Handbook on SUT:

Compilation, Application, and Practices Relevant to Africa

United Nations
Economic Commission for Africa

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Acknowledgements

Foreword

Abbreviations

ACS	African Centre for Statistics
AfDB	African Development Bank
AFRISTAT	Economic and Statistical Observatory for Sub-Saharan Africa
AI	Accounts by industry
AUC	The Commission of the African Union
BCC	Central Bank of Congo
BH	Basic heading
BoP	Balance of payments
BP	Basic prices
CFC	Consumption of fixed capital
CIF	Cost, insurance and freight
CoE	Compensation of employees
CPC	Central Product Classification
COFOG	Classification of the Functions of Government
COICOP	Classification of Individual Consumption According to Purpose
COPNI	Classification of the purposes of non-profit institutions serving households
CPI	Consumer price index
DP	Domestic production
ECA	Economic Commission for Africa
FAO	Food and Agriculture Organisation
FISIM	Financial intermediation services indirectly measured
FOB	Free on board
GCF	Gross capital formation
GDP	Gross domestic product
GDP (P)	GDP from the production side
GDP €	GDP from the expenditure side
GDP (I)	GDP from the Income approach
GFCE	government final consumption expenditure
GFCF	Gross fixed capital formation
GVA	Gross value added
GVAPW	Gross value added per worker
GVO	Gross value of output
HFCE	Household final consumption expenditure
HICES	Household Income, Consumption and Expenditure Survey
HS	Harmonized Commodity Description and Coding System
IC	Intermediate consumption
ICBT	Informal cross border trade
ICT	Information, communication and telecommunications
ICP	International Comparison Program
IEA	Integrated Economic Accounts
IET	Inter-industry exchange table
ILO	International Labour Organization
IMF	International Monetary Fund
IMTS	International Merchandise Trade Statistics

IOT	Input output table
ISIC	International Standard Industrial Classification
LFS	Labour force survey
MRDS	Minimum requirement data set
NPISH	Non-profit institutions serving households sector
NPV	Net present value
NSDS	National Strategy for the Development of Statistics
OECD	Organisation for the Economic Cooperation and Development
PIM	Perpetual inventory method
PNRDM	Purchases by non-resident in the domestic market
PP	Purchasers' prices
PRA	Purchases by resident abroad
ProDoc	Project Document
QEI	Quarterly Employment Inquiry
SITC	Standard International Trade Classification
SNA	System of national accounts
SUB	Supply use balance
SUTs	Supply and use tables
TTM	Trade margins and transport costs
UN	United Nations
UNECA	United Nations Economic Commission for Africa
VAT	Value added tax
WB	World Bank
ZIMSTAT	Zimbabwe National Statistics Agency

Introduction

The African Centre for Statistics of UNECA is continuing its efforts for statistical harmonization in Africa in the field of national accounts. In order to provide a solid basis for the formulation of economic policy and for the purposes of international comparisons it is necessary that national accounts data become a reliable source of information. National accounts, a useful tool of economic management, provide synthetic information about the economic situation of a country. Knowledge of the national economy is crucial, especially for policy makers, but also for researchers, businesses, the general public and international organizations.

Supply and use tables (SUTs) are an essential part of the System of National Accounts (SNA), a macroeconomic framework which describes the overall economic system and analyses its mechanisms, and allows studying the behaviour of economic actors. In its efforts to harmonize statistical methods, and in line with recommendations of the Project Document (ProDoc) of the African Project for the Implementation of 2008 SNA, UNECA has developed this theoretical and practical Handbook about the compilation of supply and use tables for African countries.

Supply and use tables include accounts for industries, imports and exports, domestic final use and accounts for products (goods and services). They provide a detailed analysis of the production process, the use of goods and services and income generated by production. It consists of four main blocks including: a supply block that indicates the origin of the goods and services; a uses block which describes the uses of goods and services including intermediate consumption; a production account; and a primary income account by industry and the associated employment vector. The production account is devoted to the gross value added and its components. The employment vector gives information about the labour input. Overall, SUTs allow the valuation from three different approaches of gross domestic product (GDP): production, expenditure and income.

This handbook focuses on general aspects such as concepts, definitions and classifications, but also goes into detail about data sources, methods and the compilation process. It also mentions treatment of some specific issues and includes case studies from countries. It is structured to ten chapters and several annexes.

The first chapter describes the concepts used in the SUTs and provides an overview of its components and their relationship with commodity flow methods, the structure and the main advantages of SUTs.

The second chapter presents various components of the supply table of the SUTs which includes production and imports. It defines the production boundary in general, illustrates specific cases for certain kinds of activities through examples, and shows different types of production and their valuation. It also describes product taxes, subsidies and margins that complement the assessment of supply to make them compatible with uses, as well as the cost insurance freight/free on board (CIF/FOB) adjustments for imports to avoid duplication of imports of services.

The third chapter presents the concepts and valuation of components of the Use Table of SUTs, including intermediate consumption, final consumption, gross fixed capital formation (GFCF), changes in inventories and exports. It defines the content of these components and their valuation method, adjustments of purchases by residents abroad and purchases in the domestic

market by non-residents. It also describes the block of value added and its components including compensation of employees, fixed capital consumption, other taxes net subsidies on production and gross operating surplus. It concludes with the main stages of compilation of SUTs.

The fourth chapter focuses on the classifications used in SUTs including activities, products and functions. These classifications determine the size or dimension of SUTs. The chapter reminds that national adaptations should have details relevant for the country and be consistent with international classifications at an aggregated level..

The fifth chapter is a description of the main data sources required for the compilation of SUTs. Suggestions are also made on the use of alternative data sources and procedures to overcome the limitations imposed by non-availability of data in the countries. These sources of data are described for both the supply and use component of the SUTs.

The sixth chapter focuses on issues that require special treatment: the production of goods for own consumption, imputed rents for owner occupied dwellings, domestic services, trade margin and transport cost, financial intermediation services indirectly measured (FISIM), consumption of fixed capital of government, the informal sector and the non-observed economy.

The seventh chapter explains the use of product balances method to estimate the supply or use of particular products or to achieve consistency between the supply and uses of products. This approach is illustrated by numerical examples of product balances.

The eighth chapter provides methods of balancing supply and use: manual balancing and automatic balancing in particular. Manual balancing means that the SUT compiler inspects the supply and use of each commodity and adjusts one or more entries so that the two sides are equal. Automatic balancing is done by an algorithm.

The ninth chapter discusses methods of updating benchmark SUTs with a minimum of data sources. This involves using both manual and automatic balancing procedures. These methods are used to identify parts of the SUT that can be updated manually. They are both for countries that update SUTs each year or only every 5^{th} year or more infrequently. Some examples are presented as illustration.

The tenth chapter shows some IT tools used for the compilation of national accounts: tools such as spreadsheets and relational databases like ERETES.

The annexes consist of practical cases from African countries in the compilation of SUTs or its components.

Chapter 1. Basic concepts of the supply and use table

1.1. Introduction

This chapter provides an overview of the supply and use tables (SUT) and their relationship to commodity flow methods. The other chapters of the handbook deal with these topics in more detail.

The System of National Accounts[1] (SNA) includes a set of sequential accounts which portrays the working of the economy showing how income is generated, distributed, redistributed and used for consumption or for the acquisition of assets. The Supply and Use Tables are an integral part of this system. The 2008 SNA (paragraph 1.24) explains "*In addition to the flow accounts and balance sheets described earlier, the central framework of the SNA also contains detailed supply and use tables in the form of matrices that record how supplies of different kinds of goods and services originate from domestic industries and imports and how those supplies are allocated between various intermediate or final uses, including exports. These tables involve the compilation of a set of integrated production and generation of income accounts for industries by drawing upon detailed data from industrial censuses or surveys. The supply and use tables provide an accounting framework within which the product flow method of compiling national accounts, whereby the total supplies and uses of individual types of goods and services have to be balanced with each other, can be systematically exploited. The supply and use tables also provide the basic information for the derivation of detailed input-output tables that may be used for purposes of economic analysis and projections*."

1.2. Commodity flow

It is useful to start by considering an estimation technique that will be familiar to most national accounts compilers namely "commodity flow"[2]. In the commodity flow approach, supplies and uses are identified for individual products (goods or services) or for a group of products. The different sources of supplies of products are traced to their subsequent uses under various categories.

[1]The United Nations first published a set of standard national accounts in 1952. Revised versions were issued in 1968, 1993, and 2008. At the present time most countries are trying to use the 2008 SNA and some, the last years started with SNA 2008, but their national accounts often retain features of the 1968. In early 2014, the regional members of the UNECA agreed to work towards adoption of the 2008 SNA and this is expected to take place over the next 4 or 5 years. Many of the differences between the SNAs of 1968, 1993, and 2008 are matters of detail and clarification and have only a small impact on the size and growth of GDP. The fact that countries may be using different SNA systems or different mixtures of them therefore detracts only slightly from the comparability of national account in Africa. Comparability is affected to a much larger extent by difference in the coverage of the accounts and, in particular, by the extent to which value added by new kinds of activities and by small, informal producers is captured in GDP.

[2]The terms "commodity balances" and "product balances" or "commodity flow approaches/methods" and "product flow methods/approaches" are used inter-changeably by national accountants. The SNA prefers to use the word "product" instead of "commodity" for individual goods and services and therefore, uses the terms, "product flow methods" and "product balances". In this Handbook both terms, "commodity flow" and "product balances" are used on the grounds of their general usage in this Region.

The basic concept behind this approach is that the amount of a product available for use within the economy must have been supplied either by domestic production or by imports. The same amount of the product entering an economy in an accounting period must be used for intermediate consumption, final consumption expenditure, capital formation (including changes in inventories) or exports.

A product balance is a powerful tool for a national accounts compiler, as it can check the consistency of data between availability of a product and its use and provides coherent estimates of the flows of supply and use of the product. This approach can be used to estimate missing data or identify a weak data source. The commodity flow approach is widely used in the preparation of estimates of household final consumption expenditure and gross fixed capital formation, which are generally based on weak data sources in the developing countries. Many times, it has been observed that household and enterprise surveys understate household consumption expenditure (especially the services) and gross fixed capital formation and are inconsistent with the supply side information. However, it is also observed that weaknesses in the data exist on the supply side as well. For example, it is difficult to estimate production of firewood and water gathering or production of agricultural commodities for own consumption from direct sources. Production of agricultural commodities for own consumption is very important for African families. It is possible to estimate such production from the use side, if the countries collect information through the household budget/expenditure surveys on household consumption from own sources.

1.3. Commodity flow and supply and use tables

Commodity flow provides a description of the supply/use balance for a single product (or a product group), whereas a generalization of this for the whole range of products in the economy gives rise to the SUTs. The SUTs build up on the same concept as that of product balances, but in an integrated manner for the whole economy showing the supply-use balances for each individual product or group of products. Thus, in the SUTs, supply is balanced with uses simultaneously for each product as well as for the economy as a whole. While the commodity flow approaches or product balances are applied at the individual product level, the SUTs amalgamate the product balances of all individual products (or group of products) in a matrix framework to present a coherent picture of supply and uses of both the individual products and the economy as a whole. The level of details for industries, final use and individual products determines the size of the SUTs being compiled.

1.4. A simplified supply and use table

Figure 1.1: Simplified Supply and Use Table illustrates a simplified Supply and Use Table. The total *Supply* of goods and services that becomes available during a given period is shown in the first two columns and the various *Uses* to which those goods and services are put are shown on the right-hand side. *Change in Inventories* (Δ INV) is shown as one of the Uses. Δ INV includes, as a positive entry, any goods and services that became available during the period but which have not yet been put to any of the other Uses. It also includes, as a negative entry, any goods and services used in the current period that were produced or imported in an earlier period. *Change in Inventories* ensures that the two sides of the SUT – the *Supply* on the left-hand side and the *Uses* on the right – will always be equal.

Figure 1.1: Simplified Supply and Use Tables									
SUPPLY		**TOTAL SUPPLY AND USES**	**USES**						
				Final Consumption Expenditure			Gross Capital Formation		
Domestic Production (DP)	Imports (IMP)		Intermediate Consumption (IC)	Government (GFCE)	Households(HFCE)	Non-profit institutions serving households (NPISH)	Gross Fixed Capital Formation (GFCF)	Change in Inventories (Δ INV)	Exports (EXP)
Goods 1 2 .. Services 1 2 ..									
TOTAL									

Figure 1.1 is shown as an equation in Figure 1.2.

Figure 1.2: Simplified supply/use equation		
Supply of a product/group of products	=	Use of the same product/group of products
Domestic production + imports	=	Intermediate consumption + final consumption + gross capital formation + exports

However, the two sides are generally on different valuations: supply is valued at basic prices meaning farm-gate or factory gate prices in the case of domestic goods supply and at their c.i.f. values at the port of arrival in the case of imports; uses, on the other hand, are valued at purchasers' prices. For product balancing, it is necessary to adjust both sides to the same valuation (purchasers' prices or basic prices). Normally, the valuation basis adopted for this purpose is the purchasers' prices. In order to bring the supply side to purchasers' prices, the trade margins and transport costs, and taxes less subsidies on products are added to the supply side. This is because the goods produced in the units have to go through the trade and transport chain and pay the necessary product taxes before they reach the users/purchasers. Services will not go through the trade and transport chain[3], as they are delivered to the users at the time of

[3] Some service-producing industries may produce products that have many of the characteristics of goods. For convenience, the products of these industries are described in the SNA as knowledge-capturing products (2008

their production but there are often product taxes on services. The equation above therefore becomes:

Figure1.3: Supply/use equation with valuation adjustment		
Supply of a product/group of products at purchasers' prices	=	Use of the same product/group of products at purchasers' prices
Domestic production+ imports + trade margins + transport costs + taxes less subsidies on products	=	Intermediate consumption + final consumption + capital formation + exports

Accordingly, figure 1.1 needs to be modified to include trade margins, transport costs and taxes less subsidies on products in the supply table. This brings the supply side to purchasers' prices.

Alternatively, the uses on the right hand side of figure 1.3 could be brought to basic prices valuation (by subtracting trade and transport margins and taxes less subsidies from each of the cells in the use table) and can be confronted with the supplies at basic prices on the left hand side of figure 1.2. Therefore, in general, when preparing supply and use tables and making the proper balancing between the two sides, there is always a choice of emphasis between two opposite lines of adjusting statistical data:

Supply of each product at basic prices could be adjusted to a purchasers' prices valuation to allow balancing with uses at purchasers' prices.

OR

Each of the uses at purchasers' prices could be adjusted to a basic prices' valuation to match with supply at basic prices.

The second option requires data on trade and transport margins and taxes less subsidies on products at individual cell level in the use table, which is more difficult to collect or estimate than in the case of first option where data is needed only at the column level for the vectors of trade and transport margins and taxes less subsidies in the supply table.

Important argument for first to balance SUT in Basic values (second option):

- *Many African countries have introduced VAT where only non refundable VAT should be recorded in the Use table.*
- *Product subsidies may only be given to some users of a product.*
- *Product taxes may not be paid by some users as for products to export.*
- *Depending on how detailed the product specification is, the trade margin can be higher for a product used for private consumption than for intermediate consumption by industries*

The advantage of adopting first option is that uses are always at purchasers' prices and are observable at the data collection stage in the surveys. At the balancing stage, it is easy to revisit the source data in both supply and use tables for identifying inconsistencies in the data and for making suitable adjustments.

SNA: para 6.13), examples are specialized information, news, consultancy reports, computer programs, movies, music, etc.

However, if the eventual objective is to compile input output tables, it is necessary to compile the matrices of trade and transport margins and taxes less subsidies, at some stage.

1.5. GDP from the production and expenditure sides

If both imports and intermediate consumption are subtracted from both sides in Figure1.4, we obtain the GDP Equation:

Figure1.4: GDP equation		
GDP from the production side : (GDP(P))	=	GDP from the expenditure side : (GDP(E))
Domestic production + trade margins + transport costs + taxes less subsidies on products – intermediate consumption	=	Final consumption + gross capital formation + exports - imports

Figure1.4 demonstrates an important feature of the SUTs: it generates estimates of GDP from both the production and expenditure sides. As there is no place in the equation for a statistical discrepancy, when GDP (P) and GDP (E) are derived from SUTs, they must necessarily be equal.

1.6. Value added components

The supply and use table in Figure 1.1 can be expanded by adding a third "quadrant" in the use table as shown in Figure 1.5. The value added quadrant is obtained by subtracting intermediate consumption from domestic production. In SUTs, both domestic production and intermediate consumption are broken down by kind of activity so value added is also shown using the same kind of activity classification.

Figure 1.5: A third quadrant can be added to the use table of SUTs	
Quadrant I: SUPPLY to industries	Quadrant II: FINAL USES
Quadrant III: COMPONENTS OF VALUE ADDED	

Value added in the lower quadrant can be broken down into the following components[4]:

- Compensation of employees;
- Other taxes less subsidies on production;
- Consumption of fixed capital;
- Net Operating surplus/Mixed income[5] (obtained as a residual).

Note that only total value added by kind of activity is obtained from the SUTs. The components of value added and labour input are all obtained from other sources and are not generated within the SUTs. The breakdown of value added is not in any way constrained by the Supply-Use

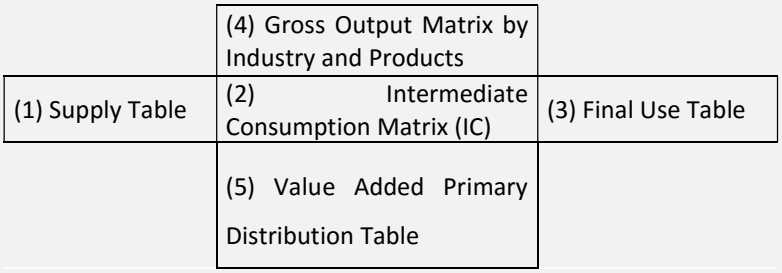
[4] In addition to the value added components, supplementary rows that are industry specific, such as employment, can also be added in the Use table below the value added components.

[5] For unincorporated enterprises, it may not be possible to estimate compensation of employees, consumption of fixed capital and a return to capital separately in which case an estimate of mixed income, covering all these items, should be made. (para 6.126, SNA 2008)

Balance. The value added quadrant clearly adds to the analytic value of the SUTs but it should be seen as an appendix to the SUTs rather than an integral part of it.

Box 1.1: Supply and Use Table: An essential component to ensure consistency inside the System of National Accounts (by INSEE France)

The Supply and Use Table (SUT) is an essential table in the System of National Accounts (SNA), because it uses large amount of data and provides a framework of inter-relations for their confrontation, and thus highlights the data inconsistencies. The SUT reinforce the exhaustiveness measure and the quality of indicators produced by the national accounts In its standard form, it is presented as an integrated system of the three Gross Domestic Product (GDP) approaches (Gross Output, Expenditure and Income), through five different tables, arranged as follow:



(1) Products x Transactions classifications (P1, P7, D2, D3, Trade/Transport margins)
(2) Products x Industries classification for P2 transaction
(3) Products x Transactions classifications (P3, P5, P6)
(4) Products x Industries classifications for P1 transaction
(5) Transactions (B1, D1, D2, D3, B2/B3) x Industries classifications.

Two interpretation of the SUT:

1. Row interpretation (1) (2) (3) describes the economic cycle of a product on the market and shows the supply and use balancing for each product.
2. Column interpretation (4) (2) (5) describes the production function of the industries, from which comes the value Added (income surplus generated during the period).

SUT is an integrated system thanks to the IC matrix (2) because it ensures consistency simultaneously between rows and columns.

The SUT concept is based on both independency and interdependency of the two tables. Though the data comes from multiple sources and may not be coherent, the national accounts compiler infers that it is always possible to use the data and restore the overall consistency. The system of national accounts (SNA) and the regional variations, such as the European System of Accounts (ESA), provide guidance to achieve this overall consistency through the SUT in order to assure national accounts users that the SNA has solid foundations. The SUT as the best foundations for the SNA is materialized into table (5). While table (5) is resulted from the four other tables, it is also the starting point of the economy measured through the Income approach and the Integrated Sector Accounts (ISA).

Main advantages of SUT:

- SUT presents in a clear and synthetic way the great amount of data necessary to its compilation, whether observed or estimated as in the case of the informal economy.
- SUT reveals the inconsistencies within and between the data sources and gives an appropriate framework to ensure consistency.
- SUT describes within the SNA framework the economic cycle of “Industries - products - institutional sectors” and thus SUT links all the GDP approaches together.
- Conceived at current prices, SUT also provides an appropriate framework to the calculation of SUT at constant prices. This one is obtained by applying to each cell of the SUT at current prices, the corresponding price index. The National Accounts aggregates and indicators are compiled from this second table.

SUT may have limitations, but it remains by far the tool for guaranteeing a good estimate of GDP.

1.7. Applications of supply and use table and commodity flows

(i) GDP estimation

SUTs provide a coherent and consistent framework for estimating GDP (together with its major components) from the production and expenditure approaches of GDP simultaneously, and thereby enable balanced estimates of GDP to be compiled that are identical in the two approaches. The SUTs framework enhances the accuracy of both production and expenditure approach GDP considerably, as the balancing is done not only for the overall economy, but at each individual product level.

From the SUTs, it is possible to obtain a disaggregation of GDP by products, as information on final uses and imports is available by products. This is done by subtracting the vector of imports, f.o.b. from the vector of final uses, both vectors being on products. Such disaggregation of GDP by products is available only from the SUTs. In this disaggregation, the share of primary and industrial products in the GDP is much higher as compared to those of primary and secondary industries in GVA[6], since trade and transport margins get embedded into the primary and industrial products, resulting in lesser share of services in the GDP, when it is broken down by products.

(ii) Product balances

The most important use of commodity flow approach is achieving balances at product level in which the supply of the product matches with the uses of the product (intermediate uses and final uses in the hands of producers and final users, respectively). This ensures a systematic accounting of all flows of goods and services in the economy at product level.

(iii) Consistency of definitions and classifications, valuations standards

Since SUTs serve as a coordinating framework for economic statistics, it ensures consistency of the definitions and classifications of all primary data used in the accounting framework. The source data generally comes according to different classifications, such as the CPC for products, ISIC for industries, functional classifications for final consumption, HS and SITC for foreign trade or country specific industry and product classifications. The SUTs should ensure that all these source data are transformed to standard industry and product classifications through the development of appropriate concordance tables with links to ISIC rev. 4 and CPC ver. 2.

(iv) Estimation of missing data

In cases where statistical information is missing for certain transactions (for example the gross fixed capital formation or the private consumption), alternative estimates can be made in a transparent way using the commodity flow approach and SUTs framework. Though this is not an ideal way of compiling national accounts, still it allows the national accounts to be compiled

[6]GVA is compiled for industries, but not the GDP, which can only be estimated for the overall economy (not at industry level) from the production or income approaches, by adding taxes less subsidies on products to the GVA of all industries. However, it is possible to show GDP by products, as explained in the paragraph, through the SUTs.

in a coherent manner even in situations when the source data is incomplete or weak in quality. Commodity flow approach also provides a basis for logical substitution of a weak data source, either on the supply side or on the use side.

Estimating missing data is particularly relevant in many countries where informal activities are not well covered in statistical surveys. Very often supply and uses do not balance because informal supply and/or uses are not properly accounted for. Bringing the two sides into balance provides an opportunity to improve coverage of the informal sector.

(v) Confrontation of data sources

SUTs incorporate all primary economic data into a framework that is interconnected and integrated. These data generally come from different kinds of statistical sources, such as administrative sources from different ministries, government accounts, agriculture census, population and housing census, industrial surveys, household income-expenditure surveys, investment surveys, foreign trade statistics and balance of payments statistics. The SUT's framework enables an efficient confrontation of all these primary data sources. This in turn, helps in the identification or detection of inconsistencies in these source data and provides a coherent and transparent basis for making appropriate corrections in the primary data.

(vi) Assessment of data requirements for national accounts compilations

Since the commodity flow approaches and the SUTs integrate all primary economic data available in the economy, it helps the national accountants as well as the management of the statistical system to understand the data requirements for national accounts compilations and correspondingly assess the gaps and weaknesses in the information system. These findings can form a vital input to the preparation the National Strategy for the Development of Statistics (NSDS).

(vii) Capacity building in national accounts

Compilation of SUTs on a regular basis helps not only to improve the national accounts, but also to improve the understanding of national accounts and the statistical capacity of the countries. This will help in the annual updating of SUTs or at least every 5 years, and taking up compilation of additional tables and accounts and enable them to meet the challenges in implementing 2008 SNA.

(viii) Implementation of 1993 and 2008 SNA

Construction of SUTs has been included under the scope of 1993 and 2008 SNA implementation by the countries in terms of Minimum Requirement of Datasets (MRDS). The SUTs also enable the first three accounts of the National Accounts framework to be compiled: Goods and Services Account; Production Accounts by industry and sector; and Generation of Income Accounts by industry and sector. Therefore, compilation of SUTs is a step towards implementation of 1993 and 2008 SNA.

(ix) Supply and use tables in the International Comparison Program (ICP)

For the ICP, final expenditures on the GDP have to be broken down into 150 to 160 "Basic Headings" (BHs). A BH is a group of goods or services which are similar to each other and for which the participating countries can reasonably be expected to estimate expenditure weights. Examples of BHs are "Rice", "Bread and Cereals", "Garments", "Financial services", "Residential Buildings", and "Transport equipment". Clearly if the product breakdown of the

SUT is consistent with the ICP classification it will be easier to use the SUT in deriving the expenditure weights.

In the ICP, as for the SUTs classification according to SNA 2008, household expenditures are classified by COICOP, government expenditures by COFOG using the distinction between individual and collective expenditures, and capital formation by CPC ver. 2. It would be helpful if the SUT compilers could review the ICP Basic Headings in deciding on the product breakdown for the SUT. Thus, for the SUTs, the product classification should be an aggregated version of CPC ver 2, specifying products important in the country's economy, and should be so detailed that it can be aggregated to the product classification required for the ICP.

(x) Updating preliminary estimates

Benchmark SUTs compiled when full set of source data are available, form the basis for preparing SUTs updates to be used in the compilation of provisional or preliminary national accounts in the subsequent years. The SUTs framework offers options for incorporating information that is periodically available. Therefore, the SUT updates can be prepared even if partial and aggregated information is available on the economy in the current year. These SUTs updates from a previous base year, assume that the distribution of product uses in prices from the base year are constant over a short period.

(xi) Construction of Input-Output tables

SUTs are the basis for the construction of symmetric input-output tables. Input-output tables cannot be compiled without passing through the supply and use stage. SUTs can be transformed to Industry by Industry IOT or Product by Product IOT.

References:

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Chapter 2. Supply table

2.1. Introduction

This chapter deals with the various components of the Supply table of the SUTs. It starts by explaining the definition of production in the SNA and explains that for certain activities production has to be defined in a special way.

Supply comes either from domestic producers or from imports. Domestic production is almost always reported at "basic prices" - also called "ex-farm" or "factory gate" prices[7] in the case of goods – while imports are customarily valued at c.i.f. prices. In order to bring the values of domestic production and imports to "purchasers' prices" we need to add trade margins, transport costs and taxes (less subsidies) on products. To avoid double counting it is necessary to also include a c.i.f.-f.o.b. adjustment in the Supply table. The nature of this and some other adjustment items is also explained in this chapter.

Finally, this chapter describes the adjustments that may be required in respect of purchases abroad by residents and purchases in the domestic market by non-residents. In practice these adjustments are almost never required[8] although they are customarily included in the standard SNA description of the SUTs. These adjustments could, in principle, apply to imports in the supply matrix and to household final consumption expenditure, intermediate consumption (in the case of business travels) and exports in the use matrix.

2.2. Domestic production

2.2.1. General definition

"*Production is an activity, carried out under the responsibility, control and management of an institutional unit that uses inputs of labour, capital, and goods and services to produce outputs of goods and services*." (SNA 2008, Paragraph 6.2) The "Production Boundary" is a means of defining what activities are defined as productive. Essentially, production is generated by five kinds of activities:

- The first of these is by far the most important. It covers the production of goods and services for sale – crops, livestock, minerals, manufactured goods, business services for example. Note that it also includes services produced by government and by non-profit institutions serving households (NPISH). These are services that the government and NPISH produce and mostly "sell" back to themselves.
- The second is particularly important in countries with a large agricultural sector. Farmers usually produce for the market but also keep back enough of what they grow

[7] The statistical data source in Africa is often the financial account for the enterprise, and output from the surveys for the enterprises will be closer to producers' prices than at basic prices. The producer's prices will be the market prices or "factory gate" prices for the enterprise.

[8] When the household final consumption expenditure estimates are not based on retail trade surveys, but are compiled through commodity flow approaches or using the data from a household budget survey.

to feed the family. All this production is included as agricultural output, whether sold or not. Building own house or storage shed also counts as production.

- Authors, film producers and musicians are also producers. The SNA treats their output as a kind of capital asset. The original manuscript or piece of music will go on producing an income for the producer over several years.
- When you live in a flat or house that you own, the SNA considers that you are an entrepreneur producing housing services and selling them back to yourself.
- Finally, households can produce domestic services, by employing cooks, butlers, gardeners and body-guards, etc. which they "sell" to themselves.

Production boundary

Production boundary includes the following:

(a) Goods

(i) Production of goods for supply to units other than their producers; and

(ii) Own-account production that is retained by their producers for own final consumption or gross fixed capital formation; and

(b) Services

(i) Individual and collective services intended to be supplied to units other than their producers,

(ii) The own-account production of knowledge-capturing products (Some service-producing industries may produce products that have many of the characteristics of goods. For convenience, the products of these industries are described in the SNA as knowledge-capturing products (2008 SNA: para 6.13), examples are specialized information, news, consultancy reports, computer programs, movies, music, etc.) that are retained by their producers for their own final consumption or gross capital formation but excluding (by convention) such products produced by households for their own use;

(iii) Own-account production of housing services by owner-occupiers, and

(iv) Domestic and personal services provided by employing paid domestic staff.

The production boundary makes it clear that illegal production (such as prostitution, production of narcotics, illicit liquor, etc.) is not excluded from the production covered in GDP estimates. Similarly, non-market production of goods, and bribes, tips, etc. which are made in return for services are within the production boundary.

The following are some additional points to note on production boundary:

- Own account production of goods mentioned under (a)(ii) has further been clarified in SNA to include:
  - production of agricultural products and their subsequent storage; the gathering of berries or other uncultivated crops; forestry; wood-cutting and the collection of firewood; hunting and fishing;
  - production of other primary products such as mining salt, cutting peat, the supply of water, etc.;
  - processing of agricultural products; the production of grain by threshing; the production of flour by milling; the curing of skins and the production of leather; the production and preservation of meat and fish products; the reservation of fruit by drying, bottling, etc.; the production of dairy products such as butter or cheese; the production of beer, wine, or spirits; the production of baskets or mats; etc.; and
  - other kinds of processing such as weaving cloth; dress making and tailoring; the production of footwear; the production of pottery, utensils or durables; making furniture or furnishings, etc.
  - own-account construction of dwellings

- own account production for gross fixed capital formation includes the production of fixed assets such as construction, the development of software and mineral exploration for own gross fixed capital formation.

- All such activities are included even if they are illegal or not-registered at tax, social security, statistical and other public authorities.
- Production excludes the production of domestic and personal services that are produced and consumed within the same household (with the exception of employing paid domestic staff and the services of owner-occupied dwellings).
- Volunteer activities that result in goods, e.g. the construction of a dwelling or other building are to be recorded as production. Volunteer activities that do not result in goods, e.g. caretaking and cleaning without payment, are excluded.
- "Do-it-yourself" repairs and maintenance to consumer durables and dwellings (For dwellings, these constitute decoration, maintenance and small repairs, including repairs to fittings, of types that are commonly carried out by tenants as well as by owners) carried out by members of the household constitute the own-account production of services and are excluded from the production boundary of the SNA. In the case of dwellings, purchases of materials for repairs become intermediate expenditures incurred in the production of housing services. Output of such repairs and maintenance is not separately recorded. Major renovations or extensions to dwellings are fixed capital formation and recorded separately as output.

2.2.2. Production of services is always the same as sales of services

For services, production and sales are always the same. A restaurant's production is what it gets from its customers for the meals it serves: the output of an airline is the value of the tickets it sells. But for goods, some of what is produced may not be sold immediately. It goes into stocks (shown in the item change in inventories in national accounts). This means that goods output may be smaller or greater than its sales. It will be smaller if it is running down its stocks of finished goods and larger if it is accumulating more stocks of goods for sale at a later date. For most kinds of activities production can be calculated as sales plus the increase in stocks of finished goods and work-in-progress, where the increase can be either positive or negative.

2.2.3. Special cases in defining and measuring gross output

Government and NPISH gross output is valued as the "costs of production". These are listed below:

- Compensation of employees is the biggest item. It consists of wages and salaries and allowances in cash and the value of any income in kind – free or subsidized housing, food and meals, transport to and from work. An important point to notice here is that wages and salaries include employer's contributions for social security – health care, unemployment insurance and pensions for example. Mostly governments provide these social benefits without making actual contributions to a social security fund. In this case, the national accountant has to estimate what the government would have to have paid into a fund in order to finance the benefits that employees actually receive. This amount is then added to wages and salaries to obtain compensation of employees. Income in kind is an important part of compensation of government employees in many African countries. For example, school teachers, hospital workers and soldiers are often provided with free accommodation both for themselves and their families. Income in kind is valued at the cost to the employer of providing free housing and other benefits.
- Intermediate consumption includes office stationery, electricity, rent and other current cost of running government offices, hospitals, schools, police forces and armies.

- Consumption of fixed capital (CFC) is the decline in the value of government fixed assets through wear and tear and through obsolescence. Government computers, vehicles and office buildings, hospital and school equipment and so on are being used up in the process of producing government services. The national accountant must include this "using up of capital" in the cost of producing government services even if governments themselves do not always show it in their accounts. Many countries do not include CFC in government expenditure even though they claim to be implementing the SNA. A 2013 survey by the AfDB[9] showed that a dozen countries do not estimate this item, including some large countries such Nigeria, Mozambique, Senegal, Uganda, and Tanzania. Omission of CFC leads to underestimation of GDP. The problem for many countries is that they don't have the long time series for government capital investment required for the compilation of CFC, using a Perpetual Inventory Model (PIM), see Chapter 6. Some problem areas.
- Net operating surplus is usually zero or negligible. It may include the operating surplus of restaurants or bookshops in museums.
- Other taxes and subsidies on production are usually zero for government but they may apply for the output of NPISH.

The output of retailers and wholesalers is not the total value of sales, but the margin. The margin is the difference between the value of goods sold and what the seller would have to pay to replace those same goods at the moment when the sales takes place. When prices are rising the replacement price of goods bought for resale will be higher than the price actually paid for those goods. For goods that remain in stock for short periods such as fresh food, it may not be necessary to adjust for the increase in price of goods bought for resale, but for goods that remain in stock for long periods, the prices of goods bought for resale should be re-valued to replacement prices to avoid overstating the margin by including a holding gain. The margin measures the cost of the services the retailer or wholesaler provides by storing goods for resale, keeping them in good condition, displaying them in an attractive fashion and providing advice to customers.

Here are some examples of how we calculate output of trade:

- A trader buys goods for resale for 50 and has sales of 75. Assuming there is no change in stocks of goods for resale and no change in the prices of goods for resale, the output will be 75 minus 50 = 25. Twenty five is the trade margin on the goods sold.
- A trader does not buy any goods for resale but sells 100 this year. Those sales must have come out of the stock purchased in an earlier year. In this case the increase in stocks for resale will be a minus figure - minus 60 which is the replacement cost of the goods taken out of stock for resale. The gross output is then 100 + (minus 60) = 40. Forty is the margin on the goods bought in an earlier period for resale but that were actually sold in the current year. These goods are valued at the prices that will have to be paid to replace them in the current year.
- A trader buys goods for resale for 70 and over the year the value of the stock of goods for resale increases by 10. Half of the increase (5) is due to inflation. If sales are 80, gross output equals 80 minus 70 plus 5 = 15. Fifteen is the trade margin on the goods bought for resale at replacement prices.

[9]African Development Bank, "Situational Analysis: The Reliability of Economic Statistics in Africa focusing on National Accounts", May 2013, Tunis.

Bank output is the value of bank services sold (usually quite small) plus the difference between the interest paid to depositors and the property income earned by banks (usually very big). The 1993 and 2008 SNA have introduced "reference rate" concept to measure the output of banking services that have been provided in respect of deposits and loans to the depositors and borrowers, respectively. The Financial Intermediation Services Indirectly Measured (FISIM) when using the reference rate approach is estimated as sum of (a) interest on reference rate minus interest paid on deposits and (b) interest received on loans minus interest on reference rate. The 2008 SNA also introduced a term "SNA interest", which (i) on deposits is the product of total stock of deposits and reference rate; and (ii) on loans is the product of total stock of loans and reference rate.

The difference between interest and other property income received and interest paid to depositors is now called FISIM. In the older versions of the SNA it was called "Imputed Bank Service Charges" and was calculated in the same way as FISIM. The 2008 SNA recommends that FISIM should be recorded as a purchase of a service either as intermediate consumption in the case of industries or as final consumption for government, NPISH, households and the rest of the world.

Insurance output covers insurance against road accidents, unemployment, ill health, house fires, and any of the other misadventures that may befall you. In the 1968 SNA the output of insurance was only the difference between premiums and claims. The 1993 SNA added "premium supplements" to the earned premiums[10], which are equal to the interest earned on the contingency funds that are held by insurance company and from which claims are paid. The reasoning behind "premium supplements" is that the contingency funds really belong to the customers and not to the insurance companies. It is as though the customers earn interest and other property income from investing those funds and then pay it to the insurance companies as an additional or "supplementary" premium. On the claims side, the 2008 SNA estimates this as claims due + changes in technical reserves and to own funds. In addition, 2008 SNA also suggests expectation approach and sum of costs approach to estimate output of non-life insurance.

For more detailed discussion on financial services, please see the *United Nations, European Central Bank: Handbook of National Accounting: Financial Production, Flows and Stocks in the System of National Accounts, 2014* and the *ECA Guidebook on the Use of Administrative Data in National Accounts, 2017.*

2.2.4. Primary and secondary products

The statistical data source in Africa is often the financial accounts for enterprises. Output from financial accounts for the enterprises will be closer to producers' prices than at basic prices. The enterprises or establishments normally produce more than one product. These include primary products and secondary products. The secondary products consist of (a) subsidiary products: those that are technologically unrelated to the primary product; (b) by-products: products that are produced simultaneously with another product but which can be regarded as secondary to that product; and (c) joint products: products that are produced simultaneously with another product that cannot be said to be secondary (for example beef and hides).

[10] Earned premiums refer to the premiums that relate only for the accounting period.

In the supply table, the primary and secondary products of an industry (in each of the columns) are shown separately against the corresponding product rows. The production boundary principles and valuation principles that are discussed below apply equally to both primary and secondary products.

2.2.5. Basic prices and purchasers' prices

In statistical surveys for enterprises or establishments, producers usually report the value of their output at "farm-gate" or "ex-factory" prices. Producers set these prices to generate an operating surplus in addition to the costs of intermediate inputs and employee compensation. These prices will also be set high enough to cover any taxes on production that producers have to pay, such as property taxes on land and buildings, vehicle licence fees, and taxes on employment but they do not include taxes on products as these are paid by the purchasers and not by the producers. Sometimes producers transport their goods to the purchaser so that the price charged by the producer will also include these transport costs. These ex-factory or farm-gate prices (which may or may not include transport costs borne by the producer) are referred to in the SNA as *basic prices*.

Box 2.1: Treatment of taxes on products in South Africa (by Statistics South Africa)

In South Africa, the supply and use table includes 6 types of taxes on products. The basic methodology is to determine a structure (spread) of these taxes across the relevant products according to their CPC classification. These distributions are then applied to control totals from Government Finance Statistics, to ensure consistency.

In the case of transfer duties (other services), provincial taxes on goods and services (other services), fuel levies (petroleum products), excise duties (fuel, alcohol and tobacco) and customs duties (various products across the spectrum), taxes can be linked directly to specific commodity groups in the use table.

The situation is more complex for value added tax. Three areas are estimated independently to derive the VAT-distribution. Economic survey results provide an indication of asset distributions of businesses so that estimates can be made for the payment of VAT on real estate services. Secondly detailed industry expenditure surveys are used to determine product groups from which VAT expenditure will not be claimed as opposed to expenditure on which VAT is payable. Thirdly a household income and expenditure survey is used to determine private consumption expenditure on commodity groups on which VAT is payable as opposed to be VAT exempt or that are zero rated. In all three cases expert opinion is used to make adjustments to these VAT-payable distributions before they are combined into a single distribution key for the economy.

The VAT distribution remains in place until the next benchmark round, whereas the other types of taxes on products can be easily linked and updated on an annual basis.

The import column shows goods and services at their c.i.f. prices. These are prices that include the costs of any transport and insurance charges to bring them to the port of entry but they exclude any customs duties, other product taxes, trade margins and transport costs that will later have to be paid by the eventual purchasers. These c.i.f. prices are also referred to as *basic prices.*

The users of these domestically produced or imported goods will need to pay *purchasers' prices* for them. These will be higher than the *basic prices* because of a number of costs that intervene between sale of commodities at the place where they are produced or imported and the place where they will be used. The relationship between *basic* and p*urchasers' prices* is as shown in Figure 2.1.

Figure 2.1: Moving from basic prices to purchasers' prices	
	Basic prices
plus	Taxes on products, excluding invoiced VAT
minus	Subsidies on products
equals	Producers' prices
plus	VAT not deductible by the purchaser
plus	Trade margins and Separately invoiced transport charges
Equals	Purchasers' prices

To convert supply at basic prices to supply at purchasers prices, the full supply quadrant of the SUT therefore looks like this.

Figure 2.2: Supply quadrant of the SUT

Supply at basic prices		***plus* adjustments to move from basic to purchasers' prices**			***equals* total supply at purchasers' prices**
Domestic production (DP)	Imports (IMP)	Transport costs separately invoiced to the purchaser	Wholesale and retail trade margins	Taxes on products *minus* subsidies on products	
Goods 1 2 .. Services 1 2 ..					
TOTAL					

The final column of Figure 2.2 now shows the total supply of goods and services at *purchasers' prices.* This column should now be equal the total of the uses in the right-hand side of the SUT as these are valued at the prices paid by those who purchase the various goods and services.

2.2.6. Transport costs and trade margins

Since freight transport costs[11] and trade margins are now shown in columns in the Supply quadrant, there is a problem of double counting because trade and freight transport services are also included in the list of commodities that are produced or imported. Figure 3 shows the counter-entries that are required to avoid double counting.

[11] Transport charge is not included in the price of the commodity the purchaser buys, but a service (transport charge) paid separately by the purchaser.

Figure 2.3: Adjustment for freight transport costs and trade margins

Supply at Basic prices		Adjustments to move from basic to purchasers' prices			Total supply at purchasers' prices
Domestic production (DP)	Imports (M)	**Transport costs invoiced to the purchaser**	**Wholesale and retail margins**	Taxes on products *minus* subsidies on products	
Food		**8**	**50**		**58**
Clothing		**5**	**90**		**95**
.					
.					
Freight transport services (13)		**-13**			**0**
Trade services (140)			**-140**		**0**
.					
.					
Other services					
TOTAL153		**0**	**0**		**153**

Freight transport costs and trade margins (13 and 140 respectively in this example) are shown as services produced in the *DP* matrix, but these same amounts are also included in the transport and trade columns as adjustments required to move from *basic* to *purchasers' price*: 58 in the case of food and 95 for clothing. The value of the transport and trade services must now be cancelled out by negative entries of -13 and -140 in their respective columns to avoid double counting. *Total supply at purchasers' prices* now increases for goods by 153, but the same amount reduces for freight transport and trade services. Thus at the overall economy level for all products combined, the difference between the basic prices and purchasers' prices is only the taxes less subsidies on products.

2.2.7. C.i.f./f.o.b. adjustment

In the SNA, both imports and exports are theoretically valued on f.o.b. In practice exports are so valued but almost all countries record imports on c.i.f. When imports are valued on c.i.f. there is another double counting problem:

The value of imported goods includes the transport and insurance services incurred in bringing them to the importing country, but these transport and insurance services will also be included either in domestic production if the transport and insurance services are provided by residents, or in imports (of services) if the transport and insurance services are provided by non-residents.

Figure 2.4 shows the adjustments required to avoid double counting freight and insurance services when, as is usually the case, imports are recorded c.i.f. Both an additional column and an additional row have to be introduced into the supply quadrant of the SUT.

In this example, the difference between imports c.i.f. and imports f.o.b. came to 20. This is the total amount of insurance and freight charges on all imports. Some of it will have been paid to domestic transport and insurance enterprises and some to non-resident enterprises and will have

been included in either in domestic production or imports of services. This 20 is the total amount that we need to deduct in order to avoid counting it twice. Note that we do not need to know how much was provided by domestic producers and how much by non-residents; we only need to deduct the total amount of 20.

In this example it is estimated that insurance on imports was 5 and the freight transport charge was 15. These are subtracted in the c.i.f./f.o.b. column in the rows for transport and insurance. Total supply at purchasers' prices is therefore reduced by the same amounts and double counting has been avoided. Imports, in total, are now valued at f.o.b. prices[12] as required by the SNA, and an offsetting entry of +20 is required at the intersection of the c.i.f./f.o.b. column and row so that the c.i.f./f.o.b. adjustment has no further impact on the SUT.

Figure 2.4: Adjustment from c.i.f. to f.o.b. for imports

Supply at basic prices			Adjustments to move from basic to purchasers' prices			Total supply at purchasers' prices
Domestic production (DP)	Imports (IMP)	C.i.f./f.o.b adjustment	Transport costs invoiced to the purchaser	Wholesale and retail margins	Taxes on products minus subsidies on products	
Food Clothing Freight transport Insurance. . Other services		 -15 -5				 -15 -5
C.i.f/f.o.b adjustment	-20	+20				0
Total	-20	0				-20

Of course, if imports are recorded on f.o.b., these adjustment items are not required.

2.2.8. Taxes and subsidies on products

This is the final adjustment column needed to bring supply at basic prices up to purchasers' prices. Taxes on products include customs duties, excise duties, sales taxes and value added taxes (VAT) not deductible by the purchaser. All product taxes are paid by purchasers and so must be included in supply at purchasers' prices.

Subsidies are transfers from government to producers and are proportional to the values or quantities of output. Subsidies are quite common in developing countries but are usually confined to only a few products such as grain, fertiliser and fuel for cooking and heating. They are treated in the SNA as negative product taxes.

A common problem is that only the total of product taxes or subsidies are known and the national accounts compiler has little information on their distribution by product. Provided that the rates of product taxes or subsidies are known these can be used to estimate the vector of net

[12] Import of goods will continue to be recorded on c.i.f., but total imports will be on f.o.b.

product taxes by product. The known totals are then used as controls to adjust the estimated breakdown by product[13].

2.3. Purchases abroad by residents and purchases in the domestic market by non-residents

In the SNA, household final consumption expenditure (HFCE) refers to the resident population. This means that:

- HFCE must include purchases abroad by residents and exclude purchases in the domestic market by non-residents;
- Exports must include purchases in the domestic market by non-residents, and imports must include purchases abroad by residents.

Consider first HFCE. Many countries estimate HFCE by household expenditure surveys. Only resident households are covered in these surveys and such surveys usually ask respondents to record expenditures made abroad. This means that if a country uses a household expenditure survey to estimate HFCE, this estimate will usually be fully consistent with the SNA: purchases in the domestic market by non-residents will have been automatically excluded because non-residents were not covered by the survey, and resident households will have reported their expenditures abroad. Of course if the household expenditure survey does not ask households to report their expenditures abroad, HFCE will need to be adjusted to include them. But this is rare and household expenditure surveys usually generate estimates of HFCE that are consistent with the SNA. These countries do not need to make any adjustment to their HFCE to take account of direct purchases.

Some countries, however, base their estimates of HFCE on retail sales or production statistics and in these countries their first estimate of HFCE will not be consistent with the SNA rules. Purchases in the domestic market by non-residents will be included and purchases by resident households abroad will be excluded. Countries whose initial estimate of HFCE is not consistent with the SNA can do one of two things:

- If they have detailed information on purchases abroad by residents and on purchases in the domestic market by non-residents, they can adjust their initial HFCE estimate at a detailed level. Usually information on this is available from tourism surveys;
- If they can only estimate the total value of purchases abroad by residents and of purchases in the domestic market by non-residents, they can add the former and subtract the latter as two, one-line adjustments to their initial HFCE estimate.

Many countries choose the second method because it is less data-demanding and in this case they will show purchases of residents abroad as a plus entry and purchases in the domestic market by non-residents as the last entries in the HFCE column of the SUT.

[13] VAT on products is deductible for most of intermediate consumption and non-deductible for final expenditure. Distributing the total figures for VAT by product on the Supply side is impossible if not looking at the use of the different products on the Use side.

Now consider exports and imports. As noted above, these must include, respectively, purchases in the domestic market by non-residents and purchases of residents abroad. In the standard SUT shown in the SNA, the supply quadrant of the SUT includes a line for purchases of residents abroad so that these can be added to other imports, and the uses quadrant includes a line for purchases in the domestic market by non-residents so that these can be added as a single figure to other exports.

In practice, however, these two adjustment lines will almost always by empty. This is because standard Balance of Payments of the IMF includes these purchases in exports and imports of services. Provided the national accountant uses the balance of payments (BOP) statistics for imports of services, the adjustment for direct purchases is not required.

References:

1. *System of National Accounts, 1993, United Nations, New York, 1993.* Paragraph 6.14 (Production Boundary) and Chapter XV Supply and Use and Input Output Tables.
2. *System of National Accounts, 2008, United Nations New York 2008,* Chapter 6. The Production Account
3. *Understanding National Accounts, François Lequiller and Derek Blades, OECD Paris 2006* Chapter 4. Production: What it Includes.

Chapter 3. Use table

3.1. Introduction

This chapter deals with the conceptual and valuation aspects of various components of use table. The previous chapter covered these aspects in respect of supply table. The source data, compilation and classification issues are dealt in the chapters on Minimum Data Requirements and Classifications of Industries and Products.

The SUTs build up on the concept that the amount of a product available for use within the economy must have been supplied either by domestic production or by imports. The same amount of the product entering an economy in an accounting period must be used for intermediate consumption, final consumption, capital formation (including changes in inventories) and/or exports.

Figure 3.1 is an illustrative Supply and Use Tables for three products and three industries.

3.2. Overview of the structure of use table

A use table shows the uses of products (goods and services) in a cross-classification of products and types of use, namely, intermediate consumption by industry, and final consumption expenditure (by households, NPISHs and government), gross capital formation (gross fixed capital formation, change in inventories and valuables) and exports.

The largest part of the Use table shows the products that are used as intermediate consumption by industries. This is also the hardest part of the Use table to compile because very few countries collect detailed information on intermediate consumption by industries.

Although not an integral part of the SUTs, it has been found to be useful for analytic purposes to show the breakdown of value added in a third quadrant of the use table. This third quadrant is usually shown under the Intermediate Uses quadrant of the SUTs. This Chapter also explains the components of value added that are required for the third quadrant, i.e. compensation of employees, other taxes less subsidies on production, consumption of fixed capital and net operating surplus/mixed income.

The intermediate use part of the table shows intermediate consumption at purchasers' prices of industries in columns 12 to14 disaggregated by products in rows 1 to 3. The total-row shows intermediate consumption by industries at purchasers' prices. *(In* Figure 3.1*, these values are: 802 for agriculture, 3717 for industry, 2492 for services and 7011 for all industries).* In the use table, the rows of trade and freight transport products will have zero entries, as their values are embedded in the tangible products of agriculture and industry (goods) since they are now valued in purchasers' prices and these prices include the trade and transport margins and taxes less subsidies on products. Therefore, at purchasers' prices there will be no entries for trade and transport margins. It may be recalled (figure 2.3) that the supply table also has zero values for the rows of trade and freight transport under the total-supply column at purchasers' prices.

Figure 3.1: Illustrative Supply and Use Table

	SUPPLY										USES								
	Agriculture	Industry	Services	Total dom. supply	Imp. c.i.f. (totalf.o.b.)	*C.i.f./ f.o.b.* adjustment	Total supply at basic prices	Transport cost and trade margins	Taxes less subsidies on products	Total supply at purchasers' prices	Agriculture	Industry	Services	Total inter-industry use	Exports f.o.b.	HFCE/NPISH final consumption expenditure	GFCE	GCF	Total use at PP
(1)	(2)	(3)	(4)	(5)=(2)+(3)+(4)	(6)	(7)	(8)=(5)+(6)+(7)	(9)	(10)	(11)=(8)+(9)+(10)	(12)	(13)	(14)	(15)=(12)+(13)+(14)	(16)	(17)	(18)	(19)	(20)=(15)+(16)+(17)+(18)+(19)
1. Agriculture	3245			3245	23		3268	30	10	3308	400	450	130	980	57	2229	15	27	3308
2. Industry		5163		5163	850		6013	100	-115	5998	160	2050	1000	3210	513	1271	130	874	5998
3. Services			6594	6594	94	-10	6678	-130	885	7433	242	1217	1362	2821	275	2456	817	1064	7433
4. C.i.f./f.o.b. adj.					-10	10	0			0									
5. Purchases of residents abroad					10		10			10						10			10
6. Purchases by non-residents in the domestic market																-20			-20
7. Total	3245	5163	6594	15002	967	0	15969	0	780	16749	802	3717	2492	7011	865	5946	962	1965	16749

BP: basic prices; PP: purchasers' prices; PRA: purchases by resident abroad; PNRDM: purchases by non-resident in the domestic market; c.i.f.: cost, insurance, freight; f.o.b.: free on board; TTM: transport costs and trade margins; HFCE: household final consumption expenditure (including those of NPISHs); GFCE: government final consumption expenditure; GCF: gross capital formation.

The final uses part of Figure 3.1 (columns 16 to 19) shows exports; final consumption expenditure of households, NPISHs and government; and gross capital formation broken down into gross fixed capital formation and other gross capital formation (i.e. change in inventories and net acquisition of valuables) at purchasers' prices. The total-row shows final use by use categories at purchasers' prices. *(These values are: 865 for exports, 5946 for household and NPISH final consumption expenditure, 962 for government final consumption expenditure and 1965 for gross capital formation, with total final use being 9738).*

3.3. Valuation

Both the intermediate uses and the final uses are valued at purchasers' prices, as industries and final users purchase products for their use at purchasers' (market) prices. As explained in the previous chapter, the supply table, which is initially compiled at basic prices, is converted to that at purchasers' prices by adding trade margins and transport charges and taxes less subsidies on products, so that both supply and use tables are brought to the same valuation basis.

In the use table, exports are valued on f.o.b. prices. This price represents the value at the border of the exporting country and includes all distributive services up to the border as well as any export taxes minus export subsidies. The f.o.b. price is considered to be a special purchasers' price applied to exports.

In the use table compiled at purchasers' prices, there are no entries for consumption of wholesale and retail trade services as these are included with the expenditure on the goods either in intermediate consumption or in final uses. Also, taxes less subsidies on products are included in the purchaser's value of products and are not shown separately in the use table.

The non-market services produced by government and NPISHs are valued on non-market basis[14] as the sum of the costs incurred in their production; that is, as the sum of: intermediate consumption, compensation of employees, consumption of fixed capital, and other taxes less subsidies, on production.

3.4. Intermediate consumption of industries

Intermediate consumption consists of value of goods and services that are used as inputs in the production process. These products are entirely used up and transformed in the production process resulting in output of products which may further be used in the production process (such as wheat flour for making bread) or for final use. The intermediate consumption excludes the use of fixed assets, which is recorded as consumption of fixed capital and also excludes expenditures on valuables. However, expenditures on hand tools which are of low value are included in the intermediate consumption, though they are not used up in the production process.

Intermediate consumption is recorded on an accrual basis, i.e. at the time when a good or service is actually used in the production process, as distinct from the time of acquisition. For services, of course, the two times coincide. On the other hand intermediate consumption of

[14]Non-market means that the services or goods are provided free or at prices that are not economically significant, that is at prices which do not have a significant influence on the amounts that producers are willing to supply or on the amounts that purchasers wish to buy.

goods is equal to purchases (including other types of acquisitions) minus additions to inventories plus withdrawals from inventories:

Intermediate consumption = acquisitions – changes in inventories of goods for intermediate consumption

Intermediate consumption is normally valued in purchasers' prices, as that is the price paid by the producers for the intermediate inputs. This price consists of *(i)* basic price received by the producer of the good or service, *(ii)* transportation costs paid separately by the purchaser, *(iii)* wholesale and retail trade margins, and *(iv)* any non-deductible tax less subsidies on the product payable, but these elements are not separately shown in the use table.

The sources of data for intermediate consumption by industry and products may be economic censuses, annual enterprise surveys, business accounts, government budget documents, administrative data and cost studies. Also, some countries conduct focused input-output surveys, on small select units covering each activity.

3.5. Consumption expenditure of Non-Profit Institutions Serving Households (NPISHs)

Non-profit institutions (NPIs) are legal or social entities created for the purpose of producing goods and services but whose status does not permit them to be a source of income, profit or other financial gain for the units that establish, control or finance them. The NPIs can have surpluses but they cannot be appropriated by the institutional units which establish them.

NPIs that are controlled by government are treated as government units, while NPIs controlled by corporations fall under the institutional sector of corporations[15]. All other NPIs are treated as a special group of units called NPISHs. The SNA defines NPISHs as non-profit institutions which provide goods or services to households free or at prices that are not economically significant. This definition of NPISHs indicates its two special features – (a) they provide their services (and sometimes goods) on a non-market basis, and (b) they are mainly financed by donations or regular subscriptions from households, though they may also receive donations from other institutional units or from other sources such as property incomes.

Some NPISHs provide services only to their members (trade unions, sports bodies and political parties); while other types of NPISHs serve the entire community (charities, relief and aid agencies). Health services, recreation, culture, education and welfare services are provided by either type of NPISHs. All services provided by NPISHs are treated as individual in the 1993 SNA although the 2008 SNA recognises that NPISH may also produce collective services such as research activities.

Final consumption expenditures of NPISHs are equal to the gross output of producers of NPISHs services less sales and own account capital formation plus social transfers in kind. The treatment of NPISHs is very similar to that of general government and its valuation is as mentioned earlier.

The final expenditures of NPISHs are generally classified according to COPNI (housing, health, recreation and culture, education, social protection, religion, political parties, labour

[15] These NPIs typically charge membership fees to cover their costs.

and professional organizations) and these need to be converted to a product classification for compiling the use table. Very often, NPISHs are combined with households for estimating final consumption expenditure due to the absence of data on NPISHs.

In many countries, NPISHs are exempt from paying taxes, but the tax authorities nevertheless collect accounts of NPISHs. This could be a source of data on NPISHs. The other sources could be economic censuses, enterprise surveys, annual accounts, and labour force surveys. The BoP statistics may also provide information on current transfers made to NPISHs.

3.6. Government final consumption expenditure

The term "general government" in the 1993 SNA includes all levels of government (municipal, local, state, provincial and federal). According to 2008 SNA: The "general government sector" consists mainly of central state and local government units. In addition, it includes extra budgetary units, NPIs engaged in non-market production that are controlled by government units and social security funds. General government incurs expenditures on a wide range of consumption goods and services to produce services for own final use on non-market basis. Though these services are provided to people either individually and collectively, the costs of producing these services are shown as final consumption expenditure by the government. Receipts from sale of government services is generally very little compared to the costs involved and the government meets most of its expenditures from taxes and other revenues.

The output of government services is measured on the basis of costs of production. Government final consumption expenditure is equivalent to government output, less the value of government sales of non-capital goods and services, plus social benefits in kind[16]. Other government expenditures such as subsidies to industries to reduce operational costs or costs of capital goods, interest payments, costs of capital goods procurement, etc. do not form part of government output or final consumption expenditure.

The final consumption expenditures of the general government sector are divided into two categories of consumption - individual and collective on the basis of who is consuming these services – households or the community as a whole. Individual consumption expenditure benefits individuals or small groups of individuals whereas collective consumption expenditure provides services to the community as a whole or to large sections of it.

Individual final consumption expenditures of government consist mainly of *(a)* health services including public health, *(b)* recreation, culture and religion, *(c)* education, *(d)*social security and welfare services, and *(e)* housing, refuse collection and sewerage services. The main characteristic of individual consumption expenditure is that, "it must be possible to observe and record the acquisition of the good or service by an individual household or member thereof and also the time at which it took place".

The final consumption expenditures by general government for individual goods and services are also called social transfers in kind by general government (further sub-divided into *(a)* social benefits in kind, and *(b)* transfers of individual non-market goods and services, which are produced by the government on a non-market basis).

[16]Social benefits in kind represent the value of goods and services purchased from market producers for delivery to households free or at economically insignificant prices. These do not form part of government output.

The goods and services purchased by the government to be given to households without any further processing are valued at purchasers' prices, while the services produced by government for consumption by individual households are valued at cost.

Collective final consumption expenditures include only services (there are no collective goods) with the following characteristics:

(a) Collective services can be delivered simultaneously to every member of the community or of particular sections of the community;
(b) The use of such services is usually passive and does not require the explicit agreement or active participation of all the individuals concerned;
(c) The provision of a collective service to one individual does not reduce the amount available to others in the same community or section of the community. There is no rivalry in acquisition.

Current expenditures defined as collective fall under the broad headings of general public services, defence, public order and safety, economic affairs and environment protection but they also include certain expenditures under housing, health, recreation and culture, education and social protection that are considered to be for the benefit of the community at large. The government consumption expenditures are recorded according to the classification COFOG and the sources of data are the general government budget documents. Collective consumption expenditure by government is valued at cost.

3.7. Household final consumption expenditures

Household consumption corresponds to the value of goods and services used for the direct satisfaction of human needs, whether individual or collective. Household final consumption expenditure consists of expenditure incurred by resident households on consumption goods or services[17]. A household is resident in the economic territory in which household members maintain or intend to maintain a dwelling. Being present for one year or more in a territory or intending to do so is sufficient to qualify as having a principal dwelling there[18]. For example, students, who go abroad for full-time study generally, continue to be resident in the territory in which they were resident prior to studying abroad. This treatment is adopted even though their course of study may exceed a year. However, students become residents of the territory in which they are studying when they develop an intention to continue their presence in the territory of study after the completion of the studies.

The household final consumption expenditure includes the estimated value of barter transactions, goods and services received in kind, and goods and services (as per the production boundary of SNA) produced and consumed by the same household. However, household final consumption expenditure excludes expenditure on fixed assets in the form of dwellings or on valuables.

Household final consumption expenditures include:

- all purchases of consumer non-durable and durable goods except dwellings;
- imputed purchases of consumer durables by financial leasing;
- imputed gross rental for owner-occupied housing services;

[17] 2008 SNA (Section D, Chapter 9)

[18] *Ibid*, para 26.37

- own-account production and consumption of goods;
- bartered consumer goods and services (net);
- domestic services provided by domestic servants;
- goods and services in kind provided by enterprises as wages;
- imputed financial intermediary (banking, insurance, pension, etc.) service charges;
- purchases by residents abroad;
- *minus* purchases by non-residents in the domestic market.

The use table also has a provision to record *actual final consumption* of institutional sectors - households, NPISHs and general government. Of these sectors, conventionally, the NPISHs do not have actual final consumption, as their expenditures are of the nature of individual final consumption (being social transfers in kind made available to the households) and, therefore, become part of household actual final consumption. The actual final consumption of general government is its collective consumption expenditure. The individual consumption expenditure of general government becomes part of actual final consumption of households. Thus, the actual final consumption of households includes:

a) household final consumption expenditures;
b) final consumption expenditures of NPISHs; and
c) individual final consumption expenditures of general government.

The 2008 SNA states that household final consumption expenditure should be recorded at the purchasers' prices[19] paid by households including any transport charges and taxes on products that may be payable at the time of purchase. Individual consumption expenditure of households includes a number of imputed expenditures. Goods that are consumed by the households (including family members) that produce them should be valued at purchasers' prices although in practice purchasers' prices for goods consumed from own production should be identical to basic prices because trade margins and transport charges and net taxes on products consumed from own production will be zero. Income in kind is valued at purchasers' prices if the employer has purchased the goods or services that are being provided to the employees. It is valued at producers' prices if the goods or services have been produced by the enterprise itself.

The data sources for household consumption expenditures are the household income-expenditure surveys, retail trade surveys and other administrative data. Commodity flow approaches are widely used to estimate the household final consumption expenditure.

3.8. Gross fixed capital formation

Gross fixed capital formation (GFCF) is measured by the total value of a producer's acquisition, less disposal, of fixed assets during the accounting period plus certain additions to the value of non-produced assets realized by productive activities of resident producers. Fixed assets are tangible or intangible assets which are outputs of production processes, and are used repeatedly or continuously in production processes. They must have a life span of not less than one year. Fixed assets do not include small tools of economically insignificant value. GFCF includes expenditures (including own account production) on the acquisition of dwellings and other buildings/structures, machinery and equipment, mineral exploration, computer software,

[19] The purchaser's price of a good is defined as the amount payable to take delivery of a unit of the good at the time and place required by the purchaser.

databases, military weapon systems, Research and Development (successful and unsuccessful), cultivated assets (trees, livestock), etc[20].

GFCF also includes major improvements to tangible non-produced assets, including land, plus any costs associated with the transfers of ownership of non-produced assets, major renovations to existing assets, own account GFCF, capital transfers in kind and fixed assets acquired through barter.

Asset boundary, fixed assets and GFCF

The asset boundary: The boundary line between those products that are retained in the economy and are used for consumption and those products that are used for capital formation is known as the asset boundary. The asset boundary for fixed assets consists of goods and services that are used in production for more than one year. Exclusions are (i) consumer durables and (ii) hand tools and other small and inexpensive goods which may otherwise meet the criteria of fixed assets. Improvements to existing assets and the cost of ownership transfer of assets are included in asset boundary.

Fixed assets: Produced assets that are used repeatedly or continuously in production processes for more than one year.

GFCF: Total value of a producer's acquisitions, less disposals, of fixed assets during the accounting period plus certain specified expenditure on services that adds to the value of non-produced assets. In general, when the production of fixed assets takes a long time to complete, those assets whose production is not yet completed at the end of the accounting period are recorded as work-in-progress. However, when the assets are produced on own account they are treated as being acquired by their users at the same time as they are produced and not as work-in-progress.

GFCF is usually shown by type of asset

(i) Dwellings (buildings that are primarily used as residences. Incomplete dwellings are included in GFCF if the construction is on own-account or if there is a sale or purchase. Dwellings acquired for military personnel are also included).

(ii) Other buildings and structures (include non-residential buildings, other structures and land improvements).

(iii) Machinery and equipment (cover transport equipment, machinery for ICT equipment, and other machinery and equipment. Machinery and equipment under a financial lease are treated as acquired by the user (lessee) rather than as acquired by the lessor. Machinery and equipment other than weapons systems acquired for military purposes are included).

(iv) Weapons systems (include vehicles and other equipment such as warships, submarines, military aircraft, tanks, missile carriers and launchers, etc. Some single-use items, such as certain types of ballistic missile with a highly destructive capability are also included).

[20] Please see *Table 10.2: The capital account - the classification of fixed assets* in 2008 SNA, for the classification of fixed assets.

(v) Cultivated biological resources (cover animal resources yielding repeat products and tree, crop and plant resources yielding repeat products whose natural growth and regeneration are under the direct control, responsibility and management of institutional units).

(vi) Costs of ownership transfer on non-produced assets (represent produced assets but their value cannot be integrated with the value of another produced asset. They are shown as a separate category of GFCF. However, costs of ownership transfer of land are treated as land improvements).

(vii) Intellectual property products (Examples are the results of research and development, mineral exploration and evaluation, computer software and databases, and entertainment, literary or artistic originals).

GFCF estimates are based on construction surveys, building permits, enterprise surveys, accounts of corporations and NPISHs, government budget documents, foreign trade statistics and the household surveys (for estimating own account construction). However, commodity flow methods are widely adopted to estimate GFCF by developing countries. GFCF is valued at purchasers' prices and include costs of transport and installation and any fees or taxes for transfer of ownership. Own-account GFCF is valued at basic prices or at the costs of production plus estimated operating surplus[21].

3.9. Changes in inventories

Changes in inventories are measured by the value of the entries into inventories less the value of withdrawals and less the value of any recurrent losses of goods held in inventories during the accounting period. Some of these acquisitions and disposals are attributable to actual purchases or sales, but others reflect transactions that are internal to the enterprise.

Inventories are usually classified into three broad categories – finished goods, materials and fuels, and work-in-progress. Finished goods include goods acquired for resale by wholesalers and retailers, all goods stored by government as strategic reserves, such as food and fuel, as well as finished goods that are awaiting delivery to customers. Materials and fuels include raw materials and supplies which will be used up as intermediate consumption in the course of production in a future year. Work-in-progress consists of goods and services on which some processing has taken place but which are not yet in a finished form suitable for delivery to customers. In agriculture, work-in-progress consists of the natural growth of vineyards, orchards, plantations and timber tracts and the natural growth in livestock that are being raised for slaughter.

Valuing change in inventories is more complicated than in the case of other aggregates. It can be approximated by taking the difference between closing (i.e. end of year) inventories and opening (i.e. beginning of year) inventories both valued at average annual prices for the year in question. The data required are prices for inventories at the end of the year, at the beginning of the year and the average for the year as a whole. The physical change in inventories valued at average annual prices is then obtained as follows:

[21] return to capital is not included in the own account production of fixed assets (and hence in GFCF) for non-market producers

Figure 3.2: Calculating change in inventories at average 2011 prices		
(a) Value of inventories at beginning of 2011 (i.e. at 31 December 2010)		660
(b) Value of inventories at end of 2011 (i.e. at 31 December 2011)		855
(c) Change in value of inventories (i.e. change in book value) in 2011	(a) – (b)	195
Price indexes for inventories		
(d) Price index at beginning of 2011 (base year of volume estimates =100)		110
(e) Price index at end of 2011 (base year of volume estimates =100)		114
(f) Average price index for 2011 (base year of volume estimates =100)		112
Inventories at constant prices		
(g) Book value level at beginning of 2011, at constant prices	(a)/(d) x 100	600
(h) Book value level at end of 2011, at constant prices	(b)/(e) x 100	750
(i) Change in book value in 2011, at constant prices	(h) – (g)	150
Change in inventories at average 2011 prices		
(j) Change in inventories at average 2011 prices	(i) x (f)/100	168
Capital gain	(c) – (j)	27

Source: National Accounts Framework in the ICP: Operational Material, ICP 2011 Global Office.

3.10. Acquisitions less disposals of valuables

Valuables are produced goods of considerable value that are not used primarily for purposes of production or consumption but are held as stores of value. Valuables are expected to appreciate or at least not to decline in real value, nor to deteriorate over time under normal conditions. They consist of precious metals and stones, jewellery, works of art, etc. Valuables may be held by any of the institutional units (government, financial and non-financial corporations, households and NPISHs).

Just as in the case of fixed assets, acquisitions of valuables are valued at their purchase prices together with associated costs of ownership transfer. Disposals are valued at their sale prices less any associated costs of ownership transfer.

3.11. Exports

Exports of goods and services consist of sales, barter, or gifts or grants, of goods and services from resident to non-residents. In theory, exports occur when transfer of ownership from residents to non-residents takes effect, but in practice change of ownership is deemed to occur when goods cross international boundaries. Exports are valued f.o.b. i.e. measured without the costs of transport and insurance services to bring goods from the border of one country to that of another country. As mentioned earlier, the f.o.b. price is regarded as the purchaser's price. Data for exports of merchandise (goods) come mainly from foreign trade statistics. Data for exports of services come mainly from balance of payments.

As measured in the balance of payments, exports of services include direct purchases in the domestic market by non-resident households ("tourist expenditures"). Provided exports of services do in fact include direct purchases, the adjustment item for exports in the standard SUT table "direct purchases by non-resident households" will be zero.

3.12. Adjustment items[22]

3.12.1. The adjustment for purchases of residents abroad

Direct purchases by residents abroad are treated as both imports and household final expenditure by the SNA. While these values are recorded under the imports column in the supply table against the adjustment row *(*10 in the *supply part of* Figure 3.1*)*, the same amount is recorded in the use table under household consumption column against the adjustment row (10 in Figure 3.1*)*. Though, SNA mentions that the values of residents' purchases abroad to be shown against adjustment rows, the European System of National Accounts (ESA) recommended classifying these expenditures by products. It may also be mentioned that ESA recommends allocation of these direct purchases abroad also to intermediate consumption in addition to household consumption, in cases of business travels.

Countries that base their estimates of household final consumption expenditure on a household budget survey will not need to make this adjustment if, as is usually the case, the survey covers expenditures by resident households abroad. The adjustment for resident purchases abroad is only required if the household budget survey excludes expenditures by resident households abroad or if the estimates for household final consumption expenditure are based retail sales or other statistical sources which exclude purchases by resident households abroad.

3.12.2. The adjustment for purchases of non-residents in the domestic market

Direct purchases in the domestic market by non-residents are included in exports of goods and services and also as a negative entry in the household final consumption expenditure. In the use table, these are normally shown as adjustment entries in a separate row at the end of the product rows, under exports and household final consumption expenditure columns (20 in Figure 3.1*)*. However, ESA recommends that these be broken down by types of goods and services. One way of achieving this is using the tourism satellite accounts (TSA) if the country has compiled it, otherwise, distributing the total expenditures to tourism specific products and tourism connected products on the basis of a specifically conducted survey.

For most developing countries, which usually base their estimates of household final consumption expenditure on a household budget survey, this adjustment is not required.

3.13. Value added components (quadrant III)

The third quadrant of the SUT shows the components of gross value added at basic prices. An illustrative quadrant III is shown in Figure 3.3. The numbers are consistent with Figure 3.1. As already mentioned, quadrant III is conventionally shown in the SUT below the uses table.

Figure 3.3: Quadrant III: components of gross value added				
	Agriculture	Industry	Services	Total

[22] These adjustment items are not applicable if the household consumption is estimated through household consumer expenditure surveys and the imports and exports data include resident and non-resident purchases abroad and in the economy, respectively.

1. Gross output at basic prices	3245	5163	6594	15002
2. Intermediate consumption at purchasers' prices	802	3717	2492	7011
3. Gross value added at basic prices	2443	1446	4102	7991
3.1 Compensation of employees	1000	700	2000	3700
3.2 Consumption of fixed capital	238	136	407	781
3.3 Other taxes on production	2	4	3	9
3.4 Operating surplus/mixed income	1203	606	1692	3501

Line 1 in Figure 3.2 is taken from the supply side of Figure 3.1 and is gross output at basic prices. Line 2 is taken from the uses side of Figure 3.1 and is total intermediate consumption of industries at purchasers' prices. The difference between these two is shown in line 3 as gross value added (GVA) at basic prices. Total GVA at basic prices is 7991 and to convert this to GDP at market (or purchasers') prices we need to add taxes on products less subsidies on products. These are shown in Figure 3.1 as 780 so GDP is 7991+780 = 8771. GDP can also be obtained from Figure 3.1 by deducting imports (967) from the total of final uses (9738) i.e. 9738 – 967 = 8771.

While gross value added is derived from SUT, the components of GVA are from quite different sources and their values are in no way constrained by any of the entries in the SUT itself. In this sense Quadrant III is to be seen as an optional add-on to the SUT. It enhances the analytic value of the SUT but it is not an integral part of it. The GVA components are as follows:

3.13.1. Compensation of employees

Compensation of employees (COE) is defined as the total remuneration, in cash or in kind, payable by an enterprise to an employee in return for work done by the latter during the accounting period. Compensation of employees is recorded on an accrual basis. It consists of *(a)* wages and salaries payable in cash or in kind, and *(b)* social insurance contributions payable by employers.

3.13.2. Consumption of fixed capital

Consumption of fixed capital (CFC) is the decline, during the course of the accounting period, in the current value of the stock of fixed assets owned and used by a producer as a result of physical deterioration, normal obsolescence or normal accidental damage. Business accounts use the term of "depreciation" and several countries use the depreciation figures in place of consumption of fixed capital. However, it is avoided in the SNA because in commercial accounting the term depreciation is often used in the context of writing off historic costs whereas in the SNA consumption of fixed capital is dependent on the current value of the asset. SNA recommends preparation of estimates of capital stock and changes in the capital stock over time through the perpetual inventory method (PIM)). Estimates of consumption of fixed capital are obtained as a by-product of the PIM. However, preparation of capital stock estimates through the PIM requires long-term data on GFCF. It may also be mentioned that CFC is applicable only to produced assets and not to valuables. The chapter on "Some Problematic Areas" provides a method for estimating CFC when data on capital stock is not available from a PIM.

3.13.3. Other taxes less subsidies on production

These are taxes that have to be paid by entrepreneurs such as property taxes on the value of the buildings or land that they own, license fees to operate passenger transport vehicles, or road licenses for goods vehicles. These taxes, less any subsidies, are usually unrelated to the level of activity or the scale of output of the enterprises. Other taxes less subsidies on production are included in basic prices

3.13.4. Operating surplus (OS)/mixed income (MI)

Operating surplus/mixed income is the residual when COE, CFC, and other taxes less subsidies on production have been deducted from gross value added. Operating surplus and mixed income, represent the contribution of capital to the generation of value added and measures the surplus or deficit accruing from production before taking account of any interest, rent or similar charges payable on financial assets or natural resources borrowed or rented by the enterprise, or any interest, rent or similar receipts receivable on financial assets or natural resources owned by the enterprise. For unincorporated enterprises owned by households in which the owner(s) or members of the same household may contribute unpaid labour inputs. In such cases, the surplus is described as mixed income because it implicitly contains an element of remuneration for work done by the owner, or other members of the household, that cannot be separately identified from the return to the owner as entrepreneur.

3.14. Procedures to compile use table

The use table is compiled from the data available through enterprise surveys, agricultural surveys, administrative data, foreign trade statistics and balance of payments. One approach of compiling the use table is through product balances achieved through commodity flow approach (row approach). The second procedure is using the product-wise information on intermediate consumption by industries, consumption expenditure, capital formation and exports, which is normally available from the above stated sources (column approach). However, this approach results in different values for product outputs between supply and use tables. For achieving consistency between the two tables in which total output by products is identical in both the tables, balancing procedures need to be adopted. A separate chapter deals with the balancing procedure. Most countries adopt the column approach for compiling use table, as source data is available in this format.

3.15. Major steps in compiling supply and use tables

The compilation of the supply and use table is not linear because arbitrations cannot be planned in advance. There is no clear path to compile national accounts of a country. Certainly there is a diagram tracing the great lines by which national accountants can follow to manage this complex activity; but many variations are possible within available resources, local economic characteristics, and the nature and quality of the statistical system. The choices therefore remain open for each local team of national accountants.

The SUT approach should be based on three principles:

- an integrated work process from inputs to the results;
- a coherent way of treating the data from different sources; and
- an iterative process for integrating all available information by double-checking and balancing them.

The SUT development process can be summarized in four major steps:

- collection and processing of data;
- reconciliation of data sources and preparation of matrices (taxes, social contributions, gross fixed capital formation (GFCF), change in inventories, final consumption, employment, exports and imports);
- compilation of supply and use balance (SUB) and accounts by industry (AI); and
- summary: intermediate and final.

3.15.1. Collection and processing of data

This step consists of the collection, processing and data formatting in accordance with the central framework and concepts defined in the SNA. It allows for the coherence of each data source.

The statistical work at this stage includes the following:
- data collection;
- data treatment including data entry, editing of files, quality and consistency control, reconstitution of missing data;
- conversion of data sources to national accounts concepts;
- data aggregation to form macroeconomic databases;
- creation of archives for each source in order to preserve the integrity.

A quality control of the collected individual data is essential. It should cover the following elements: accounting balance, time series and missing data. The sources are treated independently, but once the data collection and processing is complete, all data is put together in a database. Note that for the same operation we can have several sources. Therefore, the various sources should be compared to ensure coherence.

3.15.2. Reconciliation of data sources and preparation of matrices

Reconciliation of sources is an operation that completes the collection and processing of data. It allows to sort sources or to make the first arbitration for some operations.

For each operation, one person should be responsible to carry out the technical work. He/she needs to collect all the information for the operation. It is at this stage that the proposal is made for the first allocation of the following matrixes: taxes (by product and by industry), social contributions by industry, gross fixed capital formation (GFCF) by institutional sectors and products, changes in inventories by products and institutional sectors, final consumption by product, exports and imports by product, employment by sector and status.

Generally, these are the steps to take:
- establishing working tables;
- making an inventory of available sources;
- assessing the available macroeconomic data (judging their value if they reflect the reality, check time coherence);
- identifying missing information;
- making an assessment of the information;
- make allocation proposal; and
- preparing a new data table.

3.15.3. Compilation of supply and use balance (SUB) and industries accounts (IA)

It is a phase of systematic confrontation of all collected data. The sources of these data are many and varied and sometimes follow different logic. The confrontational approach combines both the accounting relations in the system, and the economic and technical relationships between all operations. This is an iterative process as each available evaluation for a given operation is involved in at least two ways in the relations of the system.

Supply and use balance (SUB): The objective here is to link together supply and demand for each product of the classification. Data from multiple statistical sources and of different origin that are not related to each other needs to be combined. So we need to establish a balance ex-post. We seek to balance supply and demand for a product by making justified assumptions. The SUB can be done by physical quantity and/or by value; at current prices and/or at constant prices.

The industries accounts (IA): IA is a table that presents the production and generation of income accounts by economic activity. It is supplemented by ratios that help to understand the relationships between variables. IAs are done at current prices and constant prices, and they build a relationship with the production factors used (raw materials, labour, fixed capital). The compilation process includes the following steps:

- 1st phase: verification of the economic consistency of existing data;
- 2nd phase: linking grand total of variables with the totals of (statistically) known sectors and ratio analysis with theoretical totals if they exist; and
- 3rd phase: completing the missing data.

3.15.4. Intermediate summary table

There are two kinds of summary tables: intermediate and the final. The intermediate summary table allows for an analysis of the values obtained after working on the SUB and IA. The aim is to verify the data of the original matrix or the source data, and to confront them with the results obtained through analytical work. It should be checked if the data is to be kept or modified, and introduce new information to move towards the final summary table.

The drafting is conducted iteratively between the analytical phases (SUB and IA) and the intermediate summary table. The intermediate summary which maintains the consistency with the master data is repeated several times and must converge to the final summary table.

These are intermediate summary tools that allow the comparison of different sources and their coherence. The SUTs through the SUB and IA aims to draw together different sources. But this work is done with three other intermediate summary instruments that are the matrices of employment, gross fixed capital formation (GFCF) and changes in inventories.

The process to conduct the confrontation between all data must systematically associate both accounting relationships and the economic and technical relationships between all these operations. The work is done at each economic activity and SUB at the detailed product level.

3.15.5. Final summary table

Through the final summary table, we try to solve contradictions in order to achieve a coherent set of macroeconomic data that is balanced and economically significant. The final summary therefore finalizes the work on the SUT and integrated economic accounts (IEA) that constitute the elements of the central framework of the System of National Accounts.

The summary table of SUT is done in two main phases: through the inter-industry matrix or matrix of intermediate consumption (IC) and through the other elements of SUTs.

There are nine recommended steps to develop a summary intra-industry matrix:

a) Highlight the overall gap between supply and demand for IC, and see how it is distributed at the aggregated level of products and branches;
b) Make an inventory of contradictions already highlighted but not yet resolved;
c) Evaluate, for each aggregate involved in the compilation process, how a correction would be economically the most appropriate, if we had to make one. This step of course, should be also carried out at the GDP level;
d) Browse inside the intra-industry matrix. Identify the most important cells and do not hesitate to consult the more detailed intra-industry matrix to identify related sectors and products;
e) Start phase 1 of the arbitration process: in this step, the aggregate amounts of SUB and IA are not changed. We want to bring closer the supply and demand in each cell, without compromising the total;
f) Start phase 2 of the arbitration process: during this phase, it is possible to change the total supply and demand, but it is then necessary to propose the counterparties of these changes in the SUB and IA concerned. It is also recommended to decide at which level the proposed corrections should be done;
g) Correct the SUB and IA concerned, but only at the aggregate level, and without in the base (but only in the summary tables published at the beginning);
h) Confirm the results from a macroeconomic point of view;
i) Make an inventory of the arbitrations made and make a report as detailed as possible.

3.15.6. Rebalance the entire supply and use tables

As the inter-industry matrix is completed, all the corrections introduced during phase 2 resulted in one or more modifications in the SUB and IA. These corrections are defined only at the aggregate level of the industry and product classifications, so they must be now implemented at the detailed level. This is performed in two steps:

- 1st step: validate the summary SUTs: Go through all the decided corrections, by product and by industry (all at the aggregate level) and check that all these corrections give the required accounting balances. In the case of SUB, this checking should focus on the set of equations contained therein, while in the case of IA, corrections must be made by production type.

- 2nd step: make a detailed summary of SUB and IA: once this is done, we can check the compliance of obtained results with the validated data at the aggregate level.

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Chapter 4. Classification of industries, products, and size of supply and use tables

4.1. Introduction

This chapter deals with the classifications of industries and products that are used in the SUTs and also various columns of SUTs.

Once a country decides to compile SUTs for its economy for the first time, two questions come up – what should be the size of the SUTs and how to put together the data that is available from different sources according to different classifications, into the matrix structure of SUTs.

The size of SUTs primarily refers to the number of industries and products for which the SUTs present two identities, *(i)* supply equals uses, for each product, and *(ii)* total output equals total inputs (sum of intermediate inputs and primary inputs[23]), for each industry. As these identities suggest, there is a direct relationship between the size of SUTs and the quality of SUTs, as more industries and products included in the SUTs mean more coherence to the integrated set of product balances achieved in the SUTs, though this may not be true always, when source data available is not so detailed.

As an illustration, for the ICP, the guiding factors for determining the size and classifications (especially for products) for SUTs is *(i)* they should be at a reasonable classification level; and *(ii)* they should match with ICP basic heading classification, at least at some aggregation levels. The AFRISTAT recommendation for size of SUT is of 44X44 dimension. Size of SUT may also depend on its use and national circumstances, though its main objective is to provide coherence and consistency to national accounts.

In most countries, the primary data is available from the source agencies according to the national classifications used by each country. In most cases, these national classifications are based on international classifications, namely, the Central Product Classification (CPC) for products, International Standard Industrial Classification (ISIC) for industries, functional classifications (COICOP and COFOG) for final consumption, and the Standard International Trade Classification (SITC) and the Harmonized Commodity Description and Coding System (HS) for foreign trade. In the SUTs, the integration of these data is achieved through the establishment of concordance tables between these classifications and a standard product classification. Such concordance tables between international classifications are available from the international agencies. If the national classifications are based on these international classifications, concordances between the national classifications can be easily built up on the basis of the concordances between international classifications. Otherwise, the countries need to go through the entire process of matching item by item for establishing concordances between their national classifications. However, it should be understood that concordances between classifications may not be easy and needs to be done carefully.

[23]Primary inputs comprise labour and capital; uses of value added at basic prices include primary incomes to labour (compensation of employees), capital (operating surplus/mixed income) and taxes less subsidies on production other than taxes less subsidies on products.

4.2. Classification of industries[24] for the supply and use tables

The SUTs include a common set of industries in both the supply and use tables. For classifying the industries, SNA recommends the use of International Standard Industrial Classification (ISIC). The latest activity classification of the UNSD[25] is ISIC Rev. 4 (2008). The previous versions, Rev. 3 (1990) and its update Rev. 3.1 (2002) or the country-specific industrial classifications based on these classifications, however, are also used by the developing countries at present.

The ISIC is structured at four levels – Level 1 refers to Sections; Level 2 to Divisions; Level 3 to Groups and Level 4 to Classes. As these terms suggest, Sections are 1-digited; Divisions, 2-digited; Groups, 3-digited; and Classes, 4-digited. The ISIC Rev. 3.1 has 17 Sections (against 21 in Rev. 4), 62 Divisions (88 in Rev. 4), 161 Groups (238 in Rev. 4) and 298 Classes (419 in Rev. 4). Therefore, the most detailed level, at which industries are classified, is at 4-digits, and theoretically, SUTs can be compiled at 4-digit ISIC.

In practice, however, it is very difficult for the countries to collect data from all the enterprises/establishments at 4-digit ISIC. Nor is this required, as several activities listed at 4-digit level in the ISIC may not be relevant to all the countries. The enterprise/establishment surveys and censuses provide information only for those industries which are relevant to the economy. Therefore, identification of industries to be included in the SUTs should be based on the detailed level at which data on industries is available in the countries. Some countries launch focused input-output surveys to collect product-wise data on the intermediate inputs for various industries from a select list of representative units under each economic activity. In such cases, the level of industries in the SUTs could be determined on the basis of industries included in these specific surveys.

An important point to be remembered is that administrative agencies sometimes use their own classifications instead of the NSO's recommended industry and product classifications. In such a situation, it becomes necessary for the SUT compilers to first convert the source data to NSO adopted classifications, and then apply concordances among them to generate product level data. However, it is preferable that the NSOs of countries should advice all data collecting agencies in the country to follow the NSO recommended classifications.

It is common for most developing countries which presently have SUTs, to construct SUTs after compiling their preliminary or provisional or final annual national accounts, though SNA recommends that SUTs be compiled as part of the process of compiling annual national accounts. Countries follow this practice mainly due to the reason that the preliminary or provisional annual national accounts are based on indicators, extrapolations and aggregated information provided by the source agencies. Also, the time-lines and resources available to the national accountants to compile these provisional estimates do not permit them to use the SUTs framework, which requires balances to be established at product level. Further, in some countries, the situation regarding primary data does not improve even for the final national accounts estimates since the surveys and censuses are conducted only at periodic intervals. In such situations, it is preferable to compile the benchmark SUTs for the years for which maximum primary data is available from the censuses and surveys, with the industry classification as detailed as the source data permits. For other years, the benchmark SUTs could

[24] The classification for industries should be specified by Market producers, Production for own final use, Non-market producers-general government, and NPISHs

[25] UN Classifications Registry (http://unstats.un.org/unsd/class/default.asp)

be updated[26], using data available at that time and the coefficients from the benchmark SUTs or past surveys or other sources. The industry classification for the updates of benchmark SUTs could be a 1-digit ISIC or the industries for which the country compiles or releases the production GDP data. With this aggregated industry classification, it is possible to use SUT framework even for the provisional national accounts compilations.

As an example, the ICP does not make any specific recommendation on the size of industries, as the requirements under ICP are the GDP expenditures in terms of products and purposes. For the ICP, product classification and product balances are more important than the industry classification, though more disaggregated the industry classification in the SUTs is, the more coherence would be the achievement for the national accounts.

The industry classification of SUTs can range from three broad groups of activities (agriculture, industry and services) to a larger number of industries based on a combination of Sections, Divisions, Groups and Classes of ISIC. Normally, it is the importance of activity (irrespective of the level at which it is classified in ISIC, even if it is at 4-digit level) to the country that determines the basis for its inclusion in the SUTs. Another industry classification that is used in some countries (Europe) is the NACE.

In the background of above discussions, countries may choose an industry classification for SUTs on the basis of their importance to the economy, availability of data from the censuses and surveys and the detailed level at which production GDP data is compiled as part of annual national accounts.

4.3. Classification of products for the supply and use tables

The SUTs essentially aim to achieve individual product balances. Therefore, product classification becomes the most important aspect in the construction of SUTs. This is in two ways – *(i)* the number of products to be included in the SUTs determines the quality of SUTs and consequently the national accounts, because more products in the SUTs normally means more product balances and thus coherence to the national accounts[27]; *(ii)* classification scheme to be adopted for the products is equally important, as different components of supply and use tables follow different classifications (for example, the purpose classifications for final consumption expenditures and SITC or HS classifications for imports and exports) and there is a need to have established correspondences between these classifications and the product classification chosen for the SUTs.

The SNA recommends use of Central Product Classification (CPC) of the UN for classifying the products. As in the case of ISIC, the CPC is structured in terms of Sections (1-digit), Divisions (2-digit), Groups (3-digit), Classes (4-digit) and Sub-classes (5-digit). The latest version of this classification is CPC ver. 2.1 (2015) and the previous versions were CPC ver. 2.0 (2008) and CPC ver. 1.1 (2002) and ver. 1.0 (1998). The CPC ver 2.1 has 10 Sections, 71 Divisions, 329 Groups, 1299 classes and 2887 Sub-classes. Another product classification that is used in some countries (Europe) is the CPA.

Theoretically, SUTs can be compiled for products at extensively disaggregated levels. Some developed countries compile SUTs for few thousand products, but this is difficult for developing countries. Therefore, these countries may choose the number of products to be

[26] This topic has been discussed in a separate chapter.
[27] Though this may not be true when source data is not as detailed.

included in their SUTs on the basis of their importance to the economy and availability of detailed source data at product level in their countries. Generally, the number of products included in the SUTs is more than the number of industries.

Some countries choose the characteristic products of industries in the SUTs as the number of products (which makes the SUTs as square tables), thereby the number of products become equal to the number of industries in the SUTs. Further, some countries show only diagonal entries in the supply table implying that the industries are homogenous and produce only the characteristic products and not any secondary or by-products. However, it is common knowledge that industries do produce either or both secondary products and by-products. Therefore, in SUTs these secondary and by-products need to be shown as off-diagonal entries against the respective products/industries.

For example, for the ICP, the ideal product levels to be included in the SUTs should be the basic headings[28] (BH), since GDP expenditure values are needed to be provided at this level for the ICP. These values are required both for providing weights to the prices collected in the ICP and for the compilation of real GDP expenditures. However, if the countries find it difficult to compile SUTs at this product level in the first attempt, they may choose a higher level of product classification, but it needs to be ensured at the same time that this classification corresponds to ICP basic headings at some level. This will help the countries achieve robustness of data of GDP expenditures at least at higher product levels. Further disaggregation from these higher product levels to ICP basic headings could subsequently be achieved by using indicators or information obtained from specific surveys.

Figure 4.1: Distribution of basic headings, ICP

Aggregate	Number of basic headings
Individual consumption expenditure	132
by households	110
by NPISHs	1
by government	21
Collective consumption expenditure by government	5
Gross fixed capital formation	12
Change in inventories	2
Net acquisitions of valuables	2
Net international trade	2
Gross domestic product	155

Source: National Accounts Framework in the ICP, Global Office, 2011 ICP

While determining the size of SUTs, the key criterion should at least be to provide quality data for the components of GDP of the economy, with gradual progress to higher level of products and industries.

4.4. Final consumption expenditure vectors

The final consumption expenditure vectors in the use matrix refer to the institutional sectors of households, NPISHs and government. For the final consumption expenditure vectors, the main issues here relate to the development and use of concordance tables between the classifications used for estimating final consumption expenditures and the product classification of the SUTs.

[28]There are 155 basic headings in the ICP.

The recording of expenditures of these three institutional sectors follows the classifications of final expenditure by purpose, namely, the classification of individual consumption by purpose (COICOP), classification of the purposes of non-profit institutions serving households (COPNI) and classification of the functions of the government (COFOG). An important point to note is that all these classifications are somewhat linked to each other, with the COICOP also including all individual consumption expenditures made by the NPISHs (in division 13) and government (in division 14), in addition to those of households in the divisions 01 to 12.

The COICOP is structured into 14 divisions (2-digit), which are further disaggregated into groups and classes. The divisions 01-12 refer to individual consumption expenditure of households, division 13 refers to individual consumption expenditure of NPISHs and division 14 refers to individual consumption expenditure of general government.

The structure of COPNI and COFOG are also similar to the COICOP. The COPNI includes at 2-digit level, the final expenditure purposes of *housing, health, recreation, education, social protection, religion, political parties, environmental protection and services, n.e.c.* By convention, all these NPISHs expenditures are considered individual consumption. The COFOG includes under collective expenditure, the purposes of *general public services, defence, public order and safety, economic affairs, environmental protection and housing and community amenities*; and under individual consumption expenditure, the purposes of *housing, health, recreation and culture, education and social protection*.

The primary data that is available on consumption expenditures of households, NPISHs and government, according to the above purpose classifications need to be reclassified to the product classification chosen for the SUTs, which preferably should be either CPC or a classification based on CPC. The correspondence tables between COICOP and CPC are available at http://unstats.un.org/unsd/cr/registry/regot.asp?Lg=1, and countries can use these concordance tables to convert data based on purpose classifications of expenditures to the products included in the SUTs.

4.5. Import and export vectors

The international classifications for recording imports and exports are the Standard International Trade Classification (SITC) and the Harmonized Commodity Description and Coding System (HS). While the SITC is structured under Sections (2-digit), Divisions (3-digit), Groups (4-digit), Sub-groups (5-digit) and basic headings (6-digit), the HS is organized into 21 sections and 96 chapters followed at 4-digit level by headings and at 6-digit level by divisions. There is scope to add further digits in these classifications to meet specific requirements. As in the case of final consumption expenditure vectors, the issue here too is the availability and application of concordance tables to transform the data on imports and exports that is based on SITC/HS classifications to the products included in the SUTs, based on CPC classification. The web link shown in the previous paragraph provides the necessary concordance tables.

4.6. Conclusion

It is difficult to make any specific recommendation on the number of industries and products to be included in the SUTs. However, the guiding factor is that there is generally a direct relationship between the size of SUTs and the quality of SUTs and the national accounts based on these SUTs. Therefore, countries have to choose the size of SUTs on the basis of a number

of factors that include *(i)* importance of industries/products to the country and its cultures, *(ii)* availability of primary data, *(iii)* current national accounts compilation practices, especially in respect of production approach GDP, and *(iv)* resources available for the national accounts compilation work.

For the ICP, the SUT is the recommended framework for compiling and supplying the data on GDP expenditures at basic heading level. Therefore, the guiding factor to meet the ICP requirements for the countries is to construct SUTs at the basic heading level. This may not be difficult for the countries that presently compile SUTs. They may simply need to expand the product list to the ICP basic heading levels. For other countries which do not presently compile SUTs, the first step should be to gain experience of compiling SUTs. This can be done perhaps by choosing products and industries at fairly aggregated level (industries - may be at 1-digit ISIC or at the level at which the production GDP data is released as part of national accounts; products – slightly more detailed than the industries, but having some correspondence with ICP basic headings). After gaining experience in compiling SUTs, the industry and product dimension could be increased to match the requirements of ICP.

Chapter 5. Data sources for compiling supply and use tables

5.1. Introduction

This chapter provides an outline of the data requirements for the compilation of SUT and goes on to describe the sources of data for each component of SUT. It suggests alternative data sources and procedures to overcome the limitations imposed by non-availability of data in the countries.

Construction of SUT requires information from various sources on the following components of supply and use, disaggregated by products:

- Supply
  - Domestic output by industries[29]
  - Imports
    - Goods
    - Services
    - C.i.f.-f.o.b. adjustment
    - Purchases of residents abroad (no adjustment needed if the data is already included in the balance of payment statistics)
  - Trade margins
  - Transport costs
  - Taxes on products
  - Subsidies on products

- Use
  - Intermediate consumption by industries[30]
  - Exports
    - Goods
    - Services
    - Purchases of non-residents in the domestic economy (no adjustment needed if the data is already included in the balance of payment statistics)
  - Household final consumption expenditure
    - Adjustment items (no adjustment required if the estimates are based on household income-expenditure surveys)
      - Resident purchases abroad
      - Purchases of non-residents in the domestic economy
  - Final Consumption expenditure of NPISHs
  - Government final consumption expenditure
    - Individual consumption
    - Collective consumption
  - Gross fixed capital formation
  - Change in inventories
  - Valuables

[29] Domestic output of industries by institutional sectors including own account production meeting the criteria of production boundary.

[30] By institutional sectors.

- Value Added components
    - Compensation of employees
    - Other taxes on production
    - Other subsidies on production
    - Consumption of fixed capital
    - Net operating surplus/mixed income

It is clear that construction of SUTs in the manner it is recommended to be compiled is very data demanding and uses information available in the statistical system from all sources, namely, censuses, surveys, administrative data, small scale sample surveys/studies, and expert judgments. The data requirements for constructing SUTs go beyond those required for preparing goods and services account in the national accounts, to the extent of data needs at individual product levels.

For constructing quality SUTs, countries ideally need detailed and independently available data at product level for each component of the SUTs. Availability of such detailed data makes it possible to mix and confront different sources of data through the supply and use framework, so that weaknesses in the data systems, including their meeting national accounts concepts, are identified and appropriate adjustments are made in the source data.

However, in reality, the economic database that is available in the countries (especially, in the developing countries) is much less than the ideal situation. Non-availability of complete data may affect the quality of SUTs (and consequently the national accounts) to some extent, but SUTs is the ideal framework (with it's in built cross-checks and balances) to maximize the quality of national accounts, even with limited source data. Therefore, it is all the more important to use SUTs framework for national accounts compilations, when source data is incomplete. In such situations, countries may be required to adopt commodity-flow approaches, use auxiliary data sources, small sample surveys or studies or even be required to borrow ratios from neighbouring countries or similar economies and use expert judgments, wherever necessary.

The major sources for economic data are the following:

- Agriculture, livestock, forestry and fishing
    - Agricultural surveys and censuses
    - Area, yield and prices of crops
    - Livestock censuses for data on livestock population and annual surveys for data on yield of livestock products
    - Administrative statistics on agriculture, livestock, forestry and fishing
    - Administrative data maintained by local and regional traditional authorities
    - Reports of agricultural commodity boards
    - Land utilization statistics/surveys
    - Household income-expenditure surveys
    - Population censuses and projections for population numbers

- Mining, manufacturing, utilities and construction
    - Administrative data on mining (output of minerals) and utilities from regulatory bodies
    - Economic censuses
    - Annual manufacturing surveys
    - Construction and/or investment surveys

- Surveys or administrative data on building materials
- Annual enterprise surveys covering all non-agricultural economic activities
- Administrative data on utilities (electricity, gas and water supply)
- Government budget documents
- Accounts of companies/corporations – government owned and private
- Labour force surveys and population censuses
- Reports of industry associations
- Tax data disaggregated by products
- Data on production of industrial goods

- Services
  - Economic censuses
  - Annual enterprise surveys covering all non-agricultural economic activities
  - Wholesale and retail trade surveys
  - Accounts of companies/corporations – government owned and private
  - Financial statistics from central bank
  - Regulatory agencies of insurance companies
  - Government budget documents/government finance statistics
  - Administrative data for services (such as telecom, transport, airlines, etc.)
  - Reports of industry associations
  - Tax data, disaggregated by products
  - Reports of research organizations
  - Labour force surveys and population censuses
  - Data on indicators of output of services, such as freight tonne kilometres, passenger kilometres, number of vehicles on road, etc.

- Final consumption expenditure
  - Household income-expenditure surveys
  - Retail trade surveys
  - Tax data on select products, such as alcohol, tobacco, motor vehicles, etc.
  - Government budget documents
  - Surveys on NPISHs
  - Population censuses and projections for population numbers

- Gross capital formation
  - Capital expenditure and inventory surveys
  - Annual enterprise surveys covering all enterprises/establishments
  - Government budget documents
  - Construction statistics
  - Estimates of own account production of fixed assets
  - Merchandise trade statistics and balance of payments statistics

- Imports and exports
  - Merchandise trade statistics from customs authorities for goods
  - Balance of payments statistics for services

Box 5.1: Principal data sources used in Rwanda (by Tim Jones, Consultant)

Source	Type	Purpose
Enquête Intégré des Conditions de Vie(EICV) (Integrated Living Conditions Survey)	Multi-purpose household survey	Household final consumption expenditure Auto-consumption/non-market output Imputed rents/non-market output Household construction costs Informal turnover Increase in animal inventories
Revenue Authority: VAT and business income tax databases	Administrative	Formal non-agricultural output Local "output VAT" & "input VAT"
Revenue Authority: customs database	Administrative	Imports & exports of goods; VAT on imports, import & excise duties
Informal cross border survey	Border survey	Imports & exports of goods
Central Bank	Mainly banking data	Imports & exports of services
Survey of departing visitors	Border survey	Travel credits (& split by product)
Central Bank	Regulatory	Banks & insurance companies' accounts
Crop forecasts Seasonal agriculture survey	Assessment agricultural survey	Agricultural production & inputs
Ministry of Finance (MINECOFIN)	Administrative	Government value added output and expenditure
Revenue authority	Administrative	Other local taxes
Public sector enterprises	Administrative	Production accounts and subsidies
Integrated business enterprise survey	Business sample survey	IO ratios and margin percentages
Census of establishments (2010)	Census	Grossing up NGO data
Population census (2012)	Census	Animal stocks

The above stated sources are indicative, and may differ from country to country, but it provides an idea of the enormous and exhaustive data needs for the compilation of SUTs. However, all the above stated sources may not be available in the countries. Therefore, countries may have to resort to a combination of these sources, mix and match the data from different sources and apply commodity flow approaches for compiling SUTs, when source data is incomplete or inadequate. Sometimes, the source data may be available only at broad commodity level (for example, cereals, food products, fuel, personal services, office expenses, travel, energy consumption, etc.), rather than at individual products level (as often seen in the case of data on government expenditures – the government budget documents mostly provide information on expenditures at broad item group level). In such cases, further break-down of broad-product level expenditures to detailed product levels can be done on the basis of small surveys or studies, or by discussing with specialists or even using neighbouring countries' ratios with similar economic structure. The weighting diagrams of PPIs or CPIs or expert opinions could be other options.

It is preferable to compile supply table first since most developing countries prefer compiling GDP by production approach and use the supply side information to estimate expenditure aggregates. Therefore, the supply table is generally considered to be more important for these countries and, therefore, the first step should be to finalize the supply table (even when using expenditure side information to estimate the output of some of the products) in order to establish a set of control figures on total supply disaggregated by products.

It is possible to compile SUTs with very limited data sources. Countries with limited data sources could start compiling simpler SUTs and expand them as the source data improves. A

reasonably comprehensive household budget survey can also be used to estimate the supply side information for some of the products (for example, production of fuel wood, agricultural crops, etc.), which are to a large extent gathered or produced for own consumption in some of the developing countries and may not be adequately covered in the production surveys.

The following text suggests alternative approaches/data sources for estimating different quadrants of SUT, when data sources mentioned above are not available.

5.2. Columns of domestic output (in the supply table) and intermediate consumption (in the use table) by products and industry

The requirement of data for these components is the output and intermediate consumption by products further disaggregated by industries included in the SUTs. Broadly, the major sources for these data by products/industry are those mentioned above. In addition, dedicated input-output surveys in which product-wise data is collected on output and inputs, from limited number of establishments in different industries, could be an important source.

In some countries, data on total output and total intermediate consumption by industry is collected, but further disaggregated data, product-wise, are not collected. In such situations, outputs could be assigned to the characteristic products of industries (diagonal entries), though this is a crude procedure[31] and should be adopted only as a last resort. However, intermediate consumption broken down by products, is an essential requirement in the construction of SUTs. In such cases, the fall back options are: *(i)* focused input-output surveys covering a few establishments in each industry, *(ii)* expert opinion of engineers and concerned entrepreneurs, *(iii)* standard input structures of different industries (for example, in the construction activity), and *(iv)* borrowing intermediate consumption coefficients from neighbouring countries with similar economic structure.

In the focused input-output surveys, a few establishments under each economic activity are selected (units could be selected from the business register or annual enterprise surveys or economic censuses) and a questionnaire is sent to them to collect detailed information on product profile of output, intermediate consumption, inventories and value added components. The coefficients built up from the results of these surveys are applied on the marginal totals available from the regular surveys and other sources.

5.3. Imports (supply table) and exports (use table) by products for total economy

The requirement of data for these components is the data on imports and exports, by products for the total economy. Imports and exports comprise both goods and services. While, data on merchandise (goods) comes mainly from foreign trade statistics maintained by customs authorities, data on services mainly comes from balance of payments statistics compiled by the central bank. Countries may also need to make adjustments for informal and illegal border trade, data on which can be estimated from small surveys or studies or seizures and penalties.

[31] Several products are produced by industries as by-products or as part of their secondary activities.

The SNA recommends valuation of imports and exports on f.o.b. basis. Though exports data is available on this valuation, imports data is usually available on c.i.f. basis. Therefore, countries need to introduce an adjustment column and row in the supply table to convert imports, c.i.f. to imports, f.o.b. The data on insurance and freight, which is the difference between the two valuations, is normally available in the balance of payments statistics and this information could be used. The following tables illustrate this adjustment:

Figure 5.1: Example for adjusting imports from c.i.f. to f.o.b. valuation

Industry\product	Imported goods c.i.f. (total f.o.b.)	Services	C.i.f./f.o.b. adjustment	Total imports (total, f.o.b.)
Goods	G, c.i.f.			G, c.i.f.
Services		S	-Adj	S - Adj
C.i.f./f.o.b. adjustment	-Adj		+Adj	0
Total imports, f.o.b.	G, c.i.f. - Adj	S		G, c.i.f. + S - Adj

Adj: transport and insurance services on imports that are provided by both resident and non-resident producers

Industry\product	Imported goods c.i.f. (total f.o.b.)	Services	C.i.f./f.o.b. adjustment	Total imports (total, f.o.b.)
Goods	100			100
Transport		20	-10	10
Insurance		30	-15	15
Other services		35		35
Total imports	100	85	-25	160
C.i.f./f.o.b. adjustment	-25		+25	0
Total imports, f.o.b.	75	85	0	160

Another adjustment that is required to be made in the imports and exports columns is for purchases of residents abroad and non-resident purchases in the domestic economy, respectively. The source for these data is the balance of payment statistics or international passenger survey or consumption expenditure survey. This adjustment is, however, not necessary, if these data are already included in the balance of payment statistics under imports and exports of goods and services. If these statistics are compiled according to BPM6 (IMF) guidelines, purchases of residents abroad and non-resident purchases in the domestic economy are always included in imports and exports of services, so in practice this adjustment item is almost never required in the SUT.

5.4. Taxes and subsidies on products (supply table) and other taxes and other subsidies on production (use table)

Data on taxes and subsidies on products and other taxes on production are available from the government budget documents or tax authorities. While data on taxes and subsidies on products are required by products for the total economy, the information on other taxes on production is only needed for quadrant III showing the breakdown of value added.

The source for other taxes on production and subsidies may be government tax records, the economic censuses or enterprise surveys or business accounts of corporations.

In some countries, data on product taxes is available only at the aggregate level (such as total excise duties, total sales tax or VAT or GST) for the total economy, and not with product-wise disaggregation. In such cases, countries first need to estimate product taxes for each product on the basis of average tax rates (output at basic prices multiplied by average tax rate) and then

adjust these to the control figure of total product taxes on pro-rata basis. For an appropriate distribution of total product taxes to commodities, it is better to adopt this procedure for each type of tax on product (excise, VAT, sales tax, import duties, etc.), as tax rates are different for different types of taxes on the same product.

5.5. Trade margins (supply table)

The data required are trade margins by products for the total economy. The data on trade margins[32] by products is mostly estimated through indirect methods. Usually, the enterprise surveys and business accounts of trading units provide data on total trade margins, and not by the margins earned from each of the products traded). Also, for the informal trading enterprises, the output is estimated through the labour input method, which provides estimate of output for the entire activity together and this method can in no way provide trade margins at product level. Very few countries are able to collect information on trade margins by products through the survey on trading enterprises.

The indirect method involves four steps:

a) estimating total output of trade (in the supply table), which is equivalent to the sum of
   i. output of principal product of trading industry and
   ii. output of trade of other industries[33];
b) estimating (or assuming) trade margin ratios for each product;
c) estimating trade margins for each product (only goods) by applying the trade margin ratios on the product's output at basic prices; and
d) finally, adjusting the trade margins for each product to the controlled figure, which is the total output of trade as in a) above.

In the above method, assumption of trade margin ratios for each product is a key requirement. These trade margin ratios for different products can be estimated on the basis of small surveys of wholesalers and retailers or seeking their expert opinion. Alternatively, these ratios can also be estimated from the product-wise data collected on outputs and inputs in the enterprise surveys (if such data is collected in these surveys). The difference between the output price of a product (which is at basic prices) and the input price of the same product (may be used by another industry) (which is at purchasers' price), duly adjusted for product taxes, can be assumed to be the trade and transport margins. Further break-up between trade and freight transport margins can be made on the basis of their shares in output or discussion with experts or few transporters and traders.

It is advisable to estimate trade margins by products separately for wholesale and retail trade, as trade margin ratios are different for the same product in the hands of wholesalers and retailers, especially for the agricultural and perishable goods. A more detailed procedure to estimate trade margins by products has been suggested in the Eurostat Manual of Supply, Use and Input-Output Tables (Sections 4.2.3 and 6.3).

[32] The output of trading activity is the trade margins, which is derived as the difference between the sale and purchase value of traded goods.

[33] Several industries (other than trade), sell products in the same condition as they are purchased. The margins from such sales should be marked as trade product, as a secondary activity of these industries.

5.6. Transport costs (supply table)

The requirement of data is transport costs[34] by products for the total economy. As in the case of trade, the transport costs can also be estimated through indirect methods, in the absence of direct product-wise information on transport costs from the enterprise surveys. The procedure is exactly the same as mentioned under trade margins. The Eurostat manual provides a very detailed method for indirectly estimating transport costs by products. It is also advisable to estimate transport costs by products, separately for each mode of transport, namely, railways, road, air, and water, if feasible.

5.7. Household final consumption expenditure (use table)

The requirement of data for this component is the expenditures of households, disaggregated by products (for the SUT) and purposes (for national accounts) for the total economy. Concordance tables between the purposes (COICOP classification) and the products (CPC) are available in public domain.

The data sources for household final consumption expenditures are the household income-expenditure surveys, retail trade surveys, agricultural production surveys and other administrative data.

In some countries, household income-expenditure surveys are not carried out annually. In such cases, the benchmark estimates are prepared using survey results and annual estimates are based on retail trade surveys. Many countries also use a combination of various sources for estimating different items of household consumption expenditure (for example, consumption of alcohol from the excise authorities, purchase of motor vehicles from the motor vehicle registrations or sales, electricity consumption from supply by electricity distributors, consumer durables from retail sales, etc.). There are also other expenditures of households (such as, imputed rents of owner occupied dwellings, FISIM, insurance service charges) that need to be accounted for in the household consumption expenditure, which are not collected directly from surveys. Besides these sources, commodity flow approaches are widely used to estimate the household consumption expenditure as residual, by many developing countries.

5.8. Government final consumption expenditure (use table)

The requirement of data for this component is the expenditures of general government, disaggregated by products (for the SUT) and purposes (for national accounts) for the total economy. Concordance tables are available between the purposes (COFOG classification) and the products (CPC). The main data sources are the budget documents of federal government, provincial governments and local governments and accounts of social security funds. The autonomous government organizations and NPIs which are fully funded by the government also fall under the category of general government, and it is important to analyse their accounts and include their expenditures under the general government final consumption expenditure. The government expenditures are further classified as individual consumption and collective consumption. Though, it may sometime be difficult to distinguish the government expenditures between individual and collective consumption, the fall back procedure is to assume all government expenditure on the functions of housing, health, recreation and culture, education

[34] Freight transport charges paid by the purchasers on the products.

and social protection as individual consumption. If the accounts of local governments and autonomous government institutions are not available, their expenditures may be estimated on the basis of grants given to them by the federal or provincial grants, whose details may be available in their budget documents.

Detailed product-wise data on government expenditures is required for the intermediate consumption of activities classified under general government sector. This information is generally not available in the government budget documents, or if available, it is in some aggregated form, such as, "office expenditure", "transportation including fuel", etc. In such cases, firstly these expenditures should be classified under broad product-groups included in the SUT. Further break-up of expenditures between these product-groups can be done if few government departments could provide a break-up of their department's expenditures according to the products included in the SUT.

5.9. Final consumption expenditure of NPISHs (use table)

The requirement of data for this component is the expenditures of NPISHs, disaggregated by purposes/products for the total economy. The main data sources are focused surveys on NPISHs (based on the frame available with the registering authorities) or annual accounts of NPISHs. The other alternative data sources could be the economic censuses or annual enterprise surveys in which a separate code of NPISH could be given to identify the NPISH units.

In countries which do not have the above sources, estimates could be compiled on the basis of labour force surveys, if it is possible to identify the number of employees in NPISHs from these surveys. Another source could be the tax records. In most countries, NPISHs are exempt from paying taxes, but the tax authorities do collect accounts of NPISHs. This could be a source for data on NPISHs.

5.10. Gross fixed capital formation (use table), by products

The requirement of data for this component is the gross fixed capital formation, disaggregated by type of assets (products) (mainly construction and machinery & equipment, but will also include mineral exploration, software, data bases, weapons systems, etc.). The main data sources are construction surveys, building permits and construction starts, annual enterprise surveys, accounts of companies and NPISHs, government budget documents, foreign trade statistics and the household surveys (for information on own account construction).

In the absence of surveys, several developing countries adopt commodity flow methods, which are based on the availability of products for GFCF from domestic production and imports. Normally, data on GFCF is available for the government part from the budget documents, and for the corporations from their annual accounts. The household GFCF part is estimated as residual from the overall GFCF estimates compiled through the commodity flow approach. If Household GFCF is estimated independently based on benchmark surveys and indicators, the sum of GFCF of government, corporations and households (including NPISH) can be cross-checked with the GFCF estimated independently through commodity flow approach.

5.11. Change in inventories (use table), by products

Some developing countries do not compile the estimates of changes in inventories and show them together with the statistical discrepancy (difference between production and expenditure GDP), derived as a residual. On the other hand, some countries only compile estimates of gross fixed capital formation and assume it be equivalent to gross capital formation. It is important that this residual estimate, disaggregated by products, has to be thoroughly examined. The residual for services has to be removed by correcting either on the supply side or in the Household consumption on the use side, as services are not expected to be in inventories.

The requirement of data for this component is the change in inventories disaggregated by goods for the total economy. The sources of data are the annual enterprise surveys, agricultural surveys, food balance sheets, dedicated surveys on inventories, company accounts, government budget documents and government strategic stocks of food, oil, etc.

Countries that do not regularly compile estimates of change in inventories, should focus on estimating inventories at least for the government and corporations from their annual accounts, which are generally available. For the household enterprises, indicators or benchmark surveys could be used for estimating change in inventories. For the product level distribution of change in inventories, the key characteristics of the industry in terms of its outputs and input structure could be a basis, if the enterprise surveys or business accounts do not provide such details.

5.12. Acquisition less disposals of valuables (use table), by products

Many developing countries do not compile estimates of net acquisition of valuables. Also, this item may not be of much significance in some of these countries, unless there are substantial imports of valuables and domestic production. The main sources of data for estimating this component are the imports and exports statistics and domestic production of valuables. While the imports and exports data comes from customs authorities, the domestic production can be estimated by identifying the establishments/enterprises associated with the production of valuables.

5.13. Compensation of employees by industry (quadrant III: components of value added)

The most common data sources for estimating compensation of employees by industry are *(i)* the annual enterprise surveys, *(ii)*, business accounts, *(iii)* government budget documents, *(iv)* administrative data and *(iv)* labour force surveys. Information on compensation of employees can also be indirectly compiled from the social security records, since social security contributions are usually made as a fixed percentage of salaries and wages. Data about the compensation of employees is normally compiled for an industry by its institutional break-up, just as in the case of production and intermediate consumption.

If the countries do not have annual enterprise surveys or do not have access to business accounts, the benchmark estimates based on economic censuses could be extrapolated with growth in employment numbers combined with a wage index or the CPI. Other alternatives could be applying data on wages per employee of government (or a percentage of this) to those in different industries, or conduct a small sample survey on wage payments as percentage of value added (or output) in different industries and use the ratios on the overall value added or output of the industries. However, while using such ratios, it is advisable to apply them at

institutional sector level within each industry, as ratios of compensation of employees to value added significantly differ between institutional sectors.

5.14. Consumption of fixed capital by industry (quadrant III: components of value added)

The estimation of CFC has been covered in some detail in the chapters on use table and problem areas. The recommended method of compiling CFC estimates by industry is the perpetual inventory method (PIM) along with the estimates of capital stock by industry. The perpetual inventory method requires long-term data (about 30 years) on gross fixed capital formation by type of assets cross-classified by industry/institutional sectors, the life expectancy (average service lives) of these assets and their associated price indices.

Some developing countries may not have such detailed long-term data on GFCF (and hence may not have the the capital stock and CFC estimates), therefore, use either depreciation rates provided in the business accounts or fixed ratios of output. If countries are using depreciation rates given in the business accounts, SNA recommends that these be adjusted for "historic costs to current prices".

A short-cut method for estimating capital stocks and consumption of fixed capital is suggested in the following chapter.

5.15. Net operating surplus/mixed income by industry (quadrant III: components of value added)

This component – namely, the difference between the industry output and the sum of intermediate consumption, compensation of employees, consumption of fixed capital (CFC) and other taxes less other subsidies on production – is derived as a residual. This is also the balancing item in the generation of income account. It is also possible to derive this data from the item profits shown in the accounts of enterprises, but it is still a residual as that is the only way that the enterprises themselves can calculate it. If countries do not compile CFC estimates, then the residual becomes the gross operating surplus/mixed income. However, non-availability of CFC estimates can lead to under-estimation of output of non-market activities, which are estimated on cost basis.

Box 5.2: Data sources for compiling supply and use table in Cameroon (by Institut National de la Statistique of Cameroon)

Construction of SUTs requires information from various sources on the following components of supply and use, disaggregated by products. In Cameroon, the following sources of data are used for each component of SUTs.

1. Supply table

Item	Sector	Sources of data
Domestic output by industries	Formal sector	- Statistics and tax returns (DSF) (financial and non-financial corporation) - Government budget documents/ government finance statistics (revenue and expenditure) - Finance statistics of social security fund - Finance statistics of local administration and public administrative companies - Administrative statistics on agriculture, livestock, forestry, fishing and crude oil. - General business census 2009: it include information on NPISHs
	Informal sector	Survey on employment and the informal sector (2005, 2010)
Imports	Goods	Merchandise trade statistics from customs authorities
	Services	Balance of payment statistics
Trade margins/Transport costs	Formal sector	Statistics and tax reporting of companies: provides the trade margins and the transport cost of the formal companies
	Informal sector	- Survey on employment and the informal sector (2005, 2010): provides the trade margin by product - Prices survey on food products: provides the trade margin and transport cost by product
Taxes/subsidies on products		- Government budget documents, the General Tax Code and the Finance Law for taxes; - Stabilization fund of oil prices for fuel subsidies.

2. Use table

Item	Sector	Sources of data
Intermediate consumption by industries	Formal sector	- Statistics and tax returns (DSF) (financial and non-financial corporation) - Government budget documents/ government finance statistics (revenue and expenditure) - Finance statistics of social security Fund - Finance statistics of local administration and public administrative companies - Administrative statistics on agriculture, livestock, forestry, fishing and crude oil. - General business census 2009: it includes information on NPISHs
	Informal sector	Survey on employment and the informal sector (2005, 2010)
Exports	Goods	Merchandise trade statistics from customs authorities
	Services	Balance of payment statistics
Household final consumption expenditure		Household income-expenditure surveys 2007
Final Consumption		General business census 2009: it includes information on NPISHs

expenditure of NPISHs		
Government final consumption expenditure		Government budget documents/ government finance statistics (revenue and expenditure) - Finance statistics of social security Fund - Finance statistics of local administration and public administrative companies
Gross fixed capital formation	Formal sector	- Statistics and tax returns (DSF) (financial and non-financial corporation) - Government budget documents/ government finance statistics (revenue and expenditure) - Finance statistics of social security Fund - Finance statistics of local administration and public administrative companies - Administrative statistics on agriculture and livestock
	Informal sector	Survey on employment and the informal sector (2005, 2010)
Change in inventories		Statistics and tax returns (DSF) (only non-financial corporation)

3. Value added components

Item	Sector	Sources of data
Compensation of employees	Formal sector	- Statistics and tax returns (DSF) (financial and non-financial corporation) - Government budget documents/ government finance statistics (revenue and expenditure) - Finance statistics of local administration and public administrative companies - Administrative statistics on agriculture, livestock, forestry, fishing and crude oil. - General business census 2009: it include information on NPISHs
	Informal sector	Survey on employment and the informal sector (2005, 2010)
Other taxes/subsidies on production	Formal sector	- Government budget documents/ government finance statistics (revenue and expenditure) - Statistics and tax returns (DSF) (financial and non-financial corporation)
	Informal sector	Survey on employment and the informal sector (2005, 2010)
Consumption of fixed capital	Only for public administration (non-market production)	The method used is the perpetual inventory method (PIM): use of the long-term data (about 25 years) on gross fixed capital formation by type of assets, the life expectancy of these assets and their associated price indices.

Chapter 6. Some problematic areas

6.1. Production of goods for own consumption

The SNA requires that all goods that are produced should be assigned a value and included in gross output. This applies both to goods that are sold and to those that are used by the producers themselves either as consumption goods or as capital assets. In the African context this means that GDP should include the values of crops and livestock products that many farm households produce as part of their "subsistence" income as well as the value of dwellings and farm buildings that many rural households build for themselves.

6.1.1. Crops

You will first need an estimate of the total production of the main food crops. This can come from agricultural surveys conducted by the statistical office, or from estimates made by the ministry of agriculture which might also be based on surveys. The food balances compiled by the FAO are another source that national accountants can use. Although these are based on statistics supplied by the countries themselves they have been edited and improved by the FAO after comparing trade statistics between countries and by applying various credibility checks such as minimum calorie consumption per person.

Figure 6.1: FAO Food Balance: Malawi, 2007, million kilograms

	Production	Import	Stock Variation	Export	Domestic supply	Feed	Seed	Processing	Other Uses*	Food
Maize	3,226	39	-322	392	2,551	380	52	12	240	1,867

*Mainly maize grain lost to pests or through bad storage.
Source: http://faostat.fao.org/site/368/DesktopDefault.aspx?PageID=368#ancor

Figure 6.1 is from the FAO data base and shows the food balance for maize in Malawi in 2007. The food balances are in an SUT-type format except that household, NPISH and government consumption are all shown as a single column "food" and no column is included for gross fixed capital formation (because none is needed for food crops). Of course, the FAO food balances may not be the best source for your country and you may prefer to use household survey data or some other source but in any event you will need to derive an estimate of how much of the total supply of maize was used for food – the last item in the above figure.

The food balance shows that 1,867 million kilos of grain were available for consumption as food. To simplify, let us suppose that there was no NPISH or government consumption of maize. In that case the SUT compiler needs to value that part of the 1,867 million kilos that was bought by households from shops and markets at purchasers prices and that part that was consumed by the producers at basic ("farm-gate") prices. Here is how the SUT compiler proceeds:

- She knows that the latest household survey shows that on an average 80% of maize consumed by households is from own production – i.e. 1,494 million kilos. The remaining 373 million kilos were bought in shops and markets.
- The average farm-gate price of maize in 2007 was 450 kwacha per kilo. This is the basic price but as trade margins, transport costs and product taxes are all zero in the case of food produced for own consumption, the basic price is exactly the same as the purchasers' price.
- Transport costs are about 3% of farm-gate prices and trade margins are 18% of the farm gate price plus the transport cost. There are no product taxes on basic food items like maize. She

therefore calculates the purchasers' prices of the 373 million kilos of maize production that was sold in shops and markets as *((450 x 1.03) x 1.18) = 547 kwacha per kilo.*

- The total value of household consumption of maize is therefore: *(450 x 1494) + (547 x 373) = 876,331 million kwacha.*

There is no point in trying to cover subsistence consumption and production of every last type of food crop. Focus on the main ones which in most countries will include grains like maize, sorghum, millet, rice, and wheat, root crops such as manioc (cassava), sweet potatoes and yams and fruit and vegetables like pumpkins, bread-fruit, mangoes, pineapples, tomatoes, bananas, and coco-nuts.

6.1.2. Livestock

As with crops, focus on the main types of livestock products. Chicken eggs and poultry meat are important in all countries. Other foraging animals that feed themselves are also important in many countries. They include goats, ducks, geese and pigs. Cattle require extensive grazing land and are only important in a countries with low population densities –in South Africa, Botswana, the Sahel, the Horn of Africa, for example.

Data on the total numbers of livestock will come from an agricultural or livestock census or surveys of farm households. In countries where cattle are important, the agriculture ministries may make animal counts every year. Agriculture ministries and veterinary departments can usually supply information on production and slaughter rates. These are generally similar across countries so you could borrow estimates made in a neighbouring country.

Here is an example of how own account consumption of poultry meat might be estimated. The compiler starts with the following basic information:

- A recent survey showed that, on average, farm households each have 7 chickens.
- The population census held two years ago showed there were 1,250,000 farm households and that the farm population was growing at 1% per year.
- The Veterinary Department recently made a study of poultry farming and concluded that in a normal year the national poultry flock renews itself every 15 months. In other words, all the chickens alive at the beginning of the year will have been eaten by the end of the third month of the next year and replaced by the same number of new chickens.

  Using this information the compiler first estimates the number of chickens slaughtered for food this year:

- Number of farm households: $1{,}259{,}000 \times 1.01^2 = 1{,}284{,}306$
- Number of chickens at the beginning of the year: 1,284,306*7 = 8,990,141
- Chickens slaughtered for food in the year: 8,990,141 x 12/15 = 7,192,113.
- From the consumer price index the compiler learns that the average market price of a live chicken was *45 lari*. Although this is the purchasers' price he decides to take it as the basic, or farm-gate, price because the sellers bring their own chickens to market so there are no transport costs and he reckons that the farm-gate and market price must be virtually the same.
- Conclusion: household consumption of chicken meat this year was *7,192,113 x 45 = 323,645,076 lari*.

But we have not yet finished with chickens. The production of live birds is also a productive activity. Gross output is calculated as the increase in the national flock of chickens multiplied by their average basic price. The model used to estimate production of poultry meat assumed that the number of chickens increases in line with the growth in the number of farm households i.e. 1% increase each year. At the beginning of the year there were *8,990,141* live chickens in the national flock so the production of chickens during the year was *8,990,141 * 0.01 = 89,901*

The average price of a chicken for sale as food was 45 *lari* and the compiler decided to take this as both the purchasers' and basic price. However, this is the price of a mature chicken so the compiler uses only half the price to value the increase because it will include chickens of all ages up to maturity. The gross output of live chickens is therefore *89,901*(45/2) = 2,022,782lari.*

This chicken output is shown as capital formation on the uses side of the SUT, but the question is whether to show it as GFCF or as change in inventories. According to the SNA, production of livestock reared for slaughter is shown as change in inventories whereas animals primarily reared for breeding purposes, for use as draught animals, or to produce milk, wool or other livestock products are regarded as fixed capital assets and belong in GFCF. Poultry are a mixed case as they both produce eggs and are bred for slaughter. The usual practice is to treat the increase in the poultry flock as a change in inventories.

6.1.3. Buildings

In many countries rural households build their own houses and farm buildings – often using a mixture of purchased inputs such as glass, doorframes, and corrugated roofing sheets and locally collected materials such as sun-dried bricks, mud, thatch, and palm fronds. The value of these buildings is the cost of purchased materials plus the labour input to collect and process the other inputs and erect the buildings. Purchased inputs are valued at their purchasers' prices and the labour input equals the time taken multiplied by a wage rate. The minimum rural wage could be used as the wage rate.

The number of dwellings constructed each year has two components – new dwellings needed to house the increase in the population and dwellings needed to replace those that are demolished each year. Suppose that on average an own-constructed dwelling lasts for 19 years and the population is growing at 1.8% each year. Suppose also that there were 46,000 dwellings at the beginning of the year. With these assumptions there will have to be *0.018 x 46,000 = 828* new dwellings and 46,000/19 = 2,421 replacement dwellings constructed in the course of the year – i.e. 828 + 2,421 = 3,249 dwellings.

Similar calculations can be made for the values and numbers of the different kinds of farm buildings such as food stores and animal pens.

6.1.4. Estimating imputed rents for owner occupied dwellings

Rents for dwellings are a large component of Household Final Consumption Expenditure in all countries but they are difficult to estimate because in many countries by far the largest part of rents is for owner-occupiers and has to be imputed. The standard procedure recommended in the SNA for owner-occupied dwellings is to assume that the rents that would be paid by owner occupiers are the same as the rents actually paid for similar dwellings. But the standard procedure cannot always be applied. This is the case where so few dwellings are rented that rents actually paid cannot be regarded as typical. For example, in some countries, most of the dwellings available for rent are occupied by foreigners or by employees of government or large

public enterprises at rents which cannot be regarded as representative, while in other countries, dwellings may only be available for rent in the capital city or other principal urban areas. And of course dwellings that families construct for themselves are almost never rented to another family.

When the standard procedure cannot be used, expenditure on dwellings is estimated by the **user cost** method. The user cost method consists of estimating each of the costs that owners of dwellings would need to take into account in fixing a market rent if they decided to rent their dwellings to other people rather than living in them themselves. These costs are:

- Intermediate consumption;
- Repairs and maintenance;
- Insurance service charges;
- Land and property taxes;
- Consumption of fixed capital; and
- Net operating surplus.

Information on repairs and maintenance and on insurance could come from a household expenditure survey. Remember that the insurance cost is the service charge not the gross premium paid. In practice most dwellings will not be insured at all so this item will be zero in many countries. Land and property taxes – if any – should be available from the local authorities. The main problems are caused by the last two items since they are both calculated as percentages of the current market value of the capital stock.

The standard procedure for estimating the stock of a capital asset is the Perpetual Inventory Method (PIM). The PIM requires long time series on gross fixed capital formation (GFCF) and on prices of capital assets as well as assumptions about the average service lives of assets and about how retirements of assets are distributed around this average. Most countries, however, do not have the means to derive capital stock estimates by the PIM so it is necessary to use an alternative method as follows:

The first step is to draw up a classification of dwellings which distinguishes between the main types of owner-occupied dwellings in the country. The stocks of owner-occupied dwellings will then be estimated separately for each type. A simple classification such as traditional (own-built) dwellings, modern single family dwellings (houses or villas), and two or three size classes of apartments could be used but if more detail is available a more detailed breakdown can be used.

Information on the numbers of dwellings may be obtained from a recent population or housing census. The population growth rate can be used to update information from the most recent census.

The next step is to obtain the **average price of a new dwelling of each type**. We discussed above how to estimate the price of a traditional (own-built) dwelling. New prices for modern dwellings could be obtained from estate agents or from classified advertisements' in newspapers or magazines specializing in property sales. As prices of dwellings vary according to location, prices need to be collected in all the main conurbations and averaged for the country as a whole using population densities as weights. The CPI surveys may also provide information on house rentals.

The stock of each type of dwelling is then valued at **half** of the new price for each type of dwelling. Using half of the new price assumes a) that the stock of dwellings is stable in number,

and b) that dwellings lose their value by the same amount each year from when they are newly constructed until they are demolished at the end of their useful lives. These are crude assumptions and you may be able to improve on them if, for example, you know that the stock of dwellings is not stable but is actually increasing or falling.

Once an estimate of the current market value of the stock of dwellings has been obtained, consumption of fixed capital is most easily calculated by "geometric depreciation" this involves multiplying the stock of dwellings by a fixed coefficient. This coefficient could be 1/L where L is the average life of the dwelling. Countries in Europe that apply the user cost method for owner-occupied dwellings use **accelerated** depreciation meaning that depreciation is bigger than 1/L. Some experimented with 2/L but in the end they agreed that this was too high and they now use *1.6/L*. This means, for example, that if L (the average life of a particular type of dwelling) is assumed to be 70 years the depreciation rate will be *1.6/70 = 0.023* and consumption of fixed capital will be *V*0.023*, where V is the current market value of the stock of dwellings.

The current market value of the housing stock is also used to estimate the operating surplus. The operating surplus is usually assumed to be the real (i.e. inflation adjusted) rate of return that the owner could have obtained by investing in a safe long-term financial asset instead of investing in a dwelling. European countries that apply the user cost method calculate the operating surplus at 2.5% of the value of the current market value of the housing stock. This means that the operating surplus will equal V*0.025 using the notation above. (In the case of traditional, own-built dwellings, you may decide that the operating surplus is zero.)

6.2. Domestic services

The employment of domestic servants – cooks, maids, security guards – is seen in the SNA as production by households of services for their own consumption. These services are valued at the wages paid to domestic servants. Remember that the wages must include income in kind and this may be an important part of the total wages paid to domestic servants. Domestic servants will often be provided with living quarter, they may be provided with shoes and clothing and they may receive food and meals. Income in kind is valued at the costs to the employer of providing the goods and services they receive as part of their wages.

6.3. Trade margins

Trade margins have a separate column in the SUT and are one of the adjustments to move from the supply of goods and services at basic prices to supply at purchasers' prices. Trade margins are the difference between the prices at which the traders sells goods and the prices they paid to purchase them. Some points to note:

- Trade margins include both wholesale and retail margins; no distinction is called for in the SUT.
- There are no trade margins on services[35]. Trade margins are only relevant for transactions in goods.

[35] Exceptions could be knowledge-capturing products, see footnote 3.

- The trade margin is not the difference between the value of sales and the cost of goods bought for resale because some goods sold may have come out of inventories and some of the goods bought for resale may have been added to inventories. Trade margins should be calculated taking account of changes in inventories valued to current year prices. Some countries ignore this refinement but it will not usually result in significant errors. (Please see Chapter 2 for examples on the calculation of output of trade)

Trade margins are allocated to each of the goods listed in the rows of the SUT. Trade margins differ between various types of goods. They are usually lower on goods with a fast turnover such as food, beverages and household consumables and higher on goods that have a lower turnover and therefore remain in stock for longer periods. Goods that generally have high trade margins include clothing and footwear, household durable goods and motor vehicles.

Information on trade margins usually comes from business surveys or censuses. As trade margins are fairly stable from year to year, estimates obtained from a survey even 4 or 5 years ago will still be relevant. A more important problem is that surveys often provide information on trade margins only according to type of store – grocery store, furniture store, vehicle show-room, department store, kiosk, etc. – and not on the specific types of commodities sold, so there is inevitably some approximation in assigning trade margins to particular types of goods specified in the SUT.

Countries where subsistence agriculture is important generally record low trade margins for crops and livestock products. In general, countries with high per capita GDP will usually have higher trade margins in percentage terms than poorer countries. In richer countries, trade margins will be set to cover costs of air-conditioning, better informed sales assistants, more elaborate displays of goods on sale, and a generally luxurious ambience.

6.4. Transport costs

The costs of transporting goods[36] from where they are produced or where they arrive as imports to the place where they are acquired by purchasers must be also added to basic values to obtain supply in purchasers' prices. Transport costs are shown in a column alongside that for trade margins and, like trade margins, transport costs must be also allocated to the various goods listed in the SUT. Two points to note:

- As with trade margins, transport costs are incurred only on goods. Services are not transported.
- Producers and importers may sometimes pay the costs of transporting goods to the purchaser. If so, the SNA recommends that these costs should be included in the basic price, and only transport charges "invoiced to the purchaser" are included in the transport column of the SUT.

Total transport costs are the earnings from freight transport by land, air, sea, and inland waterways. Most countries will have an estimate of total freight transport costs from their calculation of GDP from the production side and the problem is to allocate the total to each of the goods listed in the SUT. For a given mileage, transport costs depend mainly on weight. There are very marked differences in transport cost as a percentage of basic values for, on the

[36] Transport expenditures paid by the producers for transporting goods not separately invoiced to the purchaser is not transport charges, but intermediate consumption for the producers.

one hand, heavy low-value goods like coal and iron ore and light high-value items such as clothing and electronic goods.

6.5. Financial intermediation services indirectly measured (FISIM)

Bank output is the sum of (i) value of bank services sold (usually quite small), which they charge explicitly; plus (ii) the difference between the interest paid to depositors and the property income earned by banks (usually very big). The 1993 and 2008 SNA have introduced "reference rate" concept for (ii) to measure the output of banking services (which is the service charge) that have been provided in respect of deposits and loans to the depositors and borrowers, respectively, in an indirect manner. The Financial Intermediation Services Indirectly Measured (FISIM) when using the reference rate approach is estimated as sum of (a) interest on reference rate minus interest paid on deposits and (b) interest received on loans minus interest on reference rate. The 2008 SNA also introduced a term "SNA interest", which (i) on deposits is the product of total stock of deposits and reference rate; and (ii) on loans is the product of total stock of loans and reference rate.

The difference between interest and other property income received and interest paid to depositors is now called FISIM. In the older versions of the SNA it was called "Imputed Bank Service Charges" and was calculated in the same way as FISIM. The 2008 SNA recommends that FISIM should be recorded as a purchase of a service either as intermediate consumption in the case of industries or as final consumption for government, NPISH, households and the rest of the world.

The SNA suggests that the best way to allocate FISIM is by the "reference rate" method. The reference rate is a "pure" interest that contains no service charges. FISIM paid by borrowers is the difference between the interest they actually pay and what they would have paid at the reference rate, and FISIM paid by lenders is the difference between what they actually earn as interest and what they would have earned at the reference rate of interest. In practice countries have found it difficult to apply the SNA's reference rate system for allocating FISIM to users and many prefer the other alternative suggested by the SNA – namely to allocate the total FISIM according to the shares of bank loans and deposits of each sector.

In the SUT, FISIM is shown as output of financial institutions in the supply table and as either intermediate or final consumption in the uses table. That part which is intermediate consumption must first be split between market and non-market producers – i.e. between industries on the one hand and government and NPISH on the other. That part which is intermediate consumption of industries will need to be further broken down according to kind of activity. Few, if any, countries have firm information to split FISIM between kinds of activity. One practical solution is to distribute total intermediate consumption of FISIM on the basis of interests received and paid by sectors and industries if such information is available. Another alternative could be to distribute FISIM to sectors and industries on the basis of data available on either or both of loans and deposits by sectors and industries.

The 1993 and 2008 SNA recommendation to show FISIM as final consumption of households and the rest of the world had the effect of increasing GDP because in the 1968 SNA all FISIM was treated as intermediate consumption. For the OECD countries, this change has increased GDP by 1%-2%, but in developing countries financial services are much less important and it is unlikely that allocating FISIM will increase GDP by much more than 0.5%.

6.6. Consumption of fixed capital (CFC) for government

Consumption of fixed capital is one of the cost components of government output. Governments typically own large stocks of fixed assets including office buildings, vehicles, computers, hospital equipment, and office furniture as well as infrastructure such as roads bridges, damns, and water supply and sewage networks. In the 1968 SNA CFC was not calculated in respect of most infrastructure assets because they were assumed to have infinite lives but the 1993 SNA takes the more realistic view that although infrastructure assets may have long lives they eventually do need to be replaced. CFC should therefore be calculated in respect of all government-owned assets.

In many countries the government accounts include estimates of depreciation but these are invariably calculated by writing down the acquisition, or "historic", costs of assets whereas the SNA requires that CFC be calculated after revaluing assets to their current market values. As many government assets have long lives, depreciation based on historic costs may understate CFC based on current market values by a substantial amount. In some countries the government accounts show no entry for depreciation.

The SNA recommends that CFC be calculated from capital stock estimates derived from a Perpetual Inventory Model (PIM). The problem is that a PIM requires long time series of GFCF and related price statistics and very few developing countries have so far succeeded in calculating capital stocks using the PIM. Below is an alternative approach which may be feasible in many countries as it only requires information on government GFCF for a single year. It does of course also require some bold assumptions.

6.6.1. Short-cut method to estimate capital stock

The net capital stock at the beginning of the benchmark year 0, denoted here by K^{t0}, is approximately equal to the sum of the depreciated assets, denoted here by I^t, that were installed in earlier years and that are still in use. Equation (1) expresses this relationship[37]:

$$K^{t0} \approx I^{t0-1} + I^{t0-2}(1-\delta) + I^{t0-3}(1-\delta)^2 + \ldots\ldots \quad (1)$$

Here δ is the constant rate by which each year's GFCF loses market value through obsolescence and wear and tear. (We consider its calculation later.)

Suppose now that GFCF grows each year in real terms by a constant rate denominated by θso that $I^{0t-2} = I^{0t-1}/(1+\theta)$, and $I^{0t-3} = I^{0t-1}/(1+\theta)^2$, etc., etc. Then the net capital stock at the beginning of the benchmark year can be written as:

$$K^{t0} \approx I^{t0-1}\{1 + [(1-\delta)/(1+\theta)] + [(1-\delta)/(1+\theta)]^2 \ldots\} \quad (2)$$

Equation (2) is a geometric series with $\frac{1-\delta}{1+\theta}$ as the common ratio. Summing to infinity, equation (2) becomes[38]:

[37] This is an approximation to K^{t0} because I^{t0-1} will also have depreciated by the beginning of the benchmark year except in the unlikely event that all $It0-1$ occurred on the last day of the year.

[38] Recall that the sum to *n* of a geometric series of the form $a + ar + ar^2 + \ldots + ar^n$ is $a(1 - r^n)/(1 - r)$. As $n \to \infty$, r^n approaches zero if $r<1$. The sum to infinity then becomes $a/(1 - r)$. Here $r = (1-\delta)/(1+\theta)$ which must always be less than unity whatever the (positive) values of δ and θ.

$$K^{t0} \approx \frac{I^{t0-}}{1-\frac{1-\delta}{1+\theta}} = \frac{I^{t0-1}}{\frac{1+\theta}{1+\theta}-\frac{1-\delta}{1+\theta}} = \frac{I^{t0-1}}{\frac{1+\theta-1+\delta}{1+\theta}} = \frac{I^{t0-1}(1+\theta)}{\theta+\delta} = \frac{I^{t0}}{\theta+\delta} \quad (3)$$

Equation (3) shows that the net capital stock of the benchmark year (K^{t0}) can be approximated using only the GFCF of the benchmark year (I^{t0}) and assumptions about the rate of (geometric) depreciation (δ) and the average real growth rate of GFCF (θ). How do we calculate δ and θ?

Clearly δ will vary depending on the type of asset so you will need to break down government GFCF into as many categories as possible. A three way breakdown is the minimum:

- machinery and equipment;
- government buildings; and
- roads, bridges, damns and other infrastructure.

The depreciation term δ is calculated as d/L where L is the expected service life of the asset and d is the depreciation factor which is usually set between 1.0 and 2.0. If d is set equal to 2.0 depreciation is described as "double declining" and this is the depreciation method often used by commercial accountants. Here we will set d at 1.6: this value of d generates a depreciation profile similar to that obtained using straight-line depreciation which is generally regarded as the most appropriate method of calculating depreciation. (The problem with straight-line depreciation is that it requires a time series of GFCF and associated price deflators: geometric depreciation, which is being used here, is much less data-demanding.)

The growth term, θ, is the average real annual growth in government GFCF. Assuming that you have no long time series on real GFCF for government, θ could be set equal to the long-term real growth rate of GDP. In the OECD this is probably around 2%, but in many developing countries it will be higher than this – between 4% and 5% perhaps. Of course, if you have reason to think that government GFCF has actually been growing faster or more slowly than real GDP, you should use your own best estimate of θ.

The table below gives some illustrative values for δ and θ.

Figure 6.2: Illustrative value for depreciation and average real annual growth in government GFCF

Type of government asset	Depreciation factor *(d)*	Possible service life *(L)* in years	Possible values of δ, i.e. d/L	Illustrative values of ϑ, i.e. long-term real growth rate of government GFCF
Machinery and equipment	1.6	8-12	0.200 to 0.133	0.04 – 0.06
Buildings	1.6	50 - 70	0.032 to 0.023	0.04 – 0.06
Infrastructure (roads, etc.)	1.6	100 -150	0.016 to 0.011	0.04 – 0.06

Suppose, for example, that we have the following information on government GFCF in the benchmark year:

- GFCF in machinery and equipment is estimated at 246,000 kwacha. Using, as an illustration, the mid-points from the table for δ and θ the government capital stock of machinery and equipment will be estimated as 246,000/(0.167 + 0.050) = 1,133,641 kwacha.

- GFCF in roads, bridges and other infrastructure is estimated at 403,500 kwacha. Again using mid-points for δ and θ the stock of infrastructure assets will be calculated as 403,500/(0.0135 + 0.050) = 6,354,331 kwacha.

This very simple model for calculating a capital stock can sometimes be improved in either of two ways:

- If government GFCF is volatile from year to year it may be better to take an average of GFCF for three or four years as the starting point for calculating the capital stock.
- Another possibility is to calculate the capital stock not for the benchmark year but for the earliest year for which a time series of government GFCF (at constant prices) is available. The stock calculated for this earliest year is then updated to the benchmark year by adding each year's GFCF and multiplying each updated estimate of the stock by (1 – δ). In this way maximum use is made of the available data rather than using an estimated growth rate of θ.

6.6.2. Consumption of fixed capital

Consumption of fixed capital (CFC) for the benchmark year consists of two elements.

- First, there is CFC on the stock of assets in place at the beginning of the benchmark year. In the example above the stock of infrastructure assets was estimated to be 6,036,614 kwacha so CFC on the existing stock will be 6,354,331 x 0.0135 = 85,783 kwacha.
- Second, there is CFC on the assets put in place during the benchmark year. If all these assets had been put in place on the 1st January they would all have depreciated by δ, and if they had been put in place on the 31st December there would be no depreciation at all. Assuming that the infrastructure GFCF occurred evenly throughout the year, CFC can be calculated as δ/2 x 403,500 = 2,724.
- Total CFC on infrastructure for the benchmark year is therefore 85,734 + 2,724 = 88,458 kwacha.

This is obviously a crude method of estimating the capital stock and CFC, but it is certainly better than assuming that CFC is zero (i.e. just ignoring it) and it is most likely to be nearer the true figure for CFC than a depreciation estimate based on historic costs that may be available from the government accounts

6.7. GDP exhaustiveness and Informal economy[39]

6.7.1. GDP exhaustiveness

Ensuring exhaustiveness of GDP is one of the most important challenges faced by the national accountants in developing countries. By exhaustiveness, we mean that the GDP measure takes into account all economic activities undertaken in the economy that are included within the production boundary of the 2008 System of National Accounts.

[39] The UNECA also prepared a draft Guide Book on informal sector accounting in national accounts, which may be referred to for detailed discussion on the topic.

The main activities which usually get under-reported or not reported by the data source agencies are:

- informal activities;
- illegal activities;
- own account construction of dwellings and farm buildings;
- agricultural produce for own consumption;
- services of owner occupied dwellings;
- paid domestic services;
- wages paid in kind; and
- local administrative units (at village or block level).

In addition to these activities, under-estimation of GDP can also result due to:

- defective sampling frames, especially due to the failure to keep business registers up to date;
- non-response;
- deliberate misreporting by establishments/enterprises etc.

The Eurostat "tabular approach" and the handbook, "Measuring the Non-Observed Economy"[40] provide guidelines on achieving GDP exhaustiveness. The term "Non-Observed Economy" (NOE) refers to those economic activities which should be included in the GDP but which, for one reason or another, are not covered in the statistical surveys or administrative records from which the national accounts are compiled.

The different types of non-exhaustiveness described in the Eurostat tabular approach and the non-observed activities mentioned in the OECD handbook, normally overlap each other and it is difficult to estimate their various components separately. The end objective, however, is to identify and include all these activities in the GDP estimates. Among the non-observed activities, informal sector is a major component in the developing countries and, often, it is not properly accounted in the GDP estimates.

6.7.1.1. Eurostat tabular approach to exhaustiveness

This approach provides a consistent and complete conceptual framework by classifying adjustments into seven types of "non-exhaustiveness" (listed under N1 to N7 in Figure 6.3 below). It also suggests suitable compilation methods (such as the employment method, fiscal audits, VAT comparisons, etc.) for the non-exhaustiveness types (indicated in bold letters in the table below).

The starting point in identifying the seven types of non-exhaustiveness is the production (or output) approach, by activity. Once gross output has been corrected for non-exhaustiveness, the SUT provides the framework for correcting the estimates of intermediate consumption and final uses.

Figure 6.3: The Eurostat tabular approach to exhaustiveness

Not registered	N1 - Producer deliberately does not register (underground activity)	The producer does not register in order to avoid tax and social security obligations or to avoid losing some social benefits. Typically this category includes small producers with income above the threshold set for registration. Producers who do not register because they are engaged in

[40]OECD, IMF, ILO, and CIS STAT (2002).

		illegal activities should be classified to N2, while producers who deliberately misreport their activities should be classified to N6. **The methods that can be used to estimate the adjustments required include labour inputs (from household-based labour force surveys), commodity flows and supply-use tables.**
	N2 - Producer deliberately does not register (illegal activity)	The producer deliberately fails to register because he/she is involved in illegal activities such as prostitution, sale of stolen goods, dealing in drugs, smuggling, illegal gambling, etc. This category excludes any illegal production not reported by registered producers (which should be classified to N6) and illegal production by units not required to register (classified to N3). **The methods that can be used to estimate the adjustments are the quantity-price method, unit per input or use, and expert judgment.**
	N3 - Producer not required to register	Such producers are not required to register because they do not have any market output or it is below a set threshold. Activities include production for own final consumption, own fixed capital formation including construction of own dwellings and repairs to dwellings. They also include market output of households that is below the level at which the producer is obliged to register as a business, paid domestic services, etc. No adjustment is necessary if the estimation method for a particular activity (or survey) implicitly takes account of the non-registered activity. **The methods that can be used to estimate adjustments are household expenditure surveys, building permits, commodity-flow methods, administrative data and time use surveys.**
Not surveyed	N4 - Legal producers not surveyed	Legal producers who may be registered can still be excluded from statistical surveys. For example, the producer may be newly registered and not yet recorded on the business register because the register updating procedures may be slow or inadequate. On the other hand, a producer may be recorded on the business register but still could be excluded from survey frames because classification data used in developing the frames (e.g. activity code, size of business, geographic location) might be wrong, or there may be a size cut-off that precludes the producer from being selected to participate in a particular survey. **The methods that can be used to estimate adjustments are surveys of the quality of the business register, a review of the lags involved in update procedures and whether they change over time, or cross checking the business register against other administrative sources of businesses.**
	N5 - Registered entrepreneurs not surveyed	Registered entrepreneurs (e.g. consultants, private writers, freelance journalists) may not be recorded in the business register, either deliberately or because the register updating sources do not include details of such persons. Even if their details are recorded in the business register they may be excluded from statistical surveys either because of errors in details recorded (e.g. activity code, size of business, geographic location) or because of the small size of their individual activities. **The methods that can be used to estimate adjustments are surveys of the quality of the register, cross-checking against other administrative sources (e.g. income tax statements) or via specialized surveys.**
Mis-reporting	N6 - Misreporting by producers	Misreporting involves under-reporting gross output (and therefore revenues) and/or over-reporting intermediate consumption (and therefore the costs of production) in order to avoid paying income tax, other taxes such as value added tax (VAT), or social security contributions. Misreporting

		may involve maintaining two sets of books to conceal the full extent of sales, hidden secondary activities, cash settlements for sales that are unrecorded because no receipts are given, VAT fraud, salaries paid in cash to avoid social security payments or employment taxes (so-called "envelope salaries") or salaries recorded as external contractual services. **The methods that can be used to estimate adjustments are data from tax audits, comparing average salaries and profits with similar businesses, comparing input/output ratios with those of similar businesses, special surveys and expert judgment on the accounting relationships expected to be observed in such businesses.**
Other	N7 - Other statistical deficiencies	This category can be divided into two parts - data that are incomplete or cannot be directly collected from surveys, or data that are incorrectly compiled during survey processing. **The items that should be considered in determining the adjustments to be made include how non-response was taken into account, the extent to which wages and salaries were paid in kind, production for own final use by market producers, tips, valuation techniques and adjustments for accruals.**

Several of these seven types of "non-exhaustiveness" can be accounted for (though not separately for each type) through the use of labour input methods. If the employment (in terms of jobs, which can be compiled by adding the second or multiple jobs undertaken by persons) data is available by activities and sectors from the labour force survey, population census or other demographic surveys, a labour-input matrix can be constructed, which is considered to exhaustively represent the labour force in the economy. The balance between the employment reported in the surveys and the labour-input matrix can be used to estimate the output industry-wise for missing units in corporations (under-reporting, underground, non-response, etc.) and household (including informal and illegal activities) sectors.

6.7.1.2. Non-observed economy

The handbook, "*Measuring the Non-Observed Economy"* is another important document which provides guidelines on measuring the non-observed economy which encompasses the informal sector as one of its components. Non-observed activities are those that are missing from the basic data used to compile the national accounts because they are underground, illegal, informal, household production for own final use, or due to deficiencies in the basic data collection.

The 5 components of the NOE mentioned in the handbook are:

- economic underground;
  (1) underground production;
  (2) illegal production;
  (3) informal production;
- (4) household production for own final use;
- (5) statistical underground.

The underground production refers to the deliberate concealment of legal activities from public authorities to avoid payment of taxes, social security contributions, meeting certain legal standards, like minimum wages, health and safety regulations, compliance costs (filling up of returns, etc.) or to claim unemployment benefits.

The illegal production is defined as "all illegal actions that fit the characteristics of transactions – notably that there is mutual consent – are treated in the same way as legal actions". The illegal production covers activities forbidden by law, such as production of goods and services whose production or sale is forbidden by law, and activities which are usually legal but illegal for unauthorised producers.

The informal sector, as defined by the 15th International Conference of Labour Statisticians, covers "units engaged in production of goods/services with primary objective of generating employment and incomes to the persons concerned". These units typically operate at low level of organization, with little or no division between labour and capital and on a small scale. Labour relations, where they exist, are based mostly on casual employment, kinship or personal and social relations rather than contractual arrangements. A vast majority of informal sector activities provide goods and services whose production and distribution are perfectly legal.

The household production for own final use includes production of crops, livestock, other goods, construction of own houses, imputed rents, and services produced by domestic servants.

The statistical underground refers to production missed due to deficiencies in data collection programme, under-coverage of enterprises, non-response, under reporting and conceptual issues such incorrect treatment of tips and wages and salaries in kind.

The handbook outlines the action on two fronts for measurement of NOE:

- improvements in direct measurement by the data collection programme, resulting in fewer non-observed activities and hence fewer non-measured activities; and
- improvements in indirect measurement during compilation of the national accounts, resulting in fewer non-measured activities.

Box 6.1: Estimating the non-observed economy: South Africa (by Statistics South Africa)

The Handbook on the Non-observed Economy identifies 5 areas that must be included in estimates of national accounts. These are treated as follows in South Africa:

Underground production

No explicit estimates are made, but in principle some of these activities are included in estimates of the informal sector.

Illegal production

Estimates are based on administrative records and provide a lower boundary estimate. Sources include the South African Police Service, South African Revenue Service as well as research done in non-governmental organizations. Typically estimates are made for agriculture (cannabis and abalone), mining (gold, coal, and diamonds), manufacturing (alcohol, media piracy), trade (tobacco, clothing) and services (prostitution). Administrative sources estimate turnover with value added then estimated based on value added ratios per unit of production, legal production margins etc.

Informal sector production

The informal sector is defined as all economic activity undertaken by "businesses" that are not registered for tax. This is a convenient definition as we are confident that our regular economic statistics survey program covers all tax registered business. Benchmark estimates are derived from a multiple-stage household survey. The quarterly labour force survey is designed to measure employment in the formal and informal sector. Respondents that indicate that they are employed in the informal sector are then sampled in a Survey of Employers and Self Employed which gather information such as income, related expenditure and industry of activity. For subsequent years, the value added per capita per industry is used and combined with the actual number of people active in the informal sector by industry to estimate new levels of informal sector production.

Household production for own final use

Estimates are primarily for subsistence agriculture (estimated by the Ministry of Agriculture), domestic workers, and owner occupied dwellings. Domestic workers are based on information from Population census and quarterly labour force survey as well as research on minimum and actual wages paid. Estimates are extrapolated based on volumes in the labour force and relevant consumer price indices. Estimates for imputed rent are based on housing stock estimates from the periodic Population Census and annual General Household Survey. This is linked to rental information from the periodic Income and Expenditure Survey, regular consumer price surveys as well as industry research.

Production missing due to deficiencies in data collection programs

These deficiencies are accounted for through sampling techniques and a taxation-based business register that ensure excellent coverage of the formal sector.

The estimates above provides the initial starting point for estimates in the supply and use framework and will typically be adjusted through the commodity flow approach and balancing.

6.7.2. Accounting for the informal sector

Informal economy encompasses the informal sector enterprises and informal employment. In most developing countries, the informal sector and informal employment account for a significant share in the employment and gross domestic product (GDP). Figure 6.4 is based on survey carried out in 2013 by the African Development Bank. It gives the estimated shares of informal value added, excluding agriculture and imputed rents, in GDP. In 60% of the 37 countries, informal value added is estimates to account for at least 15% of GDP. Note, however, that the shares are surprisingly low for several countries – Malawi, Namibia, Nigeria, Mali, and Swaziland for example – suggesting substantial underestimation of informal activities in several countries.

Figure 6.4: Informal value added (excluding agriculture and imputed rents) as percent of GDP

Under 5%	*5-9%*	*10-14%*	*15-19%*	*20-24%*	*25-29%*	*30-34%*	*35-39%*	*40% of more*
Botswana Cape Verde Equatorial Guinea Malawi Namibia Nigeria Sao Tome & Principe Seychelles	Mali Mauritius South Africa Swaziland	Egypt Ghana Tunisia	Angola Burkina Faso Chad Congo Kenya Lesotho Madagascar Sierra Leone Zimbabwe	Democratic Republic of the Congo Ethiopia Liberia Niger	Rwanda Cameroon	Burundi Gabon Tanzania	Benin Guinea Senegal	Cote d'Ivoire

Availability of separate data on employment and output in the informal sector is important for policy purposes, besides helping in measuring the GDP exhaustively. However, this sector is often missed in the current surveys and data collection mechanisms in the countries due to various reasons. This calls for procedures to identify the informal sector and laying down a methodology to measure its contribution, either directly or indirectly.

There are several documents and guidelines available on informal sector and its accounting. Some of these are, *(i)* proceedings of 15th International Conference of Labour Statisticians (ICLS) on informal sector (1993) and 17th ICLS on informal employment (2003), *(ii)* System

of National Accounts 1993, *(iii)* OECD publication Measuring the non-observed Economy, A Handbook, (iv) UN-ECE publications Non-observed Economy in National Accounts: Survey of Country Practices (2003, 2008) (v) Delhi Group deliberations and recommendations, (vi) ILO manual *Measuring Informality: a Statistical Manual on the informal sector and informal employment* and (vii) Chapter 25 on Informal Aspects of the Economy, System of National Accounts, 2008.

Informal sector

The term ”informal sector” is used to denote tiny units, engaged in the production of goods and services but whose activities were not recognized, recorded, protected or regulated by the public authorities and includes a wide range of activities from street vending, shoe-shining, food processing and other petty activities requiring little or no capital and skills to activities involving some amount of skill and capital such as tailoring, repair of electrical and electronic goods, and operation of transport equipment. The definitional and measurement issues of this sector outlined in some important documents are summarized below:

(a) 15th ICLS and 1993 SNA

In 1993, the ILO included a resolution in the ICLS (15^{th} ICLS) giving a conceptual framework and guidelines for the collection of statistics on the informal sector. The resolution was intended to provide the first internationally approved technical guidelines for the development of statistics on the sector. The resolution also led to including informal sector accounting in the 1993 SNA. The 1993 SNA characterized the informal sector as consisting of units engaged in the production of goods or services with the primary objective of generating employment and income to the persons concerned.

The broad characteristics of the informal sector outlined in 15th ICLS and 1993 SNA are as follows:

- Private un-incorporated enterprises owned by households (enterprises owned by individuals or households that are not constituted as separate legal entities independent of their owners), as part of the household sector in SNA, with further bifurcation as *(i)* own-account enterprises (that do not employ employees on a continuous basis) and *(ii)* enterprises of employers (that employ one or more employees on a continuous basis). (There is a terminology difference between the ICLS and the SNA, although ICLS terms the informal sector as a sub-sector of household sector of SNA. The informal sector referred to in the 15^{th} ICLS refers to a group of producing units, whereas the household sector in SNA refers to an institutional unit consisting of both production and consumption units);
- Units for which no complete accounts are available that would permit a financial separation of the production activities of the enterprise from other activities of its owners;
- Produce *at least some* of their goods or services for market (sale or barter) (as against the SNA concept of market producers as those that sell *most or all* of their production on the market at economically significant prices);
- Produce goods and services using labour as input (as against the SNA concept which also includes production for own consumption without using labour as output, such as owner occupation of dwellings). The ICLS recognized that depending on national circumstances, certain production units of the households sector may fall outside the distinction between formal and informal sectors, such as the units exclusively engaged in *(i)* agricultural activities, *(ii)* production of goods for own final use, and *(iii)*production of services for own final consumption by employing paid domestic workers;

- Refers to a group of production units based on their characteristics, irrespective of*(i)* kind of workplace where the productive activities are carried out, *(ii)* extent of fixed capital assets used, *(iii)* duration of the operation of the enterprise (perennial, seasonal or casual), *(iv)* operation as a main or secondary activity of the owner;
- The employment size of the enterprise is below a certain threshold (to be determined according to national circumstances);
- And/or not registered under specific form of national legislation.

(b) 2008 SNA

Chapter 25 of 2008 SNA, "Informal aspects of the economy" summarises the definitional and measurement issues dealt by the ICLS and the handbook on NOE and supplements these with the identification of informal sector units and approaches for collecting data from them.

The chapter examines the characteristics of production units and tries to identify those significant for the non-observed economy, the informal sector or both. The chapter also discusses the differences in terminology and concepts between the SNA & ICLS, especially on "sector"[41], "enterprise"[42], and "sub-sectoring production"[43].

The 2008 SNA notes that ICLS always regarded informal sector as a subset of household unincorporated enterprises operating within the production boundary of the SNA. Thus, for identification of informal sector, the SNA household sector is divided into:

- households containing an unincorporated enterprise that is registered or has more than a given number of employees;
- institutional households, such as prisons, religious orders and retirement homes etc.;
- households with no unincorporated enterprises;
- households only undertaking production for own final use (services of owner occupied dwellings, subsistence farming, and services of paid domestic staff);
- informal sector enterprises (households containing unincorporated enterprises that are not registered and/or have less than given number of employees)
    - without employees "informal own-account enterprises"
    - with employees "enterprises of informal employers".

The operational guidelines to identify activities undertaken by informal enterprises within the national accounts are in the following manner:

- exclude the following from SNA households sector:
    - institutional households such as prisons, and retirement homes;

[41]ICLS refers informal sector to a group of production units, whereas the SNA refers a sector to an institutional unit.

[42]The use of unincorporated enterprise in the ILO description of the informal sector does not correspond to the totality of unincorporated activity of a household but to each activity separately. In SNA terms, the unincorporated enterprise is broken down into a number of unincorporated establishments, some of which may be included in the informal sector and some excluded, even for the same household. Further, the ILO identifies individual members of a household as owning each establishment/enterprise and capable of employing workers. In the SNA, it is the household collectively that is responsible for all activity and for employing workers. (Para 25.50, SNA, 2008)

[43]Producers for own final use need to be sub-divided into those where some of the production is for sale or barter and those where the production is exclusively for own final use for the ILO concept. In the case of unincorporated enterprises where only some of the production is sold or bartered, all of the production of the unit of those goods and services is still included in production by the informal sector. (Para 25.51, SNA, 2008)

    - households with no production activity;
    - produce exclusively for own final use;
    - households whose only activity is the production of services from owner-occupied dwellings, the production of services by employing domestic staff;
    - NPISH, if included in household sector;
    - agricultural production;
    - households with enterprise that is registered or has more than a given number of employees;
- consider national practices in establishing the households sector to see if any adjustment to the first step is necessary; and
- provide a breakdown by type of activity so that common exclusions according to type of activity can be made.

Informal employment

As a consequence of rapid economic development and specialization of services and the increase in demand for labour resources in the recent past, the business community has moved towards outsourcing of services. This phenomenon has contributed to the development of more casual arrangements between owners of enterprises and those contributing labour services in the form of informal employment.

Informality of employment is characterized by absence of contracts, social protection, entitlement to certain employment benefits and not being subject to labour legislation or taxation. Broadly, the informal employment comprises informal jobs both in informal and formal enterprises and in households. A person can simultaneously have two or more formal and/or informal jobs. Due to the existence of such multiple job holding, jobs rather than employed persons are taken as the observation units for employment.

The conceptual framework of the informal employment endorsed by the 17th ICLS relates the enterprise-based concept of employment in the informal sector in a coherent and consistent manner with a broader, job-based concept of informal employment. There are five categories of jobs considered by the ILO. These are:

a) own-account workers (the self-employed in SNA terms);
b) heads of unincorporated enterprises with employees, treated as employers;
c) unpaid family workers contributing labour to the unincorporated enterprise;
d) employees; and
e) members of producers' cooperatives.

Informal employment can be identified from the above five categories of jobs. Formal enterprises provide informal jobs only as employees or contributing family workers. Informal enterprises may offer any of the five types of informal jobs and also formal jobs. Households provide informal jobs as own-account workers, employees and family workers. Some domestic staff may have formal jobs.

6.7.3. Approaches to measuring activities undertaken in the informal economy

The 2008 SNA suggests either direct or indirect approaches to measure the informal sector, through the following surveys:

- household surveys, and mainly labour force surveys;
- establishment surveys;

- mixed household-enterprise surveys (in these surveys, also known as 1-2 surveys, an enterprise module is attached to the labour force or other household surveys, and information on the activities of the enterprises is collected from the entrepreneurs identified in the household surveys. In another variant of these mixed surveys, informal sector enterprises are identified through household survey and information is collected from these identified units).

(a) Direct approach

The activities undertaken in the informal sector are measured through direct approaches in which data on output (if possible by products); intermediate consumption and changes in inventories are collected from the informal sector enterprises, through the establishment surveys or mixed household-enterprise surveys. Generally, the production approach is considered the best approach to estimate informal sector value added.

(b) Indirect approach

One of the indirect approaches to estimate the output of informal sector in particular and the non-observed economy in general, is through the labour input method suggested in the Handbook on Non-Observed Economy. This procedure involves three basic steps: *(i)* obtaining estimates of the supply of labour input to GDP, according to kind of economic activity and size of enterprise, from a household labour force survey, population census and/or other demographic sources; *(ii)* obtaining estimates of output per unit of labour input and value added per unit of labour input for the same activity and size breakdown from regular or special purpose enterprise survey; and *(iii)* multiplying the labour input estimates by the per unit ratios to get output and value added for the activity and size categories.

Box 6.2: Informal sector output estimation when no direct data is available (by Tim Jones, Consultant)

Best practice is to conduct surveys of informal activity or make indirect estimates as described above.

However, provided you have a high quality household expenditure survey data and estimates of formal sector output, you can derive informal production by residual in rows where HFCE exceeds formal production (plus margins). This is particularly common in food manufacturing. Formal sector margins may account for a relatively small portion of total margins, so it is likely that margins estimated product by product will exceed the margins reported by the formal sector. In the absence of other information formal sector input-output ratios may then be used to derive informal value added from the output.

These estimates will be very rough and probably not exhaustive, but they will be a lot better than nothing.

It is generally observed that establishment surveys under-report employment numbers, as informal sector units may conceal employment in order to evade taxes or administrative regulations. Therefore, direct estimation of informal sector through establishment surveys could result in under-estimation of the informal sector component in GDP. On the other hand, the labour input method takes care of this under-estimation by using the workforce data from labour force surveys/population censuses. These sources are expected to give a more complete coverage of labour input to GDP than the enterprise surveys, and therefore, would provide a basis for GDP exhaustiveness as well as for consistent estimates between employment and output. Also, persons who are engaged in illegal activities and underground production may report as workers in the labour force surveys, and thus the labour input method ensures covering more NOE activities, besides the informal sector.

For the labour input method, it is necessary to prepare a labour input matrix for estimating the formal and informal jobs, by activity and by institutional sectors with further disaggregation within household sector by formal and informal units. Such detailed data are generally available in the labour force or other demographic surveys. Alternatively, the employment by activity in the formal sector available from regular enterprise or establishment surveys or administrative sources could be subtracted from the overall estimates of jobs obtained from the labour force surveys, to derive the data on informal jobs or jobs in informal sector, in various institutional sectors and informal sector units, as a residual. It is important to go through the reconciliation process when more number of sources are used, to prepare the labour input matrix.

From the above discussion, it is clear that indirect approaches are more practical and provide a firmer basis for accounting for informal economy in the GDP estimation. The labour input method can also be used to measure the activities relating to non-response, underground, defective sampling frames and under-reporting by establishments and enterprises.

Summing up of the chapter, addressing the problematic areas is important while estimating GDP and ensuring its exhaustiveness. There are several other problematic areas, such as use of double deflation in estimating value added at constant prices, which are beyond the scope of this handbook. The support of international agencies to countries in Africa in covering these problematic areas, especially, estimation of CFC, FISIM and its allocation and accounting for informal sector in the GDP estimates is most needed.

References:

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Chapter 7. The use of commodity flow: consistency and missing values

7.1. Introduction

This Chapter explains how product balances can be used by the national accounts compiler to estimate the supply or uses of particular products or to achieve consistency between the supply and uses of products. Constructing product balances almost always requires the compilers to use their judgment about the relative reliability of individual components of supply or use and to make assumptions to fill data gaps. This is illustrated by numerical examples of product balances.

7.2. Commodity flow approach

This is the basic SUT equation:

$DP + IMP + ADJ = IC + GFCE + HFCE + NPISH + GFCF + \Delta INV + EXP$ (1)

It shows how the supply from domestic production (DP) and imports of goods and services (IMP) is equal to the uses on the right-hand side – intermediate consumption (IC), government final consumption expenditure (GFCE), household final consumption expenditure (HFCE), final consumption expenditure of non-profit institutions serving households (NPISH), gross fixed capital formation (GFCF), change in inventories (Δ INV), and exports of goods and services (EXP). The ADJ item consists of the adjustments need to bring DP and IMP from basic prices to purchaser's prices and consists of trade margins, transport costs and net taxes on products.

Although equation (1) applies to the complete SUT, it is equally applicable to individual goods and services without necessarily going on to compile a complete SUT. When equation (1) is used for individual goods or services, it is usually described as a "commodity flow approach". The commodity flow approach involves constructing "product balances" for individual goods and services. It is a technique for:

- ensuring consistency between the supply and uses side; or for
- estimating a missing value, either on the supply or uses side.

Some practical examples of the application of the commodity flow approach are given below.

7.3. Examples of commodity flow

7.3.1. Poultry meat: missing value for household consumption expenditure

Here is the information we have to start with:

Imports of poultry meat at c.i.f. values were 350. The value of domestic production at basic prices is estimated to be 6,150. This is based on estimates of the total numbers of poultry in the country, take-off (slaughter) rates and average prices per bird obtained from various sources such as the Ministry of Agriculture and the Veterinary Department. Pet food manufacturers have reported purchases of 1,000 and exports of poultry meat come to 45.

Now the national accountant has to make some assumptions to fill in the gaps:

Transport charges are roughly estimated at 1% of the value of domestic production and retail margins on poultry for domestic consumption are estimated at just over 2%. These margins are low because most poultry in this country is produced by farm households for own consumption and only a small part is commercialized. The estimated rates for both transport charges and trade margins are rough estimates based on the compiler's judgment. They may need to be revised in a later year if better information becomes available.

A nominal figure of 10 is assigned to "other trade margins" to represent the margin on sales of poultry meat to the pet food manufacturers. The national accountants have no firm information on the actual margin, but they are sure that it is not zero and that 10 must be closer to the truth than zero. Note that the national accounts compiler could equally well have used 5 or 15 instead of 10. Any of these numbers are likely to be nearer to the true figure than zero. It is a purely notional figure and could be revised at a later date if better information on transport costs ever becomes available.

Inventories are always very small because of the problems of storing the slaughtered poultry for any length of time so it is reasonable to assume zero change in inventories.

We now put this information into a product balance framework. Final consumption expenditure by households on poultry is the difference between the estimated total supply at purchasers' prices – 6,705 – and total known uses, also at purchasers' prices – 1,045.

Figure 7.1: Product balance for poultry meat

SUPPLY	
Domestic production (value at farm gate)	6,150
plus imports (c.i.f.)	350
plus taxes on poultry	0
less subsidies on poultry	0
plus trade margins (on household consumption)	130
plus trade margins (on purchases by pet food manufacturers)	10
plus transport charges	65
equals total supply	6,705
USES	
Intermediate consumption (for pet food)	1,000
plus household final consumption expenditure	Unknown
plus government final consumption expenditure	0
plus gross fixed capital formation	0
plus change in inventories	0
plus exports	45
equals total known uses	1,045
RESIDUAL CALCULATION	
Total supply	6,705
less total known uses	1,045
equals final consumption expenditure by households	5,660

Notice that in this example, we only had four firm pieces of information: imports, domestic production of poultry, purchases by pet-food manufacturers for intermediate consumption, and exports of poultry. The other estimates – for trade margins and transport costs and for changes in inventories were all based on assumptions made by the national accountant. This is quite a typical situation.

Box 7.1: Livestock output, inventory and capital formation using the livestock estimation model- Uganda's case (by Uganda Bureau of Statistics)

Uganda uses an MS Excel based application livestock model for deriving the output, inventories and capital formation of livestock. The 2008 Livestock Census provided the benchmark stock figures by sex and age (beginning inventory) for all the livestock. The ending inventory is derived as a difference between total animal supply and total animal use.

The model is composed of two main parts, total supply and total uses. Ending inventory in current quarter becomes beginning inventory in the following quarter.

Total animal supply is taken by adding together total beginning inventory, number of animals born, number of animals purchased/given as gifts and number of animals imported.

Total animal use is taken by adding together number of animal slaughtered (farm and abattoir), number of animals that died, number of animals sold/given away as gift and number of animals exported.

Number of animals born is derived from total females of reproductive age at beginning inventory using birth ratio, number of animals purchased is derived from total animals at beginning inventory using purchase ratio. Number of animals exported and imported is obtained from the external trade statistics unit within the statistics office.

Data on death and birth rate and productivity is from the household surveys and neighbouring countries. The indicators here are; meat of cattle and goats/sheep, milk, hides and skins, of cattle and goats/sheep, chicken slaughtered and the eggs production. By applying value indices (volume indices adjusted for price change) for extrapolating gross output and intermediate input the IC/GO ratio varies from time to time. Availability of new indicator ratios from the National Panel Survey (NPS) and other sources ensures that data is available for regular revision of the livestock output, inventories and capital formation trends.

Output of the model

Currently the model has nine animal categories namely; indigenous and exotic cattle, goats, sheep, pigs, rabbits, other animals, chickens and other birds on different estimation worksheets and it is updated on a quarterly basis.

The gross value added (GVA) is derived as a residual after estimating the gross output (GO) and intermediate consumption (IC). The model also provides estimates of gross fixed capital formation (GFCF). The output is broken down into formal and informal and monetary and non-monetary

The latest Uganda SUT is for 2009/10 while, the livestock census was for 2008. However, using the livestock model approach the 2009/10 preliminary estimates for the SUT were derived pending Supply and Use Tables balancing.

7.3.2. Household consumption of tobacco: consistency check

Here is the information we have to go on:

A household expenditure survey from a few years ago reported expenditure on tobacco at 7,000.

Updating this value by the CPI gives 8,000 for the current year. This is just the increase in value due to the price increase. No allowance is made for population increase because smoking rates are known to have dropped but there are no details as to by how much. The national accountant makes the simple assumption that the increase in population of smoking age and the decline in smoking rates offset each other.

The latest industrial census shows domestic production at basic prices came to 8,200. Imports (c.i.f.) are 1,200.The Ministry of Finance reports that sales taxes and import duties on tobacco, which are each levied at a rate of 5%, amounted to 940 for the year. The tobacco companies reported a fall in inventories of tobacco of 10.Exports of 350 were recorded in the merchandise trade statistics.

There is no firm information on trade margins or transport costs. Some assumptions will be needed:

A trade survey some years ago showed that wholesale and retail margins added about 10% to the basic prices plus excise taxes so trade margins are set at 10% or 1,340.

A neighbouring country made a transport survey recently and found that for all consumer goods, transport margins were about 3% of values at basic prices plus product taxes. Transport charges are estimated to be about 3% rounded to 300.

Figure 7.2 shows the available information as a product balance:

Figure 7.2: Product balance for tobacco consumption

SUPPLY	
Domestic production (basic prices)	8,200
plus imports (c.i.f.)	1,200
plus taxes on tobacco	940
less subsidies on tobacco	0
plus trade margins (on household consumption)	1,340
plus transport charges	300
equals total supply	11,980
USES	
Intermediate consumption	0
plus household final consumption expenditure	8,000
plus government final consumption expenditure	0
plus gross fixed capital formation	0
plus change in inventories	–10
plus exports	350
equals total uses	8,340
DISCREPANCY	
Total supply	11,980
less total uses	8,340
equals discrepancy	3,640

In the case of poultry, we used the product balance to estimate a missing value – household consumption expenditure on poultry. In this tobacco example we use the product balance to check the consistency of our estimates. The problem is that our estimate of total supply is bigger than our estimate of total uses by 3,640. Now what?

The imbalance between supply and uses (which should be equal, by definition) is very large (3460). Checking the source data shows that all the supply components are based on reliable sources and the taxes received are consistent with the value of domestic production and imports.

Similarly, the change in inventories and the value of exports are considered to be fairly firm estimates.

However, experience has shown that household expenditure surveys tend to underestimate the true value of tobacco consumption and so the estimate of 8,000 from the household expenditure survey is replaced by 11,640, which is the balance between the total supply (11,980) and the uses other than household final consumption expenditure (340).

7.3.3. Sawn timber, plywood and wood laminates: consistency check

The following information is available:

Domestic production: 4,900

Imports: 1,050

Product taxes: 0

Exports: 1,800

Purchases by public works department: 260

Purchases by private construction companies: 4,500

Purchases by furniture manufacturers: 3,750

Purchases by households: 235

Change in inventories reported by domestic producers: minus 785

There is no firm information on trade margins and transport costs so some assumptions will again have to be made:

Timber has a low value/weight ratio so transport costs will be relatively high as a proportion of basic value. After discussions with a builder's merchant the national accounts compiler estimates transport costs as 10% of the basic value of both domestic production and c.i.f. imports, i.e. 0.10 x (4900 + 1050) = 595.

The average trade margin on all traded goods is about 20%. In the absence of any specific information for timber products, the compiler decides to use the average rate, so trade margins are estimated as 0.20 x (4900 + 1050 + 595) = 1309.

This information is now put into a product balance framework:

Figure 7.3: Product balance for sawn timber, plywood and wood laminates

SUPPLY	
Domestic production	4,900
plus imports	1,050
plus transport costs	595
plus trade margin	1,309
plus product taxes	0
Equals total supply at purchasers prices	7,854
USES	
Intermediate consumption (260 + 4500 + 3750)	8,510
plus household final consumption expenditure	235
plus gross fixed capital formation	0
plus change in inventories	-785
plus exports	1,800
Equals total uses	9,760
DISCREPANCY	
Total supply	7854
less total uses	9,760
Equals discrepancy	-1,906

Recorded uses are 1,906 higher than recorded supply. How to proceed?

On the uses side, the compiler believes that intermediate consumption, household expenditure and exports are reliable[44]. Changes in inventories were not reported by all enterprises so they are not reliable but she has no better information and therefore accepts the reported figure.

On the supply side, both reported domestic production and imports could be underestimated. There are known to be unreported imports of timber from neighbouring countries and domestic production is only reported for large enterprises although there are also informal enterprises producing sawn wood.

The compiler decides to remove the discrepancy by increasing total supply at purchasers' prices by 1906. As she does not know whether most of the discrepancy is attributed to domestic production or to imports she decides to adjust both by the same percentage.

She also decides to apply the same rates of transport costs and trade margins to the adjusted figures. This means that domestic production and imports will both need to be increased by $1+x$ calculated from the following equation:

$$(4{,}900 + 1{,}005) * (1 + x) * (1.10) *(1.20) = 9{,}760$$

(DP) + (IMP) (Transport cost) (Trade margin) = (Total Supply/Use)

The equation is solved with x = 0.243, so both domestic production and imports are increased by 24.3%

The corrected product balance is given in Figure 7.4.

Figure 7.4: Product balance for sawn timber original and adjusted

SUPPLY	*ORIGINAL*	*ADJUSTED*
Domestic production	4,900	6,089
plus imports	1,050	1,305
plus transport costs	595	739
plus trade margin	1,309	1,627
plus product taxes	0	0
Equals total supply at purchasers prices	7,854	9,760
USES		
Intermediate consumption (260 + 4500 + 3750)	8,510	8,510
plus household final consumption expenditure	235	235
plus gross fixed capital formation	0	0
plus change in inventories	-785	-785
plus exports	1,800	1,800
Equals total uses	9,670	9,760

Note that in this example the compiler has changed the import figures even though these may be regarded as "official" statistics. The fact is that in countries with open borders there is inevitably some cross-border trade which is not recorded by the customs authorities and in these countries both imports and exports may need to be adjusted to achieve product balances.

[44] This may not always be true. Quality of data on different components differs among countries. Therefore, national accountants have to assess which of the components' data is reliable and to what extent, in their countries.

Note too, that in this example, GDP (P) will need to be increased. The product balance has shown that there is more value added in timber production than had previously been estimated.

7.4. Conclusions

1. Here are some lessons we can draw from these three examples:

- When a product balance does not balance, identify those items which are thought to be firm estimates. Adjustments will have to be made to the other entries.
- If we know that an item is not zero it is always better to enter a number than to leave the cell empty. If no entry is made the compiler is implicitly estimating the item as zero. Entering a notional figure (transport costs of 10 in the poultry example) must be closer to the true figure than zero.
- Assessing the quality of available data is important. This can be done through various means such as discussion with experts in the industry or trade associations, using economic ratios, such as per capita consumption of tobacco, etc.
- Make use of information that comes from other countries. For example, you might be able to use information from a neighbouring country that has made a survey of transport costs or trade margins.
- Use your knowledge of your country. For example, if your country has extensive land borders it is certain that there will be some cross-border trade that is not recorded in the official trade statistics so for certain goods, imports or exports may need to be adjusted upwards.
- Statistics on domestic production will often only cover production by large enterprises, so you may need to make adjustments for production by informal producers.
- Making product balances balance may change GDP (E) or GDP (P). Neither of these GDP estimates should be regarded as sacrosanct. The revised estimate derived after constructing a product balance must be a better estimate of GDP than the unrevised figure. Therefore, it is possible to have revisions in GDP (P) following the compilation of SUT, though generally, the commodity flow methods are used to derive missing values or correcting values on the GDP (E) side.

References:

1. *Handbook of Input-output Table Compilation and Analysis, United Nation, New York 1996 (Studies in Methods Series F, No. 74)* Chapter VIII Commodity Flow Method and Table Balancing
2. *System of National Accounts, 2008, United Nations New York 2008,* Chapter 14. The Supply and Use Table and the Goods and Services Account
3. *Understanding National Accounts, François Lequiller and Derek Blades, OECD, Paris 2006* Chapter 12 National Income and Production Accounts of the USA.

Chapter 8. Balancing supply and uses

8.1. Introduction

If the supply and use tables were based on perfect knowledge, the two sides would automatically balance for each commodity. But of course in the real world both the supply and uses sides contain many estimates that had to be made to fill gaps. The data sources for almost all commodities are incomplete and the two sides will usually not be in balance. The SUT compiler's task is to bring the two sides into balance. There are two ways of doing this – manual balancing and automatic balancing.

8.2. Manual balancing

"*Manual balancing*" means that the SUT compiler inspects the supply and use of each commodity and adjusts one or more entries so that the two sides are equal. The balancing must be done at the most detailed level – that is for each of the commodities listed in the first column of the SUT. In manual balancing we use the identity *Supply* ≡ *Uses* and some components of a product's supplies or uses will either be derived as a residual or undergo adjustments.

Here is an example of manual balancing for the commodity *garments*. Here are the unbalanced statistics:

Figure 8.1: Example on garments – unbalanced statistics	
Domestic production at basic prices	48,920
Imports at c.i.f values	145,770
Transport costs	5,841
Trade margins	74,345
Product taxes	21,990
Subsidies	0
Total supply	**296,776**
Intermediate consumption	4800
Government final consumption expenditure	0
NPISH final consumption expenditure	0
Household final consumption expenditure	291,175
Gross fixed capital formation	0
Change in inventories	-75
Exports at f.o.b. values	46,980
Total uses	**342,880**

Total uses are more than 15% higher than total supply. If the difference had been only one or two percent we could have made an automatic adjustment using the RAS method explained later but as the difference is so large we need to look carefully at each estimate to see where the error may lie:

- Some figures are quite firm and we should not change them. The SUT compiler decides to treat the following as firm estimates: imports, exports, product taxes and subsidies, intermediate consumption reported by government and NPISH (4,800) and change in inventories. The zero for gross fixed capital formation is also a firm figure.
- Household final consumption expenditure is taken from a household expenditure survey. The problem with the survey is that coverage of low income households is weak. Richer

households tend to spend more on garments than poorer households, so the SUT compiler assumes that the household expenditure survey has overestimated expenditure on garments. After discussion with the survey specialists, the compiler decides that expenditure on garments may be overestimated by between 4% and 5%.

- Domestic production is taken from an establishment survey but the survey was made three years ago. In addition it only covered enterprises with five or more employees but a lot of garments are made by tailors working from their homes with help from family workers and these small enterprises were not covered in the survey.
- The compiler decides to reduce the household consumption estimate by 4% and to keep all the other uses the same. This gives a new estimate of total use of 331,233 – slightly lower than the unbalanced estimate of 342,880. This becomes the new control figure for total supply.
- Transport margins were originally estimated as 3% of domestic production plus imports at basic prices, and trade margins were estimated as 37% of supply at basic prices plus transport costs. Both these percentages are based on a recent trade and transport survey and are thought to be accurate. However the new domestic production that has been "discovered" is production by very small enterprises – usually just one person - and the garments they produce are sold directly to the purchaser so there are no trade margins or transport costs and no taxes on products. These three items- transport costs, trade margins and product taxes will not be changed.
- Domestic production now becomes the balancing item i.e.331,233 – 145,770 – 5,841 – 74,345 – 21,990 = 83,287 as explained in see Figure 8.2.

Figure 8.2: Example on garments – results of manual balancing

Supply/Use	Unbalanced estimates	Balanced estimates
Domestic production at basic prices	48,920	83,287
Imports at c.i.f. values	145,770	145,770
Transport costs	5,841	5,841
Trade margins	74,345	74,345
Product taxes	21,990	21,990
Subsidies	0	0
Total supply	**296,776**	**331,233**
Intermediate consumption	4800	4800
Government final consumption expenditure	0	0
NPISH final consumption expenditure	0	0
Household final consumption expenditure	291,175	279,528
Gross fixed capital formation	0	0
Change in inventories	-75	-75
Exports at f.o.b. values	46,980	46,980
Total uses	**342,880**	**331,233**

In the balanced supply and use estimates for garments, a small downward adjustment has been made to household consumption expenditure on the supply side and on the uses side a large upward revision has been made for domestic production. These revisions were based on the compiler's assessment of the reliability of the underlying data sources. The revision for domestic supply is large but there had to be a mistake somewhere and the compiler has used his knowledge of the data sources to make the best possible adjustment.

Note that both GDP(P) and GDP(E) will need to be revised: there is now more value added in garments manufacture and less household consumption expenditure on garments. The two new

revised estimates of GDP(P) and GDP(E) with respect to garments will now balance and, we hope, will be more accurate.

Here is another example – advertising services. Below are the unbalanced statistics:

Figure 8.3: Example of advertising services – unbalanced statistics	
Domestic production at basic prices	68,000
Imports at c.i.f. values	0
Transport costs	0
Trade margins	0
Product taxes	48
Subsidies	0
Total supply	**68,048**
Intermediate consumption	0
Government final consumption expenditure	0
NPISH final consumption expenditure	45
Household final consumption expenditure	0
Gross fixed capital formation	0
Change in inventories	0
Exports at f.o.b. values	0
Total uses	**45**

Most of the cells in the unbalanced table are zero. For services there are never any transport costs, trade margins, or changes in inventories and there is usually no gross fixed capital formation. In this case there were no imports or exports either. The only uses recorded were purchases of 45 by NPISH, but the three advertising agencies in the country reported sales of 68,000. How were the other 67,955 of advertising services used?

The SUT compiler decides that:

- Government does not usually purchase any advertising services so government intermediate consumption expenditure is assumed zero. This means that the rest of the advertising services must have been purchased by either enterprises as intermediate consumption or by households as final consumption expenditure.
- The only product taxes are value added taxes. These must have been paid by households because enterprises do not pay VAT on intermediate consumption and NPISH do not pay VAT either. VAT is charged at 10% so households must have purchased advertising services valued at 480 before tax and advertising services including VAT of 480 + 48 = 528
- The rest of the advertising services (67,475) must have been purchased by enterprises as intermediate consumption.

Here is the balanced table for advertising services:

Figure 8.4: Example on advertising – results of manual balancing		
Supply/Use	Unbalanced estimates	Balanced estimates
Domestic production at basic prices	68,000	68,000
Imports at c.i.f. values	0	0
Transport costs	0	0
Trade margins	0	0
Product taxes	48	48
Subsidies	0	0
Total supply	**68,048**	**68,048**
Intermediate consumption	0	67,475
Government final consumption expenditure	0	0
NPISH final consumption expenditure	45	45
Household final consumption expenditure	0	528
Gross fixed capital formation	0	0
Change in inventories	0	0
Exports at f.o.b. values	0	0
Total uses	**45**	**68,048**

In these examples we have been balancing the rows of the SUT, but once these have been balanced and the uses equal supply, the column totals will also need to be balanced. For example, when new figures are introduced into the column for household final consumption expenditure, the column will not equal the control total for HFCE. Similarly when new estimates are made for intermediate consumption in order to balance supply and use, the new totals for intermediate consumption by each kind of activity will not agree with the control totals. This means that the columns will now need to be corrected but this will, in turn, disturb the row totals. An iterative procedure is therefore required in which the rows and columns are adjusted one after the other until they agree with the correct marginal figures. This is a challenging and time-consuming exercise and when the largest differences have been eliminated, automatic balancing procedures are often used to eliminate any small discrepancies that remain.

8.3. Automatic balancing

The most widely used method of automatic balancing is called the RAS method. It is used to revise the internal entries in a matrix so that they agree with the margin totals. RAS is used when the margin totals – total supply/use of commodities, or total gross output by kind of activity, for example – are believed to be correct but the breakdown inside the matrix is not consistent with the margin totals. RAS is far more commonly used and is the method described in detail in the United Nations *Handbook of Input-output Table Compilation and Analysis.*

When a benchmark SUT is being compiled, manual balancing should be carried on until the remaining differences have been reduced to a minimum. A good rule of thumb is that the row and column totals should sum to within ±5% of the known correct marginal figures before resorting to automatic balancing. RAS and similar procedures will produce a balanced matrix even if the discrepancies are large but the resulting table may be very misleading. Automatic balancing methods cannot judge the reliability of the numbers they are adjusting. That is the job of the compiler.

The RAS method is often described in terms of matrix algebra and an algebraic description is given in the next chapter where we consider how to update an SUT. But when we are balancing a benchmark (first-time) SUT, the RAS method is best regarded as a purely mechanical

process. This process can be seen as an iterative one in which the rows and columns of the matrix are alternately forced to agree with the correct marginal totals. An example follows.

The figure below is a matrix of domestic production showing three commodities and three kinds of activity. The margin totals are assumed to be known accurately while the internal entries have been estimated from various less reliable sources and do not sum to the correct marginal totals. The task now is to revise the internal entries so that they agree with the correct margin totals.

Figure 8.5: Automatic balancing procedure

Automatic balancing - Basic data: correct margins but internal entries not consistent

	Agriculture	Industry	Services	Row total	**Correct total**
Crops	*20,0*	*30,0*	*15,0*	*65,0*	**70,0**
Manufactures	*10,0*	*60,0*	*20,0*	*90,0*	**80,0**
Services	*40,0*	*55,0*	*5,0*	*100,0*	**120,0**
Column total	*70,0*	*145,0*	*40,0*		
Correct total	**80,0**	**140,0**	**50,0**		

As noted, the RAS adjustment can be seen as an iterative process in which columns and rows (or rows and columns) are successively forced to sum to the correct marginal totals. In this example the internal entries rapidly converge to the correct row and column margin totals. After four iterations the sums of the three rows are within 0.2 of the correct row totals and by the fifth iteration the rows and columns sum to the correct margin total at one decimal place.

Figure (a): **First iteration** - Recalculate the rows

	Agriculture	Industry	Services	Row total	**Correct total**
Crops	*21,5*	*32,3*	*16,2*	*70,0*	**70,0**
Manufactures	*8,9*	*53,3*	*17,8*	*80,0*	**80,0**
Services	*48,0*	*66,0*	*6,0*	*120,0*	**120,0**
Column total	*78,4*	*151,6*	*39,9*		
Correct total	**80,0**	**140,0**	**50,0**		

In this first iteration, each row is forced to agree with its correct row total. To achieve this, each row entry was multiplied by the ratio of the correct row total to the actual row total. The first row (Crops) was multiplied by 70/65, the second row (Manufactures) was multiplied by 80/90 and the third row (Services) by 120/100. The rows in Figure (a)now sum to the correct totals, but the column totals are still wrong.

Figure (b):**Second iteration** - Recalculate the columns

	Agriculture	Industry	Services	Row total	**Correct total**
Crops	*22,0*	*29,8*	*20,2*	*72,0*	**70,0**
Manufactures	*9,1*	*49,2*	*22,3*	*80,6*	**80,0**
Services	*49,0*	*60,9*	*7,5*	*117,4*	**120,0**
Column total	*80,0*	*140,0*	*50,0*		
Correct total	**80,0**	**140,0**	**50,0**		

In the second iteration, the new column totals obtained in Figure (a) are forced to agree with the correct column totals. Each entry in the column for agriculture is multiplied by 80/78.4, entries in the column for industry by 140/151.6, and entries in the column for services by 50/39.9. The column totals in Figure (b) are now correct but the row totals are wrong again.

Figure (c): **Third iteration**: Recalculate the rows

	Agriculture	Industry	Services	Row total	**Correct total**
Crops	*21,4*	*29,0*	*19,7*	*70,0*	**70,0**
Manufactures	*9,0*	*48,9*	*22,1*	*80,0*	**80,0**
Services	*50,0*	*62,3*	*7,7*	*120,0*	**120,0**
Column total	*80,4*	*140,2*	*49,4*		
Correct total	**80,0**	**140,0**	**50,0**		

In the third iteration the new row totals that were obtained in Figure (b) are forced to agree with the correct row totals: crops, manufactures and services are multiplied by 70/72.0, 80/80.6, and 120/117.4 respectively

Figure (d): Fourth iteration: Recalculate the columns

	Agriculture	Industry	Services	Row total	**Correct total**
Crops	*21,2*	*29,0*	*19,9*	*70,1*	**70,0**
Manufactures	*9,0*	*48,8*	*22,4*	*80,1*	**80,0**
Services	*49,8*	*62,2*	*7,8*	*119,8*	**120,0**
Column total	*80,0*	*140,0*	*50,0*		
Correct total	**80,0**	**140,0**	**50,0**		

In the fourth iteration the new columns totals that were obtained in Figure (c) are forced to agree with the correct totals. The entries for Agriculture, Industry, and Services are multiplied by 80/80.4,140/140.2 and 50/49.4 respectively.

Figure (e): Fifth Iteration: Recalculate the rows

	Agriculture	Industry	Services	Row total	**Correct total**
Crops	21.2	29.0	19.9	70.0	**70.0**
Manufactures	9.0	48.7	22.3	80.0	**80.0**
Services	49.9	62.3	7.8	120.0	**120.0**
Column total	80.0	140.0	50.0		
Correct Total	**80.0**	**140.0**	**50.0**		

In the fifth iteration the new rows that were obtained in Table are forced to agree with the correct totals. The entries for crops, manufactures, and services are multiplied by 70/70.1, 80/80.1 and 120/119.8 respectively. It can be seen that by the fifth iteration, RAS has forced the originally incorrect internal cells to sum to the correct marginal totals. No further iterations are required

RAS can be used in either a complete or **modified form**. In the complete form all the internal entries in the matrix will be revised. In the modified RAS any cells or vectors which are believed to be accurate are removed from the matrix and new margins are calculated without these correct figures. The RAS is then performed as described above and when enough iterations have been made the vectors or cells that were thought to be accurate are reinserted. It is always best to use RAS in the modified form because this makes use of the compiler's assessment of the reliability of the basic statistics. If compilers are confident in a particular cell or vector they should prevent RAS from changing it.

In this example, RAS was used to enforce consistency between the margins and the internal entries of a bench-mark SUT but RAS can also be used to update a benchmark SUT when the next year's margin totals become available. The use of RAS for updating an SUT is discussed in the next chapter.

One final point: there is no need to go through the iteration procedure described above if the statistical software available for compilers incorporates RAS. Most of them do.

With regard to balancing, if some countries desire to show statistical discrepancy in the SUT, it is possible to present the same in a separate column in expenditure/supply side, depending upon which side of GDP estimates, the statistical discrepancy is shown.

While balancing between supplies and uses is necessary also for SUT at constant prices, it is preferable to initially balance the two tables at current prices, and then apply price deflators to compile SUT at constant prices.

References:

1. *Handbook of Input-output Table Compilation and Analysis, United Nation, New York 1996 (Studies in Methods Series F, No. 74)* Chapter IX. Updating input-output tables: RAS methods.

Chapter 9. Updating Supply and Use Tables

9.1. Introduction

This Chapter explains how a benchmark SUT can be updated using a reduced data set. This involves using both manual and automatic balancing procedures. The chapter first identifies those parts of the SUT that will need to be manually updated and offers some suggestions as to how this might be done. Manual updating should always be taken as far as possible because an automatic procedure can never produce a better estimate than one based on the compilers knowledge of the economy.

When RAS is used to update a benchmark estimate it is no longer a purely mechanical process of forcing the internal cells to agree with the marginal totals. This Chapter explains how RAS can be given an "economic" interpretation when it is used for updating an existing SUT.

9.2. How good is an updated supply and use table?

The generally accepted rule is that a benchmark SUT can be updated 4 times before a new benchmark SUT needs to be calculated. This implies a five-yearly cycle of the large scale economic surveys that provide the basic data for the bench-mark SUT. Of course, if there are major changes in the economy- development of new mineral reserves or sharp movements in relative prices, for example - even the five-year rule is no longer valid. In practice of course many African countries hold major economic surveys at much less frequently – every ten years or more. In this situation any SUT that is updated using the methods described here can no longer be considered reliable five years or more after the benchmark.

Within the five-year period however, the updated SUTs can be used to generate the basic GDP estimates – GDP(P) and GDP(E) – and these will usually be more reliable than GDP estimates that are calculated without the benefit of an SUT.

9.3. General approach

Bench-mark SUTs are usually compiled on the occasion of a large scale industry survey or economic census. The benchmark SUT is then updated to the current year by a combination of manual and automatic (RAS) updating to produce an annual time series between benchmarks. The basic idea is that the marginal totals are updated using the latest information available and the internal cells of the SUT are then forced to agree with the new marginal rows and columns by a mathematical procedure such as RAS.[45]

[45]RAS is not the only method available for forcing the internal cells of a matrix to agree with the total row and total column. However, other methods have not been shown to be superior to RAS and RAS is included in most statistical software. See *Chapter IX Updating Input-Output Tables: RAS Methods* in "Handbook of Input-Output Table Compilation and Analysis," (United Nations New York, 1999) for a discussion of other methods.

Although part of the work is left to RAS, a substantial amount of "manual" updating is required. By manual updating we mean using whatever information is available from the national accounts and other sources to fill the marginal totals and other key parts of the SUT. The shaded areas of the supply and use tables in Figure 9.1 and Figure 9.2 are those parts that will need to be manually updated before applying RAS to automatically update the non-shaded parts of the SUT, especially the inter-industry consumption matrix on the use side and the domestic production matrix on the supply side. If a country desires to show statistical discrepancy in SUT, it can show the same in a separate column in expenditure/supply side, just as being done in the case of c.i.f.-f.o.b. adjustment, depending upon where the SD is shown in national accounts, although SNA generally recommends avoiding statistical discrepancy. Also, it is easier to update SUTs in nominal prices, SUTs can also be updated at constant prices.

9.4. Supply table

The first marginal total that must be updated manually is the column showing the total supply of goods and services at purchasers' prices according to type of commodity. In this example we assume that it has been decided to estimate this column in the Supply Table rather than in the Uses Table. In most countries GDP is more accurately estimated from the production side rather than from the expenditure side so this will usually be the preferred option. The SUT compiler will need to manually update all the columns in the Supply Table that are needed to obtain the total supply of goods and services at purchasers' prices. These are the shaded columns in Figure 9.1.

Here are some suggestions on how these shaded columns can be manually updated.

- It will usually be impossible to update the benchmark breakdown of domestic production in the full commodity breakdown used in the benchmark SUT. It may often be necessary to make several approximations such as using changes in gross value of output (GVO) or gross value added (GVA) if GVO data is not available, by kind of activity to update benchmark estimates of gross output by commodity or to update groups of commodities by a single value of GVO or GVA figure. As an example, gross output of manufactured commodities may have to be updated by changes in GVO or GVA for just a few broad groups of manufacturing industries, and all products of agriculture may have to be updates by a single figure for GVO or GVA in total agriculture.

- Data on imports of merchandise will usually be available in full commodity detail. In the BoP statistics, imports and exports of goods are generally shown in a single row, but data on trade in services is presented according to 12 standard components of services, namely, (a) manufacturing services on physical inputs owned by others; (b) maintenance and repair services n.i.e.; (c) transport; (d). travel; (e) construction; (f) insurance and pension services; (g) financial services; (h) charges for the use of intellectual property n.i.e.; (i) telecommunications, computer and information services; (j). other business services; (k) personal, cultural and recreational services; and (l) government goods and services n.i.e. Sometimes, it is possible that no up to date estimate is available for imports of services or there may only be an estimate of total service imports. International freight and insurance on merchandise imports are usually the most important service imports and they can be updated using the change in the value of merchandise imports. Other services could be updated by the latest growth trends and using total service imports, if available, as the control total:

- Trade and transport margins tend to be stable from year to year so the benchmark percentages can be applied to the new estimates of domestic production and imports at basic prices.

- Taxes and subsidies on products may not be available in commodity detail but provided figures are available for total product taxes and product subsidies the benchmark breakdown by commodity can be used to distribute the total figures. Of course, if rates of taxes or subsidies have changed since the benchmark year, the new rates will have to be used and not those from the benchmark table.

Figure 9.1. Supply quadrant of the SUT

Commodities ⋮	**Supply at basic prices**					*plus* **adjustments to move from basic to purchasers' prices**			*equals* **total supply at purchasers' prices**
	Domestic production by kind of activity				Imports: goods & services	Transport costs separately invoiced to the purchaser	Wholesale and retail margins	Taxes on products *minus* subsidies on products	
	1	2	..	Total					
Goods	..								
1									
2									
..									
Services									
1									
2									
..									

Note: Shaded areas are the rows and columns that need to be manually updated.

9.5. Use table

The manually-updated estimates of total supply by commodity at purchasers' prices then become the marginal control column of total uses for updating the Uses Table. The shaded parts of the Uses Table in Figure 2 are the rows and columns that will need to be manually updated before using RAS to automatically update the non-shaded parts of the table.

Some points to notice:

- ***Updating the cell values in the intermediate consumption matrix (quadrant 1)***
  - Step 1: The column of total intermediate consumption (i.e. the total for all kinds of activities) can be obtained by deducting total final uses from total supply/use.

- Step 2: Total intermediate consumption for each of the industries (columns) is also available from the source data that is used to compile preliminary GDP estimates (shaded row of total in figure 9.2).
    - Thus, we have control figures of row totals and column totals of intermediate consumption, and we need to fill up the cells in between that represent the intermediate consumption of commodities by industry.
- Step 3: The cells can be filled up by updating the intermediate consumption matrix cell values of the benchmark SUT with the corresponding price indices to bring them to the current year prices. This step may be necessary when prices of different commodities rise differently.
- Step 4: The cell values obtained in Step 3 can be updated using RAS so that the row totals and column totals agree with the control totals, obtained in Step 1 and Step 2.

- ***Updating the cell values in the final use columns (quadrant 2)***
    - The final consumption expenditure of households, NPISH, and government by commodity can be updated automatically by RAS because experience shows that in most cases the commodity composition of these final expenditures changes only gradually over time.
        - However if some commodity detail is available this should be used to update these vectors. For example, there may be information in the regular national accounts on household final consumption expenditure by broad groups of commodities – *food and beverages, footwear and clothing, etc.* If so, it will always be better to update all the detailed items under food and beverages, footwear and clothing, etc. by the changes in the group totals rather than leaving it to RAS.
        - Government final consumption expenditure data may also be available by COFOG classification
        - Price updation of benchmark cell values may be necessary before using the RAS, especially when price rise is different in different products between the benchmark year and the current year.

- The commodity breakdown of merchandise exports may be available and if so this part of the export vector can be manually updated and exports of services can be updated by RAS, if product break up is not available in the BoP statistics. However, if BoP statistics are compiled following BPM6, data on trade in services should be available according to 12 standard components of services, as mentioned above under imports in the supply table).

- The commodity breakdown of gross fixed capital formation and of changes in inventories can also be done automatically by RAS but this is not advisable because there can be sharp changes from year to year in the commodity composition of both these vectors. The SUT compilers should, therefore, update these two vectors manually and that is why these two columns are shaded in Figure 9.2.

    - Usually, GFCF data is compiled in the preliminary national accounts, separately for few assets or atleast with the break up of construction and machinery & equipment.

    - Changes in inventories are a troublesome item for many countries. While it is not generally possible to measure changes in all inventories, there will usually be some information on inventories held by, for example, electricity generating plants, petroleum producers and importers, large retailers, and stocks of food and strategic materials held by government. In any event, updating this vector cannot be left to RAS because changes

in inventories can have different signs (+ or -) from year to year and so it must be manually updated.

Figure 9.2: Use Table of the SUT

	Intermediate consumption by kind of activity				Final consumption			Capital formation		
	1	2	…	Total	Government	households	NPISH	Gross fixed capital formation	Change in inventories	Exports
Goods 1 2 … Services 1 2 …										
Total										

Note: Shaded areas are the rows and columns that need to be manually updated.

9.6. Manually updating other parts of the SUT

In addition to the shaded portions of the Supply and Uses Tables it may be possible to manually update individual cells. RAS updating will never be better than manual updating based on knowledge of what has actually happened in the real world. For example, you may have information on sales of electricity to households or to enterprises in particular kinds of activity. If so, the relevant cells in the intermediate consumption matrix and the vector for household consumption can then be manually updated.

Manual updating is also essential if there have been significant changes in the composition of domestic production. If new enterprises have been established such as new clothing or footwear factories, a vehicle-assembly plant, call centres or a new generating plant the compiler will have to insert the new industries into the domestic production matrix and estimate the cells for output and intermediate consumption.

Any cells that have been manually updated will be removed from the matrix that is to be updated by RAS and new column totals are calculated. RAS is then used to update the remaining cells and the manually updated cells are reinserted. This procedure is usually referred to as **"modified RAS".**

9.7. Economic interpretation of RAS

In the previous chapter the RAS method was explained as an iterative process of successively forcing rows and columns to agree with known marginal totals. Looking at RAS as a purely mechanical procedure is appropriate when it is used for a benchmark first-time estimate but when RAS is used to update an existing SUT (or input-output table) it is possible to put an economic interpretation on the RAS procedure.

In general, the RAS method aims at finding a set of multipliers to adjust the columns and the rows so that the sum of the cells of the adjusted matrix will be equal to the required rows and columns. We can recall that the modification of coefficients may be due to the changes in technology or in relative prices. The underlining assumption of the RAS method is the following: between two consecutive years, the technology does not change a lot; therefore, the modification of coefficients will not be substantial.

$$A\,(1) = \begin{pmatrix} r_1 & 0 \\ 0 & r_2 \end{pmatrix} \times A\,(0) \times \begin{pmatrix} s_1 & 0 \\ 0 & s_2 \end{pmatrix}$$

$$A\,(1) = \begin{pmatrix} r_1 & 0 \\ 0 & r_2 \end{pmatrix} \times \begin{pmatrix} a_{11} a_{12} \\ a_{21} a_{22} \end{pmatrix} \times \begin{pmatrix} s_1 & 0 \\ 0 & s_2 \end{pmatrix}$$

$$A\,(1) = \begin{pmatrix} r_1 a_{11} s_1 r_1 a_{12} s_1 \\ r_2 a_{21} s_2 r_2 a_{22} s_2 \end{pmatrix}$$

Where A (0) is the matrix of the benchmark year.

United Nations (1999) explains these effects as follow: *(i)* the matrix *r* represents the effect of substitution and measures the extent to which product *i* has been replaced by, or used as a substitute for, other products in industrial production; and *(ii)* the matrix *s* represents the effect of fabrication and measures the extent to which industry j has come to absorb a greater or smaller ratio of intermediate to total inputs in its production. The objective of the RAS method is to find the "best" set of multipliers.

9.8. RAS updating

RAS is applied to the supply and use tables separately. Even though each table is updated separately, the updated supply and use tables will be consistent with each other because the same marginal column has been used for the total supply/use of goods and services at purchasers' prices.

As already explained the modified version of RAS is used to the maximum extent possible because RAS can never generate an estimate that is better than one based on the compiler's knowledge of the economy. With modified RAS any internal cells or vectors that have been manually updated are removed, the marginal rows and columns are recalculated, RAS then forces the remaining internal cells to be consistent with these reduced marginal rows and columns, and the cells and vectors that were manually updated are put back into the SUT. The SUT has been updated.

But caution! Although the updated RAS is now mathematically correct, it still needs to be reviewed critically by the SUT compiler. One useful check is to calculate GVA by kind of activity by deducting intermediate consumption in the uses table from gross output in the supply table. Are these GVA estimates consistent with the industry breakdown of GVA in the national accounts? Large differences should be investigated and, if necessary, corrections should be made and the SUT will have to be rebalanced by RAS. The vectors for government

and household consumption expenditure should also be subjected to credibility checks. Such checks may again lead to manual revisions requiring a further round of RAS balancing.

The difference between updating SUT with RAS and balancing SUT with RAS is at the initial point: the matrix which is used for the calculation. The iterations can be operated as presented in the Box earlier. On one side, when the compiler is balancing a SUT, it means that s/he has been able to compile data in a matrix format but that s/he is only sure of the quality and consistency of total of rows and columns. On the other side, when the compiler is updating a SUT, it means that s/he is compiling for the year $n+x$ (the benchmark year is n) and s/he has been able to compile total of rows and columns (including production row). In that case, the initial matrix will be equal to the multiplication of input-output coefficients matrix of the benchmark year by the production row of the year $n+x$.

9.9. Alternative methods for balancing supply and uses tables

The RAS method, which is commonly used, can only balance tables with equal row and column sums. In cases where the row and column sums are not balanced, they become endogenous variables and the RAS is no longer applicable. Various methods have been developed by different authors in order to overcome the problems. Below we provide a general overview of the methods for matrix balancing before giving a few examples of methods used specifically for balancing supply and uses tables.

9.9.1. General overview of methods for balancing matrices

The RAS method is just one among numerous methods for balancing matrices. These methods are generally classified into two categories: the entropy methods and the quadratic adjustment methods.

The entropy methods: In these approaches a measurement of entropy is used for producing the minimally biased estimate of an array under given marginal conditions. These models can be further subdivided into those that maximize an entropy criterion and those that minimize a divergence in information criterion. The second method is more relevant to balancing supply and uses tables as it starts from a known matrices that is not balanced and tries to create a balance matrix as close as possible to the initial matrix. The RAS method is part of these methods also known as bi-proportional methods.

The quadratic adjustment methods: The basic problem is the same as for the entropy methods above, but, in this case, a quadratic distance function is used to measure how close the estimated array is from the initial array. A major weakness of the quadratic adjustment methods is that they do not guarantee that all elements of the estimated array will be positive numbers even when the initial matrix has only positive values.

9.9.2. Examples

The Stone-Byron method: The Stone algorithm (Stone et *al*., 1942) is a method of automatic balancing that can be used for balancing national accounts even in the case where the row and column totals are not balanced and should therefore be endogenous variables. It uses measures of reliability to determine the flows that should be adjusted. Taking into account the errors in measurements, the Stone algorithm make bigger adjustments to the flows with largest errors. The stone algorithm is based on the least square principle. It has the advantage of being relatively flexible, allowing some constraints to be set exactly while others are allowed to be

subject to errors. Its main disadvantage is that is that it does not guarantee preservation of sign of the variables. The method of calculation proposed initially by Stone et al required heavy calculations, even though, in 1978, Byron proposed a conjugate gradient algorithm that is computationally efficient.

The Nicolardi method: Nicolardi (1998, 2000) has developed a method close to the Stone-Byron method but which requires less computational resources. The idea is to decompose the accounting matrix into blocks so as to reduce the memory requirements for the calculations.

The Dalgaard and Gysting algorithm: Dalgaard and Gysting (2002) have proposed an algorithm that can be used to balance automatically a commodity-flow system where the rows and columns are not balanced in advance. The algorithm, which is very similar to the RAS method, balances the differences between rows totals and columns totals (between the output and expenditure approaches of GDP) by changing intermediate consumption while keeping gross output constant at the initially estimated values. The internal balancing of rows and columns uses the same principle as the RAS method.

Other methods: Numerous authors have developed methods for solving the problem of balancing a matrix under limited information. These includes Chen (2006), De Mesnard (1990), Grad (1971), Gilchrist & St. Louis (1999), Israilevich (1986), Osborne (1960), Schneider (1989, 1990), Uribe et al. (1965) and Vermot-Desroches (1986) for example. The software ERETES, which is used in some countries also facilitates in updating SUTs automatically.

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Chapter 10. Software used for compiling supply and use tables

10.1. ERETES

ERETES[46] is a computer system designed to help national accountants to compile the Integrated Economic Accounts (IEA) and SUTs consistent with the UN System of National Accounts (SNA). It is currently used by 19 countries in Africa and 7 countries in Latin America and the Caribbean. Algeria and Mauritius are expected to adopt ERETES in the near future. Figure 10.1 list the countries now using ERETES or expected to do so in the near future.

Figure 10.1: Twenty-one countries in Africa using ERETES or expected to do so in the near future

Algeria	*Comoros*	Mali
Benin	Congo	Mauritania
Burkina Faso	Cote d'Ivoire	*Mauritius*
Burundi	Democratic Republic of the Congo	Morocco
Cameroon	Equatorial Guinea	Niger
Central African Republic	Gabon	Sao Tome and Principe
Chad		Togo
		Tunisia

Note: Countries in *italic*s are expecting to use ERETES in the near future

Although the objective of ERETES is to generate SUTs and the IEA, ERETES can also be used by countries which have limited data resources. The minimum data requirements to use ERETES are an enterprise and a household budget survey, foreign trade statistics, government accounts, balance of payments and banking statistics: with these data ERETES will help countries to generate current price estimates of GDP. If price or volume indices are available, constant price estimates of GDP can also be obtained. Information on intermediate consumption and on trade and transport margins is required to produce SUTs. A module designed to estimate informal sector value added requires additional data on the total labour force by kind of activity. Thus the fact that a country reported using ERETES does not necessarily mean that it is using ERETES to estimate both SUTs and IEA: some may be using it to estimate GDP without going any further. In practice, however, almost all the African countries that have adopted ERETES use it to generate both SUTs and the IEA. It should be noted that many countries using ERETES also use short-cut, rapid, estimation procedures to estimate GDP for the most recent period before the more reliable ERETES-based estimates are available.

There are other computer systems for national accounts apart from ERETES[47]. All make use of the accounting identities of the SNA to confront and adjust data coming from different

[46] ERETES is the French acronym for ***E**quilibre **R**essources-**E**mploiset **T**ableau **E**ntrées-**S**orties* (Supply-Use Balances and Input-Output Tables). Spanish and English versions of the ERETES system are available but there are no Spanish or English versions of the acronym and "ERETES" is used in all languages. ERETES is jointly owned by EUROSTAT and the French Foreign Ministry (Ministère français des Affaires Etrangères). See http://www.eretes.net/FR/index.htm for further information.

[47]Malawi currently uses software for its SUTs developed by Statistics Norway. Dr Jan van Tongeren, formerly with the UN Statistical Division and now at Tilburg University Netherlands, has developed a computer system that has been used to estimate SUTs in Central America. See "From national accounting to the design, compilation, and use of bayesian policy and analysis frameworks", Van Tongeren, J.W., Tilburg University 2011.

sources. Data confrontation and adjustment are that has been essential parts of the compilation of national accounts: traditionally this was done manually but it is both quicker and more accurate to do these tasks using specially designed computer software. The main advantage of ERETES compared with other computer systems is that ERETES is supported by a permanent secretariat which can call on a group of multilingual national accountants and IT experts who have gained experience of applying the system for more than a decade in nearly thirty developing countries. ERETES is also regularly updated and improved: for example a new module is being finalized to allow ERETES to provide retrospective estimates and the latest versions of ERETES are consistent with the 2008 SNA. (Most of the ERETES versions currently used in Africa are consistent with the 1993 SNA.

The fact that a country reports that it is using ERETES – or some other computer system – does not guarantee that its national accounts are comprehensive and reliable: that depends as always on the reliability and range of source data available. But the use of a computer system such as ERETES ensures that whatever data are available are being exploited in the most efficient way possible.

Installing ERETES involves a substantial investment by countries. Data preparation before ERETES can be applied may take up to two years – only three months in some countries depending on the country – as the available source data must be entered in the ERETES worksheets in a very precise and careful manner since mistakes made at this stage will falsify the results. Skilled national accounts staff will need to be taken off their regular duties for extended periods during this preparatory phase. Hitherto, no country has installed ERETES without training and technical assistance from the ERETES team. Depending on the skill levels of the recipient statistical office between seven and fifteen missions may be required with the ERETES experts staying for one or two weeks each time.

Once a country has agreed to install ERETES, the software itself is supplied free of charge. The main cost to countries is the travel, per diem, and accommodation of ERETES staff on mission. Until recently these costs were often met by the European Commission but this source of funding is no longer available.

The ERETES web page http://www.eretes.net/FR/index.htm is multilingual – French, English, Spanish, and Portuguese. It provides practical information on ERETES, and how countries can initiate an ERETES programme.

Box 10.1: Computer tools or IT used to compile national accounts in Africa (by INSEE)

Introduction

At the end of the "International Conference on Global Implementation and Outreach for the System of National Accounts and Coordination in National Accounts for Sustainable Development and Growth", which was held from 6 to 8 May 2008 in Luxembourg, the main international organizations recommended application of common software tools to compile national accounts.

The use of such a tool provides several advantages to users and decision makers. It can in fact be used as a base for exchange of good practices between national accountants and become a body of dissemination of international standards within regional statistical capacity building programs. The tool should conceptually allow to national accountants to:

- store the detailed data of sectors, industries and products in their original format (data sources);
- ensure the compliance of data with the concepts of National Accounts (SNA) and record any changes in order to have a complete history between the initial data to those compatible with the national accounts concepts;
- calculate aggregates of national accounts so as to obtain the total economy by aggregating the detailed data of sectors and resident industries;
- control the data within and between the two main tables of national accounts (SUT and IEA) to get discrepancy at the level of different accounting equations;
- provide tools for ensuring the uniqueness of the data so that any changes are immediately updated in all tables that use the modified data;
- have useful working tables that allow for each product to compare supply with uses;
- store the final estimates and published indicators for a systematic analysis of the reliability of the published data.

Several software tools are used in Africa to compile national accounts, including: ERETES, IAS and SNAPC.

ERETES, the most used tool in Africa

ERETES is conceptually a help tool in the compilation of national accounts which was set up jointly by the French Ministry of Foreign Affairs, the CREPFI, INSEE (National Institute of Statistics and Economic Studies and Eurostat. Since 1997, its first version has been used by Cameroon and the Central African Republic, ERETES has continued to evolve. The first version had only a module to compile SUT from which it takes its name (ERE-TES means supply and use balance – input-output table), the fourth and current version is more ergonomic and helps to compile IEA while maintaining consistency between the two tables. The tool provides to national accountants a database with all available information, and a series of working tables allowing easy access to this information. National accountants can complement them, compare and do adjustments if necessary.

ERETES is in compliance with international standards of system of national accounts 1993 and 2008 (SNA). It has several working tables that facilitate the work of the compiler. These are is particularly suitable for the estimation of the informal sector. The high number of users of the tool forced its regular update. However, to quickly take advantage of the full potential of the tool, the first implantation of it in a new accountants team requires support by an experienced user.

Other tools

There are other tools to support the compilation of national accounts, however, only a small number of countries are using them in Africa.

1. NADABAS . NADABAS combines Microsoft Excel with a database, which can be Microsoft Access or SQL. Calculations are done in Excel worksheets, while results, be it organised source data or national accounts variables, are uploaded to a database; they are then downloaded to other Excel files. The development of NADABAS started in 2004, in a Scandinavian cooperation project in Mozambique. The system is now used in Kenya, Lesotho and Swaziland and will be introduced in other countries in Southern and Eastern Africa. A supply and use table (SUTs) has been compiled in Kenya using NADABAS.

2. SNA-NT. Malawi has used a software SNA-NT developed by Statistics Norway for compiling SUTs in current and previous year prices according to SNA 2008 for the years 2002-2010. The SUTS for the year 2010 is a reliable base year, and from 2010 Excel spreadsheets are used for annual updating.

3. Excel, even if it is not an expert system, but a general system. Excel spreadsheets are used by those who do not use the tools mentioned above to compile national accounts. ERETES, or NADABAS have the links with Excel to allow users to perform work not initially covered. Excel is appreciated for its flexibility and ease of use, but the risk of loss of information is very high. It is also not appropriate for teamwork as it requires computer skills for the user to understand the procedures it performs.

10.2. Simplified system using MS Excel

Some countries may prefer to build their own system using MS Excel rather than to rely on a purpose built system such as ERETES. This is a possible and acceptable way to proceed, especially if you have a certain number of Excel skills and a systematic approach. One such system, suitable for a national accounts team doing SUTs for the first time, is described briefly in the Box 10.2. It is specifically designed so that all adjustments (especially to the expenditure components of GDP) are explicit and transparent. Other formulations are possible.

Advantages

Excel is readily available; fully transparent; easy to insert data; highly flexible; by copying and pasting links, links to the data source can be maintained to facilitate updates.

Disadvantages

Lacks security (formulas may get corrupted). While many data compilers may be given copies of sheets to complete, balancing can only be done centrally. Only does one year. It also lacks full detail of quantities, prices (where applicable) and functionality for "arbitrage" (IC matrix balancing).

Box 10.2: A spreadsheet system (by Tim Jones, Consultant)

The system has two main files. The first (called SUT) is for commodity flow accounts with the output and intermediate consumption both in single columns. The second (called PA) for the production accounts with an intermediate consumption matrix is not described here. To establish a benchmark level of GDP, the second is not essential, but best practice would be to complete both, as doing the second part may lead to changes in the first. The main SUT workbook has ten worksheets: a summary "balance" (BAL) sheet, eight "flow" sheets and one "labels" sheet, all with the products in rows.

Figure 10.2 shows the top part of a partially balanced "balance" spreadsheet. It shows the total and subtotal rows at the top and the first few detailed items below. For aggregation purposes, extensive and systematic use is made of the SUMIF function and product coding structure to provide subtotals at higher levels of aggregation. All the formulas are essentially the same.

Eight of the columns correspond to the eight summary "flows", four for supply and four for demand (use). The total supply and total demand columns are just sums of the flow columns, and the "diff" column is the difference between them. No data is entered into this sheet.

Figure 10.3 shows a portion of one of the flow sheets, for total output (TO). The total output column in the BAL sheet is linked to the first (total) column in this sheet. The total column is the sum of the total data entered plus any adjustments inserted by the person balancing the table. The other columns correspond to

the different data sources. This part of the table has not been balanced, but some adjustments have been made, for example to allocate production between products with the same industry code.

Figure 10.2: A partially balanced SUT

BALANCE OF SUPPLY AND DEMAND

Agg	CPA code	Imports	Total output	Margins	Taxes	TOTAL SUPPLY	Diff	TOTAL DEMAND	Intermed demand	Other fnl demand	Fnl HH demand	Exports	Labels
	Tot	1,181,179	4,264,413	260,075	346,955	6,052,621	254,049	6,306,670	1,490,114	1,389,499	2,884,073	542,983	Total Rwanda
Tot	A1	50,300	1,048,317	37,346	230	1,136,193	-283,561	852,632	187,517	0	654,163	10,952	Food crops
Tot	A2	3,669	34,313	1,822	463	40,266	12,196	52,462	0	0	6,919	45,544	Export crops
Tot	A3	3,572	11,651	214	6	15,444	33,700	49,143	0	0	29,713	19,430	Livestock & livestock products
Tot	A4	802	150,095	135	76	151,108	31,022	182,130	0	0	181,723	407	Forestry
Tot	A5	495	481	30	10	1,015	20,020	21,035	0	0	19,823	1,212	Fishing
Tot	B0	12,525	82,988	23,545	990	120,048	-20,461	99,588	0	0	0	99,588	Mining & quarrying
Tot	C1	111,766	233,475	16,177	22,056	383,474	12,324	395,798	21,713	0	322,442	51,643	Manufacturing of food
Tot	C2	15,150	262,165	15,055	65,537	357,908	911	358,819	48,468	0	306,135	4,215	Manufacturing of beverages & tobacco
Tot	C3	42,244	47,236	78,029	11,686	179,196	0	179,196	18,800	0	154,250	6,146	Manufacturing of textiles, clothing & leather goods
Tot	C4	26,059	27,651	5,698	6,427	65,835	0	65,835	38,309	0	26,843	684	Manufacturing of wood & paper; printing
Tot	C5	322,807	40,842	63,675	71,788	499,111	0	499,111	371,403	0	112,712	14,996	Manufacturing of chemicals, rubber & plastic products
Tot	C6	60,464	25,958	24,093	11,468	121,982	0	121,982	118,309	0	207	3,466	Manufacturing of non-metallic mineral products
Tot	C7	334,731	30,646	120,299	60,753	546,430	377	546,807	254,686	175,902	102,413	13,806	Manufacturing of metal products, machinery & equipment
Tot	C8	27,665	19,932	6,568	3,887	58,053	94	58,147	3,060	19,895	33,561	1,631	Furniture & other manufacturing
Tot	D0	0	40,135	0	8,265	48,400	0	48,400	37,723	0	10,677	0	Electricity
Tot	E0	0	21,481	0	109	21,590	0	21,590	4,600	0	16,990	0	Water & waste management
Tot	F0	2,456	387,048	0	18,876	408,381	450,667	859,048	20,000	724,370	114,678	0	Construction
Tot	G1	0	20,349	0	2,963	23,313	-13,132	10,181	0	0	10,181	0	Maintenance and repair of motor vehicles
Tot	G2	0	133,895	-133,895	0	0	2,874	2,874	0	0	0	2,874	Wholesale & retail trade
Tot	H1	-8,239	77,308	0	1,976	71,045	0	71,045	7,142	0	61,349	2,554	Land transport
Tot	H2	31,776	21,618	0	40	53,434	0	53,434	17,614	0	8,435	27,385	Air transport
Tot	H3	318	31,703	0	1,962	33,983	0	33,983	30,444	0	3,046	493	Other transport & postal services
Tot	I0	0	242,134	0	9,151	251,285	0	251,285	4,244	0	247,041	0	Hotels & restaurants
Tot	J1	8,978	8,617	1,284	1,302	20,181	0	20,181	9,643	0	10,531	7	Publishing & broadcasting activities
Tot	J2	21,054	116,785	0	27,329	165,168	0	165,168	87,136	0	57,812	20,220	Telecommunication
Tot	J3	0	23,083	0	2,219	25,302	0	25,302	5,060	19,505	736	0	Information technology services
Tot	K0	4,312	158,926	0	9,279	172,517	0	172,517	102,534	10,537	58,383	1,063	Financial services
Tot	L0	0	258,372	0	553	258,925	0	258,925	8,240	0	250,685	0	Real estate activities
Tot	M0	1,559	33,051	0	2,536	37,146	6,693	43,838	19,435	246	6,123	18,035	Professional, scientific and technical activities
Tot	N0	0	24,083	0	2,717	26,800	-140	26,660	17,892	0	8,768	0	Administrative and support service activities
Tot	O0	53,030	278,591	0	1,058	332,679	0	332,679	14,531	268,825	3,912	45,411	Public administration and defence; compulsory social security
Tot	P0	0	201,292	0	40	201,332	-0	201,332	476	114,410	86,446	0	Education
Tot	Q0	0	68,837	0	242	69,078	34	69,112	0	55,032	14,080	0	Human health and social work activities
Tot	R0	164	15,713	0	156	16,033	9	16,042	0	0	15,901	140	Arts, entertainment and recreation
Tot	S0	7	47,053	0	802	47,862	-17	47,845	1,000	778	46,066	1	Other service activities
Tot	T0	0	13,364	0	4	13,367	-26	13,341	0	0	13,341	0	Domestic services
Tot	V0	53,513	0	0	0	53,513	0	53,513	40,134	0	-137,702	151,080	Travel debits & credits

Agg	CPA code	Imports	Total output	Margins	Taxes	TOTAL SUPPLY	Diff	TOTAL DEMAND	Intermed demand	Other fnl demand	Fnl HH demand	Exports	Labels
Tot	X0	0	25,224	0	0	25,224	466	25,690	0	0	25,690	0	Unallocated products
A1	A111	2,040	67,812	3,487	120	73,459	-4,377	69,082	58,379	0	10,496	207	Sorghum
A1	A112	7,476	100,580	4,376	15	112,447	-63,472	48,975	19,344	0	28,933	698	Maize
A1	A113	28,228	1,987	1,786	0	32,000	-13,339	18,661	18,164	0	473	23	Wheat
A1	A116	369	62,783	2,965	2	66,119	-29,577	36,542	4,500	0	31,722	321	Paddy & husked rice

Figure 10.3: Corresponding output sheet

Agg	RCPA	Total output	Temp adj	Total	VAT turn-over	Excise duties	Non-VAT BIT	Informal marktd	Non-market	Resale costs	% margin	Labels
	Tot	**4,264,413**	**171,726**	**4,092,686**	**2,183,220**	**-41,932**	**298,795**	**1,276,681**	**1,244,921**	**-868,999**		**Total Rwanda**
A1	A111	67,812		67,812	0		4,712	62,445	655			Sorghum
A1	A112	100,580		100,580	0		0	78,532	22,047			Maize
A1	A113	1,987		1,987	0		0	1,838	149			Wheat
A1	A116	62,783		62,783	0		0	58,852	3,932			Paddy & husked rice
A1	A119	0		0	0		0	0	0			Other cereals
A1	A121	112,683		112,683	0		0	69,433	43,250			Irish potatoes
A1	A122	125,338		125,338	0		0	60,557	64,781			Sweet potatoes
A1	A123	108,535		108,535	0		0	86,318	22,217			Cassava
A1	A129	31,220		31,220	0		0	19,411	11,809			Other roots and tubers
A1	A131	97,549		97,549	0		0	8,547	89,001			Dried beans
A1	A132	9,089		9,089	0		0	4,193	4,896			Peas & other legumes
A1	A139	48,429		48,429	0		0	15,740	32,689			Other vegetables
A1	A141	114,317		114,317	0		0	108,380	5,937			Bananas for beer
A1	A142	104,992		104,992	0		0	61,409	43,583			Bananas for cooking
A1	A143	17,163		17,163	0		0	11,824	5,340			Bananas (sweet)
A1	A149	12,450		12,450	0		0	1,519	10,931			Other fruit and nuts
A1	A151	24,912		24,912	0		0	24,561	351			Ground nuts
A1	A152	8,480		8,480	0		0	8,022	458			Soya
A1	A159	0		0	0		0		0			Other oil seeds
…												
C1	C111	899		899	739		104		57			Beef
C1	C112	3,084		3,084	0		0		3,084			Other meat and meat products
C1	C120	0		0	0		0		0			Prepared and preserved fish
C1	C131	1,890	1,000	890	839		0		51			Fruit juices
C1	C139	3,500	3,500	0	0		0		0			Other prepared and preserved vegetables
C1	C140	519		519	0		0		519			Animal and vegetable oils and fats
C1	C150	14,801		14,801	7,364		568		6,869			Dairy products
C1	C161	25,645	19,000	6,645	0		0		6,645			Maize flour
C1	C162	20,182	-1,000	21,182	14,710		5,732		741			Wheat flour
C1	C164	40,010	21,000	19,010	0		0		19,010			Cassava flour

Agg	RCPA	Total output	Temp adj	Total	VAT turn-over	Excise duties	Non-VAT BIT	Informal marktd	Non-market	Resale costs	% margin	Labels
C1	C166	5,000	5,000	0	0		0		0			Rice, semi- or wholly milled
C1	C169	33,106	22,000	11,106	0		0		11,106			Other grain mill products
C1	C170	24,083	21,000	3,083	3,083		0		0			Bakery products
C1	C180	0		0	0		0		0			Animal feed & other by-products
C1	C191	4,293		4,293	204		4,079		11			Coffee, decaffeinated or roasted
C1	C192	34,368		34,368	31,789		2,546		33			Tea, dried
C1	C193	5,385		5,385	5,385		0		0			Sugar
C1	C194	0		0	0		0		0			Cooking salt
C1	C199	16,707		16,707	236		16,409		62			Other food products n.e.c.
C2	C211	89,895	81,000	8,895	0		0		8,895			Banana beer
C2	C212	38,868	37,000	1,868	0		0		1,868			Other traditional beer

Annexes: Practices in African countries

Annex I. Balancing SUT

I.1. Burkina Faso: balancing SUT

I.1.1. Issues under consideration

The issue under consideration is the balancing of supply and uses. In Burkina, the national accounts currently follow the 1993 SNA concepts and are compiled using ERETES software. The supply and uses are manually balanced at the commodity level. We follow the SNA recommendation to use the previous year's national accounts structure for extrapolating to the current year.

I.1.2 Data requirements, availability, gaps and meeting challenges to fill data gaps

When starting the work on commodity flow for each product, we have data on formal and informal domestic production, imports, taxes, subsidies, and exports. These data are supplied by industries, Government, and NPISH with separate estimates made for the informal sector. There are also first estimates of final consumption at purchasers' prices. The objective is now to make first estimates of trade and transport margins (only those paid by buyers), intermediate consumption and capital formation and to subsequently achieve the identity supply= uses.

I.1.3 Compilation practices

The general approach begins with the estimation of the intermediate consumption at basic price of each product using the previous year's structure. Next, trade and transport margins are estimated, followed by first estimates for final consumption and capital formation. After this, taxes less subsidies on products and trade and transport margins are allocated to products in the uses matrix. This allocation depends on the nature of the product because there are some products where no taxes are charged and there are no trade or transport margins. Finally, we determine the intermediate consumption and capital formation at purchasers' prices and final consumption at basic price by subtracting trade and transport margins and taxes less subsidies from final consumption which was initially estimated at purchasers' prices.

The last step in the commodity flow approach is to balance supply and uses by adjusting the gap between intermediate consumption, final consumption and capital formation on the one hand and total supply of commodities on the other. The sum of trade and transport margins on intermediate consumption, final consumption, capital formation and exportations is carried forward to the supply side to ensure that total supply equals total uses.

An important point to note is that we do not estimate changes in inventories when there is no credible data source. Total gross capital formation by product for the formal industries and for government is calculated by using the available data sources. Capital formation for the informal

sector is estimated using “model methods”. Note in particular that gross capital formation for livestock is estimated by the AFRISTAT recommended method.

The reconciliation of intermediate consumption estimated by commodity flow with intermediate consumption by kind of activity completes to a large extent the process of balancing the supply and use table.

Credibility checks are made using indicators such as ratios of intermediate consumption to domestic production and value added per employee by kind of activity. These credibility checks may lead to revisions to the production accounts. The global synthesis can also lead us to make further adjustments.

Annex II Crops and forestry products

II.1. Ghana: how to value growing of standing timber in Ghana's GDP

II.1.1. Introduction

According to the 2008 SNA, natural growth of non-cultivated biological resources – natural forests, fish stocks etc. - are regarded as economic assets, but growth of these resources is not under the direct control, responsibility and management of an institutional unit and thus, is not regarded as production. It is only the end product (i.e. when harvested) that is regarded as output.

However, deliberate cultivation of trees for timber is included in the national accounts as produced asset and classified in ISIC revision 4 under 0210. The output from such economic activities takes long time to be realized. According to the 2008 SNA compilation guidelines, when it takes a long time to produce a unit of output, it becomes necessary to recognize that output is being produced continuously and to record it as "work-in-progress" (paragraph 6.90, 2008 SNA). It therefore recommends that, whenever a process of production extends over two or more accounting periods, it is necessary to calculate the work-in-progress completed within each of the periods in order to be able to measure how much output is produced in each period.

II.1.2. Data requirements and availability

To estimate the contribution of this activity to the GDP, the main data needed are:

- area under cultivation of timber seedlings;
- number of seedlings per hectare;
- current price per hectare of a plantation when it is harvested;
- number of years between when a seedling is planted and when it is harvested.

II.1.3. Compilation practices

The teak tree is the specie planted in Ghana under its reforestation programme. The teak is the common name for the tropical hardwood tree species Tectona Grandis and its wood products. The full maturity period of the teak tree is 25 years, but the trees are harvested after 10 years in Ghana. At age 10 the trees are matured enough to be used as electricity poles, and for manufacture of furniture and other wood products. Therefore, after computing the work in progress for the 10th year for a particular established plantation, the total value of the plantation, the Statistical Service estimates the value of that plantation as zero afterwards. Since the maturity period of a fully grown teak tree is 25 years (but the trees are harvested after 10 years), the estimated value is discounted at a rate of 6 percent. Intermediate consumption is estimated at 10 percent.

The plantations are valued in constant 2006 US dollars, so for constant price estimates, the local currency equivalent to the US dollar in 2006 is used to convert the values to the local currency, while the current local currency to the US dollar equivalent is used for the current price estimates.

The computation formula is shown below:

$$Value\ added = value\ of\ stock\ addition(t) + \sum_{t=1}^{n} WIP_{t-1}$$

Where n = number of years plantation was established, 1≤ n ≤25, *t* = time, and *WIP* = work in progress on earlier additions to the stock which have not yet reached maturity. Below is an example of how the stock additions and the work-in-progress (WIP) are added together to give the value added.

Figure II.1: Ghana – Computation of additions to stock and work-in-progress of forest plantations (2002 to 2008)

Table I: Estimated value of forest plantations developed in 2008

Year	Area Established (ha)	Establishment value/ha *(NPV discounted over 25 years at 6% p.a.)*(US$)	Estimated Establishment Value (US$)	Marginal annual increments in value/ha (US$) (WRT 2007/2008)	Incremental value (US$)	Total 2008 incremental + establishment value
2002	19,069	11,503	219,350,707	1,038.00	19,793,622	
2003	24,950	11,503	286,999,850	972.00	24,251,400	
2004	22,999	11,503	264,557,497	908.00	20,883,092	
2005	18,425	11,503	211,942,775	846.00	15,587,550	
2006	19,383	11,503	222,962,649	789.00	15,293,187	
2007	18,435.6	11,503	212,064,706.8	733.00	13,513,294.8	
2008	12,314.8	11,503	141,657,144.4	0.00		250,979,290.2

Table II: Estimated value of forest plantations developed in 2007

Year	Area Established (ha)	Establishment value/ha (NPV discounted over 25 years at 6% p.a.)(US$)	Estimated Establishment Value (US$)	Marginal annual increments in value/ha (US$) (WRT 2006/2007)	Incremental value (US$)	Total 2007 incremental + establishment value
2002	19,069	11,503	219,350,707	972.00	18,535,068	
2003	24,950	11,503	286,999,850	908.00	22,654,600	
2004	22,999	11,503	264,557,497	846.00	19,457,154	
2005	18,425	11,503	211,942,775	789.00	14,537,325	
2006	19,383	11,503	222,962,649	733.00	14,207,739	
2007	18,435.6	11,503	212,064,706.8	0	0	301,456,592.80

Table III: Estimated value of forest plantations developed in 2006

Year	Area Established (ha)	Establishment value/ha (NPV discounted over 25 years at 6% p.a.)(US$)	Estimated Establishment Value (US$)	Marginal annual increments in value/ha (US$) (WRT 2005/2006)	Incremental value (US$)	Total 2006 incremental + establishment value
2002	19,069	11,503	219,350,707	908.00	17314652	
2003	24,950	11,503	286,999,850	846.00	21107700	
2004	22,999	11,503	264,557,497	789.00	18146211	
2005	18,425	11,503	211,942,775	733.00	13505525	
2006	19,383	11,503	222,962,649	0	0	293,036,737.00

Table IV: Estimated value of forest plantations developed in 2005

Year	Area Established (ha)	Establishment value/ha (NPV discounted over 25 years at 6% p.a.)(US$)	Estimated Establishment Value (US$)	Marginal annual increments in value/ha (US$) (WRT 2004/2005)	Incremental value (US$)	Total 2005 incremental + establishment value
2002	19,069	11,503	219,350,707	846.00	16132374	
2003	24,950	11,503	286,999,850	789.00	19685550	
2004	22,999	11,503	264,557,497	733.00	16858267	
2005	18,425	11,503	211,942,775	0	0	264,618,966

Table V: Estimated value of forest plantations developed in 2004

Year	Area Established (ha)	Establishment value/ha *(NPV discounted over 25 years at 6% p.a.)*(US$)	Estimated Establishment Value (US$)	Marginal annual increments in value/ha (US$) (WRT 2003/2004)	Incremental value (US$)	Total 2004 incremental + establishment value
2002	19,069	11,503	219,350,707	789.00	15045441	
2003	24,950	11,503	286,999,850	733.00	18288350	
2004	22,999	11,503	264,557,497	0		297,891,288

Table VI: Estimated value of forest plantations developed in 2003

Year	Area Established (ha)	Establishment value/ha (NPV discounted over 25 years at 6% p.a.)(US$)	Estimated Establishment Value (US$)	Marginal annual increments in value/ha (US$) (WRT 2002/2003)	Incremental value (US$)	Total 2003 incremental + establishment value
2002	19,069	11,503	219,350,707	733.00	13977577	
2003	24,950	11,503	286,999,850	0		300,977,427

Table VII: Estimated value of forest plantations established in 2002

Year	Area Established (ha)	Establishment value/ha (NPV discounted over 25 years at 6% p.a.)(US$)	Estimated Establishment Value (US$)	Marginal annual increments in value/ha (US$) (WRT 2002)	Incremental value (US$)	Total 2002 incremental + establishment value
2002	19,069	11,503	219,350,707	0		219,350,707

Source: Economic Statistics Division, Ghana Statistical Service and Forestry Commission

Annex III. Exports and imports of goods and services

III.1. Benin: informal international trade estimation in national accounts

III.1.1. Issues under consideration

The issue under consideration is the estimation of informal international trade due to the weak covering of geographic borders by custom services. Moreover, there are lots of villages and towns that are shared with neighbouring countries. This allows traders to bring merchandises through uncovered ways into the country, without paying relevant taxes.

III.1.2. Data requirements

Benin compiles national accounts by following the 1993 SNA concepts with the software ERETES. This system recommends taking into account the informal economy. Informal international trade is one of the important parts of informal economy in Benin because of its geographic position.

Estimation of informal sector needs a lot of data like, all statistics dealing with official international trade (imports, exports, re-exports), statistics on the primary sector (agriculture, fishing, etc.), household surveys data, and specific studies made by official institution of the administration on the domain of informal international trade. These studies highlight the importance of this activity and help to know the key products of this activity, the estimated prices of these key products in the other countries, which is important to determinate the price of re-export, using the method FOB.

III.1.3. Compilation practices

Benin estimates each component of this informal international trade (informal imports, informal exports and informal re-exports) by using appropriate methods as described below.

The first step concerns the informal re-exports. This first component of informal international trade is estimated by using a method of supply and use balance. The data from the household surveys helps to determine the domestic consumption of key products. Using this data and the data available from the supply side, estimates of re-exports for each key product is made by applying the supply and use method (and commodity flow methods).

The second step deals with the informal exports of primary goods produced in Benin. For this component too, the estimation procedure uses supply and use balance method and official statistics available on the primary sector.

In the third step, the estimation of informal imports is made. This step concerns a lot of goods imported from Nigeria like, petroleum products, medicines, flowers, etc. For the petroleum products (the important one), estimation is more difficult. Benin uses the data on national official sales, number of vehicles, imports of goods that use petroleum products and the population growth rate, to estimate the informal imports of petroleum products.

III.1.4. Way forward

Like the 1993 SNA, the 2008 SNA also recommends accounting for informal sector in the national accounts statistics. Thus, Benin will refine this methodology by using the data from the Informal International Trade Survey. Indeed, in January 2010 and September 2011, Benin

conducted two informal international trade surveys that are otherwise supposed to be done in four stages in each of the four quarters. Nevertheless, some estimation for the whole year is available now and could be used in the national accounts estimations.

Example 1: informal re-export estimation of rice

Rice is one of the key products Benin re-exports to its neighbouring countries, especially to Nigeria. Here is the information we have to estimate this informal international trade in 2007.

- In 2007, Benin's imports of rice were 681,673 t in quantity and at c.i.f. the value was 100,461 million francs. The domestic production of rice is estimated to 21,184 t in quantity and at basic price the value was 2,298 million francs (data from ministry in charge of agriculture).
- The household survey of 2007 estimated the household consumption expenditure in domestic and imported rice at 22,551 million francs (83,334 t in quantity).
- The enterprises' statistical reports permitted to estimate the changes in inventories of rice at 5,500 million francs (11,022 t).
- The intermediate consumption of rice is usually estimated by considering an enterprise survey made to measure the structure of intermediate consumption. In addition, the household survey of 2007 permitted to know the value of rice paid by household in restaurant.

Using all these information in a commodity flow approach we estimated the re-exports in rice and this is supposed to be 504,204 in 2007. The box 1 below gives a summary of the product balance for rice in quantity.

Figure III.1: Benin - Product balance for rice (in quantity)	
Supply	
Domestic production (data from ministry of agriculture)	21,888
Imports	681,673
Total supply	703,561
Uses	
Intermediate consumption	105,001
Household final consumption expenditure	83,334
Change in inventories	11,022
Exports	504,204
Total uses	703,561

After making the product balance for rice in quantity we moved for value by using appropriate prices. Figure III.2 below gives details. There isn't a separation between transports margins and trade margins. It is one of weakness of Benin national account and this will be corrected in future years.

Figure III.2: Benin – Product balance for rice (in value, millions of CFA)	
SUPPLY	
Domestic production (value at basic price)	2,298
Imports (c.i.f.)	100,461
Taxes on rice	11,083
Subsidies on rice	
Total trade and transports margins	19,829
Other taxes	

Non-deductible VAT	7,117
Total supply	142,788
USES	
Intermediate consumption (at basic prices)	28,885
Trade and transports margins on intermediate consumption	3,923
Non-deductible VAT on intermediate consumption	4,255
Intermediate consumption at purchasers 'prices	37,063
Household final consumption (at basic price)	16,834
Trade and transports on Household final consumption	2,855
Non-deductible VAT on Household final consumption	2,862
Household final consumption at purchasers 'prices	22,551
Change in inventories (at basic price)	5,500
Transport margins on Change in inventories	0
Non-deductible VAT on Change in inventories	0
Change in inventories at purchasers 'prices	5,500
Exports (at basic prices)	62,623
Trade and transports margins on Exports	15,051
Taxes on Exports	
Exports at purchasers 'prices	77,674
Total uses	142,788

Example 2: informal import estimation of petroleum product

Petroleum products are one of the key products informally imported from Federal Republic of Nigeria by the Republic of Benin. The estimation of this informal trade is based on the use of petroleum. Indeed, the evolution of the informal imports of these goods depends on political decisions in two countries. When Nigeria raises its domestic prices, the trade is negatively affected and national official enterprises of Benin increase their sales. In the same case, when Benin makes a decision to regulate this activity through custom offices, this trade is negatively affected and national official enterprises improved their sales.

Thus, one of the best ways to take in account this activity is a final use approach. In this condition, all information related to all goods susceptible to use petroleum products is considered. In Benin's case, these goods are: all categories of vehicles (most important), machines that use oil, planes (not so important). Population growth rate is also considered to estimate the petrol used by households. In 2007, information used for the estimations were:

- Official imports of petroleum products of 2006 were: oil (gasoline) (14,762 million francs or 43,684t), gas oil (or diesel) (41,537 million francs or 143,856t), and petrol (kerosene oil) (7,064 million francs or 19,430 t). Same data for 2007 were: oil (31,907 million francs or 104,534 t), gas oil (63,135 million francs or 244,552t), and petrol (7,491 million francs or 27,369 t).
- Vehicles registration growth rate in 2007 was 14.0% (from 9,711 in 2006 vehicles to 11,067 vehicles in 2007).

- In 2007 the motorbike drivers' population growth rate is 18.9% for Cotonou (economic capital where this activity is well developed).
- Household expenditure as given by household survey was 40,869 million f (99,225 t) for oil, 1,943 million f (5,325t) for gas oil and 16,072 million f (40,009t) for petrol.
- In 2006, the total use of each good was: 567,324 t for oil, 229,219 t for gas oil and 46,848t for petrol. Thus in 2006 the total use of fuel in Benin is estimated to be 850,346t.

To update this estimation for 2007, we used volume index of vehicles registration (1.14) as an indicator for the use of gas oil. For oil, we used a composite index that takes in to account the vehicles registration growth rate and the population growth rate of motorbike drivers (1.16 for 2007). Finally the population growth rate (3.25%) is considered for petrol.

These estimations are corrected by the changes in inventories of formal enterprises that, sometimes, made some stocks waiting for a political decision to improve their sales. For example, when they made a stock for a year for a product, it will increase the sales of the informal product corresponded (and so the informal imports of the product had to increase). We suppose that informal traders didn't make any stock because of the nature of the products.

Thus, we can estimate the need for 2007 in petroleum products as follow: oil (666,166 t), gas oil (261,309t) and petrol (48,368t)

After this first step of estimation, product balance on petroleum products is used to finalize the estimation. Appropriate prices are considered to make the product balance in value.

III.2. Congo and Democratic Republic of the Congo: treatment of external trade and the balance of payments in SUT

III.2.1. Issues under consideration

The issues under consideration here are: the distribution of imports and exports by products and the accounting for under-coverage in the imports and exports

The challenge to face is the quality of data that is not satisfactory. Both the Congo and the Democratic Republic of the Congo have similar cases. They are both still in 1968 SNA but are moving to the 1993 SNA. Thus both of them have already at least the national accounts of years 2005 and 2006 in version of 1993 SNA. Opportunity is given here to explain a bit how despite the difficulties encountered good results had been obtained. Let us recall that both countries are using the tool ERETES for the compilation of their national accounts.

III.2.2. Data requirements, availability, gaps and meeting challenges to fill data gaps

As the two countries are in a similar situation let us focus on the Democratic Republic of the Congo as an example. For a proper work it would have been necessary to have the following statistical data:

- External trade statistics giving the distribution of imports (c.i.f.) and exports (f.o.b.) by product according to HS (8 digit at least) classification. It is also useful if possible, to get duties and taxes perceived in customs on these products.
- For the level of the balance of payments data, it is necessary to have a detailed version of the balance of payments if possible in the version of handbook 5.

In the Democratic Republic of the Congo the data of the external trade statistics are weak; they are not very precise and cover less than 40% of the external trade. The sources are the Customs Office (OFIDA) and at a less degree the Office of Control of Congo (OCC).

The balance of payments data suffer of the weakness of the external trade statistics. Sometimes they are not sufficiently detailed to facilitate their correct use. The source is the Central Bank of Congo (BCC).

III.2.3. Compilation practices

In the context of the SNA, it is recommended that there should be coherence between the balance of payments statistics and the national accounts data. Both the balance of payments statistics as well as external trade data are used in the national accounts compilation process. In the case of the Democratic Republic of the Congo, an effort is made by the BCC to include an estimate for under-declaration or frauds, in the BoP statistics. Mostly, this relates to exports of minerals and agricultural products.

The BCC makes adjustments for fraudulent exports and imports of goods in the BoP statistics. For this purpose, BCC undertakes a survey among producers. The survey carried in 2005 provided the following percentages on account of fraud included in exports and imports:

- Diamond 33%;
- Coffee 150%;
- Cocoa 25%;

- Rubber 10 %;
- Tea 25 %;
- Cement 25 %;
- Ethanol 25 %; and
- Others 25 %.

In the national accounts, data on imports and exports is same as that shown in the BoP statistics, which are now adjusted for under-declaration or frauds by the BCC. The challenge now is the distribution of the external trade by products (goods and services).

A preliminary work is carried out to transfer the data of the external trade from HS classification into the national accounts products classification data.

A first estimate of the data by product is made at the beginning of the compilation process of the national accounts with ERETES software. This phase is called the pre-reconciliation of data. Then in the process of the SUT, which passes through the compilation of product balances and industries accounts, a cross check of various data are carried out and through a certain number of iterations where successive reconciliation are made, we get an acceptable distribution of imports and exports as integral part of the SUT. The correction of c.i.f./f.o.b. is carried out by means of the elements of the balance of payments (freight transport and freight insurance) being given that the imports resulting from the external trade are c.i.f i.e. they incorporate already payments towards freight transportation and freight insurances.

The adjustment for purchases by residents and non-residents is made by means of the item travel in the balance of payment statistics. The balance is set with the household final consumption expenditure.

III.2.4. Way forward

An improvement of the external trade statistics is necessary for the Congo and the Democratic Republic of the Congo. They need to keep on working hard to get more reliable and up to date data. The central banks are making efforts to update their balance of payments compilation. The national accountants need to supplement the efforts of central banks by providing guidance on accounting for under-declarations and frauds, and also share any further evidence obtained at the time of constructing SUTs.

III.3. Uganda: informal cross border trade – exports and imports

III.3.1. Background

Uganda shares numerous border crossing points with its neighbours, some of which are formal while others are informal and very porous in nature. Along the border crossing points formal and informal imports and exports take place. The informal imports and exports data is not captured by the customs procedures, which leads to under coverage of the import/export trade. Goods that do not attract taxes are of limited interest to the tax authorities. Some of the notable informal exports are ferried up to the border points and to avoid truck entry charges the goods are carried across the border by either bicycle, head/hand or motorcycles until all the goods have been ferried across. By ferrying the goods in small quantities the customs documentation is bypassed leading to loss of vital trade data. The need to capture the informal trade flows led to the inception of the ICBT surveys in Uganda in 2004. The initiative, the first of its kind on the African continent, was aimed at enhancing compilation of International Merchandise Trade Statistics (IMTS) that is used in the compilation of the Balance of Payments Statistics.

Trade between Uganda and its regional neighbours (namely, Sudan, Kenya, Tanzania, Democratic Republic of Congo and Rwanda) has grown in importance over the years. The trade was stimulated by the restoration of peace and security in areas which had conflicts and by the expansion of economic activity throughout the region. A significant share of regional trade consists of informal cross border trade that is not captured in the official statistics. Data on informal cross border trade are important for more accurate current accounts in the balance of payments. In 2010, Uganda's informal exports amounted to over 500 million US$ representing almost one quarter of the country's total exports.

III.3.2. System of national accounts in use

The informal cross border trade survey follows the International Merchandise Trade Statistics Concepts and Definitions, Rev 2 1998, which is aligned to the 1993 SNA and the Balance of Payments manual 5th Edition, 1993.

The informal cross border trade survey follows the Standard International Trade Classifications (SITC Rev 3) Rev 3 and the Harmonized Commodity Description and Coding System. The survey is in compliance to SITC Rev 3 in terms of coverage, time of recording, included and excluded goods. The change of ownership is largely approximated to movement of goods across the border. In the ISIC Rev 3 as a general guideline it is recommended that goods should be included at the time when they enter or leave the economic territory of a country as opposed to customs based data collection which should consider the date of lodgement of the customs declaration. The SITC Rev 3 also recognizes surveys as a supplementary means of obtaining external trade data.

Comprehensive data on external trade is required for all the country's border entries and exits. Unfortunately in Uganda's case, informal exports and imports are not captured through normal customs procedures. Trade data is available only for formal trade from customs records and for cash crops from the regulatory or development organizations. Through the informal cross border surveys data gaps have been filled but since not all border entries/exits are covered and also the survey may not cover all the months there are still trade data gaps. Secondly, the survey is done between 7.00 am and 6.00 pm so trade occurring out of this time period is missed out. Furthermore, the porous nature of some borders and failure to monitor all border crossings may have led to underestimation of the true levels of informal trade flows. Lastly, assignment of values, quantities and units of measure some unique commodities may not be accurately done.

III.3.3. Data availability, gaps and challenges of filling the gaps

Some of the steps taken to fill the data gaps include; data verification involving validation, consistency checks and coding in line with international merchandise trade statistics recommendations, data up-rating to take care of unmonitored border posts and periods, and a new instrument "the vehicle form" was introduced for obtaining detailed records of the merchandise for cases where trucks/vehicles are loaded with mixed goods.

III.3.4. Compilation practices

Data captured in the monthly cross border trade survey includes item being transited by unit, quantity, domestic price at the border point of entry or exit, mode of transport and country of origin/destination. The product coding to ISIC or HS classifications is done at the data processing stage.

Due to the porous nature of the borders between Uganda and its neighbours, the informal cross border trade data is obtained through a survey that targets sampled official border crossings. Originally the survey was quarterly but has since graduated to monthly monitoring of the crossing points. By interview and observation techniques, data on items, quantities and price are captured for a period of two weeks each month and an estimate is made for the other two weeks during data processing.

The data processing is done using an up-rating model, estimating data for un-monitored months, and application of interpolation and extrapolation methods.

The data on the informal trade is combined with the formal trade data to get the aggregated exports and imports information which is included in the current accounts of the balance of payments.

Figure III.3: Uganda – Formal and informal trade (US$ millions), 2008-2010

		2008	2009	2010
Exports	Total exports	2,531.7	2,366.16	2,146.94
	Informal exports	807.7	798.54	528.34
	Formal/official exports	1,724.0	1,567.61	1,618.60
Imports	Total imports	4,604.11	4,339.62	4,730.88
	Informal imports	78.11	82.03	66.49
	Formal/official imports	4,526.0	4257.6	4664.38
Overall trade balance	Total trade balance	-2,072.41	-1,973.46	-2,583.94
Informal trade	Informal exports	31.9	33.75	24.61
	Informal imports	1.7	1.89	1.41
Source: Uganda Bureau of Statistics and Bank of Uganda				

III.3.5. Way forward

Steps are being taken to increase the border crossings coverage in the surveys and the frequency which has since increased from quarterly to monthly and for a period of two weeks each month.

Annex IV. FISIM estimation and allocation to industries and final users

IV.1. Cameroon: Financial Intermediation Services Indirectly Measured

IV.1.1. Issues under consideration

In general, only a small part of intermediation services is charged explicitly, as commissions, by financial institutions (banks) to their customers. Financial institutions charge implicitly (i.e. indirectly) a large part of their services to their customers by lending at higher interest rates to their borrowers and borrowing at lower interest rates from their depositors. Therefore FISIM is the indirect measure of the value of the production of services that financial intermediaries (banks) do not explicitly charge to their customers.

For the year 2005, the National Institute of Statistics of Cameroon has decided to put in place a benchmark year for national accounts. One of the main objectives of that benchmark year was to implement the 2008 SNA. So, for the treatment of FISIM, Cameroon is currently following the recommendations of the 2008 SNA version. Before that, Cameroon was following the 1993 SNA version, but the consumption of FISIM was not allocated between users.

The 2008 SNA suggests the use of the reference rate method to deal with the issue of calculating and allocating the FISIM. While the 1993 SNA left the possibility to countries to continue to follow the 1968 SNA convention whereby the whole of FISIM is allocated to intermediate consumption of a notional industry, this possibility has been removed in the 2008 SNA. FISIM should be allocated between the different users, and the allocated amounts treated either as intermediate consumption or as final consumption or exports.

By application of the reference rate method, the 2008 SNA calculates the output of FISIM as difference between the rate paid to banks by borrowers and the reference rate plus the difference between the reference rate and the rate actually paid to depositors. Thus FISIM is calculated according to the formula $(r_L - r_r)\ L + (r_r - r_D)\ D$, where r_r is the reference rate, r_L is interest rates on loans and r_D is interest rates on deposits, L is the total amount of loans and D is the total amount of deposits. The reference rate of interest is a risk-free interest rate and it does not include any financial intermediation services. The 2008 SNA suggests that the interbank rates are suitable proxies for the reference rate.

IV.1.2. Data requirements, availability, gaps and meeting challenges to fill data gaps

For the calculation of FISIM, data on the total amount of loans granted to borrowers and the total amount of deposits made by lenders are needed for the accounting period; also needed are data on the interests paid to banks by borrowers and interests received by depositors from banks; debtor interest rates (interest rates on loans), creditor interest rates (interest rates on deposits) and inter-bank borrowing and lending rate need also to be known. These data need to be available by sector or industries if possible. All these data are normally available from the central banks and commercial banks statistics.

In Cameroon the mains data sources for the calculation of FISIM are:

- *The central bank (BEAC[48]) monetary situation*. This data source is a summary of the data contained in the balance sheets of financial institutions (banks, central bank and other financial institutions). It gives information on the financial assets owned and the liabilities owed by financial institutions towards the other institutional units. A concordance table is set up to pass from banks' statements to national accounts' financial assets (loans and deposits) and identify the debtor or creditor sector for each asset.
- *The statistical and fiscal statements of banks and credit cooperatives*. This data source helps to calculate property incomes received by banks and credit cooperatives, the interests that they pay and also the commissions that they receive or pay.
- *The balance of payments (BoP) statistics*. This data source gives information on interests paid on loans and commercial credits at credit (resources for the national economy) and at debit (uses) and by institutional units. This information permits the calculation of imports and exports of FISIM.
- *The statement of the financial operations of the State*. This data source gives the amount of interests paid by the central State on the domestic debt and the external debt.
- *The statistical and fiscal statements of non-financial corporations and the administrative or management accounts of public administrations*. This data source gives information on the structure of interests paid or received by industries. This structure is used to breakdown the intermediate consumption of FISIM by industry.
- *Other publications of the central bank, in search of interest rates*. These documents provide floor creditor interest rates, ceiling debtor interest rates and inter-bank borrowing and lending rate.

IV.1.3. Compilation practices

To calculate the FISIM, the following steps are followed:

1) Identification of financial assets and liabilities that correspond to loans and deposits, by institutional sector: when there is no information on stocks of loans and deposits, data on interests paid or received are used to estimate the stock of loans and deposits by using average interest rates by sector.

2) Determination of interest rates by institutional sectors: to calculate FISIM we need to know the interests rates that banks charge to their borrowers (debtor rate) and the one that they pay to their lenders (creditor rate). Given the lack of information on the rates that banks actually apply to their customers by sector, we decided to use the floor creditor interest rate and the ceiling debtor interest rate.

3) Calculation of actual interests paid on loans and deposits detained by resident banks: actual interests paid to or received from banks are calculated for each sector, using the amounts in step 1 and the rates in step 2.

4) Calculation of FISIM for resident banks: the reference interest rate is used to calculate reference interest (i.e. SNA interest according to 2008 SNA) on loans and on deposits. We use the inter-bank borrowing and lending rate, as reference rate, for this calculation. FISIM of resident banks is obtained by sector using the formula: (actual interests on loans – reference interests on loans) + (reference interests on deposits – actual interests on deposits).

5) Calculation of importations of FISIM: importations of FISIM are calculated from two elements of the BoP: incomes of investments of public administrations and incomes of

[48] Banque des États de l'Afrique Centrale (BEAC).

investments of others sectors. The latter are supposed to be only units of the non-financial corporation's sector. A method of calculation similar to the above (steps 1 to 4) is implemented to calculate importations of FISIM.

6) Compilation of information on interests and FISIM: the national production of FISIM and the importations of FISIM are put together to build up the commodity flow table of FISIM for the global economy.

IV.1.4. Way forward

This technical note presents what has been done in the 2005 benchmark year national accounts compilation. It was just the first step forward. To overcome data challenges we have faced, more investigation has to be done to get average actual interest rates that banks practice for their different customers (corporations, government and households), through a survey, for example. Also, the 2008 SNA recommends that FISIM should be calculated on mortgages, and treated as intermediate consumption of households for their construction of dwellings. The current methodology does not estimate that component. Hence all consumption of FISIM by households is only final consumption. This issue has to be addressed as well in future development of the methodology for Cameroon.

References:

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IV.2. Mauritius: Estimation of FISIM as per literature

Financial intermediation services cannot be valued in the same way as other services, because these services are not charged explicitly. For this reason, the output of financial intermediation services should be measured indirectly as follows.

When financial intermediaries provide lenders and borrowers with financial intermediation services, they do not charge them explicitly but charge implicitly by paying or charging different rates of interest to borrowers and lenders. They pay lower rates of interest than would otherwise be the case to those who lend them money and charge high rates of interest to those who borrow from them. The resulting net receipts of interest charged implicitly represent the output of financial intermediation services and are used to defray their expenses and provide an operating surplus.

IV.2.1. FISIM on loans and FISIM on deposits

FISIM on loans and deposits may be calculated as follows:

$$FISIML = RL - (L \times r^*) \quad (1)$$

$$FISIMD = (D \times r^*) - RD \quad (2)$$

with

FISIML: FISIM on loans

FISIMD: FISIM on deposits

RL: interest flows receivable on loans

RD: interest flows payable on deposits

r*: reference rate

L: stock of loans

D: stock of deposits.

Total FISIM is obtained as sum of FISIM on loans and FISIM on deposits as follows:

$$FISIML + FISIMD = RL - (L \times r^*) + (D \times r^*) - RD$$

$$= RL - RD - (L - D) \times r^* \quad (3)$$

If the stock of loans is equal to the stock of deposits, total FISIM will be interest flows receivable on loans minus interest flows payable on deposits (Total FISIM = RL - RD).

IV.2.2. Allocation of FISIM in Mauritius

The quarterly distribution of FISIM by sector

The quarterly figure of FISIM is calculated from data available on deposits, loans and prevailing rates. It is distributed by sector according to the methodology below:

- Step 1: The monthly bulletin of the Bank of Mauritius (BOM) contains data on the sector wise distribution of credit to the private sector (loans) and ownership of banks' deposits (deposits) by sector as at end of quarter [Col 3 & Col 7].
- Step 2: For each sector (household, government, export and industry):
    - Calculate interest paid on total deposits based on interest rate on deposits [Col 6].
    - Calculate interest received on total loans based on interest rate received on loans [Col 9].

    - Calculate FISIM by sectors available based on actual rates, interest receivable on loans less interest payable on deposits [Col 10].
- Step 3: Work out the pure cost of borrowing (interest) based on loans less deposits using the reference rate which in the Mauritian case is the "Lombard/Key Repo rate" [Col 11 & Col 12]. This process gives "L x r*" and "D x r*" as in equations 1 and 2 above.
- Step 4: Work out the difference between the FISIM calculated on actual rates at Step 2 and the FISIM calculated on the reference rate [Col 13]. This process gives FISIML and FISIMD as in equation 3 above.
- Step 5: Work out the percentage distribution of FISIM by the components [Col 14]. Based on the production account available from the survey data of non-financial public corporations, the ratio for public non-financial corporations is redistributed among the activities within the industry group [Col 15].
- Step 6: Imports and exports of FISIM are calculated using data on interest received and paid to the rest of the world obtained from banks. FISIM for both imports and exports are calculated based on the ratio of FISIM to interest amount for domestic transactions.
- Step 7: Export of FISIM is deducted from the total FISIM published. The resulting value of FISIM is then allocated by activity groups according to the distribution at Step 5 above [Col 16 & Col 17].

The annual distribution of FISIM by sector

FISIM calculated for the four quarters is added for the year.

IV.2.3. Data gaps and way forward

1. To use the interbank rate as the reference rate instead of the repo rate as suggested in SNA.
2. To use data on deposits and loans in main partner countries to estimate import of FISIM.

Figure IV.1: Mauritius – Distribution of FISIM by sector

		Col 1	Col 2	Col 3	Col 4 (Col 3/1000)	Col 5	Col 6 (Col 4*Col 5)	Col 7	Col 8	Col 9 (Col 7*Col 8)	Col 10 (Col 9-Col 6)	Col 11 (Col 7-Col 4)	Col 12 (Col 11*Col 2)	Col 13 (Col 10-Col 12)	Col 14 (Col 13/13169)	Col 15	Col 16 (Col 14+Col 15)	Col 17 (Col 16*1567)
		Institution	Lombard/ Key Repo Rate	Total Deposits (Rs 000)	Total Deposits (Rs Mn)	Interest Rate	Interest paid on deposits (Rs Mn)	Loan (Rs Mn)	Interest Rate	Interest received (Rs Mn)	Calculated FISIM on actual rates	Loans less deposits (Rs Mn)	Loans less deposits *repo rate (Rs Mn)	Calculated FISIM minus (Loans less deposits based on repo rate) (Rs Mn)	Distribution	Breakdown of Public Non Financial Corporations	Final distribution	Published FISIM (Rs Mn)
	TOTAL published FISIM																	**3,178**
	Less Export (FISIM from abroad all banks)														**0.51**			**1,611**
	FISIM to be distributed			**385,492,198**	**385,492**		**31,996**	**201,318**		**28,129**	**(3,867)**	**(184,174)**	**(17,036)**	**13,169**	**1.00**		**1.00**	**1,567**
Household				**135,746,855**	**135,747**		**11,267**	**19,236**		**2,867**	**(8,400)**	**(116,510)**	**(10,777)**	**2,377**	**0.18**		**0.18**	**283**
	Personal	HH	9.25	117,008,524	117,009	8.30	9,711.71	14,603.90	14.50	2,117.57	(7,594.14)	**-102,405**	**-9,472**	**1,878**	**0.14**		**0.14**	**223**
	Professional	HH	9.25	964,353	964	8.30	80.04	628.20	14.50	91.09	11.05	**-336**	**-31**	**42**	**0.00**		**0.00**	**5**
	Other customers	HH	9.25	17,773,978	17,774	8.30	1,475.24	4,004.30	16.45	658.51	(816.73)	**-13,770**	**-1,274**	**457**	**0.03**		**0.03**	**54**
Government				**2,122,585**	**2,123**		**176**	**44,314**		**6,426**	**6,249**	**42,192**	**3,903**	**2,347**	**0.18**		**0.18**	**279**
	State and Local Government	NFC	9.25	434,385	434	8.30	36.05	55.70	14.50	8.08	(27.98)	**-379**	**-35**	**7**	**0.00**		**0.00**	**1**
	Statutory and parastatal bodies		9.25	1,688,200	1,688	8.30	140.12	44,258.50	14.50	6,417.48	6,277.36	**42,570**	**3,938**	**2,340**	**0.18**		**0.18**	**278**
Industry Group				**247,622,758**	**247,623**		**20,553**	**137,767**		**18,836**	**(1,717)**	**(109,856)**	**-10,162**	**8,445**	**0.64**		**0.64**	**1,005**
	Public Non Financial Corporations	NFC	9.25	13,745,130	13,745	8.30	1,140.85	6,886.50	16.00	1,101.84	(39.01)	**-6,859**	**-634**	**595**	**0.05**		**0.00**	**-**
	Agriculture & Fishing	NFC	9.25	2,250,645	2,251	8.30	186.80	9,504.90	15.13	1,437.62	1,250.81	**7,254**	**671**	**580**	**0.04**		**0.04**	**69**
	Manufacturing	NFC	9.25	5,898,913	5,899	8.30	489.61	16,091.50	15.41	2,478.90	1,989.29	**10,193**	**943**	**1,046**	**0.08**		**0.08**	**124**
	Infrastructure (energy)	NFC	9.25	1,311,046	1,311	8.30	108.82	5,297.50	14.88	788.00	679.19	**3,986**	**369**	**310**	**0.02**	0.02	**0.04**	**62**
	Construction	NFC	9.25	3,161,854	3,162	8.30	262.43	25,775.80	14.50	3,737.49	3,475.06	**22,614**	**2,092**	**1,383**	**0.11**		**0.11**	**165**
	Traders (wholesale and retail trade)	50HH/50NFC	9.25	8,183,699	8,184	8.30	679.25	21,265.30	15.75	3,349.28	2,670.04	**13,082**	**1,210**	**1,460**	**0.11**		**0.11**	**174**
	Tourism(Hotels and restaurants)	NFC	9.25	3,333,032	3,333	8.30	276.64	21,339.10	14.63	3,120.84	2,844.20	**18,006**	**1,666**	**1,179**	**0.09**		**0.09**	**140**
	Transport	NFC	9.25	1,005,435	1,005	8.30	83.45	1,694.10	15.38	260.47	177.02	**689**	**64**	**113**	**0.01**		**0.01**	**13**
	Financial and business services	FC	9.25	24,229,351	24,229	8.30	2,011.04	16,216.80	15.00	2,432.52	421.48	**-8,013**	**-741**	**1,163**	**0.09**	0.02	**0.11**	**172**
Business services			9.25	183,826,497	183,826	8.30	15,257.60	12,806		0.00	(15,257.60)	(171,020)	(15,819)	2,650	**0.20**	0.01	**0.21**	**328**
	Regional Development certificate holders	NFC	9.25	21,668	22	8.30	1.80			0.00	(1.80)	**-22**	**-2**	**0**	**0.00**		**0.00**	**0**
	Regional headquarters certificate holders	NFC	9.25	8,202	8	8.30	0.68	0.50		0.00	(0.68)	**-8**	**-1**	**0**	**0.00**		**0.00**	**0**
	Global Business Licence Holders (Offshore)	NFC	9.25	180,659,588	180,660	8.30	14,994.75	11746.8	16.38	1,923.54	(13,071.21)	**-168,913**	**-15,624**	**2,553**	**0.19**		**0.19**	**304**
	Information Communication and Technology/ New economy	NFC	9.25	1,907,705	1,908	8.30	158.34	670.00	15.88	106.36	(51.98)	**-1,238**	**-114**	**63**	**0.00**		**0.00**	**7**
	Freeport enterprise certificate holders	NFC	9.25	1,226,287	1,226	8.30	101.78	388.50	15.00	58.28	(43.51)	**-838**	**-77**	**34**	**0.00**		**0.00**	**4**
	Modernisation and expansion enterprise certificate holders	NFC	9.25	675	1	8.30	0.06	0.10	16.07	0.02	(0.04)	**-1**	**0**	**0**	**0.00**		**0.00**	**0**
	Human resource development certificate holders	NFC	9.25	2,372	2	8.30	0.20	0.10		0.00	(0.20)	**-2**	**0**	**0**	**0.00**		**0.00**	**0**
Education			9.25		-		-			0.00	-							
	Education	NFC	9.25	489,448	489	8.30	40.62	486.20	13.50	65.64	25.01	**-3**	**0**	**25**	**0.00**		**0.00**	**3**
Health			9.25		-		-			0.00	-							
	Health development certificate holders	NFC	9.25	21,088	21	8.30	1.75	74.90	16.63	12.45	10.70	**54**	**5**	**6**	**0.00**		**0.00**	**1**
Other services			9.25		-		-			0.00								
	Media, entertainment and recreational activities	NFC	9.25	166,620	167	8.30	13.83	328.50	15.50	50.92	37.09	**162**	**15**	**22**	**0.00**		**0.00**	**3**
	Total			**385,492,198**	**385,492**		**31,996**	**201,318**	**-**	**28,129**	**(3,867)**	**(184,174)**	**(17,036)**	**13,169**	**1**	**-**	**1**	**1,567**

Annex 5. Informal sector accounting

V.1. AFRISTAT: current Practices followed by AFRISTAT countries

This section describes the process of inclusion of the informal sector data in the national accounts of Member States of AFRISTAT. It also summarizes the various sub regional and regional forwards on the extent of this important and growing sector in Africa.

Acronyms used in this section

AFRISTAT	Economic and Statistical Observatory for sub-Saharan Africa
CAS	African Centre for Statistics
DSF	Statistical Reporting And Tax
EBE	Gross Operating Surplus
ECA	Economic Commission for Africa
ERETES	supply-use balances and input-output table
GDP	Gross Domestic Product
GSIA	Working Group on Informal Sector in Africa
IC	Intermediate consumption
ILO	International Labour Organization
NSO	National Statistic Office
SNA 93	System of National Accounts 1993

V.1.1. Issues under consideration

As in most developing countries, the informal sector plays an important economic and social role in the economies of member states of AFRISTAT. No analysis in terms of employment, poverty or economic dynamics can be carried out well without knowledge of the sector. In 2009, the ILO estimated that about 60-70% of jobs were created by the urban informal sector in sub-Saharan Africa and the informal sector also contributes to the increase of the natural wealth for up to 20% of GDP.

Despite its importance, the informal sector did not have a reliable, comprehensive and regular measurement system. In the absence of data on the informal sector, statistical and tax reporting remained the most recurring sources to develop reliable national accounts in the AFRISTAT member States, though they do not capture the actors in the formal sector. The data on the informal sector are obtained either by difference or introduced via the use of surveys on employment and the informal sector. The latter are, in fact, not conducted regularly.

However, since the adoption of the 1993 SNA, all countries seek to incorporate more and more the informal sector in national accounts. They are supported by AFRISTAT that focuses its activities in the field of capacity building through training workshops and technical support missions, but also through methodological documents that would be developed and maintained on a regular basis.

The main information on the informal sector relevant to the economic and social analysis comes from increasingly used employment surveys (step 1) and informal sector surveys (step 2) or other similar devices. These include, inter alia, the following:

- characteristics of the informal sector by major categories of activities with knowledge of employment and other operating factors (production, value added, investment, capital, etc.);
- contribution of informal sector to the national economy;
- interdependence with the formal sector;
- characteristics of employment in the informal sector and informal employment and its role in the labour market.

This information is supplemented by data from the structures involved in agricultural activities. It is, therefore, essential to make an inventory of information sources available in the country to better understand the informal sector. Unfortunately, in many countries, efforts are still needed to support the regular surveys (surveys on employment and the informal agricultural survey) at the national level.

V.1.2. Data requirements, availability, gaps and meeting challenges to fill data gaps

Estimates of aggregate indicators and the informal sector can be made from various statistical sources and by different methods.

A direct estimate can be obtained through specific surveys designed for a comprehensive collection of data in the sector. These are multi-phase surveys, sometimes referred to as 1-2 surveys. In the first phase a household survey is used to identify the owners of informal enterprises and a special survey of owners is carried out in phase 2. This is the approach used by many countries but other countries are choosing to focus on the facts on the ground, from surveys measuring the activity to the industries in which the informal sector is represented significantly. Compared to the first approach, it is obviously a second-best solution, especially in the current context of developing countries where surveys are not conducted regularly. But if the financial constraint is lifted, the direct approach with a series of sub-annual surveys on employment and the informal sector is the most desirable.

The data on the informal sector in AFRISTAT member States does not include agricultural activities as suggested by the Delhi Group and the International Labour Organization (ILO). Indeed, the Delhi Group[49]has proposed a total of 10 recommendations to help ensure a minimum comparability at international level. Reviewing these recommendations in part is required on how to process data on employment and the informal sector by sector of activity.

In the non-agricultural sector, informal sector is predominant in the following industries: slaughtering, processing and preservation; food manufacturing; manufacture of paper, cardboard, print edition; furniture making; craft; repair services; accommodation and food services; transport; buildings; and especially trade.

The direct approach to the estimation of aggregates and indicators of the informal sector is to first identify potential household heads of informal production units (in the survey on employment). This step is not only to develop the matrix of domestic jobs, but also to establish more rigorously the basic frame of informal production units. The survey on the informal sector will be based on informal production units. These are direct information obtained from surveys or multi-phase surveys.

[49]Delhi group on informal employment and informal sector (January 2010), Manual on surveys, 389 pages.

Alongside these actions, other sources of information on the informal sector should be exploited, for example through specific surveys. The survey of buildings for example, can provide information on the part of the informal sector of the building activity. If one assumes that buildings constructed without building permits, which represent a certain share of all constructions, are in part of the informal economy, one can estimate the share of informal constructions. But as can be seen, such investigations may require making assumptions, which can be quite strong and based on weak information.

In brief, the surveys are statistical sources rich in information. Unfortunately, they are made on an irregular basis and require substantial resources (human and financial). However, national accounts need information that is collected regularly. Compilation of national accounts from inadequate data sources requires a clear methodology for data integration.

V.1.3. Compilation practices

The methodology of integrating the informal sector is mainly based on the 1993 SNA. It is often based on the production and expenditure approaches. In ERETES, used by most AFRISTAT member States, informal mode is one of seven production methods considered.

The mode of compilation adopted for production accounts by activities, need to meet three objectives: *(i)* differentiating the production functions in the economic activities; *(ii)* isolating informal activities and underground activities; and *(iii)* cross-classification between activities and institutional sectors.

Thus, in a household survey of 1-2 type (or other multi-phase surveys) for each identified informal activity, we identify the following variables:

- goods and services produced;
- production by commodity;
- total value of intermediate consumption;
- list of goods and services included in intermediate consumption (IC) and values;
- the number of hours worked;
- salaries paid;
- taxes paid;
- value and gross operating surplus.

From this information, we derive the following ratios:

- output per capita;
- overall technical coefficient;
- coefficient technical product used in IC;
- wage rate;
- tax rate;
- EBITDA rate and the rate of value added;
- investment rate.

A key product expected from this exercise is the matrix that establishes the employment relationship between survey data and the production account with an assumption of constancy of the production function. Then there is confrontation between supply and demand to confirm

the correctness of the value of informal production. Finally, the compilation of the operating account of the informal sector completes the process.

V.1.4. Way forward

As in many developing countries, the informal sector is not well measured in AFRISTAT member States. Specific surveys on the informal sector are often not repeated and coverage is limited to major cities. The costs of these surveys do not encourage their periodic repetition as required by international standards. Alternative approaches are often developed to compensate for the lack of data and meet international requirements. Under these conditions, it is challenging to harmonize the methodological approaches of countries to facilitate comparisons as well as to contribute to a better assessment of the informal sector.

Therefore, the joint ACS/ECA and AFRISTAT working group to develop harmonized methodological approaches in the activities of the informal sector in Africa is very encouraging and has been instrumental in the growing efforts to measure the informal sector in African states. The plans to test some pilot countries through a series of tools and methodological approaches to help facilitate the comparison of data on employment and the informal sector and data integration of the informal sector in developing national accounts have been initiated.

In its strategic planning work for the period 2011-2015, AFRISTAT attaches great importance to measuring the informal sector. The technical support to assist its member states in the organization of informal sector surveys and the statistical capacity of NSOs will be strengthened. The Methodological Guide for the Development of National Accounts in the Member States of AFRISTAT of 2012 pays special attention on informal sector.

V.2. Zimbabwe: adjustments for GDP exhaustiveness in Zimbabwe

V.2.1. Issues under consideration

The issue under consideration is the exhaustiveness of the coverage of all economic activities that fall within the production boundary of 1993 SNA in calculating the gross domestic product of Zimbabwe.

The Zimbabwe National Statistics Agency (ZIMSTAT), formerly the Central Statistical Office (CSO) largely follows the 1993 SNA. The 1993 and 2008 versions of the SNA extend the production boundary especially in the household sector. These increase the gross domestic product (GDP) due to reclassification of items from intermediate consumption to capital formation and final consumption. However, most of the under-coverage in Zimbabwe takes place in what also falls within the production boundary of the 1968 SNA. It is not easy to isolate the reasons for under-coverage in Zimbabwe. However, evidence that there is under coverage comes, for example from the consideration of numbers employed from the sources on which the estimates of GDP are based (mainly establishment based surveys) and the household based surveys such as the population and housing census and the labour force survey. It also comes from comparing the supply of products that are used in production and their recorded use. An example is cement of which there are consistently more supplies than those accounted under recorded uses such as intermediate consumption, exports or inventory accumulation, leading to the conclusion that construction activity is under-covered in the GDP.

V.2.2. Data requirements, availability, gaps and meeting challenges

Ideally for exhaustive coverage of GDP, information according to industrial statistics survey questionnaires should be available to the compiler of national accounts with respect to every establishment in the economic territory, including the unincorporated enterprises. These questionnaires include values (and possibly, also in quantities) of production or variables such as sales and changes in inventory, and values of intermediate inputs used in the production. Additionally information on capital formation and employment is also collected when the data is obtained through such a survey.

In Zimbabwe, industrial production questionnaires are sent to or administered on establishments engaged in mining, manufacturing, electricity and water supply and construction. Less detailed questionnaires are sent to establishments engaged in the services sector. Agriculture statistics are largely collected through questionnaires administered on a sample of households in the peasant sector and on a sample of plots in the resettled, former commercial sector.

The register for the census of industrial production questionnaire is incomplete and does not keep a timely track of births and deaths of enterprises and establishments. The smaller establishments are particularly difficult to keep track of. Backyard, perambulatory or establishments with no fixed premises, as well as those of fixed premises in congested “industrial parks” have never been included in the statistical register. Response rates are poor, lately being consistently below 50% by head count.

V.2.3. Compilation practices

Previously in order to estimate production by unincorporated enterprises, information was obtained from the Household Income, Consumption and Expenditure Survey (HICES) which was meant to be conducted once every five years. But this schedule was disrupted during the

years of economic difficulties. Data on outputs and details of inputs is obtained from the HICES. The estimate of contribution to GDP from this source, which was regarded as an estimate of the contribution of the informal sector was then added to the "formal sector" of the year in which the HICES was conducted. The ratio of "informal" to "formal" sector contributions was calculated and used for making estimates for non-HICES years.

An exercise has been carried out to assess the undercount in GDP on account of under-reporting in the formal sector and under-estimation in the informal sector. The following are the results of this exercise.

The employment figures are available from the establishment based Quarterly Employment Inquiry (QEI) and the same have been compared with those from the household based Labour Force Survey (LFS). The LFS figures have been split among formal, informal and household workers. Gross value added per worker (GVAPW) figures calculated for each broad kind of activity group separately for formal sector and for informal sector have been applied on the respective workers component to obtain the GVA.

Formal sector

If coverage of the formal sector through the establishment based QEI were adequate then the formal sector figures from the LFS would be approximately equal to those of the QEI for each kind of activity group. However, this has not been so, as under-count in employment numbers is visible even in the case of formal sector. The difference in the numbers of employment between LFS and QEI has been multiplied by the GVAPW to estimate the under coverage of GVA in the formal sector.

Informal and household sector

The informal workers and workers in the household sector are both regarded as informal. Data from the census of industrial production indicates that establishments with more than 9 employees had 1.9 times the GVAPW of those with less than 9, in the manufacturing sector in 2005. The informal sector establishments are not expected to be more productive than the small formal sector establishments. Hence the GVAPW for the informal sector has been estimated to be about half of that of the formal sector.

The tables below illustrate the results of the exercises.

Figure V.1: Zimbabwe – Numbers of workers according to LFS 2004

Industry	Formal sector workers	Informal sector workers	Household workers	Total workers from LFS
1	2	3	4	5=2+3+4
Agriculture, forestry and fishing	236,190	13,355	3,057,781	3,307,326
Mining and quarrying	58,670	32,536	0	91,206
Manufacturing	182,062	104,486	4,547	291,095
Electricity and water	9,585	2,465	0	12,050
Construction	36,763	45,718	2,375	84,856
Wholesale and retail trade, hotels and restaurants	133,682	75,112	542	209,336
Transport, storage and communication	90,029	16,371	0	106,400
Finance, real estate and business services	45,202	3,024	362	48,588
Community, social and personal services	409,414	417,940	89,816	917,170

Industry	Formal sector workers	Informal sector workers	Household workers	Total workers from LFS
1	2	3	4	5=2+3+4
Total	1,201,597	711,007	3,155,423	5,068,027
Total excluding agriculture, forestry and fishing	965,407	697,652	97,642	1,760,701

Figure V.2: Zimbabwe – Estimated GVAPW of the formal sector

Industry	QEI Emp. Ave	GVA of formal sector ('000 USD)	GVAPW in formal sector (USD)
1	6	7	8 = 7/6*1000
Agriculture, forestry and fishing			
Mining and quarrying	52,100	604,157	11,596
Manufacturing	166,200	604,361	3,636
Electricity and water	16,300	147,402	9,043
Construction	38,100	59,466	1,561
Wholesale and retail trade, hotels and restaurants	102,300	306,432	2,995
Transport, storage and communication	37,200	465,230	12,506
Finance, real estate and business services	30,700	771,075	25,116
Community, social and personal services	460,000	1,399,923	3,043
Total			
Total excluding agriculture, forestry and fishing	902,900	4,358,047	4,827

Figure V.3: Zimbabwe – Estimated undercount in formal sector GVA

Industry	QEI Emp. June (No.)	LFS ave. emp in formal sector (No.)	Formal sector undercount in emp. in QEI (No.)	Under-count in formal sector GVA ('000USD)
1	9	10=2*6/9	11=10-6	12=11*8/1000
Agriculture, forestry and fishing				
Mining and quarrying	50,100	61,012	8,912	103,346
Manufacturing	163,100	185,522	19,322	70,263
Electricity and water	16,200	9,644	-6,656	-60,189
Construction	37,900	36,957	-1,143	-1,784
Wholesale and retail trade, hotels and restaurants	102,200	133,813	31,513	94,394
Transport, storage and communication	36,300	92,261	55,061	688,605
Finance, real estate and business services	31,500	44,054	13,354	335,406
Community, social and personal services	464,200	405,710	-54,290	-165,222
Total				
Total excluding agriculture, forestry and fishing	901,500	968,973	66,073	1,064,818

Figure V.4: Zimbabwe – Estimated GVA of informal sector

Industry	Total number of workers in informal sector	GVAPW infl. Sector (USD)	GVA of informal sector (‘000USD)
1	13=3+4	14=8*0.5	15=13*14
Agriculture, forestry and fishing			
Mining and quarrying	91,206	5,798	528,817
Manufacturing	286,548	1,818	520,994
Electricity and water	12,050	4,522	54,484
Construction	82,481	780	64,367
Wholesale and retail trade, hotels and restaurants	208,794	1,498	312,713
Transport, storage and communication	106,400	6,253	665,329
Finance, real estate and business services	48226	12558	605633
Community, social and personal services	827,354	1,522	1,258,948
Total excluding agriculture, forestry and fishing	1,663,059		4,011,287

Figure V.5: Zimbabwe – Total under-count in GVA

Industry	Total GVA (published) (‘000USD))	Total undercount in GVA (‘000USD)	Percentage of under-count
1	16	17=12+15-(16-7)	18
Agriculture, forestry and fishing	1,417,534		
Mining and quarrying	764,756	471,565	62
Manufacturing	755,451	440,167	58
Electricity and water	148,891	-7,194	-5
Construction	71,646	50,404	70
Wholesale and retail trade, hotels and restaurants	403,200	310,340	77
Transport, storage and communication	588,899	1,230,265	209
Finance, real estate and business services	915,034	797,081	87
Community, social and personal services	1,440,646	1,053,003	73
Less financial intermediation services indirectly measured	-349,066		
Net other taxes on production	142,036		
Net taxes on products	856,047		
GDP	7,155,074	4,345,630	61

Comments on the tables

LFS here stands for the household based Labour Force Survey conducted in **June 2004**. QEI stands for the Quarterly Employment Inquiry, conducted every quarter on all establishments in the statistical office’s business register. In the above tables “ave” is average figures for the four quarters of 2004. The LFS average numbers of employees are estimated by multiplying each survey figure relating to June 2004 by the ratio of the corresponding average QEI to June QEI figures. The assumption is that the seasonality in the employment figures would be the same in the LFS as in the QEI figures.

The gross value added (GVA) of the formal sector, (7) of table 49, differs from the published GVA, (17 of table 52), by the amount estimated to be contributed by the informal sector, and

based on the Income Consumption and Expenditure Survey (ICES). For these figures, the contributions were based on the 2001/02 ICES.

According to the above figures the undercounting of the gross domestic product (GDP) in Zimbabwe was about 61 percent of the published GDP figures. The transport, storage and communication sector is the most undercounted sector both in value and percentage terms with USD1.23 billion, or 209% of the published USD 0.59 billion being unrecorded. Community, social and personal services are the next highest contributors to the unrecorded economy leaving out USD1.05 billion or 73% unrecorded. Finance, real estate and business services contribute USD 0.80 billion while mining and manufacturing add USD0.47 billion and USD0.44 billion, respectively. Altogether USD 4.3 billion was unrecorded, against the USD 7.16 recorded.

V.2.4. Way forward

Improvements in this method include estimation of the GVAPW for the informal sector for each kind of activity. Furthermore, work needs to be done within the framework of a Supply and Use Table (SUT) so that inputs and final uses get appropriately adjusted.

The method will be refined and applied using the 2011 LFS, which is being processed, and the estimates will be examined through SUT tables to be constructed.

V.3. INSEE: informal sector estimation through ERETES

Here is how the ERETES proceeds to implement the informal sector indirect approach measure:

- First of all measuring jobs in informal sector according to the IOT recommendations: e.g. thanks to different surveys, a labour matrix "activities X status" (declared and non-declared workers, self-employed, employers, unpaid family workers) has been built, in which informal sector activities are often obtained as a balancing item. Other surveys (of the 1-2-3 kind) or monographic studies allowed to draw then ratios per capita by industry, such as gross output per capita, wages and technical coefficient.
- ERETES provides a specific worktable, named Industry Account table, which makes the Informal Sector estimation easier on the basis of the employment matrix and the ratios, which are available as soon as they are loaded in its database.
- Within this worktable each industry is disaggregated into different production modes[50] arranged in columns. They enable to put apart accurate information (provided for example by formal sector) on one hand, from less accurate one (informal sector) on the other one.
- For example, the table here below shows in bold data sources about India's agriculture industry, as it appears in ERETES Industry Account table after loading.

Figure V.6: India – Agriculture industry account in ERETES after data sources loading

	Firms Formal Sector	Reconstructed Companies	Informal Sector	Household for own account	Total
Output	**401,280**				401,280
Intermediate consumption	**71,280**				71,280
Gross value added	**330,000**		**5 240 000**	**30 000**	5,600,000
Wages	**156,723**				156,723
Net taxes	**12,841**				12,841
Gross operational surplus	**160,436**				160,436
Workforce	**110,000**	**20 000**			130,000
Undeclared workforce	**2,460,000**		**336 300 000**		338,760,000
Ratios					
Wage/workforce	**0.061**		**![51] 0.000**		0.000
GVA/workforce	**0.128**				0.017
Output GVA	**1.216**				0.072
IC/output	**0.178**		**! 0.000**	**! 0.000**	0.178

- Each data as well ratios resulted from the surveys exploitation, as well as the results from ERETES concerning informal sector and own account production.

Figure V.7: India – Economic ratios extracted from the survey exploitation for the agriculture industry

Ratios	Informal Sector	Household
Output/GVA	1,359	1,283
Wage/workforce	8 450	

Figure V.8: India – Informal sector and household for own account estimation

[50] "Construire les comptes de la Nation - © Ed. Economica, 1996" *of* Michel Séruzier.

[51] "!" symbol means that cell which display calculus contains also inside a data source which may differ with the screen value. The values inside the cells with "!" symbol are given by table 2 below.

	Firms formal sector	Reconstructed companies	Informal sector	Household for own account	Total
Output	**401,280**		***7,120,380***	***38,490***	7,560,150
Intermediate consumption	**71,280**		***1,880,380***	***8,490***	1,960,150
Gross value added	**330,000**		**5,240,000**	**30,000**	5,600,000
Wages	**156,723**		***2,841,274***		2,997,997
Net taxes	**12,841**				12,841
Gross operational surplus	**160,436**		***2,398,726***	***30,000***	2,589,162
Workforce	**110,000**	**20 000**			130,000
Undeclared workforce	**2,460,000**		**336,300,000**		338,760,000
Ratios					
Wage/workforce	**0.061**		***![2] 0.008***		0.009
GVA/workforce	**0.128**		***0.016***		0.017
Output GVA	**1.216**		***! 1.359***	***! 1.283***	1.350
IC/output	**0.178**		***0.264***	***0.22***	0.259

- The ERETES surplus provides a framework within which the national accounts compiler has the available data at his fingertips and can disaggregate the agriculture industry in several production modes arranged next to each other. That enables to make several analyses (in column: intra-consistency controls inside a mode; in row: inter - consistency control between them).
- It remains to clarify the reconstructed companies' production mode. The information provided by the household survey shows there are 130 thousand declared workers in the formal sector instead of 110 thousands declared by formal firms. We assume some firms are new and have forgotten or have been delayed to send their activity report. So we apply the formal sector production mode ratios to the reconstructed one:
    - We apply the formal sector workforce gross value added productivity to the 20 thousand workers of the reconstructed mode and we obtain 2 568 million rupees of GVA.
    - On this GVA we apply then the formal sector Output/GVAratio to get the reconstructed mode total output of 3,123 million rupees.
    - We have then easily the intermediate consumption (output minus GVA) and the value added decomposition (wages: 20 thousand x declared wage per worker 8,450 rupees; net taxes: reconstructed total output 3,123 multiplied by the formal sector net taxes/output ratio).

Figure V.9: India – Reconstructed companies estimation

	Firms Formal Sector	Reconstructed Companies	Informal Sector	Household for own account	Total
Output	**401,280**	***3,123***	***7,120,380***	***38,490***	7,563,273
Intermediate consumption	**71,280**	***555***	***1,880,380***	***8,490***	1,960,705
Gross value added	**330,000**	***2,568***	**5,240,000**	**30,000**	5,602,568
Wages	**156,723**	***1,680***	***2,841,274***		2,999,677
Net taxes	**12,841**	***100***			12,941
Gross operational surplus	**160,436**	***788***	***2,398,726***	***30,000***	2,589,951

[2] "!" symbol means that cell which display calculus contains also inside a data source which may differ with the screen value.

Workforce	**110,000**	**20,000**			130,000
Undeclared workforce	**2,460,000**		**336,300,000**		338,760,000
Ratios					
Wage/workforce	**0.061**	***0.084***	***! 0.008***		0.009
GVA/workforce	**0.128**	***0.128***	***0.016***		0.017
Output GVA	**1.216**	***1.216***	***! 1.359***	***! 1.283***	1.350
IC/output	**0.178**	***0.178***	***0.264***	***0.22***	0.259

Some remarks:

- In this case we assume agriculture industry total GVA is unknown because we accepted a 2,568 million rupees increase compared to data available.
- Wage per worker between formal sector and reconstructed one differ due to composition effects. Reconstructed companies are assumed to have only declared workers, there are paid the official rate wage whereas the formal sector rate ratio includes undeclared worker paid a lower rate.
- Output/GVA ratio shows formal sector is orderly more efficient than both household for own account and informal sector. One explanation may be formal sector workers are ten times better paid than informal sector ones and workers for own account have more interest in work so they are both more efficient than those in the underpaid informal sector.

Annex VI. Intermediate consumption by products

VI.1. Burkina Faso: intermediate consumption

VI.1.1. Issues under consideration

The issue under consideration is the estimation of intermediate consumption, which must be seen under the double view of supply and uses of intermediate consumption. On the one hand, there is intermediate consumption by product estimated using the commodity flow approach and, on the other hand, the uses of products as intermediate consumption by industries. The total uses of a product by industries must be equal to the amount of the same product estimated from the commodity flow approach.

VI.1.2. Data requirements, availability, gaps and meeting challenges to fill data gaps

Burkina national accounts currently follow 1993 SNA concepts.

The data required for the commodity flow approach by product are:

- on the supply side: domestic production, imports, trade and transport margins, and taxes less subsidies on products;
- on the uses side: intermediate consumption, final consumption, capital formation, and exports.

In general, apart from trade and transport margins, intermediate consumption, and capital formation, other data are either available from information supplied by industries, central and local government, and foreign trade statistics or they have been independently estimated – as is the case with final consumption and informal sector production.

For products, the balancing process (described later in "balancing issue") determines the amount of intermediate consumption.

For activities, the total amount of intermediate consumption is in general available from company accounts and statistical surveys or it has been estimated by other means as is the case with the informal sector. Some formal industries provide a disaggregation of their intermediate consumption by product (electricity, water, gas, etc.). The issue is how to disaggregate and reconcile these reported amounts with the intermediate consumption estimated from the commodity flow approach by product.

VI.1.3. Compilation practices

SNA recommends using the previous year accounts structure to estimate data for the current year. In a first step in the commodity flow approach, we follow this recommendation to estimate intermediate consumption, trade and transport margins, and capital formation. In a second step, we achieve balance by adjusting the gap according to the global structure of intermediate consumption, final consumption and capital formation. The sum of trade and transport margins estimated on the uses side is carried forward to the supply side. In general, the other data (domestic production, imports, taxes, subsidies, and exports) are not modified.

Intermediate consumption by kind of activity is disaggregated by extrapolating the previous year's structure of intermediate consumption by kind of activity. The reconciliation is done in the general framework of inter-industry exchanges table.

These first estimates of intermediate consumption may subsequently need to be modified to be consistent with the global synthesis of the national accounts. This can lead to reworking some commodity flows to reconcile supply and use.

As a precaution, official data are not altered during this reconciliation process. Official data are: imports and exports of goods and services, taxes and subsidies, and all the official data provided in detail by government, financial and non-financial societies to some extent. The data that could be modified in general are final consumption and the informal sector accounts.

VI.2. Mozambique: intermediate consumption

VI.2.1. Issues under consideration

Mozambique currently follows the 1993 SNA concepts.

In Mozambique, the majority of households are devoted to subsistence agriculture, i.e. they produce mainly for own consumption. Their work is not mechanized, and they almost never use pesticides and fertilizers. The same is true for manufacturing activities in households; the production is mainly manual. Examples are: the transformation of grains into flour (maize, millet and cassava too); the preparation of traditional beverages; the manufacture of sweepers and bags whose main raw material is grass. Thus, one can conclude that intermediate consumption (IC) is directly linked to employment, and for most kinds of activity, the main production cost is the payment of salaries.

For estimating IC in household production we paid attention to the above mentioned factors and IC is assumed to be zero. For agriculture in general IC is the sum of purchases; it reflects the value of produced products used up by the productive units. For manufacturing according to the statement of accounts, IC is equal to the purchases values of raw- material. The value of IC is valued by the technical coefficient (P2 IC/P1 Output).

It is important to note here that in Mozambique, all big companies are automatically in the sample and the small ones are sampled according to number of employees, turnover, etc. There is a file of all statistical units which are more than 28,000 units. From this file (like master sample) is obtained the sample of survey. The above coefficients are obtained excluding the extreme values (1^{st} and 5^{th} quintiles) at ISIC classification level.

VI.2.2. Data requirements, availability, gaps and meeting challenges to fill data gaps

For the household sector, the household budget survey (HBS), is the main data source. It occurs every 5 years. For the years with no HBS, we use the ratios of the base year.

The existence of enterprises information is a prerequisite for success. Although in Mozambique, we conduct yearly an enterprise survey, the response rate is still a big problem to solve.

VI.2.3. Compilation practices

Each industry has its particular characteristics, but in general terms, IC is compiled according to the purchases of goods and services used up during the productive process.

The National Institute of Statistics (INE) conducts an enterprise survey, but it also uses information compiled by a private organization enterprise, which ranks the biggest 100 enterprises and provides their statement of accounts.

VI.2.4. Way forward

After recognizing the problems of non-response to the enterprise survey, INE took some actions to improve the response rate. Since 2007 the scenario has changed a little bit and the tendency is to improve.

National accounts are in the process of changing its base year from 2003 to 2009, and one of the improvements is precisely the quality of the annual enterprise survey.

In order to avoid duplication and reduce the reporting burden on the respondents, the INE is working together with the Revenue Authority to share records.

Annex VII. Livestock products – output, change in inventories and GFCF

VII.1. Congo and Democratic Republic of the Congo: measuring output of livestock in national accounts

VII.1.1. Issues under consideration

A harmonization of the treatment of livestock was undertaken by AFRISTAT for its member countries ten years ago. That is to enhance comparability among members' data. That method is applied to both the Congo and the Democratic Republic of the Congo. This section provides an illustration of how livestock output is measured and how this output is allocated between various intermediate and final uses.

VII.1.2. Data requirements, availability, gaps and meeting challenges to fill data gaps

Required information is: (i) the size of herd at the beginning and at the end of year; (ii) exploitation rate of the herd; that is the total number of animal that went out of the herd during a year (for slaughter, for export, etc.); (iii) average weight of animal by type of transaction; and (iv) ratio of meat to animal weight.

VII.1.3. Compilation practices

For an illustrative purpose let us consider the case of cattle through a very simple example as follows. The size of the cattle herd at the beginning of the year is 2,000 heads and at the end of the year it grows up to 2,100 heads. A recent livestock survey provides the following data:

- Exploitation rate of the herd: 10 %;
- Average weights of the animals exported or taken along to slaughter: 200 kg,
- Ratio of meat to cattle weight: 70%.

Note that the tradesmen of cattle buy them on average at 60 dollars per cattle and convey them to the points of sale where they take an average margin per animal of 20 dollars; a tax of 2 dollars per animal is also perceived by the Government when it is sold in the local market or exported.

Note also that the cattlemen took for their own consumption 50 animals and they imported 10 animals of an improved race at 100 dollars per animal which is exonerated of taxes; they are to be integrated to the cattle herd at the end of the year.

Notice also that the production of cattle comprises two items: (i) exploited growth (production A): this production is obtained by multiplying the average number of animal during the year by the exploitation rate; (ii) non-exploited growth (production B) that is the production measured by the growth of the herd out of which 67% is supposed to be the Gross Fixed Capital Formation (GFCF) and 33% the change in inventories.

It is asked to draw up the balance of cattle in number of animals as well as in value and to give the production in quantity of cattle meat in this economy.

Figure VII.1: Congo – Measuring output of livestock in national accounts

OPERATION	No. of animals	Prices	Value	Explanation
Production A	205	60	12,300	205=0.10 x (2000+2100)/2
Production B	100	60	6,000	100 = 2100-2000
Import	10	100	1,000	
Marge of transport	_____	___	_____	
Marge of trade	_____	20	3,100	3100 = [(135+20) x 20]
Taxes	_____	2	310	310 = [(135 +20) x 2]
TOTAL SUPPLY	315	_____	22,710	
Intermediate consumption	135	82	11070	82= 60 +20 +2
Final consumption expenditure of household	50	60	3,000	
Gross capital formation	77	(60; 100)	5,020	77= 67 + 10 5020 = (67 x 60 +10 x 100)
Change in inventories	33	60	1,980	
Exports	20	82	1,640	82= 60 +20 +2
TOTAL USE	315	_____	22,710	

The production of cattle meat is: 135 x 200 kg x 0, 70 = 18,900 kg. With regard to the livestock, all the movements of cattle (or poultry) during one year are taken into account. Indeed, the exploitation rate of the herd (or the poultry) measures the ratio of the whole of the animals (poultry) which leave the herd during the year either to be exported or to be used locally (slaughter, animal used for transport, etc.) on the average number of the herd. The change in the inventories gives the result of other movements (birth, death, etc.), which gives what is called non-exploited growth. The method is therefore complete.

VII.1.4. Way forward

To make the treatment easy, it would be good that if a livestock survey was taken every five year on average so we can be confident of the size of the herd, the exploitation rate as well as other parameters.

VII.2. Ghana: estimating value added of livestock in national accounts

VII.2.1. Issues under consideration

Due to the lack of regular specialist surveys, information on livestock in Ghana is far from complete, actually nearly non-existent.

VII.2.2. Data requirements, availability, gaps and meeting challenges to fill data gaps

The Ministry of Food and Agriculture provides annual data on livestock but the herd sizes are far below that obtained by all rounds of the Ghana Living Standards Surveys (GLSS). Data from the surveys look consistent with growth in livestock production between successive rounds of the survey.

VII.2.3. Compilation practices

In order to estimate the output of the livestock sector, a demographic model was used for the larger species. This allowed for the establishment of a relationship between herd size and take-off (meat production) as well as stock estimates in line with the 1993 SNA.

The model was developed in the Sudan and though the situation is somewhat different in Ghana, the basic parameters of the model are the same and applied to livestock numbers (based on interpolation of successive rounds of the Ghana Living Standards Survey) for successive years resulted in sets of parameters that were both plausible and yielded consistent results. As there is no information available for the various parameters used in the model for Ghana, the starting point was the Uganda parameter values. As the model gives the estimated change in livestock "on the hoof" at year-end, the change in stocks can be calculated. This is incorporated in the system as gross fixed capital formation. The livestock model does not include poultry as its life cycle is much shorter than one year. An extract from the livestock projection model for cattle can be found in VII.2.4.

Way forward

An agriculture census will be conducted in 2013, and the stock of livestock will be compared with that produced by the livestock model to check for possible errors.

Figure VII.2: Ghana – Extract from the livestock projection model for cattle

	Type of herd	2008	2009	2010
1	Basic herd (000)	2,470	2,579	2,689
2	Males rate	0.24	0.24	0.24
3	Males	582	608	633
4	Females	1,888	1,971	2,056
5	Breeding females rate	0.46	0.46	0.46
6	Breeding females	878	911	950
7	Females (0 – 1 yr)	287	299	311
8	Females (1- 2 yr)	264	276	288
9	Females (2 – 3 yr)	241	253	265
10	Females (3 – 4 yr)	219	231	243
11	Calving rate	0.75	0.75	0.75
12	Young stock	658	684	712
13	Mortality Young Stock	0.09	0.09	0.09
14	Surviving Young Stock	599	622	648
15	Male Young Stock	299	311	324
16	Mortality Males rate	0.07	0.07	0.07
17	Surviving Males	841	876	913
18	Extraction Males rate	0.40	0.40	0.40
19	Extraction Males	233	243	253
20	Total Males	608	633	660
21	Female Young Stock	299	311	324
22	Surviving Breeding Females	834	866	902
23	Surviving Females (0 – 1 yr)	276	288	299
24	Surviving Females (1- 2 yr)	253	265	276
25	Surviving Females (2 – 3 yr)	231	243	254
26	Surviving Females (3 – 4 yr)	210	222	233
27	Total Surviving Females	2,103	2,194	2,288
28	Extraction Females rate	132	138	144
29	Total Females	1,971	2,056	2,145
30	Of which: Breeding	911	950	992
31	Total Extraction	365	381	397
32	Extraction rate	0.15	0.15	0.15
33	Final Herd size	2,579	2,689	2,804
34	Increase or decrease in herd size	109	110	115
35	Increase or decrease %	4.2%	4.1%	4.1%

VII.3. Ghana: estimating value added of fishing in national accounts

VII.3.1. Issues under consideration

Fish stock in fresh water and marine environment is a non-cultivated biological resource and its growth is not regarded as production in the 1993 SNA. It is only when the fish is harvested that output is recorded.

VII.3.2. Data requirements, availability, gaps and meeting challenges to fill data gaps

The principal source of information is the monthly report of the Fisheries Department of the Ministry of Food and Agriculture. The report contains data on (i) total catch of marine fish by large fishing vessels and canoes; (ii) catch of inland water fish; (iii) landings by foreign vessels on contract; and (iv) wholesale price of fish by type. Intermediate consumption in marine fishing and fresh water fishing has been computed separately, that is, 50.7% and 0.1% respectively.

Data on fish catch shows that there are 69 different types of fish, but for convenience they have been grouped into 18, as shown in Figure VII.3. Data on aquaculture (ISIC 0321 and 0322) are weak, though it is an important component of quarterly GDP estimates.

VII.3.3. Compilation practices

Table below summarizes the reference period weights and indices compiled for each fish type. Percentage changes computed from the combined indices are used to adjust the value added to arrive at the constant price estimates. Wholesale price index of fish is used to adjust constant price estimates to arrive at current price estimates.

Figure VII.3: Volume indices of fish catch by type (2006=100)

Fish Type	Weight	2006	2007	2008
ANCHOVY	0.1285	100	22.5	90.5
BIGEYE	0.0050	100	361.5	582.9
BURRIOT	0.0588	100	111.6	88.2
CASSAVA FISH	0.0012	100	78.2	131.5
CHUB MACKEREL	0.0134	100	83.8	84.3
CUTTLEFISH	0.0175	100	79.1	78.5
FLAT SARDINELLA	0.0681	100	51.8	66.7
FRIGATE MACKEREL	0.0083	100	195.5	169.0
RED MULLET	0.0025	100	140.8	171.5
ROUND SARDINELLA	0.2023	100	56.9	34.4
SARDINELLAS	0.0004	100	859.6	946.4
SCAD MACKEREL	0.0002	100	266.9	87.4
SEABREAMS	0.0608	100	195.4	126.1
SHRIMPS	0.0020	100	41.0	37.8
SKIP JACK	0.1334	100	108.5	87.4
SOLES	0.0000	100	193.5	142.0
YELLOWFIN	0.0454	100	103.8	98.0
OTHERS	0.2523	100	120.4	194.1
Combined Index	**1.0000**	**100**	**92.8**	**108.9**

Source: GSS computations from Fisheries Department Data

VII.3.4. Way forward

The planned 2013 agriculture census will cover aquaculture, and this will form the basis for the proper accounting of the activity in the country's fisheries sector.

VII.4. Mozambique: estimation of livestock output

VII.4.1. Issues under consideration

Mozambique currently follows 1993SNA. In order to elaborate livestock product balance, Mozambique has identified the following products: cows, pigs, poultry (mainly chicken) and other live animals.

VII.4.2. Data requirements, availability, gaps and meeting challenges to fill data gaps

There are a lot of data sources to compile and balance livestock products: annual report of agriculture (cattle sector); agricultural and livestock census – CAP - that occurs every 10 years; annual agricultural census; ministry of agriculture; and household budget survey (IOF) that occurs every five years.

The above sources provide the following data:

- number of live animals divided by household and enterprise sectors: by type of animal there are specific groups like for example cows for work, cows for reproduction, female and male cows, young and adult cows, cows for producing milk;
- animal age and animal weight;
- number of animal births (and the inventories);
- meat production by type and category of animal;
- revenue by animal (according to specific characteristics);
- purchase price of animals and meat; and
- percentage of meat for self-consumption and for selling.

VII.4.3. Compilation practices

During the benchmark years, since we have a lot of available data, we produce technical coefficients that will help to determine the universe of animals in the years with no information. The HBS is helpful because household patterns of consumption and trading are reported. The information from the external trade service is also very important because it helps to understand how many animals the country has and from which sector they are coming. Information regarding production costs by species can be obtained both from the agricultural census and IOF.

Like all other products that compose Mozambican product classification (which is based on CPC), we elaborate resources and uses balance.

It is usually possible to obtain information on production for sale, production for own consumption, intermediate consumption, changes in inventories, gross formation of fixed capital, imports and exports of the products.

VII.4.4. Way forward

Although we have a lot of data, there is still a problem of obtaining data in time. In some years the ministry of agriculture does not conduct the annual survey; there is a delay in providing the results of census. These problems have direct impact on us, because it delays our calculations.

VII.5. Namibia: agriculture in national accounts

VII.5.1. Issues under consideration

The issue under consideration is compilation of output, changes in inventories, and GFCF of agriculture and livestock products.

VII.5.2. Data requirements, availability, gaps and meeting challenges to fill data gaps

The national accounts estimates are compiled in line with the 1993 SNA. To compile livestock output, the basic data are available from the Meat Board of Namibia, which provides data both on large and small livestock marketed. Data provided includes prices and numbers of livestock slaughtered at butcheries and livestock exported live to the Republic of South Africa. The Ministry of Agriculture provides annual livestock population data.

Livestock changes in inventory are calculated as the difference between opening and closing stocks.

Therefore, Total output is calculated from:

- livestock marketed; and
- changes in inventory of livestock

Output of live animals and animal products comprises the following:

- cattle raised and sold for slaughter including an estimate of slaughter on the farm. Hides and skins are considered to be output of manufacturing;
- small stock (goats and sheep), same remark as for cattle;
- pigs grown and sold for slaughter;
- karakul wool and pelts. The pelts produced on the farms are an output of agriculture;
- estimates of fresh milk, wool, poultry and eggs are also included.

Gaps in data:

- absence of addition to livestock being the calves born during that year – currently it is implicitly calculated as a residual;
- cows/ewes/nannies able to give births.

VII.5.3. Compilation practices

The output of livestock is calculated within the framework of a commodity flow. The value of output of livestock production is derived as follows:

Output at current prices = exports to South Africa+ meat at abattoirs+ butchers+ 5% assumption of stolen livestock from data on export to South Africa + inventories.

To estimate output on constant prices, output data on current year is multiplied by the base year price and intermediate consumption on current prices is derived from the data for local butcher and slaughterhouses.

In addition to the flow of animal related products, other organizations such as Karakul Board, the Namibian Agricultural Union, Ministry of Agriculture, Water and Rural Development,

Poultry Association and the Bank of Namibia also furnish data on value of produced milk, egg, wool, and pelts, game and seal products.

Current price estimates are obtained from the data supplied with the exception of game, the assumption that output should be 75% more than export data (ratio based on the NHIES data). To estimate output on constant prices, production data is multiplied by the base year price except for game which is deflated with the PPI-(SA). Intermediate consumption is assumed to be 40% of output.

Own produce: Output at constant price is derived from movement in the output of animal flow based on the benchmark data of NHIES for own produce. To move to current prices, the output of constant prices are then inflated with the average CPI for meat, cheese, milk, oil and fat. While intermediate consumption is assumed to be 5% of the output.

VII.5.4. GFCF in agriculture

GFCF is broadly defined as the value of acquisitions, less disposal, of new and used fixed assets by producers. This term is loosely used by economists to mean investment. This variable measures total expenditures on products intended to be used for future production. In agriculture, data for GFCF is obtained from the following items: buildings; construction works; transport equipment; and machinery and other equipment.

Current price estimate for building, constructions, transport equipment, and machinery is obtained by:

- reflating constant prices estimate with deflators of building industries for buildings;
- reflating constant price estimate with deflators of construction works for construction;
- reflating constant price estimate with deflators of transport equipment for transport equipment;
- reflating constant price estimate with deflators of machinery and other equipment for machinery and other equipment.

Whereas constant prices estimate are obtained on the basis of:

- volume changes are assumed to remain constant over the years for buildings;
- volume changes are assumed to grow by 0.5% for construction;
- volume changes are assumed to grow by 0.5% for transport equipment;
- volume changes are assumed to grow by 0.5% for machinery.

VII.5.5. Way forward

Develop a livestock model with the help of the QNA DFID technical assistance. In addition, review deflation techniques and appropriateness of price indices.

Annex VIII. Own-account construction

VIII.1. Madagascar: estimation of own-account construction

VIII.1.1. Issues under consideration

This section shows the different types of own-account constructions and their valuation. Currently, Madagascar compiles national accounts according to 1993 SNA.

The totality of the own-account construction during one given accounting period must be recorded in the output and also in the gross fixed capital formation of the end-user, who is also a producer. This is irrespective of whether the construction is finished or not yet finished. Theoretically, when such own account construction is already completed, it must be valued by its estimated basic price. But, if it is not possible to estimate the basic price of the construction completed, it must be valued by its total costs of the production, plus an amount corresponding to the operating surplus. If a part or a totality of the labour is provided free, as it can be seen at the community activities of construction of the households, it is necessary to include an imputed value for such voluntary labour by using the effective standards of wages in the area, which has the similar categories of labour.

VIII.1.2. Data requirements, availability, gaps and meeting challenges to fill data gaps

Own-account construction can be carried out by a company, a household community or a household. Data on own-account construction can be collected through specific surveys focusing on producer units. For example, in the case of households, specific questions on own-account construction could be included in the classical questionnaire of 1-2-3 survey or a household budget survey, where the survey unit is a household. Similar procedure could be adopted in the case of companies, where the survey unit is an enterprise. For the communities, they could build roads, bridges and so on, which are eventually transferred to the beneficiaries. The beneficiaries are usually decentralized collectivities and are the persons in charge for the maintenances of such construction. The suitable survey unit in this case should be the decentralized collectivities.

There are four principal sources of data on construction in Madagascar:

- census of the population and the habitats (last conducted in 1993);
- formal companies survey (last conducted in 2004);
- investigation budget spares (last conducted in 2010);
- 1-2-3 survey (last conducted in 2010).

The information that is available from the above surveys is the following:

- The census provides information on the stock and the structure according to certain characteristics of the dwellings. However, the census data does not provide information on their values;
- The formal companies survey provides data on the value of production of building firms;
- The households survey presents data on the purchases of residential buildings and their value, but not by its type, namely, own account or not;

- 1-2-3 survey provides data on production and operating statement of companies in informal sector engaged in construction activity. On the other hand, information on own-account construction of the households is not available. Construction on own account of the households has two forms:
    - Construction on own account in which labour is paid: the 1-2-3 survey considers only the abstract company which provides services of labour to the construction industry. So, the survey does not give the value of construction nor the intermediate consumptions, but provides data on labour engaged in own-account construction.
    - The own-account construction with voluntary labour is not at all covered in the 1-2-3 survey.

We notice that the constructions of own account of the civil engineering made by the communities, especially found in the villages, are not yet included into the national accounts because of non-availability of data.

VIII.1.3. Compilation practices

The value of own-account construction with paid and unpaid labour is estimated using labour input and residual methods, respectively. The steps involved are the following:

1) For the valuation of own-account construction with paid labour, the estimated number of workers engaged in such construction (obtained from the 1-2-3 survey) is multiplied with the productivity of work of the companies having a similar labour. The intermediate consumption can be estimated using the technical coefficients of similar companies.
2) For the valuation of own-account construction with unpaid labour, initially, the overall estimates of value of residential buildings are made. From this estimate, value of construction by companies, household producers and own-account construction with paid labour is subtracted. The procedures are detailed below:
    - The value of total production of residential buildings is estimated on the basis of data on these buildings available from the household survey, increase in demographic rate (for extrapolating to current year and thereby deriving the number of dwellings constructed in the reference year) and average prices of buildings.
    - The production of the residential buildings by the formal companies is estimated from the formal companies' survey. The production of residential buildings of informal companies is estimated from the data provided by the 1-2-3 survey. The total production of residential buildings is the sum of these two productions.
    - The value of own-account construction on account of voluntary labour is obtained by the total production minus own-account construction with paid labour minus residential buildings produced by enterprises.

VIII.1.4. Way forward

To integrate into next 1-2-3 survey, a specific questionnaire meeting the needs of the national accounts as regards the data on own-account constructions.

VIII.2. Uganda: estimating own account construction

VIII.2.1. Introduction

In Uganda consideration and measurement of own-account construction is predominantly for the traditional housing which is basically rural based construction. It does not take into account modern construction of permanent structures by the different institutional units, structures produced for own communal use by groups of households and therefore not complete in coverage.

The population of Uganda is predominantly rural with over 80 percent of the population being rural based. In the rural areas housing construction is mostly on own account construction and the houses are usually made of mud and wattle walls and grass thatched roofing. However there is a notable shift to iron roofing in some regions of the country in which case there would be a combination of own account construction and hired labour. The shift to iron roofing is associated to either improvement of the family income or depletion of thatching material due to increasing population.

VIII.2.2. Compliance with the 1993 SNA

The measurement of own account construction is in accordance with the 1993/2008 SNA. The eventual user of the structure, are one and the same institutional unit.

According to SNA, if the own account construction is within the same institutional unit the whole output of the own-account construction should be recorded as gross fixed capital formation, even if the structure is not finished. The own account construction measured in the national account conforms to the above statement in that the construction is part of the gross fixed capital formation. The structure and the institutional unit (for our case the household) are one and the same and the valuation of the finished structure is at basic prices.

VIII.2.3. Measurement approach

In a situation of limited data like is the case for Uganda, the beginning should be to establish a benchmark estimate which can be used for determining the degree of importance of the activity in the construction industry and in the overall economy. Suitable volume indicators should then be identified for estimating the activities of own account construction.

The readily available data for estimating own account construction is first the benchmark estimates from the population and housing census and subsequently the household budget surveys. The Uganda National Household Surveys (UNHS) usually includes a module on the housing characteristics which can be used to determine the volume changes between the survey years.

VIII.2.4. Compilation practices

Volume movements for non-market output of own account construction is based on the use of the rural population growth rates to estimate the output. The SUT 2002 gross output, input and input-output ratio values for traditional houses are taken as benchmarks. The rural population trends are then used to extrapolate the traditional houses output. The SNA also recommends that volume movements for non-market output be based on output and not input indicators. In between household budget surveys the traditional housing construction output is estimated

using the rural population data but when the survey results are released revisions are done, adjusting downwards or upwards in equal amounts depending on the result.

VIII.2.5. Way forward

- Obtain benchmark data on own account construction (excluding the traditional houses) from the Uganda Business Inquiry 2009/10.
- Estimate output of own account construction of traditional houses using the 2009/10 household survey results.
- Develop methodology for quarterly/annual estimation of own account construction for the non-traditional own account construction.
- Improve on the indicators for estimating own account construction along the current developments to improve on the estimation of the construction activities.

Annex IX. Transport costs and trade margins

IX.1. Mauritius: estimation and distribution of trade and transport margins

IX.1.1. Issues under consideration

The issues under consideration are the sources and methods for distributing trade margins and transport costs among the goods in the supply table.

Although wholesalers and retailers actually buy and sell goods, the goods purchased are not treated as part of their intermediate consumption when they are resold with only minimal processing such as grading, cleaning, packaging, etc. Wholesalers and retailers are treated as supplying services rather than goods to their customers by storing and displaying a selection of goods in convenient locations and making them easily available for customers to buy. Their output is measured by the total value of the trade margins realized on the goods they purchase for resale. A trade margin is defined as the difference between the actual or imputed price realized on a good purchased for resale and the price that would have to be paid by the distributor to replace the good at the time it is sold or otherwise disposed of. The margins realized on some goods may be negative if their prices have to be marked down. They must be negative on goods that are never sold because they go to waste or are stolen (2008SNA 6.146).

The output of wholesale and retail trade is measured by the value of the trade and transport margins realized on the goods they sell. Goods resold are not included either in the output or the inputs of wholesale and retail trade. The trade and transport margins include trade margins plus any transport charges paid separately by the purchaser in taking delivery at the required time and place.

In the supply table, output of goods is at basic prices; output of the associated trade services and transport services are given at basic prices in their respective columns and rows. This means that taxes (except invoiced VAT) on the product payable by wholesalers and retailers are pooled with the other taxes (except invoiced VAT) on products and total non-deductible VAT to form the additional column of taxes on products in the supply table, and correspondingly the additional column of subsidies on products. Trade and transport margins are additionally distributed by products in the additional column of trade and transport margins of the supply table. In that column, negative entries appear on the rows for trade and transport services in order to have the total of that column equal to zero. In purchasers' prices, total supply of trade services does not include trade margins, nor does total supply of transport services include transport margins; both of these having been allocated to the goods to which they relate.

IX.1.2. Data requirements

The data that is actually required for computing trade and transport margins by products in the supply table is the margins of wholesale and retail traders and transporter costs that are involved in making available the goods from their places of production to the purchasers. In essence, these are the payments made by the purchasers to the traders and transporters to acquire the goods from their places of production.

However, such detailed data on trade and transport margins is usually not available by products. The data that is usually available is ratios of trade margins and transport costs in terms of output.

IX.1.3. Compilation procedures

In Mauritius, the trade and transport margin rates are collected through the Census of Economic Activities and other administrative sources and these data are used to derive trade and transport margins by products. The actual procedure is described below.

Trade margins by product

1. Most of the goods used in Mauritius are imported. Thus, trade and transport margin is calculated using data on imports supplemented with data on agricultural production and locally manufactured goods for consumption.
2. Statistics Mauritius carries out a Census of Economic Activities every five years. One of the data collected is trade margin rates on different products.
3. Concerning agricultural production, the difference between the Producer Price Index and the Consumer Price Index for the different agricultural products is used as a proxy for Trade margin rate. For locally manufactured goods for local consumption, the trade margin is estimated using the margin rates obtained from the Census of Economic Activities.
4. To obtain trade margin by product we multiply imports (classified by SITC) by the margin rate and for agriculture we apply the margin rate to the value of production. As an illustration, calculation for imported goods has been shown in annexed table.
5. The total trade margin for the economy is calculated using the information available from the Census of Economic Activities for the benchmark year. For the inter-censual years estimates are based on imports of goods, agricultural production and locally manufactured goods.
6. The total trade margin obtained at 5 is distributed using data at 4.
7. Trade margin by CPC (product classification used for SUT) is obtained by using the correspondence table of SITC to CPC.

Transport margins by product

8. The amount to be paid for handling cargo, clearing of goods and transport are obtained from the Mauritius Ports Authority. The same rate (%) is assumed for all transport of goods throughout the island.
9. To obtain margin by product we multiply imports by the margin rate. Calculation is shown in annexed table.
10. The total transport margin for the economy is calculated using information from the Census of Economic Activities for the benchmark year. For the inter-censual years estimates are based on licences issued by the National Transport Authority.
11. The total margin obtained at 10 is distributed using data at 9.

IX.1.4. Way forward

The current procedure followed for estimating trade and transport margins provides reliable estimates of these data by products. However, further refinements will be introduced in the estimation procedures if needed.

Figure IX.1: Mauritius – Trade and transport margins						
SITC Section*	Imports C.I.F (Rs million)	Transport margin rate (%)	Transport margin (Rs million)	Taxes and other charges	Trade margin rate (%)	Trade margin (Rs million)
	col 1	col 2	col 3= col 1* col 2/100	col 4	col 5	col 6= (col 1 + col 3 + col 4)* col 5/100
0	9,701	3.8	369	825	33	3,639
1	843	3.8	32	1,671	31	790
2	5	3.3	0	0	38	2
3	3,247	2.1	68	88	19	635
4	34	2.6	1	2	27	10
5	2,338	0.3	7	183	24	614
6	901	6.5	59	100	43	454
7	4,698	4.1	195	1,014	20	1,181
8	3,863	6.5	251	558	40	1,888
GRAND TOTAL	25,631		981	5,422		9,213

SITC: Standard International Trade Classification

-Margins have been worked out at detailed product level but are shown here at section level only For trade margin; they are calculated for both wholesale and retail

IX.2. Cameroon: calculating trade margins by products

IX.2.1. Concepts of trade margins

In the national accounts, trade margin cost is added to the price received by the producer of a good and charged to the buyer. For merchants, trade margins represent their production (i.e. difference between the selling price of goods and their purchase cost).

They are spread over the different uses of the property with the exception of changes in inventories (intermediate consumption, final consumption, gross fixed capital and export). They are taken into account only when the distribution of property is made by a third person other than the producer.

Figure IX.2: Cameroon – Concept of trade margins

		001001 Cereals	032004 Trade	Total economy
Supply		120	0	120
	output	100	20	120
	Trade margins	20	-20	0
Use		120	0	120
	Final consumption			
	Basic prices	100		100
	Trade margin	20		20
	Purchasers' prices	120		120

SNA proposes that, by convention, trade margins by product are negative and equal in absolute value to the total of trade margins on goods, while moving towards purchasers' prices from basic prices. Thus, it appears that the resources of trade products are zero and that they do not have use: "avoid double counting."

IX.2.2. Data sources

- Employment and informal sector survey (EESI): provides an initial estimate of commercial output in the informal sector and allows calculation of gross profit margin by product charged by the business units; and productivity ratios of industries.
- Statistics and tax return (DSF): provides data on output of commercial units in formal business
- Training survey of food prices (FORPRIX): data on trade margins at both wholesale as retail level of 13 food products in Douala and Yaoundé.

IX.2.3. Estimation of output and trade margins

Two procedures are used to estimate trade margins: (i) estimated output from commercial industries; and (ii) estimation of trade margins from balancing supply and use of goods.

Figure IX.3: Cameroon – Groups of branches of trade activities

Code	Industries
032001	Commercial vehicles, accessories and fuel
032002	Wholesale of agricultural raw materials and live animals
032003	Other wholesale
032004	Retail trade (except auto and motorcycle)

The first step is to estimate the accounts of branches, from the production of commercial activities (CB) which is based on economic ratios (mainly the productivity ratios provided by the source data).

The second step is to estimate the trade balances from supply and use by product (SUP), by applying the margin of trade by product, provided by the data sources (EESI, DSF).

The sum of the production of commercial activities (CB) (estimated in the first step) is generally different from the sum of gross margins (SUP) (estimated in the second step). Hence, there is a need for reconciliation of data between the two approaches:

- by keeping the amount of product margins, we must return to the accounts of branches to examine the productivity ratios and hence also employment;
- when productivity ratios by industry and output mode is finalised, these data is used to finalize trade margins in supply and use by product.

IX.2.4. Borderline cases: margin services or other particular products

Most services are supposed to have been consumed as soon as they are produced. It is not often possible to consider margins on services. However, there are some services which can be stored and transported or marketed by external intermediate. Some external stakeholders may be involved in the distribution and marketing of specific products such as phone credit (call-box), transportation and resale of water, electricity resale, manufacture and sale of ice. The treatment made is to attach to the main activity in the spirit of the new ISIC 4 (2008 SNA).

IX.3. Cameroon: calculating transport costs by products

IX.3.1. Concepts of transport costs

In the national accounts, transport cost is added to the price received by the producer of a good and charged to the buyer. For carriers, transportation margins represent output in freight transport. They are distributed only on intermediate consumption and gross fixed capital formation i.e. final consumption, changes in inventories and exports have no transport margins. They are taken into account only when the transport of the goods is made by a third person other than the producer. The treatment of transports costs differs from that of trade margins on several points:

- There are exports and imports of services of transport of goods.
- There is intermediate consumption of transport services of goods.
- There are no transport margins on final consumption for two main reasons: (i) for the final consumption of households, it is difficult to separate the services of passenger transport services of freight; (ii) similarly, it is difficult to separate the transport of market goods is considered a margin transport of non-market services produced by households is considered as a purchase of goods.

Figure IX.4: Cameroon – Concept of transport costs

		001001 Cereals	***034004 Freight transport by road***	***032004 Trade***	***Total economy***
Supply		**243**	**20**	**0**	**263**
	Output	200	30	33	263
	Transport cost	10	-10		0
	Trade margins	33		-33	0
Uses		**243**	**20**	**0**	**263**
	Intermediate Consumption				
	Basic prices	100	20		120
	Transport margins	10			10
	Trade margins				0
	Purchasers' prices	110	20		130
	Final consumption				
	Basic prices	100			100
	Transport margins				0
	Trade margins	33			33

	Purchasers' prices	133	0		133

IX.3.2. Data sources

- Employment and informal sector survey (EESI): provides an initial estimate of commercial output in the informal sector and allows calculation of gross profit margin by product charged by the business units and productivity ratios of industries.
- Statistics and tax return (DSF): provides output data of commercial units in formal business

  Training survey of food prices (FORPRIX): allows for estimating transport costs of 13 food products in Douala and Yaoundé.

IX.3.3. Estimation of output and transport margins

Unlike of trade where output equalizes the total margins, in the case of transport services, the output covers transportation margins and purchases of services by traders. The estimation procedures are similar to those developed in the estimation of production and trade margins, with the difference that the convergence is not sought. Three procedures are used to estimate the production and transportation margins of goods: (i) estimated production from individual businesses involved in freight transportation; (ii) estimated freight margins by product; and (iii) distribution of transport margins by type of transport. Groups of industries included in the classifications are:

Figure IX.5: Cameroon – Groups of branches of transport activities

Code	Type of transport
034001	Rail
034003	Other road passenger transport
034004	Freight transport by road
034005	Other transport (air, water)

The first step is to determine a level of employment by comparing the data sources (DSF and EESI); the second step is performed to obtain production by applying the productivity of DSF to formal employment and the EESI informal employment. The second step is to estimate the production of transportation from balances supply and use by product, by applying the rates of transport margins by products obtained by the data source (EESI, DSF).

IX.3.4. Distribution of transports costs by type of transport

The scarcity of information on goods transported increases the difficulty to allocate transport margins between different types of transport. Conversely, to determine for each mode of transportation the part that is charged to third parties other traders to make transport margins is difficult. As a solution, a distribution margins in proportion to the output of freight services is proposed.

Annex X. Owner occupied dwelling services

X.1. Cameroon: econometric approach to calculate imputer rents of owner occupied dwelling services

X.1.1. Issues under consideration

According to the national accounts, construction or purchase of house by a household is considered as an investment. For owners and similar (free housing), they are supposed to pay rent (called imputed rental) for the property they occupy. Thus, they produce dwelling services they consume.

X.1.2. Data requirements

The necessary data for estimating imputed rentals of owner occupied dwellings is on houses by their various characteristics (principal data source is a population census or a household budget survey that includes a section on housing and habitat characteristics): region, residence (urban, rural), type of dwelling, number of rooms, main floor material, main wall material, main roof material, main source of lighting, type privies (WC with flush, fitted toilets, unimproved toilets), mode of evacuation of household waste, gender, highest qualification and marital status of household head, etc.

A question in the survey allows owners of dwellings to provide information on their assessment of the amount of rent they would have to pay if they had let the house they are occupying. This approach raises a number of questions: are owners and similar are sufficiently informed to give the right information? We think that they will tend to give the amount of which they would rent their house, not what the law of supply and demand would impose.

X.1.3. Compilation practices

Econometric modelling, based on dwelling and household characteristics to assess the amount of rent, is more appropriate. Then, we proceed with the imputation of households living free rent.

The econometric model to estimate is a selection model, namely, the Heckman model. Theoretically, two equations are estimated:

i) Main equation: $Y_j = X_j\beta + u_{1j}$ (1)

ii) Selecting equation: $Z_j\gamma + u_{2j} > 0$ (2)

with: $u_1 \rightarrow N(0,\sigma)$

$u_2 \rightarrow N(0,1)$

$\text{cov}(u_1,u_2) = \rho$

We assume that the endogenous variable (the logarithm of the annual rent) is actually observed if the household pays rent (selecting equation).

The inverse Mills ratio resulting from this regression, which is actually a probit model, is injected into the main equation

Imputation

The values estimated by the model have three scenarios in terms of owner and free housing households:

- Some households are on the supply curve, and give the amount they would receive if they had to put their house on rent.
- Others lie on the demand curve, and underestimate therefore the actual value of their dwellings (giving the amount they would pay if they were renting).
- The last category consists of those who are at the intersection of supply and demand curve.

The results obtained are as follows:

Figure X.1: Cameroon – Average of the key variables by tenure status

Tenure status		Declared annual rent	Estimated annual rent by the model	Annual rent with imputation of the owners and related
Owner with land title	Mean	361,1568	2,915,274	2,915,274
	N	32,1209	321,652	321,652
	Std. Deviation	692,0024	468,5245	4,685,245
Owner without land title	Mean	109,1305	972,364	972,364
	N	1,644,088	1,645,112	1,645,112
	Std. Deviation	153,2876	103,4022	1,034,022
Lease	Mean	183,9946	187,7613	1,839,946
	N	739,809	739,809	73,9809
	Std. Deviation	401,9304	297,7206	4,019,304
Rental sale	Mean	457,8296	7,350,616	4,578,296
	N	4,158	4,158	4,158
	Std. Deviation	379,1171	9,112,270	3,791,171
Housed by the employer	Mean	171,5482	1,900,020	1,900,020
	N	100,967	101,587	101,587
	Std. Deviation	499,0805	4,603,411	4,603,411
Housed by a friend/parent	Mean	94,6291	95,7644	957,644
	N	288,560	288,665	288,665
	Std. Deviation	149,1384	976,168	976,168
Other	Mean	103,7695	945,743	945,743
	N	19,753	19,753	19,753
	Std. Deviation	145,5651	880,969	880,969
Total	Mean	153,9591	1,424,384	1,411,761
	N	3,118,544	3,120,736	3,120,736
	Std. Deviation	341,5447	2,506,423	2,806,720

N= number of households, Std. Deviation = standard deviation

Annex XI. Non-life insurance

XI.1 Cameroon: measurement of the output of non-life insurance services according to SNA 2008

XI.1.1. Issues under consideration

The evaluation of the output of non-life insurance services in the national accounts is done in most countries of the world and in Cameroon in particular, by the method described in the 1993SNA. In this system, the output of insurance services is calculated as the sum of premiums earned and investment products from these premiums during the financial year, net of allowance for claims incurred during the same accountant year.

However, the use of this methodology can lead, in the years with severe loss, the output values to be zero or even negative. In Cameroon, for example, with the crash of the Boeing of Cameroon Airline (CAMAIR) in 2000 in France, the very high amounts of compensations led to a zero output. Yet, the average consumption of per capita insurance services (insurance density) is about 4,200 CFA since 1997. Moreover, unable to fully compensate all victims in a year, the insurance companies spread the compensations to the following years.

A draft of solutions is provided by the 2008 SNA to overcome the problems posed by the old method of 1993 SNA.

XI.1.2. Approaches for calculating the output of non-life insurance services according to the 2008 SNA

The volatility of the output of non-life insurance services according to the 1993 SNA is related to benefits. The main change in the formula to calculate the output of the insurance services is related to compensations. The 2008 SNA proposes three approaches to estimate the adjusted benefits from the new calculation of the following output:

Value of output of non-life insurance services = total premiums (contributions) earned + premium supplements – total compensation (benefit) adjusted.

Premium earned and premium supplements are defined as in the 1993 SNA. However, the 2008 SNA provides an opportunity to advance the premium supplements if they are experiencing huge fluctuations.

Proactive approach

This approach is based on the ex-ante model used by insurance companies to set premiums based on their expectations. In the absence of data from insurance companies, the 2008 SNA recommends applying a statistical technique to simulate this approach using macro-statistics and historical data smoothed to provide the expected benefits.

Accounting approach

In this approach, the adjusted compensation are determined by summing the benefits incurred to changes in equalization provisions and, if necessary, changes in equity. Equalization are made on deals with recurring expenses relating to transactions covering risks due to natural elements, atomic risk, liability risks due to pollution and space risks. They also involve

provisions offsetting credit insurance, technical deficits arising at the end of the year, and those coping with fluctuations in claims relating to group insurances against injury.

Cost approach

This approach has also been suggested in the 2008 SNA, but its implementation also refers to an anticipation of profit insurers. Indeed, by this method, the output is estimated as the sum of costs for insurance companies and their profits. Information on corporate profits is generally difficult to obtain, hence the idea to replace the profit collected by the early profit. This approach is therefore strongly connected to the first through the idea of anticipation.

XI.1.3. Compilation practices using the proactive approach of the 2008 SNA

The purpose of the national accounts is to trace the various existing flows between economic agents in a given period. The recording of insurance should be based on the calculations of insurance companies. Moreover, damage insurance is calculated as the sum of premiums earned and investment income on technical reserves deducted by expenses claims. This equality is strict and similar to that used in the national accounts (1993 SNA) where the life insurance and claims are respectively considered as approximations of production and the compensation due. The analysis of this long-term relationship between these variables using a co-integration model showed that long-term life insurance activity is related to financial products and claims. However, this long-term relationship has showed after controlling for the breaks in trends in our series. In other words, the idea in the 2008 SNA to adjust the compensation incurred has been found suitable for the case of Cameroon.

The model was also tested using the results obtained by Stock and Watson, and Sims on causality between damage insurance and claims in Cameroon. This test is done in the context of a usability methodology similar to that of Australia. The result of this test shows that the knowledge of future values of the compensation amount does not improve the results in damage insurance in Cameroon.

An error correction model was developed and it shows that in the short term, only financial products and occurrences of major events influence the outcome of the non-life insurance in Cameroon. These results show that the expectations of payable compensation may only be based on past normal compensation values. Exponential smoothing is just a method for predicting the values of a series from past values. Indeed, according to Venezian (1985) the pricing methods adopted by insurers, and generally based on an anticipation of future claims, are the main cause of the existence of cycles in life insurance. Phillip D. Cagan proposed the following model on the principle of adaptive anticipation of the amount of future losses:

$$EC_t^{t+1} - EC_{t-1}^t = \lambda(C_t - EC_{t-1}^t),$$

$$where\ 0 < \lambda < 1$$

and $E\ C\ _i^{i+1}$ represents the expectations made on the amount of compensation for the period i+1 and i. λ materializes the adjustment behaviour of agents following an anticipation error.

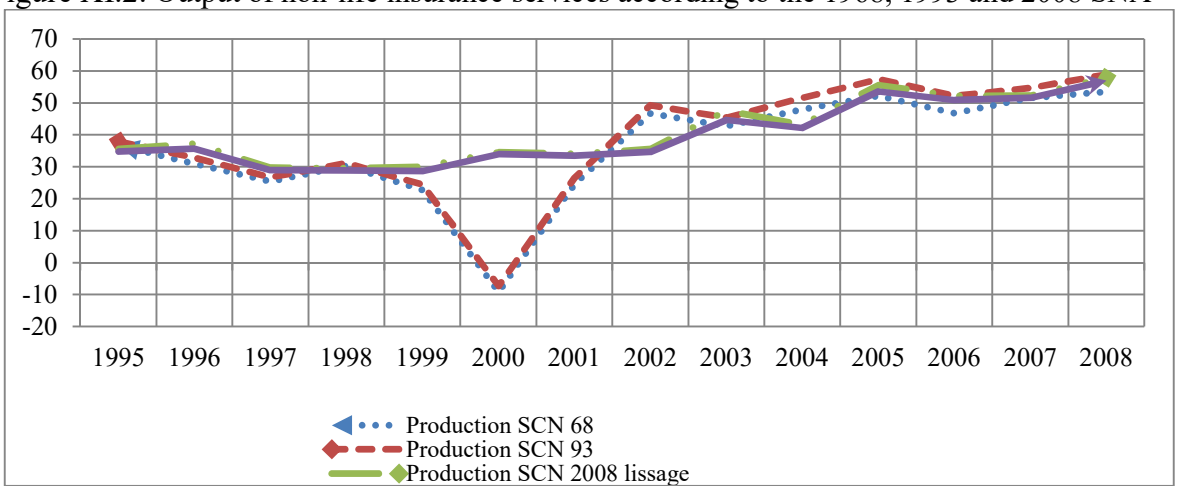
XI.1.4. Results obtained

Figure XI.1: Cameroon – Calculation of adjusted claims

Date	Premiums earned	Supplements premiums	Claims due	Adjusted claims by smoothing	Adjusted claims by Box &Jenkins
1995	60,4	1,2	23,7	26,1	26,9
1996	59,0	1,9	28,0	23,6	25,2
1997	54,8	1,3	29,4	26,3	27,1
1998	56,7	0,8	26,3	27,9	28,6
1999	54,3	1,8	31,6	26,0	27,4
2000	62,2	1,8	71,4	29,5	30,1
2001	66,1	2,0	41,6	33,9	34,6
2002	68,1	2,6	21,4	35,1	36,0
2003	72,1	2,6	29,3	27,1	30,0
2004	70,8	3,6	22,8	31,3	32,3
2005	77,9	5,1	25,6	27,4	29,4
2006	75,3	5,5	28,5	28,6	29,9
2007	80,3	3,1	28,7	31,1	31,8
2008	84,2	5,5	30,6	31,7	32,6

Source: Insurance Division, ASAC, FANAF and our treatments

Figure XI.2: Output of non-life insurance services according to the 1968, 1993 and 2008 SNA



Source: Insurance Division, ASAC, FANAF and our treatments

Annex XII. ERETES and compilation of national accounts

XII.1. Central African Republic

XII.1.1. Summary

One of the tasks of Central African Institute of Statistics and Economic Studies (Institut Centrafricain des Statistiques et des Etudes Economiques et Sociales) is the compilation of national accounts. The Central African Republic was the first pilot country to using ERETES for the compilation of national accounts.

XII.1.2. Emergence of ERETES

Following the resumption of activities of Statistics and Economic Studies Division (DSEE) in 1988, national accounting made a new start with the support of French cooperation which developed the PIAF project to assist countries to have administrative software packages. Each of these packages led to a standardized tool adaptable to the needs of countries.

In 1989, a team was formed to implement the ERETES project: an international expert in national accounts (Michel Seruzier) and an international computer expert (Bernard Bourriquen) were selected. The project was conducted in three phases:

- in 1990, a feasibility study was done;
- the second phase was to put into place a set of specifications, and missions were carried out in five countries (Central African Republic, Niger, Cameroon, Gabon and Madagascar) to study local practices in national accounts and computing environment in which the tool should evolve;
- the Central African Republic was selected as the first partner country.

In 1994, a prototype software was developed at the same time as the national accountants were compiling national accounts for the year 1990. To write their programs, computer experts were first appraised with the way national accountants carry out the compilation work. To better design the software, national accountants and computer experts have implemented the classifications of activities, products, operations, sectors, sources and others to facilitate the codification. The work resulted in a total of 21 groups of coding and other specific technical annotations related to computerization.

XII.1.3. Computer processing of national accounts

General organization of primary data

To better understand the approach used by Central African national accountants, it is useful to analyse the IT organization and processing of primary data.

Computer tools

In 1994 the Service of the National Accounts had a modern IT infrastructure with Pentium I and II. The most used software at that time was as follows:

- Excel was used for processing primary data in the informal sector, of corporations and quasi-corporations using their statistical and tax returns (DSF) (data entry was done with SUT and IEAT approaches), as well as for processing DSF of the primary sector (food and industrial agriculture, wood). It was also used to make economic analysis;

- Tools developed under PROGRESS: the application of external trade was developed in the Department of National Accounts for the transcription of customs data to national accounts data, because the External Trade Service codifies products differently;
- Lotus was used to process data from public administration and non-profit institutions (NPI);
- Word software was used for publication;
- TRISTENT was a software designed to capture and use statistics and tax returns within the Industrial Production Department;
- EUROTRACE: this is a software of the Service of External Trade at the DSEE (these files are recoverable in text format for processing in national accounts), the primary source is SIDONIA software used by the Customs Department; and
- Other databases.

The main sources of data in the use of ERETES

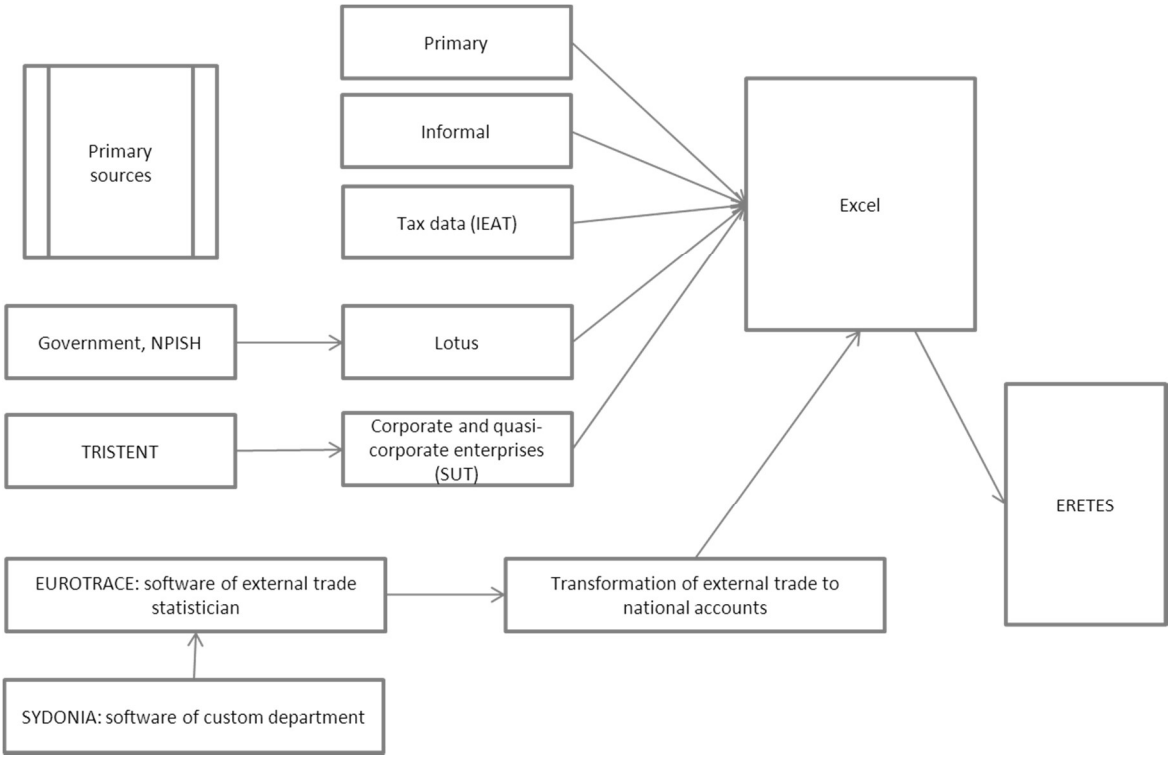
Many and varied data sources are used, available on electronic files and paper. Therefore, there is a need to process data by sector or by industry:

- for food crops, the main source is the annual agricultural survey; yield and production of various food crops are from the Ministry of Agriculture and Livestock; information about technical services is provided by ACDA and ANDE); and the sources of industrial crops are producing companies like SOCOCA for cotton, ORCCPA for coffee, CETAC for tobacco;
- agricultural marketing structures;
- mining data comes from BECDOR in the Ministry of Mines;
- to capture the informal sector compilers estimated data using the modern sector structures with the same activity and used data from consumer budget surveys;
- the Department of Water Affairs and Forestry sent to the Institute of Statistics an annual yearbook on logging;
- the transport yearbook was developed by the Ministry of Transport;
- corporations and quasi-corporations annually send statistics and tax returns (DSF) to tax directorates, and national accountants also evaluation of under-reporting;
- the person in charge of administration is responsible for collecting all available information on government and NPIs (Treasury, Tax Directorate, various technical departments, budgets, etc.);
- statistical yearbooks, quarterly statistical bulletins, annual bulletins on consumer price indexes, quarterly surveys of production, external trade statistics yearbooks;
- balance of payments, specific surveys conducted among subsidiaries of multinational companies;
- surveys on consumption budgets and other sources available from the various technical departments.

IT organization of data sources

Sources are organized by the institutions in charge of industries and by sectors. In computing terms, the sources are processed in Excel, Lotus and other compatible applications. During the early work with the ERETES prototype, national accountants could not capture quickly the coherence of data sources in time. They automatically uploaded the information. This is not the case anymore, except for the data on public administration. All other information was transferred to Excel in order to have a temporal comparison of the data. Accordingly, sources are organized in two ways.

Figure XII.1: Central African Republic - Organization of data sources in Excel



The software that provides the interface between the data sources and ERETES is the Excel spreadsheet. To load the source data into the ERETES database, an uploading table or a transfer sheet must be established. In the transfer sheet, each economic variable must be properly coded according to the 21 code groups; therefore a thorough knowledge of the codes is needed. The work of national accountants is to enter the primary sources in Excel processing sheets. Data sources are processed in a transversal way: arbitration and the first economic analysis of consistency are made in Excel. For matrix form sources (e.g. tax matrix), an Excel application transforms the transfer sheet matrix. At the end of the process, all data will be transferred to ERETES for the compilation of detailed accounts of supply and use balance (SUB) and industry accounts.

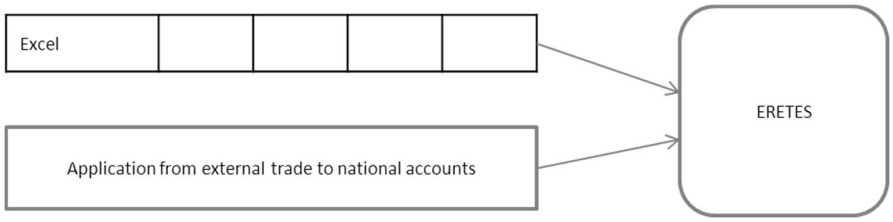
Compilation of the accounts with ERETES

In order to compile the detailed economic accounts, each national accountant in charge of an industry or a sector collects all the transfer sheets and forwards them to the IT person (the database administrator) for loading.

Loading data in the central database

For a new year, the responsible person creates a new folder to contain all the information relating to the new database and then initializes the procedure. Each compilation job must have only one folder and is initialized only once at the start of work. The transfer of the data sources is done in a standard format that can be either text format (csv) or Excel format. The transfer is done with the tools available in the ERETES software: it is an import operation of data from Excel files to ERETES database.

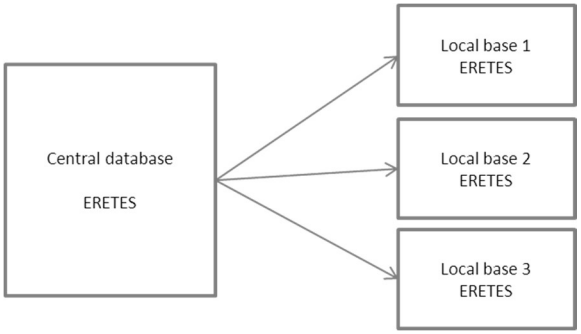
Figure XII.2: Central African Republic – Loading data in the database



Distribution of the central database to local decentralized databases

After loading the data sources, the person responsible for the data base secures it by creating a zip backup. In the Central African Republic the national accounts team adopted another approach, but similar to that proposed by ERETES. It no longer does pre-arbitration after loading the data because data arbitration is already carried out during data processing. So, after saving the base, the database is distributed to national accountants according to industry and sector responsibilities. This distribution operation is commonly called decentralization of the central base to local bases. The purpose of decentralization is to allow each national accountant to compile detailed economic accounts, namely the compilation of accounts by kind of industry and supply and uses balance.

Figure XII.3: Central African Republic – Distribution of the central database



To better compile the industries accounts and the supply and uses balances, each national accountant must have a good knowledge of the commercialization channels, production techniques, and regulations in the industries for which he or she is responsible.

Supply and use balance

The supply and uses balance (SUB) is done by using working table of SUB of ERETES at the lowest level (level 3 for products in the Central African Republic). The structure of the SUB screen respects the accounting equation regarding supply equal to uses:

supply: domestic production + imports + taxes/import + margins + indirect taxes - subsidies on products

=

uses: intermediate consumption + final consumption expenditure + change in inventories + gross fixed capital formation + exports.

For the accounts in current year, the operations of uses are broken down in basic price which we add margins (transport and trade) and taxes to get the purchase price. On the working table of one product, three SUB and three indexes are shown in columns: value of year N-1; price of

year N-1; volume index allowing having the value of year N with price of year N-1 (constant price value on the previous year); the price index (the product deflator); the current value N; and the value index. Supply and uses balance is done by using the methodological notes, the ERETES notepads while respecting the accounting constraints. The SUB tool also allows you to check if the supply and uses is balanced in each column, and if it is, we can move to another product. If all SUBs are done and balanced, we can compile accounts by kind of industry.

Study of production function: industry accounts

The difference between the industries accounts and SUB tool is at the level of classification of products by production function (in column):

- declared modern sector: DSF sources (mode 2);
- undeclared modern sector: DSF sources of small enterprises, technical studies (mode 3) and under-reporting;
- government and NPISH (mode 4);
- informal sector: household and individual entrepreneurs (mode 5);

The industries account tool lists at the row-level labels for operations concerning the current year:

- domestic production, intermediate consumption, value added;
- compensation of employees, social contribution, taxes on production, subsidies, gross operating surplus;
- employed population ratios and mode of production: value added per worker, technical coefficients, etc.

The industries accounts have no macroeconomic constraint to be balanced like the SUB, but they do have an economic consistency constraint. If all supply and uses balances are made, local databases must be returned to the central database.

Centralization of local databases

This is to bring again local databases to the central database after the compilation of detailed accounts on local databases. When the centralization of databases is performed, a checking procedure of database consistency is launched. The main tables of general summaries such as summary table of products and industries can be printed to control the level of imports and exports which come from the balance of payments, taxes and social contributions. After these operations, we must save the database for a second time. At this point we can now prepare the tools for economic analysis of the detailed accounts.

XII.1.4. Economic analysis of centralized data

Data extraction

For all elaborated and centralized account, the extraction of operations (production, import, taxes, margins, exports, etc.) by product at the lowest level is useful for relevant economic analysis. To extract, there are several tools in ERETES and other devices developed in EXCEL. With the prototype version, if you start checking the consistency of the database, a file was automatically generated for economic analysis, but the current version no longer generates this file.

Economic analysis of accounts

After extracting all the information required in Excel files, you can start analysing the data. This phase of analysis involves three parts.

Analysis of products and operations

With the help of Excel tools, we develop a first analysis by product and operations by comparing the volume indexes, price indexes, value indexes and the elasticity of some products depending on the operations. If there are discrepancies, the responsible person of the sectors concerned must give convincing explanations. This phase is done in group; all the responsible persons of industries are involved. For example, in 1991 the import of sport products was multiplied by forty, from 14 million FCFA in 1990 to 408 million FCFA. Sources were able to show that the Central African Republic has received donations of balls from Germany. We calculate the production volume index at level 2 in the production sheet and in the sheet of intermediate consumption, as well as the price index of these products in level 1 of products classification (higher level).

Once this step is completed, you have all the supply and use balances by product in rows and in columns all operations ranging from production to export; all this is available in an Excel sheet. So we have a sheet for SUB in value N-1; a sheet for SUB in volume (N with prices of N-1); a sheet for SUB in value N; a sheet for the price indexes; and a sheet for volume indexes. This format allows us to analyse step by step the products at level 3. After this, we can prepare the summary of intermediate consumption at level 1 (supply) for the cross-checking with intermediate consumption of industries (demand).

Industries accounts analysis

It is made when the work on products is completed. We estimate domestic production and intermediate consumption of industries by using the volume index of production, in order to compare intermediate consumption of industries and those of products and to take economic conclusions for the next phase.

XII.1.5. Estimation of intermediate consumption matrix

To estimate this matrix, national accountants had applied two methods.

First method

The first method was to estimate the intermediate consumption by sector (some products used by industries are available at level 3, 2, or 1of the products classification): corporations and quasi-corporations, the government sector and the informal sector (households and individual entrepreneurs). The estimation method of intermediate consumption of government was different. We first calculated a PAASCHE price index to deflate intermediate consumption of government (administrative sources were retained). After estimating the inter-industry exchange table (IET), we upload all the information for the next step.

Second method

In the second method, the estimation of IET is easily done when the previous steps were actually made. We first confronted the intermediate consumption of SUB and those of industries. When the sum of intermediate consumption of industry is different from the SUB, we analyse the difference and revisit all the SUBs made earlier. The basic assumption is that

according to economic logic there must be a consistency in the SUB if they are well-processed because the balances are linked in volume, prices and value (macroeconomic and temporal coherence). The database is redistributed to check all industries accounts to reach convergence. Each accountant works on the industries of his field according to the guidelines adopted (volume indexes of intermediate consumption of industries must go in the same direction with those of production). If convergence is achieved, we can now estimate the inter-industry exchange table.

For the estimation, we use the IET for year N-1 applied to industry production volume industry at level 2 to have the IET in volume. Then we multiply it by price indexes of intermediate consumption of products at level 1, so that we obtain the IET in value of year N.

Currently the estimation of the intermediate consumption matrix is done by using the estimation tool of ERETES.

XII.1.6. Balancing the inter-industrial exchanges table (IET)

National accountants use two methods to balance the IET. The balancing is done in rows and columns. We tend to balance first the rows (products sold confronted with purchases of industries) and then the columns. The manual method is used when the estimation of intermediate consumption was made with the first method.

Manual method

After loading the data, ERETES offers among its tools a table that presents the IET: in rows we have intermediate consumption supplied and in columns the intermediate consumption purchased by industries and by product. As the outcome of intermediate consumption estimation, often the first lines (primary sector) are almost balanced. We adjust the information when we progress in the work. The adjustment is done either by returning manually to change the intermediate consumption of SUB or those of industries. Each change causes an effect which must be managed carefully to maintain the balance of data. For example, if you change the intermediate consumption of a product, you must change it on every product used by industries and restore consistency on the concerned product. Recall that the summary is done at the higher aggregated level of classifications, but changes must be reflected in lower levels of the classification of products and activities. At the end of the process, the sum of intermediate consumption from the industries should be equal to those of SUB: the balance of the IET is thus achieved. The manual method is used when we do the estimation of IET with the first method.

RAS method

When estimating the IET, if the sum of intermediate consumption of the SUB is equal to that of the industries, we can move on to the RAS method, otherwise we redistributes the database for reconstructing and analysing data consistency product by product and by industry. This iteration is done until we converge and we make the assumption that the SUBs follow an accounting logic, respond to macroeconomic constraints and are linked in volume, price and value. Thus we can only modify industry accounts to balance the two sums. Then we retake the estimation of the matrix of intermediate consumption. To apply the RAS method, we use the estimated value of intermediate consumption. RAS method requires the use of several sheets:

- a base sheet and another sheet to initialize RAS;
- a sheet of exogenous variables;

- a row spreadsheet;
- a column spreadsheet;
- a results sheet;
- a sheet for rounding;
- a sheet for each sector;
- a sheet for deflation (intermediate consumption by volume).

When we finish, we take all matrices in order to load them into the database. So we can have the first summary of SUT, a first part of IET (production account, operating account) by using devices developed in Excel.

Preparation of the publication of the national accounts

When the IET is ready, we prepare summary tables, write the comments and submit the work to the reading committee. If the work is adopted, we can publish the national accounts.

Perspective: automating the development of the Social Accounting Matrix (SAM) macro in ERETES

The ERETES software for the compilation of national accounts was developed by the French Ministry of Foreign Affairs in cooperation with the European Union (Eurostat). Several member States of AFRISTAT and countries in Latin America use this software to compile the final national accounts.

To prepare the accounts, you must first collect the data sources, transcribe them into the language of the national accounts, and then load them into the software. Many of the data processing steps in the software have been provided, but the most important are (i) development of supply-use balances (SUB) of different products contained in the classification, and (ii) development of industry accounts or production functions of activities of the classification. Afterwards, ERETES can generate two summary tables: SUT and Integrated Economic Accounts Table (IEAT). This action is initiated when the IET is balanced.

As most components of the SAM are in the ERETES database, it is important to generate SAM from the software. Noting that the main tables to build the SAM are coming from ERETES, its compilation can be simplified. It would make ERETES complete to incorporate a SAM module in the production process of the final national accounts. National accountants could easily produce the three main summary tables of the economy, allowing time for the specialists in general equilibrium to convert the MCS macro by incorporating meso-and micro-economic data.

The crucial action is the design of the computerization program to create this module. EUROSTAT currently heads the ERETES Committee may rely on the company in charge of maintenance (TRASYS) of ERETES to develop a module of the SAM macro.

Figure XII.4 : Central African Republic – Simplified organization of data sources

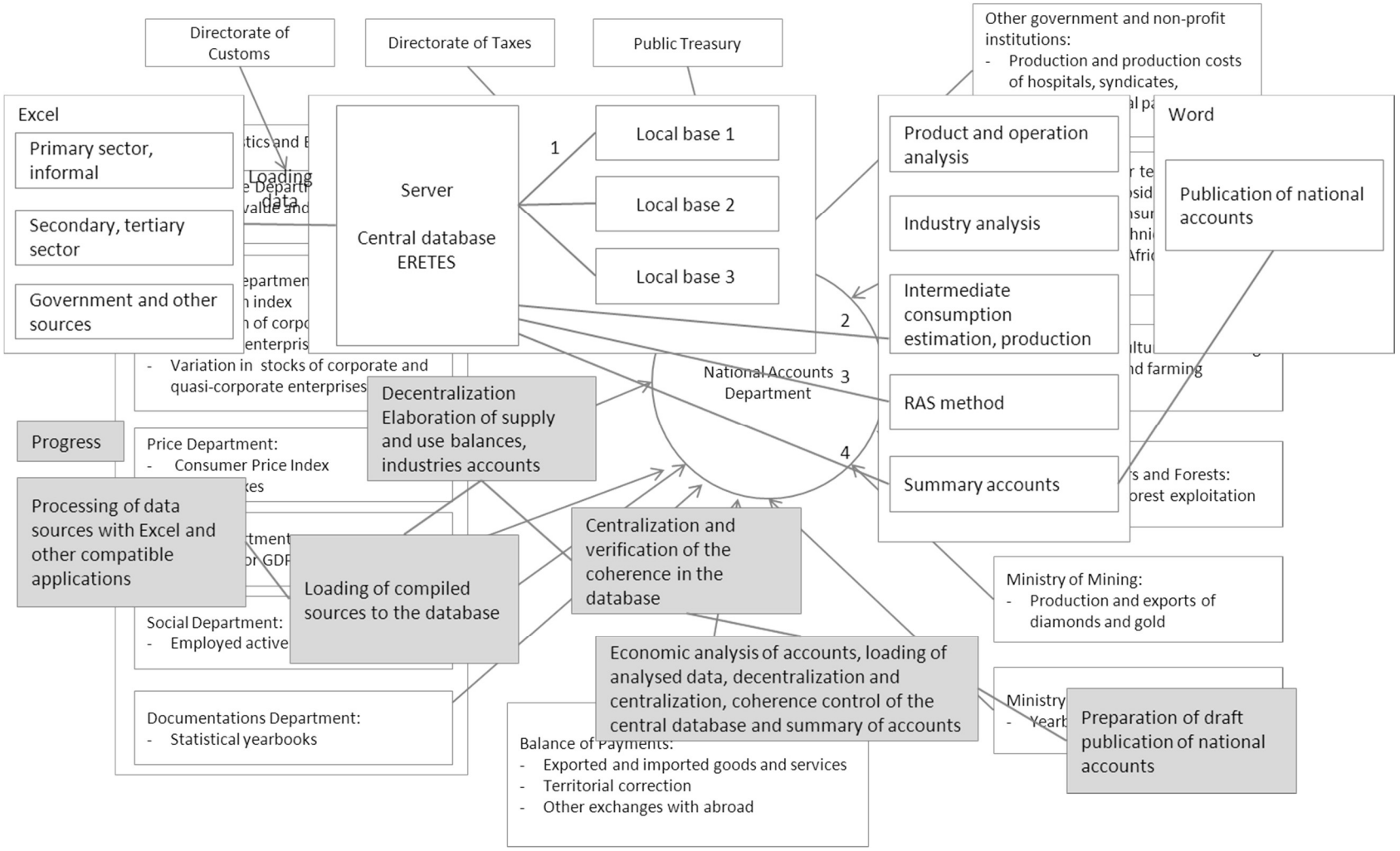


Figure XII.5: Central African Republic – Simplified steps of data processing