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Workshop on
Methodology for the Compilation of
Supply Utilization Accounts and Food Balance Sheets:
Challenges and Proposals for Improvement
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Working Document on Satellite Account for Food Balances

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1. Introduction

The conventional UN System of National Accounts (popularly known as SNA) has been expended in 1993 to enhance analytical capabilities for selected areas of social concern. Instead of overburdening or disrupting the central system the SNA has recommended use of satellite accounts for this purpose. The SNA (paragraph 21.4) has suggested that typically satellite accounts may be compiled for:

(a) providing additional information on particular social concerns of a functional or cross-sector nature;
(b) using complementary or alternative concepts, including the use of complementary or alternative classifications and accounting frameworks, when needed to introduce additional dimensions to the conceptual framework of national accounts;
(c) extending coverage of costs and benefits of human activities;
(d) analysis of data by means of relevant indicators and aggregates; and
(e) linkage of physical data sources and analysis to the monetary accounting system."

The FAO's System of Economic Accounts for Food and Agriculture (SEAFA), using this recommendation of the SNA has included Satellite Accounts for Food Balances (SAFB) in Part II of the system to establish:

(a) "food" sector by combining economic activities of crop, livestock, livestock products, fish, minor forest produce and agro-industries,

(b) linkage between monetary data on expenditure on food with the physical data on quantity of food consumed as well as the nutrient content of food.

The SAFB consist of accounts and tables that are based on the format of accounts and concepts recommended by the SNA. The concepts, definitions or classifications used in the SAFB are consistent with the main international statistical systems and standards, such as ISIC and CPC used by the SNA. In addition, the SAFB uses data on nutrient content (energy, protein and fat) in various items of food as being used by the FAO in compiling the Food Balance Sheets. The main objective of the present paper is to (a) further elaborate the SAFB from the existing description given in the

SEAFA, (b) demonstrate compilation procedure of the account, and (c) compare the results of SAFB with the Food Balance Sheet.

2. Satellite Accounts for Food Balances

The structure of the Satellite Accounts for Food Balances (SAFB) is based on the SNA's Goods and Services Account and has been linked with production, generation of income and capital formation account. The SAFB include four accounts and six statements. Two of the accounts are, respectively, the production and generation of income accounts for establishments whose principal activity is production of food[1]. Of the remaining two accounts one relates to capital formation in food production activity and the other shows the supply and use of food products. The supporting statements to the accounts establish links between consumption expenditure (apparent consumption in monetary terms) and consumption expressed in quantity terms as well as with the nutritional value of the food consumed and are discussed in the next section. The framework of these accounts is given in Annex.

The production boundary of SAFB is the same as given by the SNA. It includes the imputed value of own-account food production such as subsistence farming, kitchen gardening in urban areas or food gathering (including meat obtained from hunting, etc.), but does not include the processing of food for immediate consumption within the household. The main interest of the SAFB is focused on food production for human consumption. Thus, the accounts and tables included in the Part II of the SEAFA covers only those establishments that are wholly or partly engaged in production of food products only. As a result, all those establishments that are producing agro-products not for human (food) consumption are excluded. While preparing the production and income generation account for this activity, the non-food products produced by food producing units, are treated as secondary products and are excluded from the food balances. In this connection, however, it may also be noted that, apart from including non-food products, the total production of this account will also include that part of output of food products that is being used as intermediate consumption in food as well as non-food industries. Although the Production and Generation of Income Accounts does not show these data exclusively, but the Goods and Services Account does take care of such products as the basic compilation is done

[1] In the present structure, although accounts for traders dealing with food products has not been included, it would be useful to include three accounts (production, generation of income and capital formation account) for such trading establishments to extend the analysis to project role of such intermediaries and to have a comprehensive view of food security status. For this extension it would be necessary to define a clear boundary of the activity.

at individual item level. Thus these accounts present the economics of food production as well as the details of food products originating from establishments engaged in agriculture, forestry, fisheries and food processing activity.

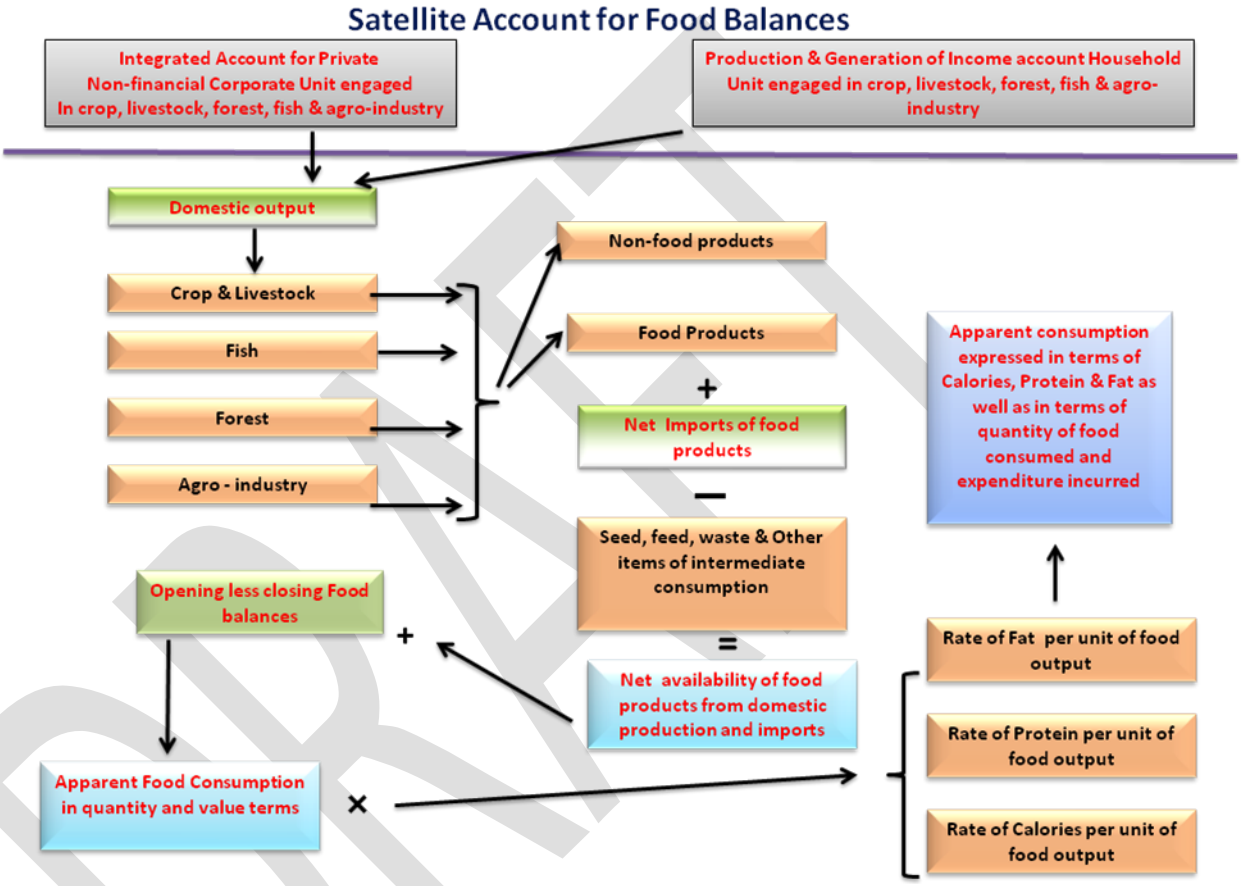
In SAFB, the concept of wastage includes wastage of food by the producer (pre-harvest losses) as well as by the distributers (post harvest losses). Total wastage has been divided into two components: wastage in production process and wastage in the distribution channels. Wastage of the former type is taken into account in the production account while the latter type is included in the Goods and Services Account. An over-view of the SAFB is given on the next page. For the sake of improving accuracy establishments have been divided in to two groups. Depending upon data availability the domain can be divided into more groups.

The supporting statements to the SAFB express food availability in supply and use accounts. In the first statement, details of supply and utilization of food by type of products are presented in quantity terms. This statement also gives per caput per day utilization of food products in terms of calories, protein and fat and total domestic food supply and utilization by components and by type of products at current and constant prices. The other statements give data in constant prices and producer or consumer prices of selected items of food products.

3. Sources for basic information

For compiling SAFB, in addition to the data on quantity of production and foreign trade for food items required for compiling food balance sheet, data on value/prices of production as well as data on quantity and value of intermediate consumption of agricultural and agro-industrial producing establishment are also required. As we need to merge the data in one account the whole data sets should be consistent to each other. This implies that, firstly, the country should have a comprehensive statistical system which records all current information relating to each component of the SABF starting from data on production to consumption. Secondly, concepts of the information adopted should be uniform (preferably as recommended by the SNA). 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. Inaccuracies and errors for different databases are different in nature from each other. Even in the few, mainly developed, countries which possess sophisticated reporting procedures and full cooperation of respondents, the available data do not always meet either the second or third condition. However, as sources of data required for both the exercises are somewhat similar in nature only and has been discussed and documented time and again limited

discussion on sources of basic data taken from existing documents has been included here just to refresh the memory.



A conceptual problem frequently arises with respect to coverage/representativeness of the basic data. Production statistics are mostly confined only to commercialized major food crops. Non-commercial or subsistence production (i.e. home produce and food from hunting, fishing and gathering by households for their own consumption) are usually not included. This might be an appreciable part of total production in some countries. Manufacturing surveys may cover only a certain size of industrial establishment. 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 available, but waste/losses during storage, transportation or on quantities intentionally discarded for the purpose of price control

or epidemic disease control may not be available. In these cases, even though the basic data are reliable, some adjustments are required to be made to adapt the basic concepts/coverage.

The incompleteness and inaccuracy of the basic data tend to be the major problems. Production statistics may not be available for all commodities needed. Even where the statistics are available, they are not always reliable. This may be due to the fact that crop patterns and utilization of some crops in developing countries are sometimes rather complicated, making it difficult to estimate the production. The estimation of production of some crops is further complicated because they are continuously harvested at regular or irregular intervals over a long period of time, e.g. cassava and certain fruits and vegetables. Moreover, for certain crops, the produce is not completely harvested; a portion is held back as a reserve from which to draw if the need arises or even left to rot, e.g. cassava and plantains. Moreover, depending upon local customs adjustment for certain kinds of food may be necessary as these items are not included in the national production statistics for the sake of international comparison. Meat, such as that of game, wild animals and insects, may be excluded from the national statistical system for this reason. Under conditions such as those prevailing in many developing countries, this meat may form a substantial part of the low consumption level of animal protein. Also, major food crops may not be grown in pure stands but mix-planted in fields of bewildering complexity. The reliability of official production data may also be questionable. This is because farmers frequently equate production with tax collection and, in some cases, because reliable information on pre-harvest food grain losses caused by pests and diseases are not usually available. Hence, the estimates of yield are likely to be inaccurate; if so, it follows that production statistics derived from the harvested area and the estimated yield may be subject to a biased estimation.

The availability of basic data on the feed, seed and industrial/manufacture use components are rather limited. Seeding rates for crops are fairly well established in most countries, but when the quantities fed to animals have to be estimated, many aspects must be considered. Feeding practices vary from country to country according to the quantity and quality of pastures, the degree to which rearing is intensive, the prices of feedstuffs, etc. In addition, the quality of grain and other feedstuffs fed to livestock may vary from one year to the next. Cost of production surveys and manufacturing surveys, which are the appropriate sources of such data, are not conducted regularly in most developing countries. Even where surveys are conducted, their coverage is usually limited (e.g. cost of production surveys cover only a few major crops or do not cover livestock commodities, etc.). Moreover, information on stock changes and losses/waste are often nearly non-existent or, at best, only

fractional in its coverage, e.g. commercial stocks of some commodities may occasionally be available from official sources or marketing authorities.

The data on quantity and value of agro-industry production and use of raw-material are generally collected by Ministry of Commerce / Industry through an Annual Survey of Industry. In most of the countries the coverage of these surveys are restricted to establishments above a given size of worker/ value of annual production or size of the capital employed. Data on production as well as intermediate consumption are tabulated using a classification prepared by a combination of ISIC and CPC. These data have following three major limitations:

- There are many gaps and missing value in the data on output and intermediate consumption as any items may be clubbed under "others",
- The quantity and value are not consistent, and
- The code used by the survey are very much aggregated e.g. vegetable and animal fat/oil are given the same class

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. Moreover, import and export transactions may not receive equal attention from the custom's administration because taxes or quantitative controls are generally concentrated more on import items than export. As a consequence, the reliability of export data may also be questionable.

The estimate of the total population is also a part of the set of ongoing official statistics. The *per caput* figure of each food commodity is obtained by dividing the figure for food available for human consumption by the total population partaking of it during the reference period, i.e. refers to *de facto* population. However, for many countries, this figure may also 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, foreigner/ diplomatic personnel and their dependents, foreign armed forces, etc., are not included. This omission may constitute a considerable part in some countries. This, therefore, would understate the total partaker population.

There are also problems related to the time-reference period to be used. Several twelve-month periods have been proposed and were indeed also applied. However, the application of a time-reference period during which the bulk of the harvest takes place may be a suitable choice provided that it is possible to linking the agricultural statistics with those of the industrial and other sectors of the economy.

4. Consistency check of the basic data and Compilation of SAFB

The compilation of SABF brings together a large database originating from a number of sources which have been collected following different methods. However, conceptually as these databases refer to a given population/area as well as the same reference period, these should converge to a common total. Three consistency exercises are executed to these databases to achieve the required convergence:

(a) Internal consistency of quantity and value data of agri-production, agro-industrial production, intermediate consumption, imports, exports and re-export are checked by compiling unit value of individual items and comparing these unit values with the various available price data collected in other independent enquiries. Temporal and cross section consistency is also examined to cover those items where independent price data are not available.

(b) Estimation of missing data and intra-industry consistency of the basic data are a common problem in the industrial statistics. Just to get over these problems intra-industry checks are imposed by comparing data on production and intermediate consumption at lower aggregation level (say at four digit ISIC level).

(c) Inter-industry consistency – It is very common that a single item can be used as input in many industries while same item can be available from a number of sources (e.g. from domestic production as well as from import). To have reliable estimates it is necessary that the supply and use of each item must match. To obtain such consistency SAU equation is used at somewhat higher level of aggregation of each product type.

Compilation of SAFB can be divided into two parts: (a) Creation of worksheets formats, and (b) preparing the basic data to compile the accounts. In the present paper these two aspects have been discussed in relation to Goods and Services Accounts for food products which compare well with the FAO's Supply and Use Account. The three consistency checks listed above have been incorporated in the basic formats of the worksheets. Format of the worksheet for Production and Generation of Income Accounts depend more on the type and quantum of data available for an individual country (as it has to take care of data gaps).

Basically two formats are required for compiling the SAFB. The first one relates to compiling basic data on production, intermediate consumption of food products producing establishments engaged in crop & animal husbandry, forestry, fishing and manufacturing establishments as well as data on import, export and re-export and

changes in stocks of food products. Data in these worksheets are collected after making an inventory of all statistical and administrative sources. Data on production, intermediate consumption and changes in stocks may be compiled using ISIC and CPC codes and data on foreign trade using the HS classification. As these data sets are available in quantity and value terms, it is suggested that unit values may be compiled and cross section and temporal consistency may be checked as indicated above. In summary following steps have been adopted to check consistency of agro-industry and external trade data:

Step I: Compile unit value for each item and compare the same with the price data obtained from other sources like domestic production and foreign trade,

Step 2: Estimate the missing quantity data for agro-industries output and input using value and unit prices.

Step 3: Estimate the gap in value data at four-digit level for output and input data using totals derived from national accounts data, and distribute the difference among items (available from Ministry of Commerce and Industry Survey at six digit level by ISIC_CPC code) on pro-rata basis.

Step 4: Estimate the quantity of output and input corresponding to this new blown-up data using unit value and value estimates.

Step 5: Compare quantity and value data of agro-industry output with the quantity and value of agro-industry input at 4-digit level to check the intra-industry consistency

The second worksheet relates to collating data from various sources. For this step the author has developed a set of SAFB codes which are also used to present the final results. The SAFB codes have been developed using the classification for food items in the "Classification of Individual Consumption According to Purpose (COICOP) recommended by the SNA. The classification has 9 main groups, 40 sub-groups and 321 items. To facilitate the work of compilation correspondence has been developed between SAFB codes with the HS Classification as well as with the ISIC_CPC codes which have been used for compilation of primary data in the format 1. Further links have been established with the SAFB codes and technical conversion factors relating to the nutrient content of food (Energy, protein, fat). The trade and transport margins and wastage rates have also been linked to SAFB codes to facilitate compilation. Annex .includes list of items included in summary results. In nut shell the worksheets to compile SAFB can be divided in four broad groups:

Group 1: Workbooks containing base data on crop, livestock, fishery, forest products and agro-industry data

Group 2: Worksheet containing structural data on classification of items of food, wastage rates, trade & transport margins and content of food in terms of energy, protein and fat

Group 3: Set of worksheets created to compile validated data on crop, livestock, fishery, forestry, agro-industry, foreign trade items on food

Group 4: Worksheet to compile the SAFB

5. Food Balance Sheet

A major concern of the FAO and its member countries is to raise levels of nutrition and standards of living. To meet this goal and to formulate national food and nutrition policies the following additional information is required:

(a) Quantities and types of food available for consumption in each country;

(b) Wastage and losses of food as a result of processing, distribution and other production channels as well as the food of consumption habits of the population;

(c) The current and evolving structure of the national food supply in terms of the major food commodities and their nutritive values;

(d) Various aspects of food availability such as domestic production of food; import or export of food products; set-up of food processing establishments in terms of production and capital formation, producer and consumer prices of food products; and generation of income.

FAO, in partial fulfilment of its goal, is preparing Food Balance Sheets which provides the most essential information. A Food Balance Sheet is a system of presenting a comprehensive view of a country's food supply for human consumption at national level. The food balance sheet shows for each food item -- i.e. for each primary commodity and for a number of processed commodities potentially available for human consumption -- the sources of its supply and its utilization. Thus it employs a supply and utilization account framework to arrive at apparent consumption (of food) of the population of the country defined in the following manner:

Apparent Consumption = (commercial production + estimated own account production for self consumption + import + opening stocks) minus (exports + re-export + usage input for processed food + seed + feed + non-food usage + wastage + closing stocks)

where: COMMERCIAL PRODUCTION (OF FOOD) is the total domestic production of food products (including derived products) finally available for human consumption. Food can be reported in terms of primary product equivalents, such as

wheat and milk, or in the form in which the products will actually be consumed, such as flour and cheese. OWN-ACCOUNT PRODUCTION FOR OWN-CONSUMPTION includes non-commercial production, production from kitchen gardens, food gathered from forest areas etc. IMPORT, EXPORT and RE-EXPORT include recorded as well as unrecorded foreign trade including food aid. OPENING and CLOSING STOCKS include governmental, commercial and farm held stocks. USAGE OF PROCESSED FOOD includes quantities of primary agricultural commodities used for production of processed food products such as cheese, alcoholic beverages, flour, pasta or pastry. SEED is an estimate of the amount of the agricultural product set aside for reproductive purposes, such as seed and sugar-cane for planting, eggs for hatching and fish for bait, whether domestically produced or imported. FEED is the amount of a commodity fed to livestock during the reference period, whether domestically produced or imported.

NON-FOOD USAGE is a miscellaneous category of utilization of food products that are neither identified nor used as food for the population of the country. This includes items such as use of oils and fats to produce soap and food used to feed tourists or refugees. This item is also sometimes used to record suspected statistical discrepancies arising from unrecorded exports. WASTE is an estimate of what is wasted at all stages of food production and distribution from the point at which production is first recorded. It includes waste in processing, storage and transportation. Waste from losses occurring before and during harvest as well as wastage by ultimate consumer household are excluded. Losses identified as waste normally occur as a result of inadequate storage practices, but also in cases where food remains unsold or there is wilful destruction of a product because of an imbalance between supply and demand. This is particularly true of perishable foods such as fresh fruits and vegetables.

The food balance sheet presents data on selected food product items in quantity terms, giving distribution of domestic supply and domestic utilization by broad categories as listed above; total per caput supply per year in quantity terms; and per caput per day supply in terms of quantity and also in terms of caloric value, protein and fat content.

6. Advantage of SAFB over FBS

The data on apparent food consumption derived from the SAFB are (a) based on establishment approach in comparison to FBS data which are based on individual items of food products, (b) SAFB provide data tabulated using “Classification of Individual Consumption According to Purpose (COICOP) recommended by the SNA and hence can be directly compared with the data on consumption expenditure of

households if available from independent survey, and (c) the SAFB data are available in terms of quantity consumed, value of quantity consumed and in terms of nutrients. This makes the data more useful for dynamic analysis. From the SAFB data it is also feasible to have clear views of import dependence for each category of food products as well as production efficiency of different class of establishments (household, private corporate sector and public sector). The SAFB data are likely to be more realistic as the system uses current inter-industry coefficients instead of fixed format of commodity tree as used by FBS. Another additional advantage comes from use of national accounts format in which primary data are compiled before bringing it into SAFB compilation.

Acknowledgment

This paper is based on the experience gained in Sultanate of Oman. This work is first of its kind where it was feasible to compile a full set of SEAFA accounts. The author gratefully acknowledges support provided by Dr Sabir Said Rashid Al-Harbi, Director General and Ms. Salima Al-Harthi, Head National Accounts, Directorate General of Economic Statistics, Ministry of National Economy, Sultanate of Oman and their staff for providing support to make my dream a reality. The author has also used the material available on FAO web-site on Food Balance Sheet and details provided by Ms. Gabriella Laurenti, (FIPS, FAO).

ANNEX: 1

Framework for satellite accounts for food balances

Account 1: Food Producing Establishments

Account 1.1: Production Account

USES	RESOURCES
1.Intermediate consumption for 1.1 ---------- 1.2 ---------- 1.3 ---------- 1.4 ---------- 2. Value added, gross	4.Gross output 4.1 primary (food) production of 4.1.1 ---------- 4.1.2 ---------- 4.1.3 ---------- 4.1.4 ---------- 4.2 secondary (non-food) production of 4.2.1 ---------- 4.2.2---------- 4.2.3 ---------- 4.2.4 5.Other products
3.Total uses	6.Total resources

Account 1.2: Generation of Income Account

USES	RESOURCES
1.Compensation of employees 2.Taxes on production 3.Taxes on imports 4.Subsidies (less) 5.Operating surplus 6.Mixed income	8. Value added, gross
7.Total uses	9. Total resources

Account 1.3: Capital Account

CHANGES IN ASSETS	FINANCING FOR CHANGES IN ASSETS
1.Gross fixed capital formation 1.1 1.2 1.3 1.4 2.Changes in inventories 2.1 2.2 2.3 2.4	4.Finances for gross capital formation
3.Gross capital formation	5.Finances for gross capital formation

Account 2: Goods and Services Account for food products

RESOURCES	USES
1.Gross output of primary food products 2.Import of food products 3.Food aids 4.Taxes on food products 5.Subsidies (less)	7.Output going to food production 8.Output going to non-food uses 9.Export of food products 10.Consumption waste 11.Food for consumption 12.Changes in inventories
6.Total supply	13.Total uses

ANNEX: 2

List of items included in summary presentation of the data in the SAFB tabulation

1. Bread and cereals
    - 11. Wheat & Wheat Flour
    - 12. Rice
    - 13. Other Cereals
    - 14. Cereal products
    - 15. Pulses
2. Meat and Poultry
    - 21. Cattle Meat
    - 22. Mutton Lamb
    - 23. Other Meat
    - 24. Poultry Meat
3. Fish and Sea Food
4. Milk, Cheese and Eggs
    - 41. Milk & Milk products
    - 42. Eggs
5. Oils and Fats
    - 51. Vegetable Oils
    - 52. Animal Fat
    - 53. Oil Seed
6. Fruits and Nuts
    - 61. Nuts
    - 62. Fruits
    - 63. Dates
7. Vegetables
    - 711. Potatoes
    - 712. Other Roots and Tubers
    - 72. Tomatoes
    - 73. Cabbages
    - 74. Chilies & Green Peppers
    - 75. Onions
    - 76. Other Vegetables
8. Sugar and Sugar Products
9. Food Products, n. e. c.
    - 91. Fruit Juices
    - 92. Stimulants
    - 93. Spices
    - 94. Other Food Products
    - 95. Alcoholic Beverage

Total