

**The Impact of Domestic and Trade Policies on<sup>\*</sup>  
Sudan's Agricultural Export Earnings**

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## **The Impact of Domestic and Trade Policies on Sudan's Agricultural Export Earnings**

**Abstract:** This paper assessed the impact of domestic and trade policies on the performance of agricultural exports in Sudan by estimating the effect of changes in domestic taxes and the exchange rate of Sudanese currency on agricultural production, consumption, consumers and producer's welfare and agricultural exports earnings. Multi-market, partial equilibrium model was used for the analysis. Some selected policy scenarios were simulated that ranging from partial to full liberalization scenarios combined with exchange rate scenario. The results showed that partial and full liberalization policies have positive impact on the trade performance of agricultural exported commodities. The welfare of agricultural producers was improved, while the welfare of consumers was reduced due to higher domestic prices. The appreciation of Sudanese dinar against the dollar has negative impact on the trade performance of agricultural exports as it reduced the benefit from trade liberalization policies. The paper concluded that liberalization policy is not alone enough and it should be supported by favorable macroeconomic policies like appropriate exchange rate to encourage exports of agricultural commodities. The paper recommended reducing or removing direct and indirect taxation on agricultural commodities that accompanied by a realistic exchange rate policy.

**Keywords:** Trade liberalization, exchange rate policy, multi-market analysis

## Introduction

Sudan's economy is based largely on agriculture as a source of non-petroleum foreign exchange earnings, raw materials and for food market. Moreover, it is a source of services produced by other sectors, as well as a source of more than two thirds of the labor force in the country. The agricultural sector has contributed, on average, about 45% of Gross Domestic Product (GDP) during the period 1994-2005 (Table 1). The agricultural exports were the main sources of foreign currency before exploitation of oil e.g. during the period 1994-1998, agricultural products represented about 88.6%, on average, of the total country's exports, and this share declined to only 12.0% in 2005 (Table 2).

**Table (1) Contribution of agriculture to the GDP in Sudan, 1994-2005**

Year	Gross Domestic Product (GDP)*		Agricultural GDP		Share of agriculture in GDP (%)
	(million SD)	Growth rate	(million SD)	Growth rate	
1994	953.6	4.5	392.0	9.3	28.7
1995	996.7	4.5	428.3	9.3	43.1
1996	1043.6	4.7	369.4	9.6	45.0
1997	1107.1	6.1	527.4	12.3	47.6
1998	1173.0	6.0	571.2	8.3	48.7
<b>Average</b>	<b><u>1054.8</u></b>	<b><u>5.16</u></b>	<b><u>457.66</u></b>	<b><u>9.76</u></b>	<b><u>42.62</u></b>
1999	1243.4	6.0	619.7	8.5	49.8
2000	1346.2	8.3	624.4	0.8	46.4
2001	1432.2	6.4	653.7	4.7	45.6
2002	1524.6	6.5	701.6	7.3	46.0
2003	1617.3	6.1	738.1	5.2	45.6
2004	1801.1	9.1	706.0	-4.3	39.2
2005	1950.5	8.3	751.9	6.5	38.6
<b>Average</b>	<b><u>1559.3</u></b>	<b><u>6.6</u></b>	<b><u>685.0</u></b>	<b><u>4.1</u></b>	<b><u>44.4</u></b>

\*At constant 1981/82 prices

Source: Bank of Sudan, Annual Reports.

**Table (2) Agricultural exports of Sudan and its share in total exports, 1994-2005**

<b>Year</b>	<b>Agricultural exports (M US\$)</b>	<b>Share in total exports (%)</b>
1994	472.1	90.1
1995	488.5	87.9
1996	536.0	86.4
1997	527.5	88.8
1998	535.7	89.9
<b><u>Average</u></b>	<b><u>511.9</u></b>	<b><u>88.6</u></b>
1999	432.0	55.4
2000	372.0	21.3
2001	240.6	14.9
2002	356.2	18.8
2003	410.3	16.1
2004	590.7	16.5
2005	578.8	12.0
<b><u>Average</u></b>	<b><u>425.8</u></b>	<b><u>22.1</u></b>

Source: Bank of Sudan, Annual Reports

During the last two decades, Sudan implemented different development strategies and various reform programs. The major policies targeted the agricultural sector due to its largest share in the economy. The liberalization and privatization policies are the main instruments adopted to enhance agricultural production and economic growth. Also, at macro level policies are aiming to reduce total taxation on agricultural sector and to maintain the stability of Sudanese currency (current currency is pound which replaced dinar) exchange rate especially against the dollar (Ministry of Agriculture and Forestry, 2004).

The direct and indirect taxation of agricultural sector was considered to be the main traditional source of government revenues in the past. Efforts have been done by the government of Sudan to reduce such kind of taxation. In 1998, the total taxation on agricultural products was limited to 20% in the rain-fed sector and to 15% in the irrigated sector. From 1998 to 2004, the profits tax on agricultural products reduced from 35% to 10%. Moreover lowest level of customs tariffs was applied on agricultural inputs (Ministry of Agriculture and Forestry, 2004).

Sudan has also relied on taxes imposed on international trade as a source of income. However, in the context of policy reforms, the exports taxes for all agricultural commodities were reduced to 5% except for cotton and gum Arabic which remained at 10% level, and at the beginning of 1998 export tax rates for all commodities were reduced to 3% except for cotton and gum Arabic (remained at 7 %). In 2000, a decision has been taken to exempt agricultural exports from export tax (Sudanese Custom Union, annual reports).

Despite of liberalization and privatization policies adopted by the government and declaration of supporting agricultural sector, heavy taxes are still imposed on agricultural production and export in different kind e.g. administration fees, transportation fees, production fees and other domestic taxes (zakat, state support fees, ports fees, profits tax and others).

Economic distortion may be emanated from micro and sectoral policy intervention deployed on agriculture. This direct set of distortions should be distinguished from distortion that influence the sector indirectly and are induced by policy directed at the macroeconomic management of the economy. It is widely accepted now that economy wide distortion, such as overvaluation of exchange rate, can have great effects on tradable sectors of the economy such as agriculture (Badawi 2002). In Sudan, the macroeconomic economic policies in recent time can be considered unfavorable and imposed heavy indirect taxation on agricultural sector especially for the exported crops e.g. macro policies that led to appreciation of Sudanese currency. An overvalued exchange rate means that farmers receive less for their exported crops than they would if the price of foreign exchange is determined by the market. Generally, devaluation eliminates the currency overvaluation and enhances the international competitiveness of traded goods of the devaluating country.

The exchange rate in Sudan before 1998 was not stable and fluctuated from year to another. In an attempt to control the exchange rate, the foreign exchange policies followed by the Central Bank of Sudan determined the official exchange rate after taking a look at commercial banks prices and take the average rate. In recent years, Bank of Sudan foreign exchange policies aimed at floating the foreign exchange rate, organizing and developing a free unified wide exchange market and maintaining the stability of Sudanese currency. The main objective of these policies is to attain a real value of Sudanese currency, and as a consequent, the Sudanese currency appreciated

by 21% against the dollar at the end of 2006, and expected to be further appreciated in near future (Bank of Sudan, 2006). The appreciation of the currency has a direct link with the increasing of foreign reserved at the Central Bank of Sudan from the revenues generated from oil exports.

Agricultural sector experienced continuous deterioration in recent years, in spite of Sudan adoption of strategies and reforms targeted towards development of agriculture and export sector. For example cotton export volume and value were, on average, about 433.6 thousand bale and US\$ 109.7 million during the period 1994-1998, respectively, this were declined to 118.3 thousand bale and US\$ 42 million during the period 1999-2005 (Bank of Sudan Annual Reports). This could be attributed to many factors such as continuing direct and indirect taxation of agricultural sector and appreciation of Sudanese currency which makes many agricultural export products uncompetitive in the world market. This paper tends to estimate and quantify the effect of domestic taxation and appreciation of Sudanese currency on agricultural trade performance.

### **Methodology**

A multi-market model was used for the analysis. The model was built in Microsoft Excel program. Multi-market model is a useful tool in analyzing a number of various agricultural and trade policy issues. The model can analyze how changes in government policies or in world markets affect the supply and demand relations in each region and how changes in the supply and demand modify the trade balance (Abdel Karim, 2002).

The model consists of a set of demand and supply equations for each commodity with the level of production and demand determined by factors such as prices, income, shift variables and various other assumptions about policies. The model allows for the simultaneous determination of supply, demand, trade levels and prices including their cross-market linkages for all commodities covered.

The model includes five major agricultural export commodities namely cotton, sesame, groundnuts, sorghum and sugar. The main policy instruments in the model are producer and consumer prices. These are influenced by instrumental variables such as export taxation, subsidization and exchange rate or changes in world market prices.

The supply and demand functions for each commodity covered by the model were derived from a reduced form Cobb-Douglas function (Ibrahim, 2004; Abdel Karim, 2002; Kirschke, 2002). In order to make the model capable of different market adjustments and substitutions between commodities, both on supply and demand side, the respective functions include not only own price elasticities, but also a set of cross price elasticities ( von lamp, 2000).

The supply and demand functions in the model are specified as follows:

$$q_i^s = C_i \cdot (p_i^s)^{\varepsilon_{ii}} \cdot \prod_{j \neq i} (p_j^s)^{\varepsilon_{ij}}, \quad i, j = 1, \dots, 5 \quad (1)$$

$$q_i^d = K_i (p_i^c)^{\eta_i} \cdot \prod_{j \neq i} (p_j^c)^{\eta_{ij}} Y_i^{\alpha_i}, \quad i, j = 1, \dots, 5 \quad (2)$$

Where

Supply function	Demand function
$q_i^s$ = quantity supplied of product i. $p_i^s$ = producer price of product i. $p_j^s$ = producer price of competing product j. $C_i$ = calibrated constant term. $\varepsilon_{ii}$ & $\varepsilon_{ij}$ = own supply price elasticity of product i and the cross price elasticity of product i to product j.	$q_i^d$ = quantity demanded of product i. $p_i^c$ = product consumer price. $p_j^c$ = consumer price of competing Product j. $K_i$ = calibrated constant factor. $\eta_{ii}$ , $\eta_{ij}$ and $\alpha_i$ = own demand price elasticity, cross price elasticity and income elasticity of product i, respectively. $Y_i$ = per capita income

### **Price Relationships**

In most trade models, policies are introduced in the price linkage equation (FAO, 1995). This approach usually involves both the use of price wedge defining the absolute gap between domestic and international price levels and a response

parameter (transmission statistics) indicating the connection between domestic and world market movements.

By assuming full transmission of world market prices into domestic prices in Sudan, the relationship between producer price of exportable products, the consumer price and the world market price in the model taken into account taxation or subsidization is represented by the following equations (see Braverman and Hammer, 1986):

$$p_i^S = p_i^w (1 - t_i^P) \cdot \chi \quad i = 1, \dots, 5 \quad (3)$$

$$p_i^C = p_i^w (1 + t_i^C) \quad i = 1, \dots, 5 \quad (4)$$

Where,

$p_i^w$  = world market price.  $t_i^P$  = producers domestic rates of taxation or subsidy.

$t_i^C$  = consumer domestic rates of taxation or subsidy.  $\chi$  = foreign exchange rate.

### ***Welfare Analysis***

Welfare constituent parts are producer surplus, consumer surpluses and government revenue. Total welfare is the sum of the producer surplus, consumer surplus and government revenue. For more details about welfare analysis see Abdel Karim (2002).

## **Results and Discussion**

### ***Domestic Policies in the Base Period***

The model was calibrated to the base period data, which is an average of years 2000 and 2001 where the foreign exchange rate was about 257.92 dinars per dollar. In the base period the transportation cost for all commodities covered by study is set to equal 10%, administration fees is about 1% and the domestic taxation was about 4% for cotton, 31% for sesame, 38% for groundnuts, 6% for sorghum and 2.5% for sugar. The production fee is applied only for sugar and it is about 10%. Summing all these costs, the divergence between producer prices and world market price becomes about 15% for cotton, 42% for sesame, 49% for groundnuts, 17% for sorghum, while for sugar production; producer price is above world market price by 48%. This is might be considered as a subsidy for sugar industry applied through direct intervention or through border control to protect domestic sugar producers from outside competition.

The consumer tax was set to equal 30% for the covered commodities (see Ibrahim, 2004).

### ***Scenarios***

The following policy scenarios are formulated to analyze the impact of price policy changes on Sudan's agricultural export earnings and their consequences for production, consumption, prices and welfare:

1. Partial liberalization scenarios: under this scenario, first the taxes and subsidies in the base period were reduced by 50% for the selected commodities under current base period foreign exchange rate (257.9 dinar/US\$). Then, the same scenario was simulated under expected new foreign exchange rate in 2007-2008 as speculated by the government (180 dinar /US\$).
2. Full liberalization scenarios: first, full liberalization scenario was simulated under base period foreign exchange rate (257.9 dinar/US\$), and then it was simulated under expected foreign exchange rate in 2007-2008 (180 dinar/US\$).

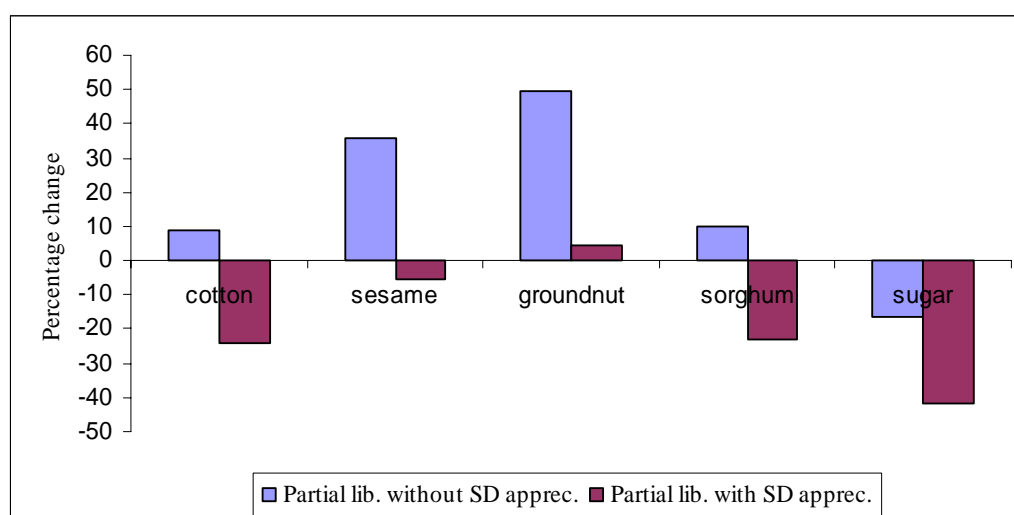
### ***Effects on Domestic Prices***

The scenarios of partial liberalization and full liberalization without appreciation of Sudanese dinar (SD) have positive effect on domestic prices. The domestic prices increase for most covered crops except for sugar. The price increase range between 8.8% - 17.6% for cotton, 36% - 72% for sesame, 49%- 98% for groundnut compared to the base period, while sugar domestic prices sharply decrease by 16% - 32% due to reduction or removal of subsidy. When the appreciation of Sudanese dinar introduced in the simulated scenarios, the positive effect of liberalization policy on the domestic prices was change to a negative one. For example the domestic price of cotton decrease by 17 - 24% compared to 8.8% - 17.6% increase under unchanged exchange rate value (Table 1 and Figure 1). As indicated by the figures in table 1, the exchange rate policies are matter very much for traded agricultural commodities than the level of domestic taxation.

**Table (3) Percentage changes in the domestic prices under the simulated scenarios**

	Partial liberalization		Full liberalization	
	Without appreciation of SD	With appreciation of SD	Without appreciation of SD	With appreciation of SD
Cotton	8.8	-24.1	17.6	-17.9
Sesame	36.0	-5.1	72.1	20.1
Groundnut	49.3	4.2	98.7	38.7
Sorghum	10.2	-23.1	20.5	-15.9
Sugar	-16.3	-41.6	-32.6	-53.0

**Figure (1) Percentage changes in the domestic prices under partial liberalization scenario**



### ***Effects on Domestic Supply***

Higher domestic prices resulted from liberalization scenarios without changes in the value of Sudanese dinar have led to an increase in the domestic supply of the covered commodities e.g. cotton supply increased by 1.9% under partial liberalization scenario, and by 9.0% under full liberalization scenario, likewise sesame supply increased by 5.9% and 62% compared to the base period. The sorghum supply decreased by 1.8% despite of the increase in its domestic prices and this can be attributed to substitution effects between sorghum, sesame and groundnuts. Also, the removal of subsidy from sugar industry has negative effects on its domestic supply.

The appreciation of Sudanese dinar, which leads to lower domestic prices, has drastic impact on the domestic supply of the covered commodities (Table 2).

**Table (4) Percentage changes in the domestic supply under the simulated scenarios**

	Partial liberalization		Full liberalization	
	Without appreciation of SD	With appreciation of SD	Without appreciation of SD	With appreciation of SD
Cotton	1.9	-16.7	9.0	-9.9
Sesame	5.9	0.2	62.5	18.4
Groundnut	2.8	2.8	108.0	40.7
Sorghum	-1.8	-2.2	13.7	-11.3
Sugar	-2.1	-4.7	-25.1	-42.4

### *Trade Effects*

The liberalization policy, partial or full, has positive impacts on the exports of agricultural commodities, on both quantity and value. The trade balance of the covered commodities greatly improved as a result of higher domestic prices. The export quantity of cotton, sesame, and sorghum increased by 8.1 thousand bales, 21.4 thousand metric tons and 26.7 thousand metric tons under partial liberalization scenario without appreciation of Sudanese dinar, respectively (Table 3 and Figure 2). The lower domestic prices for sugar as a result of reduction of subsidy changed sugar from exported commodity to imported one. This may reflect a lower comparative advantage of sugar production in Sudan. By considering the appreciation of Sudanese dinar in the simulated scenarios, two traditional exported commodities (cotton and sorghum) become uncompetitive, and even more an import of them is needed to cover the domestic demand deficit. This would be very harmful for the food security in Sudan because sorghum and sugar are very important staple food products in Sudan. The same implication is also true for trade values of the covered commodities as result of simulated scenarios (Table 4 and Figure 3).

**Table (5) Absolute changes in the trade balance under the simulated scenarios**

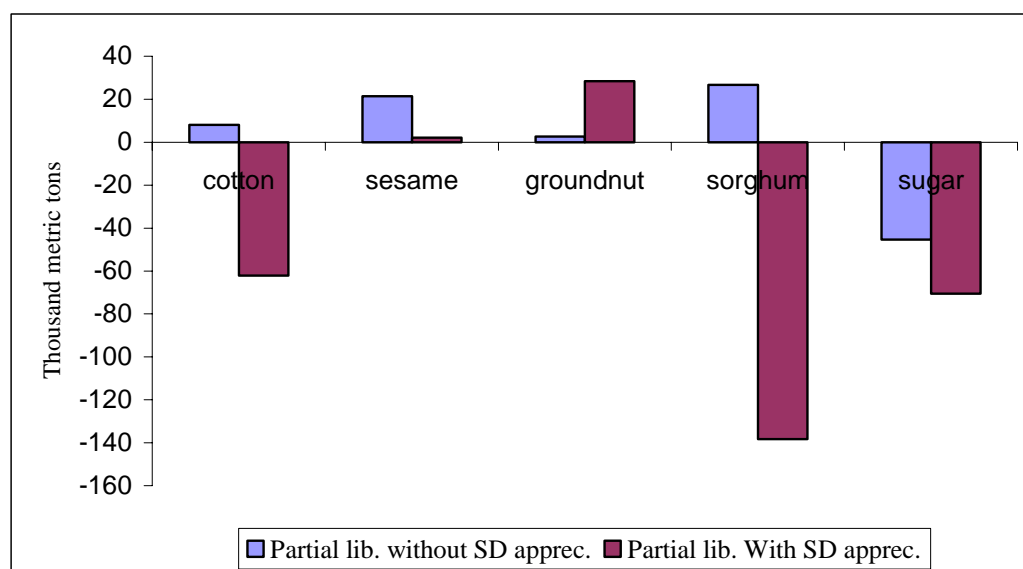
(000 metric tons)

	Partial liberalization		Full liberalization	
	Without appreciation of SD	With appreciation of SD	Without appreciation of SD	With appreciation of SD
Cotton	8.1*	-62.2*	18.3*	-53.3*
Sesame	21.4	2.1	38.1	18.3
Groundnut	2.6	28.4	1.3	33.1
Sorghum	26.7	-138.3	65.9	-276.2
Sugar	-45.4	-70.5	-102.5	-201.5

\* Thousand bales

**Figure (2) Absolute changes in the trade balance under partial liberalization scenario**

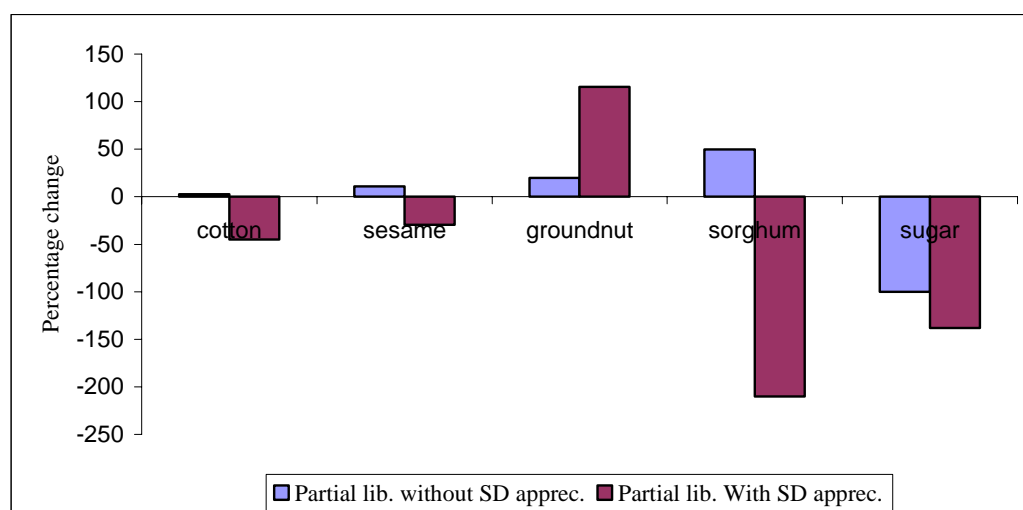
(000 metric tons)



\* Cotton in thousand bales

**Table (6) Percentage changes in the trade values under the simulated scenarios**

	Partial liberalization		Full liberalization	
	Without appreciation of SD	With appreciation of SD	Without appreciation of SD	With appreciation of SD
Cotton	2.8	-45.2	6.3	-43.3
Sesame	10.8	-29.5	19.3	-23.8
Groundnut	19.7	115.5	9.9	139.4
Sorghum	49.9	-210.0	122.8	-389.2
Sugar	-100.4	-138.9	-226.3	-340.7

**Figure (3) Percentage changes in the trade values under partial liberalization scenario**

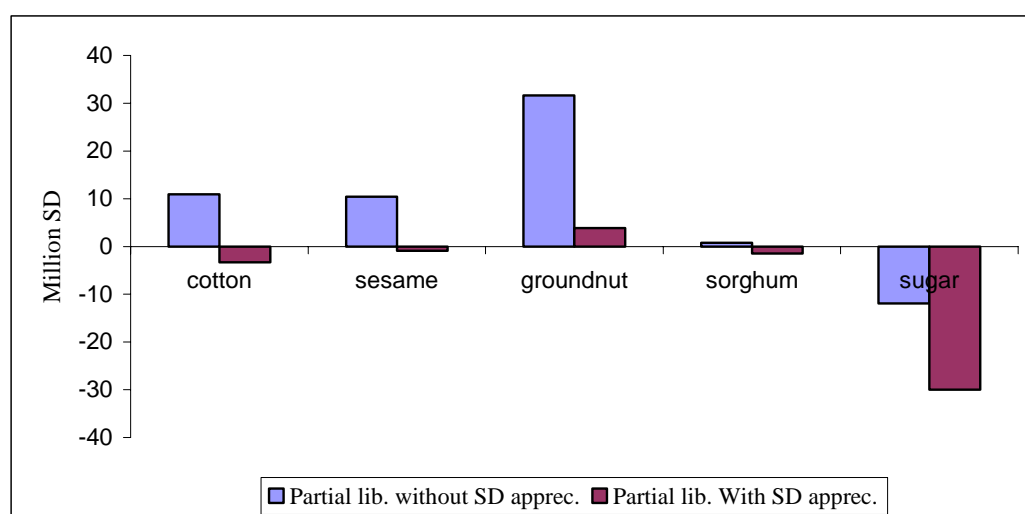
### *Welfare Effects*

The reduction or removal of domestic taxation under the liberalization policy scenario without changes in the value of Sudanese dinar has led to an improvement of producer welfare except for sugar producers due to reduction of support provided to them (Table 5). However, when the appreciation of Sudan currency is considered, all the gain accrued to the producers from the liberalization policy has been abolished or change to a loss (Figure 4).

**Table (7) Absolute changes in producer surpluses under the simulated scenarios**  
(Million SD)

	Partial liberalization		Full liberalization	
	Without appreciation of SD	With appreciation of SD	Without appreciation of SD	With appreciation of SD
Cotton	10.0	-3.3	21.1	-2.7
Sesame	10.4	-0.9	21.4	6.3
Groundnut	31.6	3.9	63.8	26.7
Sorghum	0.8	-1.5	1.7	-2.1
Sugar	-11.9	-30.0	-23.5	-37.5

**Figure (4) Absolute changes in producer surpluses under partial liberalization scenario**



The consumer's welfare is slightly affected by the liberalization policy. The most harmful effect is expected for groundnut consumers. The consumers of sugar are gaining from liberalization policy due to lower domestic prices after removal of protection. The appreciation of Sudanese dinar has led to lower domestic prices which have positive but slight effect on the consumer welfare (Table 6). For more results about the welfare implication see the annexes.

**Table (8) Absolute changes in consumer surpluses under the simulated scenarios**

(Million SD)

	Partial liberalization		Full liberalization	
	Without appreciation of SD	With appreciation of SD	Without appreciation of SD	With appreciation of SD
Cotton	0.0	0.0	0.0	0.0
Sesame	-6.5	0.0	-12.4	-4.8
Groundnut	-24.9	-19.6	-53.8	-36.3
Sorghum	1.0	-10.6	2.0	-7.4
Sugar	18.7	25.2	40.3	52.6

### Conclusions

Sudan is successfully maintaining macroeconomic stability and strong economic growth with the expanding of exports earnings as the annual average prices for petroleum products rose sharply in recent years. The services sector is also experienced a great development under high foreign direct investment. The agricultural sector has been relatively ignored and neglected after oil exploitation. The sector has been challenged by many real problems specially the heavy domestic taxation and recent appreciation of Sudanese dinar that reduce the competitiveness of the agricultural products in the world markets.

The results of this paper proved that liberalization policies could have positive impact on agricultural sector and its export earnings. But, the appreciation of Sudanese dinar has negative impact on the trade performance of agricultural exports as it reduced the benefits from trade liberalization policies by lowering the domestic prices. Therefore, a liberalization policy alone is not enough to the development of the agricultural sector unless it has been combined with suitable macroeconomic policies e.g. appropriate exchange rate policies, monetary and fiscal policies. In order to promote agricultural production and agricultural exports in Sudan, which are extremely powerful in shaping the performance of the economy, suitable pricing policies must be followed under favorable macroeconomic framework.

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**Annex (1) Percentage changes in the domestic demand under the simulated scenarios**

	Partial liberalization		Full liberalization	
	Without appreciation of SD	With appreciation of SD	Without appreciation of SD	With appreciation of SD
Cotton	-3.9	13.8	-7.4	9.4
Sesame	-3.1	1.1	-5.6	-1.4
Groundnut	2.6	-0.5	4.7	1.5
Sorghum	-3.0	2.9	-5.6	5.5
Sugar	4.9	6.1	11.3	22.6

**Annex (2) Percentage changes in the government budget under the simulated scenarios**

	Partial liberalization		Full liberalization	
	Without appreciation of SD	With appreciation of SD	Without appreciation of SD	With appreciation of SD
Cotton	-37.5	-60.2	-77.3	-81.2
Sesame	-30.5	-53.9	-70.0	-78.2
Groundnut	49.2	4.5	98.9	34.6
Sorghum	6.5	-22.9	12.0	-12.6
Sugar	100.0	130.7	100.0	100.0

**Annex (3) Percentage changes in the net welfare under the simulated scenarios**

	Partial liberalization		Full liberalization	
	Without appreciation of SD	With appreciation of SD	Without appreciation of SD	With appreciation of SD
Cotton	-0.8	-42.3	-1.3	-42.3
Sesame	-0.9	-8.2	-2.1	-9.5
Groundnut	3.2	-3.1	5.7	-0.5
Sorghum	3.7	-20.7	7.3	-14.1
Sugar	6.2	-0.4	13.6	12.3