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National Accounts in Rwanda

Data sources and compilation methods

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as at September 2011

Section 1: Summary

Introduction

1. The National Institute of Statistics of Rwanda (NISR) is responsible for compiling estimates of the level and the growth of the **Gross Domestic Product** (GDP) of Rwanda, its components and related aggregates.

2. GDP and its components are evaluated quarterly at both **current prices** (for the levels) and **constant 2006 prices** (for measuring real growth rates). Annual estimates for calendar years and for years ending June (which from July 2009 are the government's fiscal years) are obtained by summing the relevant quarterly estimates. These statistics provide key information on the structure and development of the economy.

3. In summary, the current methodology depends on establishing a "benchmark" every five years. Between these benchmarks, indicators based largely on administrative records are used to extrapolate the benchmark. At constant prices, the quarterly estimates of activity are essentially the equivalent of Indices of Production covering all types of activity in the economy. Except for price data, these quarterly estimates do not rely much on statistical surveys, which are however a key input for the benchmarks.

Challenges

4. Compiling the estimates poses many challenges especially in a country such as Rwanda. As the figures demonstrate, the **formal sector** of the economy is a relatively small proportion of activity when compared with more highly developed economies. But measuring non-formal activity is a challenge in any country. Thus while good indications of trends may be obtained for the formal sector, it is necessary, given the current limitations on resource, to fall back on rough estimates and assumptions for the rest.

5. For example, it is particularly difficult and costly to obtain reliable estimates of agricultural production (particularly year-to-year changes) on a regular basis. Although better data sources are expected to emerge in future, in order to extrapolate the benchmark, NISR currently relies on the twice-yearly crop assessments made by the Ministry of Agriculture (MINAGRI), to which adjustments have to be made when the basis of the assessments change.

Reliability

6. Users require good quality estimates as quickly as possible. The methods for producing quarterly (and hence annual) GDP have therefore been designed to be based on data that are readily available, mainly from administrative sources. In a few cases, annual data become available later, which can affect the estimates to a limited extent (see revisions policy below). However users should bear in mind that in reality the estimated annual GDP growth rate overall may not be more accurate than plus or minus two percentage points (2%).

7. On the other hand, from time to time data become available that enable more reliable estimates to be made. In 2000/01 the first in a series of Integrated Living Conditions Surveys (EICV[1]) provided the statistics necessary to compile such a benchmark. The opportunity was therefore taken to construct a simplified **Supply-Use Table** (SUT) for the year 2001. This technique is widely accepted as essential in determining the level of GDP, although it cannot be completed until some time after the reference period.

8. The second EICV took place in 2005/06, and a enterprise survey of larger businesses covering 2006 was undertaken in 2008. After this, another SUT was compiled for 2006. Following this exercise, the level of GDP for 2006 is probably correct to within 5 per cent.

9. The annual estimates were then re-aligned to this benchmark and the compilation system was converted to produce quarterly estimates. The results (including first estimates for the year ending June 2009) were published in October 2009. It may be noted that while up-to-date estimates of **Household Final Consumption Expenditure** (HFCE) are obtained as a residual, the benchmark estimates are based on direct observations from the EICV.

Dissemination

10. Although the estimates are compiled on a quarterly basis, at present these figures are not published. As stated above, the quarterly estimates are added together to provide the annual estimates for both calendar and fiscal years. The aim is to publish these annual estimates in a statistical release twice a year, in March and in October.

11. In a small economy, it is natural that activity within a year (and even between years) can be much more variable than in a large one. Thus the growth in the latest quarter may be a poor guide to growth in the next. For this reason, users should focus on annual estimates or on trends over a longer period.

Revisions

It is a fact of life in every country that national accounts statistics have to be revised as more reliable data become available and are incorporated. In addition, errors can and do occur from time to time (even in the best Statistical Offices). In statistics it is not possible to achieve the same level of perfection that is expected of a bank in recording the transactions on a person's bank account. In national accounting the

[1] EICV = Enquête Intégrée des Conditions de Vie des Ménages

processes are particularly varied and complex. Nonetheless every effort is made to minimise data and compilation errors if errors are found they will be corrected in the next release.

12. There are two main reasons why revisions will be made as a matter of course.

13. First, certain information, in particular the final annual accounts of enterprises, become available later in the year following the year to which they relate. Incorporating this type of information, and aligning the quarterly estimates with it, can cause the estimates of the previous two years to be changed. At present, however, only a small number of annual accounts are used in the system. Until more of these accounts can be incorporated, such revisions are likely to be minor.

14. Much more substantial revisions are to be expected when a new benchmark is compiled. This is because the indicators and assumptions used quarterly are likely to go "off track" as the time interval since the previous benchmark increases.

Future improvements

15. The NISR is committed to improving the quality of the national accounts statistics, to the extent possible given the availability (a) of data, (b) of resources to collect more on a regular basis and (c) of experienced personnel to maintain and to improve the compilation system. As a result of a Retreat held in Rubavu in July 2010 and of other expert reports, over 60 recommendations for improvement were identified.

16. First, plans are being made for the next benchmark, for the year 2011. A key prerequisite for this is the EICV3 due to start in October 2010, in which information on HFCE will be obtained. In addition, an enterprise survey is planned to take place during 2012 with reference to the year 2011, to provide up to date information on business cost structures. Government expenditure data will be analysed in detail, and the possibility of obtaining data from all types of NGO will be investigated. Research will also be undertaken especially into the cost structures of agricultural and other informal activities. Furthermore, data from the income tax system are also being investigated to establish the extent to which these can be used to broaden the definition of the 'formal' sector (beyond the current definition which is based on the, narrower, VAT system). With all this information a new SUT is expected to be prepared by mid-2013, together with a re-aligned set of quarterly time-series.

17. Meanwhile, a program of work is underway (a) to improve the use and quality of existing quarterly indicators, especially in the field of agriculture; (b) to develop new ones, and (c) to increase the collection and use of annual profit and loss accounts. Details are available in a separate document: *Data sources and compilation methods: Improvement action plan 2010 to 2013.*

This document

18. This document is arranged in four sections. Following the general introduction given in this Section, the conceptual framework is described briefly in Section 2. The 2006 benchmark is described in Section 3 and the quarterly and annual estimates in Section 4.

Section 2: The conceptual framework

The System of National Accounts (SNA)

19. The conceptual framework for compiling national accounts is set out in the United Nations' *System of National Accounts 1993* (SNA93). In addition to the main aggregates such as GDP, the SNA93 describes a full range of economic accounts and balance sheets suitable for the most highly developed economy including social accounting matrices, supply-use tables, satellite accounts etc. Given the resources and the data currently available in Rwanda, the focus has been on ensuring GDP and its main components are measured in the most appropriate way.

20. As far as possible, the estimates of GDP are compiled in accordance with the principles and concepts of the SNA93. However, it is not feasible to follow the SNA93 in every respect. The cost of attempting to do so would greatly exceed both the resources available and the likely benefits to the country. Examples of divergence from the SNA93 are as follows: mineral exploration costs, software development and valuables should be included in capital formation but are not; drug trafficking and prostitution should be included in production but they are not; in the absence of an annual SUT at constant prices, "double deflation" is only feasible (in part) for electricity supply; and finally, while chained Fisher indices are recommended for measuring real growth, in Rwanda GDP and its components are valued at the constant prices of a base year that remains fixed for five years or more.

Approaches to measuring GDP

21. Traditionally, three main approaches to measuring GDP are referred to. These are the output (or production) approach, the income approach and the expenditure approach.

22. The first two of these approaches are closely linked. Theoretically they both aim to measure the Gross Value Added (GVA) broadly in terms of a business profit and loss account either from the top down (output) or the bottom up (income). Both approaches involve making adjustments for FISIM and for certain taxes *less* any subsidies on products to obtain GDP at market prices (see below). In the output approach, the value of **total output** is measured and the cost of inputs (**intermediate consumption**) is subtracted to obtain the GVA. In the income approach, which is only possible at current prices, GVA is basically obtained by adding the **compensation of employees** to the **gross operating surpluses** of producers. However the income approach is not really feasible in a country where most enterprises are informal, because little reliable direct information is available on their operating surpluses in total.

23. The expenditure approach is completely different. It aims to measure GDP (at market prices) by aggregating **final consumption expenditures** (by households, NGOs and government), **capital formation**, and **exports *less* imports of goods and (non-factor) services**. In Rwanda, except in a benchmark year (see below), no direct information is currently available on household expenditure on a regular basis, so it is not possible to prepare direct quarterly estimates of GDP according to the expenditure approach. Final expenditures by NGOs are also not covered at present.

24. In Rwanda therefore, quarterly and annual estimates of GDP and the activity components are compiled using the production approach alone. Direct quarterly and annual estimates are also available for most of the expenditure components. HFCE is therefore calculated by subtraction as a balancing item. It therefore includes all the error and omissions that may have occurred since the base year.

Benchmarking

25. However, in the base year (2006), HFCE is directly estimated and plays a key role in establishing the benchmark level of GDP. While the traditional approaches may be used to make early estimates for recent years or quarters, the best approach of all to measuring GDP is to compile a Supply-Use Table (SUT). An SUT integrates all three traditional approaches in a comprehensive framework, usually incorporating a form of input-output matrix. It requires detailed information on household final consumption expenditure, in addition to information on production and its cost structure.

26. As mentioned above, a second EICV was carried out in Rwanda in the year 2005/06. This, together with information from a business enterprise survey, provided the data necessary to compile a simplified SUT and thus a benchmark estimate of GDP for the year 2006.

Mode of production

27. One of the benefits of the benchmark is that estimates can be made according to **mode of production**. This classification allows rough estimates to be made of informal activity, albeit indirectly, as a residual. Reliable direct estimates are very difficult to obtain, so this approach provides a cost effective alternative.

28. Modes of production have been split into four groups:

a) Formal private sector
b) Informal activity (monetary)
c) Non-monetary production
d) Government and NGOs

29. For practical reasons, the **formal sector** has been defined as businesses registered for VAT at the Rwanda Revenue Authority (agricultural activity is excluded, although registered agro-industries such as tea and coffee processing are included). The formal sector also includes the VAT and other taxes on products, whether collected on imports or on locally produced goods and services (classified under adjustments in the table).

30. **Informal activity** covers marketed production by all other private producers not registered for VAT. **Non-monetary production** covers goods (mostly crops) and housing services that are consumed by the producer (auto-consumption). The **Government and NGO** mode of production is assumed to be activity carried out in three branches, namely public administration, education and health.

Section 3: The 2006 benchmark

Introduction

31. This section provides a brief description of the data sources and the methods used to compile a simplified Supply Use Table (SUT) for the year 2006.

32. Benchmarking is essential in compiling estimates of GDP in an economy such as Rwanda's, in which a large proportion of activity is informal (including agriculture). Annual (as well as quarterly) estimates of GDP are based on partial indicators and a number of assumptions. These estimates are therefore very likely to go off track after a few years. However, surveys of household consumption expenditure, while by no means perfect, in Rwanda provide scientific evidence on around 80 per cent of GDP (according to the expenditure measure). Such surveys also provide data for poverty analysis and for weighting consumer price indices. But they are resource intensive and are at present only conducted every few years. When results are available, they provide the opportunity to benchmark the GDP by assembling data from a variety of sources in the SUT framework. This framework forces compilers to confront inconsistencies and gaps in the available data, and to come up with well-based estimates of GDP for the corresponding year.

33. Benchmarking is a large and complex undertaking. It is therefore appropriate to establish a project to do so. Such a project was set up by NISR in August 2008 with the aim of exploiting the results of the EICV2 and other data sources to re-estimate GDP for the year 2006, within the SUT framework.

Method of compiling the SUT

34. The activities involved in compiling the SUT were as follows:

a) establishing an integrated list of products and activities, based on international standards and adapted to local circumstances, known as the Rwandan Classification of Products by Activity (RCPA);
b) setting up an IT system for compiling the SUT;
c) creating correspondence tables between the categories used in the various sources (such as the "Harmonised System" used for classifying external trade) and the RCPA
d) converting the data into RCPA categories and entering the results into the SUT framework
e) adjusting the data so as to achieve a preliminary balance of the supply and use of products
f) undertaking additional research to fill remaining gaps
g) further balancing and finalising the benchmark

The SUT format

35. The supply-use table was set up in a MS Excel Workbook. The workbook contained several worksheets with similar layouts; each row represented a product or group of products according to the RCPA and each column represented a type of transaction or adjustment. In the summary spreadsheet, the format adopted for the columns of the supply-use tables was the following

Summary SUT

Imports of goods & servs	Total output	Margins	Taxes on products	TOTAL SUPPLY	Diff-erence	TOTAL DEMAND	Inter-mediate demand	Final BGN demand	Final HH demand	Exports of goods & servs

BGN = Business, Government and NGOs

36. The four supply side columns and the four demand side columns were linked to separate sheets used to insert the data and to make adjustments as appropriate.

37. Ideally the Intermediate Demand column would be linked to a complete intermediate consumption matrix. In the event, because of time and resource constraints it was not possible to achieve this. However, total intermediate consumption of all activities was constrained to equal the total intermediate demand in the above table.

Data sources for the SUT

38. The data sources used in compiling the SUT were as follows:

Data	**Source**	**Classification**
Household expenditure details (purchases & consumption of own produce);	EICV2 (NISR)	EICV coding
External trade data: imports cif, import duty and VAT, exports fob;	RRA (Customs)	Harmonised System (HS)
Balance of payments: detailed services (and goods, for comparison)	BNR	IMF BoP Manual (version 5)
Existing gross output estimates by mode of production	NISR National accounts	Activity codes
Monthly VAT turnover and related taxes	RRA (VAT)	ISIC
Government Expenditure (GFS) details	MINECOFIN	Budget categories
Enterprise Survey data	NISR	
Agricultural survey (2008) provisional results	NISR	
Crop assessments (2006-2008)	MINAGRI	
Agricultural prices for 2006 by market	MINAGRI	

39. A special workshop was held in February 2009 involving a number of resource persons and national accountants from neighbouring countries as well as the NISR team. During this workshop, these data were converted into RCPA categories and inserted into the SUT framework. Care was taken to ensure the control totals for each category of supply and demand agreed with the totals from the data sources. Trade margins (in percentages) were derived mainly from the enterprise survey and from the data on agricultural prices.

Balancing issues

40. Initially, after the data had been entered, some large differences between total supply and total demand became evident, often because of gaps or roughly estimated values.

41. In order to balance each row, the general policy adopted (with some exceptions detailed below) was to accept the EICV2 estimates of HFCE as well as those for exports and imports and for government expenditure. In other words, adjustments were made to the estimates of intermediate demand, or to total output

(or both). Care was taken to ensure that the intermediate demand for raw materials matched the demand by user industries, especially in the case of food products.

42. Exceptions to the general policy were made in the case of beverages and tobacco. Reliable estimates of the production (and external trade) in modern beer, soft drinks and tobacco show that (even allowing for consumption in catering establishments) households understate consumption of these products. The extent of the understatement in the case of modern beer was assumed also to apply to traditional beer made from bananas and sorghum.

Agricultural production

43. There are three sources of agricultural production data:

a) the National Agricultural Survey,

b) the Crop Assessments carried out every season by MINAGRI and

c) the estimates derived from household consumption in the EICV

44. Comparisons of these data sources show marked differences in the levels of production. There is reason to believe that, for some crops, the crop assessments reflect the potential total yield from the area planted, irrespective of the time it may take for the crop to mature. If a crop takes a year to mature, the potential annual yield is likely to be counted twice over, once every season; if a crop cycle repeats three times in a year. the annual production is likely to be understated in the assessment. On the other hand, the post-harvest surveys tend to show lower output than might be expected from the consumption estimates. This may be attributed to a reluctance of respondents to disclose the full extent of their output. As in the previous 2001 benchmark, it was decided to adopt the third source for national accounting purposes in the 2006 benchmark. These estimates set the ***level*** of value added in the base year.

The results

45. When the balancing had been completed and the differences between supply and demand eliminated, the results in the table below were obtained:

Gross domestic product at market prices (FRw billion), 2006

	New data	Old data[1]	Difference
Gross domestic product	**1,716**	**1,564**	**152**
Final consumption expenditure	**1,689**	**1,597**	**91**
Government	312	278	34
Households (incl. changes in stocks)	1,377	1,320	58
Gross fixed capital formation	**275**	**252**	**22**
Buildings & public works	204	180	24
Machinery &equipment	71	73	-2
Exports *less* imports	**-247**	**-286**	**39**
Exports of goods & services	190	153	37
less Imports of goods & services	-437	-439	2

46. Further details of the benchmark were published in the Release dated 13 October 2009 *The 2006 Benchmark*.

Section 4: Annual and quarterly estimates

Introduction

47. This Section provides an overview of the data sources and the methods used to estimate GDP and its components, quarterly and annually. The data sources are described first, followed by the methods for compiling Gross Value Added (GVA) by activity, GDP at market prices and the expenditure components. Finally, related national aggregates, calculated annually from GDP using balance of payments and expenditure data, are covered.

Data sources for regular estimates

48. The main sources of data are described below. It will be noted that, apart from prices, heavy reliance is placed on administrative data rather than on statistical surveys.

Crop assessments

49. The only regular source of information on food crop production has been the twice-yearly crop assessment exercise (for Season A ending in January, and Season B ending in July). The results are produced by MINAGRI for food security purposes. The ***movements*** in these data crop by crop are used to extrapolate the benchmark estimates, on the assumption that there is a stable relationship over time between the level of the crop assessment estimate and the actual production. Whether this is the case or not since 2006 will become evident when the next benchmark is completed.

50. While post-harvest surveys have been conducted from time to time, the lack both of continuity and of timely results precludes their use in producing consistent estimates of GDP. Although regular post-harvest statistics are expected to emerge in future, the NISR currently has no alternative but to rely on the crop assessments. However, NISR staff make adjustments to these figures when it is clear that there has been a change in the method of making the assessment.

51. These estimates of crop production also have an indirect effect on the estimates for other sectors in the economy, especially the manufacturing of food and beverages and the commercial trade and transport sectors.

Customs data

52. Statistics of external trade, based on data from the RRA Customs Department, play a significant role in the estimates of GDP by activity. For consistency the statistics are obtained from the BNR. Exports of mining products are used to estimate mining production (some of which is informal), while those of coffee are use as a check on data from OCIR Café.

53. Imports of cement (together with local output) are used in assessing the quantity of construction; imports more generally (together with other indicators) are used to determine retailing and wholesaling activity (commercial trade) at both current and constant prices, which also feeds through to estimates of land transport.

Imports of machinery and equipment are used to estimate capital formation on these items.

54. In July 2009, a change was made to the valuation for Customs purposes (import duties and VAT). Previously the valuation had been CIF at the Rwandan border. From mid 2009, imports are valued either CIF at the East African Community (EAC) border, or at factory gate prices if produced within the EAC. The effect of this change in the second half of the year was determined for each category of imports. Overall, it was found that the value of imports have to be increased by 7 per cent to obtain CIF Rwanda valuation. The appropriate ratios are applied every quarter to each category.

Data from the VAT system

55. Since 2001, when VAT was introduced in Rwanda, the total turnover of VAT registered traders by type of activity has been used both in the benchmark and to extrapolate the benchmark to estimate **formal sector** (defined as registered traders) activity. In several cases, this serves merely to split the overall estimates within a given activity (such as in the case of construction and commercial trade). In other cases, separate estimates are made for the informal sector only, and thus the VAT-based data contributes directly to the GDP, as well as indirectly through the use of production data to estimate trade and transport margins.

56. In principal, turnover should be adjusted for changes in the stock of finished products and work-in-progress to derive the production estimates. However information on these items is not readily available, but they are considered to be small and relatively stable.

57. VAT turnover data depends to an extent on the effectiveness of the RRA in collecting this revenue. However, it is a far more comprehensive and regular data source (comparable to the Customs system) than can in practice be provided by means of statistical surveys.

58. In specific cases, VAT data is used to interpolate and extrapolate annual profit and loss accounts where these are used in the GDP estimation system.

Enterprise data

59. Quarterly production data are obtained from some of the largest enterprises, for example OCIR-Thé and OCIR-Café for tea and coffee production (both crops and manufacturing output). Other major producers covered include those producing beverages, tobacco, textiles, soap, cement, electricity and water, and telecommunications.

60. For the main brewery and Electrogaz, annual profit and loss accounts are also collected and incorporated in the estimation system when they become available.

Financial institutions

61. BNR provides consolidated profit and loss account of banks quarterly, and of insurance companies annually. The latter are interpolated using VAT turnover data.

Government

62. Quarterly data of actual budget execution are used to extrapolate benchmark estimates of the total output of producers of government services as well as government final consumption. Currently the indicators (separately for Education and Health) used are based on the sum of expenditures on “wages and salaries”, on “goods and services”, and on “transfers” which are mostly transfers to other government institutions. Information on student enrolment and the number of teachers is used for estimating education activity at constant prices.

Population estimates and other indicators

63. In several cases it has been necessary to fall back on the use of population estimates where no other indicator is readily available. Indicators may be based on the total population, the urban population, or the rural population as appropriate.

64. Some other indicators (for example visitors to national parks) are available but have not yet been incorporated into the estimation system.

Prices

65. There are three main sources of prices data:

e) Consumer prices: collected and compiled monthly by NISR and BNR;
f) Food prices at local markets: compiled fortnightly by MINAGRI from about 40 markets throughout the country;
g) Producer prices: collected and compiled quarterly by NISR and BNR.

Balance of payments

66. Annual balance of payments (BOP) statistics are compiled by the BNR. While statistics of external trade in goods are available monthly, the remainder of the BOP are yet to be compiled on a quarterly basis.

Compiling GVA by activity

67. As a result of the benchmarking project (see Section 3 above), benchmark estimates for the year 2006 are available for every kind of activity of

a) Total output,
b) Intermediate consumption, and
c) Gross value added.

68. In most cases, the quarterly estimates are made by extrapolating the benchmark estimates of production using two types of indicators. These indicators are **value indices** (for current price estimates) and **quantity indices** (for constant price estimates). In most cases, in order to calculate one or other of these indices, an appropriate **price index** is needed. All these indices are equal to 100 in the base year, 2006.

There are two main ways of estimating the value indices on a quarterly basis, and three main ways of compiling quantity indices, as follows.

Value indices (for current prices)

1. If estimates of the turnover of all the producers in a sector are available directly, these can be used as an estimate of total output at current prices[2], or converted into an index to extrapolate the benchmark. Because of the large informal sector, for many sectors these figures are not available in Rwanda. But turnover data are available for the formal sector (mainly from the VAT system) and for producers of government services.

2. If turnover estimates are not available directly, a value index can be obtained by multiplying a quantity index by an appropriate price index.

Quantity indices (for constant prices)

1. If a value index is available directly (case 1 above), a quantity index can be derived by dividing the value index by an appropriate price index. (This method should be used wherever possible, according to the SNA93.)
2. If estimates of quantities produced are available, they can be converted into an index number (weighted together if necessary). There is a danger with this method: if new products are not included, a downward bias can result.
3. If neither values nor reliable quantities are available, proxy indicators of quantity may have to be used. For example in some cases the quantity indices are based on the estimated growth rate of the population of the country.

Appropriate price indices

69. Ideally the price index used in these calculations will reflect the change in the basic price of the particular goods or services in question.

- For agriculture, the (wholesale, if available) prices in local markets are accepted as reflecting movements in basic "farm-gate" prices. In Rwanda, local market prices collected by the Ministry of Agriculture are used for the main crops. For some items, specific components of the **consumer price index** (CPI) are used.
- For manufacturing activities, **producer price indices** (PPIs) are the best. In Rwanda, the comprehensive collection of PPIs for manufacturing began at the end of 2003.
- For service activities, specific components of the CPI are often the most appropriate, since there is usually little difference between the consumer price and the basic price. In some cases, the all items CPI is the most appropriate available index.

GVA by activity at current prices

70. For most kinds of activity, the usual procedure for estimating GVA at current prices is as follows. First, benchmark total output figures are extrapolated using the appropriate **value index** to obtain estimates of total output at current prices (TOCP).

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[2] In principle an adjustment might be needed for changes in the inventories of finished goods, not applicable in the services sectors, and for work in progress, but such data are not readily available and the effect on GDP is small.

Next, the appropriate **input-output ratio** is applied to the total output to estimate intermediate consumption at current prices (IC). In most cases the input-output ratios are assumed to be the same as in the previous year, but it is possible to update these ratios as more up-to-date information becomes available. (Problems can arise if ratios based on new sources of information are suddenly introduced. It may be better to wait for a new benchmark to be compiled.) Finally, the IC is subtracted from TOCP to give the gross value added at current prices (GVA CP).

GVA by activity at constant 2006 prices

71. When estimating GVA at constant prices, for most kinds of activity, a more direct method is used. This method is simply to extrapolate the benchmark GVA using the appropriate **quantity index**.

72. This method is equivalent to extrapolating the benchmark total output by the quantity index and applying the benchmark input-output ratio in every year. The assumption here is that if the *quantity* of output increases by 10 per cent (say) then the *quantity* of inputs required to produce the output will also increase by 10 per cent. In most situations this is a reasonable assumption in the short term. For example, the output of a lorry depends in theory on the distance it travels. The further it travels the more fuel it will require. Only when a more fuel-efficient lorry replaces the old one will this assumption break down. It is generally not practicable to make more accurate measurements of input quantities (**double deflation**) except in a few very specific cases.

73. This standard method is *not* the same as the "**single deflation**" of GVA and, although it may give the same result, it may not. Single deflation assumes that if the *value* of total output increases by 10 per cent (say) then the *cost* of inputs required to produce the output will also have increased by 10 per cent. This assumption may also be reasonable, but it is a stronger assumption and rather less likely to be true unless the price of outputs always change to reflect changes in the cost of inputs.

Detailed methods for each activity

74. A summary of the methods is shown in Annex A.

GDP and its expenditure components

GDP at market prices

75. Once the estimates of GVA by activity have been made, two adjustments are required in order to convert total GVA at basic prices into GDP at market prices, both current and constant. The first is for FISIM. The second is taxes (*less* subsidies) on products. These are described below, followed by the expenditure components.

Financial Intermediation Services Indirectly Measured (FISIM)

76. FISIM was formerly known as imputed bank service charges. It is basically the difference between the total interest the banks receive and the total interest they pay. This amount is considered to be part of the banks' total output. Normally, output is explicitly paid for by the purchaser. However, in this case, no explicit charges are made to bank customers who would therefore never record them in their books.

77. In order to balance the national accounts, an equivalent amount must somehow be added to the expenditures (whether final or intermediate) of those customers. In order to avoid the difficulty of allocating such imputed amounts between customers, the 1968 SNA recommended a single overall adjustment having the effect of treating all of these amounts as intermediate consumption. While the SNA93 suggested that FISIM should be allocated to the various customers, it allowed countries to adopt their own solution, including retaining the former treatment. In Rwanda, for simplicity, the former treatment has been retained for the time being.

Taxes (less subsidies) on products

78. What used to be called “Indirect taxes” is now known as “Taxes on production and imports”. The SNA93 splits these taxes between “Taxes on products” and “Other taxes on production”.

79. Taxes on products include the following items: non-deductible VAT, all types of import duties, excise duties, and other such taxes directly related to the value or quantity of the product. When total output and value added are valued at basic prices, all these taxes on products are excluded. When GDP is measured at market prices, taxes on products are included. This is why the adjustment is necessary.

80. A similar argument (in reverse) applies to subsidies.

81. “Other taxes on production” covers other types of taxes paid by producers such as business licenses or property taxes (but not taxes on profits). While forming part of producers’ costs, this category, usually small, is not part of intermediate consumption. These taxes therefore contribute in principle to GVA at basic prices, along with the compensation of employees and gross operating surpluses.

Final consumption expenditure by households and NGOs

82. Although in the benchmark year, the figures on household consumption are based very largely on the Household Budget Survey, in other years they are calculated as a residual at both current and constant prices. In other words, estimates for the other items of expenditure (government final consumption expenditure, capital formation and net exports) are subtracted from GDP at market prices.

Final consumption expenditure by government

83. Final consumption expenditure by government is derived from the central government accounts. It is defined as the total output of producers of government services (measured in terms of cost) *less* any receipts from the sales of goods and services.

Capital formation

84. Capital formation consists of three main categories: gross fixed capital formation, changes in inventories and the acquisition less disposal of valuables. No direct information is available for any of these categories. The methods used to compute the value of gross capital formation rely on the estimates of the production of the construction industry and on the imports of machinery and equipment. At

present changes in inventories are not included because of the lack of regular data. The third category, the acquisition less disposal of valuables, is considered to be negligible in Rwanda, and therefore not shown.

Net exports

85. “Net exports” is equal to total exports of goods and services minus total imports of goods and services. The figures are based on balance of payments estimates made by the Banque Nationale du Rwanda (BNR).

Related aggregates

86. The following national accounting aggregates are also calculated from information provided by the BNR on the balance of payments, and the expenditure components of the GDP:

Gross National Income (GNI)

87. GNI is obtained by adding “net factor income from abroad” (recorded by BNR in the balance of payments) to GDP at market prices

Gross National Disposable Income (GNDI)

88. GNDI is obtained by adding “net transfers from abroad” (recorded by BNR in the balance of payments) to GNI. In principle the transfers should exclude “capital transfers” but in practice these are included here.

Gross National Saving

89. Gross national saving is obtained by subtracting estimates of all final consumption expenditure (see above) from GNDI.

Net lending to the rest of the world

90. Finally, net lending to the rest of the world is obtained by subtracting capital formation (see above) from gross national saving. This flow is equivalent to the overall balance of payments on current account.

Modes of production

91. As stated earlier, for practical reasons, the **formal sector** has been defined as businesses registered for VAT at the Rwanda Revenue Authority (agricultural activity is excluded, although registered agro-industries such as tea and coffee processing are included). The formal sector also includes the VAT and other taxes on products, whether collected on imports or on locally produced goods and services (classified under adjustments in the table). The data on the total turnover of this sector, covering some 3,000 businesses, comes from the returns they make to the Revenue Authority. For the largest enterprises, and banks and insurance companies, these data are supplemented by the detailed annual (for banks, quarterly) financial accounts. It may be noted that this definition of the formal sector is subject to the compliance of businesses in registering and paying VAT, and in changes in the effectiveness of the Revenue Authority in ensuring compliance.

92. **Informal activity** covers marketed production by all other private producers not registered for VAT. By definition, there are no regular, readily available sources of information on these producers, except in the case of major crop production (for which food security forecasts have been the main source). Most informal activity is not subject to tax. The value added by the informal sector is by definition not subject to VAT (although VAT may be levied on goods imported by the sector or on other formal inputs such as petrol). Other types of tax or licenses payable are likely to be small.

93. The methods used to estimate informal activity are as follows. Benchmark estimates for total monetary production in 2006 were made during the GDP rebasing project to balance supply and demand for goods and services in the economy (the Supply-Use Table). Informal monetary activity is that which is left over in non-government sectors after formal sector activity has been subtracted. Apart from for crop production, quarterly (and annual) estimates are produced by extrapolating the benchmark using proxy indicators. For example, cereal milling activity depends on the estimated production of cereals. Often estimates of the urban or the general population are used as indicators between benchmarks.

94. **Non-monetary production** covers goods (mostly crops) and housing services that are consumed by the producer (auto-consumption). The proportions of production that are consumed by the producer were available from the EICV (Integrated Living Conditions Survey) and used to distinguish between monetary and non-monetary production in the benchmark exercise. These proportions are assumed to be constant between benchmarks.

95. The **Government and NGO** mode of production is assumed to be activity carried out in three branches of activity, namely public administration, education and health.

Annex A: Summary of data sources and compilation methods by activity

Activity GDP by Economic Activity	ISIC	Mode	Weight 10,000	Current prices Value indices (V)	Constant prices Quantity indicators (Q)	Deflator/inflator Price indices (P)
Agriculture			**3,844**			
Food crops	AA	Total	3,178	Q*P	MINAGRI crop assessments, adjusted	MINAGRI MIS & CPI items
Export crops	AB	Total	147	Q*P	OCIR Café; OCIR The	Prices paid to farmers
Livestock	AC		179			
Eggs and milk			58	Inter EICV comparison extrapolated using CPI	V/P	Eggs and milk CPI
Other components			121	Q*P	Livestock model	Meat, honey and all items CPI
Forestry	AD	Total	303	Q*P	Trend estimate based on the Enquête Intégrale sur les Conditions de Vie des Ménages 2 and Population and Housing Census 2002	CPI for solid fuel
Fisheries	B	Total	35	Q*P	Total population growth	CPI for fish
Industry			**1,376**			
Mining and quarrying	C	Total	64	Export values (BNR)	Export quantities (BNR)	V/Q
		Formal	57	VAT sales data	V/P	Same as Total
		Informal	7	Total less Formal	Total less Formal	V/Q
Manufacturing	D		680			
Food	DA	Total	285	Q*P	Agriculture production indicators.	PPI & CPI items
		Formal	33	VAT sales data	V/P	as Total
		Subsistence	4	1% of Total	1% of Total	V/Q
		Informal	249	Total less Formal and Subsistence	Total less Formal and Subsistence	V/Q
Beverages and tobacco	DB	Total	164	Formal plus Informal	Formal plus Informal	V/Q
		Formal	54	Q*P	Enterprise data	Beverages and tobacco PPI
		Informal	111	Q*P	Banana/sorghum production & Total population growth	CPI items for banana beer and traditional beer
Textiles and clothing	DC	Total	48	Formal plus Informal	Formal plus Informal	V/Q
		Formal	8	VAT sales data	V/P	PPI for textiles, clothing and footwear
		Informal	40	Q*P	Total population growth	as Formal
Wood, paper and printing	DD	Total	35	Formal plus Informal	Formal plus Informal	V/Q

Activity **GDP by Economic Activity**	**ISIC**	**Mode**	**Weight** **10,000**	**Current prices** **Value indices (V)**	**Constant prices** **Quantity indicators (Q)**	**Deflator/inflator** **Price indices (P)**
		Formal	21	VAT sales data	V/P	PPI for wood, paper and printing
		Informal	15	Q*P	Total population growth	as Formal
Chemicals, rubber, plastics	DE	Total	44	Formal plus Informal	Formal plus Informal	V/Q
		Formal	40	Soap: Q*P; VAT sales data	Soap: enterprise data; V/P	Composite index of PPIs for chemicals and plastics
		Informal	4	Q*P	Composite QI of Total population growth and soap data	as Formal
Non metallic minerals	DF	Total	62	Formal plus Informal	Formal plus Informal	V/Q
		Formal	38	Cement: Q*P and VAT sales data for other products	Cement: enterprise data; V/P	PPI for ceramic products, cement, lime and artiles of concrete
		Informal	23	Q*P	Cement indicator	As above
Furniture and other	DG	Total	42	Formal plus Informal	Formal plus Informal	V/Q
		Formal	9	VAT sales data	V/P	CPI for household equipment
		Informal	33	Q*P	Urban population	as Formal
Electricity and water	E	Total	20	Q*P constrained to annual a/c	Eletrogas data	Eletrogas data
Construction	F	Modern	612	Q*P	Lagged cement indicator (production & imports)	All items CPI & cement prices
		Formal	93	VAT sales data	V/P	as above
		Informal	407	Modern less Formal	Modern less Formal	as above
		Traditional	112	Q*P	Trend estimate based on the Enquête Intégrale sur les Conditions de Vie des Ménages 2 and Population and Housing Census 2002	as above
Services			**4,196**			
Wholesale and retail trade	G	Total	1,122	Production & import value indicators	Production & import quantity indicators	V/Q
		Formal	364	VAT sales data	V/P	as Total
		Informal	757	Q*P	Total less Formal	as Total
Hotels and restaurants	H	Total	235	Formal plus Informal	Formal plus Informal	V/Q
		Formal	78	VAT sales data	V/P	Composite of hotel rate and relevant CPI items
		Informal	157	Q*P	Urban population	as Formal
Transport, storage, communication	I		679			

Activity **GDP by Economic Activity**	**ISIC**	**Mode**	**Weight** **10,000**	**Current prices** **Value indices (V)**	**Constant prices** **Quantity indicators (Q)**	**Deflator/inflator** **Price indices (P)**
Air transport	IA	Formal	17	VAT & enterprise data	Total air passenger movements	V/Q
Other transport	IB	Total	485	Q*P	Trade & Pop. Indicators	CPI transport sub-group
			138		*Rural population growth rate*	
		Formal	65	VAT sales data	V/P	as Total
		Informal	419	Q*P	Total less Formal	as Total
Communications	IC	Total	177	VAT & enterprise data	V/P	CPI communication sub-group
Finance and insurance	J	Total	286	Income statements	V/P	All items CPI
Real estate and business services	K		660			
Owned and rented dwellings	KA	Total	542	Q*P	Pop. Indicators: Urban for rental and urban dwellings, and rural for rural dwellings.	CPI rents
Other renting and business services	KB	Total	118	Formal plus Informal	Formal plus Informal	V/Q
		Formal	97	VAT sales data	V/P	All items CPI
		Informal	22	Q*P	Urban population	as Formal
Public administration	L	Total	505	Government expenditure data adjusted	V/P	All items CPI and fixed wage increase of 3% per annum.
Education	M	Total	443	Government plus Private	Students by level and staff for primary and secondary levels.	V/Q
		Government	248	Total expenditure multiplied by fixed ratio		
		Private	196	Q*P	Private students	CPI education sub-group
Health	N	Total	133	Formal plus Informal	Formal plus Informal	V/Q
		Government	69	Total expenditure multiplied by fixed ratio	V/P	CPI medical sub-group
		Private	64	Q*P	Total population growth rate	as above
Other personal services	O&P	Total	134	Formal plus Informal	Formal plus Informal	V/Q
		Formal	16	VAT sales data	V/P	Composite deflator based on relevant CPI sub-groups.
		Informal	118	Q*P	Urban population growth rate	as above
Adjustments			**584**			
Less: FISIM			-137	Income statements of financial intermediaries.	V/P	All items CPI

Activity **GDP by Economic Activity**	**ISIC**	**Mode**	**Weight** **10,000**	**Current prices** **Value indices (V)**	**Constant prices** **Quantity indicators (Q)**	**Deflator/inflator** **Price indices (P)**
Plus: VAT and other taxes on products			722	RRA preliminary data used for quarterly estimation.	GDP at factor cost movement	V/Q

Annex 2: Update on improvements to methodology introduced in the Q2 2011 GDP release

Summary

With the launch of the regular publication of a quarterly GDP release, the opportunity has been taken to introduce some improvements to the methodology used to compile the estimates. In particular, the use of population indicators to extrapolate volume measures within the compilation methodology has been an area of weakness in the estimation process. These have now been reduced from 19.0 percent down to 7.4 percent of GDP in the 2006 base year through the introduction of a number of more representative volume indicators for: livestock; forestry; meat manufacturing; construction of traditional dwellings; wholesale and retail trade; and owner-occupied and rented dwellings. The impact of these on the aggregate estimate of GDP is shown in Table 1.

Table 1: Value of Revisions to Constant Price GDP in RWF Billions

Aggregates	2006	2007	2008	2009	2010
GDP Total	-	(1.37)	(2.04)	(2.90)	(3.38)
% change in GDP growth rate		0.08%	0.03%	0.04%	0.01%
Agriculture	-	(0.38)	(0.13)	(0.01)	0.43
Livestock	-	(0.67)	(0.95)	(0.68)	(0.50)
Forestry	-	0.29	0.82	0.67	0.93
Construction	-	(0.12)	(0.25)	(0.38)	(0.52)
Real Estate and Business Services	-	(0.72)	(1.48)	(2.29)	(3.13)
Meat Manufacturing and Trade	-	(0.14)	(0.18)	(0.23)	(0.16)

The quarterly GDP estimates have been revised from 2006 Quarter1 to 2010 Quarter 4. However, the revisions are insignificant at the total GDP level as the revised increase in forestry value added partly offsets decreases in value added for other economic activities. The percent GDP change of 0.08% (or 0.1%) shown for 2007 in Table 1 above is the difference between the current annual GDP growth rate for 2007 of 7.7% and the revised growth rate of 7.6%. The revisions reduce the annual constant price GDP growth for 2007 from 7.7 percent to 7.6 percent, and for 2009 from 6.1 percent to 6.0 percent.

These improvements are described in more detail below.

Livestock

Livestock GVA accounts for 1.2 percent of GDP in the 2006 base year.

Pervious methodology: Constant price estimates for livestock production are currently based on the 2006 benchmark Gross Output (GO) and Gross value Added (GVA) extrapolated using the total population growth rate. For eggs and milk, the trend in the value of consumption divided by the general consumer price index (CPI) is used to extrapolate GO and GVA.

Improved methodology: These indicators have now been replaced by output volume indicators for each type of animal and farm product linked to a livestock WIP (Work In Progress) model. For example, instead of extrapolating the benchmark estimate for cattle using population growth, the quarterly output volumes for cattle are now used instead. As shown in Table 2 below, the impact of using these more representative output volume indicators is to reduce the level for livestock GVA. The constant price growth rates have fallen for 2007 and 2008, but increased for 2009 and 2010.

h) Table 2: Livestock Gross Value Added in RWF Billions

Aggregates	2006	2007	2008	2009	2010
In Current Prices					
Current GVA estimate	30.9	32.9	41.8	49.2	50.8
Revised GVA estimate	30.9	32.3	40.8	48.4	50.3
Difference	-	(0.64)	(1.02)	(0.81)	(0.49)
In Constant Prices					
Current GVA estimate	30.9	32.3	33.4	34.2	35.6
Revised GVA estimate	30.9	31.6	32.5	33.5	35.1
Difference	-	(0.67)	(0.95)	(0.68)	(0.50)
Current growth rate	-	4.6%	3.4%	2.4%	4.0%
Revised growth rate	-	2.5%	2.6%	3.3%	4.6%

Forestry

The estimates account for 3.0 percent of GDP in the base year.

Pervious methodology: For forestry, the benchmark inter-EICV estimates for charcoal, firewood and logging have previously been extrapolated using the total population growth rates.

Improved methodology: Benchmark and trend data from the Population and Housing Census 2002 and the Enquête Intégrale sur les Conditions de Vie des Ménages 2006 (EICV20 on the main fuel used for cooking by households has been used to develop more representative volume indicators for charcoal and firewood production. Separate output volume indicators have been compiled based on: the number of rural and urban households using firewood for cooking; and rural and urban households using charcoal for cooking. These indicators have been used to extrapolate the relevant GO and GVA benchmarks for charcoal and firewood, instead of the general population growth rate indicator. For logging, the general population indicator has been replaced by a weighted composite volume indicator based on wood manufacturing output (40 percent), cement consumption (30 percent), and the traditional housing construction volume indicator (30 percent). As shown in Table 3 below, the impact of using these more representative volume indicators is to increase the level for forestry GVA. The constant price growth rates have increased for 2007, 2008 and 2010, but fallen for 2009.

Table 3: Forestry Gross Value Added in RWF Billions

Aggregates	2006	2007	2008	2009	2010
In Current Prices					
Current GVA estimate	52.0	52.8	67.8	72.5	75.8
Revised GVA estimate	52.0	53.0	68.8	73.4	77.0
Difference	-	0.29	1.03	0.86	1.23
In Constant Prices					
Current GVA estimate	52.0	53.4	54.9	56.4	57.9
Revised GVA estimate	52.0	53.7	55.7	57.0	58.8
Difference	-	0.29	0.82	0.67	0.93
Current growth rate	-	2.7%	2.7%	2.7%	2.7%
Revised growth rate	-	3.3%	3.7%	2.4%	3.2%

Meat Manufacturing

The estimates account for 0.2 percent of GDP in the base year.

Pervious methodology: within food manufacturing, meat production estimates are based on livestock production volumes as the indicator.

Improved methodology: As noted above, replacing the general population growth indicator with the output volume indicators for each type of animal and farm product to estimate livestock production means that meat manufacturing is no longer estimated through the indirect use of population indicators.

Construction of Traditional Dwellings

Benchmark GVA estimates of construction of traditional dwellings, accounting for 1.1 percent of the base year GDP

Pervious methodology: the estimates of construction of traditional dwellings are currently extrapolated using the rural population indicator (i.e. growth rate of 0.605 percent per quarter).

Improved methodology: The population indicator has been replaced using a volume indicator based on the quarterly rate of change in the number of rural dwellings (i.e. growth rate of 0.412 percent per quarter) using the trend between the Population and Housing 2002 and EICV2 benchmarks. As shown in Table 4 below, the impact of using the more representative volume indicator is to lower the level for construction GVA. The constant price growth rates are also lower for all years.

Table 4: Construction Gross Value Added in RWF Billions

Aggregates	2006	2007	2008	2009	2010
In Current Prices					
Current GVA estimate	105.1	131.8	193.7	218.8	245.0
Revised GVA estimate	105.1	131.7	193.4	218.3	244.3
Difference	-	(0.13)	(0.31)	(0.53)	(0.75)
In Constant Prices					
Current GVA estimate	105.1	120.9	155.1	157.3	171.1
Revised GVA estimate	105.1	120.8	154.8	156.9	170.6
Difference	-	(0.12)	(0.25)	(0.38)	(0.52)
Current growth rate	-	15.0%	28.2%	1.4%	8.8%
Revised growth rate	-	14.9%	28.2%	1.3%	8.7%

Retail and Wholesale Trade

As livestock and forestry GO are used as volume indicators in extrapolating the retail and wholesale trade benchmark estimates, replacing the population indicators for the former with more appropriate volume indicators has also resulted in reducing indirect use of population indicators for the latter by 0.6 percent of GDP.

Rented and Owner-Occupied Dwellings

Benchmark GVA estimates for this sector account for 5.4 percent of GDP in the base year.

Pervious methodology: Constant price estimates for rented and owner-occupied dwellings (actual and imputed rents) are currently based on total rural and urban dwellings from the 2006 benchmark extrapolated using rural and urban population growth rates, respectively. Using population growth rates is not appropriate as household size changes over time.

Improved methodology: quarterly indicators have been developed, for Quarter 3 2002 onwards, on rural and urban residential dwelling trends using data from the benchmark Census of Population and Housing 2002 and EICV2. As household size has continued to increase, the quarterly rate of change in the number of dwellings (i.e. 0.412 percent for rural and 0.888 percent for urban dwellings) is slightly lower than the quarterly population growth rates (i.e. 0.605 percent for rural and 0.997 percent for urban population). The impact on estimates for real estate and business services GVA is shown in Table 5.

Table 5: Real Estate and Business Services Gross Value Added in RWF Billions

Aggregates	2006	2007	2008	2009	2010
In Current Prices					
Current GVA estimate	113.2	172.1	236.5	287.0	299.1
Revised GVA estimate	113.2	171.1	233.9	282.4	292.6
Difference	-	(1.07)	(2.65)	(4.62)	(6.46)
In Constant Prices					
Current GVA estimate	113.2	126.0	146.2	158.9	161.2
Revised GVA estimate	113.2	125.3	144.7	156.6	158.1
Difference	-	(0.72)	(1.48)	(2.29)	(3.13)
Current growth rate	-	11.3%	16.0%	8.7%	1.5%
Revised growth rate	-	10.7%	15.5%	8.2%	1.0%