

Can Arab Investments Promote Traditional Agriculture in Sudan? The Case of Cereals and Oilseeds in a Global Modeling Framework

Khalid Siddig¹, Getachew Woldie² and Adam Ahmed³

¹PhD fellow, Institute of Farm and Agribusiness Management, University of Giessen, Germany, and Lecturer, Department of Agricultural Economics, University of Khartoum, Sudan, Email: khalidhasiddig@yahoo.com,
²Lecturer, Department of Economics, Arba Minch University, Ethiopia and PhD fellow, Institute of Agricultural policy and Market Research, University of Giessen, Germany, Email: getachew.a.woldie@agr.uni-giessen.de,
³Assistant professor, Department of Agricultural Economics, University of Khartoum, Sudan, Email: adamahag2002@yahoo.com

Introduction

This poster tries to simulate the overall implications of recent national and regional policy responses to mitigate food shortage and soaring food prices. Moreover, it addresses the recent capital flows from the Arab countries towards investment in the agriculture sector of Sudan. Food cereals and oilseeds are selected to represent the potential development of the sector. The first represent major staple food in the majority of the regions countries, while the second represent the major agricultural export in Sudan. Accordingly, this paper simulates efficiency improvements in these sectors through improving labor skills and capital flows. These are expected to enhance adoption of suitable agricultural practices, technologies, and high yielding varieties. The findings from this paper are appealing as it addresses an important aspect that might have some relevance to national and regional policy concerning the increasing international food and bio-energy demand.

Methodology and Data

The study will base entirely on the Global Trade Analysis Project (GTAP) and the new African database. GTAP was established in 1992 at Purdue University, USA. The global CGE modeling framework of the GTAP is a comprehensive way to analyze the economic and trade consequences of multilateral or bilateral trade agreements (Hertel, 1997). The GTAP model is a comparative static, global CGE model based on neoclassical theories. The GTAP model is a linearized model, using a common global database for the CGE analysis. It assumes perfect competition in all markets, constant returns to scale in all production and trade activities, and profit and utility maximizing behavior of firms and households respectively, and it is solved using GEMPACK software.

The GTAP Africa Database is a special version based on GTAP 6 database. It includes data for 39 regions (30 African regions and 9 other aggregated regions) and the 57 sectors of the GTAP 6 Data Base. The Sudanese Input/output Table (IOT) is one of the newly contributed IOTs among other six African countries. It was contributed by and documented in Siddig (2009a). Further, the missing bilateral trade flows for the African regions have been econometrically estimated, using the gravity approach.

The database is aggregated in a way to suit the objectives of this paper. Sectors are aggregated to 14, separating cereals and oilseeds as separate sectors. Regions are 11, including Sudan, some African neighbors, and MENA among other countries. Table (1) shows the complete list of sectors and regions considered in this paper.

Results and Discussion

Four scenarios are simulated, namely: (1) Scenario1: 5% increases in the labor and capital augmenting technology change parameter for cereals and oilseeds, (2) Scenario2: 5% increases in the labor and capital augmenting technology change parameter for cereals and oilseeds with subsidy removal, (3) Scenario3: 5% increases in the labor and capital augmenting technology change parameter for cereals and oilseeds with 0.5% tax, and (4) Scenario4: 5% increases in the labor and capital augmenting technology change parameter for cereals and oilseeds with 5% tax.

The macroeconomic impacts of efficiency improvement in Sudan are shown in Table (2). All scenarios will improve the GDP slightly in quantity terms, explained by the apparent increase in the output of grains and oilseed among other sectors. However, GDP value index decreases responding to scenario4. The negative effects of the 5% tax rate on grains and oilseeds of scenario4 is the reason, which has also negatively affected the household income and consumption. Equivalent variation increased by 40 US\$ millions reflecting the overall welfare impact of the first three scenarios. However, it reduces the trade balance by an average of 23 US\$ millions. The fall in the trade balance is attributed to import oriented household demand, which increase imports due to the increased income.

As expected, the domestic output of grains and oilseeds has positively responded to efficiency improvement in scenarios (1-3). Even though there are some contractions in the output of other sectors, most of them little affected following these scenarios, which could be attributed to resource competition between sectors (Table 3).

The increase in grains and oilseed's output due to efficiency improvement is only applicable in the absence of the 5% higher tax rates of scenario4. Interestingly, this improvement in the output of grains and oilseeds will improve other related sectors, including the processed food livestock, and service sectors. This could be justified by the importance of grains and oilseeds as intermediate inputs for the agro-industries in Sudan. Moreover, the increase in the output of these sectors in the absence of taxes, would improve private income, and hence increase the domestic demand for commodities. Efficiency improvement scenarios have also regional impacts. The levels of domestic demand for imported grains and oilseeds in other regions will be affected. These effects are shown in Figure (1), comprising both household and government domestic demand for imported grains and oilseeds into Egypt, Ethiopia, MENA, and Congo.

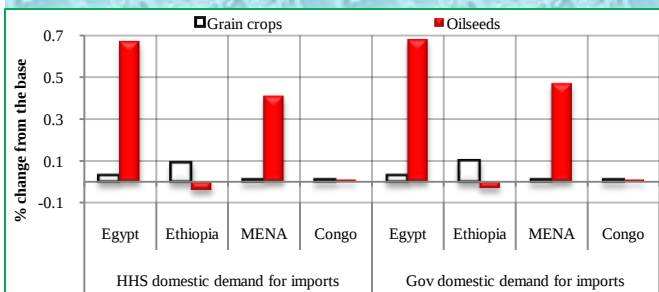


Figure 1. Effects of efficiency improvement on regional domestic demand for imports

Conclusions

This study tries to utilize the newly released GTAP Africa data base in the Global economic modeling framework of GTAP to assess the national and regional implications of the advancement of the traditional agriculture in Sudan. Its findings are appealing as it addresses important aspects that might have some relevance to national and regional policy concerning the increasing international food and bio-energy demand. Results confirms that the increasing capital flows from Arab countries and the domestic private sector to the agricultural sector could clearly contribute to improving agricultural output, people's welfare, and the country GDP. Sectoral output and trade will improve in the sectors where efficiency is improved. Accordingly, the continuation in adopting more favorable environment for investment in the Agricultural sector is crucial. Investment flows should be fairly distributed among the country regions, especially in the rural areas so as to enhance agricultural production and ultimately promote the traditional agriculture in the country.

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Table 1. Sectors and regions aggregation

Sectors aggregation	Regions aggregation
Wheat	Sudan
Cereals	Egypt
Oilseeds	Ethiopia
Sugar	Uganda
Forestry	Congo
Meat and livestock	Kenya
Extraction	Rest of the Middle east and North Africa (MENA)
Processed food	East Asian countries
Textile and wearing apparels	The European Union countries (EU25)
Light manufactories	Rest of Common Market for Eastern and Southern Africa (COMESA)
Heavy manufactories	
Utility and construction	Rest of the world
Transport and communications	
Other services	

Table 2. Effects of grains and oilseeds' efficiency improvement on Sudan's macro-indicators

Macro-indicators	Percentage change (or absolute change*) from the base			
	Scenario1	Scenario2	Scenario3	Scenario4
Trade balance* (X-M US\$ million)	-25.51	-23.23	-20.86	1.02
Equivalent variation* (US\$ million)	41.2	40.39	39.53	30.94
GDP quantity index	0.29	0.29	0.29	0.28
Volume of merchandize imports	0.94	0.86	0.78	0.03
Volume of merchandize exports	0.11	0.11	0.11	0.14
GDP value index	1.16	1.05	0.94	-0.06
Value of merchandize imports	0.94	0.86	0.78	0.03
Value of merchandize exports	-0.02	-0.01	0	0.13
Household income	1.2	1.09	0.98	-0.04
Household consumption expenditure	1.18	1.08	0.97	-0.04

Table 3. Effects of grains and oilseeds' efficiency improvement on sectors' output

Sectors	Percentage change from the baseline			
	Scenario1	Scenario2	Scenario3	Scenario4
Wheat	-1.42	-1.17	-0.91	1.51
Grain crops	2.72	2.46	2.18	-0.35
Oilseeds	4.77	4.30	3.82	-0.56
Sugar	-0.97	-0.83	-0.68	0.71
Forestry	-0.51	-0.42	-0.33	0.56
Meat and livestock	0.02	0.07	0.11	0.55
Extraction	-0.60	-0.53	-0.46	0.19
Processed food	0.25	0.25	0.25	0.26
Textile and wearing apparels	-1.95	-1.70	-1.45	0.94
Light manufactories	-2.67	-2.34	-1.98	1.32
Heavy manufactories	-0.97	-0.83	-0.69	0.63
Utility and construction	0.68	0.64	0.6	0.21
Transport and communications	0.13	0.14	0.16	0.32
Other services	0.17	0.19	0.21	0.37

Oil seeds response to scenario2 in terms of domestic demand of imports by household and government is more than the one for grains across the selected regions. With respect to regions, Egypt is the most affected region showing an average increase of 0.4% in household and government demand for the two commodities, followed by MENA with 0.2% increase. Oilseeds alone show a 0.7% increase in the domestic imports demand in Egypt, while it shows 0.5% increase in MENA. Adversely, Ethiopian domestic demand for imported cereal will increase by 0.1%, while surprisingly oilseeds demand will decrease by 0.03%. The rise in demand for imported grain in Ethiopia can be explained by the fact that prices of domestic grains are unbearably high without government subsidy compared with the imported ones and hence an inclination to pressure on demand for imported ones (WOLDIE AND SIDDIG, 2009). In Congo domestic demand for both imported commodities increased slightly by 0.01%.