialization. In view of such evidence, they argue that countries that remain at the fringes of globalization like those found in the sub-Saharan Africa should follow the example of these globalizers (Sachs and Warner's, 1995). In their struggle to foster their development and growth, African, Caribbean and Pacific Countries (ACP) as sole countries or in groups enter into economic and trade agreements with their former colonizers. The EU and the ACP countries developed a series of economic agreements over the years with the aim to help the ACP countries to benefit from internationalizing their trade relations. The trade agreements between the ACP and the EU culminated in the Economic Partnership Agreement which was concluded in 2007 Sudan as a member of the group is in the process of signing the EPA. This study is an effort to see the potential impact of signing the EPA on the Sudan major agricultural commodities production and trade and the reflection of that on the country welfare.

Problem statement

A number of African countries have put in place structures aimed at diversifying their economies and increase their foreign trade earnings. One of the reasons given for the marginalization of African countries in global trade is the limitation imposed by their undiversified exports. Two major problems can be seen concerning the agricultural trade of the ACP countries which are also the main issues at stake in their agricultural trade negotiations.

The first one is access to the markets in developed countries and the EU in particular, and the second is the competition of imports from developed countries on ACP national markets, which may create problems for domestic producers (ECDPM, 2008).

Sudan now is in the buffer zone before entering in the midst of the commitment of signing the EPA. It is difficult to generalize the experience of other ACP countries with EPA on the potential implications of the agreement on the Sudan agricultural production, domestic consumption, and trade of the major export crops. The application of zero tariffs from the side of the EU on the agricultural commodities coming from the Sudan may result in changes in the production, domestic consumption, and exports of these products. The study of possible changes in production, consumption, and trade of export crops of the Sudan is of great importance as they represent the major source of foreign currency.

Objectives of the study

The general objective of this study is to explore the potential implications of the Sudan signing the EPA on its agricultural production, consumption, and trade relationship of the major export crops. Specifically the study intended:

1. To describe current production, consumption and trade of the Sudan major export crops.
2. To estimate the potential impacts of the implementation of zero tariffs by the EU under the EPA on the agricultural production, domestic consumption, and trade of the Sudan major export crops.
3. To draw from the study some policy recommendations for the Sudan to deal with EPA implications, and suggest some areas for future research.

Research Methodology

Data collection

To achieve the objectives of the study, secondary data was collected for production, domestic consumption, and trade of the four major export crops of the Sudan. The major export crops of the Sudan are cotton, sesame, gum Arabic, and groundnut. Data collected for these crops covered the period from 2004-2014. The period of 2004-2014 was chosen as it represents the only complete available data up to year 2018. Data collected was first used to describe the current situation of the production, domestic consumption and trade of the selected crops. The average production, domestic consumption, exports, and prices for the major export crops during the period 2004-2014 was used to represent the base year for the analysis after signing the EPA by the Sudan. The data sources included the Department of Agricultural Economics and Statistics of the Ministry of Agriculture and Forestry, the Ministry of Finance and Economic

Planning, the Central Bank of Sudan, the Custom Administration of the Sudan Custom Police, Department of the EPA of the Ministry of Foreign Trade and other relevant sources.

Data Analysis

The first objective of the study was to describe the production, domestic consumption, and trade of the four major export crops cotton, sesame, gum Arabic, and groundnut during the period 2004-2014. To see the performance of the four major export crops during 2004-2014 descriptive statistics was used. The Statistical Package for Social Scientist (SPSS) was used to analyze the situation before signing the EPA.

To see the impact of signing EPA objectives between Sudan and EU the Armington model was used. Armington model is a useful tool in analyzing a number of various agricultural and international trade issues. The model introduces products differentiation and gains from trade in consuming differentiated products. It assumes that final goods internationally traded are differentiated on the basis of the country of origin. The general nature of the Armington model allows for simultaneous determination of supply, demand, producers and consumers surplus, welfare, for all commodities under the study (Lloyd and Zhang, 2006). Border prices used in the model are the export unit value. Also, the elasticity used in the equation is obtained from the previous studies. The model cover major agricultural exports of the Sudan to the EU namely, gum Arabic, sesame, cotton and groundnuts. Armington model can be specified as a system of non-linear equations:

1- Domestic Demand equation

Demand (consumption) quantity of a commodity is set to depend on its price, the price of the close consumption substitutes and consumer per capita income. Accordingly, a demand function can be expressed by the following equation:

$$q_i^d = d_i \cdot (P_i^c)^{\eta_i} \cdot \prod_{j \neq i} (P_j^c)^{\eta_{ij}} \cdot I_i^{\lambda_i}$$

Where, q_i^d is the domestic demand for commodity i ,

d_i is the calibrated constant

P_i^c is the own domestic price represented by composite price (P)

P_j^c is the domestic substitute prices

η_{ii} and η_{ij} are the own and cross price elasticity respectively

λ_i is the income elasticity and I_i is per capita income

2- Domestic Supply equation

Supply (production) quantity of commodity is set to depend on its own price and the prices of competing products. A supply function can be specified as follows:

$$q_i^s = c_i \cdot (p_i^s)^{\pi_{ii}} \cdot \prod_{j \neq i} (p_j^s)^{\pi_{ij}}$$

Where, q_i^s is the domestic demand for commodity i ,

c_i is the calibrated constant

P_i^s is the own domestic price represented by composite price (P)

P_j^s is the domestic competing prices

π_{ii} and π_{ij} are the own and cross price elasticity respectively

3- Welfare analysis

The welfare levels in this study are derived from the individual supply and demand functions incorporated in the model. The model extends the welfare analysis from partial equilibrium welfare measures, which consider only the own price changes effects, where consideration is given to welfare measurement of the effects of a price change on producers or consumers of competing commodities.

Producer surplus equals gross revenue minus total variable cost. Producer surplus can be represented by:

$$PS_i(P_i^s) = R_i(P_i^s) - C_i(P_i^s), i = 1, \dots, 8$$

Where:

$$R_i(p_i^s) = p_i^s \cdot q_i^s, \quad i = 1, \dots, 8$$

And

$$\begin{aligned} C_i(P_i^s) &= p_i^s \cdot q_i^s - \int_0^{p_i^s} q_i^s(p) dp \\ &= p_i^s \cdot q_i^s - \frac{1}{\epsilon_{ii} + 1} \cdot C_i(p_i^s)^{\epsilon_{ii} + 1} \quad \text{II}(p_i^s), i, j = 1, \dots, 8 \end{aligned}$$

Where, PS_i is producer surplus, the term R_1 and C_1 are producer revenue and variable cost respectively. On the other, consumer surplus can be measured by the difference between marginal utility, which indicates the maximum price which consumers would be willing to pay for that unit, and the price actually paid (the market price), this represents consumer welfare (Sadoulet *et al.*, 1995). By applying this desired definition consumer surplus can be measured as follows:

$$CS_i(p_i^c) = B_i(p_i^c) - E_i(p_i^c), \quad 1, \dots, 8$$

Where:

$$E_i(p_i^c) = p_i^c \cdot q_i^d, \quad 1, \dots, 8$$

u

$$B_i(p_i^c) = p_i^c \cdot q_i^s + \int q_i^d(p) dp$$

$$= p_i^c \cdot q_i^d + \frac{1}{\eta_{ti} + 1} \cdot k_i (u^{\eta_{ii}+i} - (p_i^c)^{\eta_{ii}+i}) \cdot \prod (p_i^c)^{\eta_{ij}} \cdot y_i^{a_i}, \quad i = 1, \dots, 8$$

Where, CS_i is consumer surplus, the terms B_i and E benefit and expenditure, respectively, u is the maximum price.

4- Total exports

To derive the total export value from the model, first the total export value for the exported crops in the model is measured by:

$$TE^m = \sum (q_i^s = q_i^d), p_i^w, \quad i = 1, \dots, 7$$

Where, TE^m is the model export value.

Second step is to calculate the total agricultural exports, which is made up of the model exports and the rest of agricultural exports, as follows:

$$TE^a = TE^m + TE^{a^s}$$

Where, TE^a is the agricultural export and TE^{a^s} is the exogenous rest of agricultural exports.

Finally, the total export value of the whole economy is calculated. This value is considered to be composed of agricultural and non-agricultural exports, expressed as follows:

$$TE = TE^a + TE^r$$

Where, TE is the total export value and TE^r is the exogenous rest of the economy export value.

Results and Discussion:

Production and trade of the Sudan's agricultural products before applying the EPA conditions by the EU

The Sudan foreign trade policy during the period 2004-2014 aimed at increasing non-oil exports (cotton, sesame, gum Arabic, groundnuts), in addition to improve the competitiveness of exports in general and open new markets. Agricultural products represent the major export items of the Sudan to the EU countries. The value of agricultural export crops to the EU (cotton, sesame, gum Arabic, groundnuts) declined from US\$ 862.8 million in 2004 to US\$ 677.3 million in 2014, a decrease of 3.2%. This was a result of the decrease in the value of groundnuts by 50% and sesame by 2.8%, despite the slight increase in the value of cotton, gum Arabic exports. The value of cotton exports increases from US\$ 34.0 million in 2004 to US\$ 93.75 million in 2014 an increase of 14.7%, due to the increase in prices. The value of sesame exports decreased from US\$ 466.3 million in 2004 to US\$ 178.6 million in 2014, due to the decrease in the quantities exported to EU from 472.4 metric tons in 2004 to 218.34 metric tons in 2014 and the value of gum Arabic exports increased from US\$ 60.60 million in 2004 to US\$ 97.4 million in 2014 an increase of 15.5%, due to the an increase in the quantities exported of gum Arabic from 35.42 metric tons in 2004 to 37.904 metric tons in 2014, the value of a ground nuts export declined from US\$ 13.3 million in 2004 to US\$ 6.0 million in 2014 by 50%, due to the decrease in the exported quantities of EU from 2.400 in 2004 to 451.0 million in 2014.

The potential implications of zero tariffs by the EU on production and trade agricultural products

The potential changes that may occur to the production, domestic consumption, and trade of each of the major export crops of the Sudan after applying zero tariffs by the EU will be analyzed using Armington model. The average production, domestic consumption, and trade quantities and values of the major export crops of the Sudan during the period 2004- 2014 will be assumed to represent the base year. This will allow seeing what changes can occur between a base and a scenario of a year after applying zero tariffs on imports from the Sudan by the EU countries. Imports from the Sudan by the EU countries face tariffs of 20 percent. Comparison will be done between the situations in the base year before the application of zero tariffs and the scenario which reflect the situation after applying zero tariffs on imports from the Sudan by th EU. Armington model was applied to see the changes that will be happen to production,

domestic consumption, and trade of the major agricultural exports and the reflection of these change on welfare in the Sudan, after the removal of the tariffs on the imports of each of the four crops.

1. Cotton

Cotton output in the base year was 2200.6 bales compared to 2206.36 bales in the zero tariffs year scenario, an increase of 1 percent in the production of cotton in the Sudan. At the same time total exports of cotton increased from 2033.8 bales in the base year to 2053.3 bales in the zero tariffs scenario year, an increase of almost by 1 percent. The domestic producer price and consumer price decreased by 1 percent and 48 percent respectively after applying zero tariffs on imports from Sudan by The EU. Domestic demand decreased from 166.8 bales in the base year to 153.06 bales in the zero tariffs year scenario, a decrease of 0.9 percent. Total exports to the EU increased from 449.3 bales in the base year, to 480.1 bales in the zero tariffs year scenario, an increase of 1 percent. Exports to the rest of the world decreased from 1584.5 bales in the base year, to 1573.2 bales in the zero tariffs year scenario, a decrease of 0.99 percent, as larger part of quantity exports of cotton go to the EU. See table 1.

Table 1: A comparison between the situation in the base year and the zero tariffs year scenario.

	Base year (000s bales)	Zero tariff Scenario (000s bales)	Percentage Change
Aggregate output	2200.6	2206.36	1
Domestic demand	166.8	153.06	-0.9
Export to EU	449.3	480.1	1
Export to row	1584.5	1573.2	-0.99
Total export	2033.8	2053.3	1

Source: Armington model results

A comparison between cotton welfare indicators in the base year and zero tariffs year scenario is depicted in table 2 below. As a result of the zero tariffs applied on imports from the Sudan by the EU, the producer's surplus of cotton exported increased from 2048.5 (m.s\$) in the base year, to 2075.9 (m.s\$) in the zero tariffs year scenario, an increase of 1.0 percent. The consumer surplus decreased from 6259.9 (m.s\$) in the base year, to 6153.7 (m.s\$) in the zero

tariffs year scenario, an decrease of 0.98 percent. The net welfare after applying zero tariffs on imports from the Sudan by the EU was negative by an amount of 0.95 percent.

Table 2: A comparison between welfare indicators in the base year and the zero tariffs year scenario.

	Producer surplus	Consumer surplus	Net welfare
Base year values (m.s \$)	2048.5	6259.9	8097.9
Scenario year values (m.s \$)	2075.9	6153.7	7710.2
Percentage change (%)	1.0	-0.98	-0.95

Source: Armington model results

Sesame

Sesame output in the base year was 2222.74 metric tons compared to 2360.8 metric tons in the zero tariffs year scenario, an increase of 1.06 percent in the production of sesame in the Sudan. At the same time total exports of sesame increased from 2055.5 metric tons in the base year to 2245.4 metric tons in the zero tariffs scenario year, an increase of almost by 1.0 percent. The domestic producer price and consumer price decreased by 163 percent and 77 percent respectively after applying zero tariffs on imports from Sudan by The EU. Domestic demand decreased from 166.74 metric tons in the base year to 115.4 metric tons in the zero tariffs year scenario, a decrease of 0.69 percent. Total exports to the EU increased from 160.5 metric tons in the base year, to 624.7 metric tons in the zero tariffs year scenario, an increase of 3.89 percent. Exports to the rest of the world decreased from 1895 metric tons in the base year, to 1620.7 metric tons in the zero tariffs year scenario, a decrease of 0.85 percent, as larger part of quantity exports of sesame go to the EU. See table 3.

Table 3: A comparison between the base year situation and the zero tariffs scenario.

	Base year (000s sm.t)	Zero tariffs scenario (000s sm.t)	Percentage change
Aggregate output	2222.24	2360.8	1.06
Domestic demand	166.74	115.4	-0.69
Export to EU	160.5	624.7	3.89
Export to row	1895	1620.7	-0.85
Total export	2055.5	2245.4	1.0

Source: Armington model results

A comparison between sesame welfare indicators in the base year and zero tariffs year scenario is depicted in table 4 below. As a result of the zero tariffs applied on imports from the Sudan by the EU, the producer's surplus of sesame exported increased from 2051.3 (m.s\$) in the base year, to 2097.5 (m.s\$) in the zero tariffs year scenario, an increase of 1.02 percent. The consumer surplus decreased from 6360 (m.s\$) in the base year, to 6135 (m.s\$) in the zero tariffs year scenario, a decrease of 0.96 percent. The net welfare after applying zero tariffs on imports from the Sudan by the EU was negative by an amount of 0.95 percent.

Table 4: A comparison between welfare indicators in the base year and the zero tariffs year scenario.

	Net welfare	Consumer surplus	Producer surplus
Base year values (m.s \$)	2051.3	6360	8045.9
Scenario year values (m.s \$)	2097.5	6135	7698.3
Percentage change (%)	1.02	-0.96	-0.95

Source: Armington model results

Gum Arabic

Gum Arabic output in the base year was 598.04 metric tons compared to 618.20 metric tons in the zero tariffs year scenario, an increase of 1.03 percent in the production of gum Arabic in the Sudan. At the same time total exports of gum Arabic increased from 431.3 metric tons in the base year to 443.5 metric tons in the zero tariffs scenario year, an increase of almost by 1.02 percent. The domestic producer price and consumer price decreased by 65 percent and 87 percent respectively after applying zero tariffs on imports from Sudan by the EU. Domestic demand decreased from 166.74 metric tons in the base year to 174.7 metric tons in the zero tariffs year scenario, a decrease of 10.4 percent. Total exports to the EU increased from 202.7 metric tons in the base year, to 256.7 metric tons in the zero tariffs year scenario, an increase of 1.26 percent. Exports to the rest of the world decreased from 228.6 metric tons in the base year, to 186.8 metric tons in the zero tariffs year scenario, a decrease of 0.81 percent, as larger part of quantity exports of sesame go to the EU. See table 5.

Table 5: comparison between the base year situation and the zero tariffs scenario.

	Base Value (000s sm.t)	Zero tariffs scenario (000s sm.t)	Percentage Changes
Aggregate output	598.04	618.2	1.03
Domestic demand	166.74	174.7	-1.04
Export to EU	202.7	256.7	1.26
Export to row	228.6	186.8	-0.81
Total export	431.3	443.5	1.02

Source: Armington model results

A comparison between gum Arabic welfare indicators in the base year and zero tariffs year scenario is depicted in table 6 below. As a result of the zero tariffs applied on imports from the Sudan by the EU, the producer's surplus of gum Arabic exported increased from 472.3 (m.s\$) in the base year, to 477.3 (m.s\$) in the zero tariffs year scenario, an increase of 1 percent. The consumer surplus decreased from 1687.9 (m.s\$) in the base year, to 1557.3 (m.s\$) in the zero tariffs year scenario, a decrease of 0.92 percent. The net welfare after applying zero tariffs on imports from the Sudan by the EU was negative by an amount of 0.58 percent.

Table 6: A comparison between welfare indicators in the base year and the zero tariffs year scenario.

	Producer Surplus	Consumer surplus	Net welfare
Base year values (m.s \$)	472.3	1687.9	3308
Scenario year values (m.s \$)	477.3	1557.3	1936
Percentage change (%)	1	0.92	-0.58

Source: Armington model results

Groundnuts

Groundnut output in the base year was 62.93 metric tons compared to 62.682 metric tons in the zero tariffs year scenario, an increase of 0.99 percent in the production of groundnuts in the Sudan. At the same time total exports of groundnuts increased from 62.7 metric tons in the base year to 62.33 metric tons in the zero tariffs scenario year, an increase of almost by 0.99 percent. The domestic producer price and consumer price decreased by 53.7 percent and 29.4 percent respectively after applying zero tariffs on imports from Sudan by The EU. Domestic

demand decreased from 0.23 metric tons in the base year to 0.352 metric tons in the zero tariffs year scenario, a decrease of 1.53 percent. Total exports to the EU increased from 8.4 metric tons in the base year to 49.63 metric tons in the zero tariffs year scenario, an increase of 5.90 percent. Exports to the rest of the world decreased from 54.3 metric tons in the base year, to 12.7 metric tons in the zero tariffs year scenario, a decrease of 0.23 percent, as larger part of quantity exports of groundnuts go to the EU. See table 7.

Table 7: comparison between the base year situation and the zero tariffs scenario.

	Base year (000s sm.t)	Zero scenario (000s sm.t)	Percentage Changes
Aggregate output	62.93	62.682	0.99
Domestic demand	0.23	0.352	-1.53
Export to EU	8.4	49.63	5.90
Export to row	54.3	12.7	-0.23
Total export	62.7	62.33	0.99

Source: Armington model results

A comparison between groundnuts welfare indicators in the base year and zero tariffs year scenario is depicted in table 8 below. As a result of the zero tariffs applied on imports from the Sudan by the EU, the producer's surplus of groundnuts exported increased from 33.3 (m.s\$) in the base year, to 62.9 (m.s\$) in the zero tariffs year scenario, an increase of 1.88 percent. The consumer surplus decreased from 17.34 (m.s\$) in the base year, to 195.7 (m.s\$) in the zero tariffs year scenario, an decrease of 11.2 percent. The net welfare after applying zero tariffs on imports from the Sudan by the EU was negative by an amount of 1.76 percent.

Table 8: A comparison between welfare indicators in the base year and the zero tariffs year scenario.

	Producer Surplus	Consumer surplus	Net welfare
Base year values (m.s \$)	33.3	17.34	110.9
Scenario year values (m.s \$)	62.9	195.7	195.2
Percentage change (%)	1.88	11.2	1.76

Source: Armington model results

Conclusion and Recommendations

The agricultural sector is the leading sector in the Sudanese economy. The importance of the sector is manifested in being the main source of income for the public sector, and the majority of the population. The objective of the study was to evaluate the potential implications of signing the EPA with the EU countries on the Sudan agricultural production, domestic consumption and trade relationship with the EU, and the rest of the world and the impacts on producer surplus, consumer surplus and net welfare of agricultural production in Sudan. The study results explained that applications of zero tariffs between the Sudan and EU have a positive impact on agricultural trade performance of Sudan. In order to maximize the benefits from EPA and increase the investments on the Sudanese agricultural and increase the contribution of trade to the economic development in general, Sudan needs to design and implement more effective agricultural policies than it has done in the past. Clearly efforts need to be intensified on all fronts for Sudan to improve its export performance and for trade to play a more significant role in the economic and social development of the country. These efforts include domestic policy as well as regional and international cooperation framework at the macroeconomic level. While government stabilization policy should be maintained, more innovative strategies need to be introduced in order to increase public as well as private investment in infrastructure especially in energy, roads and education. The implementation of the EPA will redirect agricultural exports of Sudan towards the EU markets, and this will impose more pressures on quality assurance and standards in order to comply with the EU market regulation.

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