



# UGANDA

## TECHNICAL ASSISTANCE REPORT—REPORT ON THE NATIONAL ACCOUNTS STATISTICS MISSION

September 2017

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# **INTERNATIONAL MONETARY FUND**

Statistics Department



## **UGANDA**

### **REPORT ON THE NATIONAL ACCOUNTS STATISTICS MISSION**

**(January 18–29, 2016)**

**Prepared by Robin Youll**

**February 2016**

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**ABBREVIATIONS**

AFE	East Africa Technical Assistance Centre of the IMF
AFR	African Department, IMF
ANA	Annual national accounts
BOP	Balance of payments
BoU	Bank of Uganda
CIF	Cost including insurance and freight
CPI	Consumer price index
FCE	Final consumption expenditure
FISIM	Financial intermediation services indirectly measured
GCF	Gross capital formation
GDP	Gross domestic product
GDPP	Gross domestic product based on the production approach
GDPE	Gross domestic product based on the expenditure approach
GFCF	Gross fixed capital formation
GO	Gross output
GVA	Gross value added
HFCE	Household final consumption expenditure
IC	Intermediate consumption
IMF	International Monetary Fund
ISIC	<i>International Standard Industrial Classification of All Economic Activities</i>
MES	Macroeconomic Statistics Division of UBOS
MSA	Macroeconomic Statistics Advisor
NAS	National accounts statistics
NPISH	Non-Profit Institutions Serving Households
QGDP	Quarterly GDP
QNA	Quarterly national accounts
STX	IMF Short-term Expert
SUT	Supply and use tables
TA	Technical Assistance
TiS	Trade in Services
UBOS	Uganda Bureau of Statistics
UGA	Uganda
UGS	Ugandan Shillings
UNHS	Ugandan National Household Survey
UNPS	Ugandan National Panel Survey
URA	Uganda Revenue Authority
VAT	Value added tax
WIP	Work-in-progress

## EXECUTIVE SUMMARY

In response to a request from the Ugandan authorities and in consultation with the African Department (AFR), I undertook a technical assistance (TA) mission to Kampala during January 18–29, 2016 to assist with the further development of estimates of quarterly Gross domestic product (GDP) for expenditure components, and to initiate the development of production accounts for main institutional sectors.

The Uganda Bureau of Statistics (UBOS) is responsible for producing the National Accounts Statistics governed by the *Uganda Bureau of Statistics Act 1998*. The institution produces annual GDP estimates by activity and expenditure at current and constant prices. Quarterly GDP by activity are also compiled at constant and current prices. No expenditure estimates of GDP are compiled on a quarterly basis.

The previous quarterly national accounts mission, conducted in August 2015, imitated a commodity flow model for estimating GDP for expenditure components. The mission recommended the continued development of the data sources and the estimation system by local counterparts.

At the outset of the mission the Short-term Expert (STX) met with UBOS's Director of the Macroeconomic Statistics Division (MES) to agree objectives. It was agreed that the mission would focus on i) further development of the quarterly expenditure GDP estimates, ii) the development of production accounts for main institutional sectors, and iii) consideration of the development of an independent annual estimate of GDP based on expenditure components. In addition, some significant issues were identified during the mission with the regular systems and methods used for the production of quarterly GDP based on the production approach. The Director asked for assistance in resolving these to enable the release of quarterly GDP on January 25, 2016.

A systematic basis for estimating expenditure components of constant price GDP based on a Commodity Flow Model (CFM) was embedded into the 'live' GDP production systems. Together with local counterpart staff, the mission finalized the MS Excel framework for producing the volume measure of constant price quarterly expenditure GDP. In addition, new methods for estimating product taxes were developed, a rules-based basis for balancing GDP each quarter was established, and benchmarking of the estimates to the published quarterly GDP levels was achieved.

The CFM will enable the estimates of constant price expenditure components to be produced routinely each quarter based largely on existing data sources. The deflators needed to establish the equivalent current price estimates were also developed. However, it was not possible to finalize this work, and so an action plan was agreed with the local staff for its completion.

The mission also discussed with staff the potential to develop an ‘independent’ estimate of GDP based on expenditure components. The CFM produces quarterly estimates which are constrained to the existing annual and quarterly production measure of GDP. The Director of MES is keen to develop independent estimates of GDP from the expenditure side. This will require significant additional data sources and also has implications for staffing. The mission discussed some prerequisites for such a development, which are described in this report.

The mission also supported the development of production accounts for each of the five main institutional sectors (Private No-Financial Corporations, Private Financial Corporations, General Government, Non-Profit Institutions Serving Households and the Household sector). The estimates are based on current price annual fiscal year data but, by extension, UBOS should now be able to develop quarterly series and for constant prices.

In addition to the core objectives of the mission, the mission provided support to UBOS to finalize the quarterly estimates of GDP for 2015 Q3, based on the production approach, which were published on January 25, 2016. There were significant issues with the software systems used by UBOS for compilation of this series, notably in relation to the procedures used for seasonal adjustment, and also with the methodology for estimating Financial Intermediation Services Indirectly Measured (FISIM). The issues were resolved and relevant advice provided.

Advice was also requested for the rebasing work on the Producer Price Index (PPI), used by national accounts, with regard to changes needed to the database systems used. A work plan was developed for this, describing the updating procedure for the specific database tables affected by the rebasing (the STX had developed the original system for the PPI in 2008).

At the end of the mission the key findings and recommendations were discussed with the management team in MES. In terms of priority, UBOS should

- i) Undertake a review of the regimes used for compiling the three difference estimates of GDP (annual fiscal years, annual calendar years and quarterly), to establish whether this could be simplified and greater consistency between the estimates achieved and;
- ii) Carry forward the quarterly expenditure compilation process by developing the basis for a current price equivalent to the constant price CFM, using the approach agreed during the mission. Once complete, TA should be provided to assist UBOS to integrate this with the regular quarterly and annual production systems. The publication of the new GDPE series should take place after the work on consistency (mentioned above) of GDP estimate is complete.

Project framework summary to improve and expand the QNA statistics in Uganda.

### OBJECTIVES

Objectives	Verifiable Indicators	Assumptions
Improvement of Uganda's QNA System	QNA figures meet stakeholders' expectations in terms of quality and timeliness and abilities of the staff.	Assumptions are that the staffing shall be appropriate in terms of numbers and qualification in addition to the availability of TA and appropriate source data.

### ACTIVITIES/OUTPUTS

DQA F	Priority	Outcomes Description	Verifiable Indicators	Completion Date	Implementation Status
0.2.1	High	<b>Statistics prerequisites:</b> Increase the current staffing level of NAS Unit by two statisticians in order to implement improvements to QGDP.	Current staffing level of NAS Unit increased from 8 to 10 statisticians.	11/21/2011	Completed. There are currently ten staff members in the NAS Unit including eight statisticians and two data editors.
0.2.1	High	Train NAS staff on the use of improved source data and compilation techniques for producing ANA and QNA.	NAS staff has the appropriate capacity and skills to compile high quality ANA and QNA.	12/31/2014	Training is being provided during missions and workshops. Need to nominate staff for IMF and other NAS courses.
3.1.1		<b>Data sources:</b> Improvement of data sources and indicators used to compile ANA and QNA in current and constant prices.	The indicators are representative and provide adequate coverage for each economic activity, expenditure component and other aggregates.	12/31/2014	A number of new surveys are being implemented to address data gaps, and coordination with other data providers is being improved.
3.3.1	Medium	<b>Statistical techniques:</b> Rebasing of QGDP	New base year 2009/10 QGDP	11/28/2014	Completed. SUT finalized and benchmark estimates compiled. QGDP series finalized and updated.



<b>DQA F</b>	<b>Priority</b>	<b>Outcomes Description</b>	<b>Verifiable Indicators</b>	<b>Completion Date</b>	<b>Implementation Status</b>
3.3.1	High	Improve the methodology for compiling QGDP at constant prices.	Methodology for compiling QGDP at constant prices revised.	05/31/2014	Completed. Improvements have been implemented and the QGDP estimates have been publicly released, with further improvements incorporated in 2013 and 2014.
3.3.1	High	Develop the methodology for compiling QGDP at current prices.	Methodology for compiling QGDP at current prices implemented.	05/31/2014	Completed. Methodology Developed.
3.3.1	High	Develop the methodology for compiling quarterly output and intermediate consumption estimates.	Output and intermediate consumption estimates compiled.	05/31/2014	Completed. Methodology and GO and IC estimates developed.
3.3.1	High	Produce QGDP estimates by expenditure share in current and constant prices.	QGDP by expenditure estimates compiled.	03/31/2016	Methodology finalized. To be implemented by NAS staff with AFE TA. Dependent on the integration of the existing systems for producing fiscal/calendar year estimates as well as quarterly estimates based on production.
3.3.1	High	Produce quarterly estimates of other key NAS aggregates in current prices.	Quarterly estimates of GNI, GNDI, saving, net lending/borrowing in current prices compiled.	06/31/2016	Methodology developed. To be implemented by NAS staff with AFE TA.
3.3.1	Medium	Produce production accounts for the main institutional sectors	Annual and quarterly production accounts compiled	06/31/2011 6	Production accounts for fiscal years developed. NAS staff to

DQA F	Priority	Outcomes Description	Verifiable Indicators	Completion Date	Implementation Status
					develop quarterly series.
5.1.1	High	<b>Dissemination:</b> Release QNA within three months after the reference quarter.	QNA released to the public within three months after the reference quarter.	12/31/2011	Completed. QGDP estimates in constant prices were released to the public in early October 2011. UBOS plan to improve timeliness to two months.
5.1.1	High	Release QGDP by economic activity based on one digit on ISIC revision 4. - press release/media - publications/websites	QGDP by activity based on one digit on ISIC revision 4 released.	11/28/2014	Completed.
5.2.1	High	Update and release revised concepts, sources and methods manual for QGDP.	Updated QGDP manual disseminated.	11/28/2014	Completed.

## I. INTRODUCTION

1. This is the technical report of the IMF's East Africa Technical Assistance Centre mission which visited Kampala during July 23–August 4, 2015 to assist the Uganda Bureau of Statistics (UBOS) with the development of estimates of quarterly GDP for expenditure components and to initiate the development of production accounts for main institutional sectors.

2. UBOS is responsible for producing the National Accounts Statistics and is participating in the IMF–DFID: Enhanced Data Dissemination Initiative QNA Module to improve and expand the QNA estimates disseminated. In addition, it has been rebasing the Gross Domestic Product (GDP) estimates to 2009/10. AFE missions during August and November 2010 reviewed the data sources and compilation methods used to compile the ANA and QNA estimates and to make recommendations for improvements.

3. Six follow-up AFE missions were undertaken during the period 2011 to 2013 to assist with improving data sources and methods, including compiling agriculture and construction Work-in-progress (WIP) estimates, improved quarterly constant price and new current price gross domestic product (GDP) estimates, and supply and use tables (SUT); as well as providing related training on the compilation methodology and use of source data. In addition, four missions were undertaken during this period to assist with data quality assurance; and the development and compilation of the SUT. A further four missions by consultants from Oxford Policy Management assisted with SUT compilation.

4. Missions in May, September and November 2014 assisted in finalizing the SUT and 2009/10 benchmark estimates; provided advice on the compilation of the rebased annual and quarterly GDP by economic activity; and made further improvements to the methodology, including improving the annual and quarterly estimates for public administration, public education, public health, and GDP by expenditure components.

5. The most recent mission, in August, 2015, initiated the development of a commodity flow model for estimating of GDP for expenditure components. The current mission was a follow-up to that, and also aimed to initiate the development of production accounts for main institutional sectors.

6. The current mission worked closely with the National Accounts Department staff. The cooperation and support of the authorities and counterpart staff is very much appreciated.

7. To assist the reader, this report includes an Executive Summary of the main findings and an updated Project Framework Summary. Following this introduction, Chapter II provides a brief update in relation to the statistics prerequisites. Chapter III gives a summary of the work undertaken during the mission, while Chapter IV considers the next steps and recommendations to take forward the work to improve the estimation.

8. Appendix I lists the main staff worked with during the mission; Appendix II illustrates the scheme for developing the sector production accounts; Appendix III sets

out the CFM methodology; and Appendix IV provides an updating procedure for the CFM.

## **II. STATISTICAL PREREQUISITES**

9. Budget funding for the UBOS has been significantly constrained in recent years. However, most of the data needed for compilation of the SUT and GDP rebasing was eventually collected. The main data gaps remaining relate to detailed international trade in services and the detailed product breakdown of IC components by economic activity.

10. The Integrated Trade in Services Survey has now been conducted and the results will be available for the next rebasing exercise. The benchmark industry production surveys need to be improved to collect more detailed IC data.

11. As the next GDP rebase will be for 2015, it is strongly recommended that UBOS secure appropriate budget funding for benchmark surveys and to recruit a suitable expert to provide the approximate 40 weeks of TA that will be required. Both Kenya and Rwanda provide good examples of how this should be done using a single external consultant with support from the AFE, as needed.

12. The current staffing level for the NAS Unit is nine staff, comprising eight statisticians and one data editor. There is a need to increase staff skills development through attendance at regional/international NAS courses, as well as training during TA missions. The MSA and short-term experts have provided training to NAS compilers during missions on good compilation practices and better use of indicators and price indices in compiling ANA and QNA. In addition, some staff members participated in the two-week AFE NAS training course conducted in Tanzania during February 2012; and the AFE QNA training courses in Uganda in September 2012 and February 2014, and Tanzania in October, 2015.

13. As recommended previously, consideration needs to be given to reviewing and improving survey and data processing timetables. There is also a need to improve data coordination and understanding of NAS requirements within UBOS and with other data providers. The recommended NAS Technical Committee is yet to be established.

## **III. WORK UNDERTAKEN DURING THE MISSION**

14. The core objectives of the current mission were: i) to develop quarterly GDP estimates by expenditure components (GDPE); and ii) to initiate the development of production accounts for main institutional sectors. The approach to achieving these was discussed with the Director of the Macroeconomic Statistics Division (MES) and his senior term at the start of the mission. The Director identified two further areas where assistance was needed: iii) improving the processing systems and methods used for estimation quarterly GDP from the production approach (GDPP); and iv) providing advice on the development of an independent estimate of GDP based on expenditure components. The following sub-sections consider these developments in turn.

**i) Developing estimates of GDP by expenditure components**

15. The previous AFE mission, in August, 2015, initiated a methodology for estimating GDPE using a Commodity Flow Model (CFM). This allows comparison of the supply and demand for 158 products each quarter. A ‘master’ workbook was established for the constant price CFM, linked to the data sources needed for each component. The detailed methods for each component of the CFM product flow are set out in Appendix III, and the scheme for updating these estimates is set out in Appendix IV.

16. The current mission reviewed the methodology and developed some improvements in the areas described in the following sub-sections.

**a) Taxes on products**

17. Some improvements estimation of taxes on products were introduced this time. During the previous mission in August, 2016, some estimates for taxes on products were produced, but not all of the data needed to estimate these were available at that time. The methodology developed this time for constant price taxes on products is:

*i) Excise on Imported Goods*

For each excisable product: the volume of goods in each quarter is multiplied by excise tax rates for imports in 2009/10. The results, by product, are constrained to the known collected total taxes for excise on imported goods.

The volume of excisable goods is calculated from the value of those goods divided by the relevant unit value (price) series for each product. The excise rates for each product in the base year (2009/10) is calculated as the ratio of the excise taxes to the CIF value of formal imports for each excisable product

*ii) Excise on Domestic Goods*

For each excisable product: the volume of Monetary GO in each quarter is multiplied by domestic excise tax rates in 2009/10. The results, by product, are constrained to the known collected total taxes for excise on domestic goods.

*iii) Customs Duties*

Same approach as for excisable imported goods is applied.

*iv) VAT (non-deductible)*

Non-deductible is payable by the final consumer, i.e., Households, General Government and NPISH. In the CFM, HFCE is calculated as a residual after the addition of non-deductible VAT (ND VAT). But ND VAT is unknown, or at least needs to be estimated, before the residual estimate of HFCE is calculated. To get around this circular dependence between ND VAT and residual HFCE, the estimation of ND VAT each quarter proceeds as follows:

- i) Calculate the ‘base rate’ of ND VAT from the SUT as:

$$r = \text{ND VAT} / (\text{FCE} - \text{ND VAT})$$

where  $\text{FCE} = \text{HFCE} + \text{GG FCE} + \text{NPSIH FCE}$ .

- ii) Each quarter calculate the volume of FCE – ND VAT as:

$$\begin{aligned} \text{FCE} - \text{ND VAT} = & \text{GO} + \text{DTM} + \text{M} + \text{Other taxes on products} \\ & \text{less (IC} + \text{GFC} + \text{X)} \end{aligned}$$

where GO= Gross Domestic Output, DTM= Domestic Trade Margins, IC = Intermediate Consumption, GFC = Gross Capital Formation, and X = Exports.

- iii) Estimate the quarterly volume of ND VAT as:

$$\text{ND VAT} = r \times (\text{FCE} - \text{ND VAT}).$$

***b) Constraining GDPE to the published quarterly results***

18. A key requirement of the CFM is that it needs to produce a level of GDP in each quarter consistent with the published quarterly production measure of GDP. To ensure that the estimates of GDP in total from the CFM are equal to the published quarterly estimates of GDPP, two constraints were applied: i) data on GO and Intermediate Consumption (IC) by industry from the live quarterly system were linked into the CFM and constrained so that the difference between GO and IC for each industry was equal to the published Gross Value Added (GVA); and ii) a rules based balancing procedure was developed to ensure that supply equals demand for each product in the CFM.

19. With regard to the use of the ‘live’ GO and IC at the detailed 158 product level, an issue arose with these estimates. In the live GDPP system only GVA is benchmarked to the annual fiscal year GVA for each of 26 industries. The GO and IC themselves are not benchmarked to the annual fiscal year GO and IC. Therefore, it was necessary to constrain the 158 industry level series to ensure the sum of their GO less the sum of their IC was equal to the published GVA for each industry. This was achieved by:

- i) calculating the un-benchmarked GVA for each of the 158 detailed industries by applying the benchmark indicator (BI) ratio for the relevant aggregate GVA series;
- ii) calculating the GO for each of the 158 detailed industries by extrapolating the 2009/10 benchmark level for GO for that series (from the Supply and Use Table) using the GO as indicators;
- iii) calculating the IC for each of the 158 detailed industries as the difference between ii) and i).

### c) *Balancing the CFM*

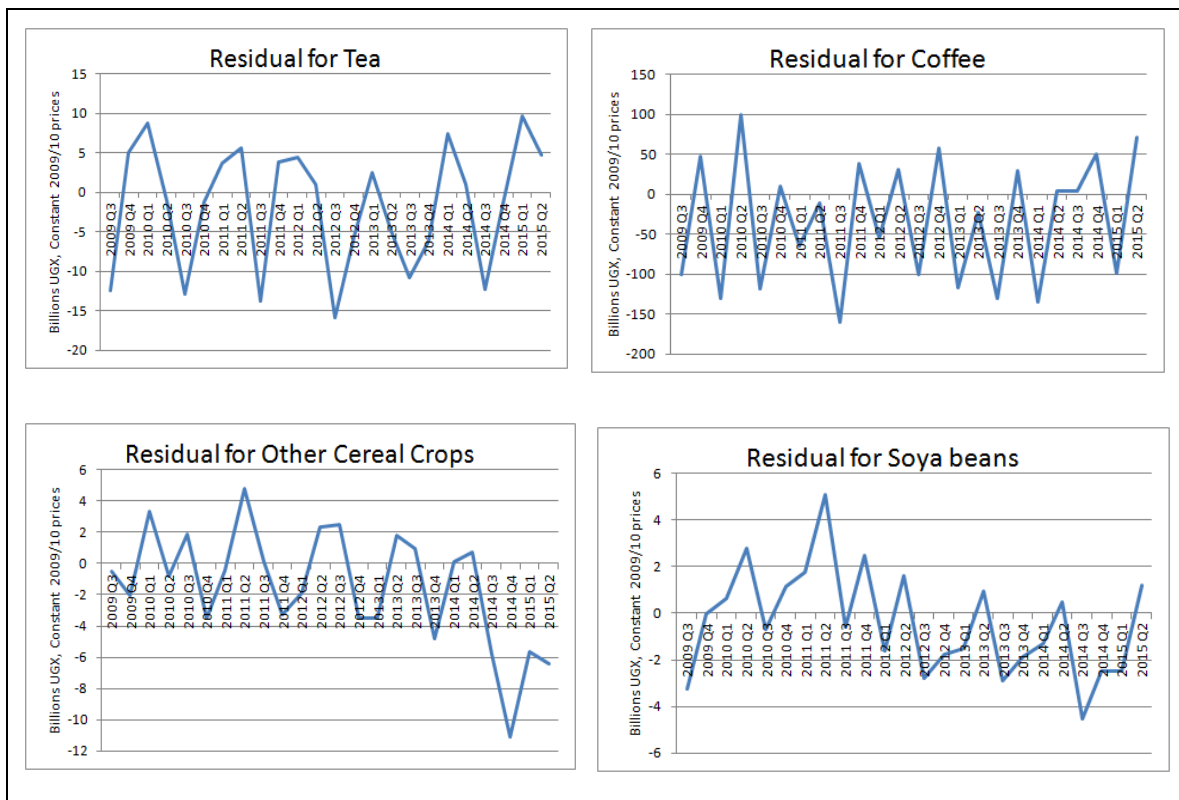
20. Each quarter the CFM produces an estimate of the supply and demand for each of the detailed 158 products. Once the CFM has been updated with the latest data (for GO, IC, taxes, trade in goods and services, General Government and NPISH expenditures, and estimates of Gross Fixed Capital Formation (GFCF) and Changes in inventories), a balancing item, or residual, is calculated as the difference between total supply and total demand. In theory, this will be equal to the Household Final Consumption Expenditure (HFCE) for each product. In practice, because of incomplete data and other quality issues, the residual will actually be a mix of HFCE and the errors in estimation.

21. For most products, the residual is taken as an indirect estimate of the HFCE. However, for some products, where there is no known HFCE, for example consumption of unprocessed coffee and the ‘Activities Auxiliary to Financial Service Activities,’ it is clear that any residual cannot be treated as HFCE. In other cases, the residual in particular quarters turns out to be negative. Again, this cannot be treated as HFCE.

22. The mission discussed with counterparts how best to resolve the product imbalances in cases where the residual is negative or where there is no known HFCE. Because of the time constraints on ‘manually’ balancing the product flows each quarter, it was agreed that a rules-based approach may be best.

23. For goods, it was agreed that these residuals may best be regarded as representing changes in inventories, e.g., for coffee and tea. Some examples are shown in Figure 1.

**Figure 1: Examples of ‘Residuals’ for Selected Goods**



24. Change in inventories are generally difficult to measure directly. For example, for the 'Other Cereal Crops,' these are nearly all produced locally (there is some small imports, mainly informal). So, the GO of 'Other Cereal Crops,' plus the trade margins, plus taxes (which are essentially zero), less any exports (which account for around 10 percent of the total supply) must be used as i) IC, or ii) consumed by households (i.e., HFCE) or iii) contribute to the change in inventory. Since total IC is fixed by the published GDPP, and by product is estimated in constant prices according the method set out from paragraph 14 in Annex 1, what remains is taken as HFCE plus the change in inventory.

25. Therefore, the HFCE for such goods is estimated in the CFM by multiplying the total 'net supply' in the current quarter (i.e., total supply less exports, capital formation, final expenditures by government and of non-profit making institutions serving households, and the acquisition less disposal of valuables) by the base year ratio of HFCE to net supply from the SUT.

26. The estimated changes in inventory for these product is then calculated as the difference between total supply less all other uses, including the estimated HFCE, plus any other explicit estimates of changes in inventories (currently these are only calculated for biological assets).

27. One consequence of this procedure, for goods where there is some HFCE, is that the quarterly path of constant price HFCE is effectively 'smoothed' by the allocation of some of the net supply to changes in inventories. This seems reasonable, since there will be at least some change in inventory for such goods, although there are no direct data to measure this change. The procedure therefore provides an indirect means of estimating changes in inventories.

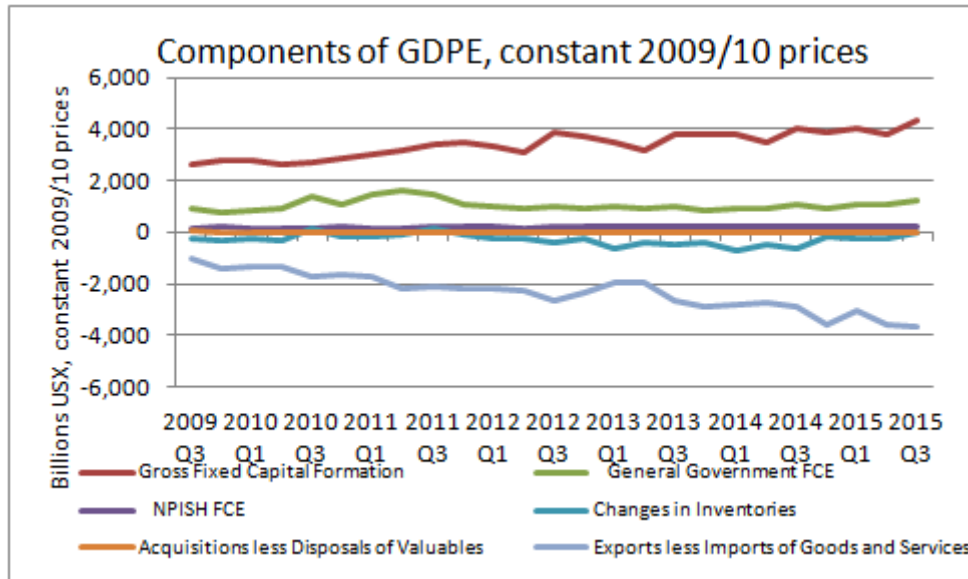
28. For services, again it is possible that for some products the residual is either negative or exists for products for which there is no known HFCE. Since there are no inventories for services, it is not possible to use the procedure described above for goods. For example, in the case of 'Employment placement & Temporary Employment Agencies Services' there is no HFCE. Any residual must therefore, theoretically, represent IC of businesses, or the final consumption expenditure of General Government (GG) or NPISH, or exports/imports of services for this product. The data sources for GG and NPISH are reasonably well-established. The estimate of IC is again given in constant prices by the method set out from paragraph 14 in Appendix III and the totals by industry are fixed by the published estimates of GDPP. So, in order to balance each product, the residual has been allocated to the balance of trade in services for each product: where the residual is positive it is allocated to exports of services for that product; otherwise it is regarded as an import of services.



*d) Some results*

29. Based on the latest version of the CFM estimates of expenditure components and total GDPE were developed. Chart 1 shows the series for the main aggregate components, except HFCE, Chart 2 shows the constant prices series for HFCE.

**Chart 1: GDP(E) Main Aggregates in Constant 2009/10 Prices**

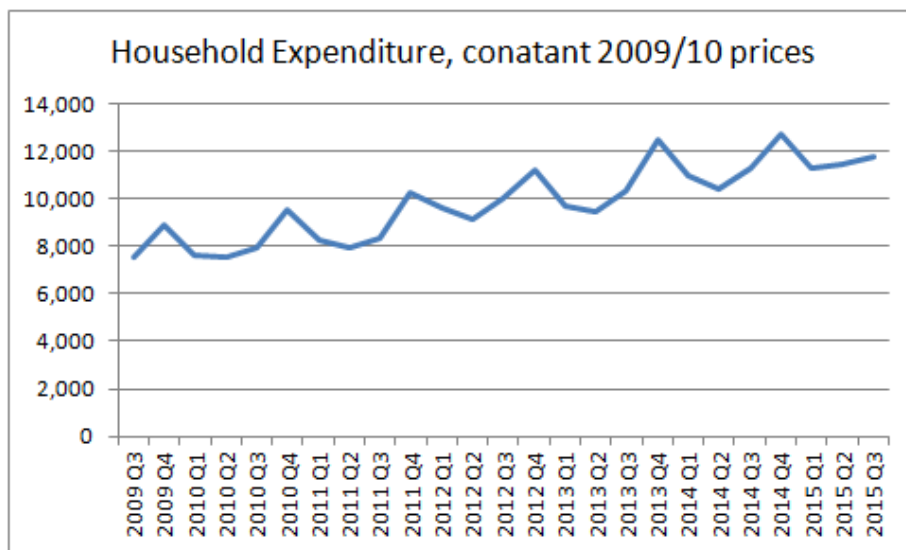


**Key:**

FCE = Final Consumption Expenditure

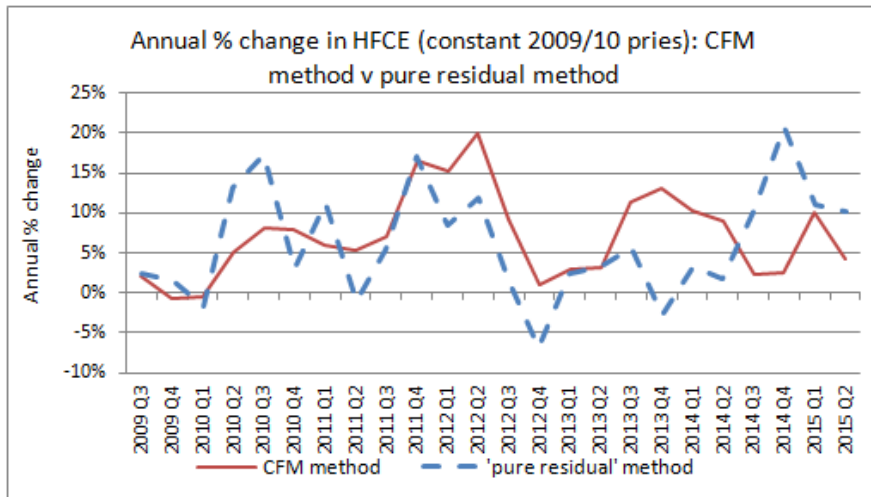
NPISH = Non-profit making institutions serving households

**Chart 2: Household Final Consumption Expenditure in constant 2009/10 Prices**



30. UBOS currently produces, on an annual basis, a simple residual estimate of HFCE based on available data for other flows. Chart 3 compares the annual growth of this ‘pure residual’ estimates of HFCE with those from the CFM.

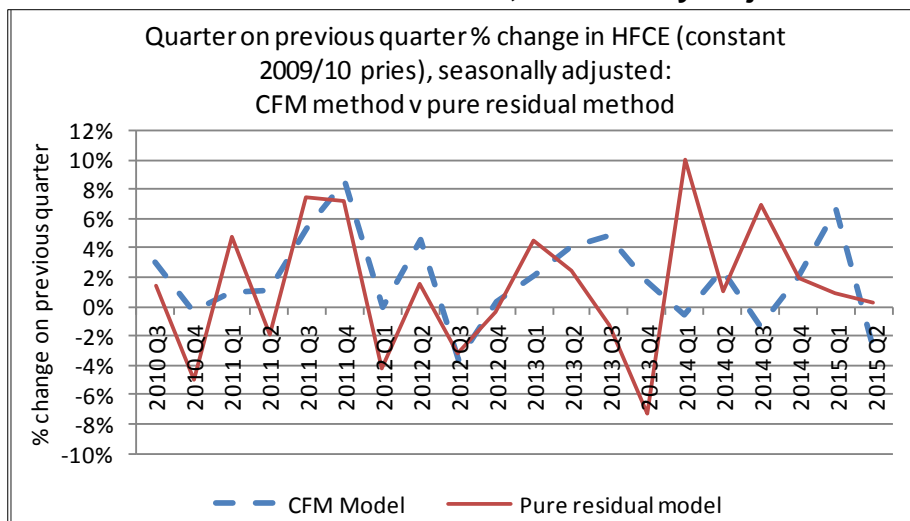
**Chart 3: Annual Percentage Change in Household Final Consumption Expenditure in Constant 2009/10 Prices: CFM Method and ‘Pure Residual’ Method**



31. The chart illustrates the greater volatility in the ‘pure residual’ method, which will include in the estimates of HFCE all errors, including the lack of explicit information on changes in inventories. The CFM method may therefore provide a more plausible estimate of the changes in HFCE.

32. Chart 4 compares these same two series on a seasonally adjusted basis, showing the quarter on previous quarter percentage changes. Again, this highlights the significantly greater volatility of the pure residual estimates. A simple metric of the volatility, the mean squared variation of each series around its average, shows the CFM estimates to be around half as variable as those derived from the ‘pure residual’ method.

**Chart 4: Percentage Change on Previous Quarter of Household Final Consumption Expenditure in Constant 2009/10 Prices: CFM Method and ‘Pure Residual’ Method, Seasonally Adjusted**



33. Some improvements to the method used for the constant price series are still possible. Notably the improvements in the product breakdown of data used for trade in services. This was highlighted in the report from the previous mission, and the relevant recommendations are repeated in the recommendations in this report, see Next Steps.

34. For most products, covering around 75 percent of total HFCE, the deflators are simply the latest, rebased, Consumer Price indexes (CPIs), released in January, 2016. For products for which there is no explicit CPI, e.g., construction materials, price indicators based on the Construction Services Index, the Unit Value Indexes of Imports or Exports or the Producer Price Index have been used.

*e) Current price CFM*

35. The mission did not have sufficient time to develop an equivalent CFM in current prices. However, the work needed to develop this was discussed with the local counterparts, and involves:

- Developing equivalent estimates for current price GO based on the GDPP system
- Estimating trade flows for goods directly from the data on formal and informal trade
- Estimating trade flows for services by reflating the constant prices estimates from the CFM
- Reflating the constant price estimates of HFCE using the deflators developed by the mission, see paragraph 34.
- For Changes in Inventories, reflating the constant prices estimates from the CFM
- For GGFCE, NPISH FCE, GFCF, and Acquisition less disposal of valuables, using the existing current price estimates
- For product taxes, using an analogue to the method described above from paragraph 15.
- For Domestic Trade Margins, using an analogue to the method described from paragraphs 13–15.

36. The one flow not considered above is current price IC. It would not be appropriate to use the method applied to constant price IC to convert the industry estimates in current prices into product estimates (described from paragraph 21. 21). This is because, while in volume terms it may be reasonable to assume that the percentage of each product used as IC within each industry is broadly stable in the short term, in current prices this will not hold. For example, the large fall in the price of oil in the recent past means that the percentage of total IC spent on oil within an industry is likely to be less than in the base year (2009/10). As a result, the current value of IC on each product needs to be estimated differently.

37. One approach would be to regard IC as the residual in the current price CFM. However, this is likely to lead to some odd, and perhaps implausible, implied deflators for some IC products (i.e., the ratio of the residual current price IC to the constant price IC). Some form of ‘balancing’ of the product flows would therefore be necessary. Such balancing could give rise to changes in the implied deflators for industries, compared with

those in the current GDPP system. In effect, this could change the current price level of GDP. The basis of deriving current price estimates based on the CFM approach will therefore need to be considered by UBOS management, since it could lead to a change in the level of GDP.

38. An alternative approach to balancing the current price commodity flows which would not lead to a change in the level of current price GDP may be considered. This might involve keeping the *industry* IC consistent with the GDPP results, for example, and balancing each product in the CFM by adjusting the deflators for some components, or the trade margins. This would leave current price GDP unchanged, but at the expense of adjustment to price deflators.

39. Because of the complexities involved, and the handling issues which may arise in terms of possible revisions to GDP, it is recommended that the current price CFM and possible approaches to balancing are evaluated in a further TA mission later in 2016, see Next Steps.

*f) Timing of the release of the quarterly GDPE series*

40. The timing of the release of the new estimates of GDPE based on the CFM is worth considering. As noted, currently UBOS publishes annual fiscal year estimates of GDPE in both current and constant prices, based on ‘pure’ residual methods. These estimates are released in October of each year, relating to the 12 months ended in the previous June. The CFM estimates of GDPE will at some stage replace the existing estimates and will be available, in principal, within three months of the end of each reference quarter. Before these are released for the first time, there are some issues to consider:

- i) There are some inconsistencies between the current estimates produced by UBOS on a quarterly and on a fiscal and calendar year basis. See from paragraph 51. To introduce a new quarterly series for GDPE before these inconsistencies are resolved may create confusion among users. It is recommended that the issue of inconsistencies between those series currently published by UBOS should be resolved before launching the new quarterly GDPE series, see Next Steps.
- ii) The CFM has been developed only in constant prices so far. Sub-section e, above, considers the work needed to finalize an equivalent series in current prices. It is recommended UBOS completes this work before releasing estimates of GDPE based on the CFM, see Next Steps.

**ii) The development of production accounts for main institutional sectors**

41. The mission worked with counterparts to develop a production account for each of the five main institutional sectors:

- Private No-Financial Corporations

- Private Financial Corporations
- General Government
- Non-Profit Institutions Serving Households and
- Households.

42. The scheme for the allocation GO and IC for each industry component of GDDP is shown in Appendix III.

43. Production accounts for fiscal years in current prices were developed during the mission but, by extension, equivalent accounts for quarters and in constant prices should be straightforward to develop, see Next Steps.

44. Table 1 shows the summary accounts for fiscal years in current prices.

**Table 1: Institutional Sector Production Accounts, current prices**

<b>Gross Output (GO)</b>	<b>2008/09</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>
General Government	3,322	4,032	6,119	5,008	5,273	5,652	6,944
Private non-financial corporati	25,143	28,962	33,917	41,479	44,977	48,238	51,737
Private financial corporations	1,499	1,759	2,183	2,676	2,912	2,977	3,683
Non profit making institutions se	711	752	810	901	1,100	1,234	1,385
Households	24,438	28,759	32,395	42,948	45,645	48,209	51,518
<b>Total Gross Output</b>	<b>55,113</b>	<b>64,265</b>	<b>75,423</b>	<b>93,012</b>	<b>99,907</b>	<b>106,311</b>	<b>115,267</b>
<b>Intermediate Consumption (IC)</b>							
General Government	1,715	2,174	3,807	2,321	2,351	2,475	3,270
Private non-financial corporati	11,772	13,299	15,323	18,872	20,285	22,149	23,247
Private financial corporations	686	819	983	1,057	1,218	1,242	1,625
Non profit making institutions se	202	220	238	295	323	348	367
Households	8,841	9,735	11,380	15,080	16,394	17,106	18,116
<b>Total IC</b>	<b>23,216</b>	<b>26,248</b>	<b>31,730</b>	<b>37,625</b>	<b>40,571</b>	<b>43,320</b>	<b>46,624</b>
<b>Gross Value Added (GVA)</b>							
General Government	1,606	1,858	2,312	2,687	2,922	3,177	3,673
Private non-financial corporati	13,371	15,663	18,594	22,607	24,692	26,089	28,491
Private financial corporations	813	940	1,200	1,619	1,694	1,735	2,059
Non profit making institutions se	509	532	572	607	777	887	1,018
Households	15,597	19,024	21,015	27,868	29,252	31,103	33,402
<b>Total Gross Value Added</b>	<b>31,897</b>	<b>38,017</b>	<b>43,693</b>	<b>55,387</b>	<b>59,336</b>	<b>62,991</b>	<b>68,643</b>
Taxes on Products	2,607	2,930	3,385	4,033	4,569	5,193	6,170
<b>Gross Domestic Product</b>	<b>34,504</b>	<b>40,946</b>	<b>47,078</b>	<b>59,420</b>	<b>63,905</b>	<b>68,184</b>	<b>74,814</b>

### iii) Issues related to GDPP addressed by the mission

45. The first week of the mission took place during the period when the third quarter estimates for GDPP were being prepared. The Director of MES asked the STX to support local counterparts with the finalization of these estimates. Two key issues needed to be resolved: the allocation to users of estimates of Financial Intermediation Services Indirectly Measured (FISM), and the procedure for seasonal and trend adjustment used by the UBOS team. In addition, some issues were identified with the consistency of the

quarterly and annual estimates of GDP, and also with the rebasing of the Producer Prices Index. These are considered in turn below.

***a) Allocation of FISIM***

46. During the rebasing of GDP in 2014/15 it was planned to allocate the consumption of FISIM to the IC of the business sector and to HFCE and Exports. Previously UBOS had simply regarded all FISIM as IC of private sector enterprises, in line with the System of National Accounts methods from 1968. While the preparation work was undertaken to allocate FISIM in the rebased GDP estimates, UBOS believed that this was not actually done when the rebased series was released in 2015. In October 2015, an attempt was therefore made to allocate FISIM, but only for loans (and not deposits).

47. Some work was undertaken during the mission to redevelop the basis of allocating FISIM on a quarterly basis, consistent with the balanced Supply and Use Table estimates for 2009/10, and including all FISIM (i.e., FISIM on loans and on deposits). The methodology for allocation was reviewed and new quarterly estimates produced. It was agreed in discussion with the MES Director to introduce these revisions with the June 2016 release (relating to quarter 4 of 2015) when the first 2015 annual estimates are produced.

48. However, since the mission, the STX has continued to work with the UBOS team on this issue. It has now been established that, contrary to the understanding of UBOS, FISIM had in fact been allocated when the SUT was compiled in 2014/15. This work was undertaken by the AFE MSA. The method used was to include in the benchmark year (2009/10) SUT estimates of IC of each industry the FISIM consumed by these industries. Since quarterly IC is benchmarked to the annual GVA, and the annual GVA itself is based on an extrapolation of the benchmark SUT IC, the quarterly GVA for each industry implicitly includes FISIM in the IC.

49. Therefore, the revisions introduced in October 2015 to 'include' FISIM, actually resulted in including it twice. UBOS will now need to revise the quarterly series back to the previous method to correct this. See Next Steps.

***b) Seasonal Adjustment System***

50. The system used by UBOS to produce seasonally adjusted and trend/cycle estimates of GDP involves the use of the US Census Bureau's X12-ARMA program embedded within an MS Visual Basic framework. This framework required that the seasonal adjustment procedure was run eight times to produce all the required outputs (current and constant price estimates for 26 series for both the seasonally adjusted and the trend/cycle series). The mission streamlined this procedure and reduced the required number of 'runs' to just two (one each for the current and constant price series). The new Visual Basic code was integrated into the existing GDPP systems and tested. New

diagnostics for the series were also developed to help improve quality assurance of the emerging estimates throughout the quarterly production cycle.

*c) Consistency between the fiscal and calendar year estimates of GDP*

51. UBOS produces in June each year the first fiscal year estimates of GDP for the current year (e.g., in June 2016, an estimate will be produced for the year ended June 2016). The annual system uses some different data sources although, largely, the differences between the sum of four quarters from the quarterly GDPP system and the annual equivalent appear to arise because of differences in methods and adjustment used.

52. The quarterly estimates of GDPP are, in principal, made consistent with the annual estimates through a standard benchmarking procedure (using the IMF's XLPBM software). However, since the mission, the STX has continued to review these published series and has identified some differences between the published fiscal year series and the sum of the quarterly series over the four quarters of each fiscal year. In particular, the series for 'Food Crops' and for 'Fishing' are the most different, with smaller differences for Manufacturing, Trade and Repairs and Professional, Scientific and Technical Activities. Other series are identical. This issue has now been raised with the UBOS team.

53. In addition to the quarterly and fiscal year systems, UBOS maintains a third system to produce estimates for calendar years. This system uses an approach to revisions which appears to be independent of that used for the fiscal year series (e.g., some of the annual calendar year industry series are frozen 'as values' in the workbooks, while in the fiscal year system they are 'live,' i.e., they will be updated as the data change). In addition, some further data sources used in the calendar year estimates may contribute to the discrepancy between this series and the sum of the four calendar quarters of the quarterly series.

54. The mission has investigated the scale of differences which arise from these different treatments, which are shown in Table 2.

**Table 2: GDP at market Prices: Comparison of Annual and Quarterly Estimates (constant 2009/10 prices, millions UGX)**

<b>Calendar Years</b>					
	2010	2011	2012	2013	2014
Sum of Quarterly	43,115	46,527	48,109	49,978	52,381
Calendar Year	43,085	46,024	47,233	49,305	51,632
	<i>percentage change compared with the previous year</i>				
	2010	2011	2012	2013	2014
Quarterly	7.9%	7.9%	3.4%	3.9%	4.8%
Calendar Year	7.7%	6.8%	2.6%	4.4%	4.7%
<i>Difference</i>	-0.2%	-1.1%	-0.8%	0.5%	-0.1%
<b>Fiscal Years</b>					
	2009/10	2010/11	2011/12	2012/13	2013/14

Sum of Quarterly	40,946	45,117	47,246	48,794	51,355
Fiscal Year	40,946	44,907	46,888	48,422	50,754
<i>percentage change compared with the previous year</i>					
		2010/11	2011/12	2012/13	2013/14
Sum of Quarterly		10.2%	4.7%	3.3%	5.2%
Fiscal Year		9.7%	4.4%	3.3%	4.8%
<i>Difference</i>		-0.5%	-0.3%	0.0%	-0.4%

55. It was unclear to the mission the benefit of maintaining separate systems for annual fiscal and calendar year and for quarterly GDP. By and large, the data sources are the same, and the main differences appear to arise because of compilation procedures.

56. It is recommended that UBOS undertake a review of the regimes used for compiling the three difference estimates (annual fiscal years, annual calendar years and quarterly), to establish whether this could be simplified and consistency between the estimates achieved. It may be that some resource savings could also be realized by some integration and simplification of the procedures. See Next Steps.

#### ***d) Rebasing the Producer Price Index***

57. The PPI is a key data source needed for the deflation of some components of GDP. The PPI is currently being rebased, which it is planned to implement in mid-2016. The systems used for the production of the PPI will need to be updated as part of this exercise. The STX developed those systems during the previous rebasing in 2007/08. The Executive Director of Statistics at UBOS requested that the STX provide assistance with systems' element of the rebasing. Advice was provided to the IT team responsible for maintaining the PPI system. Some further (remote) support will be provided by the STX in the coming period to finalize this work.

#### **iv) Developing an 'independent' estimate of GDPE**

58. The mission has developed an estimate of GDPE based on a CFM which, in constant prices, estimates HFCE for each product as a residual after estimation of the other components (although some adjustment is made for changes in inventories and for missing data on trade in services, as noted earlier).

59. Since HFCE accounts for around 70 percent of GDP, the Director of MES is keen to establish estimates of GDPE based on more direct measurement. The mission discussed this objective and the data requirements which would arise. With regard to the measurement of household expenditures, UBOS undertakes the Uganda National Household Survey (UNHS) every 2–3 years. The survey took place most recently in 2013, and the next is planned for 2016. In between these main surveys, UBOS maintains a panel survey based on a sub-set of the households covered in the UNHS (the Ugandan National Panel Survey, UNPS).

60. In Uganda, the 2010 UNHS was used as the basis of estimates of HFCE in the 2009/10 SUT. The basic survey results were 'balanced' in the SUT by confronting the



data with those from other sources, notably the supply-side data on output and imports, and with data on intermediate and other final demand components. In general, the balancing process can lead to significant adjustment to household survey estimates. For example, it is well established that, in many countries, the reporting of expenditures on products like gambling and the consumption of alcohol and tobacco can be significantly under-reported in household surveys. Data on the domestic production and imports of these products often suggest much higher consumption than reported by households. For this reason, it is generally considered inadvisable to use household survey data as providing definitive estimates of expenditures, without reference to other sources. This is not least because the sampling errors associated with such surveys are often large. Household surveys are usually designed to provide baseline statistics on poverty and food-security analysis, and so their design may be sub-optimal for producing accurate estimates of household expenditures by detailed product.

61. In order to develop truly independent estimates of GDP based on expenditure components, UBOS would need to examine in detail the quality of estimates from the UNHS. In addition, while 6-monthly panel UNPS can provide some higher frequency data, the quality issues affecting this survey are likely to be still greater.

62. The mission discussed these issues with counterparts and advised that UBOS reviews the data sources necessary to improve the quality of expenditure estimates, particularly in relation to consumption by households. These sources will include the UNHS/UNPS. However, because of the requirement to confront household survey data with other sources noted above, it will be important also to consider the availability of data relating to production activities. This is particularly relevant for the agricultural sector for which, currently, UBOS does not undertake a specific survey.

63. Given these issues, to produce more direct estimates of GDP based on expenditure components, UBOS will need to consider increasing the frequency of the development of SUTs (currently undertaken every five years). Rwanda, for example, has now moved to developing a SUT every three years. For higher frequency, for example quarterly, estimates, a commodity flow approach incorporating assumptions about the structure of the economy (e.g., input/output ratios for products) may be the best basis for making use of all of the available data when estimating expenditure components.

64. One line of research to consider here is to examine the stability of the structure of household spending by product implied by the UNHS and UNPS. If the data from these sources is found to provide a robust, and plausible, basis for estimating changes in the composition of household spending over time, it may be possible to use them within the CFM framework developed through this TA as direct measures of spending, rather than treating HFCE as a residual. This could then be used to produce estimates of GDP for expenditure components independent of those based on the production approach.

65. It is recommended that UBOS undertake a review of the quality of estimates of HFCE provided by the UNHS/UNPS to establish their utility for this purpose, see Next Steps. For each of the 158 detailed products in the UBOS CPC (as used in the SUT), the review should examine the standard errors of the estimated household spending, as well

their stability of over time. The review should also consider the wider data requirements for producing more frequent estimates of expenditure components using a CFM, notably in relation to agricultural activity but also for the activity of the formal business sector and for trade in services.

#### IV. NEXT STEPS

66. The mission established a systematic basis for the development of quarterly estimates of GDPE in Uganda, consistent with those from the live quarterly GDPP system. Improvements were made to some estimates, notably for taxes, and new methods were developed for balancing and constraining. However, it was not possible in the time available to develop the current price series. Also, some consideration was given to the development of more fully independent estimates of GDPE, including the use of the available data on household expenditures.

67. Production accounts for main institutional sectors were also developed. The template for producing these estimates was based on the fiscal year current price GDP series. However, the approach can be readily extended to the quarterly series and to constant prices.

68. Finally, improvements were introduced to the quarterly GDPP system, including the processes used for seasonal adjustment and the methods used to allocate FISIM. Examination of the systems used for producing quarterly and annual estimates also revealed some inconsistencies, which should be reviewed.

69. These streams of work now need to be taken forward by UBOS. The following sub-sections consider the main issues.

#### **Data sources used in the CFM: Trade in Services**

70. Estimates of trade in services (TiS) used in the CFM are obtained for 12 aggregate categories from the Bank of Uganda's (BoU) website. These are apportioned to the SUT products based on an approximate correspondence between the SUT product codes and the categories used by the central bank. However, this correspondence could be considerably improved if more detailed data on TiS were obtained from the BoU. TiS is an important component in the CFM for a number of services products, and the estimates of HFCE will be improved if a more direct correspondence between the TiS codes and the SUT product codes can be established, based on more detailed data for TiS.

71. In addition, in order to estimate the deflators for each TiS product, where the exchange rates for the country of origin for imported TiS are used as part of the deflation calculation, information on the source country for imported services will be useful. Alternatively, information from the main importers of services on the prices actually paid would provide an even better basis for deflation of the current price estimates, if such data can be collected.

72. In relation to this, the following two recommendations are carried forward from the previous mission report in August, 2015.

**Recommendation 1:** *UBOS should request from the central bank more detailed data on TiS, and establish a correspondence between the SUT product codes and the coding frame used for TiS.*

**Recommendation 2:** *UBOS should request from the BoU data on the country of origin of imported TiS, to improve the basis of deflation. In addition, UBOS should investigate the potential to develop Trade Price Indexes (TPIs) for the main imported services products.*

### **Improving the consistency of existing production systems**

73. Three largely independent systems are used by UBOS for producing GDDP: for quarterly, fiscal years, and calendar years. The quarterly series is benchmarked to the annual fiscal year series, but the calendar year series is not constrained (e.g., it is not equal to the sum of the four calendar quarters in the quarterly system). The differences between the estimates from these systems appear to be more the result of different working practices than to the use of different data sources.

74. A further issue may be considered here: the length of the currently available time series for GDP. The rebased published series for quarterly GDP is available from only Q3 2007. The previous series began in 1999. Because of resource constraints, and issues arising from the change in the classification from ISIC revision 3.1 to ISIC revision 4, UBOS have not yet produced a linkage between the new and the previous series. Some TA support to develop longer time series for GDP may therefore be of benefit.

75. These considerations lead to the following recommendations.

**Recommendation 1:** *UBOS should undertake a review of the regimes used for compiling the three difference estimates of GDP (annual fiscal years, annual calendar years and quarterly), to establish whether this could be simplified and greater consistency between the estimates achieved.*

**Recommendation 2:** *UBOS should develop a times series for quarterly and annual GDP in current and constant prices, consistent with the latest estimates, for the years 1999-2007. Some Technical Assistance may be beneficial to support this development.*

### **Developing the Commodity Flow Model in current prices**

76. Some work was undertaken during the mission to develop a CFM in current prices, notably for the components of GO and IC as well as for the deflators needed to 'reflate' HFCE in constant prices. This works should now be taken forward by local counterparts. An approach for this was agreed during the mission, see paragraphs 35–39 of this report.

77. Because of the complexities and handling issues which may arise in finalizing the current price estimates, it is recommended that the current price CFM and possible approaches to balancing are evaluated in a further TA mission.

**Recommendation 3:** *UBOS should develop the basis for a current price equivalent to the constant price CFM, using the approach agreed during the mission. Once complete, TA should be provided to assist UBOS to integrate this with the regular quarterly and annual production systems. The publication of the new GDPE series should take place after the work on consistency of GDP estimates, noted in recommendation 1, is complete.*

### **The development of production accounts for main institutional sectors**

78. The template for producing production accounts for the main institutional sectors developed by the mission, and used as the basis of calendar year accounts, can be used to create equivalent accounts on a quarterly basis.

**Recommendation 4:** *UBOS should develop quarterly production accounts for the main institutional sectors based on the template developed by the mission.*

### **Towards an independent estimate of GDPE**

79. The CFM produces estimates of HFCE using a (detailed) residual approach. To improve the independence of these estimates, it may be possible to utilize data from the UNHS and UNPS surveys. To establish the potential for this, an analysis of the quality of these sources should be undertaken. In addition, the wider data requirements for producing more frequent estimates of expenditure components should be considered.

**Recommendation 5:** *UBOS undertake a review of the quality of estimates of HFCE provided by the UNHS/UNPS to establish their utility for this purpose. For each of the 158 detailed products in the UBOS CPC (as used in the SUT), the review should examine the standard errors of the estimated household spending, as well their stability of over time. The review should also consider the wider data requirements for producing more frequent estimates of expenditure components using a CFM, notably in relation to agricultural activity, but also for the activity of the formal business sector and for trade in services.*

**APPENDIX I. LIST OF OFFICIALS MET DURING THE MISSION**

<b>Name</b>	<b>Position</b>	<b>Organization</b>
<b>Government of Uganda</b>		
Mrs Imelda Atai	Executive Director	UBOS
Mr Christopher Mukiza	Director	UBOS
Mr Sam Echoku	Assistant Director	UBOS
Mr John Mayende	Assistant Director	UBOS
Bright Richard	Senior Statistician	UBOS
Alizik Khaudha Lubega	Senior Statistician	UBOS
Solomy Bamanya	Senior Statistician	UBOS
Christopher Tumuhirwe	Statistician	UBOS
Vincent Nsubuga	Statistician	UBOS
Lydia Namono	Statistician	UBOS
Irene Nakate Bright	Statistician	UBOS
Yoyeta Jane Magola	Statistician	UBOS
Iraguha Moureen Mfite	Statistician	UBOS
Godfrey Nsanja	Statistician	UBOS
Hilda Arinaitwe	Statistician	UBOS
Roland Muhumuza	Statistician	UBOS

## APPENDIX II. METHODOLOGY FOR EXPENDITURE COMPONENTS OF GDP

This appendix describes the methodology used to estimate each component of the product flows used in the Commodity Flow Model.

### A. Supply Components

#### Gross Output

1. Estimates of Gross Output (GO) by industry are available each quarter for the live GDPP system. The proportions of GO in each industry for each product was used to estimate the GO by product based the industry totals in each quarter. In practice, all but one industry is 'one-to-one' with products, e.g., the 'Sugarcane industry' only produces one product, 'Sugarcane.' The exception is the product 'CAA Processed and preserved of meat' which is produced by five industries. The total GO for this product was estimated by adding together the estimated GO by product from each of the five industries. Table 1 illustrates the procedure.

**Table 1: Calculation of Gross Output for the product 'Processed and Preserved of Meat'**

<b>Percentage of total Gross Output from the SUT 2009/10</b>							
		<i>Industry:</i>					
<i>Product:</i>		Raising of Camels, Horses, Asses, Mules, etc.	Raising of goats	Raising of sheep	Raising of Swine/Pigs	Raising of Rabbits	
1	Live animals	86%	68%	94%	80%	91%	
2	Processed and preserved of meat	<b>14%</b>	<b>32%</b>	<b>6%</b>	<b>20%</b>	<b>9%</b>	
3	Gross Output by industry in 2015 Q1 (billions UGS)	0.2	91.2	12.9	227.2	0.9	
<b>Estimated output for product 'Processed and preserved of meat ' in 2015 Q1</b>							
		<i>Output from industry:</i>					
		Raising of Camels, Horses, Asses, Mules, etc.	Raising of goats	Raising of sheep	Raising of Swine/Pigs	Raising of Rabbits	<b>Total Gross Output</b>
4	Processed and preserved of meat = 2 x 3	0.02	28.99	0.81	45.80	0.08	<b>75.70</b>

2. The calculation runs as follows: take the percentage of total industry output from the SUT for each of the five industries (row 2) and multiply by the actual total industry output (in constant prices) in 2015 Q1 from the GDPP system, in row 3. This gives, in row 4, the output of the product 'Processed and preserved of meat' from each industry. Added together this gives the total output in 2015 Q1 for the product, i.e., 75.70 billion UGS (in constant 2009/10 prices). The basic assumption here is that the percentage of output in constant prices for this product from each of these five industries has not changed significantly since the base year, 2009/10, relative to their total GO.

### **Imports of Goods (Formal)**

3. Imports of goods for detailed products in current prices is available from the URA each month. A correspondence table between the Harmonised System for trade in goods (HS) and the product codes used in the SUT had been established by the MES before the mission. This was used to aggregate the current price total imports for each SUT product within each quarter.

4. To estimate the imports in constant 2009/10 prices, it was necessary to estimate, from the Custom's data, the average Unit Values (UVs) in each period for each detailed HS product (i.e., at the 8-digit level of the HS). The UVs are the ratio of the reported value of imports to the reported quantity (expressed in supplementary units, e.g., kgs, litres, tonnes, etc.,).

5. A systematic basis for the estimation of the UVIs for each SUT product has been developed based on this method and utilizing a database of the URA import data. The procedure for estimating a price index from these UVs is described in more detail in Annex 2, of the report from the August, 2015 mission, but in essence it:

- i) Identifies extreme UVs within each HS 8-digit code within each quarter using a log-transformation of the data and applying a normal (Gaussian) test to the resulting log-distribution to remove these outliers. The motivation for taking logs is that the original UV data tend to be log-normal, i.e., they are constrained to be greater than zero, but can take values very much larger than the average. The log of the UVs tends to be closer to a normal distribution, and therefore amenable to a standard normal test for outliers.
- ii) The average of the remaining observations is taken as the average UV for that product in that period.
- iii) Unit Value relatives (between successive quarters) are then calculated for each 8-digit HS code, based on these average UVs.
- iv) Within each SUT product code the geometric mean (i.e., a Jevons type index) of these price relatives is taken as the price relative for the product.
- v) These price relatives are then used to create a Unit Value Index (UVI) whose average is equal to 100 in 2009/10.

6. The current price data for imports are divided by the UVI for the appropriate SUT product to estimate the constant price value of imports.

### **Imports of Goods (Informal Cross Border Trade)**

7. UBOS undertakes a rolling survey of the passage of goods (for both imports and exports) which do not require formal processing by the URA at the border. This is the Informal Cross Border Trade (ICBT) Survey. The ICBT survey includes more than 250,000 transactions since 2008 Q1. An MS Access database has been developed to provide a systematic basis for the routine updating of the data for imports and exports each period, based on a comma separated values text file which can be created in MS Excel.

8. The system allows the estimation of ICBT for imports and exports in current and constant 2009/10 prices. For current prices, the estimates are simply the sum of the reported values of imports (and exports). For the constant prices series, as with the formal trade, it is necessary to identify extreme UVs in order to calculate stable UVIs. It was not possible to use the procedure established for formal trade for this purpose, because there are too few observations of each HS 8-digit product in each period to perform the log-transform outlier identification (for example, with just two or three observations, it is not possible to apply the standard normal test). Instead, for the ICBT, extreme values are defined as those which are greater than ' $x$ ' times the average UV for the HS product, or less than  $1/x$  time the average, where  $x$  is defined by the user. The sensitivity to the choice of ' $x$ ' was tested, and the resulting UVIs found to be reasonably stable for choices of  $x$  between 4 and 10. A value of 6 was used in the case of imports. The UVs identified as 'extreme' using this procedure were replaced by the average UV for all 'non-extreme' UVs for the specified product. Again, a Jevons type index of UVs was then calculated for each SUT product. The constant price value of imports (and exports) was estimated by dividing the current price values by the UVI for the product.

### **Imports of Services**

9. Data from the BOP calculated by the Bank of Uganda (BoU) were downloaded for the BoU website. These provide broad categories of trade in services, for both debits and credits. The classification used by the BoU was bridged to the SUT product codes, approximately, although most BoU categories corresponded to more than one SUT product. For example, the BoU category 'Transport' includes the SUT products: rail transport, land passenger transport, water transport, air transport, freight transport by road, warehousing support services for transport and postal and courier activities. To estimate the trade in services at the level required for the CFM it was necessary to apportion the quarterly BoP data for each broad category into the detailed SUT products using the proportions from the SUT.

10. The constant price series for services imports was derived using the average price deflator for imports of services which was taken from the existing annual GDPE system maintained by MES. The aggregate deflator for services imports is a weighted average of the CPIs from the countries from which the imports derive (UK, USA, France and Kenya). The export deflator is based on the mean average of the all items CPI for Uganda, the services import deflator, and the estimated deflator for exports of goods. If



more detailed data from the balance of payments can be acquired from the central bank, it should be possible to improve the quality of the trade in services deflators, particularly if information on the country of origin/destination of the trade flows is also available.

11. For BOP services imports, there are two areas of improvement which should be considered. The first is the level of detail which is used to estimate the SUT product flows. This is currently too broad, and MES should acquire the more detailed data used for the compilation of BOP to provide more precise estimates for each SUT product. In addition, the current deflator used for imports needs to be improved. This can be achieved if data on the country of origin of the imported services was also available, or if actual prices of specific services were collected by UBOS as part of the planned development of Trade Price Indexes (TPIs).

### **Taxes on products**

12. The methodology for constant price taxes on products is:

i) **Excise on Imported Goods**

For each excisable product: the volume of goods in each quarter multiplied by excise tax rates for imports in 2009/10. The results, by product, are constrained to the known collected total taxes for excise on imported goods.

The volume of excisable goods is calculated from the value of those goods divided by the relevant unit value (price) series for each product. The excise rates for each product in the base year (2009/10) was calculated as the ratio of the excise taxes to the CIF value of formal imports for each excisable product

ii) **Excise on Domestic Goods**

For each excisable product: the volume of Monetary GO in each quarter multiplied by domestic excise tax rates in 2009/10. The results by product, are constrained to the known collected total taxes for excise on domestic goods.

iii) **Customs Duties**

As for excisable imported goods.

iv) **VAT (non-deductible)**

The sum of the VAT on Domestic and VAT on imported goods, calculated as follows:

a. **VAT on Domestic**

For each product, the tax rate in 2009/10 (i.e. domestic VAT after refund divided by the value of Monetary GO less the value of formal exports in 2009/10), multiplied by the volume of Monetary GO less the volume of formal exports in each quarter.

b. **VAT on imported goods**

For each product, the tax rate in 2009/10 (i.e. the VAT on imports before refund divided by the value of formal imports), multiplied by the volume of formal imports in each quarter.

## **Trade and transport margins**

13. The trade and transport margins represent the output of the domestic trade industries (wholesale, retail and sale of motor vehicles and parts thereof). The 2009/10 SUT provides the percentage ‘mark-up’ for each product, which is the ratio of the margin to the pre-tax supply (domestic plus imported). These mark-ups for each product were applied in the CFM to the sum of GO at constant prices plus imports at constant prices to derive the constant price margins.

### ***B. Demand Components***

#### **Intermediate Consumption**

14. Estimates of intermediate consumption (IC) *by industry* are available from the GDP(P) system each quarter. These were transformed into estimates by the 158 products in the CFM in constant prices using an equivalent procedure to that used for converting GO by industry into GO by product described above.

15. In the case of IC in constant prices the underlying assumption is that the relative volumes of each product used by each industry remains constant compared with the base year (2009/10). Essentially, this is equivalent to assuming that the production technology has not changed significantly since the base year. For example, in the manufacture of clothing, it is assumed that the volumes of cloth, thread, leather, dye, as well as electricity, rent etc. are the same in volume terms in the current period as in the base year. This is generally accepted as a reasonable assumption in volume terms, if the production technology has not changed significantly. However, in current prices this assumption is unlikely to hold since the relative prices of the inputs can change considerably from period to period. When estimating IC at current prices, therefore, it will be necessary to consider the actual prices of the inputs when ‘reflating’ the constant price IC into current prices. In effect this will amount to ‘double deflation,’ i.e., where different price indicators are used for the inputs compared with the outputs. This issue will be addressed as the current price estimates are developed, see Next Steps.

16. As an example of the procedure in constant prices, we can consider the case of the electricity product as it is used by different industries. In the SUT in 2009/10, electricity is used as IC by 115 different industries. Table 2 summarizes the calculation.

**Table 2: Estimation of Intermediate Consumption of the Electricity Product in 2008 Q1**

<b>'Electricity' is used in 115 industries (first 15 shown in the table only)</b>			
<i>Industry</i>	% of total industry IC that is Electricity	Total Industry IC in 2008 Q1 (Bn UGS)	IC for Electricity in Q1 2008 (Bn UGS)
	(1)	(2)	(3)+(1)x(2)
Manufacture of Computer, Electronic & Optical Products	25%	0.2	0.0
Repairs & Installation of Machinery & Equipment	13%	1.3	0.2
Water, Sewerage & Waste Management Activities	10%	18.5	1.9
Manufacture of Rubber Prod's	10%	2.4	0.2
Manufacture of Dairy Prod's	8%	33.9	2.5
Manufacture of Plastic Prod's	6%	9.9	0.6
Manufacture of Pharmaceuticals, Medicinal Chemical & Botanical Products	5%	36.3	1.9
Manufacture of Machinery & Equipment n.e.c	5%	4.1	0.2
Manufacture of Basic Metals	5%	17.9	0.9
Manufacture of Electrical Equipment	5%	9.0	0.5
Manufacture of other metal prod's	5%	5.1	0.3
Manufacture of other chemical prod's	5%	6.3	0.3
Manufacture of paint, vanishes & similar prod's	4%	7.3	0.3
Printing & Reproduction of recorded Media	4%	7.9	0.3
etc.	etc.	etc.	etc.
<b>Total Electricity used as IC (sum of (3))</b>			<b>54.0</b>

17. Based on the proportions of the total industry IC which is for electricity in the base year (column (1)), and the actual estimated IC for each industry in 2008 Q1 (column (2)), the estimated total IC for electricity in 2008 Q1 is given by the sum of the product of (1) and (2) shown in column (3), i.e., 54.0 Billion UGS.

18. This procedure is used to estimate IC in each quarter for all 158 products in the CFM. The mission established a systematic basis for undertaking the required calculations.

### **Government Final Consumption Expenditure**

19. The quarterly current price and constant price value indicators for General Government Final Consumption Expenditure (GGFCE) by product are derived by deducting quarterly Government sales revenue from the Government output estimates for each of the main product categories in the CFM which relate to the output of government.

### **Final Consumption Expenditure of NPISH**

20. The estimates of Final Consumption Expenditure (FCE) of Non-Profit Institutions Serving Households (NPISH) are compiled by extrapolating the 2009/10 benchmark FCE estimates using the quarterly current and constant price output of NPISH by product (i.e., Agriculture Support Services; Education; Human Health and Social Work; Arts, Entertainment and recreation; and Services of Membership Organizations).

### **Acquisitions less Disposals of Valuables**

21. For Acquisitions less Disposals of Valuables, imports of precious metals and stones, antiques and collectibles are used to extrapolate the 2009/10 benchmark estimate to derive current price estimates. The general CPI is used to deflate the current price estimates to derive the constant price estimates.

### **Gross Fixed Capital Formation**

22. The coverage of Gross Fixed Capital Formation (GFCF) includes estimates of biological assets; imported capital goods, research and development, and mineral exploration. The WIP compilation methodology developed in previous TA missions was used to compile the SUT estimates for biological assets and construction GFCF. For biological assets and imported capital goods, the proportion of GFCF to total supply in the SUT is applied to the estimated total supply in the CFM each quarter to derive an estimate of the GFCF for each product. The estimates for research and development; and mineral exploration are derived by extrapolating the 2009/10 benchmark GFCF estimates using the output for Mining and Quarrying and scientific research and development.

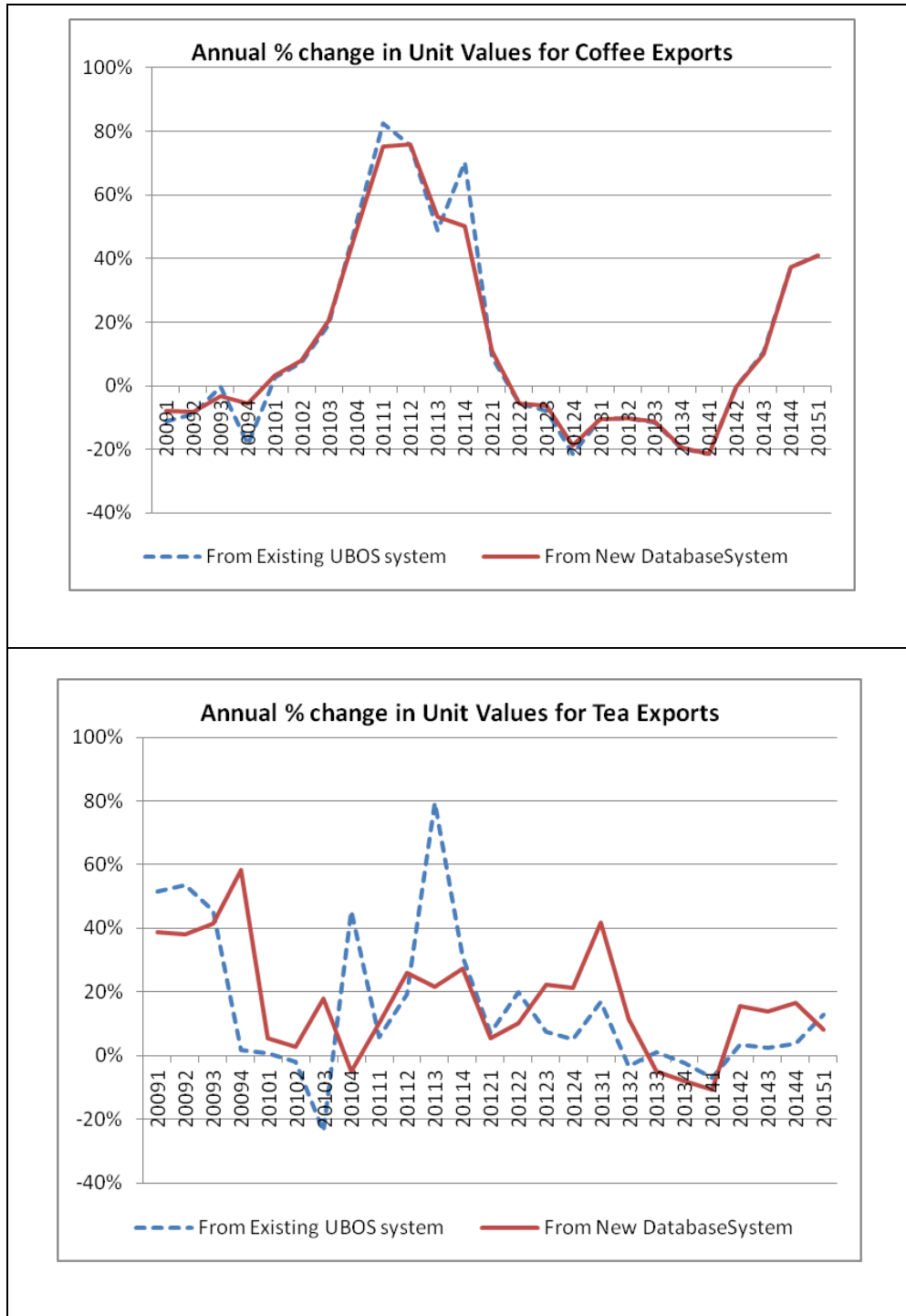
### **Exports of Goods (formal)**

23. As with imports of goods coming through the formal channels, URA external trade data are used to compile the current price estimates. These are deflated using unit prices, calculated using the same methodology described above for the informal imports.

24. This method was used in preference to that used for formal imports (see paragraph 4, above) because there are many fewer export transactions and so the log-transform normal test cannot be applied. The mission established a systematic basis, based on an MS Access database, for the calculation of the current price estimates and the UVIs needed to estimate constant price exports.

25. As an example of the procedure, Chart 1 compares the ‘outlier’ unit value for exports of coffee (Uganda’s main cash crop) with the estimates produced by MES within the trade section). The trade section produce a report for the six main exports each month. The UVI procedure developed by the mission should simply considerably the processing of these data.

**Chart 1: Annual Percentage Change in the Estimated Unit Value of Exports of Coffee and Tea (per kilo)**  
*(comparing the existing estimates produced by MES, with the estimates from the systematic basis developed by the mission)*



26. The charts illustrate that the general trend in the growth of Unit Values is similar based on both the 'UBOS method' when compared to the new basis, with the new basis removing some of the more extreme movements in the series through the outliering procedure used.

### **Exports of Goods (ICBT)**

27. The same methodology, and system, described for informal imports is used for informal exports of goods.

### **Household Final Consumption Expenditure and Changes in Inventories**

28. The remaining components of the CFM are Household Final Consumption Expenditure and Changes in Inventories. These can be estimated as a combined total using the so-called 'residual method' which, because total demand must equal total supply for each product, total supply less demand for all other components must equal HFCE plus Changes in Inventories.

29. For products for which there are no inventories, i.e., largely service sector products, the balance must be equal to HFCE. For goods, there may be some change in inventory, which is generally difficult to measure directly. For example, for the food crop 'Maize,' this is nearly all produced locally (there is some small imports, mainly informal). So, the GO of Maize, plus the trade margins, plus taxes (which are essentially zero), less any exports (which account for around 10 percent of the total supply) must be used as IC, or consumed by households (i.e., HFCE) or contribute to the change in inventory for Maize. Since in constant prices the IC can be estimated according the method set out above in paragraph 14, what remains is taken as HFCE plus the change in inventory.

30. HFCE for goods is estimated in the CFM by multiplying the total 'net supply' in the current quarter (i.e., total supply less exports, capital formation, final expenditures by government and of non-profit making institutions serving households, and the acquisition less disposal of valuables) by the base year ratio of HFCE to net supply from the SUT.

31. The estimated changes in inventory for each product is then calculated as the difference between total supply less all other uses, including the estimated HFCE, plus any other explicit estimates of changes in inventories (currently these are only calculated for biological assets).

### APPENDIX III. SCHEME FOR PRODUCTION ACCOUNTS FOR MAIN INSTITUTIONAL SECTORS

Allocation of Output and Intermediate Consumption by Industry to main Institutional Sectors			
Industry	Sector	Industry	Sector
Cash crops		Professional, Scientific and Technical Activities	
Formal	HH	Formal	PNFC
Informal	HH	Informal	HH
Food crops		Administrative and Support Service Activities	
Formal	HH	Formal	PNFC
Informal	HH	Informal	HH
Livestock		Public Administration	
Formal	HH	Formal	GG
Informal	HH	Informal	HH
Agriculture Support Services		Education	
Formal	PNFC	Formal	
Informal	HH	Informal	
Forestry		Human Health and Social Work Activities	
Formal	PNFC	Formal	
Informal	HH	Informal	
Fishing		Arts, Entertainment and Recreation	
Formal	PNFC	Formal	PNFC
Informal	HH	Informal	HH
Mining & quarrying		Other Service Activities	
Formal	PNFC	Formal	PNFC
Informal	HH	Informal	HH
Manufacturing		Activities of Households as Employers	
Formal	PNFC	Formal	HH
Informal	HH	Informal	HH
Electricity	PNFC	Taxes on products	
Water			
Formal	PNFC	Agriculture, forestry and fishing	
Informal	HH	Food crops	
Construction		Monetary	
Formal	PNFC		
Informal	HH	Education	
Trade and Repairs		Gov - Education	GG
Formal	PNFC	Private - Education	PNFC
Informal	HH	NPISH - Education	NPISH
Transportation and Storage		HH - Education	HH
Formal	PNFC		
Informal	HH		
Accommodation and Food Service Activities		Human Health and Social Work Activities	
Formal	PNFC	Gov - Health	GG
Informal	HH	Private - Health	PNFC
Information and Communication		NPISH - Health	NPISH
Formal	PNFC	HH - Health	HH
Informal	HH		
Financial and Insurance Activities			
Formal	PFC		
Informal			
Real Estate Activities			
Formal	PNFC		
Informal	HH		
key			
GG		General Government	
PNFC		Private non-financial corporations	
PFC		Private financial corporations	
NPISH		Non profit making institutions serving households	
HH		Households	

#### APPENDIX IV. UPDATING THE CONSTANT PRICE COMMODITY FLOW MODEL

This appendix provides a step-by-step procedure for updating the constant price Commodity Flow Model (CFM).

The system comprises the following integrated main files.

#### Files used in the Commodity Flow and External Trade estimation systems

#	File	Type	Purpose
<b>Commodity Flow Model System</b>			
1	Comm_Flow_Full_KP.xlsm	Excel	Links to the live GDP(P) system files and also the files 3, 3, 5, 8, 9 and 10 to produce the final CFM in constant prices
2	Comm_Flow_IC_Prod_KP.xlsx	Excel	Links to 4 to invert the IC from Industry to Product in constant prices
3	Comm_Flow_GO_Prod_KP.xlsx	Excel	Links to 5 to invert the GO from Industry to Product in constant prices
4	Comm_Flow_GO_IC_Ind_KP.xlsx	Excel	Links to the live GDP(P) system to create a time series for GO and IC by industry in constant prices (KP)
5	Comm_Flow_Taxes_KP.xlsx	Excel	Estimates taxes on products for each SUT product codes
6	Comm_Flow_Def_SUT.xlsx	Excel	Estimates deflators for HFCE for each SUT product codes
7	Comm_Flow_GO_IC_Ind_CP.xlsx	Excel	Links to the live GDP(P) system to create a time series for GO and IC by industry in current prices (CP)
8	GDP Expenditure.xls	Excel	Contains estimates of GGFCE, NPISH FCE, GFCE, Trade in Services, and inventories for biological assets.
<b>External Trade and UVI processing System</b>			
9	UGA_Ext_Trade.accdb	Access	Stores data for the formal and informal imports and exports
10	UVI_ASYCUDA_Exports_Results (V1.1).xlsm	Excel	Links to 9, and estimates UVIs for formal exports



#	File	Type	Purpose
11	UVI_ASYCUDA_Imports_Results (V5.2).xlsm	Excel	Links to 9, and estimates UVIs for formal imports
10	UVI_ICBT_Results (V1.1).xlsm	Excel	Links to 9, and estimates UVIs for informal exports and imports

The updating is as follows procedure:

Step 1: Update the existing quarterly production estimates of GDP. These are linked into the workbook ‘Comm\_Flow\_GO\_IC\_Ind\_CP.xlsx,’ which is the starting point for the KP CFM.

Step 2: Update the existing quarterly expenditure estimates in the workbook GDP Expenditure.xls.

Step 3: Update the external trade estimates (files 10–12, above) based on the instructions provided in the ‘Menu’ worksheets of each of these files. Data will need to be obtained for formal an informal trade at the detailed HS8 level from the trade team in UBOS.

Step 4: The files ‘Comm\_Flow\_GO\_Prod\_KP.xlsx’ and Comm\_Flow\_IC\_Prod\_KP.xlsx will be updated automatically. Simply open them, together with the workbook ‘Comm\_Flow\_GO\_IC\_Ind\_CP.xlsx,’ and save them all.

Step 5: The file ‘Comm\_Flow\_Taxes\_KP.xlsx should then be opened and updated and saved. It depends on the quarterly workbooks (step 1 above), as well as the imports files (step 3).

Step 6: The file ‘Comm\_Flow\_Full\_KP\_V8.xlsm’ can then be opened and the links refreshed. The results of the CFM are contained in the worksheets:  
‘CFM\_TimeSeries:’ the full product CFM for all periods  
‘GDP\_E:’ by product / period  
‘GDP\_E\_Table\_A:’ annual GDPE summary  
‘GDP\_E\_Table\_Q:’ quarterly GDPE summary

The workbook also contains a more detailed ‘snap-shot’ of the commodity flow for a selected quarter in the worksheet ‘Comm\_Flow’ and a ‘product’ flow time series (for a selected product) in in the worksheet ‘Comm\_Flow\_P.’

Step 7: Finally, in preparation for the current prices CFM, the workbook ‘Comm\_Flow\_Def\_SUT.xlsx’ should be updated. This requires the latest CPI data to be added to the CPI\_Data worksheet, as well as the CSI and PPI data, in their relevant worksheets. The cells which needs updating are highlighted in yellow in this workbook.