

AV.1 Abstract

This chapter provides guidelines on the data used to produce the Input/Output Table (IOT) for the Sudan including their sources, processing and correspondence to the standard GTAP data structure. The IOT, which is submitted to the GTAP Database version 10, is the first for the Sudan after the separation of the former Sudan into “the Sudan” and “South Sudan” in 2011. The IOT is developed based on the most recently published Social Accounting Matrix (SAM) for the Sudan (Siddig et al., 2016). The submitted IOT for the Sudan provides data on 37 sectors, 12 of them are agricultural covering crops, livestock, forestry and fishing. In addition, the IOT includes three mining, nine manufacturing, three utilities and ten service sectors. The data reported in the IOT depicts the Sudanese economy in 2012 and it is in billions of Sudanese Pounds (SDG).

AV.2 Introduction

The first IOT for the Sudan that contributed to the global GTAP database was that of 2008 (Siddig, 2008), which was part of the first release of Africa Database (GTAP Africa 1 Data Base). The IOT has relied on the Representative GTAP IOT's intermediate input matrix due to a lack of original data; therefore, it has not been included in the standard GTAP database. The Sudan was listed among GTAP top priority IOTs for years since then but the division of the Sudan into two countries in 2011 made acquiring adequate data even more difficult while at the same time making the IOT of Siddig (2008) obsolete. The Sudan is a strategically important country in Africa by its special location that bridges the MENA (Middle East and North Africa) region and SSA (Sub-Saharan Africa). The country has abundant natural resources and great economic potential. It has been an agricultural-based economy since the decline of oil resources (separation) and is said to be the breadbasket of the Middle East. Therefore, researchers are eager to use a global database that includes the Sudanese IOT to address various imperative research issues in the region. These include regional trade agreements (e.g. COMESA⁷²), climate change within the Sahel and Savannah regions of Africa, and the flow of foreign direct investment (FDI) in the African agricultural sector among other issues. The Sudan has also been amongst the top-recipients of FDI in Africa in recent years. Therefore, the authors have given considerable dedication to this IOT and the associated Social Accounting Matrix (SAM) (Siddig et al., 2016) so that they may depict the most recent economic data for the country with the highest possible level of detail. The remaining parts of this chapter are organized to provide the readers with details on the original data sources primarily used to develop a detailed SAM for the Sudan (Section 2). Section 3 shows how the SAM (Siddig, et al., 2016) has been translated into an IOT while Section 4 gives an overview of the SAM, showing its accounts and their categories. Section 5 highlights the major technical treatments applied to the

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⁷²COMESA is the Common Market for Eastern and Southern Africa, which is formed in 1994. It includes 19 member states with Sudan being a founding member among other nine member states (COMESA, 2016).

submitted IOT including the correspondence between the original data sources and the IOT, zero sectors, and the treatments of the tax accounts, households and production factors. Finally, the correspondence tables are provided in Section 6.

AV.3 Sources of data

The Sudanese IOT described here relies entirely on the latest SAM developed for the post-separation economy of the Sudan (Siddig et al., 2016).⁷³ The SAM represents the monetary flows in 2012 in billions of Sudanese pounds (SDG). The SAM⁷⁴ in turn depended on data from various sources including domestic official sources such as government offices as well as external sources, published research and experts' judgement. In order to produce a reconciled set of data, the SAM considered the Central Bureau of Statistics⁷⁵ (CBS) of the Sudan as the reference source and reconciled all other sources to coincide with its reports, especially the national accounts.

The National Accounts data of the CBS include Gross Domestic Product (GDP), total production, intermediate demand, compensation of employees, depreciation, operating surplus, and net indirect taxes for an aggregation of 39 production activities. In addition, it provides details on national income, government expenditure, private expenditure, gross fixed capital formation, changes in stocks, exports and imports of goods and services and government revenues. Besides the National Accounts, the CBS data included trade data (imports and exports) by chapter and household income and expenditure survey for 2009 (CBS, 2010).

The SAM has additionally used other local data sources such as the Central Bank of the Sudan (CBoS, 2014), the Ministry of Human Resources Development and Labor (MHRDL, 2013), Sudan Taxation Chamber (STC, 2013), Sudan Customs (Sudan Customs, 2012), the Ministry of Finance and Economic Planning (MFEP (2011; 2015), Ministry of Agriculture and Forestry (MoAF, 2014; 2015) and Ministry of Industry (MoI, 2005). In addition to local data sources, the SAM has also drawn data from several international organizations such as the World Bank (2016), the FAO (2015, 2004), the International Monetary Fund (IMF, 2014), The International Energy Agency (IEA, 2016) and the International Labor Organization (ILO, 2009).

AV.4 From SAM to IOT

Difference between the SAM and GTAP-IOT formats

A SAM is a tabular representation of all the monetary flows of an economy in a specific period of time, usually a year. The economy considered by the SAM can be that of a country, a part of a

⁷³ An active link to the SAM documentation in which the details behind the construction of the SAM is included under the reference list.

⁷⁴ The following section 3 provides a brief technical definition and description of the SAM concept.

⁷⁵ The Central Bureau of Statistics (CBS) is official authority in the Sudan that is mandated to collect and publish statistics in the Sudan. To develop a SAM for the Sudan, relevant statistics of the CBS would at least include National Accounts, trade, and household income and expenditure survey data.

country or a group of countries, with the requirement that the flows of monetary transactions within the economy as well as between the economy and other economies are available. As described by Pyatt and Round (1985), the SAM applies the double entry bookkeeping system where each entry is interpreted with respect to its column and its row and must balance, i.e. column and row totals equal. Hence, a SAM is a squared matrix with equal row and column dimension.

Contrary to the IOT, the SAM -including the Sudanese SAM for 2012- is constructed in a commodity-by-industry format as compared to the predominantly commodity-by-commodity format of the IOT such as the format adopted in the GTAP database. This implies that the SAM separates each production activity (industry) from its output (commodity). This requires that the SAM include two submatrices for the activity-commodity interaction. The first is a make-matrix showing the payment from commodities to activities (commodity output) and the second is a use-matrix depicting the payment from activities to commodities (intermediate demand by activities).

Another difference between the common SAM format (e.g. Sudan 2012' SAM) and the GTAP-IOT format is that the latter divides commodity use in the economy into domestic and imported based on its origins. The SAM format does not depict this distinction and the price paid by the purchaser (intermediate or final) applies to both domestically produced and imported goods.

In addition, the SAM reports commodity output data valued at producer price, commodity intermediate and final demands as well as imported goods valued at purchaser price, while commodity exports are valued at domestic currency units received by exporters. The GTAP-IOT however, distinguishes between transactions valued at basic price (tax exclusive) and those valued at purchaser price (tax inclusive) for both imported and domestically produced goods (i.e. the previously mentioned use matrices).

The conversion of the SAM into GTAP-IOT

The conversion of the data reported by the 2012's SAM for the Sudan into a format compatible with GTAP-IOT considers all the differences mentioned in sub-section 3.1. Two major steps are identified. Step 1: generating data matrices that distinguish the use of domestically produced commodities from the use of imported commodities. Step 2: generating data matrices that distinguish the use of commodities at basic price (tax exclusive) from the use of commodities at purchaser price (tax inclusive) for each matrix generated in step 1.

According to Huff et al. (2000), four matrices containing the IOT data are supposed to be submitted to the GTAP center as shown in Table 1. The first two matrices (UF and UP) include the usages of commodities differentiating domestically produced goods from imports. This distinction is not considered by the data presented in a generic SAM such as that of the Sudan, where commodity-use pools both domestically produced and imported commodities together.

The process of moving from a SAM-structure to the recommended GTAP four arrays is depicted Figure 1. It shows the SAM in the left-hand-side panel and the GTAP-IOT arrays in the right panel with the accounts in the rows receiving payments, while those in the columns paying to those in the rows. Supply of commodities in the SAM consist of domestic production and imports

Table 8.106: The sub-matrices of a contributed single region IOT to GTAP database

Code	Description
UF	Usage of input i in use u, commodity tax excluded
UP	Usage of input i in use u, commodity tax inclusive
OP	Output of sector i, non-commodity indirect tax included
MF	Imports of commodity i, import duties excluded

Source: Huff et al. (2000).

with imports presented in a horizontal vector while domestic production is presented by a matrix (the make matrix). This can be a squared matrix if, and only if, the SAM is one-to-one with respect to commodities and activities.⁷⁶ These two components of commodity supply correspond to OP and MF in the GTAP-IOT.

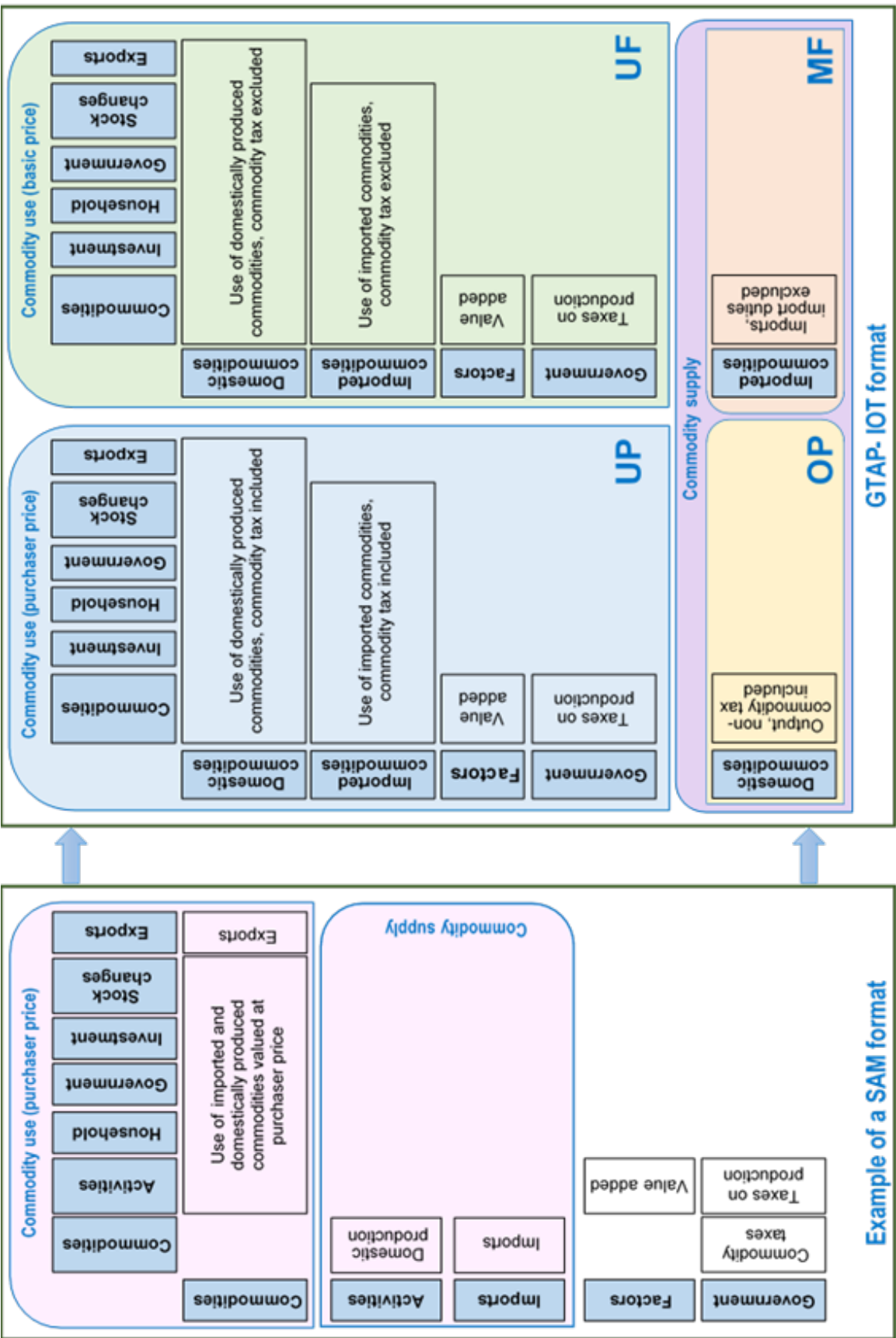
As seen in Figure 1, the major difference between the SAM and GTAP-IOT formats is in the commodity usage. In the SAM commodity usage is represented by one matrix combining domestically produced and imported commodities, whereas in the GTAP-IOT it is represented by UP and UF arrays. As shown in Table 1 both UP and UF distinguish usage of commodities by origin (domestically produced vs. imported). In addition, usage of commodities is presented tax inclusive in UP, while it is tax exclusive in UF.

This procedure of conversion is coded in GAMS⁷⁷ based on the recommendations and instructions provided in the GTAP contributor guide (Huff et al., 2000) and the GAMS code itself was developed in collaboration with the GTAP Database team (McDonald and Lakatos (2009). There are several features included in the code that can address special issues such as, but not limited to, the removal of trade and transport margins, which do not apply to the SAM for the Sudan as it does not report margin transactions.

⁷⁶This means that the number of activities equates that of commodities.

⁷⁷GAMS is General Algebraic Modeling System. See for details: <http://www.gams.com/>

Figure 8.33: Converting data from a SAM format into a GTAP-IOT format



Source: Author' own elaboration based on Siddig and Luckmann (2015); Huff et al. (2000).

AV.5 An overview of the 2012's SAM for the Sudan

The post-separation SAM for the Sudan contains data for 58 commodities produced by 71 activities. Agriculture is represented by 23 commodities that are produced by 36 activities with most of the agricultural activities differentiated by the three major farming systems in the Sudan, namely, traditional rainfed, mechanized rainfed and irrigated systems. Industrial and manufacturing commodities are 11, with each of them being produced by a single activity. Energy commodities include electricity and biofuel, where electricity is produced by two different activities, namely, hydropower and oil-based electricity generation activities. Water commodities are divided into three categories including irrigation water, pipe water and portorage water with each of them produced by a single corresponding activity. The remaining 18 commodities include construction, 2 trade commodities, 6 transport commodities (air, road, rail and water transport besides pipelines and communications) and 10 other services such as finance, business and public administration. The full list of and correspondence between activities and commodities of the SAM are shown in Table 2.

The SAM includes 16 accounts for production factors, of which 12 are labor accounts. The labor accounts cover three dimensions, namely, location (rural and urban), skill (skilled, semi-skilled and unskilled) and gender. Land accounts are 2, irrigated land and non-irrigated land, while the remaining factors are capital and natural resources.

Household accounts are 10 covering the location dimension (rural and urban) and the income dimension (5 income quintiles). Tax accounts are 6 including 4 tax accounts on commodities (sales, stamps-and-fees, import subsidy, and import tariff), production subsidy and direct taxes on households and enterprises. The remaining accounts of the SAM are government, enterprises, investment-saving, stock changes, and the rest of the world.

AV.6 Major adjustments

Mapping and aggregations

The correspondence between the sectors included in the submitted IOT for the Sudan, the GTAP 57 sectors and the 58 commodities of the SAM are depicted in Table 5. The 58 commodities of the SAM are mapped to 37 commodities in the submitted IOT. Table 3 depicts the correspondence between the final demand categories of the SAM (10 accounts for households, government demand, investment demand, Stock changes, and exports) and those of the IOT (one account for households, government demand, investment demand, stock changes, and exports). In addition, Table 4 shows the correspondence between the 16 categories of value added in the SAM and the 3 factor endowments required by the GTAP-IOT. The 12 labor accounts in the SAM are aggregated into one labor account. The land account of the IOT includes the two land accounts of the SAM as well as the natural resource account, while the capital account of the SAM corresponds to the capital account in the IOT.

The SAM includes a biofuel sector (biomass), which represents the collection and distri-

bution firewood as a source of energy. This sector corresponds to the “Gum Arabic and forestry” sector of the IOT, which aggregates biofuel to the other two forestry sectors (gum Arabic and other forest products) in one sector. The aggregated sector is eventually mapped to the GTAP-IOT sectoral classification “FRS”.

Another aggregation that needs to be noticed is that the sugar sector in the IOT for the Sudan corresponds to two GTAP-IOT sectors, namely, “C.B: Sugar cane, sugar beet” and “SGR: Sugar” (Table 5).

The Zero-Sectors

The submitted IOT for the Sudan includes three zero-sectors following the suggestion of Horridge et al. (2008). As reported by the SAM (Siddig et al., 2016) and confirmed by CBS data on production and trade (CBS, 2015a; 2015b), coal (COA) and paddy rice (PDR) are not produced in the Sudan. In addition, neither the SAM nor other domestic sources report data on dwellings, therefore, the submitted IOT designates it as a zero sector too.

The treatment of taxes

The 2012’s SAM for the Sudan (Siddig et al., 2016) provides data on six tax accounts including four commodity taxes (sales tax, stamps-and-fees, import subsidy, and import tariff), production subsidy paid to activities, and income tax levied on households and enterprises. The tax data in the GTAP-IOT is implicit and considers two aggregate tax accounts, which are explicitly reported in the submitted IOT for the Sudan. These are non-commodity indirect tax on production (production subsidy in a form of negative tax) and taxes on commodities. The latter aggregates the four commodity tax accounts (sales tax, stamps-and-fees, import subsidy, and import tariff) together.

AV.7 Tables of correspondence

Table 8.107: List of the activities and commodities of the SAM and their correspondence

Activities		Commodities	
No.	Description	No.	Description
Agricultural crops			
1	Irrigated cotton	1	Cotton
2	Mechanized rainfed cotton		
3	Irrigated-sorghum	2	Sorghum
4	Mechanized rainfed sorghum		
5	Traditional rainfed sorghum		
6	Irrigated-wheat	3	Wheat
7	Traditional rainfed wheat		
8	Irrigated maize	4	Maize

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Activities		Commodities	
No.	Description	No.	Description
9	Traditional rainfed maize		
10	Irrigated groundnut	5	Groundnut
11	Traditional rainfed groundnut		
12	Irrigated millet	6	Millet
13	Mechanized rainfed millet		
14	Traditional rainfed millet		
15	Irrigated-sesame	7	Sesame
16	Mechanized rainfed sesame		
17	Traditional rainfed sesame		
18	Irrigated sugar cane	8	Sugar cane
19	Irrigated fruits	9	Fruits
20	Traditional rainfed fruits		
21	Irrigated vegetables	10	Vegetable
22	Traditional rainfed vegetables		
23	Irrigated Egyptian beans	11	Egyptian beans
24	Irrigated sunflower	12	Sunflower
25	Mechanized rainfed sunflower		
26	Other crops	13	Other crops
Livestock			
27	Livestock cattle	14	Cattle
28	Livestock sheep	15	Sheep
29	Livestock goats	16	Goats
30	Livestock poultry meat	17	Poultry meat
31	Other livestock	18	Other livestock
32	Livestock milk	19	Raw milk
33	Livestock eggs	20	Eggs
Forest			
34	Gum Arabic	21	Gum Arabic
35	Other forestry production	22	Other forestry products
Fish			
36	Fishing	23	Fishing
Industry			
37	Crude petroleum	24	Crude petroleum
38	Other mining and quarrying	25	Other mining and quarrying
39	Food, beverages and tobacco	26	Food beverages and tobacco
40	Textile, wearing apparel and leather	27	Textile wearing apparel and leather
41	Wood and wood products including furniture	28	Wood and wood products including furniture
42	Paper and paper products printing and publishing	29	Paper and paper products printing and publishing
43	Petroleum and plastic products and chemicals	30	Petroleum and plastic products and chemicals
44	Non-metallic industries	31	Non-metallic products
45	Basic metal industries	32	Basic metal products
46	Fabricated metal products machinery and equipment	33	Fabricated metal products machinery and equipment
47	Other manufacturing industries	34	Other manufacturing products
Utilities			
48	Hydropower electricity	35	Electricity
49	Oil-based electricity		
50	Biofuel	36	Biofuel
51	Irrigation water	37	Irrigation water

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Activities		Commodities	
No.	Description	No.	Description
52	Pipe water	38	Pipe water
53	Porterage water	39	Porterage water
54	Building and construction	40	Building and construction
Trade			
55	Commerce	41	Commerce
56	Restaurants and hotels	42	Restaurants and hotels
Transport and communication			
57	Air transport	43	Air transport
58	Road transport	44	Road transport
59	Rail transport	45	Rail transport
60	Water transport	46	Water transport
61	Communication	47	Communication
62	Pipeline	48	Pipelines
Other services			
63	Insurance	49	Insurance
64	Real-estate	50	Real-estate
65	Business and finance services	51	Business services
		52	Finance
66	Public administration and defense services	53	Public administration and defense services
67	Community social and other services, other community and social services	54	Community, social and personal services, other community and social services
68	Education	55	Education
69	Health	56	Health
70	Social recreational and related community services	57	Social recreational and related community services
71	Domestic services of households	58	Domestic services of households

Source: Siddig et al (2016).

Table 8.108: Mapping the final demand accounts of the SAM to those of GTAP- IOT

SAM for Sudan	GTAP-IOT
Urban households in quintile 1	Households
Urban households in quintile 2	
Urban households in quintile 3	
Urban households in quintile 4	
Urban households in quintile 5	
Rural households in quintile 1	
Rural households in quintile 2	
Rural households in quintile 3	
Rural households in quintile 4	
Rural households in quintile 5	
Government	Government
Saving and investment	Saving and investment
Stock changes	Stock changes
Rest of the World	Rest of the World

Source: Author's own elaboration.

Table 8.109: Mapping production factors of the SAM to those of GTAP- IOT

SAM for Sudan	GTAP-IOT
Labor - urban male skilled	labor
Labor - urban male semi-skilled	
Labor - urban male unskilled	
Labor - urban female skilled	
Labor - urban female semi-skilled	
Labor - urban female unskilled	
Labor - rural male skilled	
Labor - rural male semi-skilled	
Labor - rural male unskilled	
Labor - rural female skilled	
Labor - rural female semi-skilled	
Labor - rural female unskilled	
Capital	Capital
Irrigated land	Land
Non-irrigated land	
Natural resources	

Source: Author's own elaboration.

Table 8.110: Correspondence between the sectors of Sudan-IOT, GTAP-IOT and Sudan's 2012 SAM

Sudan' 2012 IOT		GTAP Sectors		Commodities of Sudan's 2012 SAM	
No.	Code	Description	No.	Code	Description
1	PDR	Paddy rice	1	PDR	0 0 Zero sector
2	WHT	Wheat	2	WHT	3 cWheat Wheat
3	GRO	Cereal grains (sorghum, maize and millet)	3	GRO	2 cSrghu Sorghum
			3	GRO	4 cMaize Maize
			3	GRO	6 cMillet Millet
4	V_F	Vegetables, fruit and nuts	4	V_F	9 cFruits Fruits
			4	V_F	10 cVegtbl Vegetable
5	OSD	Oil seeds (groundnut, sunflower and sesame)	5	OSD	5 cGrndnt Groundnut
			5	OSD	12 cSnflwr Sunflower
			5	OSD	7 cSsam Sesame
6	C_B_SGR	Sugar cane, sugar beet and sugar	6	C_B	8 cSugar Sugar cane
			24	SGR	
7	PFB	Cotton	7	PFB	1 cCottn Cotton
8	OCR	Other crops	8	OCR	11 cEgybn Egyptian beans
			8	OCR	13 cOthercp Other crops
9	Livestock	Livestock, live animals and livestock products	9	CTL	14 cCattle Cattle
			19	CMT	
			10	OAP	20 cEggs Eggs
			10	OAP	17 cPolmt Poultry meat
			10	CTL	15 cSheep Sheep
			19	CMT	
			11	CTL	16 cGoats Goats
			19	CMT	

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Sudan' 2012 IOT		GTAP Sectors		Commodities of Sudan's 2012 SAM	
No.	Code	Description	No.	Code	Description
			10	OAP	18 cOthlvk Other livestock
			12	WOL	
			20	OMT	
10	RMK	Raw milk	11	RMK	19 CMilkrw Raw milk
11	FRS	Gum Arabic and forestry	13	FRS	21 cGmrbc Gum Arabic
					22 cOthfrst Other forestry products
					36 cBioful Biofuel
12	FSH	Fishing	14	FSH	23 cFish Fishing
13	OMN	Other mining and quarrying	18	OMN	25 cOthmq Other mining and quarrying
14	COA	Coal	15	COA	0 0 Zero sector
15	OIL_GAS	Crude petroleum and gas	16	OIL	24 cCrptrol Crude petroleum
			17	GAS	
16	Food	Food beverages and tobacco	25	OFD	26 cFdbvbtb Food beverages and tobacco
			26	B_T	
			21	VOL	
			22	MIL	
			23	PCR	
17	TEX_WAP_LEA	Textile, wearing apparel and leather	27	TEX	27 cTextile Textile wearing apparel and leather
			28	WAP	
			29	LEA	
18	LUM	Wood products	30	LUM	28 cWood Wood and wood products including furniture
19	PPP	Paper and paper products printing and publishing	31	PPP	29 cPaper Paper and paper products printing and publishing
20	P_C_CRP_GDT	Petroleum and plastic products and chemicals	32	P_C	30 cRfptrol Petroleum and plastic products and chemicals

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Sudan' 2012 IOT		GTAP Sectors		Commodities of Sudan's 2012 SAM	
No. Code	Description	No. Code	No. Code	No. Code	Description
		33 CRP			
		44 GDT			
21 NMM	Non-metallic products	34 NMM	31 cNmetal		Non-metallic products
22 I_S	Basic metal products	35 I_S	32 cBmetal		Basic metal products
23 OMF	Other manufacturing products and biofuel	34 NMM	34 cOthmch		Other manufacturing products
		36 NFM			
		38 MVH			
		39 OTN			
		40 ELE			
		41 OME			
		42 OMF			
24 FMP	Fabricated metal products, machinery and equipment	37 FMP	33 cFmetal		Fabricated metal products
25 ELY	Electricity	43 ELY	35 cElectrc		Electricity
26 WTR	Water	45 WTR	37 cIrrwatr		Irrigation water
		45 WTR	38 cPpwatr		Pipe water
		45 WTR	39 cPrwatr		Portage water
27 CNS	Building and construction	46 CNS	40 cCnstrc		Building and construction
28 TRD	Trade	47 TRD	41 cTrade		Commerce
		47 TRD	42 cRstrhtl		Restaurants and hotels
29 OTP	Road, rail transport and pipelines	48 OTP	44 cRdtrans		Road transport
		48 OTP	45 cRltrans		Rail transport
		48 OTP	48 cPpeline		Pipelines
30 WTP	Water transport	49 WTP	46 cWtrans		Water transport
31 ATP	Air transport	50 ATP	43 cArtrans		Air transport
32 CMN	Communication	51 CMN	47 cComnc		Communication

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Sudan' 2012 IOT		GTAP Sectors		Commodities of Sudan's 2012 SAM	
No.	Code	Description	No.	Code	Description
33	ISR	Insurance	53	ISR	Insurance
34	OBS_OFI	Business, real-estate and financial services	54	OBS	Realestate
			52	OFI	Finance
			54	OBS	Business services
35	ROS	Recreational, social, personal, domestic and other services	55	ROS	Community, social and personal services, other community and social services
			55	ROS	Social recreational and related community services
			58	cDmstrv	Domestic services of households
36	OSG	Public Administration, Defense, Education and Health	56	OSG	Public administration and defense services
			56	OSG	Education
			56	cHealth	Health
37	DWE	Dwellings	57	DWE	Zero sector
			0	0	

References

CBS (2015a). National Accounts of the Sudan for the Years 2011 And 2012, Department of National Account, Central Bureau of Statics, Khartoum, the Sudan. Unpublished Data Set.

CBS (2015b). International Trade Data on Imports and Exports for the Years 2011 and 2012 According to the Harmonized System. Department of International Trade, Central Bureau of Statics, Khartoum, the Sudan. Unpublished Data Set.

CBS (2010). The Basic Findings of the National Household Survey for the Year 2009 (published by the CBS in Arabic). Unpublished Data Set on Households Income and Expenditure by State, Commodity, Location and Income Quintile, Central Bureau of Statics, Khartoum, the Sudan.

CBoS (2014). The 53rd Annual Report for the year 2013. Central Bank of the Sudan, Khartoum, the Sudan. <http://www.cbos.gov.sd/>

COMESA (2016): Common Market for Eastern and Southern Africa. The official website, accessed on January 4, 2017 at: <http://www.comesa.int/overview-of-comesa/>

FAO (2015). Food and Agriculture Organization of the United Nations, AQUASTAT: Sudan Profile 2015. http://www.fao.org/nr/water/aquastat/countries_regions/sdn/index.stm

FAO (2004). Economic valuation of water resources: from the sectoral to a functional perspective of natural resources management. Food and Agriculture Organization of the United Nations. FAO water reports 27. <http://www.fao.org/docrep/007/y5582e/y5582e06.htm#TopOfPage>

IEA (2016). Sudan Balances for 2012 in Thousand Tonnes of Oil Equivalent (ktoe) on Net Calorific Value Bases. International Energy Agency Statistics. Accessed on March 17, 2016. <http://www.iea.org/statistics/statisticssearch/report/?country=SUDAN&product=Balances&year=2012>

IMF (2014). Sudan Staff Monitored Program, Staff Report; Press Release; and Statement by the Executive Director for Sudan. IMF Country Report No. 14/203, International Monetary Fund, Washington, D.C., USA. July 2014.

Horridge, M., McDougall, R., Narayanan, B. and T. Walmsley (2008): Exercises in Contributing I-O Tables to the GTAP Data Base. September 2008.

Huff, K., McDougall, R. and T. Walmsley (2000): Contributing Input-Output Tables to the GTAP Data Base. GTAP Technical Paper No. 1 Release 4.2. January 2000.

McDonald, S. and C. Lakatos (2009): Symmetric IO Tables from Supply and Use for GTAP V7 (GAMS-code). Department of Economics & Strategy, Oxford Brookes University Oxford, UK.

Pyatt G. and Round, J. (1985). Social Accounting Matrices: A Basis for Planning. The World Bank, Washington, D.C., USA.

MFEP (2011). The Overall Economy View for 2011 (“Alard Alegtisadi 2011” in Arabic). Ministry of Finance and Economic Planning (MFEP). <http://www.mof.gov.sd/>

MFEP (2015). The Overall Economy View for 2014 (“Alard Alegtisadi 2011” in Arabic). Ministry of Finance and Economic Planning (MFEP). <http://www.mof.gov.sd/>

MHRDL (2013). Sudan Labor Force Survey 2011 (SLFS 2011), Ministry of Human Resources Development and Labor, Khartoum, the Sudan.

MoAF (2015). General Administration of Agricultural Statistics, Ministry of Agriculture and Forestry. Unpublished data on production by states and method of irrigation, Khartoum, the Sudan.

MoAF (2014). General Administration of Agricultural Statistics, Ministry of Agriculture and Forestry. Unpublished data on production costs for selected crops, Khartoum, the Sudan.

MoI (2005). Gathering, processing and analyzing the results of the comprehensive Industrial Survey. Unpublished report prepared to accompany the data of the survey produced by the Ministry of Industry, Khartoum, the Sudan.

Siddig, K., Elagra, S. Grethe, H. and A. Mubarak (2016). A Post-Separation Social Accounting Matrix for the Sudan. Working paper No. 92/2016, Department of Agricultural Economics, Humboldt-Universität Zu Berlin. Accessed online on December 16, 2016 at: <https://www.agrar.hu-berlin.de/de/institut/departments/daoe/publ/wp/wp92.pdf>

Siddig, K. and J. Luckmann (2015). GTAP 9 Data Base Documentation - Chapter 7.N: Nigeria. In Aguiar, Angel, Badri Narayanan, & Robert McDougall. "An Overview of the GTAP 9 Data Base." Journal of Global Economic Analysis 1, no. 1 (June 3, 2016): 181-208.

Sudan Customs (2012). Harmonized Commodity Description and Coding System, Sudan Customs, Khartoum, the Sudan. <http://customs.gov.sd/>

Sudan Taxation Chamber (2014). Unpublished data on aggregated tax. Sudan Taxation Chamber, Khartoum, the Sudan.

World Bank (2015). World Development Indicators: Electricity production, sources and access. World Bank, Washington DC, USA. <http://wdi.worldbank.org/table/3.7>