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# Ethiopia Social Accounting Matrix 2015/16

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## **Abstract**

A Social Accounting Matrix (SAM) is a comprehensive and economy-wide database recording data on all transactions between economic agents in a certain economy during a certain period of time; its interest is twofold. First a SAM is a standard database for most whole economy modellers as it provides comprehensive data for economic modelling (multi-sectorial linear models or more complex CGE models). Second a SAM shows a complete and intuitive snapshot of the economy at hand. This report presents the Social Accounting Matrix of Ethiopia for the year 2015/16, describing its specific structure and the basis for its estimation. In this sense, it is necessary to highlight the special structure of this SAM to reflect the Home Production for Home Consumption (HPHC) issue and a high disaggregation of agricultural and food sectors, both aspects so relevant in developing countries. Finally, a complete on-line application is presented for the download of the SAM.

## 1 Introduction

One of the objectives of the European Commission is to cooperate with developing countries to find solutions to issues related to nutrition and food security. This is implemented by carrying out the corresponding assessment of policies related to this issue, facilitating access for researchers from these countries to analytical tools that enable such assessments to be carried out autonomously. In this sense, the Joint Research Centre (JRC), the European Commission's in-house science service, is committed under the Administrative Arrangement JRC N°33272-2013-10 DEVCO 325-863 between DG Development And Cooperation – Europeaid and DG Joint Research Centre (DG JRC) to provide support for: i) improvement of information systems on agriculture, nutrition and food security, ii) policy and economic analysis to support policy decision-making process and iii) scientific advice on selected topics concerning sustainable agriculture and food and nutrition security.

In particular, the Economic of Agriculture Unit of the JRC Directorate D, Sustainable Resources, is responsible to elaborate the methodology and tools to provide macroeconomic analysis related to sustainability of policies in the sectors of agriculture, social transfer and fight against food and nutrition insecurity. The analyses and tools proposed should support the EU institutions, DG DEVCO and the partner countries for the elaboration and assessment of policies and demand-driven technical and scientific advice. Among possible scientific tools, economic simulation models represent interrelationships between selected economic variables and provide a simplified representation of economic reality to be used to quantify impacts of policy changes (i.e., ex-ante policy analysis).

Ethiopia is one of the countries analysed in this context, and one of the most important pillars in the macroeconomic analysis is the elaboration of a complex database system, called Social Accounting Matrix (SAM).

The estimation of a new SAM for Ethiopia is an important achievement itself, because it provides a lot of information about the economic structure of the country and serves, also, as main database for linear multisectoral models. For this reason, Ethiopia SAM estimation has been realized jointly by Ethiopian Development Research Institute (EDRI) /Police Studies Intsitute (PSI) (Addis Ababa, Ethiopia) and the European Commission-Joint Research Centre (JRC) (Seville, Spain).

The Ethiopian Development Research Institute has built three SAMs so far following a mixture of the two approaches outlined above. The first SAM <sup>(1)</sup>, built in 2007, was based on data from the 2001/02 fiscal year. The second SAM <sup>(2)</sup>, based on data from Ethiopian Fiscal Year (EFY) 2005/06, was developed in 2009 . The third SAM was constructed using data from EFY 2010/11.

Major national surveys have been carried out in 2015/16 with the aim of serving as a baseline for the second Growth and Transformation Plan. In line with activity calendar for Ethiopia, EDRI initiated the construction of a new Social Accounting Matrix for the year 2015/16. The Supply and Use table and SAM generated using data from EFY 2015/16 is a fourth of its kind for the country.

In this report, we present the estimation method and data sources for the construction of the SAM for 2015/16. This document is structured as follows: first, the concept and general issues of SAMs are presented in Section 2. Section 3 describes the structure and estimation of the Ethiopia SAM 2015/16, presenting the Home Production Home Consumption (HPHC) approach, and specifying the raw data collection. Also, this section shows the methods used to estimate Use and Supply tables as parts of the SAM. The section end with a description of the SAM balancing and disaggregation procedures. Section 4 includes some conclusions and finally, Annex shows some additional tables and presents the download application.

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(1) Social Accounting Matrix for Ethiopia 2001/2002 (EFY 1994), Ethiopian Development Research Institute, Addis Ababa, Ethiopia, October 2008

(2) Input Output Table and Social Accounting Matrix, Ethiopian Development Research Institute. December 2009.

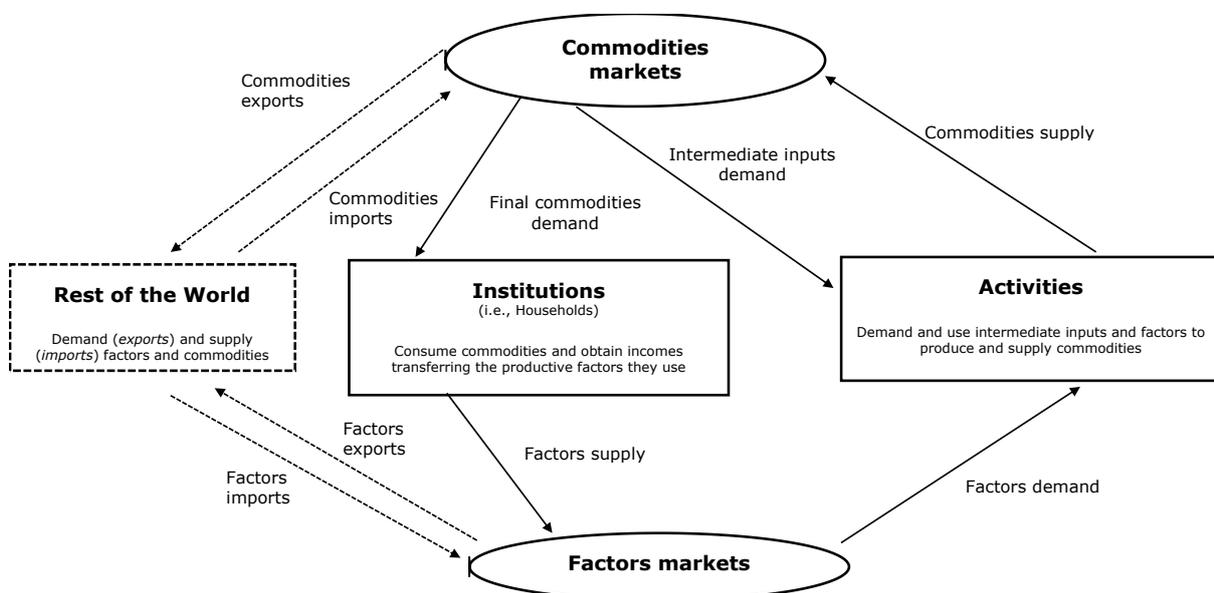
## 2 Social Accounting Matrices. Concept and general issues.

A Social Accounting Matrix (SAM) is a comprehensive and economy-wide database recording data on all transactions between economic agents in a certain economy during a certain period of time; its interest is twofold. First a SAM is a standard database for most whole economy modellers as it provides comprehensive data for economic modelling (multi-sectorial linear models or more complex CGE models). Second a SAM shows a complete and intuitive snapshot of the economy at hand (Mainar-Causapé et al., 2018).

A Social Accounting Matrix extends the traditional Input-Output tables <sup>(3)</sup>, not by using satellite accounts, but in an integrated way and in the same table or matrix, using a more disaggregated income and expenditure structure reflecting the integration of the links of the institutional sectors with productive activities, commodities (goods and services) and intermediate inputs as well as themselves. To achieve this aim, main sources are statistical systems of National Accounts, together with socio-economic statistical operations, such as household budget surveys and similar, labour force surveys or those dealing with the behaviour of foreign sector and trade.

The underlying foundation of a SAM is the concept of the circular flow of income. The concept of the 'circular-economy' or 'circular-flow' is represented <sup>(4)</sup> in Figure 1.

**Figure 1.** The circular flow (simple version)



Source: Own elaboration

In this way, the objective of closing economic flows is achieved, the SAM being a coherent framework to analyse jointly the aspects relating to production and monetary flows between institutions, representing in a full, flexible and disaggregated form all transactions of a socio-economic system. A SAM reflects the full process of production, trade, income generation and its redistribution between institutional sectors (Pyatt and Round, 1985; Pyatt and Thorbecke, 1976). This allows us with the required savings-investment accounts balance and the households budget constraint (implicit by definition of SAM), perform a reliable analysis about the distribution of wealth and income. It should be noted that some problems of I-O frameworks are still present in the SAMs, for example the use of coefficients and fixed prices for inputs and finished products.

(3) Input-output analysis primary aim is to provide a tool to analyse the production side of the economy, focussing on the intermediate input requirements and final outputs of industries. In a sense, the Social Accounting Matrices are an extension of the Input-Output analysis, but even though the traditional Input-Output framework is a key tool in the economic analysis since its origins (Leontief, 1936), providing a useful description, explanation and analysis of multi-sectorial relations the usefulness of many of these analyses is limited in the attempt to reflect the complete behaviour of the economic system, since it does not incorporate all economic transactions in the system (the circular flow). To overcome this limitation, one preferred option is to build a SAM.

(4) The circular flow is actually more complicated, existing multiple transactions between institutions (savings, direct taxes, transfers, etc.) other flows as taxes on commodities or activities, but basics of the circular flow remain.

The concept of Social Accounting Matrices begins with Stone (1947), whose pioneering work on social accounting includes most of the conventions which will later be followed by economic and statistical organisations developing this tool. Pyatt and Thorbecke (1976) subsequently formalised the concept of what is a SAM and thereby allows its use as a formal framework for economic analysis and planning (see also Pyatt and Round, 1985). A SAM provides an appropriate framework for the analysis of the key socio-economic issues such as employment, poverty, growth and income distribution, trade, etc. By the integration of data on households' behaviour in National Accounts, a SAM captures macro transactions of an economic system based on micro level transfers between all agents in the economy (Pyatt and Round, 1985; Reinert and Roland-Holst, 1997). It can incorporate various dimensions that are descriptive of the income distribution by disaggregating the households using socio-economic characteristics (e.g. income level, rural-urban division, etc.).

As mentioned previously, the estimation of a SAM contributes itself to the study of any economic system, since it collects in detail most of a country's macroeconomic (and even microeconomic) transactions. But its usefulness as a database is enormous, both in the direct application of multi-sector linear models (type multipliers) and in its use for the calibration of the sophisticated CGE models. It is also flexible in its structure and in its geographical area (national, regional, multi-regional, etc.) and time frame, allowing its use in the analysis of multitude of economic issues.

A SAM is represented by a square matrix in which each account (representative of an activity, commodity, factor or institutional sector) is represented by a row and a column. Each cell shows the payment by column account to the account in the row. Therefore, "receipts" or incomes of an account are shown along the row and "expenditures/payments" by the column. Because the double entry system of accounting ( ), for each account a SAM its total revenues correspond exactly to the total payments, and, as a result, the total of each row corresponds to the corresponding column.

Typically, a Social Accounting Matrix has six basic groups of accounts:

- Activities or Commodities (or both, separated)
- (Production) Factors
- (Private) Institutions - Households and Corporations/Enterprises-
- Government (public institution)
- (Combined) Capital accounts
- Accounts for the Rest of the World.

The final dimensions of the matrix are determined by the level of disaggregation of these six basic groups. Figure 2 shows the basic structure of a standard SAM and illustrates the complexity of the works necessary to compile it <sup>(5)</sup>. Anyway, it should be noted that concepts and assumptions sustaining a SAM are so flexible and a lot of alternative structures could be considered. Also, the order of types or groups of account is irrelevant to the information content.

Building a Social Accounting Matrix may proceed in two ways. First, it may involve building the supply use table and complement it with data on institutional accounts. Second, one may start from a supply use table generated by National Statistics Authorities and generate the SAM with the required disaggregation on activities, commodities, factors, institutions and other accounts.

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(5) Anyway, the general characteristic of this structure, as well as specific issues of its definition and composition can be found in European Commission (2013), Eurostat (2008), Mainar et al. (2018) and Miller and Blair (2009).

**Figure 2.** A Social Accounting Matrix (SAM) standard structure

	<b>Commodities</b>	<b>Margins</b>	<b>Activities</b>	<b>Factors</b>	<b>Households</b>	<b>Enterprises / Corporations</b>	<b>Government</b>	<b>Savings-Investment</b>	<b>Rest of the World</b>	<b>Total</b>
<b>Commodities (C)</b>		<b>T<sub>c,M</sub></b> Transaction costs (trade / transport)	<b>T<sub>c,A</sub></b> Intermediate (inputs) consumption		<b>T<sub>c,H</sub></b> Household consumption		<b>T<sub>c,G</sub></b> Government expenditure	<b>T<sub>c,S-I</sub></b> Investment and stock changes	<b>T<sub>c,Row</sub></b> Exports	<i>Demand</i>
<b>Margins (M)</b>	<b>T<sub>M,c</sub></b> Transaction costs (trade / transport)									<i>Margins</i>
<b>Activities (A)</b>	<b>T<sub>A,c</sub></b> Domestic production									<i>Gross output / Production (activity income)</i>
<b>Factors (F)</b>			<b>T<sub>F,A</sub></b> Remuneration of factors / Factor income						<b>T<sub>F,Row</sub></b> Factor income from RoW	<i>Factor income</i>
<b>Households (H)</b>				<b>T<sub>H,F</sub></b> Factor income distribution to households	<b>(T<sub>H,H</sub>)</b> ( <i>Inter Households transfers</i> )	<b>T<sub>H,E</sub></b> Distribution of corporations income to households	<b>T<sub>H,G</sub></b> Government transfers to households		<b>T<sub>H,Row</sub></b> Transfers to Households from RoW	<i>Household income</i>
<b>Enterprises / Corporations (E)</b>				<b>T<sub>E,F</sub></b> Factor income distribution to enterprises			<b>T<sub>E,G</sub></b> Government transfers to enterprises		<b>T<sub>E,Row</sub></b> Transfers to Enterprises from RoW	<i>Enterprise income</i>
<b>Government (G)</b>	<b>T<sub>G,c</sub></b> Net taxes on products		<b>T<sub>G,A</sub></b> Net taxes on production	<b>T<sub>G,F</sub></b> Factor income to Government / Factor taxes	<b>T<sub>G,H</sub></b> Direct Household taxes / Transfers to Government	<b>T<sub>G,E</sub></b> Direct Enterprise taxes / Transfers to Government			<b>T<sub>G,Row</sub></b> Transfers to Government from RoW	<i>Government income</i>
<b>Savings-Investment (S-I)</b>				<b>(T<sub>S-I,F</sub>)</b> ( <i>Depreciation</i> )	<b>T<sub>S-I,H</sub></b> Household savings	<b>T<sub>S-I,E</sub></b> Enterprise savings	<b>T<sub>S-I,G</sub></b> Government savings	<b>(T<sub>S-I,S-I</sub>)</b> ( <i>Capital accounts transfers</i> )	<b>T<sub>S-I,Row</sub></b> Capital transfers from RoW (Balance of Payments)	<i>Savings</i>
<b>Rest of the World (RoW)</b>	<b>T<sub>Row,c</sub></b> Imports			<b>T<sub>Row,F</sub></b> Factor income distribution to RoW	<b>T<sub>Row,H</sub></b> Household transfers to RoW	<b>T<sub>Row,E</sub></b> Corporations income to Row	<b>T<sub>Row,G</sub></b> Government transfers to RoW			<i>Payments to RoW</i>
<b>Total</b>	<i>Supply</i>	<i>Margins</i>	<i>Costs of production activities</i>	<i>Expenditure on factors</i>	<i>Household expenditure</i>	<i>Enterprise expenditure</i>	<i>Government expenditure</i>	<i>Investment</i>	<i>Incomes from RoW</i>	

Source: Aragie et al. (2017), Kiringai et al. (2007), Mainar et al. (2018), Round (2003) and own elaboration.

### **3 Structure and estimation of the Ethiopia SAM 2015/16**

For this study, an original SAM for Ethiopia has been estimated for the 2015/16 <sup>(6)</sup> period, jointly by the Ethiopian Development Research Institute (EDRI) based in Addis Ababa, and the JRC based in Seville. The estimation of this SAM is especially noteworthy because there is no IO framework from which to build the SAM. Furthermore the estimation is made from scratch, based on microdata from various statistical sources. Next to data preliminary work, an initial SAM has been obtained with additional statistical information, adjusted with available official macro-magnitudes, adequately balanced and refined. This process finally produced a highly disaggregated SAM, fully consistent with Ethiopian economy's figures.

Main databases used to estimate the SAM for Ethiopia, most of them provided by the Central Statistical Agency of Ethiopia (CSA) are:

- 2014/15 and 2015/16 National Accounts Statistics, NAS (CSA) Structure and estimation of the Ethiopia SAM 2015/16
- 2015/16 Ethiopian Household Consumption – Expenditure Survey, HCE (CSA)
- 2015/16 Ethiopian Socioeconomic Survey, ESS (CSA and Living Standards Measurement Study –LSMS–), World Bank)
- 2015/16 Fiscal data from Ministry of Finance and Economic Cooperation (MOFEC)
- 2015/16 Balance of Payments Database from National Bank of Ethiopia (NBE)
- 2015/16 Large and Medium Scale Industries Survey (CSA)
- 2015/16 data from Ethiopian Revenue and Customs Authority (ERCA)
- 2014/15 and 2015/16 Retail and producer price survey data (CSA)
- 2013/14 Labour Force Survey (CSA)
- 2015/16 Smallholder agricultural sample survey, Agss (belg and meher) (CSA)
- 2015/16 Commercial farms survey, CFS (CSA)
- 2015/16 Livestock agricultural sample survey, Lagss (CSA).
- 2015-16 Land Use Survey Report (CSA)
- 2015-16 Area and crop production report (CSA)
- 2015/16 MAFAP Public Expenditure Database (MAFAP-FAO)

#### **3.1 The Home Production Home Consumption (HPHC) approach**

Due to the special data needs of the model used in this analysis, the SAM for Ethiopia was built with a specific structure, incorporating specific accounts for the treatment of Home Production Home Consumption (HPHC) issue (Aragie et al, 2015) and a high level of regionalization.

HPHC concept is introduced in the SAM by assuming that households have a "production component". Besides the classic Representative Household Groups (RHG) that collect household behaviour as consumers of goods and services and as providers of factors of production (and receptor-contributors of transfers), the SAM includes new accounts incorporating the behaviour of households as units of production of commodities. These accounts integrate the economic behaviour of households as producers of food commodities, i.e., agricultural, livestock and fish products. This requires also separate accounts for commodities produced by these households for own consumption (HPHC as

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(6) Note the fiscal year 2008 in the Ethiopian calendar covers, approximately, June 2015 to June 2016.

input or as final product) and other marketed commodities (produced both by households and by conventional productive activities). Rows of these commodity accounts reflect HPHCs use as intermediate inputs in the productive activities of households and their consumption in final demand of households (RHG). Their row sums must be equal to the sums of the columns that summarize the contributions of the activities of households to each of these goods. Similarly, columns of the households activities show how they use inputs (HPHC and marketed), while rows show the destination of their production as inputs, own-consumption goods or marketed commodities. It is necessary to point out that households considered as producers have been broken down regionally (one household category for each region considered, i.e., Addis Ababa, Afar, Amhara, Benishangul-Gumuz, Dire Dawa, Gambella, Harari, Oromia, Somali, SNNP and Tigray), although commodities produced are taken at national level in unique accounts.

### **3.2 Raw data and proto-SAM. Coverage and data source.**

One of the most relevant aspects of the Ethiopia SAM 2015/16 is the big effort made to start from the scratch, without a previous official Supply-Use or Input-output framework. Therefore, a protosam following the accounts structure was estimated by EDRI/PSI using microdata from the different source. Later, this proto-SAM was balanced and disaggregated by JRC, using sometimes additional and complementary data sources to guarantee the economical and statistical coherence of the final matrix and to allow the targeted splits and disaggregated accounts.

The prior (proto) SAM for 2015/16 has 58 activities and 73 commodity accounts. In addition, there are factors, household, government, enterprise, tax and rest of the world accounts.

Each domestically produced goods and services is produced by an activity. The activity accounts follow the national accounts industry classification. Therefore, activity accounts cover agriculture, hunting, forestry, fishing, mining and quarrying, manufacturing, electricity and water, construction, wholesale and retail trade, transportation, communication, financial intermediation, real estate and renting, business activities, public administration and defence, education, health and social work, other social and personal services and private households with employed persons.

#### **Agriculture**

Most crops have separate commodity and activity accounts and some of the crops are grouped together. The five major cereals (teff, maize, wheat, barley and sorghum) have their own commodity and activity accounts. In addition, coffee, enset, cotton and flower have their own commodity and activity accounts. Pulses, oilseeds, fruits, and vegetables are grouped together as commodity and activity. Cash crops (sugar cane and chat) have separate commodity accounts, but they are grouped in one activity account, acash. All other crops elsewhere not classified (nec) are grouped together in ccrop, which is the commodity account, and an activity account acrop.

The livestock sector has six activity accounts and commodity accounts. These are cattle, sheep, goat, camel, poultry and other livestock. Each account covers the production of live animal as well as animal products (i.e., meat, milk, and dung).

We use data collected from both smallholder farmers and commercial farmers. Most of the dataset used are from the Central Statistical Agency of Ethiopia. Specifically, we have used:

- 2014/15 and 2015/16 retail and producer price survey data,
- 2013/14 Labour force survey,
- 2015/16 smallholder agricultural sample survey (Agss) (belg and meher),

- 2015/16 Commercial farms survey (CFS),
- 2015/16 livestock agricultural sample survey (Lagss) and
- 2015/16 Ethiopian Socioeconomic Survey (ESS).

Data used for the estimation of the supply and use values for the flower and cotton sector are obtained from selected flower companies and cotton producers' association. The price of cotton was taken from USDA GRAIN REPORT Number ET1512.

Forestry and fishing have separate activity and commodity accounts. The data source for both activities is the National Accounts Statistics.

## **Mining**

Mining and quarrying are grouped together in terms of activity and commodity. The data source for both activities is the Nation Accounts Statistics (NAS).

## **Manufacturing**

The supply and use tables for the manufacturing sector are based on data from periodic surveys of manufacturing firms conducted by CSA designed to provide basic information on the characteristics, structure and performance of manufacturing firms. Manufacturing establishments are divided into three major groups. These are:

- Large and Medium Scale Manufacturing Establishments, engaging 10 or more persons and using power -driven machinery. For this category of firms CSA conducts annual surveys. We have used the 2015/16 manufacturing survey to construct the supply and use tables.
- Small Scale Manufacturing Establishments are those engaging less than 10 persons and use power -driven machinery. CSA surveys this category of firms in a three to five years interval. The latest available survey is conducted in 2013/14. We used this data to construct the coefficients of the supply and use tables and updated the values using MOFECs 2015/16 national account estimation.
- Cottage/Handicraft Manufacturing Establishments performing their activities by hand (i.e., using non -power driven machinery). The latest data on cottage manufacturing establishments is based on the 2000/01 survey. We used this dataset to construct the coefficients of the supply and use tables and update the values based on the 2015/16 values specified in the National Accounts data.

## **Trade and transport margins**

The trade and transport margins have been estimated using data on producer prices, unit values of imports and their retail prices. We have also used data from the Ethiopian Revenue and Customs Authority (ERCA) for the tax rates on commodities. We have also used data from the Central Statistical Agency on retail and producer prices.

## **Distributive Trade**

The supply and use tables for the wholesale, retail, and motor vehicle sales and maintenance account are based on the 2013/14 distributive trade surveys of CSA. The

values are updated to 2015/16 based on values in the national accounts data. Traditionally, the distributive trade surveys used to include hotels. However, recent surveys have stopped that practice. As a result, the supply and use coefficients of the hotels activity is constructed using data from the 2003 distributive trade survey of CSA.

### **Households**

We made use of the 2015/16 household consumption expenditure data to generate the consumption pattern of various groups of households (location and quintile). Similarly, we generated the division of remittances, government transfers, factor payments, and enterprise transfer to households using the same data.

### **Government**

We use the 2015/16 Ethiopian fiscal year audited detailed government expenditure data to generate information on government consumption, direct tax by source, indirect tax by commodity, and indirect taxes by commodity.

### **Rest of the World**

Detailed commodity level import and export values can only be inferred from disaggregated import and export values at 6 or 8-digit HS code level. The only source of information for such data in the country is ERCA. For our purpose, we have used the 8-digit HS code level disaggregation to map commodities in to groups included in the SAM. The aggregate value of both imports and exports generated from the commodity level data is slightly different from the values specified in the National accounts data. We adjust the aggregate value for consistency.

The data for import and export is based on the 2015/16 commodity level data from ERCA. Transfers to the government are based on the 2015/16 fiscal data from Ministry of Finance and Economic Cooperation (MOFEC). Factor payments are generated using IMF's BOP data. Transfers to households are generated using data from the BOP database of NBE.

### **Enterprises**

The payments to and from enterprises are based on 2015/16 data from various sources. These include government budget data, IMF's BOP, and household consumption expenditure survey.

### **Saving-Investment**

The saving of the government is generated using the budget deficit in the government budget data. The saving of the rest of the world is estimated using the current account deficit in the NBE's BOP dataset. The savings of households and enterprises are estimated as residual items.

## **3.3 Methodology of Estimation: Use table**

Each activity in the SAM uses intermediate inputs and factors to produce one or more commodities. This section of the SAM is called the use table. Each item used by activities is valued at basic prices. Below we describe in detail the way intermediate inputs and factors are constructed for each type of activity. The list of activities included in this project is presented in table A.2 in the appendix.

## Intermediate inputs (Commodities | Activities)

Each activity uses commodities which are either produced by the same activity or other activities as well as imported commodities as intermediate inputs. The use of factor of production (such as land, labour and capital) is not considered as intermediate inputs.

### **Agricultural Activities**

Agricultural activities include the production of crops, livestock and livestock products, forestry, hunting, and fishing.

Crop related activities pay for fertilizers, other agrochemicals (pesticides, herbicides, fungicides and others), seeds, and manure used by farmers. The value of the inputs used by crop related activities is generated in two steps. The amount of seed, fertilizer, and other inputs utilized is generated using CSA's annual agricultural survey of both small holder farmers and commercial farms for the 2015/16 fiscal year. These quantities are converted into value by using price data from the Ministry of Agriculture (for agro chemicals) and CSA's retail price survey for seeds.

The activities in the livestock sector pay for animal feed and health services as intermediate inputs. The amount for animal feed and health services utilized is generated using CSA's annual agricultural survey of both small holder farmers and commercial farms for the 2015/16 fiscal year. These quantities are converted into value by using price data from CSA's retail price survey.

### **Manufacturing Activities**

Inputs use by large and medium industries was derived from CSA's (2015/16) Large and Medium Scale Industries Survey. Information on total raw material use by activity is available from the Small and Cottage Industries Survey, but the survey lacks information on commodity level input use. Hence, the shares of commodity level inputs for large and medium industries were used to distribute the total raw materials into commodities.

### **Whole Sale and Retail Trade**

Input coefficients for the wholesale and retail industry have been derived from the Distributive Trade Survey for 2013/14. Since the SAM is being constructed for 2015/16, the coefficients have been applied on the NAS 2015/16 aggregate value for the industry.

### **Hotels and Restaurants**

In this case, Input coefficients have been derived from the Distributive Trade Survey for 2003. This is the latest survey which has the hotel and retail sector. Since the SAM is being constructed for 2015/16, the coefficients have been applied on the NAS 2015/16 aggregate value for the industry.

### **Financial Activities**

The intermediate inputs for the financial industry are generated in two steps. We first used the 2015/16 fiscal year financial statements of three banks and two insurance companies we were able to get access to generate their input structure at a commodity level. We updated the values of the inputs to the aggregate level by using the value of the financial industry in the National Accounts data.

## **Communication**

The intermediate input structure of the communication activity is generated using the 2015/16 financial statement of Ethio telecom. The coefficients are updated to reflect the aggregate industry value using the communication industries value in the National Accounts data.

## **Other activities**

The detailed input coefficients of the activities listed above is constructed using information either from CSA surveys, administrative data from the government, or financial statements of companies. Such sources of information, however, do not exist for some activities. In this case, the input coefficients from 2010/11 SAM are applied on the aggregate values from the National Accounts Statistics (NAS) for 2015/16.

Activities included in this group are water, electricity, construction, business services, and other services.

## **Value-added (Factors | Activities)**

Value added is the payment by activities to factors of production such as labour, capital, and land. In the 2015/16 SAM, four major categories of labour have been identified based on their education (i.e., uneducated, primary, secondary and tertiary). The labour categories have been further disaggregated into urban and rural based on area of residence. Capital have been categorized into land, livestock and non-agricultural capital (see Table A.3 in the appendix for the factor categorization).

## **Agricultural Activities**

The payment for labour, land, and draught power by each crop activity is estimated in two steps. First, we estimate the per hectare cost of each factor of production for each activity (crop) using data from the Ethiopian Socio-Economic Survey (ESS) for the year 2015/16. In the second stage, we generate the total payment for each factor using the total land under cultivation for each crop using information available in the CSA's annual agricultural survey. For the livestock activities, we have used the share of value added in total value of output using the 2010/11 SAM.

The total earning of labour for each activity is disaggregate into the different labour categories using the earning share of each labour generated using CSA's 2013/14 labour force survey.

## **Manufacturing Activities**

CSA's large and medium manufacturing survey has data on the number of each types of labour (administrative and technical employees, production workers, and seasonal and temporary workers). It contains information about total compensation for each type of workers by each establishment. We use this information to impute the wages of family workers and others that are not paid in cash. The payment to capital is generated in two steps. We first generate total value added by subtracting cost of production (intermediate input) from the gross value of production. In the second step, we subtract the payment for labour from the gross value-added value.

The payment for labour and capital by small scale manufacturing firms was constructed in a similar fashion based on data from the 2013/14 survey. We use the share of labour and capital in the 2013/14 survey and apply it to the gross value-added value of small scale manufacturing industry provided in the 2015/16 National accounts data.

The payment for labour and capital by cottage manufacturing industry is generated by multiplying the labour and capital shares in the small-scale manufacturing data to the total value added of the cottage industry in the national accounts data for 2015/16.

The total payment to labour and capital is the sum of the payments to both factors from the three categories of manufacturing industry listed above. The value for labour is further disaggregated in to education and location pairs using the coefficients generated from the 2013 labour force survey of CSA.

### **Wholesale and retail trade activity**

Total Value-added statistics for the wholesale and retail trade has been obtained from the 2015/16 National Accounts statistics (NAS) estimates. The return for labour was estimated by adding the wage and compensation expenditure of urban enterprises engaged in wholesale and retail trade using the Distributive Trade Survey for 2013/14 that covers the urban areas. A constant ratio of labour costs to value added for enterprises at both urban and rural areas has been assumed. The labour cost or return for labour for rural enterprises is estimated as a residual of national and urban enterprises. The estimated value of labour was then disaggregated into various sub-accounts of labour. Once the return for labour is estimated, the return for capital is estimated as a residual of the total value added and return for labour.

### **Hotels and Restaurants activity**

The return for labour was estimated to the activity trade by adding the wage and compensation expenditure of urban enterprises in the 2014 distributive and service trade survey. A constant ratios of value added to labour costs for enterprises at both urban and national level has been assumed so that the value of labour cost at national level is estimated from labour costs of urban enterprises available in the survey. The labour cost or return for labour for rural enterprises is estimated as a residual of national and urban enterprises. The estimated value of labour was then disaggregated them into various sub-accounts of labour. Once the values added and return for labour are estimated, the return for capital is estimated as a residual of the two.

### **Financial activity**

The value added for the financial industry is generated in two steps. We first construct the value added of each financial sector firm in our dataset by subtracting cost of production from gross value of production. We then estimate the payment for capital by subtracting total wage paid from gross value of production. We update the values of both labour and capital by multiplying each item's value by the ratio of the value of the financial sector value added in the national accounts to the value added in our dataset. Similar to the discussion above, the earnings of labour is disaggregated into various labour groups by education and location using the coefficients in the 2013/14 labour force survey of CSA.

### **Communication**

The value added for communication is generated in two steps. We first construct the value added of *Ethio Telecom* by subtracting cost of production from gross value of production. We then estimate the other values following the same procedure as used with financial activities.

## **Other activities**

For other activities, the value-added statistics has been obtained from the National Accounts Statistics for 2015/16. The value of total output has been obtained using the share of value added in gross value of output from the 2010/11 National account statistics. The share of return to labour in total value added has been used from the 2010/11 Social Accounting Matrix.

## **Final Demand (Commodities | Institutions)**

The commodities available in the economy (total commodity supply) are used either as intermediate inputs in the production process or are consumed by institutions. These institutions include: households, government, and the rest of the world.

## **Households (Commodities | Households)**

The consumption of households is generated using data from the 2015/16 household consumption expenditure survey of CSA. Each consumption item in the CSA survey is mapped to the commodities in the 2015/16 SAM using the Classification of Individual Consumption According to Purpose (COICOP) classification.

The consumption of each commodity by households is classified in to two (marketed and own consumption) based on whether the good is purchased from the market or the item is produced by the household.

We also disaggregate households in to 20 groups based on location and wealth. For each location (big city, small city, other towns, and rural areas), we divided households in to quintile. The classification of households is listed in the appendix (see table A.4 in the appendix).

## **Government (Commodities | Government)**

Following standard classification, we assign certain outputs produced by the public sector as consumed by the government. These include public administration, health, and education. The values of each consumption items are generated using the detailed audited government expenditure data for 2015/16 fiscal year provided by MOFEC.

## **Rest of the World (Commodities | ROW)**

The rest of the world imports items from Ethiopia. The values of imports by the rest of world (i.e., Ethiopia's exports) is generated using 8-digit level HS code export data for 2015/16 fiscal year provided by ERCA. The values are adjusted to align aggregate value with the total export figure reported in the National accounts data.

## **Gross capital formation (Commodities | Investment)**

Gross capital formation is the addition of fixed assets and changes in stocks. The types of fixed assets considered include construction, machineries and equipment (i.e., transport equipment, software etc.). Household durables are not included as part of gross capital formation.

The total value for gross capital formation is obtained from the National Accounts Statistics for 2015/16. We have disaggregated the total gross capital formation in the respective commodities in two steps. First, we have estimated the total unused commodity/fixed assets by deducting the use of commodities/fixed assets by other

institutions (i.e., Household and RoW) from the total supply. We have estimated the share of the commodities/ fixed asset and have applied on the total Gross fixed capital formation obtained from the National Account Statistics.

### **3.4 Methodology of Estimation: Supply table**

#### **Supply of domestic activities (Activities | Commodities)**

The output of each domestic activity is divided in to two based on whether the output is sold in the market or used for own consumption. The output sold in the market is either used by domestic industry as an input, by households for consumption, or it is exported.

#### **Agricultural Activities**

For agricultural commodities (for both crop and livestock) we have used the gross value of production of activities as total domestic supply by each activity. The gross value of production is calculated using data from the 2015/16 annual agricultural sample survey and commercial farms survey of CSA.

The marketed commodity is netted out of the total supply using the information on own consumption contained in the agricultural sample survey. i.e., the value of gross output less the value of non-marketed consumption is paid from each activity to its corresponding commodity, thereby balancing activity rows and columns.

#### **Manufacturing Activities**

Certain manufacturing activities produce more than one commodity. As a result, the supply of each commodity by activity is estimated by multiplying the producer price of the commodity by the quantity of supply of the commodity by the specific activity.

This process necessitates listing all products produced by firms included in CSA's manufacturing surveys. Since some commodities are missing from the digital database, we recoded the data using the data available in the paper survey.

Note that since the way supply is constructed is different from the way gross value of production is generated there may end up being an imbalance between the column and row values. This imbalance is adjusted in the SAM balancing stage.

#### **Other Activities**

For all other activities except water, there is no own consumption. As a result, total supply of the commodity is equivalent to marketed supply of the commodity. Total supply of the commodity is in turn equal to gross value of production.

#### **Supply by the Rest of the World (Imports) (ROW | Commodities)**

Another source of supply of commodities is import from the rest of the world. To generate the values of imports for each commodity included in the 2015/16 SAM we used the 8-digit level HS code import data provided by ERCA. Values are adjusted to reflect the aggregate import value figure in the National accounts data.

Since we will later include margins and taxes to convert values of commodity supplies in to market values, we estimate imports using their FOB values.

The combination of domestic supplies at basic prices and imports at FOB value gives us the total commodity supply in the economy at basic prices. Below we discuss the inclusion of margins and taxes that convert the basic price value in to market price value.

### **Transaction costs (Commodities | Commodities)**

Margins are trade and transport costs associated with moving goods between producers, markets and national borders, either for domestic, import or export trade. For example, exporters incur transport fees when moving goods from their factories to the national border, whereas importers incur fees when delivering goods to domestic markets.

In the 2015/16 SAM, margins are estimated by the gap between producer and market prices, net of indirect taxes, using price data contained in the producer and retail price surveys of CSA. The unit values for imports and indirect taxes rates were obtained from the Ethiopian Revenue and Customs Authority.

### **Taxes on products (Taxes | Commodities)**

All indirect taxes imposed on goods and services (or net subsidies if SAM value is negative). In the 2015/16 SAM, we classified indirect taxes in to seven groups: local excise tax, local sales tax, import duty, import excise tax, import vat, import sur tax, and import withholding tax.

Estimating the amount of each type of indirect tax on products requires detailed data on commodity level transactions. 8-digit level HS code classification. The taxes paid by the commodities in each HS code are mapped to corresponding commodities.

For locally produced goods, we use data provided by MOFEC that classifies the local excise tax and local sales tax paid at commodity level.

### **Institutions**

The institutions accounts in the SAM describe the interlinkage between income and expenditures of institutions. It also records transfers between institutions.

### **Household transfers to government (Government | Households)**

These are payments by household to the government other than for direct taxes. For example, households may contribute to public social welfare schemes, including retirement and healthcare funds.

In the 2015/16 SAM, we estimate the total value of transfer from households to the government using the detailed and audited government revenue data for the 2015/16 fiscal year. The items included in the transfer are social security contributions, sales of goods and services by the government, fines and penalties.

The aggregate value is distributed across household's categories using each household type's reported transfer value share in the 2015/16 household consumption expenditure survey as a ratio.

### **Household payments abroad (Rest of World | Households)**

This refers to the amount of remittances households send abroad. In the 2015/16 SAM, the amount of payment households send abroad is estimated using the value of "personal transfers, debit" account in the IMF's BOP database for the 2015/16 fiscal year.

The transfer value is disaggregated into the 20 households in the SAM using data from the 2015/16 household expenditure survey. Specifically, we use the transfer value of

each type of household to generate a ratio and multiply those coefficients with the total value in the BOP database to generate the total transfer of each type of households abroad.

### **Government transfers to households (Households | Government)**

Government transfers to households include payments to households from a public pension or cash transfer scheme. In the 2015/16 SAM the transfer is estimated using the values reported in the 2015/16 household consumption expenditure survey. The household consumption expenditure survey lists the sources of revenue households utilized for their expenditure. We use this information to estimate the values of government transfer to households. Specifically, the items we included in the government transfer category are the following sources: social security and consumption or use of donation items, sale of donation items and donation in cash from government.

### **Government transfers to enterprises (Enterprises | Government)**

Government transfer to enterprise includes government payment of a loan to domestic banks, government injection of money to government owned enterprises.

In the 2015/16 SAM, this value is estimated using the audited government expenditure data for the 2015/16 fiscal year.

### **Government payments abroad (Rest of World | Government)**

These are transfer from the government to the rest of the world in the form of foreign aid and payment of loans.

In the 2015/16 SAM, the value of government transfer to the rest of the world is estimated by adding principal loan payments and interest payments to foreign creditors by the government in the fiscal year 2015/16. The source of data is MOFEC's audited government expenditure data for the 2015/16 fiscal year.

### **Enterprise transfers to households (Households | Enterprises)**

Enterprise transfers to households are indirect capital payments by enterprises to households as well as earnings of household non-farm enterprises.

In the 2015/16 SAM, enterprise transfer to households is estimated as a residual. Specifically, we estimate the transfer to be equal to the difference between the income of enterprises and the payment of enterprises to the government, rest of the world, taxes, and savings.

The aggregate value of the estimated transfer is divided across households using shares generated from the 2015/16 household consumption expenditure survey. For each household we estimate the income generated from non-agricultural capital by adding earnings from sources such as imputed value of dwelling units, savings, insurance, etc.

### **Enterprise transfers to government (Government | Enterprises)**

This refers to transfers from enterprises to governments other than direct tax payments. Payments included in this category are loan payments by firms to the government, dividend from government owned enterprises.

In the 2015/16 SAM, enterprise transfers to the government are estimated using data from audited government revenue for the 2015/16 fiscal year. It is the sum of fees (such

as business license fees), interest on loans, and sales of goods and services to enterprises).

### **Enterprise payments abroad (Rest of World | Enterprises)**

Enterprise payments abroad are in estimated using the "other transfers, debit" in the secondary income section of IMF's BOP database for the 2015/16 fiscal year.

### **Foreign transfers to households (Households| Rest of World)**

Foreign transfers to households are remittances to domestic households from the rest of the world. In the 2015/16 SAM the value of foreign transfers to households is estimated using the private transfers' value in the NBE's BOP data for fiscal year 2015/16.

The total value of the transfer is divided across households using data in the 2015/16 household consumption expenditure survey. We use each category of household's reported earnings from remittance to generate the shares.

### **Foreign transfers to enterprises (Enterprises| Rest of World)**

Foreign transfer to enterprise payments abroad are in estimated using the "other transfers, credit" in the secondary income section of IMF's BOP database for the 2015/16 fiscal year.

### **Foreign transfers to government (Government| Rest of World)**

This refers to transfers from the rest of the world to the government. These include foreign aid, interest payment, and loan repayment by the rest of the world.

In the 2015/16 SAM, foreign transfer is estimated using the total foreign grants value in the audited government revenue data for the fiscal year.

### **Foreign transfers to factors (Factors | Rest of World)**

This refers to payments to labour, land, capital owned by domestic residents by the rest of the world. Foreign transfer to labour estimated using the "compensation of employees, credit" and transfers to capital are estimated "investment income, credit" in the secondary income section of IMF's BOP database for the 2015/16 fiscal year.

### **Factor income to enterprises (Enterprises | Factors)**

This refers to gross operating surplus of enterprises. In other words, it measures the return to non-agricultural capital.

In the 2015/16 SAM, factor income to enterprises is estimated as the difference between the total income received by non-agricultural capital and the transfer of non-agricultural capital to the rest of the world.

### **Factor income to households (Households | Factors)**

This refers to the payment of the earnings of labour, land, and livestock. In the 2015/16 SAM it is estimated as the difference between the total income of each type of labour, land, and livestock capital and the transfer of these factors to the rest of the world.

Factor payments abroad (Rest of World | Factors)

This refers to payments to labour, land, capital owned by the rest of the world. Transfer to labour is estimated using the "compensation of employees, debit" and transfers to capital are estimated "investment income, debit" in the secondary income section of IMF's BOP database for the 2015/16 fiscal year.

### **Household payment of Taxes (Taxes | Households)**

These are taxes directly paid by households to the government. Taxes included in this category, in the 2015/16 SAM, are personal income tax, agricultural income tax, land use fee, and rental income tax. The taxes are all estimated from the audited government revenue data for the 2015/16 fiscal year.

### **Enterprise Payment of Taxes (Taxes | Enterprises)**

These are taxes directly paid by enterprises to the government. Taxes included in this category, in the 2015/16 SAM, are profit tax, agricultural income tax, dividend tax, interest income tax, capital income tax, and other direct enterprise taxes (such as municipality taxes). All the taxes are estimated from the audited government revenue data for the 2015/16 fiscal year.

### **Savings**

The savings account records the savings of all institutions in the economy. It is generally estimated as the residual (balancing item) between the earnings of the institutions and their expenditure.

#### **Foreign savings (Savings | Rest of World)**

The foreign savings is the difference between the amount of foreign exchange receipt of the country and the amount of the foreign exchange outflow out of the country. It is equal to total foreign capital or savings inflows.

In the 2015/16 SAM, foreign saving is estimated as the current account deficit. In other words, it is the difference between the income of the rest of the world and the expenditure of the rest of the world.

### **Government savings (Savings | Government)**

This refers to savings by the government. It is equivalent to the recurrent fiscal surplus for the government (of deficit if cell entry is negative).

In the 2015/16 SAM, it is estimated as the difference between revenues and recurrent expenditures of the government. Revenues are receipts of the government other than loans. Recurrent expenditures are spending by the government in terms of government consumption and transfers to other institutions (households, enterprises, and the rest of the world). In other words, recurrent expenditure consists of all expenditures of the government other than public capital investments.

### **Enterprise savings (Savings | Enterprises)**

This refers to the savings of domestic enterprises. As the resource flow is calculated in gross terms, the savings of enterprises includes consumption of fixed capital and reinvested earnings.

In the 2015/16 SAM, the savings of enterprises is estimated by deducting the savings of the rest of the world, the government, and households from the gross capital formation value given in the National accounts data.

### Household savings (Savings | Households)

This refers to Domestic private savings by households. In the 2015/16 SAM household savings is calculate as a residual item. It is the difference between total savings in the economy and the savings of all other institutions (RoW, Government, and Enterprises).

### 3.5 SAM balancing and disaggregation

The proto SAM that is constructed by EDRI / PSI, based on the microdata of the different statistical sources available for Ethiopia, was balanced and then it was made the necessary disaggregation to obtain the final version of the SAM.

The first step of this process consisted of obtaining a Macro SAM (SAM aggregated by main groups of accounts) for the period, so that, when balancing and splitting the matrix, there was a coherent reference with the main official economic aggregates of the country. This Macro SAM was constructed by combining the aggregated data of the proto SAM with the different aggregates available in the National Accounts of Ethiopia (CSA). The resulting Macro SAM is showed in Table 1.

**Table 1.** Macro SAM for Ethiopia 2015/16 (million Birr)

	Activities	Commodities	Factors	Enterprises	Households	Government	Taxes	Investment	Rest of the World	Total
Activities		2,151,741								2,151,741
Commodities	735,638				1,099,313	148,837		588,705	122,366	2,694,859
Factors	1,416,103								9,282	1,425,386
Enterprises			509,423			5,595			277	515,295
Households			910,486	369,922		11,211			127,340	1,418,959
Government				18,729	8,298		188,892		28,570	244,489
Taxes		118,590		41,207	29,096					188,892
Saving				84,828	279,600	73,063			151,215	588,705
Rest of the World		424,528	5,478	610	2,652	5,783				439,051
Total	2,151,741	2,694,859	1,425,386	515,295	1,418,959	244,489	188,892	588,705	439,051	

Source: Own elaboration

Prior to balancing and adapting to the values of the Macro SAM, the proto SAM was aggregated (except in activities and commodities) to a "base" version, in which for the labour factor, indirect taxes and households, only one single account was considered for each group. This base version was balanced using RAS and Cross Entropy methods (McDougall, 1999; Robinson et al., 2001) (7).

Once this "base" SAM was estimated, the next step was to adapt its structure and estimate the corresponding disaggregations and splits, following the basic structure of the SAM showed in Table 2. The breakdown of commodities and activities is summarized in Table 3 (Table A1 in Annex shows all accounts considered in the Ethiopia SAM 2015/16).

For the disaggregation of the SAM, the databases used for the construction of the Proto SAM have been used again, as well as the exploitations made by the authors. In addition, the additional information has been used, such as the Global Forest Resources Assessment 2015 report (FAO, Rome, 2014).

(7) These methods were also used later, in each disaggregation, to ensure the smooth estimation of some specific SAM cells, subject to known targets for accounts row or column totals, and cells or submatrices for which statistical information were available as well as the macroeconomic targets.

**Table 2.** Basic structure of flows in the Ethiopia SAM 2015

	ch	cm	m	ahf	a	flab	fland	flivst	fcp_na	hh	enter	gov	dirtax	indtax	imptax	i-s	row
HPHC commodities (ch)				X						X						X	
Marketed commodities (cm)			X	X	X					X		X				X	X
Margins (m)		X															
Households as activities food (ahf)	X	X															
Activities (a)		X															
Labour factor (flab)				X	X												X
Land factor (fland)				X	X												
Livestock (flivst)				X	X												
Capital non-agricultural (fcp_na)				X	X												X
Households (hh)						X	X	X	X		X	X					X
Enterprises (enter)							X	X	X			X					X
Government (gov)										X	X		X	X	X		X
Direct taxes (dirtax)										X	X						
Indirect taxes (indtax)		X			X												
Imports taxes (imptax)		X															
Save/Investment (i-s)										X	X	X					X
Rest of the World (row)		X				X			X	X	X	X					

Source: Own elaboration

The regional breakdown in the SAM for Ethiopia 2015/16 corresponds to the 9 administrative regions and two chartered cities of Ethiopia: *Addis Ababa, Afar, Amhara, Benshagul Gumuz, Dire Dawa, Gambelia, Harari, Oromia, SNNP, Somalie and Tigray*. In the SAM each administrative region is further disaggregated into three zones: *Rural, Small Towns, Medium and large towns/cities*. Note that for some regions, not all three zones are covered (i.e., in *Addis Ababa* only *Medium and large towns/cities zone* is considered). Finally 28 different regions are distinguished in the SAM, and each one includes one Representative Household Group (RHG) <sup>(8)</sup>.

In terms of agricultural production, the SAM accounts for three types of production agents: there are 11 household agricultural activities (*ahf*), one per each administrative region, that produce 23 "subsistence commodities" not marketed and consumed at home, and 15 marketed crops. The classic activities sectors (representing the market oriented larger holder producers) produce food and cash crops at national level.

Three types of labour are considered: skilled, semi-skilled and unskilled labour. Each labour factor is also regionalized for all 11 administrative regions, so the SAM takes into account 33 different types of labour. Regarding capital factor, it has been split into *land, livestock* and *non-agricultural capital*.

A taxation split is included in order to address fiscal issues. Thus the SAM considers specific accounts for three taxes, i.e., *direct taxes, indirect taxes* on commodities sales (including VAT) and *import taxes*.

(8) A SAM traditionally adopts the concept of Representative Household Group (RHG) where different households group are represented by an aggregated account. The assumption is that all individual households in a RHG are, on average, affected in the same manner by a policy shock. Thus, in forming household groups, it is very important to consider similar preferences and characteristics (similar households are more likely to be affected similarly by economic shocks).

**Table 3.** Activities and commodities disaggregated in Ethiopia SAM 2015/16

<i>HPHC commodities</i>	<i>Marketed commodities</i>			<i>Representative Households Groups as activities</i>	<i>Activities</i>		
Teff	Teff	Raw milk	Pharmaceutical Products	Addis Ababa	Growing of food crops	Wood and wood products	Real Estate, Renting and Business Activities
Barley	Barley	Cotton	Mineral products nec	Afar	Growing of cash crops	Manufacture of paper and paper products; publishing; printing	Business Activities
Wheat	Wheat	Animal products nec	Cement	Amhara	Growing of coffee	Manufacture of chemicals, rubber and plastic products	
Maize	Maize	Forestry	Metals nec	Benshagul Gumuz	Growing of crops nec	Manufacture of pharmaceuticals, medicinal chemicals	
Sorghum	Sorghum	Fishing	Metal products	Dire Dawa	Growing of flowers	Manufacture of mineral products	
Pulses	Pulses	Minerals nec	Motor vehicles and parts; other transport equipment	Gambelia	Raising of cattle	Manufacture of cement, lime and plaster	
Vegetables nec	Vegetables nec	Vegetable products; animal oils and fats	Electronic equipment	Harari	Raising of sheep	Manufacture of basic iron and steel	
Oil seeds	Oil seeds	Dairy products	Machinery and equipment nec	Oromia	Raising of goat	Manufacture of metal products	
Sugar cane	Sugar cane sugar beet	Sugar and sugar confectionary	Manufactures nec	SNNP	Raising of camel	Manufacture of ovens, furnaces and furnace burners	
Fruit Crops	Fruit Crops	Grain mill products and grain mill services	Electricity	Somalie	Raising of poultry	Manufacture of accumulators, primary cells and	
Tea	Tea	Food products nec; animal feeds	Water	Tigray	Raising of other animals	Manufacture of bodies (coachwork) for motor vehicles; manufacture	
Chat	Chat	Beverages	Construction		Forestry	manufacture of medical equipments	
Coffee	Coffee	Tobacco input Products	Trade and repair services		Fishing	Manufacture of furniture	
Enset	Enset	Manufactured Tea	Hotels and restaurants		Mining and quarrying	Electricity	
Cereal grains and other crops nec	Cereal grains and other crops nec	Manufactured Tobbaco	Transport services		Manufacture of dairy products	Water	
Cattle	Animal feed	Linted cotton	Communication		Manufacture of grain mill products and provision of grai mill	Construction	
Sheep	Flower	Textiles	Financial services		Manufacture of sugar	Wholesale and retail trade; repairs	
Goat	Cattle	Wearing apparel	Business Srvices		Production, processing and preserving of meat	Hotels and Restaurants	
Camel	Sheep	Leather products	Public administration and defence		Distilling, rectifying and blending of spirits; ethvl alc	Transport	
Poultry; Other small livestock	Goat	Wood products	Education		Manufacture of tobacco products	Communication	
Animal products nec	Camel	Paper products publishing	Health		Finishing of textiles	Financial intermediation	
Raw milk	Poultry; Other small livestock	Petroleum coal products	Recreation and other services		Preparation and spinning of textile fibres; weaving of	Public administration	
Forestry	Meat products	Fertilisers	Real estate and renting services		Manufacture of wearing apparel except fur apparel	Education	
	Manure (animal product)	Chemicals, rubber and plastic products			Tanning and dressing of leather	Health and Social Work	

Source: Own elaboration

## **4 Conclusions**

In summary, the 2015/16 SAM for Ethiopia consists of 227 accounts: 61 activities (11 of them accounts for households as producers) producing 71 marketed and 23 HPHC commodities using 3 types of labour (skilled, unskilled and semi-skilled) in 11 administrative regions (33 labour accounts in total), 3 types of capital (land, livestock and non-agricultural capital), 3 types of taxes (direct, indirect and import), 28 regionalized RHG and one account each for margins, saving-investment, enterprises, government and rest of the world. This highly disaggregated and complete structure confers, on the 2015/16 SAM for Ethiopia, a very important role for the analysis of the Ethiopian economy. Starting from scratch, without previous Supply-Use or Input-output framework, using relevant microdata and maintaining the coherence with main official macroeconomic data, a fundamental database has been developed. This SAM makes possible the use of multi-sectoral analysis, both linear and complex Computable General Equilibrium Models.

The Ethiopia 2015/16 can be freely downloaded from DataM portal (see Annex 2)

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# Annexes

## Annex 1. Accounts of the Ethiopia Social Accounting Matrix 2015/16

Table A.1. Accounts of the Ethiopia Social Accounting Matrix 2015/16

ahf_AdAb	Addis Ababa (HH as producers)	ccatt	Cattle	flb_USK_AdAb	Unskilled labour Addis Ababa
ahf_Afar	Afar (HH as producers)	cshee	sheep	flb_SSK_AdAb	Semi-Skilled labour Addis Ababa
ahf_Amha	Amhara (HH as producers)	cgoad	goat	flb_SKL_AdAb	Skilled labour Addis Ababa
ahf_BeGu	Benshaqul Gumuz (HH as producers)	ccaml	camel	flb_USK_Afar	Unskilled labour Afar
ahf_DiDa	Dire Dawa (HH as producers)	cpoul	Poultry; Other small livestock	flb_SSK_Afar	Semi-Skilled labour Afar
ahf_Gamb	Gambella (HH as producers)	cmeat	Meat products	flb_SKL_Afar	Skilled labour Afar
ahf_Hara	Harari (HH as producers)	cmanure	manure (animal product)	flb_USK_Amha	Unskilled labour Amhara
ahf_Orom	Oromia (HH as producers)	cmilk	Raw milk	flb_SSK_Amha	Semi-Skilled labour Amhara
ahf_SNNP	SNNP (HH as producers)	ccott	cotton	flb_SKL_Amha	Skilled labour Amhara
ahf_Soma	Somalia (HH as producers)	caprod	Animal products nec	flb_USK_BeGu	Unskilled labour Benshaqul Gumuz
ahf_Tigr	Tigray (HH as producers)	cfors	Forestry	flb_SSK_BeGu	Semi-Skilled labour Benshaqul Gumuz
afood	Growing of food crops	cfish	Fishing	flb_SKL_BeGu	Skilled labour Benshaqul Gumuz
acash	Growing of cash crops	cmin	Minerals nec	flb_USK_DiDa	Unskilled labour Dire Dawa
acofe	Growing of coffee	cvprod	Vegetable products; animal oils and fats	flb_SSK_DiDa	Semi-Skilled labour Dire Dawa
acrop	Growing of crops nec	cdairy	Dairy products	flb_SKL_DiDa	Skilled labour Dire Dawa
aflower	Growing of flowers	csug	Sugar and sugar confectionary	flb_USK_Gamb	Unskilled labour Gambella
acatt	raising of cattle	cgmill	Grain mill products and grain mill services	flb_SSK_Gamb	Semi-Skilled labour Gambella
ashee	raising of sheep	cfood	Food products nec; animal feeds	flb_SKL_Gamb	Skilled labour Gambella
agoat	raising of goat	cbev	Beverages	flb_USK_Hara	Unskilled labour Harari
acaml	raising of camel	ctob	Tobacco input Products	flb_SSK_Hara	Semi-Skilled labour Harari
apoul	raising of poultry	cmtea	Manufactured Tea	flb_SKL_Hara	Skilled labour Harari
aoiv	raising of other animals	cmto	Manufactured Tobacco	flb_USK_Orom	Unskilled labour Oromia
afor	Forestry	clcott	Linted cotton	flb_SSK_Orom	Semi-Skilled labour Oromia
afish	Fishing	ctext	Textiles	flb_SKL_Orom	Skilled labour Oromia
amining	Mining and quarrying	capar	Wearing apparel	flb_USK_SNNP	Unskilled labour SNNP
adairy	Manufacture of dairy products	cleath	Leather products	flb_SSK_SNNP	Semi-Skilled labour SNNP
agmill	Manufacture of grain mill products and provision of grain mill services	cwood	Wood products	flb_SKL_SNNP	Skilled labour SNNP
asug	Manufacture of sugar	cpaper	Paper products publishing	flb_USK_Soma	Unskilled labour Somalia
aofood	Production, processing and preserving of meat and meat products	coliptr	Petroleum coal products	flb_SSK_Soma	Semi-Skilled labour Somalia
abev	Distilling, rectifying and blending of spirits	cfert	Fertilisers	flb_SKL_Soma	Skilled labour Somalia
atob	Manufacture of tobacco products	cchem	Chemicals, rubber and plastic products	flb_USK_Tigr	Unskilled labour Tigray
atext	Finishing of textiles	cpfarm	Pharmaceutical Products	flb_SSK_Tigr	Semi-Skilled labour Tigray
aspin	Preparation and spinning of textile fibres; weaving of textiles	cminprod	Mineral products nec	flb_SKL_Tigr	Skilled labour Tigray
aapar	Manufacture of wearing apparel except fur apparel	ccement	Cement	capital_Land_Rur	Land capital
aleath	Tanning and dressing of leather	cmetal	Metals nec	capital_Livest_Rur	Livestock capital
awood	Wood and wood products	cmprod	Metal products	non_agr_capital	Non Agriculture Capital
apaperp	Manufacture of paper and paper products; publishing; printing	cveh	Motor vehicles and parts; other transport equipment	ent	Enterprises
achem	Manufacture of chemicals, rubber and plastic products	celecq	Electronic equipment	govt	Government
apharm	Manufacture of pharmaceuticals	cmach	Machinery and equipment nec	AdAb_U	Addis Ababa Medium and large town
aminprod	Manufacture of mineral products	comanu	Manufactures nec	Afar_U	Afar Medium and large town
acement	Manufacture of cement, lime and plaster	celect	Electricity	Afar_R	Afar RURAL
ametel	Manufacture of basic iron and steel	cwater	Water	Afar_S	Afar SMALL TOWN
amprod	Manufacture of metal products	ccons	Construction	Amha_U	Amhara Medium and large town
amach	Manufacture of ovens, furnaces and furnace burners	ctrad	Trade and repair services	Amha_R	Amhara RURAL
aelecg	Manufacture of electric material	chotel	Hotels and restaurants	Amha_S	Amhara SMALL TOWN
aveh	Manufacture of motor vehicles, trailers and semi-trailers	ctrans	Transport services	BeGu_R	Benshaqul Gumuz RURAL
amedq	Manufacture of medical equipments	ccomm	Communication	BeGu_S	Benshaqul Gumuz SMALL TOWN
aomanu	Manufacture of furniture	cfserv	Financial services	DiDa_U	Diredwa Medium and large town
aelect	Electricity	cbse	Business Services	DiDa_R	Diredwa RURAL
awater	Water	cpadmin	Public administration and defence	Gamb_U	Gambella Medium and large town
acons	Construction	ceduc	Education	Gamb_R	Gambella RURAL
atrad	Wholesale and retail trade; repairs	cheal	Health	Gamb_S	Gambella SMALL TOWN
ahotel	Hotels and Restaurants	coserv	Recreation and other services	Hara_U	Harari Medium and large town
atrans	Transport	crest	Real estate and renting services	Hara_R	Harari RURAL
acomm	Communication	ctefo	Teff own consumed	Orom_U	Oromia Medium and large town
afserv	Financial intermediation	cbaro	Barley own consumed	Orom_R	Oromia RURAL
apadmin	Public administration	cwheao	Wheat own consumed	Orom_S	Oromia SMALL TOWN
aeduc	Education	cmaliza	Maize own consumed	SNNP_U	SNNP Medium and large town
aheal	Health and Social Work	csorgo	Sorghum own consumed	SNNP_R	SNNP RURAL
arest	Real Estate, Renting and Business Activities	cpulo	Pulses own consumed	SNNP_S	SNNP SMALL TOWN
aoserv	Business Activities	cvego	Vegetables nec own consumed	Soma_U	Somalia Medium and large town
ctef	Teff	coliso	Oil seeds own consumed	Soma_R	Somalia RURAL
cbar	Barley	ccane	Sugar cane own consumed	Soma_S	Somalia SMALL TOWN
cwhea	Wheat	cfuito	Fruit Crops own consumed	Tigr_U	Tigray Medium and large town
cmaliza	Maize	cteao	Tea own consumed	Tigr_R	Tigray RURAL
csorg	Sorghum	cchato	Chat own consumed	Tigr_S	Tigray SMALL TOWN
cpul	Pulses	ccoffo	Coffee own consumed	indtax	Indirect Taxes
cveg	Vegetables nec	cseneto	Enset own consumed	imptax	Imports taxes
coils	Oil seeds	ccropo	Cereal grains and other crops nec own consumed	dirtax	Direct Taxes
ccane	Sugar cane sugar beet	ccatto	cattle own consumption	i..s	Saving-Investment
cfuit	Fruit Crops	csheeo	sheep own consumption	RoW	Rest of the world (total)
ctea	Tea	cgoado	goat own consumption		
cchat	Chat	ccaml	Camel own consumed		
ccoff	Coffee	cpoulo	Poultry; Other small livestock own consumed		
csent	Enset	caprodo	Animal products nec own consumed		
ccrop	Cereal grains and other crops nec	cmilko	Raw milk own consumed		
cafeed	Animal feed	cforso	Forestry own consumed		
cflower	Flower	TotalMargin	Trade and transport margin		

Source: Own elaboration

## Annex 2. On-line resources.

Most of the results presented in this report are available on the public website “Data portal of agro-economic Modelling” (DataM) run by JRC. Links can be also accessed with the below QR codes.

**Figure A1.** QR code – DataM URL

<https://datam.jrc.ec.europa.eu>



Source: JRC, 2019.

Using DataM, users can make a bulk download of the SAM in a ZIP file (Dataset\_JRC\_-\_Social\_accounting\_matrix\_-\_Ethiopia\_-\_2015\_16.zip) containing a homonymous CSV file. The hyperlink for the direct bulk download is in Figure A2

**Figure A2.** QR Code –bulk download Ethiopian SAM

<https://datam.jrc.ec.europa.eu/datam/perm/dataset/fac56b11-140a-46fa-9ae1-8b67e7dc0dcc/download/dataset.zip>



Source: JRC, 2019.

DataM includes also a function for interactive download, which allows filtering the only part of interest of the datasets and to preview results on the screen (Figure A3).

**Figure A3.** QR Code – interactive download of the dataset

<https://datam.jrc.ec.europa.eu/datam/perm/dataset/fac56b11-140a-46fa-9ae1-8b67e7dc0dcc>



Source: JRC, 2019.

Users may explore and analyse the data through an interactive dashboard placed in the home page of the website (Figure A4) under the PANAP section <sup>(9)</sup>

**Figure A4.** QR Code –dashboard Ethiopian SAM

[https://datam.jrc.ec.europa.eu/datam/mashup/SAM\\_ET\\_201516](https://datam.jrc.ec.europa.eu/datam/mashup/SAM_ET_201516)



Source: JRC, 2019.

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(9) The organization in sections of the home page of DataM might change in the future, however the direct links to dashboard and files, and related QR codes, are permanent.

Furthermore, based on the Social Accounting Matrix, the DataM "jobs calculator" allows making easy interactive simulations of the effects on employment in Ethiopia due to changes in export of given products or services.

**Figure A5.** QR Code –Jobs calculator for Ethiopia

[https://datam.jrc.ec.europa.eu/datam/mashup/JOBS\\_CALCULATOR?SAM=ET](https://datam.jrc.ec.europa.eu/datam/mashup/JOBS_CALCULATOR?SAM=ET)



Source: JRC, 2019.

To date, the job calculator works also, at time of writing, with EU and 2 other African countries.

**Figure A6.** QR Code – Jobs calculator

[https://datam.jrc.ec.europa.eu/datam/mashup/JOBS\\_CALCULATOR](https://datam.jrc.ec.europa.eu/datam/mashup/JOBS_CALCULATOR)



Source: JRC, 2019.

# Jobs calculator - quick guide

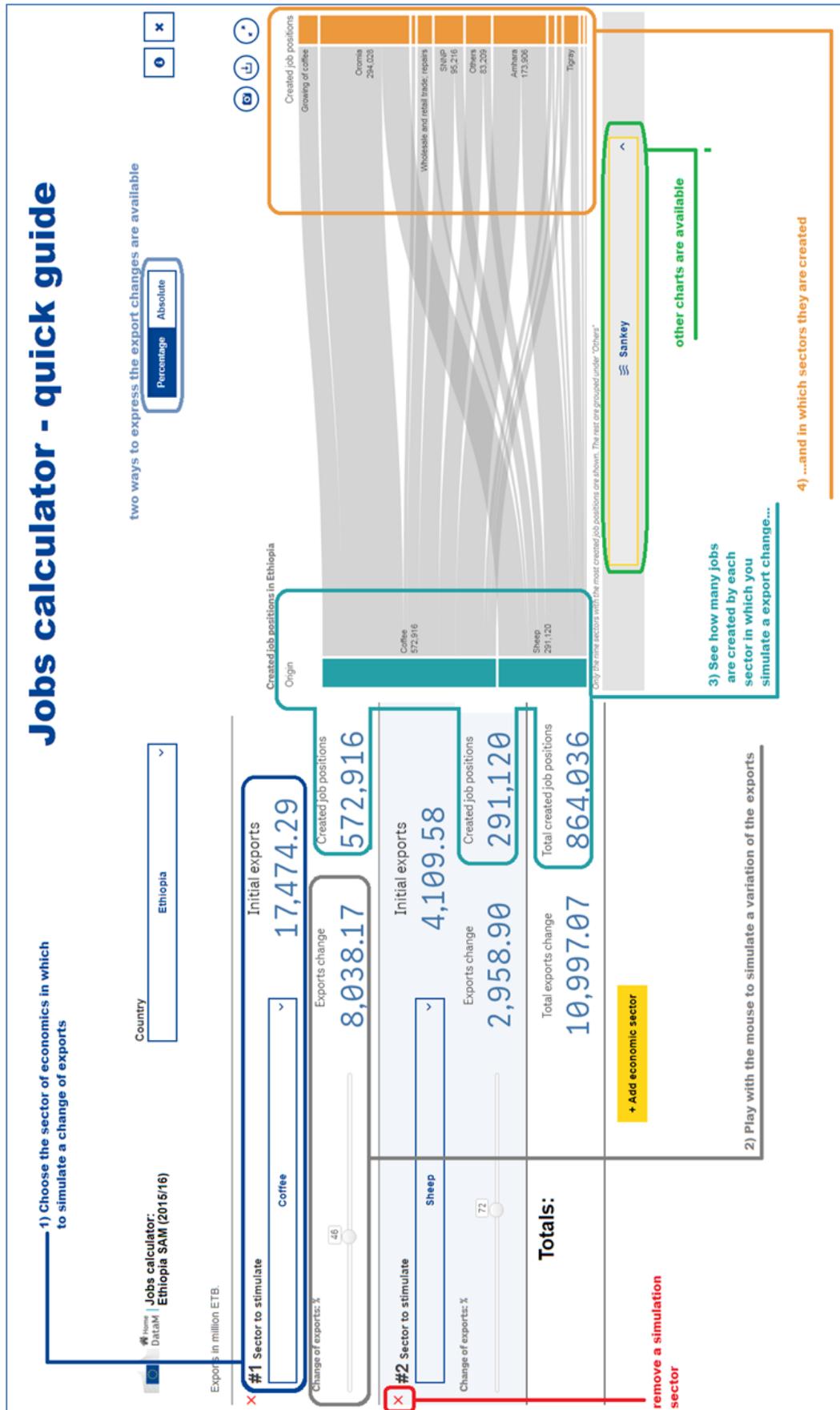


Figure A7. Jobs calculator quick guide

Source: JRC, 2019.

Finally, DataM offers the "Country Dashboards" a one-stop-shop infographics about food/nutrition security and relevant macroeconomics and agro-economic indicators produced by several organizations and gathered by country.

**Figure A8.** QR Code –Country Dashboards

[https://datam.jrc.ec.europa.eu/datam/mashup/COUNTRY\\_DASHBOARDS](https://datam.jrc.ec.europa.eu/datam/mashup/COUNTRY_DASHBOARDS)



Source: JRC, 2019.

Find below the direct link to the *fiche* of Ethiopia.

**Figure A9.** QR Code – Country Fiche of Ethiopia

[https://datam.jrc.ec.europa.eu/datam/mashup/COUNTRY\\_DASHBOARDS?iso2=ET](https://datam.jrc.ec.europa.eu/datam/mashup/COUNTRY_DASHBOARDS?iso2=ET)



Source: JRC, 2019.



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