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FOOD BALANCE SHEET (FBS) IN THE CONTEXT OF A NATIONAL STATISTICAL SYSTEM IN AFRICA¹

In the first part of this paper it is briefly presented an overview of the FBS standard methodology as currently used by FAO (cfr the FBS handbook for more details)². The second part presents how this can be applied to the context of a national statistical system in Africa: steps to be followed in the establishment of a national FBS system as well as the structure of a required database to be implemented at this end.

1. General overview of the methodology of Supply Utilization Accounts (SUAs) and FBS

A statistical framework consisting of a series of Supply/Utilization Accounts (SUAs) for food and agricultural commodities is a powerful tool for making the best use of available statistical information in formulating plans for developing the agricultural sector. Establishing such a system can also help to pinpoint many inconsistencies in the statistical series, leading to a better recognition of the need to improve statistics on food and agriculture.

The advantage of storing the commodity data in the form of SUAs is that they are internally consistent in the sense that each element of supply of a commodity matches the other and total supply matches total utilization. This system provides a check on the plausibility and coherence of statistical data supplied by various national and/or international agencies. It also provides a useful tool for choosing between alternative sources of data and a logical framework for estimating missing observations. Every effort is done to make the data consistent by adhering, as far as possible, to the same definitions, coverage, specifications (e.g. the case of total and commercial production), etc., of each commodity and each element/variable. A SUA system is therefore a valuable tool which contributes in improving data quality and preparing a number of important statistical measures such as:

- i) *Index numbers of production, trade and supply*
- ii) *Self-sufficiency ratios and import dependency ratios*
- iii) *Food balance sheets report.*

¹ Presented by Vincent Ngendakumana, Statistician, ESSB-FAO Rome

² This methodology may slightly change, in the near future, in the framework of the ongoing implementation of the modernisation of FAOSTAT (FAOSTAT2 Project).

Annual food balance sheets tabulated regularly over a period of years show the trends in the overall national food supply and reveal the extent to which the food supply of the country as a whole is adequate in relation to nutritional requirements. By bringing together the larger part of the food and agricultural data in each country, food balance sheets are useful in making a detailed examination and appraisal of the food and agricultural situation in a country. A comparison of the quantities of food available for human consumption with those imported will indicate the extent to which a country depends upon imports (import dependency ratio) to feed itself. The amount of food crops used for feeding livestock in relation to total crop production indicates the degree to which primary food resources are used to produce animal feed which is useful information for analyzing livestock policies or patterns of agriculture. Data on per caput food supplies are an important element for projecting food demand. The calorie value obtained as the mean in the FBS become proxies for the food consumption mean intake. By applying a particular cut-off point or value, in terms of human nutrition requirements, it is possible to estimate the number of undernourished population. Finally, the identification of important gaps in the available data also stimulates the improvement of national statistics at the source.

FAO has a long professional experience in this kind of activity and has provided support to countries (Rwanda, Gabon, Kenya, etc.) which are now able to compile and construct SUA/FBS. This initiative can be extended to other developing countries where needed.

Meaning of Supply utilization account

For each food product, the SUA traces its supplies from production, imports and stocks to its utilization in different forms: addition to stocks, exports, animal feed, seed, processing for food, waste (or losses), other utilization and as food available to the population. SUAs are then essentially time series data for various elements of food statistics, which are kept side by side.

SUA Equations

These elements can be inter-related in a number of balancing equations. The first equates the sum of the supply elements (opening stocks + production + imports) with the sum of the utilization elements (exports + feed + seed + waste + processing for food + food + other utilization + closing stocks).

The preparation of a balance of this kind presupposes that reliable and independent information is available for each of its elements. Alternatively, if no information is available for one of the elements, the residual will provide an estimate. In practice, however, the construction of balances of this type is rendered difficult by the absence of adequate information on opening and closing stocks. Experience shows, however, that information on changes in stocks is made more readily available than on their actual size. If a net decrease in stocks is defined as "from stocks" and a net increase in stocks as "to stocks" the following two equations will be obtained:

- i) from stocks + production + imports = exports + feed + seed + waste + processing for food + food + other utilization;
or:
ii) production + imports = exports + feed + seed + waste + processing for food + food + other utilization + to stocks.

Conceptual problems related to the preparation of SUAs

- The most important conceptual problem arises mainly with respect to the accuracy and availability of data. The incompleteness and inaccuracy of the basic data tend to be the major problems; even where the statistics are available, they are not always reliable.
- Production statistics may not be available for all commodities needed and mostly confined to important food items. Non-commercial or subsistence production, i.e. home produce by the household for their own consumption, is usually not included or it is not available which may be a large part of total production in some countries.
- Import and export data may be accurate in the majority of countries, but in some countries there may be significant amounts of trade across national boundaries that go unrecorded. As a consequence, the reliability of export data may also be questionable.

- Information on commercial stocks may be available from official or marketing authorities, factories, wholesalers and retailers, but inventories of catering establishments, institutions and households may not be available.
- Information on waste in industrial processing may be easily found, but waste during storage, transportation may not be available. There are very few surveys on which to base sound figures for waste. In some cases, these estimates are subject to significant margins of error. Typically, assumptions about waste are based on expert opinion obtained in a country. In these cases, even though the basic data are reliable, some adjustments are required to adapt the basic data to FBS concepts/coverage.
- There may not exist basic data on the feed, industrial/manufacture use of livestock products. The cost of production surveys and manufacturing surveys, which are the appropriate sources of data, has not been conducted regularly in most developing countries. Even where the surveys are conducted, their coverage is usually limited (e.g., usually, cost of production surveys doesn't cover livestock commodities, etc.).

What are Food balance Sheets (FBS)?

FBS are a special and important report, which is generated from the SUA database in conjunction with certain additional vital data, viz., food nutritional values and the total population data for the country. FBS report a single year (or an average number of years) multiplying the food available by the nutritive factors, to assess the calorie, protein and fat available to the general population.

Some notable limitations of FBS

FBS are often far from satisfactory in the proper statistical sense, as is explained below:

- The accuracy of food balance sheets depends on the reliability of the underlying basic statistics of population, supply and utilization of foods and of their nutritive value. These vary a great deal both in terms of coverage as well as in accuracy. In fact, for many countries, the population figure may be subject to either incomplete or unreliable data. The total population estimates may refer to resident population only, i.e., refers to de jure population. Thus, non-resident population, such as illegal immigrants, tourists, refugees, foreign diplomatic personnel and their dependants, foreign armed forces, etc., may not be included. This omission may constitute a considerable part in some countries. This, therefore, would understate the total partaker population. As already said, there are also many gaps particularly in the statistics of utilization for non-food purposes, such as feed and manufacture, as well as in those of farm, commercial and even government stocks. To overcome the former difficulty, estimates can be prepared while the effect of the absence of statistics on stocks can be considered to be reduced by preparing the food balance sheets as an average for a three-year period. But, even the production and trade statistics on which the accuracy of food balance sheets depends most are, in many cases, subject to improvement through the organization of appropriate statistical field surveys and records.
- At the same time, it is still difficult to prepare food balance sheets for different population groups (e.g., people of different socio-economic groups), ecological zones or geographical areas within a country or by season. To obtain a complete picture, food consumption surveys (which show the distribution of the national food supply at various times of the year and among different groups of the population) should be conducted. In fact, the two sets of data are complementary (there are commodities for which a production estimate could best be based on estimated consumption as obtained from food consumption surveys, e.g.: game meat, etc.).
- It is very important to be aware of the fact that availability for human consumption is by no means identical with consumption. The quantities of food available for human consumption, as estimated in the food balance sheet, reflect only the quantities reaching the consumer. The amount of food actually consumed may be lower than the quantity shown in the food balance sheet depending on the degree of losses of edible food and nutrients in the household (e.g., in preparation and cooking, quantities fed to domestic animals and pet, or thrown away, etc.).

2. SUA/FBS system in the context of a national statistical system in Africa

2.1. Steps to be followed in establishing a national FBS system

Step 1: Identification of required commodities

At first, it is necessary to draw up a list of relevant primary and processed commodities. The definition of a complete list of commodities presents virtually insurmountable difficulties - both conceptual and statistical. For practical purposes, therefore, a pragmatic list of commodities will have to be adopted. In drawing up such a list, countries may wish to keep in mind a general list of available food and agricultural/livestock commodities.

According to the current classification, a great degree of detail is required for the proper choice of food composition factors for the purpose of nutritional analyses (e.g., calorie, proteins and fat per 100 grams of the food item)³.

Among the various criteria to be taken into account when setting-up a commodity list, choosing suitable reporting units deserve particular attention. The data should be expressed in common units in order to facilitate international comparisons and the metric system should be adopted whenever possible. This list should, however, be adjusted according to the availability and relative importance of commodities in a given country. Generally, a list of the top 20-50 food items that comprise at least 95% of total Dietary Energy Supply (calorie/cap/day) level can be adopted (cfr the table in annex 1 showing an example of the main food items for the case of Kenya).

Step 2: Data collection

³ In the framework of the current implementation of the FAOSTAT2 Project, it is being proposed a more aggregated list, generally limited to primary products only.

The required basic data on those main items should be regularly and timely provided. Generally, basic data to be used are from various sources. Some are obtained from censuses and surveys on agriculture and livestock sectors (e.g. area and production of crops, livestock numbers, etc.), others from household surveys (e.g. consumption), administrative records (e.g. trade, slaughtering numbers, fishery data, etc.) or models or estimates (e.g. livestock products, etc). All those composite data are generally compiled and published by different national institutions (Ministries in charge of Agriculture, Livestock and Fisheries sectors, National Bureau of Statistics, Customs and Excise services, etc). In some cases, the exercise has to be based also on other external sources (e.g. trading partners data, etc.) and or technical conversion factors. In developing countries, rarely is there a unique agency making use of all these data, in particular assembling and analyzing them through a comprehensive SUA framework.

Ideally, the basic data required for the preparation of food balance sheets should be obtained from the same source. This implies that, firstly, the country should have a comprehensive statistical system which is recording all current information relating to each component of the food balance sheet (starting from producers to consumers). Secondly, concepts of the information adopted should be those of the food balance sheet concepts. Thirdly, the information available should be consistent, at least with respect to measurement unit and time reference period. In practice, however, such an ideal statistical system does not exist. The basic data are necessarily based on a large variety of sources. Therefore, for the preparation of SUA's purposes, an effort should be made to put data from different sources together, ensuring their consistency and coherence.

Step 3: Data input and control (reconciliation, adjustments and estimates)

As the basic data are necessarily based on a large variety of sources, their reconciliation as well as adjustments and estimation/imputation of the missing data are necessary. The relevancy, consistency, completeness and reliability of data retained should be carefully checked and guaranteed so that the resulting FBS's are reflecting the right picture of the food availability situation of the country. Missing data are estimated on the basis of various surveys, technical conversion factors, other information available to the economics and statistics community through the media and particular professional journals, as well as technical expertise available in the country. This is a basic axiom that one must work from. The underlying "hidden" assumption is that any number based on a professional estimation is preferred to zero. The harmonization is necessary to facilitate international comparisons.

Step 4: Construction of Supply Utilization Accounts

The account of every commodity has to be constructed, by ensuring that the balance of the SUA equation is always maintained: production + imports + stock changes = exports + feed + seed + waste + processing for food + food + other utilization. Statistical discrepancies should be avoided whenever possible.

Step 5: Calculating Per Caput Food Supply

The per caput figure of each food commodity is obtained by dividing the food available for human consumption figure by the total population partaking of it during the reference period, i.e., refers to de facto population.

In FBS, per caput food supplies in terms of quantity are given both in kgs/year and grs/day. Calorie supplies (obtained by multiplying the food available by the nutritive factors) are expressed in kilocalories (calories) per day, while supplies of protein and fat are provided in grams/day.

For the purpose of calculating the caloric value and the protein and fat content of the per caput food supplies, the choice of the appropriate food composition factors is very important. For example, the choice of the corresponding factors for cheese depends on whether the cheese is derived from whole milk, partly whole milk, or skim milk, as well as whether the cheese has been made from the milk of cows, sheep, goats, buffaloes, or camels, and lastly on whether the cheese is hard, semi-soft or soft. The nutritive factors can be obtained directly from the national or international food composition tables. These tables give the nutritional composition of food per 100 grams of edible portion.

Step 6: Standardization and production of Food Balance Sheets results

The utilization of all the information which was assembled for the construction of Supply Utilisation Accounts and a Food Balance Sheets often ends up in a rather long list of food commodities. This is certainly very useful in order to select the appropriate food composition factors which are required for expressing per caput food supplies in terms of

energy, protein and fat content. On the other hand, this detailed presentation no longer has the advantage of showing a comprehensive picture of a country's food supply. This dilemma can be solved by standardising the detailed food balance sheet. Standardisation can be achieved by showing only primary commodities, i.e. processed commodities are converted back into their originating primary commodity equivalent. Whenever possible, trade in processed commodities is also expressed in the originating/parent commodity equivalent. This procedure greatly facilitates the analysis of food balance sheets with no loss of pertinent information. This is the sort of tool that planners and economists concerned with the preparation of development plans in the food and agriculture sector need.

Step 7: Preparation and dissemination of the FBS reports

The FBS's results have to be analysed and compiled in a report to be published by the country (by hard copy, CD-Rom and or online -using CountryStat framework or any other relevant country website-). Before their publication, reports need first to be checked and cleared by the whole National Core Team. Generally, the following table of contents of the first report can be adopted:

- Preface
- Acknowledgment
- Acronyms, Symbols and units
- Summary of the methodology
- Constraints and limits
- Lessons and perspectives
- Analysis of the FBS results (years Tn-Tn+5) in Food Security perspective
- Tables of detailed FBS results (years Tn-Tn+5)
- Annex 1: Tables of basic data used for the main commodities (crop production, livestock numbers and production, fishery production, trade data) as well as TCF applied
- Annex 2: List of members of the National Core Team for the preparation of SUA/FBS

The reports covering the following years could be limited to the presentation and analysis of the related FBS results. Their publications should be done on a timely, adequate, relevant and regular basis. For example, those reports could be issued two times per year: the preliminary report during the mid of each year and the final one at the end of the same year.

Step 8: Establishment of a National Core Team for the preparation of SUA/FBS

A national SUA/FBS Framework System should be established taking into consideration the data needs for this end as well as the prevailing statistical system in the country. The structure for a required National Core Team and terms of reference have to be defined accordingly (cfr annex 2 and annex 3 as examples of the structure and working plan adopted in the case of Kenya).

In order to ensure co-ordination, synergy and sustainability of the construction of the SUAs/FBS system in the country, the National Core Team should receive concrete and continuous support from the Government (financial assistance, human and logistical resources, institutional mandate, etc.). SUA/FBS activities should be a part of the normative working plan of the country. All team members would ensure the availability, accuracy and timeliness of the basic data needed for the construction of the SUAs/FBS. Close contact should be maintained with all other partners involved in the SUAs/FBS activity inside as well as outside of the country (e.g. the FAO Statistics Division in Rome).

2.1. Structure of a required national SUA/FBS database

The SUA/FBS database should be based, managed and regularly and timely updated by the national agency coordinating statistical activities in the country. The structure of a such database has been designed and built-on to work with Excel, running under MS Windows 2000 XP. All components of the database are compiled and stored as worksheets on CD-ROM to be used by a country (French and/or English version)⁴: one Excel file called “YearCountry.XLS” for SUA data and another one called “Standardization.XLS” for FBS results. A manual intending to help in the use of that CD-ROM has been also written. A prototype of such worksheets is provided in a full operational state for any subject country. It means that, for one given country, you can start using it, without having entered basic data (unless it is explicitly requested).

In fact, the worksheet “YearCountry.XLS” contains SUA data of the recent years (at least the last five years) as sheets. In those sheets of years, all required data for SUA elements and supplementary data (technical conversion factors, nutritive factors, area planted and harvested, population, etc.) are already set for the country in subject. But, it is left to the user the possibility to modify constant and variables in successive years (or in the past ones, if more information becomes available). A new year framework (repetition of the previous year data) as well as standardized results (FBS) of one given year, related indicators (such as Import Dependency and Self-Sufficiency Ratios) and graphs can be generated automatically by running macros established at this end. Comments on the use of the whole system are also included into the worksheets and can be easily and automatically shown/activated or hidden/deactivated.

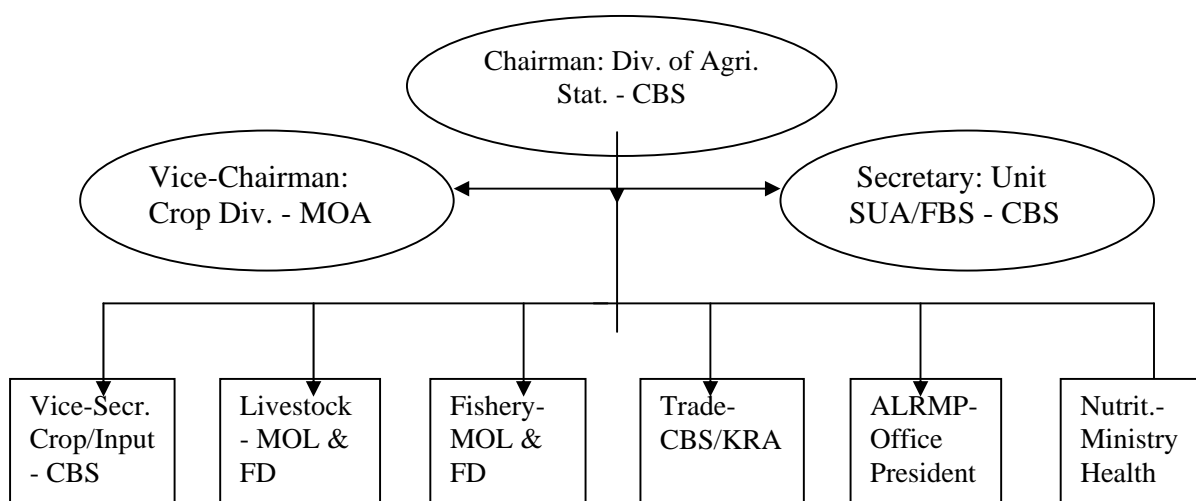
When updating the database, the system is provided with some checking tools: automatic calculation of statistical discrepancies (in order to check if SUA are well balancing), cumulative stocks (to monitor the level of stocks), calorie results (to ensure if the DES from each food item is reasonable), etc.

⁴ The CD-Rom contains also relevant methodological and technical documents.

Annex1. Main food items in Kenya (based on their Dietary Energy Supply -cal/cap/day-)

Codes	Items	1998	1999	2000	2001	2002	2003	2004
58	Flour of Maize	793	760	766	760	728	768	715
164	Sugar Refined	168	168	200	188	186	189	196
16	Flour of Wheat	156	199	196	193	182	161	195
882	Cow Milk, Whole, Fresh	108	124	138	144	159	160	138
176	Beans, Dry	149	113	117	92	134	103	108
1242	Margarine + Shortening	90	98	98	96	96	92	90
489	Plantains	68	64	58	61	57	56	56
125	Cassava	43	63	38	54	53	37	54
867	Beef and Veal	46	47	47	48	47	48	50
31	Milled Paddy Rice	19	24	39	45	44	52	50
116	Potatoes	34	55	32	56	41	60	47
122	Sweet Potatoes	33	44	42	43	33	46	43
257	Oil of Palm	41	45	44	44	43	42	42
32	Rice, Broken	9	2	6	7	7	14	32
197	Pigeon Peas	30	20	18	11	13	15	24
84	Flour of Sorghum	13	16	12	17	17	18	17
195	Cow Peas, Dry	27	12	16	12	19	12	13
575	Pineapples, Canned	9	14	15	13	13	12	13
156	Sugar Cane	7	7	6	9	9	1	12
60	Oil of Maize	12	12	11	11	11	10	10
340	Oil of Veget Origin nes	12	5	5	2	3	5	9
486	Bananas	11	10	9	12	9	9	9
242	Groundnuts in Shell	5	10	9	9	9	9	9
51	Beer of Barley	10	7	8	7	7	5	8
463	Vegetables Fresh nes	9	9	8	8	8	8	8
80	Flour of Millet	5	10	7	7	11	10	8
1020	Goat Milk	9	9	8	7	7	7	7
634	Beverages Dist Alcoholic	7	7	6	8	7	5	6
1182	Honey	7	7	7	7	6	6	6
572	Avocados	5	5	5	5	5	7	6
1058	Chicken Meat	5	6	6	6	6	6	6
977	Mutton and Lamb	4	5	5	5	4	6	6
1275	Oils Hydrogenated	1	4	9	6	7	4	6
252	Oil of Coconuts	7	6	5	6	5	6	5
1062	Hen Eggs	5	5	5	5	5	5	5
86	Beer of Sorghum	4	5	3	5	5	5	5
1017	Goat Meat	4	5	4	5	5	5	5
1505	Freshwater Cured	4	5	5	5	5	5	5
191	Chick-Peas	3	0	7	4	5	5	5
358	Cabbages	10	11	8	10	4	4	4
289	Sesame Seed	6	5	5	5	5	4	4
571	Mangoes	6	6	4	7	4	4	4
868	Offals of Cattle, Edible	6	6	6	5	4	4	4
576	Pineapple juice Sing-Stre	3	3	3	4	4	4	4
20	Bread	2	3	3	8	7	15	4
	Sub-total of main items	2005	2041	2049	2062	2039	2049	2053
	Grand total	2086	2132	2147	2159	2130	2155	2128
	% of main items (top 45)	96.1	95.7	95.4	95.5	95.7	95.1	96.5

Annex 2. Structure of the Kenya National Core Team on SUA/FBS



Annex 3. Working plan (terms of reference) of the National Core Team in Kenya

Activities	Responsible	Deadline
1. Nomination of the members	CBS	ASAP
2. Co-ordination of all activities	CBS	Continuous activity
3. Clearance of the first FBS report	All members	ASAP
4. Printing, burning on CD's and Launching of the 1 st FBS report	CBS	ASAP
5. Review and approval of the main commodities (basic data) to be reported	All members	ASAP
6. Review and approval of the relevant Technical Conversion factors to be used	All members	ASAP
7. Providing required basic data	All members	March/April
8. Data compilation and control (reconciliation, adjustments and estimates)	SUA/FBS Unit	April/May
9. Construction of SUA's	SUA/FBS Unit	May
10. Standardisation and production of FBS's	SUA/FBS Unit	May
11. Review and validation of FBS's	All members	June
12. Analysis of FBS's	SUA/FBS Unit	June
11. Validation and clearance of FBS's results and their analysis	All members	July
12. Publication of FBS's results and their analysis – hard copies on CD-ROM as well as online	CBS	July
13. To plan and conduct censuses/surveys/studies on the following specific topics: livestock production and numbers, stock changes, food processing, food waste, feed, seeds, technical conversion factors, etc.	CBS	ASAP